المؤتمر العلمي الدولي السادس للعلوم الصرفة والتطبيقية والتكنولوجية

VI. International Scientific Congress of Pure, Applied and Technological Sciences
VI. Uluslararası Fen, Uygulamalı ve Teknolojik Araştırmalar Kongresi

Full Text Book of Minar Congress 6

VI. International Scientific Congress of Pure, Applied and Technological Sciences

كتاب الوقائع
Tam Metin Kitabı
FULL TEXT BOOK

MINAR CONGRESS 6

INTRODUCTION

The Sixth International Conference on Scientific, Applied and Technological Research (MINAR CONGRESS) held between Remar Academy and Istanbul Gedik University from 3-4-5 August 2022, where Istanbul Gedik University is a stakeholder, is a sign of the resolute cooperation between institutions and organizations, their efforts and contributions Physical and moral.

Remar Academy brings together the different academic studies of the Turkish world on common ground. Persons who are distinguished in the scientific world in relation to different environments; One of the main purposes of the conference is to exchange scientific studies aimed at raising the level of development in education, literary, cultural, social, political, economic and other issues, and to present alternatives for solving bilateral or regional problems. Proceedings of the conference of the Remar Academy were prepared with the aim of transferring scientific production to the future as knowledge and contribution.

A total of 140 people applied for this conference, both at home and abroad. 113 people were accepted by the scientific committee; 3 of the accepted papers were from Turkey and 110 of them were from 7 countries outside Turkey. The conference was attended by 44 participants online and face to face, and 69 participants online. 50 complete papers and the rest of the articles were approved by the Scientific Committee to be published in Minar.

I would like to thank all scholars and express my respect for their valuable contributions to our conference.

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EFFECTS OF ADDITIVE DIFFERENT LEVELS CINNAMON AND CORIANDER POWDERS ON HEMATOLOGY AND BIOCHEMICAL PARAMETERS IN COMMON CARP CYPRINUS CARPIO L

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Abstract:

The effects of additive cinnamon Cinnamomum sp. and coriander Coriandum sativum Linn. powders on hematology and biochemical parameters in common carp Cyprinus carpio L. for 56 days were examined in this research. In comparison to control, 210 fish (81 gm fish) fed on dietary contained 1.25, 1.5, 1.75 percent cinnamon powder(diet 2,3,and 4) and coriander powder (diet 5,6, and 7) powder (diet 1). The PCV and Hb values of the fish fed the fourth, fifth, sixth, and seventh diets were significantly different ($P \leq 0.05$) from those of the fish fed the control diet. Biochemical characteristics revealed no major variations in albumin, globulin, or total protein (except in diets 2and3).The findings showed that there were no significant differences in the glucose values between the control diet and all experimental rations (except the fourth diet), but fish fed cinnamon diets had a significant decrease in cholesterol and a significant decrease in triglyceride values (diet 1 and 3). The findings show that adding cinnamon was the most effective compared with coriander in lowering glucose and triglycerides in the blood of the fish studied.

Key words: Cinnamon, Coriander, Common Carp, Blood Picture, Biochemical, Characteristics.

Introduction:

The spread and spread of diseases caused by pathogens (parasites, viruses, bacteria ... etc.) or caused by environmental factors are a major obstacle in aquaculture projects as they cause huge economic losses in these projects (Humphrey and Langdon, 1985; Brown, 1993; Noga, 2000). Blood parameters can be used to detect physiological changes in intensively farmed fish, as well as to forecast or diagnose disease. On the physiological condition of fish, where the blood picture can reflect the health and physiological state of the fish, and blood tests are used in conjunction with other diagnostic methods to determine stress-causing circumstances or diseases (Tavares-Dias and Moraes, 2004; Tavares-Dias and Moraes, 2006; Tavares-Dias and Moraes, 2007; Pavlidis et al., 2007). Blood is the most commonly studied tissue in vertebrates to identify their health or physiological status. As a result, main blood indicators such as red blood cells (RBC), hemoglobin (Hb), and packed cell volume are used to indicate health condition, such as oxygen carrying capacity (PCV) (Houston, 1997)Also, total protein and its parts can also indicate the health status of fish through their positive effects and to a large extent on the immune system of the body and thus the animal's immunity (Sala-Rabanal *et al* ., 2003; Peyghan *et al* ., 2014 ; Tan *et al* ., 2017). In addition to the Mean Corpuscular Hemoglobin Concentration (MCHC), which is one of the blood indicators for diagnosing anemia (Gabriel *et al.*,2015). Fish also adapt during stress conditions through changes in metabolic functions(Malarvizhi *et al.*,2012) Where the enzymes ALT, AST and others are stimulated or inhibited, which through their presence in the blood serum can indicate the occurrence of damage to body tissues such as liver tissue (Nemcsok and Boross, 1982; Webb *et al.*,2005) This indicates that these enzymes could be used as a marker of chemical stress in addition to their function in linking protein and carbohydrate metabolism (Abhijith, 2016). The aim of this study is to know the effect of medicinal plants represented by cinnamon and coriander on the blood picture and the biochemical characteristics of the blood.

Materials and Methods:

Study position:

The study lasted eight weeks, from November 22 to January 15, 2020, in the fish laboratory of the Department of Animal Production at the College of Agriculture and Forestry/University of Mosul.

Experience with fish:

In Iraq, the common carp, Cyprinus carpio L., has been employed as the primary breeding fish. 210 carp fish with an average of 81.1 grams per fish were divided into 21 glass aquariums of 40 x 60 x 40 cm, each containing ten fish and three replications /treatment. Before beginning the feeding experiment, the fish were acclimatized in a greenhouse for three weeks.

Breeding water's qualitative characteristics:

Dechlorinated tap water was utilized in a tank with a capacity of 70 liters to eliminate waste and maintain a safe environment for the fish. Twenty to thirty percent of the water is replenished every 24 hours. Temperatures of 24–26°C, pH 7.7–7.8, and dissolved oxygen 5.5–6.0 mg/l were the averages for specific physical and chemical parameters for the course of the experiment. These values are within the acceptable and recommended ranges (FAO, 1981).

Experimental diets:

Seven experimental diets were prepared. Diets 2, 3 and contained cinnamon powder *Cinnamomum zeylanicum,* at 1.25, 1.5, 1.75% while 4, 5 and 6 contained coriander powder *coriandum sativum* Linn. with same percentage, first diet free of additives (Table 1). The fish were fed at a rate of 3% of their live weight at the rate of two meals per day.

Statistical analysis:

The results were statistically analyzed using the data package (SPSS), version 25 (SPSS, USA, 2017) software and a complete randomized design to identify the effects of cinnamon and coriander additions on hematological and biochemical parameters (CRD). The significant differences between groups were determined using Duncan's multiple range test (Duncan, 1955). All of the results were expressed using the means. Significant differences were presented at the 0.05 significance level.

Table 1: Different quantities of cinnamon and coriander are present in the experimental diets' dietary components and proximate (percent DM).

experimental diets ／ ingredients	Control	Cinnamon			Coriander		
		1.25%	1.5%	1.75%	1.25%	1.5%	1.75%
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Fish meal	10	10	10	10	10	10	10
Soybean meal	30	30	30	30	30	30	30
Cinnamon powder	——	١,٢٥	1.5	1.75	——	——	——
Coriander powder	——	——	——	——	1.25	1.5	1.75
Wheat bran	19	19	19	19	19	19	19
Yellow corn	18.5	18.5	18.5	18.5	18.5	18.5	18.5
Local barley	20	20	٢٠	20	20	20	20
Binder (lingotech*)	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Vita. & Miner. Mix.	1	1	1	1	1	1	1
Food salt	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Lime stone	0.5	0.5	0.5	0.5	0.5	0.5	0.5
chemical analysis							
Dry matter	92.81	93.91	94.13	94.70	94.32	93.65	93.76
Crude protein	25.33	25.48	25.51	25.54	25.50	25.54	25.57
Ether extract	4.75	5.13	6.11	5.49	5.52	7.76	6.84
Crude fiber	6.38	6.63	6.68	6.73	6.73	6.80	6.87
Ash	5.99	5.71	5.78	5.47	5.57	5.77	5.89
NFE	57.55	50.96	50.05	51.47	51.00	47.78	48.59
ME(MG/KG)**	14.1	13.93	13.46	13.7	13.5	13.8	13.7

* lingosulphate feed binder EEC No . E565 (0.5g/kg).

** According to Smith's equation (1971): Protein x 18.5 + Fat x 33.5 + NFE x 13.8.

Hematological and biochemical parameters:

After eight weeks of the study ended, the fish were anesthetized with a spinal cord destruction method (Lucky 1977). Blood samples were drawn from the caudal vein behind the caudal fin, using a 3 mL plastic syringe. The blood samples were divided into two parts, the first section. The blood was placed in glass tubes that did not contain an anticoagulant to obtain serum The tubes were left tilted at room temperature for half an hour, and then placed in a centrifuge at a speed of 3000 rpm for ten minutes, 1st segment To acquire blood serum, blood was placed in glass tubes without anticoagulant, the tubes were tilted at room temperature for half an hour, Then a concentrated centrifugation process was conducted at 3000 rpm for ten minutes. The serum was withdrawn by a fine pipette and kept in special tubes to keep the serum at -20 ° C until the completion of the laboratory tests. The second portion of the blood was stored in plastic tubes containing anticoagulants (EDTA) for the purpose of subsequent blood tests. The haematological parameters were estimated Included (Hb, PCVand MCHC). The differential count of white blood cells (lymphocyte and hetrophils) was also performed to calculate the stress index, Biochemical parameters included an estimate albumin, globulin, total protein, glucose, cholesterol, triglycerides, ALT and AST.

Results and Discussion:

1- PCV, Hb and MCHC:

The results reported in the table (Table 2) showed that there were significant differences (P≤0.05) in the PCV and Hb criteria when adding cinnamon powder at 1.75%(diet 4) and coriander(diet 5,6, and 7) with their three levels (1.25%, 1.5% and 1.75%) to fish diets, which exceeded significantly for fish fed on a control diet. The results confirmed significant superiority (P≤ 0.05) when adding coriander powder to fish diets in the MCHC criteria compared to the control diet with its three levels (1.25%, 1.5%, 1.75%), although cinnamon had no effect on the significant difference (Table 2).

Table 2: Effects of cinnamon and coriander on common carp PCV, Hb, and MCHC (Mean SE).

Criteria \\ Diets	PCV %	Hb (gm/100ml)	MCHC %
(1) Control	17.33 ± 0.33 c	5.37 ± 0.13 c	33.03 ± 0.13 bc
(2) Cinnamon 1.25%	19.66 ± 1.45 bc	6.50 ± 0.49 c	33.00 ± 0.05 c
(3) Cinnamon 1.5%	20.33 ± 1.20 bc	6.76 ± 0.39 bc	33.23 ± 0.06 ab
(4) Cinnamon 1.75%	27.00 ± 1.15 a	8.96 ± 0.37 a	33.20 ± 0.05 abc
(5) Coriander 1.25%	25.33 ± 1.33 ab	8.43 ± 0.43 ab	33.26 ± 0.03 a
(6) Coriander 1.5%	27.33 ± 2.84 a	9.10 ± 0.95 a	33.26 ± 0.03 a
(7) Coriander 1.75%	27.33 ± 2.48 a	9.10 ± 0.95 a	33.26 ± 0.03 a

*Means not sharing a common superscript letter are significantly differences(P≤ 0.05).

It appears that medicinal herbs in this study, especially cilantro, contain oils that are characterized by the presence of many antioxidants in addition to their positive effects on pathological microorganisms, which provides a safe environment for the content of the digestive system, which encourages the use of nutrients that positively impact fish growth by improving the utilization of nutrients.(Al Shakarchi and Mohammad, 2021) These results are in agreement with what was obtained by Al-Hadidi (2016) in carp fish and Ahmad *et al.* (2011) in tilapia in the presence of significant differences in the parameters of the volume of blood cells and hemoglobin when adding cinnamon. Farsani *et al.* (2019) also indicated that there was a significant increase in the hemoglobin values and the mean MCHC of trout compared with the control diet.

2- Albumin, globulin total protein:

Table (3) shows the the albumin concentration decreased significantly (P≤0.05) for the second and third treatments (cinnamon 1.25% and cinnamon 1.5%) compared with the control diet. Furthermore, there was no substantial difference in globulin and total protein criteria (P≤0.05) between the control treatment and the other treatments under investigation.

Table 3: Effect of cinnamon and coriander on albumin, globulin, and total protein levels in common carp (Mean SE).

Criteria / Diets	Albumin (gm/100ml)	Globulin (gm/100ml)	Total protein (gm/100ml)
(1) Control	13.33 ± 0.66 a	18.0 ± 1.00 a	31.33 ± 0.88 ab
(2) Cinnamon 1.25%	10.66 ± 0.33 b	20.0 ± 1.52 a	31.66 ± 1.20 a
(3) Cinnamon 1.5%	10.66 ± 0.66 b	20.0 ± 0.57 a	30.66 ± 0.33 ab
(4) Cinnamon 1.75%	11.0 ± 0.57 ab	18.0 ± 0.57 a	29.00 ± 1.00 b
(5) Coriander 1.25%	11.6 ± 0.88 ab	18.3 ± 0.88 a	30.00 ± 0.00 ab
(6) Coriander 1.5%	11.33 ± 0.88 ab	19.33 ± 0.66 a	30.66 ± 0.33 ab
(7) Coriander 1.75%	11.33 ± 0.88 ab	19.33 ± 0.66 a	30.66 ± 0.33 ab

*Means not sharing a common superscript letter are significantly differences(P≤ 0.05).

Ahmad et al. (2011) indicated that the total protein values were significantly increased with the increase in the percentage of addition of cinnamon when feeding Nile tilapia fish. Farsani *et al* ., (2019) These results were in agreement with the findings of Farsani *et al.* (2019) that there were no significant effects of these additives on the parameters of albumin, globulin and total protein in trout fish.

3- Glucose, cholesterol and triglycerides:

The results of the statistical analysis of the blood glucose content shown in Table (4) indicate that adding 1.75 percent cinnamon powder (the fourth diet) resulted in a significant decrease (P≤0.05) in the amount of glucose in the blood, which reached 74 mg / 100 ml, suggesting that the level of glucose was significantly reduced. Meanwhile, fish fed a control diet had a concentration of 94.66 mg/100 ml.

In contrast to the control diet 133.0 mg / 100, adding cinnamon to 1.75 percent (the fourth diet) resulted in a substantial decrease in cholesterol value, which reached 90.33 mg / 100 ml for fish fed on the diet. Adding cinnamon did not reduce cholesterol in the body, but went beyond it to reduce the percentage of triglycerides, as it is noted in Table (4) the positive effect when feeding fish on cinnamon by 1.25% (the second diet) and 1.75% (the third diet), where the value of this is reached Criterion 189.66 and 213.0 mg / 100 ml, respectively, which differed significantly (P≤ 0.05) from the control diet. No significant difference (P≤ 0.05) was recorded when fish fed on diet coriander powder compared with control diet.

As it can be seen from the table, there are significant differences in the cholesterol standard The addition of cinnamon has resulted in a percentage (1.25 ,1.5 ,1.75)% To moral decline (P≤ 0.05) In value this criterion, while adding coriander at rates (1.25, 1.5 and 1.75%) did not lead to a change in the level of cholesterol in fish blood serum for these treatments compared with the serum cholesterol level in the control fish, which was 133.0 mg / 100 ml. The addition of cinnamon did not reduce the level of cholesterol in the body, but went beyond it to reduce the percentage of triglycerides. The positive effect of feeding fish cinnamon was 1.25 percent and 1.75 percent (the second and fourth diets, respectively), which were significantly different (P≤ 0.05) from the control diet. When fish were fed coriander powder at varied levels compared to the control meal, no significant differences were

Table 4: The effects of different cinnamon and coriander additions on common carp glucose, cholesterol, and triglycerides (Mean SE).

Criteria / Diets	Glucose (mg/100ml)	Cholesterol (mg/100ml)	Triglyceride (mg/100ml)
(1) Control	94.66 ± 14.66 a	133.0 ± 1.52 a	266.33 ± 22.58 a
(2) Cinnamon 1.25%	90.33 ± 2.60 ab	92.66 ± 3.52 bc	189.66 ± 4.66 c
(3) Cinnamon 1.5%	84.33 ± 0.88 ab	97.0 ± 1.00 bc	240.0 ± 17.32 ab
(4) Cinnamon 1.75%	74.0 ± 3.46 b	90.33 ± 14.16 c	213..0 ± 1.52 bc
(5) Coriander 1.25%	88.33 ± 1.20 ab	125.66 ± 13.83 ab	259.66 ± 22.87 ab
(6) Coriander 1.5%	85.33 ± 1.20 ab	111.66 ± 11.89 abc	241.2 ± 11.35 ab
(7) Coriander 1.75%	85.33 ± 1.20 ab	111.66 ± 11.89 abc	241.3 ± 11.35 ab

*Means not sharing a common superscript letter are significantly differences(P≤ 0.05).

The polyphenol and cinnamaldehyde compounds in cinnamon improve blood glucose and fatty acid metabolism (Gruenwald *et al.* 2010). Jarvill-Taylor *et al* (2001) indicated that the addition of polyphenols mimics the action of insulin to stimulate glucose metabolism. Cinnamaldehyde can also increase fat metabolism (Jayaprakasha & Rao, 2011). Cinnamon's bioactive substances, such as tannins, saponins, and flavonoids, lower cholesterol and triglycerides while raising HDL (high density lipoprotein) (Azima *et al* ., 2004). According to Talpur *et al.*, (2005), polyphenols have the same insulin function (insulin memetic). Peroxisome proliferator-activated receptors are also stimulated and energized by cinnamaldehyde (PPAR). Chang *et al* ., (2001) indicated that cinnamon has biological anti-diabetic properties. Adding 1% cinnamon to a tilapia diet resulted in the lowest glucose and total fat content (Ahmad *et al* ., 2011). It's likely that low blood sugar is induced by more effective delivery of blood sugar to the cell and use of it as a source of energy,

which prevents the production of fats and thereby decreases the amount of fat in the body. It also demonstrates the potential of using cinnamon extract to tackle high cholesterol in the blood, due to its ability to lower total cholesterol, lower low density lipoprotein (LDL) cholesterol, and increase high density lipoprotein (HDL) cholesterol. Low cholesterol levels, as well as lower triglyceride levels, function to prevent fat accumulation in the liver of rabbits (Azima ,2004). An increase in metabolism will hasten the adjustment of glucose and fatty acids in the blood, thereby improving fish health and allowing the precipitated protein to be used for development (Rahmawati and Ubaidillah., 2017). An increase in metabolism will hasten the adjustment of glucose and fatty acids in the blood, thereby improving fish health and allowing the precipitated protein to be used for development (Rahmawati and Ubaidillah., 2017).

Hetrophils, lymphocytes and stress index:

The general and non-specific reactions to any factor or circumstance (physical or mental harassment) that affect the normal state and homeostasis of the body and lead to the secretion of hormones related to stress or lead to a specific physiological reaction. The response to the effect of stress is through neurological and hormonal control as it activates the sympathetic nervous system and the secretory areas in the kidneys, which in turn release the stress hormones adrenaline and cortisol (Wendelaar Bonga .,1997 ; Svoboda .,2001). In mild cases of stress, the internal balance is usually restored after a while, while the prolonged or severe stress period depletes the organism's ability to resist, which leads to a disturbance in the immune mechanisms or physiological disorders such as changes in blood composition such as an increase in glucose and fatty acid concentrations as well as an increase The activity of some enzymes or the occurrence of death in severe cases, and for fish, stress occurs due to many factors, including biological reactions (such as parasitic infections and intense competition) or environmental factors (changes in temperature, oxygen concentrations, pH, and pollution) and factors related to culture (such as high density and transportation) (Witeska., 2005). the addition of cinnamon and coriander powder in different proportions led to a significant decrease (P≤ 0.05) in the numbers of heterogeneous cells as shown in Table (5) for the control system. However, the addition of these two types of herbs had no significant effect on the number of lymphocytes compared to the control diet (with the exception of adding cilantro at 1.25%). The results of the stress criterion analysis showed positive evidence in reducing the value of this criterion significantly when adding these two types of herbs to the control diet (table 5) with the exception of adding coriander

powder by 1.25%, and this is due to the containment of cinnamon and coriander many of the antioxidants mentioned previously.

4- ALT and AST:

Except for the level of addition of 1.5 percent cinnamon, the positive results obtained as a result of adding cinnamon and coriander in reducing the stress index were also shown to significantly decrease the values of ALT (P 0.05) while adding cinnamon and coriander in varying quantities (Table 6). The addition of coriander had no effect on the AST enzyme activity values for the fifth, sixth, and seventh rations, but the addition of cinnamon powder resulted in a significant decrease in AST values (P 0.05) in the fish fed the second and third rations (1.5 and 1.75 percent cinnamon), respectively, when compared with the control diet (diet 1).

Table 5: Effects of cinnamon and coriander on hetrophils, lymphocyte, and stress index of common carp (Mean ± SE).

Criteria \ Diets	Hetrophils	Lymphocyte	Stress index %
Control (1)	28.66 ± 1.76 a	89.66 ± 1.45 a	31.95 ± 0.018 a
Cinnamon 1.25% (2)	21.33 ± 1.33 b	86.00 ± 3.05 a	24.98 ± 0.025 bc
Cinnamon 1.5% (3)	18.66 ± 1.33 bc	84.66 ± 2.90 a	22.09 ± 0.017 cd
Cinnamon 1.75% (4)	15.66 ± 0.33 c	84.33 ± 0.33 a	18.58 ± 0.004 d
Coriander 1.25% (5)	22.66 ± 1.33 b	77.33 ± 1.33 b	29.38± 0.021 ab
Coriander 1.5% (6)	20.10 ± 1.15 b	83.33 ± 1.66 ab	24.02 ± 0.014 bcd
Coriander 1.75% (7)	20.00 ± 1.15 b	83.33 ± 1.66 ab	24.04 ± 0.014 bcd

*Means not sharing a common superscript letter are significantly differences(P≤ 0.05)

Table 6: Effects of cinnamon and coriander on ALT and AST of common carp (Mean ± SE).

Criteria / Diets	ALT (IU/L)	AST (IU/L)
(1) Control	201.0 ± 14.43 a	279.3 ± 5.78 a
(2) Cinnamon 1.25%	94.3 ± 1.20 d	170.6 ± 1.20 c
(3) Cinnamon 1.5%	179.3 ± 5.20 ab	220.6 ± 14.76 b
(4) Cinnamon 1.75%	161.0 ± 21.65 bc	254.6 ± 7.31 ab
(5) Coriander 1.25%	169.3 ± 4.05 bc	261.0 ± 24.57 ab
(6) Coriander 1.5%	136.4 ± 2.0 c	245.2 ± 11.13 ab
(7) Coriander 1.75%	136.0 ± 2.0 c	245.0 ± 11.13 ab

*Means not sharing a common superscript letter are significantly differences(P> 0.05).

Conclusion:

The study concluded that adding cinnamon and coriander to fish diets is important to improving the hematology and biochemical characteristics of fish.

References

1. **Abhijith**, B. D., Ramesh, M., and Poopal, R. K. (2016). Responses of metabolic and antioxidant enzymatic activities in gill, liver and plasma of *Catla catla* during methyl parathion exposure. The Journal of Basic and Applied Zoology, 77, 31-40.

2. **Ahmad**, M. H., El Mesallamy, A. M., Samir, F., and Zahran, F. (2011). Effect of cinnamon (*Cinnamomum zeylanicum*) on growth performance, feed utilization, whole-body composition, and resistance to *Aeromonas hydrophila* in nile tilapia. Journal of Applied Aquaculture, 23(4), 289- 298.

3. **Al Shakarchi** and Mohammad.(2021). Effects of additive different levels cinnamon and coriander powders on growth performance, feed utilization, survival rate and body chemical composition of common carp *Cyprinus carpio* L. . Plant Archives Vol. 21, Supplement 1, 2021 pp. 46-54

4. **Al-Hadidi**, M.A. A. (2016). Effect of using star anise and cinnamon in diets of common carp *Cyprinus carpio* L. on growth and physiological characteristics. (M.Sci. Thesis, College of Agriculture, University of Diyala, The Republic of Iraq).54pp. [in Arabic].

5. **Azima**, F. (2004). Antioxidant and anti-pletelet aggregation activities of *cassia vera (Cinnamomum burmanni Neess ex Blume)* bark extract and its potency in preventing atherosclerosis in rabbit (Doctoral dissertation, Dissertation, Graduate School, Bogor Agricultural University). 122 pp. [in Indonesian].

6. **Azima**, F., Muchtadi, D., Zakaria, F. R., and Priosoeryanto, B. P. (2004). Anti-hypercholesterolemic Potency of Cassia Vera (*Cinnamomum burmanni Nees ex Blume*) Bark Extract. Jurnal Teknologi dan Industri Pangan, 15(2), 145-145. [in Indonesian].

7. **Brown**, L., (1993). Aquaculture for Veterinarians. Fish Husbandry and Medicine. Pergamon Press Ltd., Oxford.

8. **Chang**, S. T., Chen, P. F., and Chang, S. C. (2001). Antibacterial activity of leaf essential oils and their constituents from *Cinnamomum osmophloeum*. Journal of ethnopharmacology, 77(1), 123-127.

9. **Duncan**, C.B. (1955). Multiple rang and Multiple " F " test. Biometric, 11: 1-12.

10. **FAO**, Food and Agriculture Organization of the United Nations (1981). Report of the symposium on new developments in the utilization of the heated effluents in the circulation system for intensive aquaculture stavanger, 29-30 ,Rome. Italy.

11. **Farsani**, M. N., Hoseinifar, S. H., Rashidian, G., Farsani, H. G., Ashouri, G., and Van Doan, H. (2019). Dietary effects of *Coriandrum sativum* extract on growth performance, physiological and innate immune responses and resistance of rainbow

trout (*Oncorhynchus mykiss*) against Yersinia ruckeri. Fish and shellfish immunology, 91, 233-240.

12. **Gabriel**, N. N., Qiang, J., He, J., Ma, X. Y., Kpundeh, M. D., & Xu, P. (2015). Dietary Aloe vera supplementation on growth performance, some haemato-biochemical parameters and disease resistance against Streptococcus iniae in tilapia (GIFT). Fish & Shellfish Immunology, 44(2), 504-514.

13. **Gruenwald**, J., Freder, J., and Armbruester, N. (2010). Cinnamon and health. Critical reviews in food science and nutrition, 50(9), 822-834.

14. **Houston**, A. H. (1997). Review: Are the classical hematological variables acceptable indicators of fish health?. Transactions of the American Fisheries Society, 126(6), 879-894.

15. **Humphrey**, J. D., & Langdon, J. S. (Eds.). (1985). Proceedings of the Workshop on Diseases of Australian Fish and Shellfish (27-30 May 1985, Benalla, Victoria*).* Australian Fish Health Reference Laboratory, Benalla. 311 pp.

16. **Jarvill-Taylor**, K. J., Anderson, R. A., and Graves, D. J. (2001). A hydroxychalcone derived from cinnamon functions as a mimetic for insulin in 3T3-L1 adipocytes. Journal of the American College of Nutrition, 20(4), 327-336.

17. **Jayaprakasha**, G. K., and Rao, L. J. M. (2011). Chemistry, biogenesis, and biological activities of *Cinnamomum zeylanicum.* Critical reviews in food science and nutrition, 51(6), 547-562.

18. **Lucky**, Z.(1977). The diagnosis of Bacterial disease by infection experiments. In Hoffman G.L(ed) methods for diagnosis of fish disease. Amerind New Delhi.p40.

19. **Malarvizhi**, A., Kavitha, C., Saravanan, M., & Ramesh, M. (2012). Carbamazepine (CBZ) induced enzymatic stress in gill, liver and muscle of a common carp, *Cyprinus carpio.* Journal of King Saud University-Science, 24(2), 179-186.

20. **Nemcsok**, J., & Boross, L. (1982). Comparative studies on the sensitivity of different fish species to metal pollution. Acta Biologica Academiae Scientiarum Hungaricae, 33(1), 23-27.

21. **Noga**, E.J., (2000). Fish Disease Diagnosis and Treatment. Iowa State University, Ames, Iowa. Norousta, R.,Mousavi-Sabet, H., 2013. Comparative characterization of blood cells and hematological parameters between the mature and immature Caspian *Vimba, Vimba vimba persa* (Teleostei, Cyprinidae). Aquac. Aquar. Conserv. Legis. 6.

22. **Pavlidis**, M., Futter, W.C., Kathario, P., Divanach, P., (2007). Blood cells of six Mediterranean mariculture fih species. J. Appl. Ichthyol. 23, 70–73.

23. **Peyghan**, R., Khadjeh, G. H., & Enayati, A. (2014). Effect of water salinity on total protein and electrophoretic pattern of serum proteins of grass carp, Ctenopharyngodon idella. In *Veterinary research forum: an international quarterly*

journal (Vol. 5, No. 3, p. 225). Faculty of Veterinary Medicine, Urmia University, Urmia, Iran.

24. **Rahmawati**, F. F., and Ubaidillah, M. F. (2017). The Effect Different Dossage of Cinnamomum Leaves (*Cinnamomum burmanni*) Supplementation on Growth and Survival Rate of Tilapia (*Oreochromis niloticus*). Aquacultura Indonesiana, 18(2), 62-66.

25. **Sala-Rabanal**, M., Sánchez, J., Ibarz, A., Fernández-Borràs, J., Blasco, J., & Gallardo, M. A. (2003). Effects of low temperatures and fasting on hematology and plasma composition of gilthead sea bream (Sparus aurata). *Fish physiology and biochemistry*, *29*(2), 105-115.

26. **Smith**, R. G. (1971) . A method for measuring digestibility and metabolizabble of energy of feeds . Prog. Fish Cult. . 33 : 132 - 134 .

27. **SPSS**, Statistical Package for Social Science (2017) ،SPSS Version 25, SPSS Inc, U.S.A.

28. **Svoboda**, M. (2001). Stress in fishes. A review. Bulletin VURH Vodnany. 4: 169-191 (Czech Republic). [In Czech].

29. **Talpur**, N., Echard, B., Ingram, C., Bagchi, D., and Preuss, H. (2005). Effects of a novel formulation of essential oils on glucose–insulin metabolism in diabetic and hypertensive rats: a pilot study. Diabetes, Obesity and Metabolism, 7(2), 193-199.

30. **Tan**, X., Sun, Z., Chen, S., Chen, S., Huang, Z., Zhou, C., ... & Ye, C. (2017). Effects of dietary dandelion extracts on growth performance, body composition, plasma biochemical parameters, immune responses and disease resistance of juvenile golden pompano *Trachinotus ovatus*. Fish & Shellfish Immunology, 66, 198-206.

31. **Tavares-Dias**, M., & Moraes, F. R. D. (2007). Leukocyte and thrombocyte reference values for channel catfish (Ictalurus punctatus Raf), with an assessment of morphologic, cytochemical, and ultrastructural features. *Veterinary Clinical Pathology*, *36*(1), 49-54.

32. **Tavares-Dias**, M., Moraes, F.R., (2006). Hematological parameters for the Brycon orbignyanus Valenciennes, 1850 (Osteichthyes: Characidae) intensively bred. *Hidrobiológica*, *16*(3), 271-274.

33. **Tavares-Dias**, M., Moraes, F.R.,(2004). Hematologia de peixes teleósteos. Ribeirão Preto, Villimpress Complexo Gráfio.

34. **Webb**, D., Gagnon, M. M., & Rose, T. (2005). Metabolic enzyme activities in black bream (*Acanthopagrus butcheri*) from the Swan-Canning Estuary, Western Australia. Comparative Biochemistry and Physiology Part C: Toxicology & Pharmacology, 141(4), 356-365.

35. **Wendelaar Bonga**, S. E. (1997). The stress response in fish. Physiological reviews, 77(3), 591-625.

36. **Witeska**, M. (2005). Stress in fish-hematological and immunological effects of heavy metals. Electronic journal of ichthyology, 1(1), 35-41.

CURRENT DIABETES CLASSIFICATION AND PREDICTION MODELS USING INTELLIGENT TECHNIQUES: REVIEW

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Abstract:

Diabetes mellitus (DM) is an incurable disease and should be submitted to monitoring and control for life. Diabetes is a chronic disease that arises when the pancreas fails to secrete adequate insulin or the insulin hormone produced by the pancreas is not being used efficiently. Diabetes is one of the diseases that are most quickly growing and spreading in the world, as It has now become a major global health issue that attracted the interests of researchers in the medical field to find solutions to diagnose, prevent and treat this disease. One of those solutions includes the use of tools and techniques that have arisen in the field of computer science. Most researchers have used artificial intelligence (AI) techniques and machine learning tools to develop classifier or prediction models. This study presents review of the intelligent techniques of diabetes classification and prediction published in the last six years. The review covers all stages of any diabetes prediction model including the dataset used, preprocessing techniques, intelligent algorithms of machine learning, and evaluation methods. Additionally, this study aims to reveal the purposes for which machine learning methods are used in the prediction and classification of diabetes in the literature research.

Key words: Diabetes, Intelligent Techniques, Classification and Prediction Models.

Introduction:

The human body needs energy to accomplish activities. Energy is produced in our body by converting food into glucose. When insulin is secreted by the pancreas, it transports glucose into the cells of the body in order to produce energy to make our bodies function perfectly [1]. Diabetes is Characterized by chronic hyperglycemia that arises when the pancreas does not create adequate insulin or when the insulin hormone produced by the pancreas is not being used efficiently. As a result, the person cannot efficiently use the glucose, which is the sugar that passes into the blood from the eaten food, and blood sugar rises [2]. It can also cause various diseases such as diabetes, heart disease, kidney disease, eyes, nerve damage, and blood vessel damage [3,4]. The main symptoms of high blood sugar are frequent urination, polydipsia, weight loss, blurred vision, and Impairment of growth. Most cases of diabetes are classified into two types of pathogens. Type 1 diabetes, the cause of which is the inability of the pancreas to produce adequate insulin. People at high risk of suffering this kind of diabetes can be diagnosed by serological evidence of the autoimmune disease process that occurs in the islets of the pancreas and by genetic elements. The other type, which is the most common, type 2 diabetes, is caused by a combination of insulin sensitivity and failure of respond to compensatory insulin production.

The glucose values existed in the foods we eat are the direct and important factor in the formation of blood sugar. The biological factors: Digestion, circulation, amount of insulin and body cells are also factors that affect blood sugar during the time between the glucose in the meals and the transition from blood to cells. These biological factors differ from person to person and in different situations of the person. For example, when the person is excited, afraid or does an activity that changes the circulation rate, physiological factors also change and affect blood sugar. In addition to the fact that biological factors differ from person to person, such changes in the person make the estimation of the blood sugar value a very difficult problem.

The advances in computer techniques such as Machine Learning (ML) and Artificial Intelligence (AI) have led to the automated identification and diagnosis of DM at an early stage, which is more efficient than the DM recognition manner by human [5]. ML is a subfield of artificial intelligence that solves a wide range of issues, including image and voice recognition by learning from examples rather than developing solutions using coded programs. Thanks to machine learning algorithms, it has become possible to analyze and interpret large patient data stored in a computer environment. In recent years, the health sector has been considered one of

the most important areas that have used machine learning techniques in diagnosing and predicting diseases. This study targets to determine for which purposes machine learning methods applied in diabetes prediction and classification is used with literature research.

1. DIABETES MELLITUS DESCRIPTION

Diabetes Mellitus (DM), sometimes known as diabetes, is a term that points to a set of diseases that affect how the body transforms food into energy. When food is consumed, the body transforms it into glucose, a sugar that is then transported to the circulation. Insulin is a hormone released by the pancreas gland to help glucose move from the bloodstream to the cells that need it for energy [6]. Diabetes is a disease in which the body's mechanism to manage blood sugar (glucose) is disrupted, resulting in an excess of sugar in the blood (hyperglycemia), which can lead to major health problems such diabetic retinopathy, nephropathy, and neuropathy [7].The oppositional and cooperative action of the two pancreatic hormones, insulin and glucagon, secreted by Beta and Alpha cells of the islets of Langerhans, respectively, keeps plasma glucose levels within a restricted range in most people. High blood glucose levels (BGLs) in normal people cause insulin to be produced, allowing glucose to be absorbed by target cells. Glucagon causes glycogen to be transformed into glucose in low-glucose situations. In diabetics, however, this coordinated system is broken, resulting in chronically high blood glucose levels, a condition called as hyperglycemia. Furthermore, many diabetes patients seek to prevent BGLs that are too low or hypoglycemia [8].

Two forms of diabetes can be recognized based on pathophysiology, type I and type II. The complete destruction of Beta cells characterizes type I diabetes (also called insulin-dependent Diabetes), resulting in fast development of near-absolute insulin insufficiency [9,10]. Type II diabetes is a chronic metabolic illness that worsens with time (also known as metabolic disorder, non-insulindependent, or adult-onset diabetes). Unlike type I diabetes, patients with type II diabetes can still make insulin, but their bodies are unable to utilize it efficiently, The beta cells get exhausted, resulting in a steady decrease in the beta cells' ability to produce insulin. Patients with type 2 diabetes do not suffer the severe insulin deficit observed in type I diabetes, and they may typically be managed successfully for many years with lifestyle modifications or oral medications [11].

2. THE BASICS OF INTELLIGENT TECHNIQUES

Machine learning ML and artificial intelligence AI is the science that examines how computers learn from their experiences[12]. According to some scholars, the term "ML" is a subfield of "AI," assuming that the ability to learn is the most basic characteristic of a human being. The objective of machine learning is to create computer systems that can learn from their previous observations and respond accordingly. Artificial intelligence's purpose is to create an intelligent agent or assistance that uses a variety of machine learning techniques [12].

Machine learning, which is a sub-branch of artificial intelligence, looks for patterns in the data using different techniques and methods and first learns by looking at the labels corresponding to these patterns, then it enables building of systems that can generate inferences based on their previous experiences. It gives this potential through a number of algorithms that employ a variety of mathematical and statistical techniques. By examining the case in the data set, these algorithms gain the ability to generalize on the problem after learning how these events occur [13].

Artificial intelligence is the science and engineering of producing intelligent machines that are capable of achieving goals like humans. Machine learning is a form of artificial learning that also mimics how humans learn. In the field of neural networks, the area in which in-depth networks have more than three layers, that is, more than one hidden layer, is the field of deep learning. DL is a newer sub-field of machine learning that employs computationally intensive techniques and big data to identify complicated relationships in data. In recent years, machine learning and artificial intelligence (AI) have attracted the world's interest in a variety of applications. Figure 1 presents the various areas associated to machine learning and artificial intelligence.

Many different types of machine learning techniques existed. the most common classification divides them into three categories: supervised, unsupervised, and reinforcement learning (see Figure 2).

• Supervised learning is a branch of machine learning concerned with creating a function from labeled training data. In supervised learning, training data comprises a collection of input and target pairings; where the input can be a vector of features (Attribute Vector) and the target is the desired output of the function. The target is the estimation of the class or value label. Depending on the type of objective, supervised learning falls into two categories: Classification and regression. Classification includes targets that are similar or related in any way; Regression includes targets for determining relationships between quantitative (numerical) variables [14,15].

• In unsupervised Learning, The learning algorithm is given no labels and is left alone to find structure. Unsupervised learning algorithms take a chunk of data containing only the inputs and group or cluster the data structurally. Therefore, algorithms learn from unlabeled, unclassified, or uncategorized test data. The most fundamental form of unsupervised learning is size reduction approaches like as PCA, t-SNE; PCA is usually used in data preprocessing and t-SNE is often used in data visualization. A more developed field is clustering, which looks for hidden patterns in data and then predicts about them; examples involve K-means clustering, Gaussian mixing models, latent Markov models, and others[16].

• Reinforcement learning is a machine learning approach inspired by behaviorism that deals with actions that subjects must take to achieve the highest amount of reward in an environment. Due to its generality, this issue is also addressed in variety of fields branches including game theory, control theory, operations research, information theory, simulation-based optimization and statistics. Reinforcement learning differs from supervised learning in that the correct input/output matches are not given and non-optimal actions are not externally corrected [17].

In the medical sector, machine learning algorithms are very famous for predicting and diagnosing diseases. Many researchers have employed machine learning approaches to predict and classify diabetes in the hopes of obtaining the most accurate and reliable findings. The next section presents literature review of the intelligent techniques used for classifying and predicting DM.
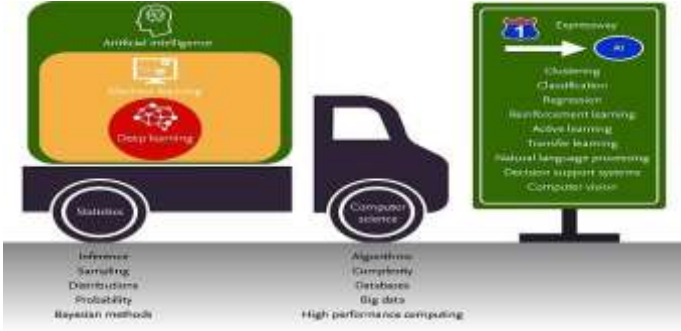
Figure 1. Various fields of ML and AI [18]
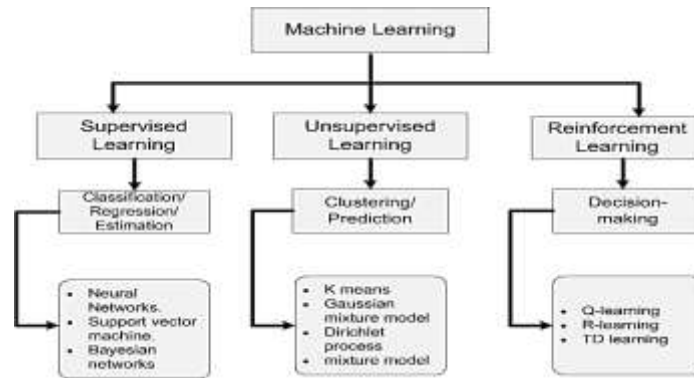
Figure 2. Types of machine learning [19]

3. RELATED WORKS

To conduct this study, more than 25 intelligent techniques related studies of the last six years have been collected. These studies are grouped into the following two categories: Classification, and Prediction of DM.In the selected works of intelligent techniques,the researchers utilized various algorithms of machine learning and artificial intelligence contributed to classify and predict the diabetes mellitus (DM).This part of study is therefore dedicated to review the intelligent techniques used for classifying and predicting DM.

3.1. Related Work of DM Classification

The use of artificial intelligence and machine learning applications in the field of health is carried out in many areas such as medical diagnosis, disease tracking, cost estimation, imaging analysis, resource planning, emergency management, and processing of unstructured data [20,21]. There are different studies carried out with intelligent techniques of artificial intelligence and machine learning for classifying the diabetes. Table 1 summarizes the work of the studies described below, related to the classification of diabetes.

Razali, N. et al (2020) used multiple classifiers Naive Bayes, Sequential Minimal Optimization (SMO), RepTree and Simple, and Logistic Regression. These classifiers were conducted on Pima Indians diabetes data set. They used SMOTE method as preprocessing step for making balance of dataset. The evaluation of classifiers was according to accuracy, precision and recall. The results of study showed that Logistic Regression got highest accuracy with 75.70% [22].

Nai-arun, N., Moungmai, R. (2015) applied four famous algorithms for classifying the risk of diabetes mellitus then making a comparison among them.These algorithms are ANN, Decision Tree, Naive Bayes and Logistic Regression. The data set was taken from 26 Primary Care Units (PCU) in Sawanpracharak Regional Hospital during the years 2012 – 2013.The authors did not mentioned any preprocessing

performed on used dataset. The accuracy using 10-folds cross validation was used as metric for evaluating the four algorithms. The results were that Decision Tree (DT) had the highest accuracy of 85.090 [23].

In addition, Lukmanto, R. et al. (2019) used SVM and fuzzy inference to classify the diabetes paitient using Pima Indian Diabetes (PID) dataset. They trained the dataset using SVM for generating the fuzzy rules then applying fuzzy inference to classify the output.To select the most valuable features to be used and analyzed in the classification task, they used F-Score feature selection as preprocessing step. They obtained promising results of accuracy with 89.02% [24].

Maulidina, F. et al. (2021) developed a model consists of the Backward Elimination and Support Vector Machine (SVM) techniques. They utilized back elimination to expect the right features for model through removing the irrelevant features rest on the linear regression model. The purpose of using SVM is to classify the PIMA Indians diabetes dataset. The metric used to evaluate the model is accuracy where the accuracy of the model has reached 85.71% employing 90% data training [25].

Bilge Ö. B. et al. (2021) compared the performance of five algorithms Decision trees DL, k-nearest neighborhood KNN, Logistic regression LR, Naive Bayes, and Random forest using evaluation metrics Sensitivity Specificity Sensitivity AUC. The dataset used in this study was collected from 130 hospitals in USA from 1999 to 2008. The results of study obtained is that Random forest achieved the best classification performance [26].

Table 1. Machine Learning Techniques for diabetes classification

authors	year	ML techniques	dataset	Preprocessing techniques	Evaluation metric	Findings
Razali, N. et al [22]	2020	Naive Bayes,Sequential Minimal Optimization (SMO), RepTree, and Simple Logistic Regression.	Pima Indians diabetes data set	SMOTE method for making balance of dataset	accuracy, precision and recall	The accuracy of LogisticRegression (75.70%), REPTree (75.10%), SMO (74.00%), Naive Bayes 73.60%.
Santhanam, T. and	2015	SVM	Pima Indians	- filling the missing values with	Accuracy,	Accuracy of SVM is 98.82

Padmavathi, M.S. [47]			diabetes data set	the mean of attribute - discarding of outliers and noisy data using k - means clustering, and using genetic algorithm for selecting the optimal features	Specificity, Sensitivity Negatively Predicted value, and Positively Predicted	
Nai-arun, N., Moungmai, R. [23]	2015	ANN, Decision Tree,Naive Bayes, and Logistic Regression	During the years 2012–2013, private dataset was obtained from 26 Primary Care Units	Transformation of variables age and BMI, calculating the missing values of attributes.	accuracy using 10folds cross validation	Decision Tree (DT) gave highest accuracy with 85.090%
Lukmanto, R. et al. [24]	2019	Fuzzy SVM techniques	Pima Indian Diabetes (PID) dataset	- Determine the features with high number of missing values. - Using F score for feature selection	Accuracy, precision and recall	The accuracy is 89.02%
Maulidina, F. et al.[25]	2021	the Backward Elimination and Support Vector Machine SVM	Pima Indian Diabetes (PID) dataset	feature selection using Backward Elimination	accuracy	The accuracy is 85.71%.

Bilge Ö. B. et al.[26]	20 21	Decision treesDT,KNN , Logistic regression LR, Naive Bayes, and Random forest	the database consists of 70000 records obtained from USA hospitals between 1999-2008		Sensitivity Specificity Sensitivity AUC	The results showed that Random forest had best performance for classification

3.2. Related Work of DM Prediction

Machine learning includes algorithms developed to find the model and parameters that best represent the available data. Machine learning, with various algorithms and methods, looks for patterns in the data and learns first by looking at the labels corresponding to these patterns, and then allows to create systems capable of making inferences by benefit from their experiences. One or more of these approaches and algorithms are used to generate models. Some of these models are used for prediction and classification. Table 2 summarizes the work of the studies described below, related to the prediction of diabetes.

Alam, T.M. et al. (2019) implemented various techniques for predicting diabetes using important attributes. These techniques are Artificial Neural Networks, K means, and Random Forest. They used the principals component analysis algorithm to select significant features. The dataset used in this work is PIDD which is available at UCI repository. The procedures of preprocessing were cleaning data by replacing missing and inconsistent values with the median of attribute, reduction of data using PCA method, and transformation of data using binning algorithm. The results explained that exist powerful association of features BMI and glucose in diabetes patients. The algorithm ANN gave highest accuracy than the two others [27].

Devi, R.D.H. et al. (2020) presented an integrated approach (hybrid model) for diagnosing diabetes. This approach consists of algorithm Farthest First to cluster the dataset into number of clusters and Sequential Minimal Optimization classifier for classifying each cluster as diabetic and non-diabetic persons. The dataset used in this study is Pima Indian dataset. As preprocessing step to enhance the quality of data, the used Inter Quartile Range (IQR) method to detect outliers in dataset. results gave accuracy 99.4% and proved that hybrid model could help the physician for making decisions better in diagnosis of diabetic patients [28].

Maan, V. et al. (2020) developed a project to identify people as diabetes or not diabetes. They selected four algorithms among machine learning algorithms. The chosen algorithms are SVM, ANN, KNN and Naıve Bayes. They used a private dataset of 400 instances with 10 factors associated with it. They did not mentioned any preprocessing conducted on dataset. The technique ANN gave highest accuracy with 96% out the rest algorithm. But the ensemble approach, An ensemble of various machine learning algorithms, bring more efficient of accuracy 98.60% [29].

Nerkar, N. et al. (2021) built a model of artificial neural networks ANN as decision support system for predicting diabetes mellitus with high precision. They used Pima Indian Diabetes (PID) dataset without performing preprocessing on it. Their model gave accuracy of 85% [30].

Roy, R. et al. (2021) used various machine leaning techniques for predicting diabetes in the initial stages. The algorithms KNN, SVM, DT, GB, and RF were used on private dataset and Pima Indian dataset. Removing the noisy data and filling the missed value performed on dataset at the preprocessing stage. the authors did not mentioned any information concerning the performance accuracy of used algorithms but they reported that diabetes prediction system is significant for physicians to help them treat patients in more better and accurate way [31].

Deberneh, H.M. and Kim, I. (2021) created a model of machine learning to predict diabetes of type2 using algorithms Logistic Regression (LR), Random Forest (RF), support vector machine (SVM), XGBoost, and ensemble machine learning algorithms for predicting the result as healthy (non-diabetic), prediabetes, or diabetes. In this work, the dataset used was obtained from private medical institute as electronic records during the years 2013 - 2018. Before building the prediction model, they selected the key features using the methods chi-squared tests, ANOVA tests, and recursive feature elimination as preprocessing procedure. The results showed that highest accuracy was given by SVM and RF with 73% [32].

Table 2. Machine Learning Techniques for diabetes Prediction

auhors	year	ML techniques	dataset	Preprocessing techniques	Evaluation metric	Findings
Alam, T.M. et al.[27]	2019	ANN, Random forest, K- means clustering	The Pima Indian Diabetes (PID)	Data cleaning (medianvalue), Data reduction (PCA), smoothing	Accuracy and AUROC curve	ANN(75.7%,0.816),Random forest (RF) (74.7,0.806),K means

				data(binning method),Association Rules (Apriori),Min-Max normalization technique		clustering(73.6%.)
Devi, R.D.H. et al.[28]	2020	Sequential minimal optimization (SMO), Farthest first clustering algorithm	Pima Indians diabetes data set	They used Inter Quartile Range(IQR) to detect and remove outliers in dataset	Accuracy, F measure, ROC area, Kappa statistics	results gave accuracy 99.4% and proved that hybrid model could help the physician for making decisions better in diagnosis of diabetic patients.
Rashid, T.A. et al.[33]	2016	ANN, Decision tree	private dataset	normalization(min-max and z-score), feature selection(Sequential Feature Selection (SFS),finding the P-value of correlation)	Accuracy with and without feature selection	ANN(76.2%,84.8%), Decision tree(57%,80%)
Joshi, R. and Alehegn, M. [34]	2017	KNN, Naïve Bayes,Random forest,J48, hybrid model	Pima Indians diabetes data set	missing value noisy,data duplicate removing	-Accuracy -F-measure -Recall Precision	hybrid approach presents best accuracy and performance than the single one.
Jose, J.A. et al[35]	2021	Auto regression, kalman filter, Recurrent Neural Networks,	private dataset(CGM). It has 55000 records total		Mean Absolute Error (MAE) and Root Mean Squared	SARIMA(3.87,6.90), KALMAN(3.21,4.36), RNN(0.32,0.56), LSTM(11.0,20.15)

		LSTM (Long Short Term Memory			Error (RMSE)	
Asaduzz aman, S. et al [36]	201 8	Data mining approach(P robability of sub factors, x2Test, Info gain), Statistical approach(P-value and Confidence Interval)	Private data set with total number of records 306, 152 affected and 154 unaffected.	They used WEKA tools to clean data.		They found that factors hypoglycemia and Insulin are the key factors of type1 diabetes. From the final decision tree formed, it is easy to describe whether the person is diabetes or not
Maan, V. et al[29]	202 0	SVM, KNN, Na¨ıve Bayes, ANN, the ensemble approach	private dataset of 400 instances, 10 factors associated with it.		Accuracy using ten fold cross validatio n techniqu e.	SVM(94%), KNN(91.23%), Na¨ıve Bayes(95%), ANN(96%),the ensemble approach(98.60 %)
Nerkar, N. et al. [30]	202 1	ANN	Pima Indian Diabetes (PID) dataset		accuracy	accuracy 85%
Mujumd ar, A. and Vaidehi, V. [37]	201 9	SVM, RF, DT, Extra Tree Classifier, Ada Boost algorithm,	Private dataset + Pima Indian Diabetes (PID)	Imputing missing values and scale the dataset to normalize all values.	accuracy , confusio n matrix and f1- score	The accuracy of Logistic Regression 96%. While the Ada Boost 98.8%.
Roy, R. et al.[31]	202 1	KNN, SVM, DT,	private dataset +	Removing the noisy data and		the authors did not mentioned

		Gradient Boosting (GB) and, RF algorithms.	Pima Indian Diabetes (PID)	filling the missed value.		any information about the performance accuracy of used algorithms.
Sharma, M.K. et al.[38]	2021	Mediative Fuzzy Logic based inference system	Pima Indian Diabetes (PID) dataset	Setting the triangular intuitionistic fuzzy number for including variables, Glucose, Insulin,Body Mass Index (BMI), Diabetes Pedigree Function (DPF), Age and Diabetes Mellitus (DM)		MFL is essential in medical area since it has contradicting element, which is a crucial feature to consider while using this approach..
Daghistani, T. and Alshammari, R. [39]	2016	Self-Organizing Map (SOM), C4.5 and RandomForest	The data sets are obtained from the MNGHA, Saudi Arabia		Recall and Precision.	C4.5 and Random Forest provide Recall and Precision over 90% while SOM gets Recall and Precision over 79%
Kandhasamy, J.P. and Balamurali, S.J.P.C.S. [40]	2015	DT J48, KNN, RF, and SVM	Dataset obtained from UCI machine learning data repository	Using the k mean clustering approach, all missing data are filled with mean and median values.	accuracy, sensitivity and specificity	The classifier J48 performs more accuracy with noisy data set. While KNN (k=1) and random forest give more accuracy than other classifiers when the

						dataset without noise.
Sisodia, D. and Sisodia, D.S. [41]	2018	DT, SVM and Naive Bayes	Pima Indians Diabetes Database (PIDD)		Precision, Accuracy, F-Measure, and Recall	In comparison to other methods, the study found that Naive Bayes had greatest accuracy of 76.30 %.
Naveen, K.G. et al.[42]	2020	SVM, decision Tree DL,NaiveBayes, Logistic Regression LR and KNN	Pima Indians Dataset Database (PIDD)		accuracy	random forest has come with highest accuracy rate of 74.4%.
Deberneh, H.M. and Kim, I. [32]	2021	LG, RF, SVM, XGBoost, and ensemble machine learning algorithms	the dataset was collected from private medical institute Hanaro Medical / Korea.as electronic records for 6 years	they selected the key features using the methods chi-squared tests, ANOVA tests, and recursive feature elimination	accuracy, recall, precision, and F1 score	The results showed that highest accuracy was given by SVM and RF with 73%, while the lowest accuracy was 71% given by LR
Lynam, A. [43]	2019	Multivariable Logistic Regression (LG)	The dataset consists of participants identified from 4 Exeter cohorts(DARE,PRIBA, MRC	The SMOTE method was used to work with imbalanced data	ROC AUC	ROC AUC=0.94

			Pro/RetroMaster,MRCcrossover) and combined in one dataset.			
Wu, H. et al.[44]	2018	improved K-means algorithm, logistic regression algorithm	Pima Indians Dataset, Dataset presented by Dr. Schorling, Dataset	Transforming the pregnancies attribute from numerical to nominal, replacing the missing value by the mean of attribute, normalization	precision, recall,, Mathews correlation coefficient, ROC	Precision (0.954.), recall (0.954.), MCC(0.899.), ROC(0.979.)
Swapna, G. et al.[45]	2018	CNN and LSTM	private dataset called Electrocardiograms		accuracy	CNN=90.9 LSTM=95.1
Metsker, O., et al.[46]	2020	ANN, SVM, Decision tree, Linear Regression, Logistic Regression	Private dataset involved a number of laboratory records	Filling the missing values with the medians, Removing features that have too many missing values	Precision, recall, F1 score, accuracy, AUC	Using the neural network classifier, it is able to get up accuracy of 82.61,

4. Discussion

4.1. Datasets

Although diabetes is a widespread condition, some datasets have been gathered and utilized in its prediction. Diabetes databases are divided into two categories, public and private, where a few of them are public and available. Given the relevance of datasets and their influence on the outcomes, it's critical to go over the primary datasets discussed in this study, as well as the attributes they contain. Some of main datasets that used in this related work are :

➢ **Private datasets**

• dataset extracted from hospital information system of MNGHA in Saudi Arabia from 2013 to 2015 [39].

• Electrocardiogram ECG data of 40 people[45], using algorithm of Pan and Tompkinson, the data were transformed to heart rate time series signals.

• Dataset collected from 26 PCU existed in Sawan Pracharak Regional Hospital in Thailand [23].

• Electronic medical records [32] for six years from 2013 to 2018 collected at institute of Hanaro Medical foundation in Seoul.

• Data of continuous blood glucose monitoring (CGM) [35] contains a 6-month recording of a person's glucose level in 5-minute increments.

➢ Public datasets

• Pima Indian Diabetes Dataset (PIDD) [65] : The National Institute of Diabetes and Digestive and Kidney Diseases provided this data. The dataset's goal is to diagnose whether a patient has diabetes using diagnostic measures provided in the collection. This dataset was used by more than 15 studies discussed in this review

• Dataset presented by Dr. Schorling[44] : Dr. Schorling from University of Virginia / Department of Medicine has contributed this diabetes dataset.

These datasets include varying numbers of instances (patients), but they all share some of the same basic attributes which chosen after conducting features selection on dataset, namely "BMI, Blood Pressure (systolic and diastolic), age, gender, history of family, Glucose concentration Level, thirst, frequent urination, HbA1c test, skin thickness ". Table 3 summarizes the datasets mentioned in the related works part.

Table 3. datasets used in diabetes prediction and classification

Dataset	Reference	Number of Samples	Number of Features	Features	Link
Pima Indians Diabetes Dataset (PIDD)	[22,24,25,27-31, 34,37-44,47]	768	8	Number of times pregnant, Age (years), Body mass index (weight in kg/(height in m)^2),Triceps skin fold thickness (mm), 2-Hour serum insulin (mu U/ml), Diabetes pedigree function, Diastolic blood pressure (mm Hg), Plasma glucose concentration a 2 hours in an oral glucose tolerance test, Class variable (0 or 1)	Pima Indians Diabetes Database	Kaggle
Dr. Schorling dataset	[44]	403	19	subject id, age, cholesterol/HDL Ratio, First Diastolic Blood Pressure, First Systolic Blood Pressure, frame, gender, Glycosolated Hemoglobin, height, High Density Lipoprotein, hip, location, Postprandial Time when Labs were Drawn in minutes, Second Diastolic Blood Pressure, Second Systolic Blood Pressure, Stabilized Glucose, Total Cholesterol, waist, weigh	http://staff. pubhealth. ku.dk/~tag /Teaching/ share/data /Diabetes.h tml
data set collected from 26 Primary Care Units (PCU) for	[23]	30,122	11	BMI, age, weight, waist, BPH, BPL, DM_family(history of diabetes in family), HT_family(history of hypertension in family), Alcohol, Smoke, sex, class	private

years 2012 – 2013					
database obtained from USA hospitals between 1999-2008	[26]	70000	16	Race, Gender, Age, Weight, Time spent in hospital, Number of laboratory tests, Number of processes, Number of drugs, Number of outpatient visits, Number of emergency department visits, Number of inpatient treatments, Number of diagnoses, A1C test result, Diabetic medication history, Variables related to the patient's drug history, class variable	private
Collection of primary records on diabetes cases	[33]	500	26	Gender, Age, Height, Weight, systolic, diastolic, Losing weight, Inheritance, Nocturia, Polyuria, Polydipsia, thirsty, Paraesthesia, inactive, Numbness, Frequent urination, losing weight, Coma, since when, Teeth, Heart, Kidney, Eyes, Skin injury, Blood glucose concentration. e type of DM (insulin / non-insulin).	private
CGM dataset	[35]	55000	1	Measuring glucose level for 6-month in 5-minute increments	private
a dataset obtained from Dhaka Based on a	[36]	306	22	HbA1c, Hypoglycemia, pancreatic disease affected in child, Age, Autoantibodies, Area of Residence, Adequate Nutrition, Education of	private

				Mother, Standardized birth weight, Sex, Standardized growth-rate in infancy, Family History affected in Type 1 Diabetes (Father and Mother), Family History affected in Type 2 Diabetes (Father and Mother), Impaired glucose metabolism, Frequent Urination, Increased thirst, Fatigue and Weakness, Unintended weight loss, Extreme Hunger	
certain questioner, .					
A dataset collection chosen on arbitrary and miscellany basis	[29]	400	10	Age, Drinking, Family history, Fatigue, Gender, Height, smoking, Thirst, Urination, Weight	private
Dataset Collection	[37]	800	10	Number of Pregnancies, Age, Blood Pressure, BMI, Glucose Level, Insulin, Job Type, Skin Thickness(mm), Outcome	private
dataset extracted from hospital information system in Saudi Arabia	[39]	66,325	18	age,gender, region, BMI (height + weight), systolic blood pressure, diastolic blood pressure, eGFR,MCV, MCH, MCHC, RDW, Plt, MPV, WBC, RBC, Hgb, Hct	private
dataset collected at institute of Hanaro Medical foundation in Seoul	[32]	535,169	12	FPG, age, family history, BMI, drinking, gamma-GTP, HbA1c, physical activity, sex , smoking, Triglycerides, uric acid	private

Electrocardiograms (ECG)	[45]	142 000	1	HRV (variations of instantaneous heart rate) extracted from ECG signals	Private
A dataset collected from Almazov specialized medical center's medical information system data set, Russia.	[46]	238,590	31	Blood in urine (BLD), gender, Low density lipoproteins(LDL), Red blood cell distribution width(RDW), age, Alanine transaminase (ALT), Aspartate aminotransferase (AST) , Bilirubin, Cholesterol, Creatinine, Glucose, Hematocrit (HCT),Hemoglobin (HGB),High-density lipoprotein(HDL), Leukocytes,(LEU), Mean cell hemoglobin (MCH), Mean corpuscular volume (MCV), Mean platelet volume,(MPW), Monocytes, nephropathy, Neutrophils,(NEUT), pH, Platelet distribution width(PDW), Platelets,(PLT), Procalcitonin (PCT), Red blood cell count (RBC), retinopathy, Triglycerides , Troponin, White blood count (WBC)	Private

4.2. Data Preprocessing

The success of Machine Learning task (ML) to solve a particular problem is influenced by a number of factors. The first and most important consideration is the creation and quality of the dataset [48]. Data in the real life is often unclean, inadequate, and unreliable. Data analysis during the training stage is more challenging if there is a lot of unnecessary and duplicated content or noisy and inaccurate data. Any form of processing techniques done on raw data to transform it into a form that may be used more easily and effectively for the next processing is referred to as data preprocessing [48,49]. The types of data preprocessing include the following categories [50,51]:

- data cleaning : The procedure of correcting or discarding inaccurate, corrupted, incorrectly formatted, redundant, or missing data from a dataset.

- Normalization : a sequence of modification procedures for transforming the original values' distribution into a new set of values with the required properties.

- Transformation : The process of building additional features from the base feature set is known as data transformation. The original raw characteristics are generally combined utilizing multiple mathematical formulae originating in pure mathematical formulas throughout the transformation process.

- feature extraction and selection : The use of approaches for dimensionality and data reduction is known as feature selection. Feature selection is a process of selecting the optimal subset of features based on a set of criteria.

From Tables 1,2 we note that eight of the studies did not perform any preprocessing of data. While the rest of the studies dealt with a preprocessing of data, and those preprocessing included all four categories mentioned above. Only two studies dealt with the problem of imbalanced data, but no study has dealt with the problems of overfitting and underfitting.

Overfitting is a basic problem in tasks of machine learning that hinders us from properly generalizing models to fit observed data on training data as well as unknown data on testing data. Overfitting occurs when a model does not generalize adequately from seen data to unknown data. Because of overfitting, the model works great on the training set but poorly on the testing set. This is because an overfitted model has trouble dealing with information in the testing set that aren't identical to those in the training set [52].

4.3.Intelligent Techniques of Diabetes Prediction and Classification

The frequency of utilizing each intelligent technique of diabetes prediction and classification was determined according to the studies done to predict diabetes in the previous six years (as shown in Tables 1,2). Decision tree, SVM, Random forest, Logistic Regression, and Naïve Bayes were the most used techniques for diabetes classification and prediction as illustrated in Figure 3.

One of the most effective methods for modeling classifiers is decision trees.. A decision tree DT is a supervised machine learning algorithm for classifying, predicting, and selecting features [53]. Researchers in statistics, machine learning, pattern recognition, and data mining are working on creating a decision tree from existing data. A decision tree is a classifier that uses recursive partitioning of the sample space to represent its classification. The decision trees are built up of nodes that create a rooted tree, i.e. a faceted tree with no incoming edges and a node called a "root". Each of the other nodes has one incoming edge. Internal or test nodes are nodes that have outgoing edges. All other nodes are referred to as leaves (known as terminal or decision nodes). Each internal node in a decision tree divides the sample space into two or more subspaces based on a discrete function of the input attribute

values.. In the simplest and most common form, each test evaluates a single attribute such that the sample space is divided based on the value of the attribute. The samples are classified according to the results of the tests along the path (path) by walking these samples from the root of the tree to the leaf [54]. The highest accuracy this algorithm achieved in the chosen works of this study was 85.09% [23].

Support vector machines (SVM) proposed by Vladimir Vapnik is a non-parametric classification approach that is based on statistical learning theory [55]. SVM was created for binary classifications, and it is feasible to get accurate classification results with a little quantity of sample data using this approach [56]. It is a method for determining the boundary among classes in the feature space using the best algorithm. The method, which was originally developed to classify two-class linear data, was later developed to classify multi-class and non-linear data. It is basically based on the principle of determining the hyper plane that can separate the two classes from each other [57].SVM combines a variety of techniques from statistics, machine learning, and neural networks. This method has the characteristic of working in multidimensional features space by using kernel functions and the results obtained from the method depend on the properties of the selected kernel and parameters [58]. The highest accuracy this algorithm achieved in the chosen works of this study was 98.82% [47].

Random forest RF is one of the most widely used and effective machine learning techniques for classifying data. It creates a forest from decision trees. A random forest is a meta predictor that uses averaging to increase predicted accuracy and control overfitting by modeling a number of decision tree classifiers on diverse subsets of the dataset. The size of the subsample is always the same as the size of the original input sample. Random forest approaches decrease the chance of overfitting by : constructing several trees, detecting and replacing observations, and Nodes are split based on the best split among a random subset of the attributes chosen at each node [59].When utilizing random forest for classification, each tree is polled for a class vote, and then the majority vote is used to classify the results. The mean of predictions from each tree at a target point is calculated when RF is used for regression [60]. The highest accuracy this algorithm reached in the chosen works of this study was 90% [39].

Logistic regression is a method used in binary classification (0 and 1) where the dependent variable is discontinuous. Logistic regression measures the relationship between the dependent variable and one or more independent variables by estimating probabilities using the basic logistic function. Apart from the field of machine learning, it is widely used in other applied sciences, real-world problems [61]. It is a popular approach because of its high computing speed and generation of a model

that offers itself to efficient scoring of new data. Multiple linear regression is similar to logistic regression, except that the result is binary. Various transformations are used to transform the problem into one that can be fitted using a linear model [62]. The highest accuracy this algorithm achieved in the chosen works of this study was 95.42% [44].

Logistic regression is a predictive analysis to explain the relationship between a binary dependent variable and a set of independent variables. The probability of an event occurring for an a+bx is as in Equation 1. The probability of the event not occurring is 1-p and the logit function given in Equation 2. Logistic regression generates the coefficients of a formula for estimating the logit transform [61].

$$P = \frac{e^{a+bx}}{1+e^{a+bx}} \qquad (1)$$

$$\text{logit}(p) = \ln\left(\frac{p}{1-p}\right) \qquad (2)$$

The logical foundations of the Naive Bayes algorithm are built on the approaches introduced by Thomas Bayes in the 18th century. These approaches allow for the evaluation of event probability as well as their reassessment in light of new data [63]. The concept of conditional probability within the scope of Bayes' Theorem is the basis for this algorithm. This concept can be expressed with the following scenario, together with both the formula and the frequently given medical test example. Let there be a cancer screening test involving 1000 people:

Let A denote the probability of having cancer, and B denote the probability of getting a positive result from the cancer screening test. Here, P(A|B) refers to the probability that a patient with a positive result in the cancer test (diagnosed with cancer) actually has cancer. This statement is like the summary of Bayesian theory [64]. This statement also emphasizes the possibility of not having cancer despite a positive result in such a cancer test. This expression also refers to the presence of patients who have cancer but do not appear to have cancer on the test. As a result, Bayes' conditional probability formula reveals the calculation of the P (A|B) value with the help of the values P(B), P(A) and P (A ∩ B). In other words, the reliability of a disease screening test with certain past statistics can be calculated with the Bayes conditional probability formula [63]. Bayesian formula is as follows.

$$P(A|B) = \frac{P(B|A).P(A)}{P(B)} = \frac{P(A\cap B)}{P(B)} \qquad (3)$$

The highest accuracy this algorithm achieved in the chosen works of this study was 95% [29].
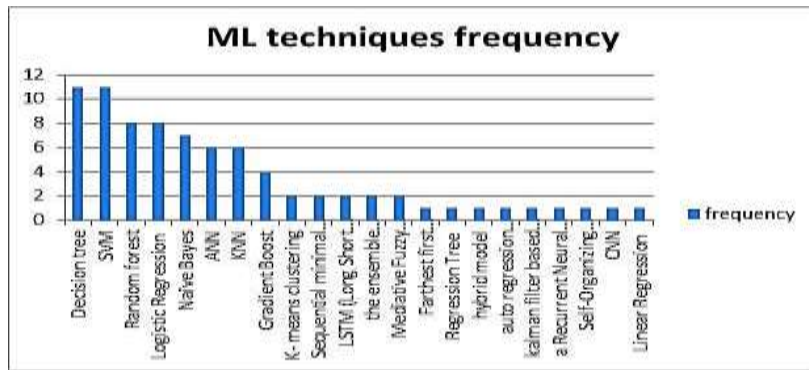
Figure 3. Frequencies of Machine Learning techniques

5. Conclusion

Machine learning algorithms enable the interpretation of big data, which is increasing day by day and becoming difficult to control by computers instead of humans. The predictive power of these algorithms stems from the mathematical properties of these algorithms based on classifying and modeling all data. These algorithms are often used in science and engineering. The power of these algorithms, together with the academic value of the results obtained from them, also helps to predict in medical fields as in diabetes mellitus prediction. Researchers are enthusiastic about experimenting with various types of intelligent techniques and developing new models for enhancing the accuracy of diabetes classification and prediction. The frequency of usage and accuracy of all intelligent techniques (Machine Learning algorithms ML) used in the previous six years were examined with description of datasets and preprocessing.These machine learning algorithms have its advantages and disadvantages as shown in table 4. The accuracy of models performance for predicting and classifying diabetes ranged between 65.1% and 99.4%. In real world, data is usually dirty, insufficient, and inaccurate. When there is a lot of unneeded and duplicated information or noisy and unreliable data, data analysis during the training stage becomes more difficult. Data preprocessing converts raw data into the form that may be used more simply and efficiently in further processing. The five types of preprocessing done on the datasets by the chosen studies are data cleaning, transformation, normalization, feature selection, and working with imbalanced data. However, no study mentioned dealing with problems of overfitting. Overfitting is a basic problem in machine learning that hinders generalizing models to fit observed data on training data as well as unknown data on testing data. Data augmentation technique may be used to solve the problem of overfitting and in the training on larger data volumes to improve the efficiency of prediction algorithms.

CONFLICTS OF INTEREST

No conflict of interest was declared by the authors.

Table 4: Advantages and disadvantages of machine learning algorithms

Algorithm	Advantage	disadvantage
Decision trees	1.It is not necessary to be an expert to interpret a decision tree representation of a problem and get the important information. 2.As decision tree structure makes no assumptions regarding class distributions, it can easily analyze datasets that have both numerical and categorical values. 3.Thanks to the representations of decision trees, it is easy to extract information from the tree by following the paths from the root to the leaves.	1. The sensitive, irrelevant attributes, and noise in dataset make the decision tree inconsistent. 2. A small modification of the split near the root will have a large impact on the outcomes.
Naive Bayes	1.Adapts well to data with missing values or imbalance problems. 2.It is applicable to data with both continuous and categorical attributes. 3.Works well at higher dimensions	1. Each attribute must work independently of the others. 2. There might be a decrease in accuracy due to conditional independence.
SVM	1.It has an edit parameter to avoid overfitting problems. 2.high accuracy 3.An SVM is defined by a convex optimization problem (local minimum) with efficient methods	1.Somehow SVM moves the overfitting problem from optimizing parameters to model selection 2.Unfortunately kernel models can be quite sensitive to overfitting the model selection criterion.
Multilayer Perceptron	1.It can be used for difficult, complex problems. 2. the potential to achieve the same accuracy as the much smaller model	1.Sometimes long training time is required. 2. An overfitting issue will arise from many hidden layers. 3. The weight setting in random way does not always result in the ideal outcome.
Logistic regression	1.Low variance. 2.Logistic regression can be used with kernel methods. 3.Probabilistic approach gives information about statistical significance of features.	1.It has High bias; imposes fairly strong constraints on the solution space, and thus can add more errors by variance reduction through bias.

| Random Forest | 1.Random Forests can be used for both regression and classification tasks.
2.Random Forest is also considered to be a very useful and easy to use algorithm because default hyperparameters usually produce a good prediction result. The number of hyperparameters is also not high and is easy to understand. | 1.The main limitation of random Forest is that a large number of trees can make the algorithm slow and ineffective for real-time predictions.
2.Random Forest is a predictive modeling tool and not an explanatory tool. This means that if you are looking for a description of the relationships in your data, other approaches are preferable. |

REFERENCES

[1]   Devi, R. D. H., Bai, A., and Nagarajan, N., "A novel hybrid approach for diagnosing diabetes mellitus using farthest first and support vector machine algorithms", Obesity Medicine, 17: 100152, March (2020).

[2]   https://www.niddk.nih.gov/health-information/diabetes/overview/what-is-diabetes

[3]   Veresiu, A. I., Bondor, C. I., Florea, B., Vinik, E. J., Vinik, A. I., Gâvan, N. A., "Detection of undisclosed neuropathy and assessment of its impact on quality of life: a survey in 25,000 Romanian patients with diabetes", Journal of Diabetes and Its Complications, 29(5) : 644–649, (2015).

[4]   Kumari V. A., Chitra R., "Classification Of Diabetes Disease Using Support Vector Machine", International Journal of Engineering Research and Applications (IJERA), 3(2): 1797-1801, (2013).

[5]   Sharma, N., Singh, A., " Diabetes detection and prediction using machine learning/IoT: A SURVEY ", Springer International Conference on Advanced Informatics for Computing Research : 471–479, Springer, Singapore,(2018).

[6]   Qureshi, I., Ma, J., Abbas, Q., " Recent development on detection methods for the diagnosis of diabetic retinopathy ", Symmetry, 11 (6) :749, (2019).

[7]   American Diabetes Association, " Diagnosis and classification of diabetes mellitus ", Diabetes Care, 37(Supplement 1): S81-S90, (2014).

[8]   Gustin, G.," Diabetes management through artificial intelligence and gamification: blood glucose prediction models and mHealth design considerations ", MSc Dissertation, Catholic University of Louvain,10, (2016)

[9]   American Diabetes Association, " Classification and Diagnosis of Diabetes: Standards of Medical Care in Diabetes", Diabetes Care, 42(Supplement 1):S13, (2019).

[10]   Oram, R. A., Jones, A. G., Besser, R. E., Knight, B. A., Shields, B. M., Brown, R. J., Hattersley, A. T. and McDonald, T.J., " The majority of patients with long-duration type 1 diabetes are insulin microsecretors and have functioning beta cells ", Diabetologia, 57(1) :187-191, (2014).

[11]   Inzucchi, S. E., Bergenstal, R.M., Buse, J. B., Diamant, M., Ferrannini, E., Nauck, M., Peters, A.L., Tsapas, A., Wender, R. and Matthews, D.R.," Management of hyperglycaemia in type 2 diabetes: a patient-centered approach. Position statement of the American Diabetes Association (ADA) and the European Association for the Study of Diabetes (EASD) ", Diabetologia, 55(6) : 1577-1596, (2012).

[12]   Chaki, J., Ganesh, S. T., Cidham, S. K., Theertan, S. A.," Machine learning and artificial intelligence based Diabetes Mellitus detection and self-management: A systematic review" Journal of King Saud University-Computer and Information Sciences, article in press, (2020).

[13]   Shalev, S., Ben, D. S. " Understanding machine learning: From theory to algorithms ", 1st ed., Cambridge University Press, New York,19-23, (2014).

[14] James, G., Witten, D., Hastie, T. and Tibshirani, R.," An introduction to statistical learning ", 112 : 18, New York: springer, (2013).

[15] Kuhn, M., Johnson, K., " Applied predictive modeling ", 26: 13, New York: Springer, (2013)

[16] Krotov, D., Hopfield, J. J., " Unsupervised learning by competing hidden units ", Proceedings of the National Academy of Sciences, 116(16) :7723-7731, (2019)

[17] Shameer, K., Johnson, K. W., Glicksberg, B. S., Dudley, J. T., Sengupta, P. P., "Machine learning in cardiovascular medicine: are we there yet?.", Heart, 104(14):1156-1164, (2018)

[18] Kim, K., Tagkopoulos, I., " Application of machine learning in rheumatic disease research.", The Korean Journal of İnternal Medicine, 34(4): 708, (2019)

[19] Sultan, K., Ali, H., Zhang, Z., " Big data perspective and challenges in next generation networks ", Future Internet, 10(7) :56, (2018).

[20] Alonso, D. H., Wernick, M. N., Yang, Y., Germano, G., Berman, D. S., Slomka, P., " Prediction of cardiac death after adenosine myocardial perfusion SPECT based on machine learning ", Journal of Nuclear Cardiology, 26(5):1746-1754, (2019).

[21] Esteva, A., Kuprel, B., Novoa, R. A., Ko, J., Swetter, S. M., Blau, H. M., Thrun, S.," Dermatologist-level classification of skin cancer with deep neural networks ", Nature, 542(7639) :115-118, (2017).

[22] Razali, N., Mustapha, A., Idrus, S. Z. S., Abd Wahab, M. H., Madon, S. A. F.," Analyzing Diabetic Data using Classification ", Journal of Physics: Conference Series, 1529, The 2nd Joint International Conference on Emerging Computing Technology and Sports (JICETS) 2019 25-27 November 2019, Bandung, Indonesia, IOP Publishing, 22105, (2020).

[23] Nai-arun, N., Moungmai, R., " Comparison of classifiers for the risk of diabetes prediction ", Procedia Computer Science, 69 : 132-142, (2015).

[24] Lukmanto, R. B., Nugroho, A., Akbar, H., " Early detection of diabetes mellitus using feature selection and fuzzy support vector machine", Procedia Computer Science, 157: 46-54, (2019).

[25] Maulidina, F., Rustam, Z., Hartini, S., Wibowo, V. V. P., Wirasati, I., and Sadewo, W.," Feature optimization using Backward Elimination and Support Vector Machines (SVM) algorithm for diabetes classification " Journal of Physics: Conference Series, Volume 1821, International Conference on Mathematics: Pure, Applied and Computation (ICOMPAC) 2020 24 October 2020, Surabaya, Indonesia (virtual) 1821(1) : 012006, IOP Publishing, (2021).

[26] Bilge Ö. B., Metin Y., E. Selin S., "Classification of Diabetes Mellitus with Machine Learning Techniques", Journal of Natural and Applied Sciences, 25(1) :112-120, (2021).

[27] Alam, T.M., Iqbal, M.A., Ali, Y., Wahab, A., Ijaz, S., Baig, T.I., Hussain, A., Malik, M.A., Raza, M.M., Ibrar, S. and Abbas, Z., "A model for early prediction of diabetes "., Informatics in Medicine Unlocked, 16 :100204, (2019).

[28]   Devi, R.D.H., Bai, A. and Nagarajan, N.," A novel hybrid approach for diagnosing diabetes mellitus using farthest first and support vector machine algorithms ", Obesity Medicine, 17:100152, (2020).

[29]   Maan, V., Vijaywargiya, J. and Srivastava, M., " Diabetes Prognostication–An Aptness of Machine Learning ", 2020 International Conference on Emerging Trends in Communication, Control and Computing (ICONC3), Lakshmangarh, India, 1-5, IEEE, February (2020).

[30]   Nerkar, N., Inamdar, V., Kajrolkar, L. and Barve, R., " Diabetes Prediction using Neural Network ", International Research Journal of Engineering and Technology (IRJET), 8(2):330-333, Feb (2021).

[31]   Roy, R., Prasad, A. and Andrews, S.M., " Diabetes Prediction Using Machine Learning ", International Journal of Research Publication and Reviews, 2(4):134-136, (2021).

[32]   Deberneh, H.M. and Kim, I., " Prediction of Type 2 Diabetes Based on Machine Learning Algorithm ", International Journal of Environmental Research and Public Health, 18(6) : 3317, (2021).

[33]   Rashid, T.A., Abdullah, S.M. and Abdullah, R.M., " An intelligent approach for diabetes classification, prediction and description ", In Innovations in Bio-Inspired Computing and Applications : 323-335, Springer, Cham, (2016).

[34]   Joshi, R. and Alehegn, M., " Analysis and prediction of diabetes diseases using machine learning algorithm: Ensemble approach ", International Research Journal of Engineering and Technology (IRJET), 4(10) : 426-435, (2017).

[35]   Jose, J.A., Waggoner, T. and Manikandan, S., "Continuous Glucose Monitoring Prediction.", Arxiv Preprint Arxiv:2101.02557, (2021).

[36]   Asaduzzaman, S., Al Masud, F., Bhuiyan, T., Ahmed, K., Paul, B.K. and Rahman, S.M., "Dataset on significant risk factors for Type 1 Diabetes: A Bangladeshi perspective.", Data in Brief, 21: 700-708, (2018).

[37]   Mujumdar, A. and Vaidehi, V., " Diabetes prediction using machine learning algorithms ", Procedia Computer Science, 165: 292-299, (2019).

[38]   Sharma, M.K., Dhiman, N. and Mishra, V.N., " Mediative fuzzy logic of sugeno-tsk model for the diagnosis of diabetes ", Journal of Physics: Conference Series, Volume 1724, International Conference on Recent Trends in Applied Mathematical Sciences (ICRTAMS) 2020 26-27 September 2020, Tiruvannamalai, India, 012028, IOP Publishing, (2021).

[39]   Daghistani, T. and Alshammari, R., " Diagnosis of diabetes by applying data mining classification techniques ", International Journal of Advanced Computer Science and Applications (IJACSA), 7(7): 329-332, (2016).

[40]   Kandhasamy, J.P. and Balamurali, S.J.P.C.S., " Performance analysis of classifier models to predict diabetes mellitus", Procedia Computer Science, 47: 45-51, (2015).

[41]   Sisodia, D. and Sisodia, D.S., " Prediction of Diabetes using Classification Algorithms ", International Conference on Computational Intelligence and Data Science (ICCIDS 2018), Elsevier, Procedia Computer Science, 2018(132), 1578–1585, (2018).

[42] Naveen, K.G., Rajesh, V., Reddy, A.A., Sumedh, K. and Reddy, T.S, " Prediction Of Diabetes Using Machine Learning Classification Algorithms ", International Journal of Scientific and Technology Research, 9(1) : 1805 – 1808, January (2020).

[43] Lynam, A.," Developing clinical prediction models for diabetes classification and progression", Ph.D thesis, University of Exeter, (2020).

[44] Wu, H., Yang, S., Huang, Z., He, J. and Wang, X., " Type 2 diabetes mellitus prediction model based on data mining", Informatics in Medicine Unlocked, 10: 100-107, (2018).

[45] Swapna, G.; Soman, K.P.; Vinayakumar, R., " Automated detection of diabetes using CNN and CNN-LSTM network and heart rate signals ", Procedia Comput. Sci., 132: 1253–1262, (2018).

[46] Metsker, O., Magoev, K., Yakovlev, A., Yanishevskiy, S., Kopanitsa, G., Kovalchuk, S. and Krzhizhanovskaya, V.V., " Identification of risk factors for patients with diabetes: diabetic polyneuropathy case study ", BMC Medical İnformatics and Decision Making, 20(1):1-15, (2020).

[47] Santhanam, T. and Padmavathi, M.S., " Application of K-Means and Genetic Algorithms for Dimension Reduction by Integrating SVM for Diabetes Diagnosis ", Procedia Computer Science, Elsevier, 47: 76 – 83, (2015).

[48] Kotsiantis, S.B., Kanellopoulos, D. and Pintelas, P.E., " Data preprocessing for supervised leaning.", International Journal of Computer Science, 1(2): 111-117, (2006).

[49] Iliou, T., Anagnostopoulos, C.N., Nerantzaki, M. and Anastassopoulos, G., " A novel machine learning data preprocessing method for enhancing classification algorithms performance", Proceedings of the 16th International Conference on Engineering Applications of Neural Networks (INNS) :1-5, (2015).

[50] García, S., Luengo, J. and Herrera, F., " Data preprocessing in data mining ", Cham, Switzerland: Springer International Publishing, 72, (2015).

[51] Alexandropoulos, S.A.N., Kotsiantis, S.B. and Vrahatis, M.N., " Data preprocessing in
[52] predictive data mining " The Knowledge Engineering Review, 34, (2019).
Ying, X., 2019, February " An overview of overfitting and its solutions ", Journal of Physics: Conference Series, 1168 (2) : 022022, IOP Publishing, (2019).

[53] Charbuty, B. and Abdulazeez, A., " Classification based on decision tree algorithm for machine learning ", Journal of Applied Science and Technology Trends, 2(01):20-28, (2021).

[54] Maimon, O. and Rokach, L. eds., " Data mining and knowledge discovery handbook ", Springer Science, Business Media Inc. : 165, (2005).

[55] Vapnik, V., " The nature of statistical learning theory ", Springer Science and Business Media, (1999).

[56] Foody, G.M. and Mathur, A., " Toward intelligent training of supervised image classifications: directing training data acquisition for SVM classification ", Remote Sensing of Environment, 93(1-2) :107-117, (2004).

[57] Ali, A.A., Hameed, E.M., Shareef, S.M. and Khalaf, B.A., " Lion Optimized K-Means Support Vector Machine for Clustering Problems in Cloud Internet of Things Environment ", Solid State Technology, 63(6):4620-4631, (2020).

[58] Kavzoglu, T., and Colkesen, I., " A kernel functions analysis for support vector machines for land cover classification", International Journal of Applied Earth Observation and Geo İnformation, 11(5): 352–359, (2009).

[59] Duchesnay, E. and T. Löfstedt, " Statistics and Machine Learning in Python ". Release 0.1, Spring, (2018)..

[60] Hastie, T., Tibshirani, R. and Friedman, J., " The elements of statistical learnin ", Cited On, 33, (2009).

[61] Yang, Y., Loog, M., " A benchmark and comparison of active learning for logistic regression ", Pattern Recognition, 83: 401-415, (2018).

[62] Bruce, P. and Bruce, A., " Practical statistics for data scientists: 50 essential concepts.", O'Reilly Media, Inc.", (2017).

[63] Lantz, B., Machine Learning with R, Packt Publishing Ltd., (2013).

[64] Suat, A., " Data, Big Data and Business Administration", Balıkesir University Journal of Social Sciences Institute, 19(35): 137-154, (2016).

[65] https://www.kaggle.com/datasets/uciml/pima-indians-diabetes-database

USAGE OF HISTOPATHOLOGY IMAGES TO STUDY THE EFFECT OF SEIDLITZIA ROSMARINUS PLANT TO TREAT WOUNDS IN RATS

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Abstract:

In our research, the Seidlitzia rosmarinus was used in two types: the first type, which is in the form of a powder, and the second type, the aqueous solution, which was prepared laboratory and because it contains materials rich in phenolic compounds and flavonoids, it was used as antioxidants and antimicrobials. It contains minerals in addition to containing active substances. The samples used are two-month-old male albino rats. Wounds were made for groups of rats and both the powder and aqueous solution were applied to these wounds. Histopathology images were used to determine the extent of the effect of this plant on the wounds. The aqueous solution of Seidlitzia rosmarinus is shows good response than Seidlitzia rosmarinus powder in treating the wound because, the oxides of the formed elements have greater effectiveness in penetrating the cytoplasm of bacteria. This can be seen from Histopathology images and the textural features extracted from energy matrix.

Key words: Energy Matrix, Histopathology Images, Medical Plant, Seidlitzia Rosmarinus Plants.

Introduction:

Natural Herbs have been used for a years in traditional medicines, and been a source components for the growth of new kind of medications [1]. The humans have used natural products, such as plants, in medicines to improve and treat diseases. The use of plants in medicines at least 60,000 years ago [2]. Between 1981 and 2002, the use of natural products in the creation of new medications was a resounding success. Drugs generated from natural products have played a significant role during that 22-year period. This is especially true in the case of antihypertensive medications, where natural product structures account for around 64% of newly synthesized pharmaceuticals. [3,4]. The leaves, stems and seeds harvested in fall are used as fodder for livestock.it is a kind of short shrub, 60 cm to 1.5m in height has a lot of sodium and potassium carbonate. These carbonates are also present in ashes of plant material are rich in organic salts[5].The Chenopodiaceae family, which is high in saponin, includes the Seidlitzia rosmarinus genus. The saponin-containing powder of Seidlitzia rosmarinus could be employed in chemical flooding of conventional oil reservoirs, according to one theory. The powder was extracted using the spray dryer method from the leaves and stems of the Seidlitzia rosmarinus plant for this purpose[6]. Diuretic, antibacterial, anti-inflammatory, antiseptic, and anti-urinary retention actions are all present in this plant. Excessive use of this herb might cause side effects like dizziness, nausea, and vomiting[7]. The ash that stays after the leaves and stems have been burned includes antiseptic and antibacterial properties. Seidlitzia rosmarinus root tissues have a great capacity for absorbing huge amounts of soil alkaline elements like Na^+ and K^+. It has also been reported that this plant has therapeutic benefits, and that it is used to treat acne[8]. the aim of this search is to investigate the activity of Seidlitzia rosmarinus plant in its both form powder and aqueous solution in treating wounds in rate.

2. Nutritional Values

Halophytes, like as Seidlitzia. rosmarinus, have good nutritional properties and provide pleasant feed when blended with other pasture plants[9]. It has also been reported that this plant has medicinal properties and is used for the treatment of some acnes [10]. The accumulation of huge amounts of soda in the plant's leaves improves the plant's value and economic relevance because it may be used in a variety of sectors, including soap and detergent production, pottery, and ceramics[11]. Table 1. contains some of active components of S.rosmarinus. While the Tannin also aids wound healing and reduces the formation of scar tissue by inhibiting the synthesis and clearance of reactive oxygen compounds. Tannins also have the following benefits: pain reduction, prevention of secondary infection, prevention of plasma loss, and stimulation of prolific epithelialization[12]. Flavonoids are phenolic chemicals extracted from a variety of vascular plants, with over 8000 different compounds identified. They have a wide range of antimicrobial, antioxidant, anti-cancer, anti-inflammatory, and wound-healing properties [13].

Saponins have the ability to speed up a variety of biological processes, including hemolysis, antibacterial, antiviral, and antioxidative properties. Saponins are also said to have anti-inflammatory properties, which can help to reduce edema and skin inflammation [14].

The alkaloid could be linked to the fact that the extract improved the rate of epithelial cell production, therefore speeding up the re-epithelialization process, which is important in wound healing. There's also a chance that angiogenesis, or the production of new blood vessels, was sped up. As a result, the blood supply to the newly created epithelial cells will be increased [15].

Table1. Active Components of Seidlitzia.rosmarinus.

Active components	Percent
Saponins	21%
Mucilage	30%
Flavonoid	5.64%
Alkaloids	1.56%
Glycosides	1.07%
Tannins	1.2%
phenols	0.08%

3. Industrialized Uses

S. rosmarinus is use as a basis of alkaline materials in soap and other industries. Anti - inflammatory and antibacterial properties are also found in ash. S. rosmarinus root tissues have a better potential for absorbing huge amounts of soil alkali metals like Na+ and K+, which are then transported to the shoots**..** The plant's principal technique of salt resistance appears to be tolerance. A lot of sodium accumulates in the vacuoles of cells. The ash is high in sodium (Na) and potassium (K) The ashes of organic-rich plant materials also include these carbonates [11].

4.The medical importance of the Seidlitzia rosmarinus

Seidlitzia rosmarinus plant has important role in medicine by use of powder or ashes and steeped Green sections and branches of little green roots to cure wounds and snakebites. It is also used to treat cold disorders, removing asthma, hard breathing, phlegm, and dysuria. It is also used in the treatment of hair loss after using its powder, and it has antibacterial activity against germs and is used in the treatment of some forms of acne [16]. The high saponin content of these plants justifies the use of their extracts to halt bleeding and cure wounds. Saponin has the capability to coagulate and precipitate red blood cells. Saponins have a number of characteristics, such as the ability to create foam in aqueous solutions, hemolytic activity, cholesterol binding capabilities, and bitterness[10]. This plant possesses diuretic, antiseptic, antibacterial, anti-inflammatory, and anti-urinary retention properties. Excessive consumption of this herb may result in dizziness, nausea, and vomiting [17].

5. Materials and Methods

The methods which is used to investigated the effect of Seidlitzia Rosmarinus Plant on the wounds is the energy matrix and the features extracted from it which are local homogeneity.

5.1 Texture Energy Matrix

In describing texture, image texture has a number of key qualities. Uniformity, density, coarseness, roughness, regularity, linearity, directionality, direction, frequency, and phase are all key properties in expressing texture, according to Law. Texture qualities are determined using the laws texture energy measures approach, which involves a rate computation. Edges and level; spots; ripples and waves in texture. Five matrix are formed from convolving each vector by itself as shown below.

The following matrix describes the level, edge, spots, ripples, and waves by convoluting the laws matrix with the texture image and calculating energy statistics[18].

$$\text{Level } L_5 = [1, 4, 6, 4, 1] \quad \text{........1}$$
$$\text{Edge } E_5 = [-1, -2, 0, 2, 1] \quad \text{.......2}$$
$$\text{Spots } S_5 = [-1, 0, 2, 0, -1]$$
$$\text{Ripples } R_5 = [1, -4, 6, -4, 1]\text{..........3}$$
$$\text{Waves } W_5 = [-1, 2, 0, -2, -1]\text{.........4}$$

$$L_5 * L_5 = \begin{bmatrix} 1 & 4 & 6 & 4 & 1 \\ 4 & 16 & 24 & 16 & 4 \\ 6 & 24 & 36 & 24 & 6 \\ 4 & 16 & 24 & 16 & 4 \\ 1 & 4 & 6 & 4 & 1 \end{bmatrix} \quad \text{......5}$$

$$E_5 * E_5 = \begin{bmatrix} 1 & 2 & 0 & -2 & -1 \\ 2 & 4 & 0 & -2 & -1 \\ 0 & 0 & 0 & 0 & 0 \\ -2 & -4 & 0 & 4 & 2 \\ -1 & -2 & 0 & 2 & 1 \end{bmatrix} \quad \text{.......6}$$

$$S_5 * S_5 = \begin{bmatrix} 1 & 0 & -2 & 0 & -1 \\ 0 & 0 & 0 & 0 & 0 \\ -2 & 0 & 4 & 0 & 2 \\ 0 & 0 & 0 & 0 & 0 \\ -1 & 0 & 2 & 0 & 1 \end{bmatrix} \quad \text{........7}$$

$$R_5 * R_5 = \begin{bmatrix} 1 & -4 & 6 & -4 & 1 \\ -4 & 16 & -24 & 16 & -4 \\ 6 & -24 & 36 & -24 & 6 \\ -4 & 16 & -24 & 16 & -4 \\ 1 & -4 & 6 & -24 & 1 \end{bmatrix} \text{...8}$$

$$W_5 * W_5 = \begin{bmatrix} 1 & -2 & 0 & 2 & 1 \\ -2 & 4 & 0 & -4 & -2 \\ 0 & 0 & 0 & 0 & 0 \\ 2 & -4 & 0 & 4 & 2 \\ 1 & -2 & 0 & 2 & 1 \end{bmatrix} \text{.......9}$$

$$Average\ Matrix = \begin{bmatrix} 1 & 0 & 2 & 0 & 0.2 \\ 0 & 8 & 0 & 5.2 & -0.6 \\ 2 & 0 & 15.2 & 0 & 2.8 \\ 0 & 4.8 & 0 & 8 & 0.4 \\ 0.2 & -0.8 & 2.8 & -3.2 & 1 \end{bmatrix} \text{....10}$$

The outputs(energy matrix) are supplied to texture features after a sequence of specific convolutions with texture images.. All the collected images are normalized after the windowing procedure in order to show an image. After that, compute four statistical features for each normalized image: absolute mean (ABSM), mean square or energy (MS), entropy and local homogeneity (LHOM) as follows [19,20] .

$$ABSM = (1/MN) \sum_{x=1}^{M} \sum_{y=1}^{N} |f(x,y)| \quad ....11$$

$$MS = (1/MN) \sum_{x=1}^{M} \sum_{y=1}^{N} f(x,y)^2 \quad ....12$$

$$Entropy = (1/MN) \sum_{x=1}^{M} \sum_{y=1}^{N} f(x,y)(-log_2 f(x,y)) \quad ......13$$

Where $f(x, y)$ is the pixel value, and M and N are image dimensions

$$LHOM = \frac{\sqrt{\sigma_{x,y}} \; \sigma_{x,u}}{\mu_{x,y}} \quad . \; ... .. \quad 14$$

Where $\mu_{x,y}$ is local mean and $\sigma_{x,y}$ is the local variance of a pixel located at(x,y) with block size of N x N. These textural features are used to exam the effect of Seidlitzia Rosmarinus Plant on wounds in Rats using Histopathology images.

5.2 Threshold

One of the most basic image segmentation techniques is threshold. The threshold is chosen depending on the image sample. If one image has a dark background and light items, the threshold is used to get the background objects since it divides the foreground and background objects [20] .The threshold is traditional segmentation the region is segmented into two part, black and white, the back ground in the image is the black and the region is the region of interest
The operation of gray value is defined by

$$f(x) = \begin{cases} 0, & x < t \\ 1, & x \geq t \end{cases} \quad .... \; 15$$

x: represented the gray value.
t: represented the threshold value.

When the point $x \geq t$ is called an object point. When the point $x < t$ is called the background point [19,20]. It was used to extracted the texture tissue from the background to ensure the exact result. The value which is used in the search was 120 for all cases.

5.3 Atomic absorption spectrometry (AAS)

The AAS procedure is used to measure the concentrations of elements using an analytical technique. AAS is so sensitive that it can detect particles as small as a billionth of a gram in a sample. The wavelengths of light that are absorbed especially from the element benefit the AAS. They come to an agreement on the energies required to move electrons from one energy level to a higher energy level(AAS) uses distinctive wavelengths of electromagnetic radiation from a light source to sense components in either solid or liquid. Individual elements absorb wavelengths in different ways, and their absorbance are measured in contravention of the criterion. Atomic absorption spectrometry, in effect, takes advantage of the varying wavelengths of radiation absorbed by different atoms [21].

5.4 Preparation of aqueous solution

For the purpose of preparing the aqueous solution, take(40gm) of Seidlitzia rosmarinus powder in an Erlenmeyer flask which contains (200 ml) distilled water, mixed them using magnetic stirrer device for one hour after that, the mixture is filtered to obtained the solution. The preparation process shown in Figure(1).
.

a   b
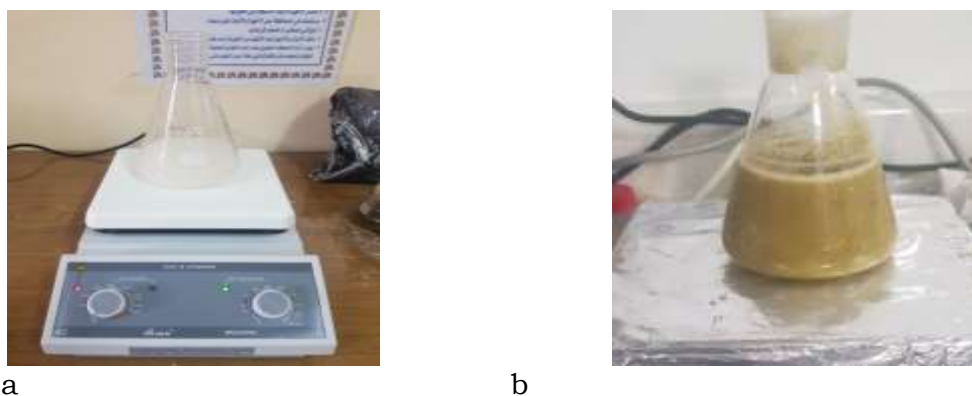
Figure 1. The preparation process.

6. Result and Discussion

The results of atomic absorption spectrometry for the Seidlitzia rosmarinus are shown in Table (2), which represent the elements that were detected upon examination (Iron, Calcium, Zinc, Manganese, Magnesium, Sodium and Potassium).

Table 2. Atomic absorption spectrometry (AAS)

	Detected	percent
1	Fe	0.052313%
2	Ca	48.914%
3	Zn	0.0656279%
4	Mn	0.007823%
5	Mg	2.409%
6	Na	7.942%
7	K	1.635%

The process by which skin heals itself is known as cutaneous wound healing. The four phases of cutaneous wound healing are universally accepted: hemostasis, inflammation, proliferation, and remodeling. Keratinocytes in humans quickly re-form a functioning epidermis (epithelialization), sealing the lesion and restoring tissue homeostasis.. Dermal fibroblasts migrate into the wound bed and multiply, generating "granulation tissue", which is rich in extracellular matrix proteins and aids in the growth of new blood vessels. This is finally reconstructed over time, restoring the injured tissue back to its pre-injury state. Deregulation about any phase of the wound healing cascade slows healing and can lead to a variety of skin conditions, such as no healing or persistent ulceration. to see how successful it is of Seidlitzia rosmarinus The animal used for study are rats with age ranging between two and three months and weight (125-150)gm classified into four groups (negative, positive, treated with powder of Seidlitzia rosmarinus and treated with solution) wounds are made to study the effect of Seidlitzia rosmarinus by studding the histopathology of rats and compare between the groups that treated. Figure (2) shows the animal while receiving treatment.
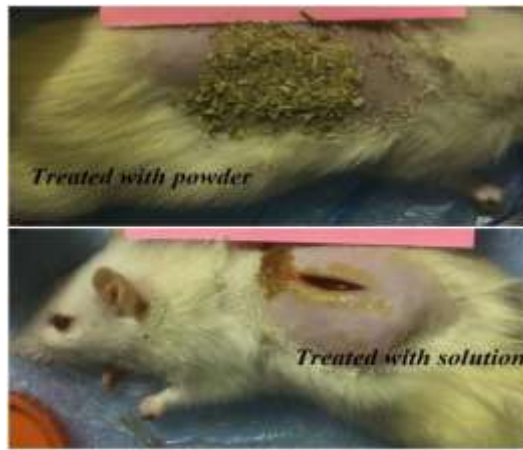
Figure 2. Rats treated with Seidlitzia rosmarinus.

6.1 Control Positive and Negative

In compared with histopathology sections of control group (Figure(3a) and Figure (3b) and Figure(4a) and Figure(4b), Figure (3a) and Figure(4a). These group have very thick layer of necrotic tissue infiltrated with inflammatory cells and fibrin covered the site of injury. Figure(3b), Figure(4b), Figure(5b) and Figure (6b), shows the threshold images which are used to discard from the glass reflection of the slid in which the Histopathology Images formed on. Underneath dermal layer shows extensive granulation tissue, fibroplasia and infiltrated leukocytes this is shown in Figure(5a) and Figure(5b) and Figure(6a)and Figure(6b). The statistical features which are obtained from the energy matrix are shown in table(3).

a   b
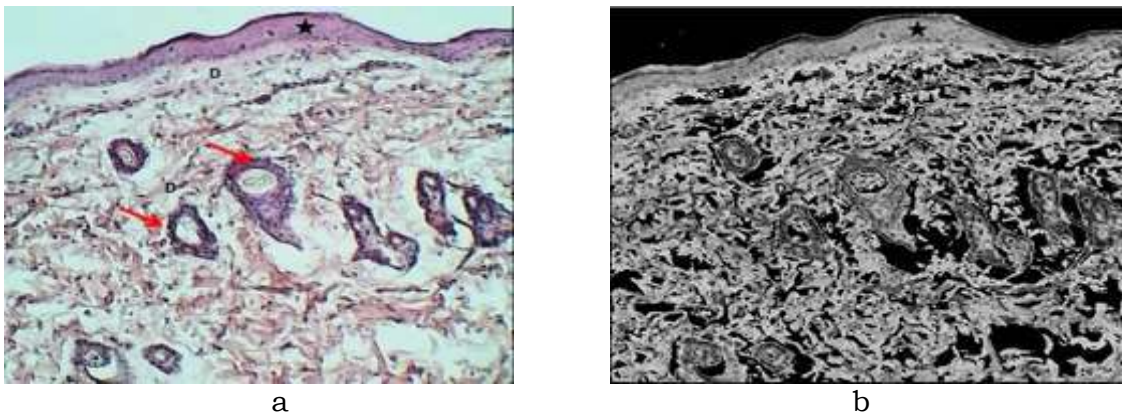
Figure 3. a Section of skin control negative shows: normal appearance of epidermis (Asterisk), dermis (D) with hair follicles (Arrows). H&E stain. 100x. b. Thersholding Image.
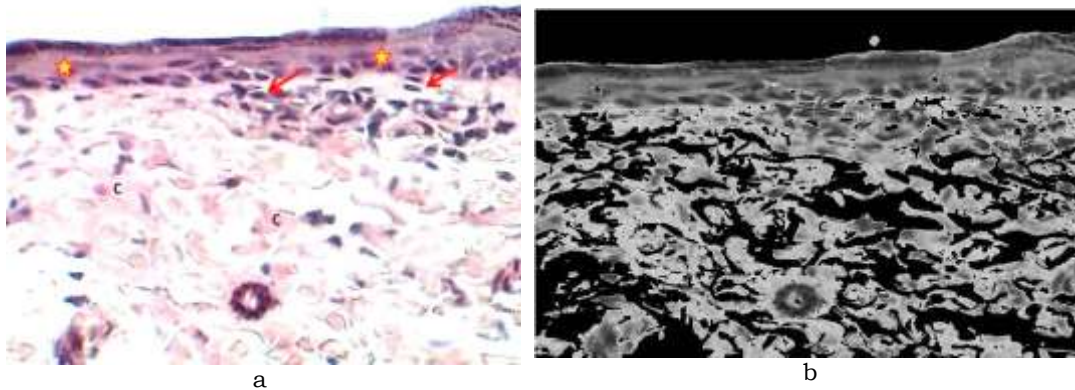
Figure 4 a.Control negative shows: normal appearance of epidermal epithelium (Asterisk), dermal collagen bundles (C) with normal content of fibroblasts (Arrows). H&E stain. 400x. b.Thersholding Image.
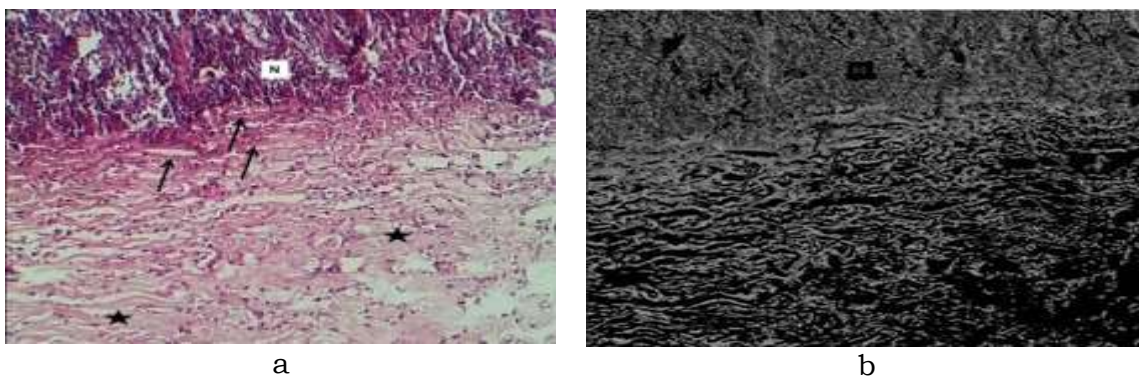
Figure 5 a. Section of skin (control positive) shows: necrotic tissue (N), fibrin network (Arrows) and granulation tissue (Asterisks). b. Thersholding Image.
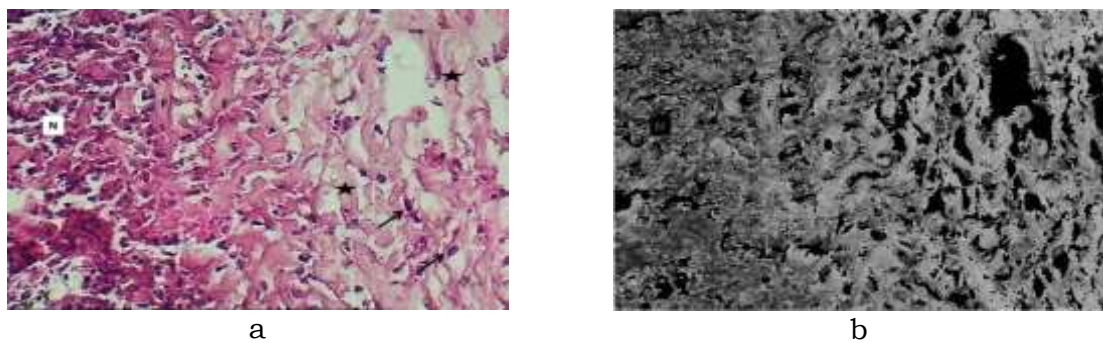
Figure 6. a.Section of skin (control positive) shows:necrosis tissue (N) collagen bundles (Asterisk), fibroblasts (Arrows). H&E stain. 400x. b. Thersholding Image.

6.2 Group of Seidlitzia Experiment
6.2.1 Seidlitzia Powder Group

Histopathology sections shows early stage of dermal tissue healing which revealed fibroplasia associated with production of collagen fibers those stage of maturation, there is residue of little degenerated leukocytes, on the other hand the sections of skin revealed no repithelization as shown in Figure (7a) and Figure (8a). The statistical features which are obtained from the energy matrix are shown in Table 3 which has been calculated from images in Figure(7b) and Figure(8b).

a

b
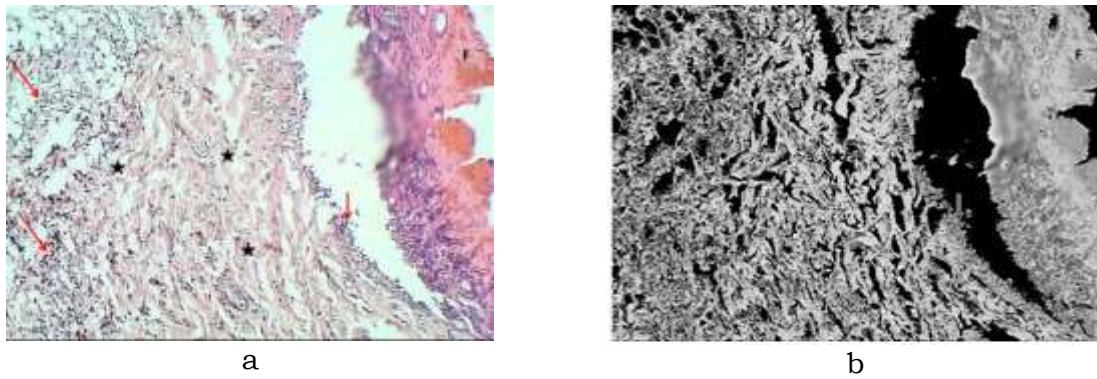
**Figure 7a. Section of skin (Seidlitzia) powder shows: thin fibrin clot (F),
inflammatory zone (Arrows) and granulation tissue (Asterisks). H&E stain. 100x.
b.Thersholding Image**

a

b
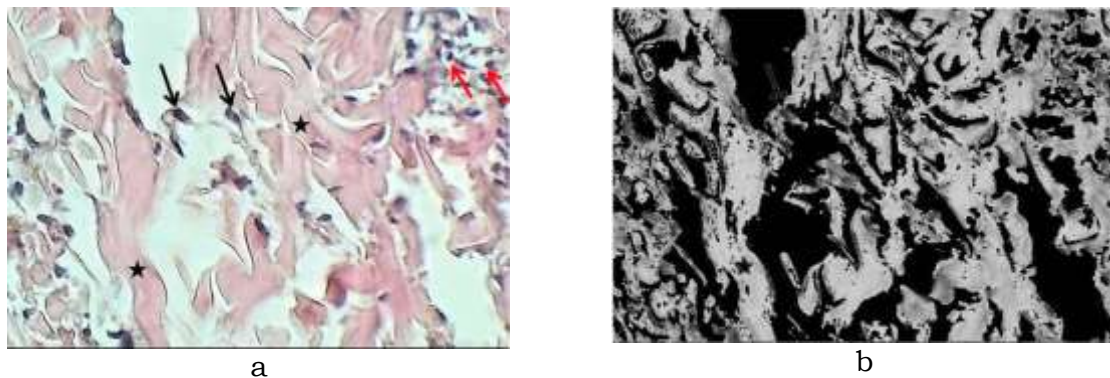
**Figure 8a. Section of skin (Seidlitzia powder) shows: mature collagen
bundles (Asterisks), inflammatory zone (Red arrows) & fibroblasts (Black
arrows). H&E stain. 400x.
b. Thersholding Image.**

6.2.2 Seidlitzia Solution Group

Histopathology Sections of this group are similar to those in control negative which revealed normal epidermal epithelium and dermal collagen bundles, hair follicles and cytoarchetecture figure(9a) and figure (9b), shows the threshold images which are used to discard from the glass reflection of the slid in which the Histopathology Images formed on.

Histopathology images of rats treated with Seidlitzia Solution and Seidlitzia powder indicate that the mean value decreased when injured occurred, as well as energy and local homogeneity, while the value of randomness (entropy) increased. Because the mean value gives information about the surface of the skin, when injured occur, the texture of the skin changes and thus the value of the mean decrease. In the injured tissue of shows an increase in entropy and a decrease in energy, and the homogeneity also decreases, this can be shown in the Table (2), Table (3) and figure(10).
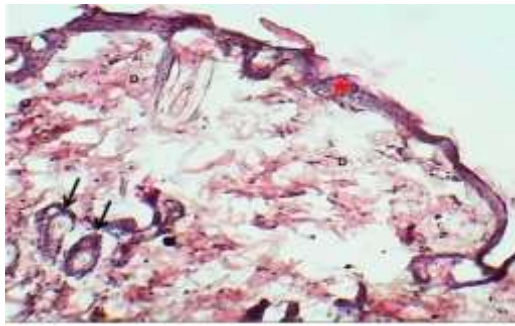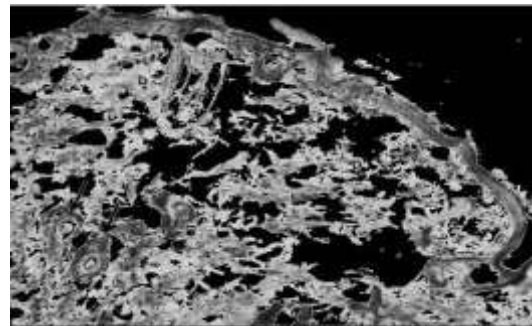
Figure 9 a. Section of skin (Seidlitzia solution) shows: normal epithelium (Asterisk), hair follicle (Black arrows) and dermis collagen bundles (D). H&E 400x.
b. Thersholding Image.

Table 2. The statistical features.

Statistical Features	Control Negative Figure 3b	Control Negative Figure 4b	Control Positive Figure 5b	Control Positive Figure 6b	Seidlitzia Powder Figure 7b	Seidlitzia Powder Figure 8b	Seidlitzia Solution Figure 9b
Absolute Mean	2.682	3.21	1.421	1.234	2.523	2.591	3.130
Entropy	0.325	0.294	0.651	0.592	0.472	0.342	0.203
Energy	0.897	0.921	0.461	0.423	0.541	0.642	0.898
Local Homogeneity	0.981	0.992	0.681	0.702	0.754	0.813	0.973

Table 3. Represent the average value for the statistical features for Control Negative Control Positive, Seidlitzia powder and Seidlitzia Solution.

Average Statistical Features	Control Negative (1)	Control Positive (2)	Seidlitzia Powder (3)	Seidlitzia Solution (4)
Absolute Mean	2.946	1.3275	2.557	3.130
Entropy	0.3095	0.6215	0.407	0.203
Energy	0.909	0.442	0.5915	0.898
Local Homogeneity	0.9865	0.6915	0.7835	0.973
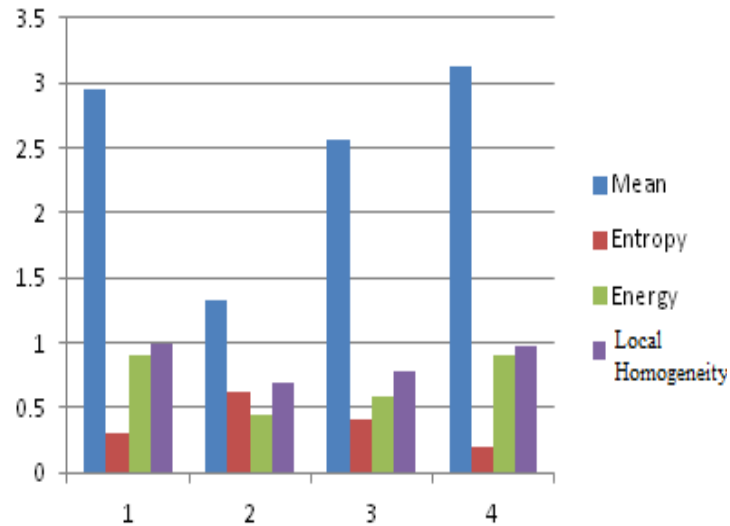
Figure. 10. The histogram distribution for average value for the statistical features for Control Negative (1) Control Positive (2), Seidlitzia powder(3) and Seidlitzia Solution (4).

7. Conclusions

The Histopathology images with the energy matrix are used to study the effects of Seidlitzia rosmarinus by calculating the textural features.Seidlitzia powder and Seidlitzia aqueous solution contain a high percentage of potassium, calcium and sodium, helps in activating the blood clotting process. When wounds occur, calcium is an essential element in activating the work of the clotting factors needed to complete the blood clotting process. Without calcium, these factors remain inactive. That is why calcium is one of the most important minerals required by the body. Magnesium helps the body fight viruses and heal wounds, when it dissolves with water it form oxide Magnesium which is an active mineral in killing bacteria. Potassium can help in the preparation of antiseptic drugs that help treat some manifestations of skin diseases such as skin surface infections resulting from wound healing, ulcers and lesions, and sodium helps in eliminating bacteria and viruses especially in water it for NaOH which helps in killing bacteria and fasting the healing wounds. The results of histopathology showed that the Seidlitzia aqueous solution gives better results than the powder, because Seidlitzia aqueous solution form the oxides of the elements.

References

[1] Amalraj A, Pius A, Gopi S, Gopi S. Biological activities of curcuminoids, other biomolecules from turmeric and their derivatives - A review. J Tradit Complement Med. 2016 Jun 15;7(2):205-233. doi: 10.1016/j.jtcme.2016.05.005. PMID: 28417091; PMCID: PMC5388087.

[2]. Yuan H, Ma Q, Ye L, Piao G. The Traditional Medicine and Modern Medicine from Natural Products. Molecules. 2016 Apr 29;21(5):559. doi: 10.3390/molecules21050559. PMID: 27136524; PMCID: PMC6273146.

[3]. DJ. Newman. Cragg GM.; J Nat Prod. Mar; **27**;83(3):770-803. (2020).

[4]. M,. Kamalifard Abbasalizadeh S. Mirghafourvand M..: A randomized, controlled, clinical trial. Phytother Res, 1–10. (2019) .

[5]. A. Mehrnaz Boyaghchi, Behzad Z. Mohammad M. Karim N., International Journal of Pharmaceutical and Phytopharmacological Research,; 7(3): 25-29. (2017).

[6]. H. Deymeh Shadizadeh, R. Motafak k., Scientia Iranica, **19**(6): 1661-1664. (2012).

[7]. RA DeFilipps. Krupnick GA.,(**102**):1-341(2018).

Rodríguez CA Effect of Cáceres . Jairo Leonardo Cuervo A. . and Javier Leonardo organic fertilization on yield and quality of rosemary (Rosmarinus officinalis L.) essential oil, Agronomía Colombiana 35(2), 232-237, 2017.

[9]. Sharifi-Rad J, Ezzat SM, El Bishbishy MH, et al. Rosmarinus plants: Key farm concepts towards food applications. Phytotherapy Research. 2020;1–45. https://doi.org/10.1002/ptr.6622

[10]. R. Harisaranraj Suresh K. Saravanababu S. Advances in Biological Research ABR**; 3** (5-6): 174-178. **(**2009).

[11]. MR. Hadi. Biotechnological potentials of Seidlitziarosmarinus: A mini review. Afr. j. biotechnol. **8**: 2429-2431. (2009).

[12]. Chokotho van. H. a pilot study, Malawi Med J. Jun; **17**(1): 19–20. (2005).

[13] Engwa, G. A. Free Radicals and the Role of Plant Phytochemicals as Antioxidants Against Oxidative Stress-Related Diseases. In: Asao, T. , Asaduzzaman, M. , editors. Phytochemicals - Source of Antioxidants and Role in Disease Prevention [Internet]. London: IntechOpen; 2018 [cited 2022 Sep 13]. Available from: https://www.intechopen.com/chapters/60884 doi: 10.5772/intechopen.76719.

[14.] Young Soo Kim, Ik-Hyun Cho, Moon-Jin Jeong, Soon-Jeong Jeong, Seung Yeol Nah, Young-Sik Cho, Seung Hyun Kim, Ara Go, Se Eun Kim, Seong Soo Kang, Chang Jong Moon, Jong Choon Kim, Sung Ho Kim, and Chun Sik Bae. Therapeutic. Effect of Total Ginseng Saponin on Skin Wound Healing, J. Ginseng Res.; **35** (3): 360-367. (2011).

[15] Fetse, John & Oppong Kyekyeku, James & Dueve, Evans & Mensah, Kwesi. (2014). Wound Healing Activity of Total Alkaloidal Extract of the Root Bark of Alstonia boonei (Apocynacea). British Journal of Pharmaceutical Research. 4. 2642-2652. 10.9734/BJPR/2014/13952.

[16] A. James. Duke, with Mary Jo Bogenschutz-Godwin, Judi duCellier, Peggy-Ann K. Duke Handbook of medicinal herbs; 2nd ed, (2002).

[17]. M., Heidari, Hosseinabadi, R., Anbari, K., Pournia, Y., & Tarverdian, Ther. Med,; 22(4): 607–613. (2014).

[18]. Alyaa Hussein Ali, Hazim I. Al-Ahmed,Sabah N. Mazhir and Aiyah S. Noori . "Using Texture Analysis Image processing Technique to Study the Effect of Microwave Plasma on the Living Tissue. *Baghdad Journal of Science.* Vol.15 pp. 87-97. 2018., DOI: 10.21123/bsj.2018.15.1.0000.

[19]. Z. Mosa Nebras H.Ghaeb , Alyaa H., Baghdad Sci. J.;**16**.: 1022-1024. DOI: http:// dx.doi.org /10.21123/bsj.2019.16.4(Suppl).

[20] A.Hussein Ali, Z.H Shakir, A.N. Mazher, S.N. Mazhir , Baghdad Science Journal, https:// doi.org/ /10.21123/bsj.2022.19.4.0855 (2022).

[21]. R. Boxer.. 10th ed. USA.; **26** : 486-492. (1997).

EFFECT OF SUSTANON ON SKELETAL MUSCLES (ARM, THIGH) AND SOME OF BLOOD PARAMETERS IN FEMALE RATS (RATTUS RATTUS) IN BABYLON-IRAQ

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Abstract:

There are random uses of androgenic anabolic steroids such as sustanon , especially among young people and adolescent.These drugs have many long-term negative side effects; therefore they have become one of major problem of health.

This study was conducted in order to examine the effect of intramuscular injection of androgenic anabolic steroide (sustanon) on some hormonal, immunological and histological parameters in female albino rats. The study carried out in the animal house (College of Veterinary Medicine/ University of Al-Qassim green). Twenty Four female rats were divided into four groups (6 replication for each), the first, second and third treatment sub groups injected by sustanon at concentrations (0.05, 0.1, 0.2) mg/kg/day respectively for six weeks, while the fourth subgroup was considered a control set which injected by physiological normal saline (0.9%Nacl). The blood parameters estimation (RBCs, WBCs, PCV, PLT,Hb)

Histologic study included studying histopathological changes in skeletal muscles tissue (thigh, arm). The results showed a significant increase ($p \leq 0.05$) of the levels (Hb,RBCs, WBCs, PCV, PLT), compared with thecontrol group. Histology study changes showed that hypetrophy of fiber muscle in thigh and arm tissue with hyperplasia of muscle cells in arm at high doses present study conclude that increasing the concentrations of sustanon drug may cause clear pathological changes (physiologically, and histologically in most of the study parameters.

Key words: Sustanon, Hypertrophy, Thigh, Arm.

Introduction:

Sustanon is an anabolic androgenic medication that is often used to increase skeletal muscle mass and strength. Testosterone propionate, testosterone phenylpropionate, testosterone isocaproate, and testosterone decanoate are all esterified testosterone derivatives. Although, little is known about the drug's cellular effects on skeletal muscle, Sustanon-induced skeletal muscle hypertrophy is linked to an increase in the number of SCs. Sustanon is a member of the AAS family of drugs, which covers a wide range of therapeutic options (Hamza & Rashid, 2017 a, b). It is used to treat a variety of medical conditions, including osteoporosis, male hypogonadism, and infertility (Harvey, 2011).

Sustanon is distinguished from other AAS medicines by its distinct pharmacological, structural, and features. It is made up of an oily mixture of four separate testosterone ester compounds, which produces a continuous release of testosterone into the blood serum for a period of 3-4 weeks2 (Al- Alwany *et al.,* 2015).Furthermore, these medicines were administered to race horses and canines that wanted to improve their physical appearance (Fitch, 2008; Rao, 2011).

It can help with muscular mass and strength, as well as bodybuilding.Sustanon is a fast- acting steroid, however it also has a number of negative side effects. Because it can convert to estrogen, it can cause an increase in breast tissue growth, a condition known as gynecomastia (Meriggiola, 2002).

Because it can convert to estrogen, it can cause an increase in breast tissue growth, a condition known as gynecomastia (Meriggiola, 2002). Acute hepatitis with jaundice, testicular dysfunction resulting in infertility, hypertension, and behavioral abnormalities (Hassan,2009; Büttner,2010) were all reported as side effects of these medications in previous research.

Materials and methods

Animals

In this investigation, twenty-four albino rats (*Rattus rattus*) weighing between 200 and 250 grams were used. Food and water were freely available to the animals. The rats were kept in a temperature-controlled environment (25-30ºC) with 12 hour light-dark cycles.

Designing Experiments

The rats wererandomly sorted into four groups (12 rats each). The first group was used as a control group, while the other three were used as experimental groups. For six weeks, the control group received (NaCl 0.09 percent) injections once a

week.For six weeks, the first, second, and third experimental groups were given sustanon-seasme oil suspension at doses of 0.05, 0.1, and 0.2 mg/kg, respectively(Al- Alwany et al., 2015).

Blood and tissue sampling: The animals were anesthetized with chloroform and slaughtered during the research. Approximately 5 ml of blood was drawn directly from the heart with sterile syringes and kept in EDTA tubes to test the concentrations of (HB, RBCs, WBCs, PCV, Platelet count), as well as muscle specimens (thigh and arm) for histological investigation (Al- Alwany et al., 2015).

Sustanon (250 mg) concentration

The local pharmacy in Hilla-Iraq provided Sustanon ampoules (made by N.V. Organon Oss Inc. Holland. Each ampoule contains 1 mL of Sustanon oily solution. This 1 mL of Sustanon, according to the manufacturer, contains four testosterone ester compounds: testosterone propionate, testosterone phenylpropionate, testosterone iso caproate, and testosterone decanoate (Khder and Falah, 2012).

Blood Analysis

In this study, an automated blood analysis device (automated blood analyzer) was used to obtain analysis results ready for a sample of blood without the use of previous conventional methods in the counting process, as it has been estimating the number of red blood cells and platelets, total count of white blood cells, hemoglobin concentration, and the rate of packed cell volume cell (Al- Alwany et al., 2015).

Histological processing and staining

According to Bancroft *et al.,*(2013),ordinary histological processes are prepared for skeletal muscles (thigh and arm) in order to evaluate the histopathological changes that may be discovered in the experimental groups when compared to the control group.

The followings were the procedures for processing and staining

24 hours in Bouin's solution with little fragments of tissues,Dehydration in ethanol at various concentrations (50, 70, 80, 90, and 100 percent) for two hours at each concentration. Clearing for two hours with xylene. Infiltration with a mixture of xylene and paraffin wax (melting point 56–58 ℃) and 30 minutes in an electric oven at 60℃. just one hour of moving to molten wax.Paraffin wax embedding and storage at room temperature. Microtome sectioning (5m thick slices on glass slides)

Haematoxylin- Eosin (H&E) staining technique

3 minutes of Haematoxylin-Harris staining, then, well washed with running tap water for 5 minutes, or until blue portions appear.For 1 minute, stained with 1% Eosin. Washed for 5-10 minutes under running water (Reference).

Microscopic examination and photomicrography

To determine the alterations in histopathology, the slides were examined under a light microscope (Olympus). and photograph with a phase contrast light microscope camera.

Statistical analysis

The SPSS program (Genstat) version was used to examine the study's findings statistically (1995). The arithmetic mean and standard error (Mean S.E.) comparison between the averages in different dose intervals is calculated using less difference between middle L.S.D. (Least Significant Differences) and under level probability 0.05 in this study.

The Results

Analyses of blood

Table 1 shows that increases in (Hb, RBC, WBC, PCV, and platelet count) of experimental animals were significantly higher (P ≤ 0.05) in females treated with sustanon (0.05, 0.1, and 0.2) mg/kg of body weight, compared to the control group

Arm muscle histological study

The main histopathological changes of arm muscle sections stained with hematoxylin-eosin in female rats treated with different concentrations of sustanon revealed a range of changes from moderate to severe, with mild hypertrophy in muscle fibers (Figure 4-2) and increased muscle mass and hypertrophy of muscle fibers (Figure 4-3).

In comparison to the control group (Figure 4-1), sustanon at 0.2 mg/kg body weight caused substantial hypertrophy and hyperplasia of muscle cells (Figure 4-4).

Muscle in the thighs

The most significant histopathological changes in thigh muscle sections stained with hematoxylin-eosin in female rats treated with various concentrations of sustanon revealed that a concentration of 0.05, 0.1, and 0.2 mg/kg body weight of

sustanon caused mild hypertrophy in muscle cell fibers (Figure 4-6), (Figure 4-7), and (Figure 4-8). (Figure 4-5) as compared to the control group.

Table (4-1). Average the total number of red blood cells and white blood cells and platelets and hemoglobin concentration in rats injected with differentSE) ± doses of sustanon Mean

Similar letters indicate no significant difference (P ≤0.05) between groups various letters indicate there was a significant difference (P ≤0.05) between groups

Six weeks				parameters
0.2 mg/kg	0.1 mg/kg	0.05 mg/kg	control group	
٦,٢٥±٠,٢٣ C	٥,٩٩±٠,١٠ b	٥,٧٦±٠,٠٦ a	٠,٠٧±٥,١١ a	Red blood cell count x 10^6 (cell/m³)
١١,١±١,١٣ A	١٠,٢±١,٠٣ a	١١,٤±٠,١٤ a	٠,٠٥±١٠,٤ a	White blood cell count x 10^6 (cell/m³)
٢٢,١±٥٩٩ C	٦٠٨,٣±٢٨,٧ c	٧٣٤,٥±٢٥,٦ b	٢٥,٩±٤٩٥,٦ a	Platelets count x 10^3 (cell/m³)
*٠,٠٨ ± ١٣,٧ C	٠,٠٨ ± ١٣ b	٠,٠٥ ± ١٢ a	٠,٢٠ ± ١١,٨ a	Hemoglobin concentration (g/100 ml)
٠,١٧ ± ٣٧,٦ D	٠,١٨ ± ٣٥,٦ c	٠,٢٣ ±٣٢ b	٠,٤٤ ±٢٨,٤ a	Percentage of blood package%
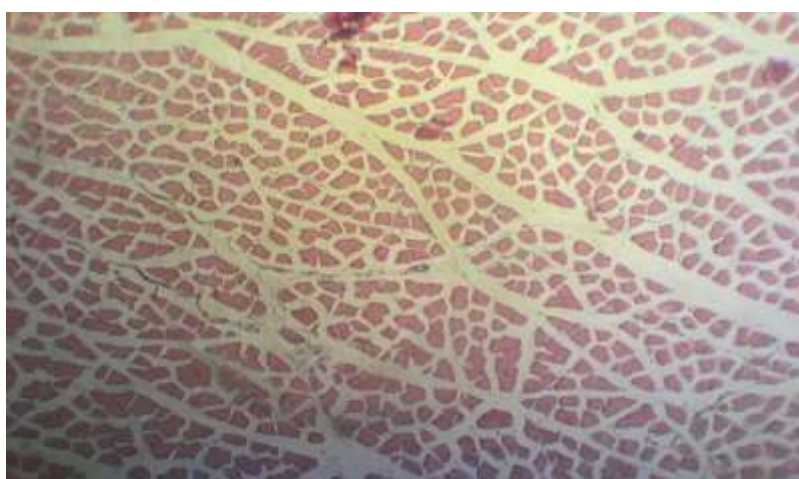
Figure (4-1).Cross section of control arm muscle in female rats (H&E, 100X)
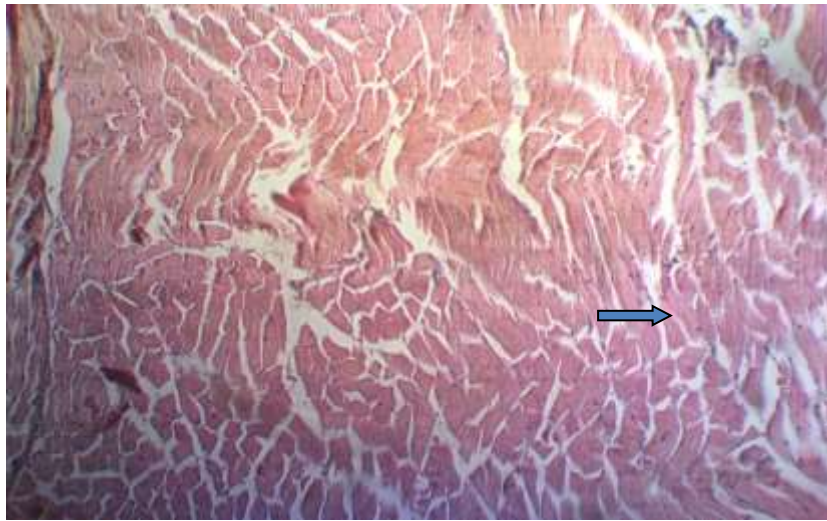
Figure (4-2). Cross section of arm muscle in female rats injected with 0.05 mg/kg of sustanon showed hypertrophy of muscle fibers ⟶(H&E, 100X).
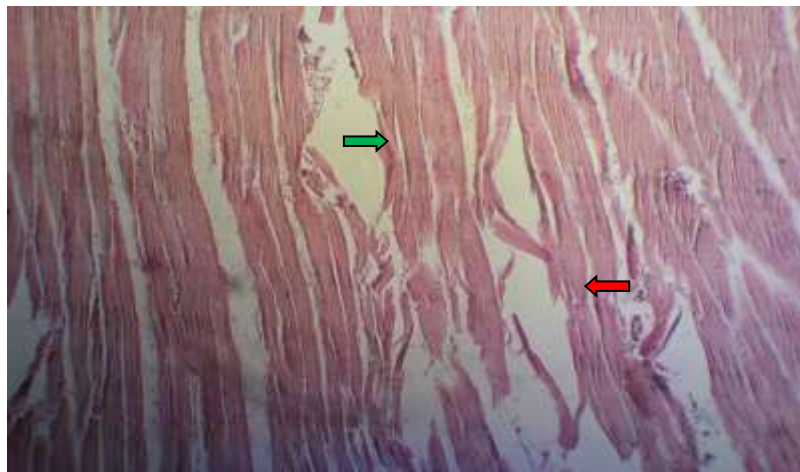
Figure (4-3). Cross section of arm muscle in female rats injected with 0.1 mg/kg of sustanon observed increase in muscle mass⟵ and ⟹hypertrophy of muscle fibers(H&E, 100X).
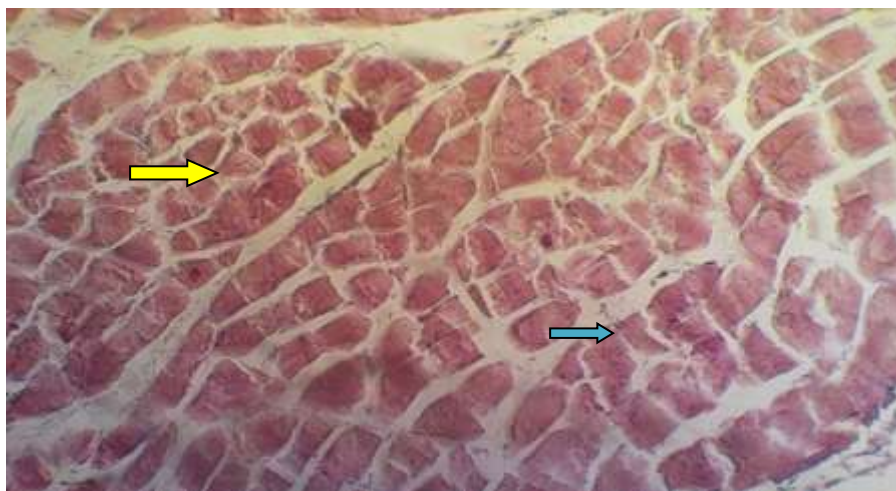
Figure (4-4).Cross section of arm muscle in female rats injected with 0.2 mg/kg of sustanon showed severe hypertrophy ⟹ with hyperplasia of muscle cells ⟹ (H&E, 100X).
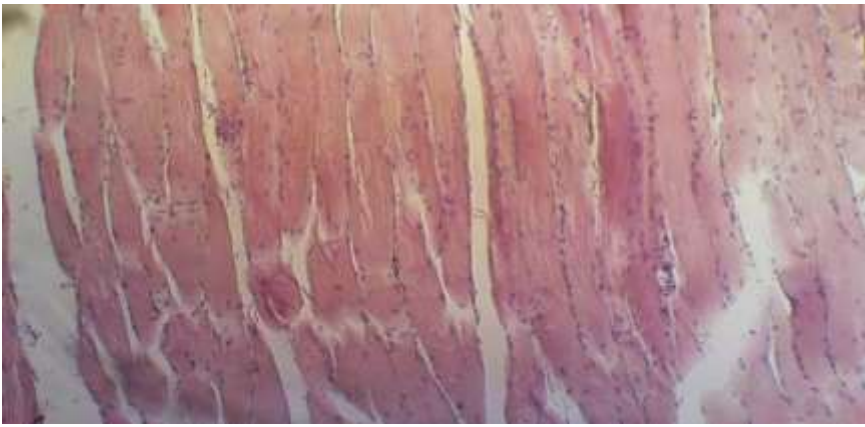
Figure (4-5).Cross section of control thigh muscle in female rats   (H&E, 400X)
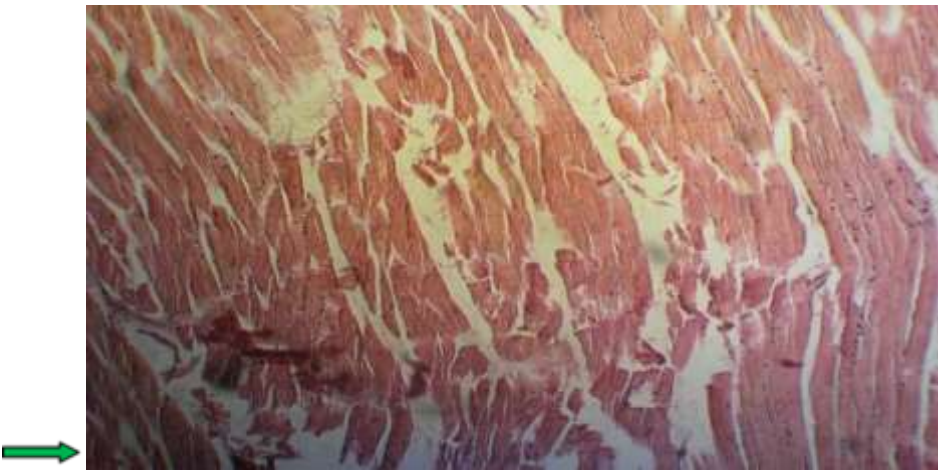
Figure(4-6).Cross section of thigh muscle in female rats injected with 0.05 mg/kg of sustanon mild hypertrophy in muscle cells fibers ⟹ (H&E, 100X)
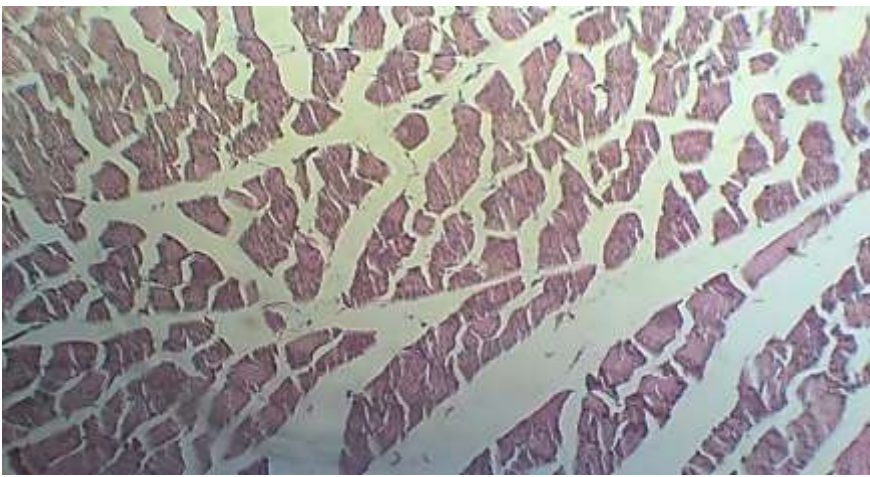
Figure(4-7). Cross section of thigh muscle in female rats injected with 0.1 mg/kg of sustanonhypertrophy in muscle cells fibers⟹ (H&E, 100X)
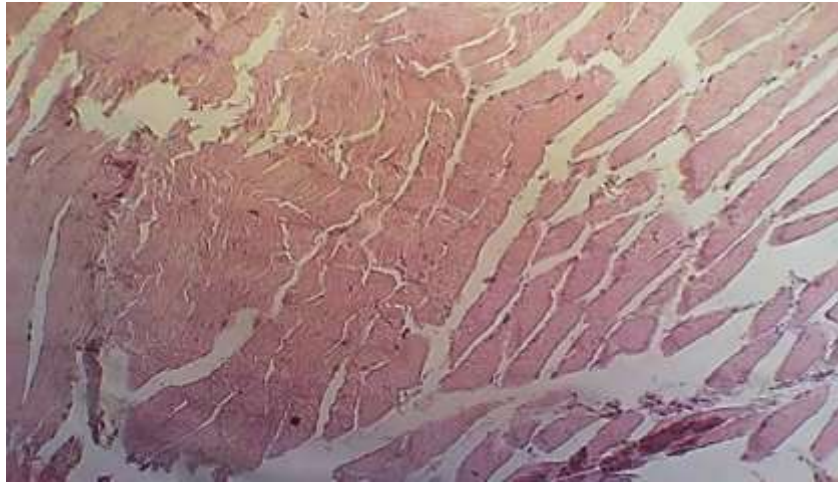
Figure(4-8).Cross section of thigh muscle in female rats injected with 0.2 mg/kg of sustanon hypertrophy in muscle cells fibers (H&E, 100X)

Discussion

Sustanon's effect on blood components

The current study's findings revealed a significant increase in RBCs, Hb, PCV, WBCs, and platelet count (table 4-1). This increase in Hb, RBCs, and PCV were due to the impact of AAS on red bone marrow, which stimulates increased red blood cell production as well as increased renal erythropoietin hormone production (Gallicchio *et al.,*1984; Urhausen *et al.,*2003), which also means (Chung *et al.,* 2007).

The current findings corroborated those of a researcher Alex and his colleagues (2011), who discovered an increase in the amount of red blood cells as a result of athletes' usage of steroids in fitness facilities Activated inflammatory events in diverse sections of the body, such as smooth muscle, liver, kidney, lungs, and skin, can lead to increased production of white blood cells WBCs of red bone marrow in response to inflammation in the body (Sengupta and Bishayi , 2002; Al- Alwany *et al.,* 2015).

The current study found an increase ($P \leq 0.05$) in platelet number, indicating that increasing platelet number with anabolic steroids increases the risk of cardiovascular disease (Achar, 2010), and that reducing and sealing vascular slits with sulphur amino acid alturin (Taurine) with activated platelets can reduce and seal those risks (Rosca *et al.,* 2013), which were likely associated with proper elevation number of hemoglobin. The findings of the study corroborate those of McCrohon *et al.,*(2000), who found an increase in the average number of platelets as a result of athletes' usage of steroids

Histopathological study

The current study found histological changes in skeletal muscles (arm, thigh) after using sustanon as an anabolic androgenic steroid on female rats. Hypertrophy with hyperplasia of muscle fibers in the arm and hypertrophy of muscle fibers in the thigh muscles were detected. There was one. Testosterone has a variety of impacts due to its androgenic and anabolic properties organs. The growth of a bigger mass of muscles, higher maturity of skeletal bones, and increased mineralization are examples of its anabolic (myotropic) effects (Kochakian and Murlin, 1935). Some studies agree with the current study, pointing out that anabolic medicines and physical activity target glycogen factors in skeletal muscle, causing hypertrophy and a rise in glycogen levels due to a decrease in the phosphorylase enzyme that degrades glycogen (Livingstone *et al.,* 2004). Anabolic steroids are thought to cause a considerable increase in muscle mass, which can overwhelm tendons and ligaments, leading to a rise in musculoskeletal problems among users (Liow & Tavares, 1995; Hamza & Rashid,2017).

Conclusions

Females' blood parameters (HB,RBCS, WBCS,PCV, Platelets) increased as a result of the study. The occurrence of histological alterations in the skeletal muscles (thigh, arm) that may compromise their function.

References

1. **Achar, S., Rostamian, A., and Narayan, S. M. (2010).**Cardiac and metabolic effects of anabolic-androgenic steroid abuse on lipids, blood pressure, left ventricular dimensions, and rhythm. *Am. J.Cardiol.;* 106:893-901.

2. **Alalwany, E..H., Al-Saadi, H.K., Hassan, A.J. (2015).**Effect of sustanon on some immunological and hormonal parameters in rats. *International Journal of Chemical Sciences,* 13(4), 1947–1960.

3. **Alex, S.M., Carlos, B., Rogerio, C. S., Tiago, O., Tomas, L., Paulo, A. S., Roberto, S., Moacir, M., and Jose, H. M. (2011)**. chronic users of supraphysiological doses of anabolic develop hematological and serum lipoprotein profiles that are characteristic of high cardiovascular risk. *Inter. J. sport and exercise. ,*3(2):27-36.

4. **Bahrke, M.S., and Yesalis, C. E. (2004).** Abuse of anabolic androgenic steroids and related substances in sport and exercise. *Curr. Opin. Pharm.,*4(6): 614-620.

5. **Bancroft, J. D., Layton, C., and Suvarna, S.K. (2013).** Bancroft's theory and practice of histological techniques. 7th edi. Chrchill Livingstone Elsevier. Elsevier Limited.

6. **Basaria, S., Wahlstrom, J. T., and Dobs, A. S. (2001)**. Anabolic androgenic steroid therapy in the treatment of chronic diseases. *J. Clin.Endocrin. Metabol., 86:* 5108–5117.

7. **Bhasin, S., Storer, T.W., and Berman, N. (1996)**. The effects of supraphysiological doses of testosterone on muscle size and strength in normal men. *N. Engl. J. Med.;* 335: 1-7.

8. **Bhasin, S., Woodhouse, L., andCasaburi, R. (2001)**. Testosterone dose-response relationships in healthy young men. *Am. J. Physiol. Endocrinol. Metab.,* 281: E1172-81.

9. **Boje, O.** (1939). Doping. *Bulletin of the Health Organization of the League of Nations.;8:439–469.*

10. **Chung, T., Kelleher, S., Liu, P.Y., Conway, A.J., Kritharides, L., and Handelsman, D.J. (2007).** Effects of testosterone andnandrolone on cardiac function: a randomized,placebo-controlled study. *Clinical Endocrinology,* 66(2),235-245.

11. **Finkle, W.D., Greenland, S., Ridgeway, G.K., and *et al.*(2014).** Increased risk of non-fatal myocardial infarction following testosterone therapy prescription in men. *PloSOne.*,*9*(1):e85805.

12. **Gallicchio, V.S., Chen, M.G.,and Watts, T.D. (1984).** The enhancement of committed hematopoietic stem cell colony formation by nandrolone decanoate after sublethal whole body irradiation. *Inter.J.Ce. Clo.*, 2(6),383-393.

13. **Gårevik, N., Strahm, E., Garlw, M., Lundmark, J., Ståhle, L., Ekström, L., and Rane, A. (2011).** Long 667 term perturbation of endocrine parameters and cholesterol metabolism after 668 discontinued abuse of anabolic androgenic steroids. *J.Steroid Biochem.,* 669 *and Molec. Biol.,127 :* 295-300.

14. **Goldspink G (2005)** Research on mechano growth factor: its potential for optimizing physical training as well as misuse in doping. Br J Sports Med 39:787-788.

15. **Hamza E. A., and Rashid, K. H. (2017b).** Histological and physiological effects of Sustanon on the liver and Kidneys of male rats.*Journal of Kerbala for Agricultural Sciences* (Proceedings of the Third Scientific Conference of the Faculty of Veterinary Medicine/ University of Kerbala on 10th April 2017.

16. **Hamza, E.A., and Rashid, K.H. (2017a).** Some hepatic and renal histological and physiological effects of the artificial testosterone (Sustanon) on female rats. *Pakistan Journal of Biotechnology,* 14(3), 369–372

17. **Hartgens, F., and Kuipers, H. (2004).**"Effects of androgenic-anabolic steroids in athletes". *Sports Med.,34* (8): 513–554.

18. **Harvey, P. W. (2011).** Prolactin-induced mammary tumorigenesis is not a rodent-specific response. *Toxicol. Pathol.,39*: 1020–1022.

19. **Johnson, J. M., Nachtigall, L. B., and Stern, T. A. (2013).** The effect of testosterone levels on mood in men: A review. *Psychosomatics.,54*(6): 509-514.

20. **Karila, T., Karjalainen, J., Mantysaari, M.J., and *et al.* (2003).** Anabolicbo-dybuilders who use anabolic steroids. androgenic steroids produce dose-dependent increase in left ventricular mass in power athletes, and this effect Cardiovascu- ed by concomitant use of growth hormone.*Int. J. Sports Med.*, *24* (5): 337-343.

21. **Kochakian, C.D., and Murlin, J.R. (1935).** The effect of male hormone on the protein and energy metabolism of castrated dogs, *J Nutr.,* 10: 437-459.

22. **Liow, R. Y., and Tavares, S. (1995).**Bilateral rupture of the quadriceps tendon associated with anabolic steroids. *British Journal of Sports Medicine*, **29**, 77–79.

23. **McCrohon, J.A., Death, A.K., Nakhla, S., Jessup, W., Handelsman, D.J., and Stanley, K.K., and Celermajer, D.S. (2000).** Androgen receptor expression is greater in male than female macrophages- A gender difference with implications for atherogenesis. *Circulation,* 101(3), 224–226.

24. **Mooradian, A.D., Morley, J.E, and Korenman, S. G. (1987).** "Biological actions of androgens". Endocr. Rev.8 (1): 1–28

25. **Rosca, A.E., Badiu, C., Uscatescu, V., Mirica1, R.,Braga1, R.I.,Pavel, B., and Zagrean1, L.(2013).** Effect of chronic administration of anabolic androgenic steroids and taurine on platelet aggregation in rats.*General EndocrinologyNations, 8,* 439-469. doi: 10.4183/aeb..33

26. **Sengupta, M.V., and Bishayi, B.L. (2002).** Effect of Irad and arsenic on Murine Macrophage response. *Drug Chem.Toxical., 25* (4): 49-72.

27. **Singh, S.K., and Abe, K. (2006).** Light and electron microscopic observations of giant cells in the mouse testis after efferent duct ligation. *Archiv. Histol.Jap., 50*(5): 579-585.

28. **Urhausen, A.,Torsten, A., and Wilfried, K. (2003).** Reversibility of the effects on blood cells, lipids, liver function and hormones in former anabolic–androgenic steroid abusers. *J.Ster. Biochem. Mol. Biolo.,* 84(2-3),369-375.

EFFICACY OF SPRAYING DIFFERENT SOLUTIONS AT DIFFERENT INCUBATION PERIODS ON HATCHABILITY AND EMBRYONIC MORTALITY RATES OF LOCAL DUCK EGGS

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Abstract:

Ducks have lower hatchability rate than other poultry species, ranging about 65-82%, and duck egg hatching is more difficult than chicken egg hatching. The present study aimed to evaluate the effect of spraying incubating duck's eggs with the olive oil, ethanol alcohol and distilled water on embryonic mortality and hatchability rates. Eight hundred fertilized eggs were used with an average weight of (65-73) g divided into four groups, each group subdivided into four sub-groups were sprayed with distilled water at 37°C temperature, olive oil and ethanol alcohol 70%, and the control group without spraying. The first group G1 was sprayed on 1st day of incubation, the second group G2 was sprayed at 7th day of incubation, and the third group G3 was sprayed at 14th day of the incubation period, and the fourth group was sprayed at 21st day of the incubation. The results revealed that the hatching rate was significant raising ($p \leq 0.05$) in eggs sprayed by water in each periods of incubation when compared with other spraying groups. Also, the embryonic mortality rate registered a significant decreasing ($p \leq 0.05$) in eggs spraying by distilled water during incubation periods compared with other spray group. In conclusions, from present results are established that the spraying Iraqi duck's eggs by distilled water could improve hatchability rate and decrease the mortality rate of embryo at variant periods of incubation.

Key words: Ducks, Hatchability, Mortality , Spray, Water.

Introduction:

Ducks are known as one of the water birds that belong to *Anatidae* family to the order of geese (Braun et al., 2002). The experiences of many countries in America, Europe and Asia have supported the strategies of raising ducks industry that providing as a part of the population's needs in animal protein (Dean 1985, Tai and Tai 2001 and Ismoyowati and Sumarmono 2019). Ducks are characterized by high resistance to diseases and endurance the high degrees of temperature and humidity (Changkang et al, 1999).

In poultry field, egg incubation technology with a continuous development attempted to achieve better hatch and posthatch performances (Mueller et al., 2015). Optimum incubation circumstances are varies due to egg weight, hen age, relative humidity, and quality of egg transport (El-Hanoun et al., 2012). Ducks have lesser hatchability rate than another poultry, ranging approximately 65-82% *vs.* about 79-85% for another birds, Moreover, duck egg hatching is more challenging than egg hatching in chickens, due to thick eggshells, high quantity of pores and large size of duck eggs (Hodgetts, 1991 and Harun et al., 2001). Ducks' eggs were hatched under standard conditions which need some factors for supporting hatching rate and embryonic growth and development during the different stages of incubation (Al-Rawi, 1969). Eggshell water vapor conductance, thickness of eggshell and density of pore are main properties of eggs that influence the survival of embryonic development in poultry to supply the embryo with essential requirements for improving hatching (Christensen et al., 2005 and Balkan et al., 2006), therefore, there are many causes for the lowing rate of hatching in duck eggs, which including the egg shell, which plays an important role in controlling the loss of the amount of water from inside the egg (Sarpong and Reinhart, 1985), so the weakness of the egg shell is a major reason for the death of the fetus inside the egg, and the reasons for this weakness may be due to an imbalance phosphorous to calcium levels or due to micro-crust diseases (Ryan et al., 2002).

As well as, relative humidity, RH, is a very crucial factor that influenced on proper conductance of embryogenesis that may be improved by sprayed the incubating eggs by water or different solution contain little percentage of water (Andrieuxa et al., 2022). RH could be used to prevent egg dehydration during raising the incubation temperature to support the hatching performances and decline embryonic mortality

Many researchers attempted to improve the rate of hatching and the reduction of embryonic mortality by spraying the eggshell with different materials during the incubation period (El-Hanoun et al., 2012 and Altaie et al., 2019). In

addition, Fasenko et al., 2009 , who spraying hatching eggs by acidic electrolyzed oxidizing water and noticed the ability of acidic electrolyzed oxidizing water to decrease eggshell microbial capacity without negatively influencing on hatchability and might make it a valuable product for hatching egg sanitation.

Besides, the oils extracted from natural compounds, including olive oil, which has an antibiotic effect for viruses as well as a booster for the immune system (Afsari et al., 2013) , olive oil contains oleic, palmitic acid and antioxidants such as flavonoids, vitamin E and carotene (Botsoglou et al., 2013). Because of the high embryonic mortality and the low rate of hatching in the eggs of Iraqi ducks and there is no or little article concerning with this feild, this study was conducted for demonstrating the effect of spraying the shell of the eggs of Iraqi ducks with different solutions at different incubation periods on the hatchability and embryonic mortality.

Materials and methods

The experiment was conducted in the hatchery of Animal production department of the College of Agriculture / University of Karbala for the period from 9/6/2020 to 3/10/2020. The incubator condition have a temperature of 37.5 ° C and a humidity of 65%.

Experimental groups: In this article, 800 fertilized eggs obtained from the field of raising local ducks belong to College of Agriculture / University of Karbala, with an average weight of (65-73 g) divided into four groups with 200 eggs per group (G1, G2, G3, G4), then each group subdivided into 4 sub-groups with 50 eggs for each group, G1: eggs sprayed with olive oil, ethanol alcohol 70% and distilled water with 37°C temperature at 1st day of incubation, G2 ,G3 and G4 refer to eggs spayed with solutions, olive oil, ethanol alcohol 70% and distilled water with 37°C temperature, at 7th, 14th and 21th days of incubation, respectively ,. 1st subgroup as control group without spray any solution, 2nd subgroup sprinkled with a distilled water at 37°C temperature, 3rd subgroup sprinkled with olive oil and 4th subgroup sprayed with 70% ethanol.

At the end of the incubation period, the hatchability rates and Embryo mortality rate were measured. according the following equation (Molenaar et al., 2011).

The percentage of eggs hatching = (the number of hatched chicks / the total number of eggs) x 100.

As for the fetal deaths, they were counted after 28 days of full development using formulas:

Embryo mortality rate: (Number of dead embryos in 28 days of incubation/Number of embryos fertilized for fertilized eggs) x100

Statistical analysis

Statistical analysis of the experimental data was carried out by using (Duncan, 1955). The multiple comparison test was applied to compare the differences between the treatments (SAS 2001).

Results and discussion

One of the most vulnerable terms for ducks' survival during incubation period is that the changing or sprinkled hatching eggs during incubation could improve prolificacy and resistances against some pathogens which depend on principle of embryonic thermal programming that has recently garnered attention (Mueller et al., 2015). As suitable shell thickness is essential for sufficient movement of respiratory gases, water vapor, development and growth of embryo and mortality during the incubation that reflected on hatchability and embryonic mortality rates (El-Hanoun et al., 2012). In the current research manifested the action of different solutions sprayed at variant periods on local ducks eggs. The statistical analysis of spraying variant solutions can effect on hatchability rate of eggs local ducks were documented in table (1). The results of G1 showed a significant high ($p \leq 0.05$) hatchability rate in group spraying by ethanol alcohol that registered 0.86 ± 0.01 in comparing with other treated groups, while olive oil spraying group recorded significant low rate of hatchability ($p \leq 0.05$) at same period when compared with other treated groups. While in G2, G3 and G4 the water spraying group showed a significant elevation ($p \leq 0.05$) in hatchability rate in compared with other spraying groups, that recorded 0.81 ± 0.03, 0.81 ± 0.03 and 0.95 ± 0.03 for G2, G3 and G4, respectively, but it lowered significantly ($p \leq 0.05$) in eggs sprayed by Olive oil was recorded 0.40 ± 0.01 and 0.39 ± 0.01 for G3 and G4, respectively.

Table (2) clarified the effects spraying of variant solutions on fetal mortality rate of local ducks eggs at end incubation period. At G1 the results recorded significant elevation ($p \leq 0.05$) in mortality rate in olive oil spraying eggs that registered 0.61 ± 0.01 in comparing with other treated group, while ethanol alcohol spraying recorded significant lower rate of mortality ($p \leq 0.05$) that registered 0.14 ± 0.01 at this period when compared with other treated groups. While at G2, the

eggs that sprayed by water displayed significant decreasing (p ≤ 0.05) in fetal mortality rate in comparison with other sprayed group. While, at G3 and G4 showed lower significant (p ≤ 0.05) in fetal mortality in eggs sprayed by water that recorded 0.19 ±٠،٠٣ and 0.04 ± ٠،٠٣, respectively, but it registered higher significant values (p ≤ 0.05) in eggs sprayed by olive oil were recorded 0.60 ±٠،٠١ and 0.61 ± ٠،٠١ for G3 and G4, respectively, when compared with other sprayed eggs.

Besides, among factor that affecting on hatchability rate of duck eggs is the condition inside the incubator like ventilation, humidity and temperature can be influenced on hatchability (Archer et al. 2017),as well as, to success the hatching require functional eggshell conductance to supply water vapor, delivered oxygen needed for metabolism during embryo development and eliminate carbon dioxide produced during embryonic metabolism and growth (Christensen et al., 2005), in current study, the statistical analysis reported elevation the hatchability rate in water spraying groups with values 0.81 ± 0.03, 0.81 ± 0.03 and 0.95 ± 0.03 that sprayed at 7th 14th and 21st days of incubation, due to the positive effects of water spraying on eggs shell pores conductance which are critical for the respiratory gases exchanging along incubation periods (Onbaşılar et al., 2014) and/or because the ability of water at 37°C temperature to act as neutral buffer to interact with cuticle of egg shell, that permit the embryos to break eggs shell by its peak at hatch (Shafey, 2002).

The early embryonic development is highly sensitive to the water evaporation and temperature during incubation, so that, the early embryonic mortality related with disturbances in organization the first structure of embryo, while the midmortality related with beginning the functions either renal system or respiratory system, also late mortality is known as the mortality in hatchery occurred due to difficult of exiting of eggshell, in consequence, any altering in factors during these incubation periods considered lethal for embryo (Loyau et al., 2015). Besides, The present data concluded that there is a decline in embryonic mortality rates when sprayed ducks eggs with water 37C at 14th and 21st day of incubation with values 0.19 ±٠،٠٣ and 0.04 ± ٠،٠٣, respectively, this current results agreement with the finding of (Onbaşılar et al., 2014) who reported that the spraying duck eggs with warm water 25–28°C for 4- 25 days of incubation could be decreased the late embryonic mortality and increased the hatchability rate due to warm water action in thickness of eggshell enhancing the evaporation of water and gas exchange that positively related with hatchability (El-Hanoun et al., 2012).

Also, other study recorded there are many factors that influencing on embryo growth at incubation periods like temperature, humidity, air velocity and egg size

(Ramli et al., 2017), also reported that the water spraying of big eggs helpful for relieving heat stress produced during embryo development at incubation period, therefore the enhancement of hatchability rate might be due to regress the embryonic mortality where spraying water can be regarded as anti-stress factor (Peebles et al., 2001).

Besides, the present results agreement with (Altaea et al., 2020) who recorded decline embryonic mortality percentage and high hatchability percentage of chicken's eggs sprayed with distilled water and olive oil because it making barrier around eggs to protect embryo and its internal contents from microbial contamination that threaten embryonic life (Gatea et al., 2019). Moreover, El-Hanoun et al., 2012, noticed that the altering in RH have a vital role on embryonic mortality during the 14 to 24 and 0 to 24 days of incubation periods, also who concluded that the ducks eggs require specific RH to achieve the best hatchability and post-hatching duckling performance (El-Hanoun et al., 2012).

Table (1): local ducks eggs sprayed by different solutions on hatchability rate at variant periods of incubation.

Groups	G1	G2	G3	G4
Control (1st subgroup)	0.62 ±0.01 E	0.60 ±0.01 EF	0.56 ±0.01 G	0.59 ± 0.01 F
Water Spraying (2nd subgroup)	0.62 ±0.03 E	0.81 ±0.03 C	0.81 ±0.03 C	0.95 ±0.03 A
Olive oil Spraying (3rd subgroup)	0.39 ±0.01 H	0.67 ±0.01 D	0.40 ±0.01 H	0.39 ±0.01 H
Ethanol alcohol Spraying (4th subgroup)	0.86 ±0.01 B	0.67 ±0.01 D	0.67 ±0.01 C	0.61 ±0.01 EF
LSD	Treatment = 0.0104	Period=0.0104	Overlap =0.0208	

- Different capital letters refers to significant value at $P<0.05$ in same column , with mean ± SE.
- G1 refer to hatching eggs sprayed at 1st day of incubation period.
- G2 refer to hatching eggs sprayed at 7th day of incubation period.
- G3 refer to hatching eggs sprayed at 14th day of incubation period.
- G4 refer to hatching eggs sprayed at 21st day of incubation period.

Table (2): local ducks eggs sprayed by different solutions on fetal mortality rate at variant time of incubation.

Groups	G1	G2	G3	G4
Control (1st subgroup	0.38 ±0.01 D	0.40 ±0.01 B	0.44 ±0.01 C	0.41 ±0.01 CD
Water Spraying (2nd subgroup)	0.38 ±0.03 D	0.19 ±0.03 F	0.19 ±0.03 F	0.04 ±0.03 H
Olive oil Spraying (3rd subgroup)	0.61 ±0.01 A	0.33 ±0.01 E	0.60 ±0.01 B	0.61 ±0.01 A
Ethanol alcohol Spraying (4th subgroup)	0.14 ±0.01 G	0.33 ±0.01 E	0.33 ±0.01 E	0.38 ±0.01 D
LSD	Treatment = 0.0187	Period= 0.0187	Overlap =0.0375	

- Different capital letters refers to significant value at $P<0.05$ in same column , with mean ± SE.
- G1 refer to hatching eggs sprayed at 1st day of incubation period.
- G2 refer to hatching eggs sprayed at 7th day of incubation period.
- G3 refer to hatching eggs sprayed at 14th day of incubation period.
- G4 refer to hatching eggs sprayed at 21st day of incubation period.

Conclusion

The current results documented that the spraying Iraqi duck's eggs by variant solution could improve hatchability rate of fertilized eggs and decrease the embryonic mortality rate when sprayed with distal water at 37°C. In future, several inspects required to evaluate the correlation between the microbial and fungal load on the surface eggs.

References

• Afsari M, Mohebbifar A, Torki M. (2013).Effects of phytase supplementation of low phos-phorous diets included olive pulp and date pits on productive performance of laying hens, egg quality traits and some blood parameters. Annu Res Rev Biol ٣:٧٧٧;e93.

• Al-Rawi B.A. (1969). Effect of corssbreeding on productive and reproductive characters in Iraqi chicken . M.Sc. Thesis . College of Agric. Baghdad Univ. Iraq

• Altaie SMS, Khafaji SS, Mahdi S, Al-Janabi TK (2019). Evaluation the influence of dwarf gene on some fecundity features in dwarf hens. Biochemical and cellular archives, 19, 2.

• Andrieux C., Biasutti S., Barrieu J., Morganx P., Morisson M., Coustham V. , Panserat S., Houssier M. (2022). Identification of different critical embryonic periods to modify egg incubation temperature in mule ducks. Animal. 16(1):1-8.

• Archer, G.S., Jeffrey, D. and Tucker, Z. (2017) Effect of the combination of white and red LED lighting during incubation on layer, broiler, and Pekin duck hatchability. Poultry Science 96 (8): 2670-2675

• Balkan M., Karakas R., Biricik M. (2006). Changes in eggshell thickness, shell conductance and pore density during incubation in the Peking duck (Anas platyrhynchos f. dom.) Ornis Fenn., 83, pp. 117-123

• Botsoglou E.N., Govaris A.K., Ambrosiadis I.A. and Fletouris D.J. (2013). Olive leaves (*Olea europaea* L.) versus α-tocopheryl acetate as dietary supplements for enhancing the oxidative stability of eggs enriched with very-long-chain n-3 fatty acids. J. Sci. Food Agric. 93:8.

• Braun CM, Neuman S, Hester PY, Latour MA, (2002). Breeder age alters offspring performance in the Pekin duck. J. Appl. Poult. Res. 11, 270-274.

• Changkang W., Ang L. and Guangying W., (1999). Effects of the quanitative characters of hatching eggs on hatchability in Muscovy duck. Pages 188–192 in Proc. 1st World Waterfowl Conf., December 1–4, Taichung, Taiwan.

• Christensen, V.L., Wineland M.J., Ort D.T., Mann K.M., (2005) Eggshell conductance and incubator ventilation as factors in embryo survival and poultry quality. Int. J. Poult. Sci. 4, 818-826.

• Dean W (1985) Duck production and management in the United States. In: Farrell D and Stapleton P (eds.), Duck Production Science and World Poultry Practice (Armidale, NSW: University of New England, pp. 258-66.

• Duncan, D.B. (1955). Multiple range and multiple F tests. Biometrics. 11:1-42.

• El-Hanoun AM, Rizk RE, Shahein EHA, Hassan NS and Brake J (2012) Effect of incubation humidity and flock age on hatchability traits and posthatch growth in Pekin ducks.Poult. Sci. 91, 2390-2397.

• Fasenko GM, O'Dea Christopher EE and McMullen LM.(2009). Spraying hatching eggs with electrolyzed oxidizing water reduces eggshell microbial load without compromising broiler production parameters. Poultry Science 88 :1121–1127.

• Gatea SM, Altaie, SMS, Khafaji SS, ALjanabi TK, Shatti DH, Hussain MA (2019) .Influence of spraying different solutions at different incubation periods on hatchability parameters of local Iraqi's eggs. IOP Conf. Ser.: Earth Environ. Sci. 388.

• Harun MA, Veeneklaas RJ, Visser GH and Van Kampen M (2001). Artificial incubation of Muscovy duck eggs: why some eggs hatch and others do not. Poult. Sci. 80, 219-224.

• Hodgetts, B., (1991). Current hatchabilities in species of domestic importance and the scope for improvement. In Proceedings of the Avian incubation conference, sine dato 1990, sine loco, pp. 139–144.

• Ismoyowati and Sumarmono J (2019). Duck Production for Food Security. IOP Conf. Series: Earth and Environmental Science 372 (2019) 012070.

• Loyau T., Bedrani L., Berri C., Métayer-Coustard S., Praud C., Coustham V., Mignon-Grasteau S., Duclos MJ., Tesseraud S., Rideau N., Hennequet-Antier C., Everaert N., Yahav S., Collin A. (2015). Cyclic variations in incubation conditions induce adaptive responses to later heat exposure in chickens: A review. Animal, 9 pp. 76-85

• Molenaar R, Hulet R, Meijerhof R, Maatjens C, Kemp B and Brand HV (2011). High eggshell temperatures during incubation decrease growth performance and increase the incidence of ascites in broiler chickens. Poult. Sci. 90: 624–632.

• Mueller C.A, Burggren W.W., Tazawa H. (2015). The physiology of the avian embryo . Scanes C.G. (Ed.), Sturkie's Avian Physiology (sixth ed.), Elsevier, Denton, TX, USA (2015), pp. 739-766

• Onbaşılar EE, Erdem E, Kocakaya A and Hacan Ö (2014). Effect of spraying Pekin duck eggs obtained from different breeder age on Hatchability. Europ.Poult.Sci., 78.

• Peebles ED, Doyle SM, Zumwalt CD, Gerard PD, Latour MA, Boyle CR and smith TW (2001). Breeder age influences embryogenesis in broiler hatching eggs. Poultry Science, 80 (3):272-277 .

• Ramli MB, Wahab MS, Zain BA, Raus AA, Raja P and Pahat B (2017). Effect ofincubation temperature on ikta's quail breed with new rolling mechanism system. Journal of Mechanical Engineering SI, 4 (3): 78-88

• Ryan D, Antolovich M, Prenzler P, Robards K and Lavee S (2002). Biotransformations of phenolic compounds in *Olea europaea* L . Scientia Horticulturae 92: 147-176.

• Sarpong S and Reinhart S (1985). Effect of spraying White Pekin duck eggs on hatchability. Sci. 64, 221-225.

• SAS 2001 SAS/STAT Users Guide for Personal Computer. Release 6.18. (New York: SAS Institute Inc).

• Shafey TM (2002). Egg shell conductance, embryonic growth, hatchability and embryonic mortality of broiler breeder eggs dipped into ascorbic acid solution. Br. Poult. Sci. 43: 135–140.

• Tai C and Tai J-JL 2001. Future prospects of duck production in Asia. The Journal of Poultry Science. 38(1):99-112

STUDYING THE POLYMER CONCRETE HARDENING BEHAVIOR UNDER DIFFERENT HEATING CONDITIONS

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Abstract:

The properties of concrete are affected by various factors, some of which affect its strength and others affect its hardening. Curing methods are among the main factors that greatly affect the setting time and the speed at which it gains strength. In this study, heat curing was used to increase the speed of polymer concrete strength gaining. The mechanical behavior was investigated under two heating conditions (1 and 2 hours a day for a week) for unsaturated polyester polymer concrete specimens. Results showed that 87% and 90% of the compressive strength at 28 days are obtained after 4 days of 1 hr. and 2 hrs. of heat curing respectively, while 89% and 91% are obtained after 7 days of 1 hr. and 2 hrs. of heat curing respectively. In contrast, 86% and 93% of the splitting tensile strength at 28 days are obtained after 4 days of 1 hr. and 2 hrs. of heat curing respectively, also 90% and 94% are obtained after 7 days of 1 hr. and 2 hrs. of heat curing respectively.

Key words: Polymer Concrete, Heating Curing, Mechanical Properties.

Introduction:

Polymer concrete (PC) is considered as a material that is produced from fine and coarse aggregate, binding polymer, and additives, with no cement and water addition [1]. Adhesive polymers are used in concrete due to their good mechanical and physical properties and also due to their rapid setting and hardening since setting refers to the changing process from a fluid to a rigid stage while hardening refers to the strength gaining [2,3]. In the hardening process of polymer concrete, most thermoset liquid resins such as polyester resins, epoxy resins, and modified resins are polymerized at room temperature [4].

During the curing process and depending on the season and environmental conditions, polymer concrete is subjected to a variety of outside conditions [5, 6]. Depending on the environment, degree of direct heat exposure and color of the material, the temperature on the surface of a material can change from below zero to 80 degrees Celsius during all seasons except winter. Polymeric materials have the major drawback of being highly susceptible to curing temperature [7]. The mechanical properties of polymer materials, on the other hand, can differ greatly depending on the curing temperature. If the employed polymer's temperature during curing is close to its glass transition temperature, the applied temperature would have a greater effect on its mechanical properties [8]. As a consequence of this, the unsaturated polyester polymer concrete is supposed to be extremely susceptible to curing temperature. Many studies have been carried out to cover this field for different types of concrete, in 2020, Baoju et al. tested the compressive strength and permeability of concrete specimens cured by steam under various curing methods. They discovered that the compressive strength improved with curing time, while the permeability of air-cured specimens reduced and then improved with curing time [9]. In 2020, Jinyan et al. analyzed the curing methods' effects and heat damage on the characteristics of concrete specimens under steam-curing using three treatment temperatures. The findings revealed that there are variations between the exterior and interior of steam-cured concrete, which can be defined using surface permeability. The microstructures of the geotextile-covered surface are the most compact and have the lowest permeability [10]. In 2021, Muhammad et al. explored the impact of casting and curing temperatures on plain and blended cement concrete. Different casting temperatures of 25, 32, 38, or 45 °C were used, as well as different curing conditions of Immersion in water and hot weathering. The findings found that specimens cured in the water had better properties than those cured by hot weathering [11].

2- Experimental work

2.1 Specimens preparation and Curing

A dry mixing was done to the fine (AL- Ekhieder sand) and coarse aggregates for three minutes in a dry steel tub. The unsaturated polyester resin (USP) was used to bind them together after being combined with its hardener in 0.01 percent and placed in oiled steel molds in three stages using an electrical vibrator to obtain optimum compacting and then left in the air at laboratory temperature for different curing times. An hour later, the molds were positioned in an oven to cure at 100 °C for 1 and 2 hours (equal specimens' numbers) and then return to the air. The specimens were demolded After 24 h. and this heat curing process was continued for 7 days. Table 1 indicates the proportions of the constituents utilized in the mixture:

TABLE 1

MIXTURE DETAILS IN kg/m^3.

Polyester resin	Fine Aggregate (sand)	Coarse Aggregate (gravel)
400	600	800

2.2 Tests Procedure

The following mechanical properties were measured to assess the effect of heat curing on PC behavior.

2.2.1 Compressive and splitting tensile strengths

According to BS-1881-116 [12], compressive strength was calculated on 100 mm cubic specimens. ASTM C496 [13] was utilized to determine the splitting tensile strength on cylindrical specimens with 100 mm * 200 mm. The tests were carried out at the ages of 4, 7, 14, 21, and 28 days of air curing.

3- Results and Discussion

3.1 Compressive Strength

The increase in compressive strength of the specimens that cured under heating is shown in figure (1), as well as shows the specimens that cured with 2 hrs. of heating are hardened faster than that cured in 1 hr. This increasing is due to the continuation of the polymerization process, which increases the strength between the resin and the aggregates, In addition, the pores are partially filled with polymer particles leading to a decrease in the porosity, this agreed with [14].
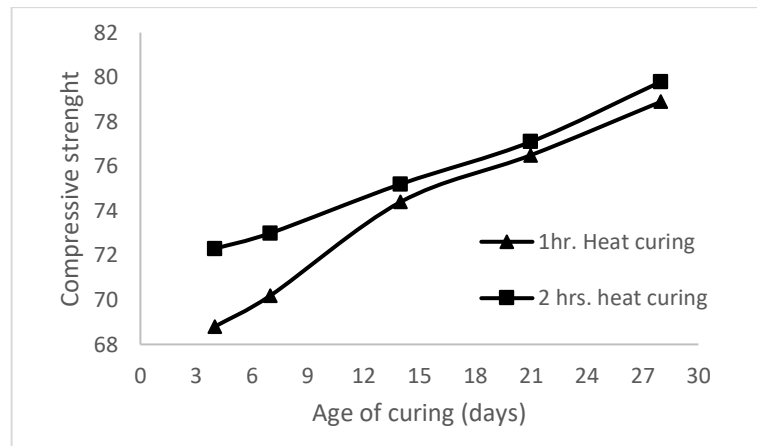
Figure (1) shows the compressive strength values under two heat curing conditions.

The results evaluation showed that approximately 87% and 90% of the compressive strength at 28 days are obtained after 4 days of 1 hr. and 2 hrs. of heat curing respectively. On the other hand, nearly 89% and 91% of the compressive strength at 28 days are obtained after 7 days of 1 hr. and 2 hrs. of heat curing respectively. Figures 2 and 3 show the increasing ratio in compressive strength of the specimens under heat curing after 4 and 7 days respectively.
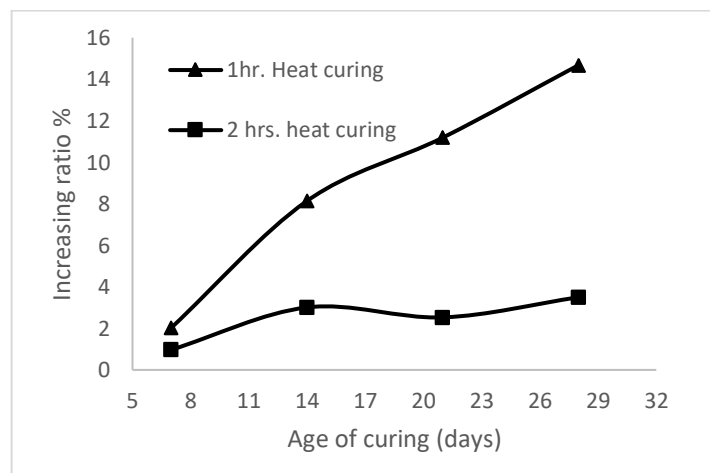
Figure (2) shows the effect of heat curing on the increasing ratio in compressive strength after 4 days.
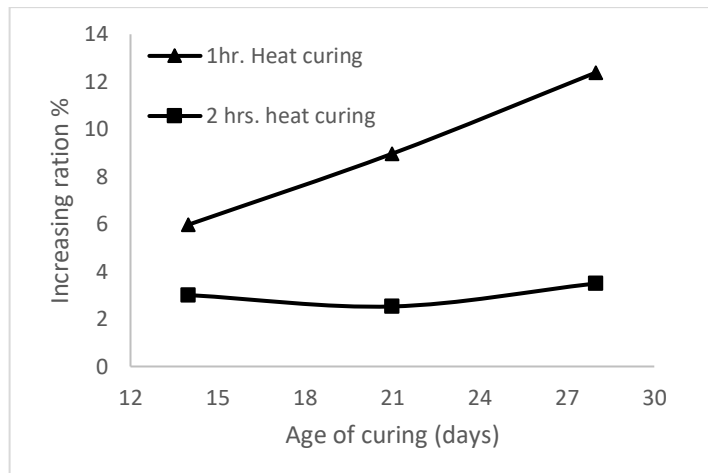
Figure (3) shows the effect of heat curing on the increasing ratio in compressive strength after 7 days.

3.2 Splitting Tensile Strength

Figure (4) shows the effect of heat curing on the splitting tensile strength for polymer concrete specimens is presented in. Results clarified that, for all heat curing conditions, At all testing ages, the splitting tensile strength exhibits a significant improvement. This increment is attributed to the good distribution and of the matrix, as well as the main influence of the resin within the concrete which increases the bonding with aggregates, in addition, to prevent the microcracks developing, and in turn, the tensile strength.
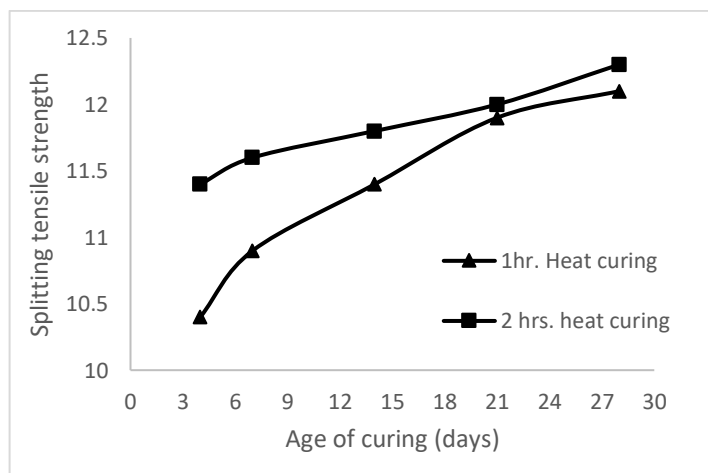
Figure (4) shows the splitting tensile strength values under two heat curing conditions.

The results evaluation showed that approximately 86% and 93% of the splitting tensile strength at 28 days are obtained after 4 days of 1 hr. and 2 hrs. of heat curing respectively. In contrast, approximately 90% and 94% of the splitting tensile strength

at 28 days are obtained after 7 days of 1 hr. and 2 hrs. of heat curing respectively. Figures 5 and 6 show the increasing ratio in compressive strength of the specimens under heat curing after 4 and 7 days respectively.
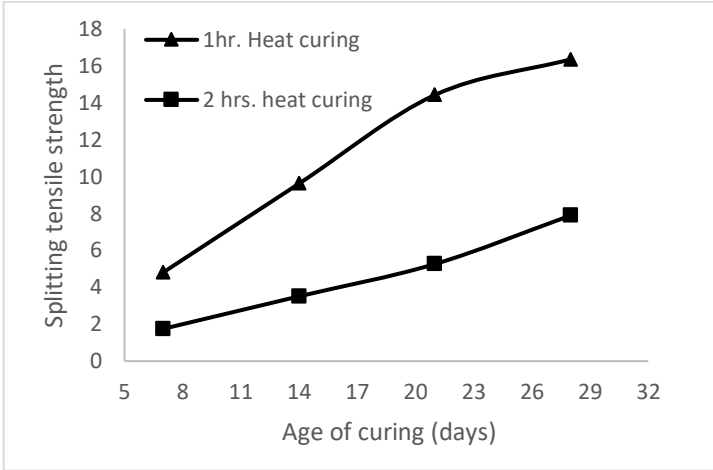
Figure (5) shows the effect of heat curing on the increasing ratio in splitting tensile strength after 4 days.
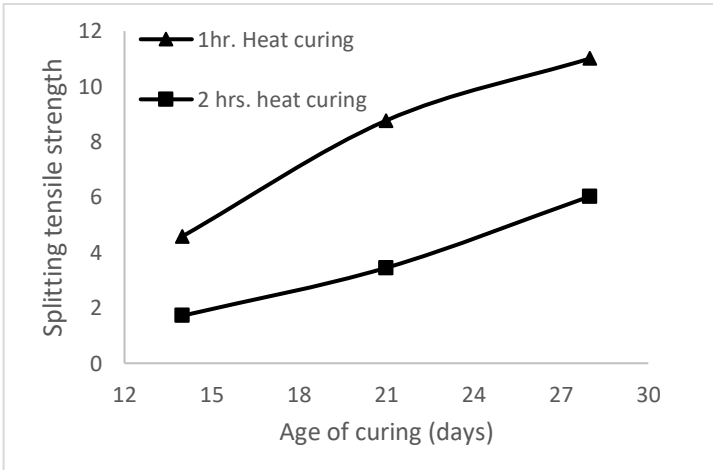
Figure (5) shows the effect of heat curing on the increasing ratio in splitting tensile strength after 7 days.

Conclusions

• The heat curing process affects the hardening and strength gaining of polymer concrete since heating leads to accelerate the polymerization process.

• The increase in heating time to 2 hrs. increases the compressive and splitting tensile strength.

• The strengths values can be relied upon after 4 days since they represent the equivalent of more than 85% of the 28 days' strength.

References

1. Blagga, A & Beaudoin, J.J. 1985. Polymer Modified Concrete, Division of Building Research, National Research Council Canada, Canadian Building Digest 241, Ottawa.

2. Lahiba Imtiaz , Sardar Kashif Ur Rehman , Shazim Ali Memon, Muhammad Khizar Khan and Muhammad Faisal Javed. 2020. A Review of Recent Developments and Advances in Eco-Friendly Geopolymer Concrete. Applied sciences, 10, 7838; http://doi:10.3390/app10217838

3. Sanaa Abdul Hadi and Mustafa Hassan Omar. 2016. "Effect of Hydrocarbon Solutions on Polymer Concrete" Eng. & Tech. Journal, Vol.34, Part (B), No.2, pp.: 234-242

4. Rakesh Kumar. 2016. A Review on Epoxy and Polyester Based Polymer Concrete and Exploration of Polyfurfuryl Alcohol as Polymer Concrete. Journal of Polymers, Volume 2016, Article ID 7249743, 13 pages. http://dx.doi.org/10.1155/2016/7249743

5. Lindvall, A. 2003. Environmental Actions on Concrete Exposed to Marine and Road Environments and Its Response. Ph.D. Thesis, Chalmers University of Technology, Göteborg, Sweden.

6. Issa, M.A. 2003. Investigation of cracking in concrete bridge decks at early ages. J. Bridge Eng. 4, 116–124.

7. Guide to Selecting Protective Treatments for Concrete; ACI 515.2R-13; American Concrete Institute: Farmington Hills, MI, USA, 2013.

8. Reis, J.M.L.; Ferreira, A.J.M. 2006. Freeze-thaw and thermal degradation influence the fracture properties of carbon- and glass fiber reinforced polymer concrete. Constr. Build. Mater. 20, 888–892.

9. Baoju Liu, Junyi Jiang, Shuai Shen, Feng Zhou, Jinyan Shi and Zhihai He c. 2020. Effects of curing methods of concrete after steam curing on mechanical strength and permeability. Construction and Building Materials (256), 119441.

10. Jinyan Shi, Baoju Liu, Xiang Wu, Jinxia Tan, Jingdan Dai and Roujia Ji. 2020. Effect of steam curing on surface permeability of concrete: Multiple transmission media. Journal of Building Engineering 32, 101475.

11. Muhammad Umar Khan, Muhammad Nasir, Omar S. Baghabra Al-Amoudi, and Mohammed Maslehuddin. 2021. Influence of in-situ casting temperature and curing regime on the properties of blended cement concretes under hot climatic conditions. Construction and Building Materials 272, 121865.

12. B.S.1881, Part 116, "Method for Determination of Compressive Strength of Concrete Cubes", British Standard Institution, 1989, 3pp.

13. ASTM C496-86, "Standard Test Method for Splitting Tensile Strength of Cylindrical Concrete Specimens", Annual Book of ASTM Standard, Vol.04.02, 1989, PP. 259–262.

14. Sujjavanich, S., and Lundy, J.R., 1998. "Development on Strength and Fracture Properties of Styrene-Butadiene Copolymer Latex Modified Concrete," ACI Materials Journal, vol. 95, No. 2. pp. 131-143.

NEW MIXED LIGANDS Cu(II) COMPLEXES, PREPARATION CHARACTERIZATION, ANTIMICROBIAL EVALUATION

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Abstract:

Using traditional and microwave heating methods, new Copper(II) complexes containing mixed ligands isatinazine (IAH2) and benzilthiosemicarbazonebenzelidene (BtscbH), or benzilthiosemicarbazone-ortho-hydroxybenzelidene (BtscoH2), or benzilthiosemicarbazone-meta-hydroxybenzelidene (Btsc Physical and chemical techniques were used to characterise the chemicals that resulted. In neutral (or slightly acidic) media, the ligands produced ionic complexes with the general formula [Cu(IAH2)(LHi)Ac], but in basic medium, neutral complexes with the general formula [Cu(IAH)(LHi-1)] were generated, where LHi = BtscbH, BtscoH2, BtscmH2, or BtscpH2 ligands; LHi-1= deprotonated As a result, deformed octahedral geometries have been examined in hexa-coordinated mononuclear complexes have been investigated having distorted octahedral geometries Agar plate diffusion techniques were used to test the biological activity of the ligands and all of the complexes against Staphylococcus aureus, pseudomonas aeruginosa, Proteus mirabilis, and Escherichia coliThe antifungal activity of all the ligands and compounds was tested in vitro against Aspergillusniger and Candidaalbicans. There have been no observed effects.

Key words: Mixed Ligands, Copper(II) Complexes, Isatinazine, Benzilthiosemicarbazone-Benzelidene, Biological Activity.

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Introduction:

Copper is essential for all living things. Copper and its compounds have been employed for a variety of purposes, including the treatment of radiation sickness and, more recently, as an adjuvant to radiotherapy for cancer patients. [1-3]. Azines take a wide field of study and numerous transition metal complexes of these ligands have been investigated, because of their potential to act as a multiidentate donor Azines and their complexes also had major analytical, commercial, and biological applications. [4-8]. Thiosemicarbazones have been studied due to their capability of acting as multidentate NS, NNS, SNNS donor. Thiosemicarbazones and their complexes had important biological applications. They have been receiving considerable attention due to their pharmacological properties, antitubercular activity, activity against viruses, protozoa small pox and certain kinds of tumor[9-16].Metal complexes of Schiff-bases have been widely studied. This may be attributed to their stability, biological activity and potential applications in many fields such as oxidation catalysis, electrochemistry, etc[17-24].Due to their importance in the field of metalloenzymes and other biological processes, mixed ligand complexes have sparked a lot of attention. On their complexes, a lot of research has been done. [25-32].

Microwave is an electromagnetic radiation, it is a prominent method used to prepare chemical compounds. The short time, high yield and pure products in addition to the un limited uses of microwave heating made this technique very merit [33-40]. Antibacterial and antifungal activity of complexes aroused considerable interest [41-43]. by chemists and biologist and a good deal of work has been reported on preparation of compounds that can be used as antibiotics to kill or inhibit the bacteria or fungi [44].We participated in the chemistry of mixed ligand complexes and their biological activity, and various articles were published, due to the importance of mixed ligand complexes, their production in microwave oven (Green chemistry), and their importance antibacterial activities. [49-52].

1- Materials and Methods:

The primary compounds have been supplied from Merck, Aldrich, BDH, and Fluka. All the compounds and solvents have been used as supplied, except aniline has been used after purification by distillation

I- Preparation of ligands by classical methods

IAH_2 ligand (Fig. 1) has been prepared according to the literature method[53]. Btsch has been prepared according to the published method[54], followed by the preparation of the ligands BtscbH, $BtscoH_2$, $BtscmH_2$ and $BtscpH_2$ (Fig. 1) as follows:

(10 g, 0.0353 mol) Btsch dissolved in 20 ml ethanol has been added to a solution of (3.29 g, 0.0353 mol) or (3.85 g, 0.0353 mol) or (3.85 g, 0.0353 mol) or (3.85 g, 0.0353 mol) aniline or ortho-hydroxyaniline or meta-hydroxy-aniline or para-hydroxyaniline, respectively. The mixtures were refluxed for half an hour, then evaporated to half their original volume and cooled. Filtration was used to separate the residues, which were then washed in cold water and crystallised from hot ethanol.

II- Preparation of ligands by heating with microwave technique

(1 g, 0.0034 mol) isatin has been mixed with (0.44 g, 3.4×10^{-3} mol) hydrazine sulfate and (0.12 g, 3.4×10^{-3} mol) conc. ammonium hydroxide. The mixture has been heated in microwave oven for 98 second, the resulted product (IAH_2) has been washed with cold distilled water followed by cold ethanol and dried at 70 °c. The product is dark yellow, it's melting point 224 °c, it's molecular weight theor. (exp.)= 290.28 (297.05).

BtscH has been first prepared as follow: (10 g, 0.0476 mol) benzil mixed with (4.34 g, 0.0476 mol) thiosemicarbazide and (3.90 g, 0.0476 mol) anhydrous sodium acetate. The mixture has been heated in microwave oven for 120 second, the resulted product has been washed with cold distilled water followed by cold ethanol and dried. The product is yellow crystals, it's melting point=118 °c, it's molecular weight theor. (exp.)= 283.35 (271.11).

III- Preparation of thiosemicarbazone benzilidene and substituted benzilidene

(2 g, 0.0071 mol) of BtscH has been mixed with (0.66 gm or 0.77 g or 0.77 g or 0.77 g, 0.0071 mol) aniline or ortho-hydroxyaniline or meta-hydroxyaniline or para-hydroxyaniline. The mixture has been heated in microwave oven for 100 - 130 second, the resulted product has been washed with cold distilled water followed by cold ethanol and dried. The product of BtscbH is yellow crystals, it's melting point=175 °c, it's molecular weight theor. (exp.)= 358.46 (348.95). The product of $BtscoH_2$ is yellow crystals, it's melting point=143 °c, it's molecular weight theor. (exp.)= 374.46 (361.92). The product of $BtscmH_2$ is yellow crystals, it's melting point=95 °c, it's molecular weight theor. (exp.)= 374.46 (361.92). The product of $BtscpH_2$ is yellow crystals, it's melting point=135 °c, it's molecular weight theor. (exp.)= 374.46 (361.92).
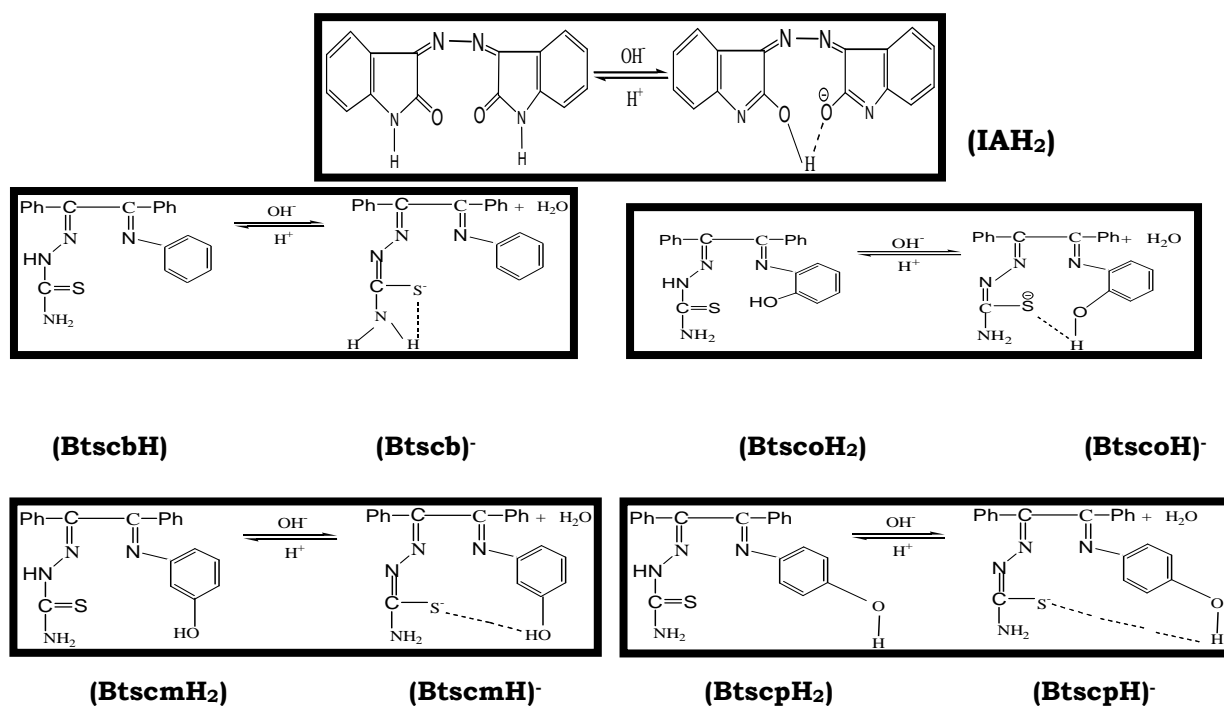
Fig. 1: Model structures of the ligands

2- Preparation of the complexes: (In neutral (or slightly acidic) medium):

a-Reflux method

$[Cu(IAH_2)(BtscbH)Ac]Ac$ has been prepared by the reaction of (0.5 g, 2.5×10^{-3} mol) $Cu(Ac)_2.H_2O$ dissolved in 10 ml. distilled water with ethanolic solution of (2.5×10^{-3} mol) IAH_2 and (2.5×10^{-3} mol) BtscbH ligands in 1:1:1 molar ratio. For three hours, the mixture has been refluxed. It cooled after evaporating to about half its original volume. The resultant complex was filtered, washed with cold distilled water, then washed again with diethylether before being dried . Complexes with the other ligands have been prepared using same method (Table 1)

b- Microwave heating:

$[Cu(IAH_2)(BtscbH)Ac]Ac$ has been prepared by the reaction of (0.5 gm, 2.5×10^{-3} mole) $Cu(Ac)_2.H_2O$ with (2.5×10^{-3} mole) IAH_2 and (2.5×10^{-3} mole) BtscbH. 2 drops of distilled water were added and mixed well then heated using microwave oven (500 watt) for certain time until the reaction completed. The compound was washed with cold distilled water followed by diethylether and dried. Complexes with the other ligands have been prepared using same method (Table 1)

II- In basic medium:

a-With solvent:

Complexes of the type $[Cu(IAH)(Btscb)]$ has been prepared by the reaction of (0.5 g, 2.5×10^{-3} mol) $Cu(Ac)_2.H_2O$ dissolved in 10 ml distilled water with ethanolic

solution (2.5x10^{-3} mol) IAH$_2$ and (2.5x10^{-3} mol) BtscbH in 1:1:1 molar ratio. The mixture was heated until it produced a clear solution. Drop by drop, a 2M sodium hydroxide aqueous solution has been added to the mixture until the pH reaches 9-10. The goods were filtered, washed with cold distilled water, then dried with diethylether. Complexes with the other ligands have been prepared using same method (Table 1)

b- Microwave heating:

Complexes of the type [Cu(IAH)(Btscb)] has been prepared by the reaction of (0.5 g, 2.5x10^{-3} mole) Cu(Ac)$_2$.H$_2$O with (2.5x10^{-3} mol) IAH$_2$ and (2.5x10^{-3} mol) BtscbH and amount of sodium hydroxide (Table 1) mixed then 2 drops of distilled water were added, mixed well then heated using microwave oven (500 watt) for certain time until the reaction was completed. The compound was washed with cold distilled water followed by diethylether and dried. Complexes with the other ligands have been prepared using same method (Table 1)

Table (1): Experimental conditions and the suggested formulae oh the prepared complexes

No.	Wt. ligands (gm)	Wt IAH$_2$ (gm)	pH	T. (Sec)	Amounts of KOH	%	Suggested Formula
1	0.8977	0.7269	7-6	-		75	[Cu(IAH$_2$)(BtscbH)(Ac)]Ac
2	0.8977	0.7269	7-6	18		85	[Cu(IAH$_2$)(BtscbH)(Ac)]Ac
3	0.8977	0.7269	10	-	20	82	[Cu(IAH)(Btscb)]
4	0.8977	0.7269	10	20	0.110 g	84	[Cu(IAH)(Btscb)]
5	0.9377	0.7269	7-6	-		90	[Cu(IAH$_2$)(BtscoH$_2$)(Ac)]Ac
6	0.9377	0.7269	7-6	20		80	[Cu(IAH$_2$)(BtscoH$_2$)(Ac)]Ac
7	0.9377	0.7269	10	-	15 d	83	[Cu(IAH)(BtscoH)]
8	0.9377	0.7269	10	20	0.084 g	88	[Cu(IAH)(BtscoH)]
9	0.9377	0.7269	7-6	-		70	[Cu(IAH$_2$)(BtscmH$_2$)(Ac)]Ac
10	0.9377	0.7269	7-6	15		75	[Cu(IAH$_2$)(BtscmH$_2$)(Ac)]Ac
11	0.9377	0.7269	10	-	20 d	94	[Cu(IAH)(BtscmH)]

12	0.9377	0.7269	10	7	0.110 g	83	[Cu(IAH)(BtscmH)]
13	0.9377	0.7269	7-6	-		80	[Cu(IAH₂)(BtscpH₂)(Ac)]Ac
14	0.9377	0.7269	7-6	17		83	[Cu(IAH₂)(BtscpH₂)(Ac)]Ac
15	0.9377	0.7269	10	-	10 d	83	[Cu(IAH)(BtscpH)]
16	0.9377	0.7269	10	20	0.056 g	84	[Cu(IAH)(BtscpH)]

T= time heated in microwave oven, d= drops ; ligands= BtscbH, BtscoH₂, BtscmH₂, BtsepH₂, Ac= CH₃COO⁻

3- Analytical and physical measurements:

The prepared complexes were analyzed for carbon, nitrogen, hydrogen, sulfur (CHNS) in Turkeya-Diyar Bruker-Dykel University by Instruments Elemental Combustion Costech Type 4010 and S.N/2110910423 (Italy). Copper contents have been determined by titration method[55] after the complexes have been decomposed with strong nitric acid Cryoscopically, the relative molecular weights of the ligands and their complexes were determined (56). Molar refraction measurements were performed using a 10-3 M dimethylsulfoxide solution by Atago Illumination, Atago Co-LTD, Japan. [56] (Danials, 1962) .

 A LF-42 electrolytic conductivity measuring set and a Multiline f/SET-2WTW Multiline f/SET-2WTW Multiline f/SET-2WTW Multiline f/SET-2WTW Multiline f/SET-2WTW Multiline Using 10-3 M dimethylsulfoxide at 25 oC, Wiscenschaf Tecchnische Werketattem 82362 Weiheim (57). (SHERWOOD SCIENTIFIC Magnetic Susceptibility (MSB) at 25C° was used to determine the magnetic susceptibility of the complexes. Electronic spectra were acquired using a 1 cm cell on a Shimadzu UV-1650 PC UV-Visible Spectrophotometer at 25 C° for 10-3 and 10-4 M solutions of the ligands and their complexes in dimethylsulfoxide. On a Model Alpha–Bruker, the infrared spectra of the ligands and their complexes were recorded in the range 400-4000 cm-1. ¹H NMR have been recorded for the ligands by NMR Bruker Ultra Shield 300 MHz in Dayquil University- Turkeys using Deutrated DMSO. Mass spectra have been recorded for the ligands at Sheffield University by Water-Micromass LCT Electrospray Mass Spectrometer using Deutrated DMSO

4- Antimicrobial Evaluation :

To investigate the antibacterial activity of the ligands and their complexes, four harmful microorganisms were chosen: Staphylococcus aureus, Escherichia coli,

Pseudomonas aeruginosa, and Proteus mirabilis. Before being used in the Biology Department of Mosul University's Education for Pure Science College, all bacterial strains were identified (58). The antibacterial activity of a range of medicinally significant gram-positive and gram-negative bacteria has been assessed using the agar plate diffusion technique(59,60). In this method, nutrient agar plates were seeded with 0.1 ml. of the tested microorganism's broth culture containing (108) cells/ml., filter paper discs were impregnated with the tested materials and placed on the surface of seeded Nutrient agar plates, the plates were incubated at 37 C° for 24 hours, the zone of inhibition was measured, and different concentrations of the tested materials (500, 25) were used to determine the These dilutions were carried out three times. Using the same technique as before, two pathogenic bacteria, Aspergillus niger and Candida Albicans, were chosen to investigate the antifungal activity of the ligands and their complexes. (59,60).

RESULTS AND DISCUSSION

The reaction of copper (II) acetate and the ligands in 1:1:1 molar ratio in neutral and basic medium can be represented by reactions:

$Cu(CH_3COO)_2.H_2O + IAH_2 + LHi \longrightarrow [Cu(IAH_2)(LHi)(CH_3COO)](CH_3COO) + H_2O$

$Cu(CH_3COO)_2.H_2O + IAH_2 + LHi + 2KOH \longrightarrow [Cu(IAH)(LHi-1)] + 2 CH_3COOK + 3H_2O$
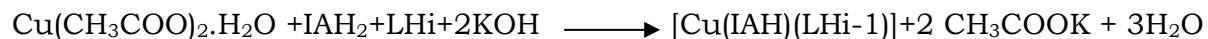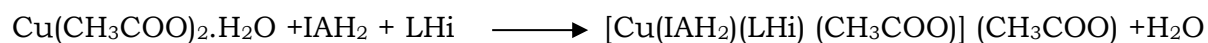
The resulted complexes were colored solids, Insoluble in water but soluble in dimethylsulfoxide, air stable. The complexes possessed the f element, metal content, and molecular weight, according to the elemental analysis.the formulas $[Cu(IAH_2)(LHi)Ac]Ac$ and $[Cu(IAH)(LHi-1)]$ in neutral and basic medium, respectively (Table 2).

Table (2): CHNS analysis, Metal contents and M.Wt. of the prepared complexes

No.	%C (Exp.) Calc.	H% (Exp.) Calc.	N% (Exp.) Calc.	S% (Exp.) Calc.	Cu% (Exp.) Calc.	ΔT °C	M. Wt. (Exp.) Calc.
1	(59.24) 59.31	(3.91) 4.13	(13.86) 13.49	(3.31) 3.86	(7.62) 7.65	0.64	(828.99)830.40
2	(58.80) 59.31	(4.55) 4.13	(14.23) 13.49	(3.15) 3.86	(7.93) 7.65	0.64	(828.99) 830.40
3	62.57	3.69	15.78	4.51	(8.52) 8.95	0.55	(712.22) 710.295
4	62.57	3.69	15.78	4.51	(8.89) 8.95	0.55	(712.22) 710.295
5	58.18	4.05	13.24	3.79	(7.62) 7.51	0.65	(841.96) 846.40
6	58.18	4.05	13.24	3.79	(7.30) 7.51	0.65	(841.96) 846.40
7	(61.61) 61.19	(3.21) 3.61	(15.43) 15.43	(4.31) 4.41	(8.89) 8.75	0.56	(725.20) 726.29
8	(61.47) 61.19	(3.94) 3.61	(15.66) 15.43	(3.79) 4.41	(8.89) 8.75	0.56	(725.20) 726.29
9	(58.08) 58.18	(3.75) 4.05	(13.94) 13.24	(4.87) 3.79	(7.30) 7.51	0.65	(841.96) 846.40
10	(57.40) 5818	(3.01) 4.05	(13.75) 13.24	(3.60) 3.79	(7.62) 7.51	0.65	(841.96) 846.40
11	61.19	3.61	15.43	4.41	(8.52) 8.75	0.56	(725.20) 726.29
12	61.19	3.61	15.43	4.41	(8.89) 8.75	0.56	(725.20) 726.29
13	58.18	4.05	13.24	3.79	(7.93) 7.51	0.65	(841.96) 846.40
14	58.18	4.05	13.24	3.79	(7.62) 7.51	0.65	(841.96) 846.40
15	(61.43) 61.19	(2.41) 3.61	(15.66) 15.43	(4.95) 4.41	(8.52) 8.75	0.56	(725.20) 726.29
16	(61.32) 61.19	(3.30) 3.61	(15.74) 15.43	(4.96) 4.41	(8.89) 8.75	0.56	(725.20) 726.29

The values of the molar conductivities (30-39 and 8-17 $\Omega^{-1}cm^2mol^{-1}$) approached those expected for 1:1 and nonelectrolytes, for complexes prepared in neutral (complexes no. 1, 2, 5, 6, 9, 10, 13, and 14) and basic (complexes no. 3, 4, 7, 8, 11, 12, 15, and 16) medium [61] respectively (Table 3). The magnetic moments (1.548- 1.735 B.M) Copper(II) complexes [62] with octahedral geometry showed the existence of one unpaired electron. (Table 3). The refraction of the complexes in 10^{-3} M dimethylsulfoxide solution were in the range 1.4773×10^{-4}-1.4877×10^{-4} (Table 3) The property of molar refraction is both additive and constitutive. It was employed to construct the compound's correct structure. [63] . The electronic spectra of the complexes (Table 3) in dimethylsulfoxide solution have been recorded giving d-d and charge transfer spectra. Copper(II) complexes showed a wide absorption band at 15384.62-17543.86 cm^{-1} attributed to the accumulation of the two electronic transitions $^2Eg{\rightarrow}^2B_1g$ and $^2A_1g{\rightarrow}^2B_1g$. The presence of this band strongly supported the octahedral geometry of the complexes, and since the higher ability of the stable state Eg for the Jian-Teller effect, therefore copper ion in their complexes showed distorted octahedral geometry [64-66].The charge transfer band was observed at 40000-45248.87 cm^{-1}. The values of C.F.S.E. have been also determined which were in the range 9230.77-10526.32 cm^{-1}.

Table (3): some physical and spectral properties of the prepared complexes

No.	Color	M.P or d. p.* (°c)	Λ_M*	R.F x10^{-4}	μ_{eff}** (B.M)	υ_1 (cm^{-1})	C. T. (cm^{-1})	CFSE
	Brown	195*	32	1.4877	1.629	17543.86	45248.87	10526.32
2	Brown	194*	35	1.4774	1.609	17543.86	45248.87	10526.32
3	Brown	188*	15	1.4875	1.563	17391.30	44247.79	10434.78
4	Brown	188*	17	1.4876	1.548	17391.30	44247.79	10434.78
5	Brown	158	39	1.4877	1.700	17421.60	43103.45	10452.96
6	Brown	156	31	1.4875	1.699	17421.60	43103.45	10452.96
7	Brown	198*	10	1.4775	1.550	17543.86	40322.58	10526.32
8	Brown	199*	15	1.4774	1.548	17543.86	40322.58	10526.32
9	Brown	155	36	1.4773	1.735	17543.86	44247.79	10526.32
10	Brown	158	32	1.4774	1.719	17543.86	44247.79	10526.32
11	Brown	210*	8	1.4876	1.590	17543.86	45146.78	10526.32
12	Brown	209*	11	1.4877	1.609	17543.86	45146.78	10526.32
13	Brown	189*	31	1.4875	1.711	15527.95	40000.00	9316.77
14	Brown	187*	30	1.4877	1.633	15527.95	40000.00	9316.77
15	Brown	250	17	1.4775	1.557	15384.62	40000.00	9230.77
16	Brown	250	10	1.4876	1.581	15384.62	40000.00	9230.77

Λ_M*: Molar conductivities in dimethylsulfoxide (Ω^{-1} cm^2 mol^{-1}) ; **μ_{eff}: Magnetic

moment in Bohr Magneton

The infrared spectra of IAH$_2$ (Table 4) showed band at 1610 cm^{-1} due to $\upsilon_{C=N}$[67]. This band was split into two bands after coordination, one of which appeared at the same time as the other but at a lower frequency. This showed that the metal ion had only one nitrogen atom linked to it [67]. Furthermore, the positive shift in N–N on complexation can be used to assist the azine nitrogen's coordination to the metal ion [66-68]. For complexes formed in neutral (or slightly acidic) solution, The following band, designated to C=O at 1717 cm-1, changed to a lower frequency. [67]. Meanwhile, in basic medium, this band vanished in complexes, and a new band

attributable to C-O was found at 1145-1146 cm-1, demonstrating ligand coordination through enolic oxygen atoms (67,68). For complexes formed in neutral (or slightly acidic) media, the next band at 3176 cm-1 ascribed to NH remained unchanged, showing that there is no coordination between this group and the metal ion (67). Meanwhile, due to the enolic form, this band has vanished from the basic medium.

The thiosemicarbazone ligand infrared spectra (Table 4) revealed a prominent band at 1655-1657 cm-1, which was attributed to the C=N group (66,67). Due to the decrease in bond order as a result of metal nitrogen bond formation, a negative shift in C=N stretching vibration on coordination was detected (5,6). The C=S group is responsible for the following strong band at 1325-1326 cm-1 (5,6). For complexes produced in neutral (or slightly acidic) media, this band was seen at the same position on coordination (67-69) suggesting that there was no coordination through the thio sulphur Meanwhile, in basic medium, this band vanished in complexes, and a new band was found at 871-874 cm-1 due to C-S, indicating that the ligand is coordinated through the thiol atom (68). The ligand's position band in the range 3254-3261, 3390-3494, and 1450 cm-1 remained unchanged due to N-H, NH2, and NH2, respectively, demonstrating that there is no coordination between these groups and the metal ion (68,69). Schiff-base spectra revealed a prominent band in the area 1615-1620 cm-1, which was attributed to C=N stretching vibrations (7). This band began to shift to a lower frequency, indicating that the imine nitrogen was coordinated to the metal ion (67). The following band, due to C-O, in the range 1290-1291 cm-1, remained unchanged after coordination, showing that there is no coordination between these groups and the metal ion (67). The spectra of complexes produced in neutral (or slightly acidic) media, on the other hand, revealed additional bands at 1520-1521 cm-1 due to ionic acetate (32). Furthermore, due to (s)Ac and (as)Ac, complexes displayed bands at 1327-1328 cm-1 and 1507 cm-1, respectively (68). The difference between s(Ac) and as(Ac) cm-1 that supported the monodentate ligand bonding of one acetate group through the oxygen atom. The spectra of all the complexes revealed new bands at 410-491, 458-549, and 401-420 cm-1, respectively, due to M-N, M-O, and M-S. (67-69).

Table (4): Some important bands in the infrared spectra of the ligands and their complexes

Compd.	IAH₂				Thiosemicarbazone			Schiff base			ν_{M-N}	ν_{M-O}	ν_{M-S}	ν_{Ac}
	$\nu_{C=N}$	ν_{N-N}	$\nu_{C=O}$ or ν_{C-O}	ν_{NH}	$\nu_{C=N}$	$\nu_{C=S}$ or ν_{C-S}	ν_{NH}	$\nu_{C=N}$	ν_{C-O}	ν_{OH}				
IAH₂	1610	93i	1717	3176	-	-	-	-	-	-				
BtscbH	-	-	-	-	1655	1325	3259	1619	-	-	-	-	-	-
BtscoH₂	-	-	-	-	1655	1326	3260	1618	1290	3177	-	-	-	-
BtscmH₂	-	-	-	-	1657	1325	3254	1616	1290	3164	-	-	-	-
BtscpH₂	-	-	-	-	1656	1326	3260	1615	1290	3164	-	-	-	-
1	1610, 1578	983	1591	3176	1609	1325	3255	1549	-	-	423, 435 464	480 480	-	1507, 1327 1521
2	1509 1578	984	1591	3172	1610	1326	3255	1549	-	-	410, 419 435	480 490	-	1507, 1327 1521
3	1610 1578	984	1145	-	1595	873	-	1549	-	-	410, 424 436	458 479	401	-
4	1609 1578	984	1145	-	1595	873	-	1549	-	-	421, 479	518 546	405	-

											491			
5	1611 1578	984	1590	3176	1595	1327	3260	1519	1291	3177	425, 440 462	480 519	-	1508, 1328 1521
6	1609 1578	984	1590	3174	1595	1327	3256	1550	1289	3162	425, 441 481	491 546	-	1508, 1328 1521
7	1611 1558	985	1146	-	1596	873	-	1541	1291	3177	439, 459 472	484 490	419	-
8	1609 1558	985	1146	-	1595	871	-	1541	1289	3162	450, 482 491	530 549	410	-
9	1611 1578	984	1591	3177	1609	1326	3255	1541	1290	3165	420, 460 480	491 545	-	1507, 1327 1521
10	1609 1578	983	1591	3175	1608	1325	3260	1541	1291	3172	415, 460 481	490 546	-	1507, 1327 1521
11	1611 1577	998	1146	-	1609	874	-	1541	1290	3165	435, 453	491	420	-

											468	528		
12	1609 1578	984	1145	-	1608	873	-	1541	1291	3172	436, 469 482	490 546	416	-
13	1611 1577	983	1591	3177	1608	1326	3261	1541	1290	3164	421, 436 474	490 547	-	1507, 1327 1521
14	1609 1577	984	1591	3174	1608	1326	3261	1541	1290	3173	420, 459 482	491 546	-	1507, 1327 1521
15	1610.40 1569	985	1146	-	1608	874	-	1545	1290	3164	425, 433 440	459 479	416	-
16	1609 1569	983	1145	-	1608	873	-	1546	1290	3173	426, 436 461	480 525	416	-

[1]H nmr spectra of the ligands in Deutrated dimethylsulfoxide as internal reference were measured. The results were listed in (Table 5; Fig. 2), The results of **H[1] nmr spectra** supported the structure of the ligands under investigation.

Table (5) - Some important bands in the H[1] nmr spectra of the ligands (ppm).

Compd.	Ar-H s	NH s	NH$_2$ s	OH s	SH s
IAH$_2$	8.00 - 7.06 (m)	11.00 (s)	-		
BtscH	7.90 - 7.10 (m)	8.70 (s)	7.04 - 6.80 (d)		
BtscbH	7.94 - 7.40 (m)	8.64 (s)	7.00 - 6.90 (d)		4.50 (s)
BtscoH	7.94 - 7.23 (m)	8.90 (s)	6.64 - 6.38 (d)	8.64 (s)	4.50 (s)
BtscmH$_2$	7.95 - 7.59 (m)	8.82 (s)	6.77 - 6.00 (d)	8.65 (s)	4.50 (s)
BtscpH$_2$	7.95 - 7.18 (m)	9.90 (s)	6.77 - 6.40 (d)	8.40 (s)	4.50 (s)

(m) = multiplet; (s)= singlet, (d)= doublet
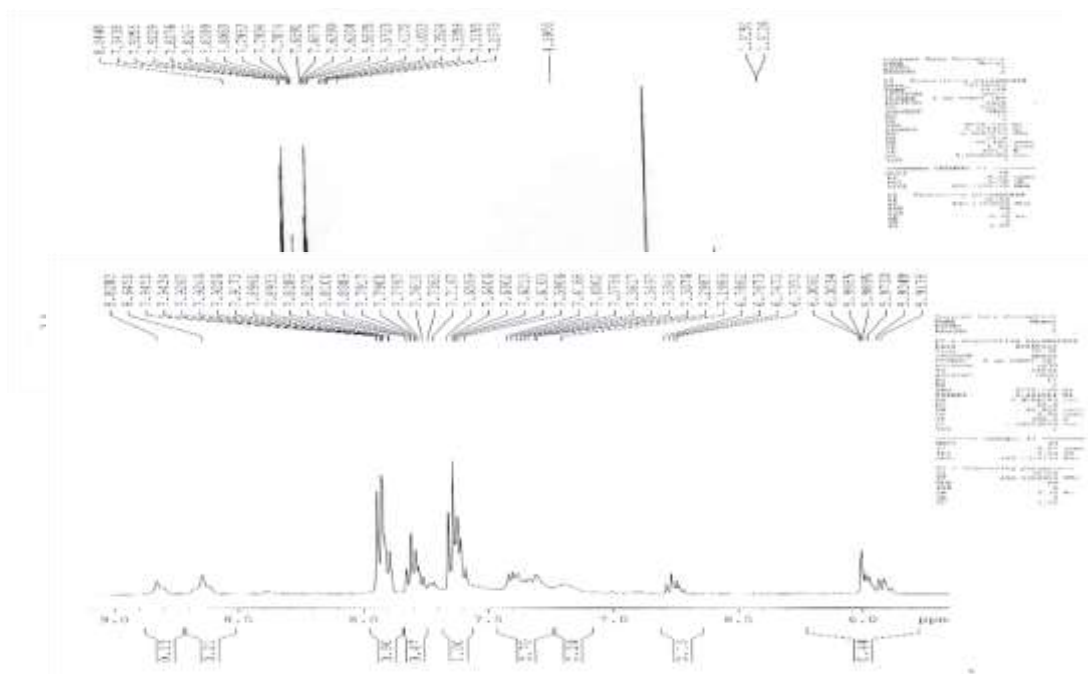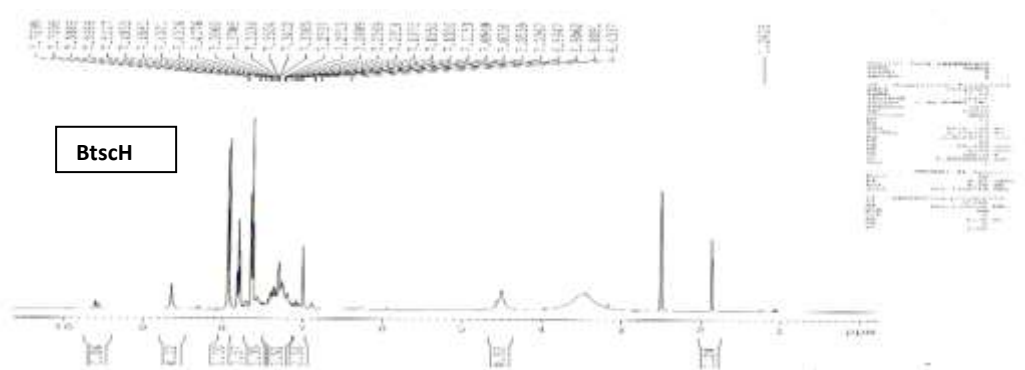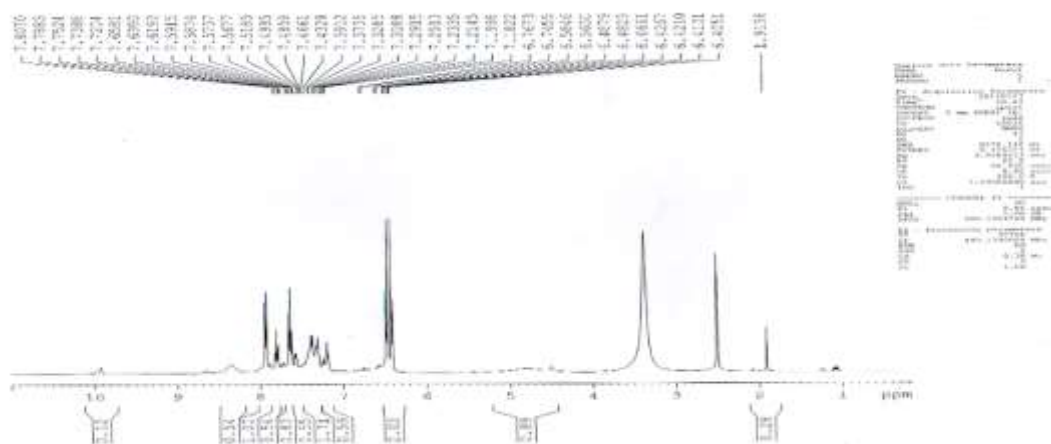
Fig (2): H¹ nmr spectra of the ligands

An intensity vs. m/z spectrum is a mass spectrum (mass-to-charge ratio). A mass spectrometer converts individual molecules to ions so that they can be moved around and manipulated by external electric and magnetic fields in order to measure their properties. A mass spectrometer's three primary functions and associated components are:

1. An electron is lost and a tiny sample is ionised, usually to cations (The Ion Source).

2. Ions are separated and sorted based on their mass and charge (The Mass Analyzer).

3. The separated ions are measured and the findings are presented graphically (The Detector).

A graph depicting a chemical analysis as a result, a sample's mass spectrum is a pattern that represents the distribution of ions in terms of mass (or, more precisely, mass-to-charge ratio). The mass spectra of BtscH (C15H13N3SO), BtscoH (C21H19N4SO), BtscmH2 (C21H19N4SO), BtscpH2 (C21H19N4SO), and IAH2 (C16H13N4O2) were obtained (Fig. 3) and confirmed the structure of the ligands under investigation[71]
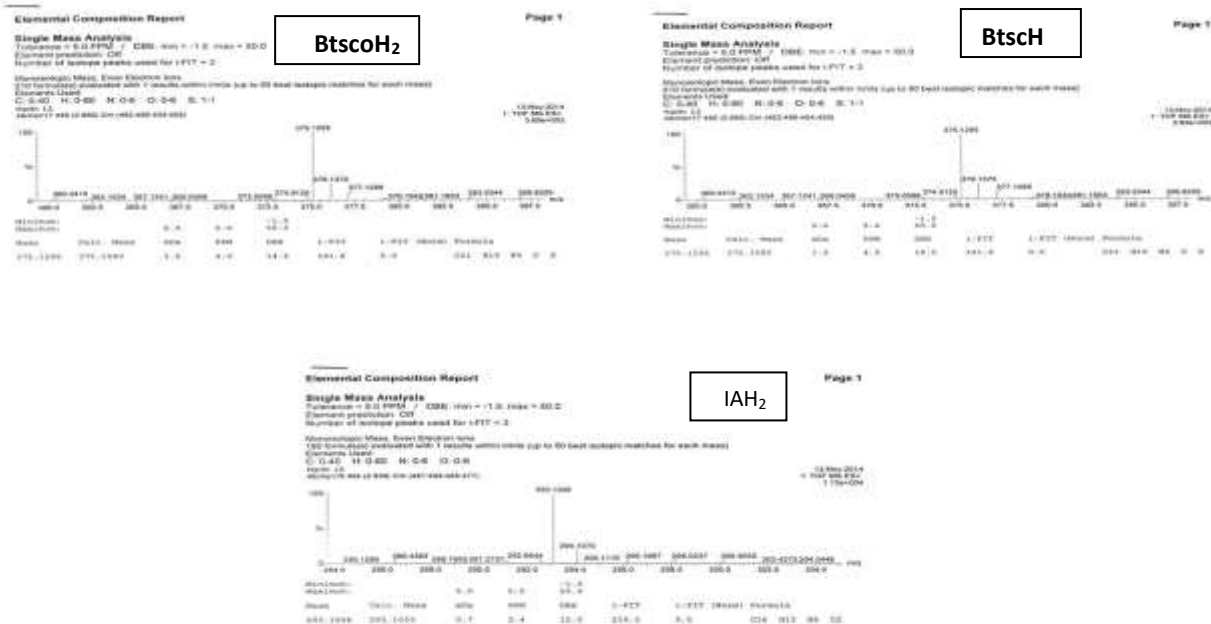
Fig (3): Mass spectrum of ligands

Biological Activity

Many chemical compounds had a good ability to attack bacteria through their effects on ribonucleic acid synthesis, which could be due to the inhibition action of these compounds on the bacteria's DNA, which caused inhibition of DNA gyrase enzyme activities such as supercoiling, decantenation, and unkotting of the DNA [25-28]. Furthermore, antibacterial agents were found to kill or hinder the growth of germs by influencing specific target areas such as cell wall, protein, and nucleic acid synthesis, or by disrupting the function of the cell membrane, binding of the sulfhydryl groups of cell enzymes with complexes [18]. The antibacterial effect of the complexes has been studied. IAH2 and complex No.3 have antibacterial action against Pseudomonas aeruginosa, whereas IAH2 and BtscmH2 have antibacterial activity against E. coli, and IAH2, BtscbH, BtscoH2, BtscmH2 and complexes No. 2, 9, 10 and 12 have antibacterial activity against Staphylococcus aureus (Table 7 Fig. 4). Because metal ions preferentially attach to the –SH group of the cell enzyme,, The ligands and complexes examined are likely to have been engaged in competitive equilibria involving the SH group of the cell enzyme. As a result, we came to the conclusion that some of the chemicals have biological activity. If this is the case, the chemicals that were expected to bind to the cell enzyme's –SH group acted more strongly than the nitrogen donor atom in the ligand (Table 7), which is consistent with what many other researchers have discovered.

Table 7: Antibacterial activity (inhibition zone) of different concentrations of the ligands and complexes (µg/ml)

المُركّب	Psudomonus auruginosa			Proteus mirabilis			Escherichia coli			Staphylococcus aureus		
	125	250	500	125	250	500	125	250	500	125	250	500
IAH$_2$	9	12	10	-	-	-	8	12	10	8	12	10
BtscbH	-	-	-	-	-	-	-	-	-	9	12	12
BtscoH$_2$	-	-	-	-	-	-	-	-	-	12	12	-
BtscmH$_2$	-	-	-	-	-	-	7	7	7	7	7	7
BtscpH$_2$	-	-	-	-	-	-	-	-	-	-	-	-
1	-	-	-	-	-	-	-	-	-	-	-	-
1 2	-	-	-	-	-	-	-	-	-	-	-	-
2 3	-	-	-	-	-	-	-	-	-	-	7	9
3 4	-	-	-	-	-	-	-	-	-	-	7	9
4 5	-	-	-	-	-	-	-	-	-	-	-	-
5 6	10	10	7	-	-	-	-	7	8	-	7	8
6 7	-	-	-	-	-	-	-	7	7	-	-	7
7 8	-	-	-	11	10	6	-	-	-	-	7	9
8 9	-	-	-	-	-	-	-	-	-	-	-	7
9 10	-	-	-	-	-	-	-	-	-	-	-	7
10 11	9	12	7	-	9	8	-	-	-	-	-	7
11 12	-	-	-	-	-	-	-	7	9	-	-	7
12 13	-	-	-	-	-	-	-	7	9	-	8	9
13 14	-	-	-	-	-	-	-	7	9	-	7	9
14 15	-	7	10	-	-	-	10	12	8	10	12	8
15 16	-	-	-	-	-	-	-	-	-	-	-	7
Ax25	-			-			-			9		
CIPS	10			10			10			10		

Inhibition of E. coli by
6 & 7

Inhibition of *P. mirabilis by*
Complex 8 & 11

Inhibition of E. coli by
Complex 6

Inhibition of *S. aureus by*
Complex 14 & 15

Inhibition of E. coli by
Complex 12, 13 & 14

Inhibition of P. auruginosa by
Complex 15

Inhibition of S. aureus by
Complex 7, 9-12,16

Inhibition of P. auruginosa by
Complex 6 & 11

Inhibition of P. auruginosa by IAH2

Inhibition of E. coli by Ligands

Inhibition of S. aureus by Ligands

Fig. (4) Antibacterial activity

The antifungal activity of all the ligands and compounds was tested in vitro against Aspergillus niger and Candida albicans.

Conclussion :

The following observations have been made based on analytical, physical, and spectral studies, leading to the following conclusions:

In both neutral and alkaline medium, the ligand IAH2 behaved as a tridentate chelating ligand with the metal ion via the azomethine nitrogen and two oxygen atoms. In neutral media, the ligands BtscbH, BtscoH2, BtscmH2, and BtscpH2 operated as bidentate chelating ligands joined by nitrogen atoms, while in basic medium, they acted as anion (-1) tridentate chelating ligands.

One acetate ion acted as monodentate ligand for complexes in neutral medium and the other acetate joint in ionic manner All the resulted complexes in neutral medium were ionic had the formula $[Cu(IAH_2)(LH_i)(Ac)]Ac$ and non ionic had the formula

[Cu(IAH)(FA)(LH$_{I-1}$)] in basic medium. Copper ion in all the complexes have been probably hexacoordinated, leading to distorted octahedral geometries as shown below:
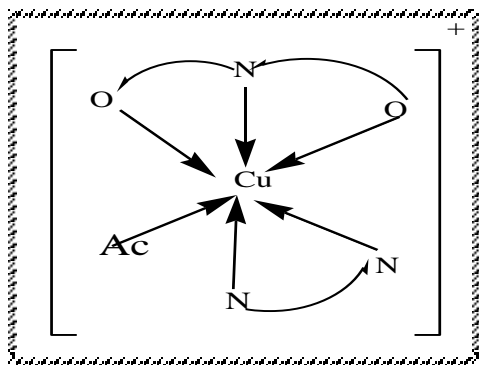
(I) Complexes in neutral medium
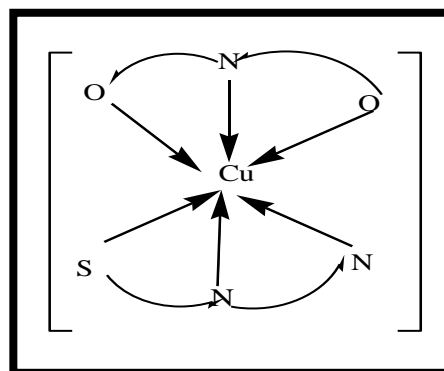
(II) Complexes in basic mediu
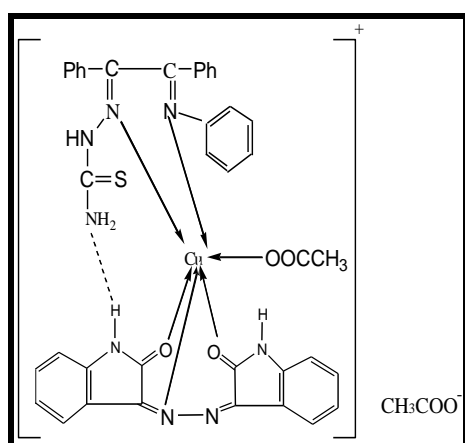
Complexes in neutral medium
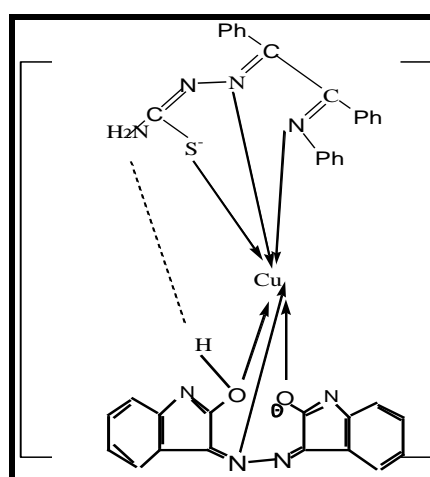
Complexes in basic mediu

All of the compounds remained stable when exposed to laser light. Antibacterial activity was found in certain ligands and complexes against Psudomonus auruginosa, Staphylococcus aureus, and Escherichia coli. Against Aspergillus niger and Candida albicans, none of the ligands or compounds have antifungal action.

References:

1- Wilkinson G., Gillard R. D. and McCleverty J. A. (1987). Comprehensive Coordination Chemistry,Pergamon Press, Oxford, England, 1st Ed., Vol.5, 534

2- Stwertka A.; "A Guide to The Elements(1998). Oxford Univ. Press Inc., New York, Rev. Ed., 96-98

3- Caret R. L., Denniston K. J. and Topping J. J.; "Principle and Application of Inorganic, Organic and Biological Chemistry"; McGraw-Hill, U.S.A., 62 (1997).

4- Chaloner-Gill B., Euler W.B., Mumbauer P. D. and Roberts J. E. (1991) J. Am. Chem. Soc.; 113, 6831.

5- Kalyanasunaram K.; (1997). Int. J. Enorgy Res.; 21(14) 1345-1350

6- BayraK R., Akfay H. T., Piskin, Durmus M. and Degirmeneioglu I. (2013).; Dyes and Pigments; 95(2) 330-337

7- Zhang W., Chen O. M., Cheng X., Wu N., Yi G. B., Li D., Tan J. H., Huang Z. S., Gu L. Q. and An L. K.; (2013). Dyes and Pigments; 99(1) 120-143

8- Karaoglu K., Serbest K., Emirik M. and Sahin E. (2015). J. Organomet. Chem.; 775, 80-87

9- Pandeya S. N. and Dimonock J. R.; Pharmazie; (1993). 48(9) 659-666

10- Miller M. C., Bastow K. F., Stineman C. N., Vance J. R., Songe S. C., West D. X. and Hall I. H.; (1998). Arch. Pharm. (Weinheim); 381(4) 121-127

11- Haribabu P. and Reddy K. H(2011)..; Indian J. Chem.; 50A, 996-1001

12- Pahonta E., Fala V., Gulea A., Poirier D., Tapcov V. and Rosu T.; (2013). Molecules; 18, 8812-8836 54

13- Kumar S. and Kumar N.; (2013).Intern. Curr. Pharm. J.; 2(4) 88-91

14- Mahjoub O. A. and Farina Y.; (2014). AIP Conf. Proc.; 1614, 186

15- Hosseini-Yazdi S. A., Hosseinpour S., Khandar A. A., Kassel W. S. and Piro N. A.; (2015). Inorg. Chim. Acta; 427,124-130

16- Sen S. K., Guadie A. and Temesgen A(2015)..; Int. J. Chem. Natur. Sci.; 3(1) 217-223

17- Al Zaubi W.; (2013). Intern. J. Org. Chem.; 3(3A) 73-95

18- Khalaji A. D., Gholinejad M. and Triki S. (2013).; Russ. J. Coord. Chem.; 39(2) 209-213

19- Hussain Z., Yousif E., Ahmed A. and Altaie A. (2014).; Org. Med. Chem. Lett.; 4(1) 1-4

20- Priya B. D. and Lakshmi S. S.; (2014). Int. J. Chem. Tech. Res.; 6(1) 87-94

21- Ibrahim O. M., Mohamed M. A. and Refat M. S.; (2014). Can. Chem. Trans.; 2(2) 108-121

22- Ejidike I. P. and Ajibade P. A(2015)..; Molecules; 20, 9788-9802

23- Asuigui D. R. C. and Deifel N. P.; H. Sc. (2015). J. Sci.; IV

24- Jamebozorgi S. and Liyaghati-Delshad M(2015)..; J. Nov. Appl. Sci.; 4(2) 135-139

25- Rakhi C. and Shelly; (2011). Res. J. Chem. Sci.; 1(5) 1-5

26- Kumar L. Sh., Prasad K. Sh. and Revanasiddappa H. D(2011).; Eur. J. Chem.; 2(3) 394-403

27- Ali M. A., Mirza A. H., Yee Ch. Y., Rahgeni H. and Bernhardt P. V. (2011) Polyhedron; 30(3) 542-548.

28- Saif M., Mashaly M. M., Eid M. F. and Fouad R.; (2012). Spectrochim. Acta A. Mol. Biomol. Spectrosc.; 92, 347-356

29- Lobana T. S., Kumari P., Butcher R. J., Jasinski J. P. and Golen J. A.; Z. Anorg. Allg(2012).. Chem.; 638(11) 1861-1867

30- El Amane M., Kennouche Y. and Hamidi M. E. M.; (2014). Res. J. Chem. Sci.; 4(10) 72-84

31- Ghosh M., Layek M., Fleck M., Saha R. and Bandyopadhyay D(2015)..; Polyhedron; 85, 312-319

32- Javidhya P., Ganeshpadian M., Dhivya R,, Akbarsha M. A. and Palaniandavar M(2015)..; Dalton Trans.; 44, 11997-12010

33- Kappe C. O.; Angew(2004). Chem. Int. Ed.; 43, 6250-6284

34- Van de Kruijs B. H. P.; Microwave Matler Effects in Metal (Oxide) Mediated Chemistry and in Drying(2010).; Ph. D. Thesis, Technische Univ. Eindhoven, 4

35- Rathore K., Singh R. K. R. and Singh H. B. (2010).; E. J. Chem.; 7(S1), S566-S572

36- Jain R. K., Mishra A. P., Mishra D. K. and Gupta S. K.; (2012). E. J. Chem.; 9(4) 1721-1727

37- Mishra A. P., Sharma N. and Jain R. K.; (2013). OJSTA; 2(2) 56-62

38- Ahmed M. and Mohammadyunus V.; Orien. (2014). J. Chem.; 30(1) 111-117

39- Fakruddin M. A. A. and Asafa S.; (2014).World J. Pharm. Res.; 3(8) 467-480

40- Srivastava K. P., Singh S. K. and Mishra B. P. (2015).; Int. J. Chem. Tech. Res.; 7(5) 2272-2279

41- Maiman T. H.; (1967). Ruby Laser System; United State Patent Office; 3, 353, 115

42- Dhar S., Nethaji M. and Chakravarty A. R.; (2006). Inorg. Chem.; 45,11043-11050

43- Manshina A. A., Povolotskiy A. V., Ivanova T. Y., Tveryano-vick Y. S., Tunik S. P., Kim D., Kim M. and Kwon S. C.; (2007). Appl. Phys. A.; 89(3) 755-759

44- Prathima B., Rao Y. S., Reddy S. A., Reddy Y. P. and Reddy A. V(2010)..; Spectrochim. Acta A. Mol. Biomol. Spectrosc.; 77(1) 248-252

45- Al-Bayati R. I. H., Mahdi F. R. and Al-Amiery A. A. H.; (2011). British J. Pharm. Texicol.; 2(1) 5-11

46- Aliyu H. N. and Mohammed A. S.; Glo. (2012). Adv. Res. J. Microbiol.; 1 (5) 67-71

47- Reddy N. Sh., Shankara B. S., Krishana P. M., Basavaraj C. and B. Mahesh B.; (2013) Intern. J. Inorg. Chem.; 2013.

48- Chundawat N. S. and Pandya M. (2015).; World J. Pharm Pharmac. Sci.; 4(7) 657-664

49- Dawood Z. F., and Al-Bustani R. R. A.; (2011). 2nd Sci. Conf. Biol. Sci. -Sci. Coll. -Mosul Univ.; 16-17 Nov. 54-71

50- Dawood Z. F., and Al-Neami N. A. K. (2013).; Baghdad J. Sci. Women; 10 (3), 509-524

51- Dawood Z.F. and Al-Bustani R.R.A. (2017).; IJST; 12(3), 38-50

52- Dawood Z. F., and Al-izzy A. M. (2018).; JES-PS; 27(4)49-66

53-. Vogel A. I.; "Textbook of Practical Organic Chemistry"(1964).; Longman Green, London, 3rd Ed., 722

54- Singh R. B., Gary B. S. and Singh R. P(1978)..; Talanta; 25, 619-632,

55- Vogel A. I.; "Textbook of Quantitative Inorganic Analysis" (1978); Longman Green, London, 3rd Ed., 379-380 .

56- Danials J. W.; "Experimental Physical Chemistry"; (1962). McGraw-Hill, 6th Ed., 81

57- Al-Mukhtar S. and Mustafa I. A.; (1988). "Inorganic and Coordination Chemistry"; Arabic Version, Mosul Univ. Press., Mosul-Iraq

58- Atlas R. M.; (1995). "Principle of Microbiology"; Mosby-year Book. Inc., 76-77

59- Collins C. H., Lyne P. M. and Grange J. M.; (1989). "Microbiological Methods"; Buterwoths, London, 6th Ed., 409

60- Chakravarty R. (2006).; J. Chem. Sci.; 118(6) 443-453

61- Geary W. J. (1981).; Coord. Chem. Rev.; 7, 81

62- Kulaksizoğlu S., Gōkçe C. and Güp R.; (2012).Turk. J. Chem., 56, 717-733

63- Kulaksizoğlu S., Gōkçe C. and Güp (2012).R.; J. Chil. Chem. Soc., 57(3) 1213-1218

64- Gahlot A., Sharma S. and Mehta R. K.; (1986). J. Indian Chem. Soc.; 63, 198

65- Al-Moula F. J. A.; "Preparation and Characterization of Some Complexes of 3d Transition Elements Containing Mixed Ligands"; (2008). M. Sc. Thesis, Mosul Univ., Educ. Coll., Mosul-Iraq

66- Al-Neami N. A. K.; "Preparation and Characterization of Some New Copper(II) Complexes and Estimation of Biological Activity on Two Type of Bacteria and The Effect of Laser on Them" (2012).; M. Sc. Thesis, Mosul Univ., Educ. Coll., Mosul-Iraq

67- Nakamoto K.; (1976)" Infrared and Raman Spectra of Inorganic and Coordination Compound"; John Wily and Sons, New York, 3rd Ed., 166-322.

68- Singh P. K., Koacher J. K. and Tandon J. P. (1981).; J. Inorg. Nucl. Chem.; 43, 1775

69- Al-Deleme Z. M. J.; (2012). "Preparation, Characterization of New Nickel (II) Complexes Containing Mixed Ligands and Study of Laser Effect on Them and Their Biological Activity"; M. Sc. Thesis, Mosul Univ., Educ. Coll., Mosul-Iraq

70- Krishna P. M., Shankara B. S. amd Shashidhar N.; (2013), International Journal of Inorganic Chemistry; Volume 2013 http://dx.doi.org/10.1155/2013/741269

MODIFICATION OF ELGAMAL ELLIPTIC CURVE CRYPTOSYSTEM ALGORITHM

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Abstract:

The importance of data encryption has grown dramatically, especially in terms of personal data. The elliptic curve cryptosystem is the major solution for data security because it has become more prevalent. Security and privacy are required to ensure the data has recently generated much concern within the research community. This paper's objective is to obtain a complicated and secure ciphertext and make cryptanalysis difficult. In this paper, we modified the El-Gamal Elliptic Curve Cryptosystem (ECC) by producing new secret keys for encrypting data and embedding messages by using Discrete Logarithm Problem (DLP) behavior. This modification is to offer enhanced encryption standards and improve the security. The experiential results show that the proposed algorithm is more complex than the original method.

Key words: Elliptic curve, El-Gamal ECC, Keys, DLP, Encryption, Decryption.

Introduction:

Many researchers have worked on designing cryptosystems that are suited for sending secure information through networks. Numerical techniques have also been required to create and improve cryptosystems. The suggested update to the El-Gamal ECC employing the polynomial interpolation technique transfers the set of encrypting points via the Lagrange polynomial interpolation method [1]. To improve data security while lowering processing costs, [2] proposes a public key cryptography scheme based on the quartic Bezier curve over the Galois field GF(Pm). [3] employed a cubic spline curve. This article presents a public key cryptography technique based on El-Gamal mode encryption and decryption that operates in an asymmetric block cypher mode. The key length required for the current implementation being implemented in this job is smaller than the key length required for the ECC technique. For modifying El-Gamal ECC, [4] used a quadratic Bezier curve for encrypting the key and sending it with ciphertext to the recipient side using PGP behavior.

Elliptic Curves (EC) over Prime field F_p

The equation (1) is used to define $E(F_p)$ as the elliptic curve E over F_p [5]:

$$E: y^2 = x^3 + ax + b \quad mod\ p \qquad (1)$$

If p is an odd prime ($p > 2,3$), then **a** and **b** satisfy the formula $(4a^3 + 27b^2)\ mod\ p \neq 0$ in F_p, and each point $P = (p_1, p_2)$ on E.

Mathematical Procedures on EC over Prime Field F_p

The following mathematical procedures are employed in EC methodologies [6]:

- ***The Procedure for Adding Points***

Supposing $P = (p_1, p_2)$ and $Q = (q_1, q_2)$ belong to E. Then, $H = P + Q = (h_1, h_2)$ is calculated as follows:

$$\lambda = \frac{q_2 - p_2}{q_1 - p_1} \qquad (2)$$

$$h_1 = (\lambda^2 - p_1 - q_1)\ mod\ p \qquad (3)$$

$$h_2 = [\lambda(p_1 - h_1) - p_2]\ mod\ p \qquad (4)$$

- ***The Procedure for Doubling Points***

$P = (p_1, p_2)$ represents a point in E. Point doubling is the ability to add a point P to itself to get another point that belongs to E:

$$P + P = 2P = H = (h_1, h_2) \qquad (5)$$

and calculated as follows:

$$\lambda = \frac{3p_1{}^2 + a}{2p_2} \qquad (6)$$

$$h_1 = (\lambda^2 - 2p_1) \bmod p \qquad (7)$$

$$h_2 = [\lambda(p_1 - h_1) - p_2] \bmod p \qquad (8)$$

- *The Procedure for Scalar Multiplication*

Let $P = (p_1, p_2)$ represent a point on E and k represent a positive integer. Scalar multiplication is the repeated addition of point as follows:

$$kP = \underbrace{P + P + \cdots + P}_{k\text{-times}} \qquad (9)$$

- *The Procedure for Inverse Operation*

Let $P = (p_1, p_2)$, the negative of P is $-P = (p_1, -p_2)$ such that $P + (-P) = 0$.

ELLIPTIC CURVES CRYPTOGRAPHY

Elliptic curve cryptography (ECC) is an efficient encryption method established by Neal Koblitz [7] and Victor Miller [8]. The complexity of Elliptic Curve Discrete Logarithm Problem (ECDLP) determines the security level of ECC [9].

Elliptic Curve Discrete Logarithm Problem (ECDLP)

The ECDLP must be unsolvable in order for all ECC schemes to be secure. In this problem, an elliptic curve E defined over a prime field F_p, a point $P \in E(F_p)$ of order N, and a point $Q \in E(F_p)$ that is a multiple of P are given, and it is chosen to discover the integer $\beta \in [0, N-1]$ such that $Q = \beta P$.

The public parameters E, F_p, and P are chosen in ECC schemes, and N is computed. The user then selects a random integer β from the range $[1, N-1]$ and computes $Q = \beta P$. The user's public key is Q, and his secret key is β. Obviously, if the ECDLP is simple, an attacker can determine β from Q. As a result, the hardness of the ECDLP is critical for the security of all EC schemes [10].

El-Gamal ECC Algorithm

Koblitz, in 1987, presented an analogue of the El-Gamal public key cryptosystem depending on the EC over a finite prime field $E(F_p)$[7]. The El-Gamal ECC algorithm is described in [11]:

The Initialization

- Public $E(F_p)$.

- Public base point $B \in E(F_p)$.

Keys Production

1. The Recipient

- At random, choose a secret integer d.

- Compute the public key k_R using the integer d: $dB = k_R$.

2. The Sender

- At random, choose a secret integer e.

- Compute the key k_S using e and k_R: $k_S =. ek_R$

Encryption (The Sender)

- Choose $M = (\rho_1, \rho_2)$ associated with $E(F_p)$.

- Encrypt M with k_S as follows: $C = M + k_S$, where C is the ciphertext.

- Determine eB.

- Send $\{C, eB\}$ to the recipient side.

Decryption (The Recipient)

- Receive $\{C, eB\}$ from the sender side.

- Determine $k_S = d(eB)$.

- Decrypt the ciphertext C using k_S by: $P_M = C - k_S$.

- The original message $M = (\rho_1, \rho_2)$.

The proposed approach for improving data privacy during transmission is presented in this research. We modified the El-Gamal ECC algorithm by using Discrete Logarithm Problem (DLP) behavior for producing two keys by using a random one point that is taken from EC points for encrypting message points.

PROPOSED MODIFICATION

The proposed modification is categorized into four main components, which are as follows:

- The secret message point $M = (\rho_1, \rho_2) \in E(F_p)$, by scalar multiplication compute ρ_1 and ρ_2 with base point B to be two points belongs to the $E(F_p)$ points (P_{ρ_1} and $P_{\rho_2} \in E(F_p)$), followed by system initialization between sender and recipient with agreement on a random point (from the $E(F_p)$ points).

- The secret key production stage, in which a secret keys points δ_1 and δ_2 is created by using on random point P and $k_S \in E(F_p)$ using scalar multiplication (these keys which the sender produced), is used to encrypt message points P_{ρ_1} and P_{ρ_2}.

- The encryption stage is related to the message points P_{ρ_1} and P_{ρ_2} encryption process to get the ciphertext (C_{ρ_1} and C_{ρ_2}) and then compute eB.

- The decryption stage is a description of the process for retrieval of the plaintext using the private and public keys. First, compute the key k_S by eB and then get the secret key points δ_1 and δ_2. Finally, decrypt the ciphertext (C_{ρ_1} and C_{ρ_2}) and get the original message points (P_{ρ_1} and P_{ρ_2}). Then, using DLP, to get ρ_1 and ρ_2.

The Proposed Modification Algorithm

The Initialization

- Public $E(F_p)$.

- Public base point $B \in E(F_p)$.

- Secret random point $P = (x_1, x_2) \in E(F_p)$.

Keys Production

1. The Recipient

- At random, choose a secret integer d.

- Compute the public key k_R using the integer d:

$dB = k_R$.

2. The Sender

- At random, choose a secret integer e.

- Compute the key k_S using e and k_R: $ek_R = k_S = (k_1, k_2)$.

- Products new keys by $P = (x_1, x_2)$ and $k_S = (k_1, k_2)$ by: $\delta_1 = x_1 k_S$ & $\delta_2 = x_2 k_S$

.

Encryption (*The Sender*)

- Select the point $M = (\rho_1, \rho_2)$.

- Compute by scalar multiplication ρ_1 and ρ_2 with base point B:

$\rho_1 B = P_{\rho_1}$ and $\rho_2 B = P_{\rho_2}$

- Encrypt P_{ρ_1} and P_{ρ_2} with δ_1 and δ_2 as follows:

$C_{\rho_1} = P_{\rho_1} + \delta_1$ and $C_{\rho_2} = P_{\rho_2} + \delta_2$.

- Compute eB.

- Send $\{C_{\rho_1}, C_{\rho_2}, eB\}$.

Decryption (*The Recipient*)

- Receive $\{C_{\rho_1}, C_{\rho_2}, eB\}$ from the sender.

- Determine $k_S = (k_1, k_2) = d(eB)$.

- Generate the keys δ_1 and δ_2 by using $P = (x_1, x_2)$ as follows: $\delta_1 = x_1 k_S$ & $\delta_2 = x_2 k_S$.

- Decrypt C_{ρ_1} and C_{ρ_2} using δ_1 and δ_2 by: $P_{\rho_1} = C_{\rho_1} - \delta_1$ and $P_{\rho_2} = C_{\rho_2} - \delta_2$.

- Using B with P_{ρ_1} and P_{ρ_2} to get ρ_1 and ρ_2 by DLP.

- Rewrite $M = (\rho_1, \rho_2)$.

Example

The Initialization

- The sender and recipient initiate use of the system and use public $E(F_{37})$ and $B = (0, 9) \in E$, such that the equation of EC is $E: y^2 = x^3 + 3x + 7 \ mod \ 37$.

Table 1. Represents the points on $E(F_{37})$.

(0, 9)	(0, 28)	(1, 14)	(1, 23)	(2, 13)	(2, 24)	(4, 3)
(4, 34)	(5, 6)	(5, 31)	(7, 1)	(7, 36)	(8, 5)	(8, 32)
(10, 1)	(10, 36)	(16, 9)	(16, 28)	(18, 11)	(18, 26)	(19, 2)
(19, 35)	(20, 1)	(20, 36)	(21, 9)	(21, 28)	(22, 18)	(22, 19)
(23, 12)	(23, 25)	(24, 18)	(24, 19)	(26, 7)	(26, 30)	(28, 18)
(28, 19)	(29, 10)	(29, 27)	(35, 17)	(35, 20)	(36, 15)	(36, 22)

- The sender and recipient agree upon a random secret point $P = (21, 9) \in E(F_p)$

Keys Production

1. The Recipient

- At random, choose a secret integer $d = 5$.

- Compute the public key: $k_R = dB = 5(0, 9) = (4, 3)$.

2. The Sender

- At random, choose a secret integer $e = 8$.

- Compute by using the recipient's public key:

$$k_S = ek_R = 8(4, 3) = (22, 19).$$

- Products new keys δ_1 and δ_2 by $P = (21, 9)$ and $k_S = (22, 19)$ by:

$$\delta_1 = 21(22, 19) = (8, 5) \quad \text{and} \quad \delta_2 = 9(22, 19) = (21, 28).$$

Encryption (The Sender)

- Select the point $M = (18, 26)$.

- Compute P_{ρ_1} and P_{ρ_2} by using $\rho_1 = 18$ and $\rho_2 = 26$ with $B = (0, 9)$ by:

$$P_{\rho_1} = \rho_1 B = 18\,(0, 9) = (29, 27) \text{ and } P_{\rho_2} = \rho_2 B = 26\,(0, 9) = (19, 35).$$

- Encrypt $P_{\rho_1} = (29, 27)$ and $P_{\rho_2} = (19, 35)$ with δ_1 and δ_2 as follows:

$$C_{\rho 1} = P_{\rho_1} + \delta_1$$

$$= (29, 27) + (8, 5)$$

$$= (36, 15).$$

$$C_{\rho 2} = P_{\rho_2} + \delta_2$$

$$= (19, 35) + (21, 28)$$

$$= (0, 28) \ .$$

- Compute $eB = 8(0, 9) = (23, 12)$.

- Send $\{C_{\rho 1}, C_{\rho 2}, eB\}$.

Decryption (*The Recipient*)

- Receive $\{C_{\rho 1}, C_{\rho 2}, eB\}$ from the sender.

- Determine k_S by: $d(eB) = 5(23, 12) = (22, 19) = k_S$.

- Create the keys δ_1 and δ_2 by using $P = (21, 9)$ as follows: $\delta_1 = 21(22, 19) = (8, 5)$ and $\delta_2 = 9(22, 19) = (21, 28)$.

- Decrypt $C_{\rho 1}$ and $C_{\rho 2}$ using δ_1 and δ_2 by: $P_{\rho_1} = C_{\rho 1} - \delta_1$ and $P_{\rho_2} = C_{\rho 2} - \delta_2$.

$$P_{\rho_1} = C_{\rho 1} - \delta_1$$

$$= (36, 15) - (8, 5)$$

$$= (36, 15) + (8, -5 \bmod 37)$$

$$= (36, 15) + (8, 32)$$

$$= (29, 27).$$

$$P_{\rho_2} = C_{\rho 2} - \delta_2$$

$$= (0, 28) - (21, 28)$$

$$= (0, 28) + (21, -28 \bmod 37)$$

$$= (0, 28) + (21, 9)$$

$$= (19, 35).$$

- By DLP, using B to get ρ_1 and ρ_2: $P_{\rho_1} = \rho_1 B$ => $(29, 27) = \rho_1(0, 9)$

$B = (0, 9)$, $2B = (36, 22)$, $3B = (22, 18)$, ... , $18B = (29, 27) = P_{\rho_1}$.

So, $\rho_1 = 18$.

In the same way with $P_{\rho_2} = \rho_2 B$, we get $\rho_2 = 26$.

- Rewrite $M = (18, 26)$.

Robustness of The Proposed Algorithm

Because there are relatively few algorithms for solving the Discrete Logarithm Problem (DLP) in points on an elliptic curve, the security of the cryptosystem is still difficult to break and also secure for sending data to the recipient [12].

Using DLP behavior, which has been used to create keys and embed messages in this proposed modification, gives the cryptosystem more complexity and hardness for an attacker's work.

Suppose the attacker is already familiar with the current algorithm. He can obtain admission to and read the ciphertext $C_{\rho 1}$, $C_{\rho 2}$, and eB, as well as the parameters of the elliptic curve over finite field F_p and the base point B and the recipient k_R's public key, because these are publicly available. The attacker cannot access the secret random value e for the sender or the secret key d for the recipient, nor can he access the secret point $P = (x_1, x_2)$ because these parameters are selected in secret, and only the sender and the recipient are informed of them.

As a result, the attacker will have difficulty breaking the ciphertext $C_{\rho 1}$, $C_{\rho 2}$ because he is unable to achieve the parameters e, d, P to calculate and discover the keys δ_1 and δ_2 (two components (keys) used to process the ciphertext. The parameters d or e and also P and the DLP behavior is using to produce the keys and embedding message are important for the attacker to handle for the original message.

The proposed algorithm has been implemented on a Core i3 computer with a CPU speed of 2.00GHz and a RAM capacity of 4GB, and it has been tested for its performance with existing key protocols using MATLAB R2018b (9.5.0.944444) 64-bit software.

The times for encryption and decryption procedures for messages are tested as shown in table(2).

Table 2. Running time of encryption and decryption of messages.

Message Points	$M = (18, 26)$ from Above Example $E(F_{37})$			$M = (74, 5)$ with Large Prime Field $E(F_{313})$		
Running time Methods	Encryption	Decryption	Total Time	Encryption	Decryption	Total Time
The Original of El-Gamal ECC	0.000585 seconds	0.000587 seconds	0.001172 seconds	0.001324 seconds	0.000853 seconds	0.002177 seconds
The modification of El-Gamal ECC	0.071610 seconds	0.008087 seconds	0.079697 seconds	0.047764 seconds	0.034667 seconds	0.082431 seconds

CONCLUSION

The proposed algorithm described in this paper is to enhance the security and confidentiality of data when it's being sent. The updated keys and embedded messages that belong to EC are produced by DLP behavior in this algorithm to get complex and secure cryptography. The proposed algorithm for encrypting data as in table (2) appears slow compared with the original method, but it gains more complexity through the computational processes that are used to solve DLP. The proposed approach improved the security requirements of the keys, which are used for encrypting and decrypting data, as well as the computational complexity of the encrypting and decrypting procedures.

REFERENCES

[1] L. K. Jie and H. Kamarulhaili, 2011 Polynomial Interpolation in the Elliptic Curve Cryptosystem. Journal of Mathematics and Statistics 7(4): 326-331.

[2] B. V. Srividya and S. Akhila, 2014 Novel cryptosystem based on Bezier curve using GF(Pm). International Conference on Circuits, Communication, Control and Computing. IEEE.

[3] Addepalli V. N. Krishna, Addepalli Hari Narayaa, 2017 Cubic spline curve public key cryptography. Journal of Discrete Mathematical Sciences and Cryptography. Vol. 20 (2017), No. 2, pp. 453-461.

[4] Dua Mohammed Ghadi. (2021). A Novel Encryption System Based on PGP Using Elliptic Curve Cryptosystem and Bézier Curve for Secure Information Exchange, J. Phys.: Conf. Ser. 1999 012111.

[5] Manuel Mogollon, 2007 Cryptography and security Services: Mechanisms and Applications. University of Dallas.USA.

[6] William Stallings, 2017 Cryptography and Network Security: Principles and Practices. Seven Edition. Pearson Education.

[7] N. Koblitz, 1987 Elliptic curve cryptosystems, Mathematics of Computation, 48 (1987), 203- 209.

[8] V. S. Miller, 1986 Use of elliptic curves in cryptography, Advanced in Cryptology. Proceedings of Crypto85. Lecture note in Computer Science. v. 218, pp. 417-426.

[9] Sheetal Kalra and K. Sandeep Sood, 2011 Elliptic Curve Cryptography: Current Status and Research Challenges. Communications in Computer and Information Science 169. 455-460.

[10] A. Menezes, 2001Evaluation of Security Level of Cryptography: The Elliptic Curve Discrete Logarithm Problem (ECDLP). University of Waterloo.

[11] Song Y. Yan, 2002 Number Theory for Computing. Second Edition. Springer. Berlin.

[12] Md Nizam Udin, Suhaila Abd Halim, Mohd Idris Jayes, and Hailiza Kamarulhaili, 2012 Application of message embedding technique in ElGamal Elliptic Curve Cryptosystem. 2012 International Conference on Statistics in Science, Business and Engineering (ICSSBE).

SPECTROSCOPIC ANALYSIS OF DOMESTIC AND IMPORTED EGGSHELLS POWDER

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Abstract:

The research aims to study the spectra analysis of the elements present in local and imported eggshells. The study process is carried out using X-ray fluorescent (XRF) and spectral analysis of atomic emission for plasma by interaction of laser with eggshells the laser – induced breakdown spectroscopy(LIBS) method is used for this purpose. The spectral range was (300-800) nm using a Nd:YAG pulsed laser with 1064 nm wave length and have energies (500, 600, 700) mJ. The result of (XRF) shows that the mean concentrations of (Magnesium, Silicon, phosphor, Sulfur, Chlorine, Potassium, Sodium, and Calcium) in domestic eggshell were higher than the mean concentrations in imported eggshell. The mean concentrations were recorded (0.693, 0.327, 0.393, 0.873, 0.1036, 0.0702, 1.301, 56.71) % respectively in domestic eggshell, these concentrations were recorded less values in imported eggshells (0.634, 0.266, 0.327, 0.746, 0.067, 0.046, 1.158, 56.23) % respectively. The intensity of the spectral emissions in the domestic eggshells was higher than the spectral emission in the imported eggshells for all these elements.

Key words: Eggshells, XRF, LIBS, Nd:YAG Pulsed Laser. Optical Emission Technique, Boltzmann, Plasma.

Introduction:

Eggshells are considered one of the successful adaptations in order to resist challenges external and physical conditions and are considered as a protective wall to protect the fetus from diseases, and also eggshells are considered a primary source of important elements such as calcium and some other essential elements, therefore, eggshells are considered as a reservoir rich in calcium, certified food type. Eggshells are very useful because they carry out a vital process by organizing the exchange of gas and water [1- 2]. Egg shells are an important source of calcium because it is considered as a nutritional supplement, as well as calcium carbonate is used as a treatment for soils which is poor in elements and also used as animal feed [3]. The minerals are inorganic substances present in proportions less than 1 to 2500 mg found in the tissues of the body and are necessary for chemical and physical activities for the continuation of life because they have an important role in the activities of the body [4-5]. The x-ray fluorescent (XRF) used to analysis and show spectrum of distinctive lines of elements on the matter without causing matter damage [6. The eject an electron from the atom and causing unstable atom forcing the upper electron to fill gab with emitting photon has energy equal differences energy between the two orbitals [7]. The laser – induced breakdown spectroscopy(LIBS) is a powerful and versatile spectral analytical technique for analyzing the important elements present in the material to be examined as it relies on spectroscopic analysis of the optical emission of the laser induced plasma which is a source of ions and electrons, in this method the laser pulse interacts with the matter to generating plasma [8-9].

Method:

The plasma temperature (Te) represents by equation (1) and the electron density(ne) represents by equation (2) of Saha-Boltzmann [10].

$$Te = \frac{(E2-E1)}{k \ln \left(\frac{I1\lambda1A2g2}{I2\lambda2A1g1}\right)} \quad (1)$$

$$ne = \frac{I1}{I2} 6.04 \times 10^{12} (T)^{\frac{3}{2}} e^{\frac{(E1-E2-Xz)}{kt}} \quad (2)$$

where

Xz= Ionization energy of matter in ev.

Tz= Line intensity for transition from upper level to lower level.

λ_2= Wavelength of transition from upper level to lower level.

g_2= Statistical weight of transition.

Te= Electron temperature.

While the plasma frequency calculated from the equation is [11]:

$$f_p = 8.98\sqrt{n_e} \text{ (Hz)} \tag{3}$$

One of the fundamental plasma parameters is this frequency that depends only on the plasma density. The plasma frequency is normally very high due to the smallness of m [4]. Deby shielding (λ_D) is the charged particles reactions to decrease the local E effect and the shielding gives the plasma its characteristic of quasineutrality. The distance λ_D (length of Debye), is defined by [12]:

$$\lambda_D = \sqrt{\frac{\varepsilon_0 k_B T_e}{n_e e^2}} = 7.43 \times 10^2 \sqrt{T_e/n_e} \tag{4}$$

As compared to the machine dimension, the length of Debye should be minimal. This first condition is defined as follows for the plasma life [13]:

λD<<< L

L is the dimension (cm) of the device and N.D. Based on the density and temperature of the electron, it describes the density of particles on the surface of Debye. This second N.D.>>>1 condition for plasma life is as follows: [14]:

$$N_D = \frac{4\pi}{3} n_e \lambda^3 D \tag{5}$$

The experimental steps is as follow:

1-The eggshells were collected for two types, local and imported, and were cleaned of the residues of materials and protein materials by using boiling water and removing the white matter.

2- The eggshells were dried after washing well in oven at temperature 30 C for 5 mints

3- The eggshells were grind by collision with milling tool to produced powder with (60μm) grain size.

4-The eggshells powder were pressed to form discs or pellet with 2cm of diameter by hydraulic press operating with (6pa) for 5 mints time.

5-These samples were send to XRF test, and LIBS test which used Nd:YAG laser.

6- The laser beam has wave length (1064nm) and energies (500,600,700) mJ to find most elements on the eggshells.

Results and Discussion:

The result shows that, the mean concentrations of most elements are measured for domestic and imported eggshells powder by using XRF and LIBS methods. Table (1) and Fig. (1, 2a, b). displays the chemical synthesis of the Domestic and Imported eggshells, which is obtained using the XRF examination technique. In this study, the plasma parameters of eggshell such as electron temperature (Te), electron density (ne), plasma frequency (fp), Debye length (λD), and Debye number (Nd) are studied using optical emission technique which serves to capture the spectrum. Different energies form is used with rang from (500-700) mJ. The temperature is calculated using the Boltzmann Plote, while the electron density is determined from Stark's Line Broadening. The spectroscopic study of the eggshell carried out in the air, and the distance of the laser from the target was 8 cm, while the distance of the optical fiber from the target was 0.5 cm. The results obtained for the electron temperature range (1.28 - 1.44) electron volts with a wavelength range between (500-700) nm.

Table (1) the mean concentration of eggshells.

No.	Elements	Symbols	Mean Concentration%	
			Domestic	**Imported**
1.	Magnesium	MgO	0.693	0.634
2.	Silicon	SiO_2	0.327	0.266
3.	Phosphor	P_2O_5	0.393	0.327
4.	Sulfur	SO_3	0.873	0.746
5.	Strontium	SrO	0.0256	0.1499
6.	Aluminum	$Al2O_3$	0.0708	0.0726
7.	Chlorine	Cl	0.1036	0.067
8.	Potassium	$K2O$	0.0702	0.046
9.	Iron	Fe_2O_3	0.00014	0.04040
10.	Sodium	Na_2O	1.301	1.158
11.	Calcium	CaO	56.71	56.223
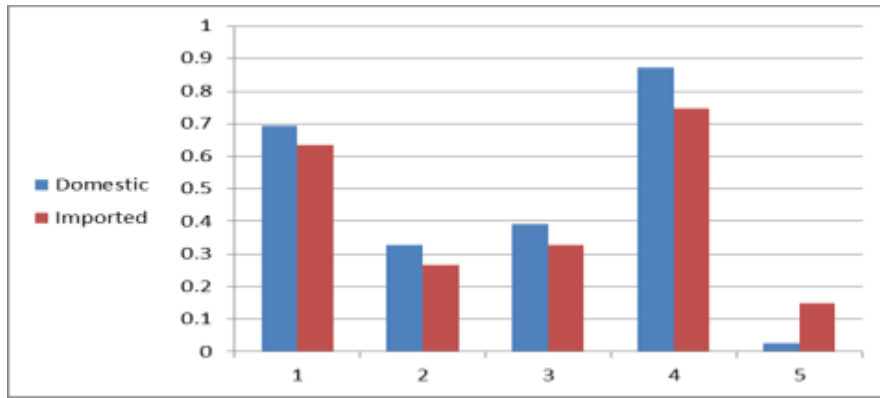
Figure (1) Mean concentration of MgO, SiO$_2$, P$_2$O5, SO$_3$, and SrO for domestic and imported eggshell powder.

(a)   (b)
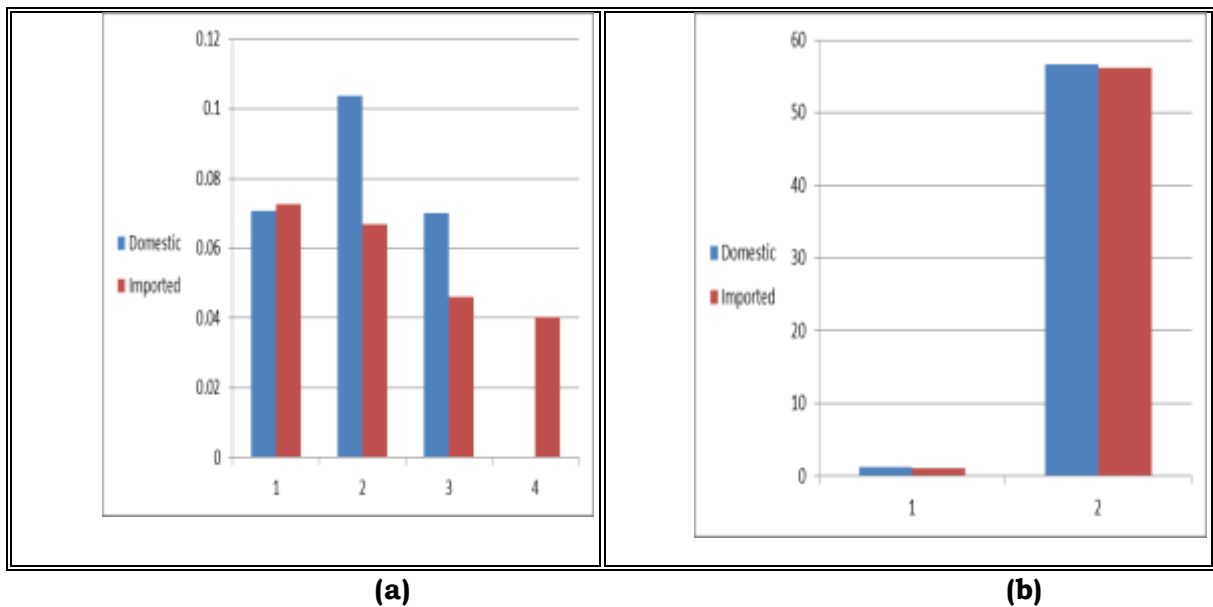
Figure (2 a, b) Mean concentration of Al2O$_3$, Cl, K$_2$O, Fe$_2$O$_3$ Na2O, and CaO

for domestic and imported eggshell powder.

The results of Laser induced plasma analysis can be show in Tables (2) and Fig. (3). The figure (3 a,b) shows the eggshell spectrum of different energies of the atoms and ions of the elements that make up the eggshell, as demonstrated by the XRF analysis, it is found that with the increase in the laser energy, the intensity of the peaks increased.
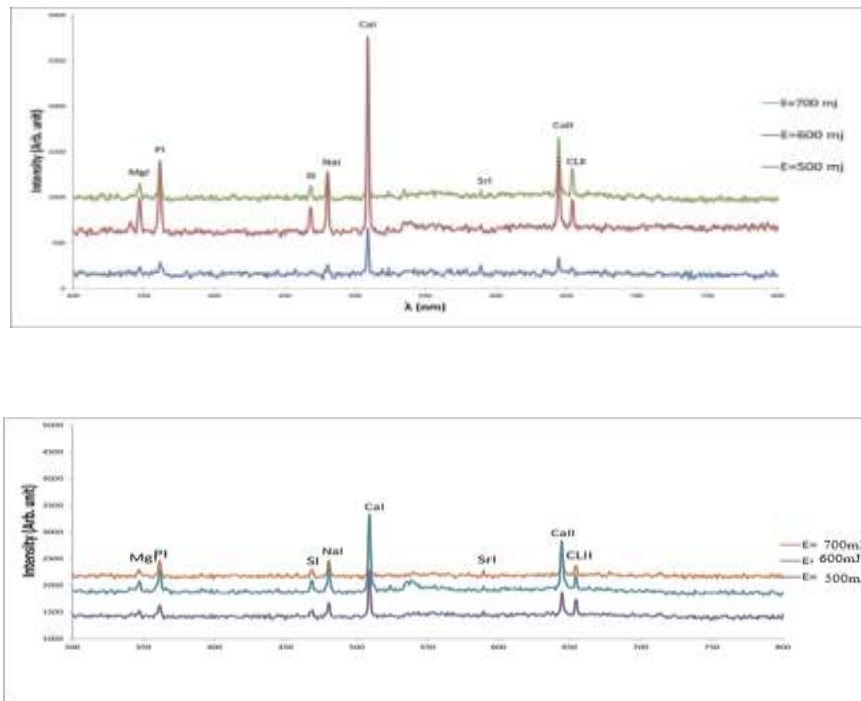
Figure (3 a, b) Optical Emissions spectra of laser induced domestic and imported eggshell powder target with different energies.

Table (2) Plasma parameters for domestic and imported eggshells target with different laser energies.

Laser Energy(mJ)	Te (eV)	ne (cm-3)	fp (Hz) *1012	λD	Nd *103
	Domestic eggshells				
700	1.447	11.750 E+16	3.078 E+12	2.607E-06	8.7E+005
600	1.447	12.000 E+16	3.078 E+12	2.607 E-06	8.7E+005
500	1.281	11.750 E+16	3.078 E+12	2.453 E-06	8.7E+005
	Imported eggshells				
700	1.447	11. 8E+16	3.1E+12	2.6E-06	8.7E+005
600	1.281	11. 8E+16	3.1E+12	2.6E-06	8.7E+005
500	0.891	11. 8E+16	3.1E+12	2.6E-06	8.7E+005
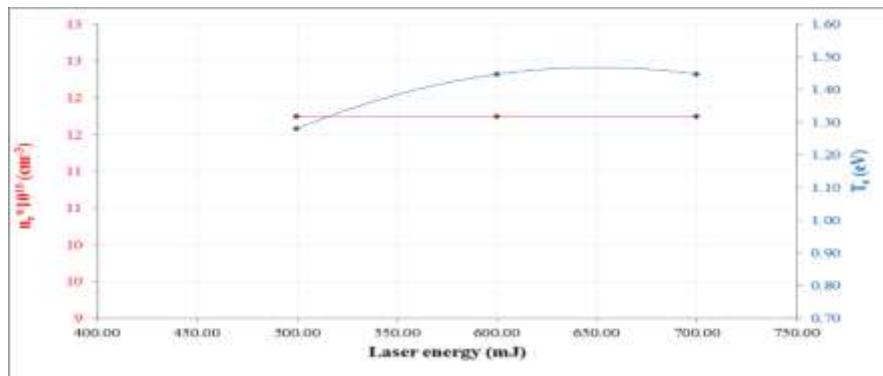
(a)
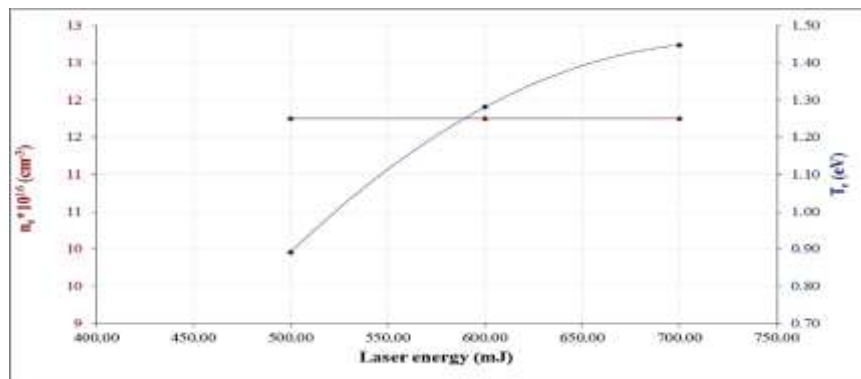
(b)

Figure (4 a, b) Variation of (T_e) and (n_e) versus the laser energy for domestic and imported eggshell powder respectively.

The results of x- ray fluorescent in above table and figures. shows that the mean concentrations of (Magnesium, Silicon, phosphor, Sulfur, Chlorine, Potassium, Sodium, and Calcium) were higher concentration in domestic eggshell than imported eggshell. The mean concentrations were recorded (0.693, 0.327, 0.393, 0.873, 0.1036, 0.0702, 1.301, 56.71) % respectively in domestic eggshell, these concentrations were recorded less values in imported eggshells were recorded (0.634, 0.266, 0.327, 0.746, 0.067, 0.046, 1.158, 56.23) % respectively. About the other elements the results show that the mean concentrations of (Strontium, Aluminum, and Iron) were less concentration in domestic eggshell than imported eggshell were recorded (0.0256, 0.0708, 0.00014) % in domestic eggshells and recorded (0.1499, 0.0726, 0.0404) % respectively in imported eggshell. The differences in elements concentrations of these two types of chicken eggs due to differ in genetics, nature, nutrition, and the nature of the ground on which these poultry feed, so there was a difference in the concentrations of elements and minerals in the eggshells, where small percentages were found in the levels of iron, strontium, and aluminum in the

domestic chicken eggshell powder(4). Strontium is one of the elements or soft minerals found in the earth's crust and is ranked 15th among the elements found on earth. It has a great resemblance to calcium from a chemical point of view, quick to react with water and air, and quick absorption, so it is found in eggshells. The result of LBES on fig. (3a, b) shows that the emission of laser induced eggshells target with spectral range (300-500) nm, the.   It is clear that the intensity of spectral lines in domestic eggshell was higher than imported eggshells.   The spectral intensities of Ca, Na, Mg, P, S, Sr and Cl ions were appeared in domestic eggshells with high peak intensities. The Si, Al, Fe elements weren't appears, due to these elements concentrations on the eggshells. The elements concentrations are effect on emission line intensity which leads to excite atoms that appear as peaks. Table (2) and Fig.(4 a, b) shows that the electron temperature (T_e) and electron density (n_e) are increased with increasing of laser energy (500 to 700) mj for domestic eggshells. In imported eggshells, the electron temperature (Te) was increased with increasing of laser energy, but the electron density (n_e) remind constant.

References:

1. Hincke MT, Nys Y, Gautron J, Rodriguez-navarro AB. The eggshell : structure , composition and mineralization. 2012;(July 2014).

2. Orłowski G, Hałupka L, Pokorny P, Klimczuk E. The pattern of distribution and interaction of metals and calcium in eggshells and egg contents in relation to the embryonic development of eggs in a small passerine bird. 2017;297–309.

3. Khan FA, Ameer K, Qaiser MA, Pasha I, Mahmood Q, Anjum FM, et al. Development and analysis of bread fortified with calcium extracted from chicken eggshells of Pakistani market. 2020;2061:1–7.

4. Al-obaidi FA. Identification of inorganic elements in egg shell of some wild birds in Baghdad. 2018;(October).

5. Schaafsma A, Doormaal JJ Van, Muskiet FAJ, Hofstede GJH, Pakan I, Veer E Van Der. Positive effects of a chicken eggshell powder-enriched vitamin – mineral supplement on femoral neck bone mineral density in healthy late post-menopausal Dutch women. 2002;25:267–75.

6. Uo M, Wada T, Sugiyama T. Applications of X-ray fluorescence analysis (XRF) to dental and medical specimens. Jpn Dent Sci Rev. 2014 Jan 1;

7. Ahmad M, Pratx G, Bazalova M, Xing LEI. X-Ray Luminescence and X-Ray Fluorescence Computed Tomography : New Molecular Imaging Modalities. IEEE Access. 2014;2:1051–61.

8. Series C. Calcium to phosphate ratio measurements in calcium phosphates using Calcium to phosphate ratio measurements in calcium phosphates using LIBS. 2018;

9. Chaudhary K, Haider Z, Ali J. Laser-Induced Plasma and its Applications. In 2016.

10. Claude LU, Lyon B. Laser-induced plasma as a function of the laser parameters and the ambient gas Xueshi Bai To cite this version : HAL Id : tel-01127499 Délivrée par. 2015.

11. M. C. Chen and E. C. Chen, Introduction To Plasma Physics And Controlled Fusion, Los Angeles, vol. 1 1983.

12. Cremers, D. A.; Radziemski, L. J. Handbook of Laser-Induced Breakdown Spectroscopy; John Wiley & Sons, Ltd: West Sussex, England, 2006.

13. Chandra S, Textbook of plasma physics, first ed., India 2010.

14. Connell D O, Cox L J, Hyland W B, McMahon S J, Rreuter S, Graham W G and Gans T, J. C, Applied Physics letters. 98, 2011, 43701.

ON THE ROUGH CONVERGENCE OF DOUBLE SEQUENCE IN CONE S-METRIC SPACES

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Abstract:

The most reason of this article is to consider the thought of r-convergence of double sequences in cone S-metric space and, this article discuss some important results about this concept.

Key words: S-Metric Space, Cone S-Metric Space, R-Convergence of Double Sequences.

Introduction:

Pringsheim [25] studied the idea of convergence of double sequences. Furthermore, the theory on the convergence of double sequences studied in [2], [3], [4], [18], [19], [22] and many authors.

It can be found more theory about the convergence of double sequences in [2], [3],[4], [5], [7], [8] and many others.

The have a look at of cone of matric space changed into began with the paper [10]. seeing that then, diverse research was obtained on cone metric areas as an instance, see [7], [8], [13] and [14] for greater details.

In 2012, a generalization of metric spaces introduced as S-metric spaces [26]. As you know there is a relationship between a metric and S-metric spaces. These relationships have been given with some counter examples [11], [12], and [20]. After that, a new generalized concept for metric space was discussed and named as a cone S- metric space by Dhamodharan and Krishnakumar [5]. In [17] Malviya and Fisher introduced N-cone metric space. Some well-known fixed-point solutions (e.g., [5], [9], and [17]) have been generalized to both cone S-metric and cone N-metric spaces.

Phu [23] presented the motif of rough convergence of finite dimensional normed spaces by single sequences, also he extended the motif for infinite dimensional normed spaces in [24].

Following establishing the concepts of an S-metric space, a cone S-metric space

and also metric spaces and cone metric spaces as being equivalent in 2018, N. TAS [27] Cone S-metric spaces are equal to N-cone metric spaces.

The notion of rough convergence of single sequences in a cone metric space introduced by A. K. Banerjee and R. Mondal [1]

***Definition 1.1:* [10]**

Let $\mathfrak{B}$ be a Banach space and let $\mathcal{O}$ be a set such that $\mathcal{O} \subseteq \mathfrak{B}$. Then $\mathcal{O}$ is said to be a cone if and only if:

c_1. $\mathcal{O}$ is nonempty, closed and nonzero.

c_2. $e_1 v + e_2 w \in \mathcal{O}$ for all $v, w \in \mathcal{O}$ and nonnegative real numbers e_1, e_2.

c_3. $\mathcal{O} \cap (-\mathcal{O}) = \{0\}$.

Assumed a cone $\mathcal{O} \subset \mathcal{B}$, we characterize a partial ordering $\preccurlyeq$ as for $\mathcal{O}$ by $v \preccurlyeq w$ if

and only if $w - v \in \mathcal{O}$. We will compose $v < w$ to demonstrate that $v \preccurlyeq w$ but

$v \neq w$, while v, w will represent $w - v \in int\mathcal{O}$, where $int\mathcal{O}$ signifies the interior of $\mathcal{O}$.

If there is an integer $\Upsilon > 0$ such that $0 \preccurlyeq v \preccurlyeq w$ implies $\|v\| \preccurlyeq \Upsilon \|w\|$ for each $v, w \in \mathcal{O}$

, the cone O is said to be normal. The normal constant is the smallest positive number that satisfies the criteria above.

The ascending sequences that are bounded from above must all converge for the cone $\mathcal{O}$ to be regarded as regular. That is, if $\{q_n\}$ is a sequence such that

$q_1 \preccurlyeq q_2 \preccurlyeq \cdots \preccurlyeq q_n \cdots \preccurlyeq w$ for some $w \in \mathcal{O}$, then $\|q_n - v\| \to 0$ as $n \to 0$ if there is

$v \in \mathcal{O}$. Every decreasing sequence that is bounded from below must be convergent in

order for the cone $\mathcal{O}$ to be proportionally regular. An interesting fact is that a normal

cone is just that-normal. Assume that $\mathcal{B}$ is a Banach space, $\mathcal{O}$ is a cone in $\mathcal{B}$ with

$int\mathcal{O} \neq 0$, and $\preccurlyeq$ is a partial ordering with respect to $\mathcal{O}$.

***Example 1.2:*[6]**

Let $\Upsilon > 1$ be given. Consider the real vector space with

$$\mathcal{B} = \{e_1 v + e_2 : e_1, e_2 \in \mathbb{R} ; v \in \left[1 - \frac{1}{\Upsilon}, 1\right]\}$$

with supremum norm and the cone $\mathcal{O} = \{e_1 v + e_2 : e_1 \geq 0, e_2 \geq 0\}$ in $\mathcal{B}$. The cone $\mathcal{O}$ is regular and hence normal.

***Theorem 1.3:*[1]**

Let $\mathcal{O}$ be a cone in $\mathcal{B}$ such that $\mathcal{B}$ is a real Banach space. If $u \in \mathcal{O}$, $v \in int\mathcal{O}$, so $u + v \in int\mathcal{O}$.

***Definition 1.4:*[10]**

Let $\mathcal{T}$ be a nonempty set. Suppose the mapping $\mathcal{M}: \mathcal{T} \times \mathcal{T} \to \mathcal{B}$ satisfies

1. $\mathcal{M}(v, w) \geq 0$, and $\mathcal{M}(v, w) = 0$ if and only if $v = w$ for all $v, w \in \mathcal{T}$,

2. $\mathcal{M}(v,w) = \mathcal{M}(w,v)$ for all $v, w \in \mathcal{T}$,

3. $\mathcal{M}(v,w) \leq \mathcal{M}(v,f) + \mathcal{M}(f,w)$ for all $v, w, f \in \mathcal{T}$

Then $(\mathcal{T}, \mathcal{M})$ is called a cone metric space simply *CMS*.

Example 1.5:[10]

Let $\mathcal{B} = \mathbb{R}^2$ and let $\mathcal{O} = \{(v,w) : v, w \geq 0\}$, $\mathcal{B} = \mathbb{R}$ and $\mathcal{M} : \mathcal{T} \times \mathcal{T} \to \mathcal{B}$ such that $\mathcal{M}(v,w) = (|v-w|, \alpha|v-w|)$ where $\alpha \geq 0$ is a fixed. Therefore $(\mathcal{T}, \mathcal{M})$ is a Cone metric space.

Definition 1.6:[21]

Let $\delta : \mathcal{T} \times \mathcal{T} \times \mathcal{T} \to [0, \infty)$ be a function satisfying the following requirements for all v, w, a, g $\in \mathcal{T}$ and g for any set $\mathcal{T} \neq \emptyset$.

1. $\delta(v,w,g) \geq 0$

2. $\delta(v,w,g) = 0$ if and only if $v = w = g$

3. $\delta(v,w,g) \leq \delta(v,v,a) + \delta(w,w,a) + \delta(g,g,a)$.

So the mapping δ is said to be an S-metric on $\mathcal{T}$ and the pair $(\delta, \mathcal{T})$ is said to be an S-metric space essentially SMS.

Example 1.7:[28]

Consider the non-empty set $\mathcal{T}$, d an ordinary metric space on $\mathcal{T}$, therefore

$$\delta(v,w,g) = d(v,g) + d(w,g)$$

is an S- metric on $\mathcal{T}$.

Definition 1.8:[5]

Suppose that $\mathcal{B}$ is a real Banach space, $\mathcal{O}$ is a cone in $\mathcal{B}$ such that $int\mathcal{O} \neq \emptyset$, and $\preccurlyeq$ is partial ordering with respect to $\mathcal{O}$. Suppose that $\mathcal{T}$ is a nonempty set, a function $C^S : \mathcal{T} \times \mathcal{T} \times \mathcal{T} \to [0, \infty)$ It is referred to as a cone S-metric on $\mathcal{T}$ if it fulfills the following characteristics"

1. $C^S(\ell, k, j) \succcurlyeq 0$

2. $C^S(\ell, k, j) = 0$ if and only if $\ell = k = j$.

3. $C^S(\ell, k, j) \preccurlyeq C^S(\ell, \ell, i) + C^S(k, k, i) + C^S(j, j, i)$.

The mapping C^S is said to be a cone S-metric on $\mathcal{T}$ and $(\mathcal{T}, C^S)$ is named cone S-metric space essentially CSMS.

Example 1.9:[5]

Assume $\mathcal{B} = \mathbb{R}^2$, $\mathcal{O} = \{(v,w): v,w \geqslant 0\}$, $\mathcal{T} = \mathbb{R}$ and $C^S: \mathcal{T} \times \mathcal{T} \times \mathcal{T} \to \mathcal{B}$ such that $C^S(v,w,g) = (d(v,g) + d(w,g), \tau(d(v,g) + d(w,g)))$, $(\tau > 0)$. Therefore is an cone S-metric on $\mathcal{T}$.

Lemma 1.10:[5]

Assume $(\mathcal{T}, C^S)$ is an cone S-metric space. Then $C^S(\ell, \ell, \jmath) = C^S(\hbar, \hbar, \jmath)$.

A relationship between a cone metric and a cone S-metric is shown in the next two lemmas.

Lemma 1.11:[5]

If $(\mathcal{T}, \mathcal{M})$ is a cone metric space. Then the next properties are fulfilled:

1. $C^S(v,w,g) = d(v,g) + d(w,g)$ for all $v,w,g \in \mathcal{T}$ is an cone S-metric on $\mathcal{T}$.

2. $(\mathcal{T}, \mathcal{M})$ is complete if and only if $(\mathcal{T}, C^S)$ is complete.

Lemma 1.12

Let $(\mathcal{T}, \mathcal{M})$ be a cone metric space. Then

1. $q_{jk} \to \xi$ in $(\mathcal{T}, \mathcal{M})$ if and only if $q_{jk} \to \xi$ in $(\mathcal{T}, C^S)$

2. $\{q_{jk}\}$ is Cauchy in $(\mathcal{T}, \mathcal{M})$ if and only if $\{q_{jk}\}$ is Cauchy in $(\mathcal{T}, C^S)$

Definition 1.13

If $(\mathcal{T}, C^S)$ is cone S-metric space .

a. A double sequence $\{q_{jk}\}$ in $\mathcal{T}$ converges to ξ if and only if $C^S(q_{jk}, q_{jk}, \xi) \to 0$ as

$j,k \to \infty$. That is, $\exists n_0 \in N$ such that for every $j,k \geqslant n_0$, $C^S(q_{jk}, q_{jk}, \xi) \ll z$ for each $z \in \mathcal{B}$, $0 \ll z$. We denote this by $\lim\limits_{j,k \to \infty} q_{jk} = \xi$ or $\lim\limits_{n \to \infty} C^S(q_{jk}, q_{jk}, \xi) = 0$.

b. A double sequence $\{q_{jk}\}$ in $\mathcal{T}$ is called a Cauchy sequence if $C^S(q_{jk}, q_{jk}, q_{ih}) \to 0$ as

$j,k,i,h \to \infty$. That is, there exists $n_0 \in N$ such that for all $j,k,i,h \geqslant n_0$,

$C^S(q_{jk}, q_{jk}, q_{ih}) \ll z$ for each $z \in \mathcal{B}$, $0 \ll z$

c. Every Cauchy double sequence is Convergent in cone S-metric space $(\mathcal{T}, C^S)$ is called complete

2. The Chief Consequences

Definition 2.1

Assume $\{q_{jk}\}_{j,k \in \mathcal{N}}$ is a double sequence of a cone S-metric space $(\mathcal{T}, C^S)$ and r is a positive real number. Therefore $\{q_{jk}\}_{j,k \in \mathcal{N}}$ is said to be r-convergent to $\xi \in \mathcal{T}$, denoted by $q_{jk} \xrightarrow{r} \xi$, if for any $\varepsilon > 0$ there exists $N \in \mathfrak{N}$ such that for all $j, k \geq N \in \mathfrak{N}$ we have

$$C^S(q_{jk}, q_{jk}, \xi) < r + \varepsilon$$

In this case ξ is called an r-limit point of q_{jk}.

Definition 2.2

A double sequence $q = \{q_{jk}\}_{j,k \in \mathcal{N}}$ in $\mathcal{T}$ is called bounded if there is a non-negative real number H with $C^S(q_{jk}q_{jk}, q_{ih}) < H$ for all $j, k, i, h \in \mathcal{N}$.

Definition 2.3

A double sequence $q = \{q_{jk}\}_{j,k \in \mathcal{N}}$ is called rough Cauchy sequence with roughness degree r if for any $\epsilon > 0$ there exists $N \in \mathfrak{N}$ such that $C^S(q_{jk}, q_{jk}, q_{ih}) < r + \varepsilon$ for all $j, k, i, h \geq N$.

We call a rough Cauchy sequence $q = \{q_{jk}\}_{j,k \in \mathcal{N}}$ of roughness degree r in short r-Cauchy sequence.

Theorem 2.4

If a double sequence $\{q_{jk}\}$ in $(\mathcal{T}, C^S)$ is bounded, then $LIM^r q_{jk} \neq \emptyset$ for $(0 <<)r \in \mathcal{B}$.

Proof.

Let $\{q_{jk}\}$ be bounded, then there exists a $(0 <<)p$. So that $C^S(q_{jk}, q_{jk}, q_{ih}) << p$ for all $j, k, i, h \in \mathcal{N}$.

Hence $p - C^S(q_{jk}, q_{jk}, q_{ih}) \in int\mathcal{O}$ for all $j, k, i, h \in \mathcal{N}$. subsequently by Theorem 1.3 $\forall (0 <<)\varepsilon \in \mathcal{B}$. we obtain

$[p - C^S(q_{jk}, q_{jk}, q_{ih})] + \varepsilon \in int\mathcal{O}$

for all $j, k, i, h \in \mathcal{N}$. Hence

$C^S(q_{jk}, q_{jk}, q_{ih}) << p + \varepsilon$

for all $j, k, i, h \in \mathcal{N}$. So for any $, t \in \mathcal{N}, C^S(q_{jk}, q_{jk}, q_{st}) << p + \varepsilon\ \forall j, k \in \mathcal{N}$. Thus $\{q_{jk}\}$ is p-convergent to $q_{ih}\ \forall s, t \in \mathcal{N}$. So $LIM^P q_{jk} \neq \emptyset$.

Theorem 2.5

If $(\mathcal{T}, C^S)$ is cone S-metric space, then every r-convergent double sequence is bounded.

Proof.

Suppose that $\{q_{jk}\}$ is r-convergent double sequence and r-convergent to ξ in $(\mathcal{T}, C^S)$. Thus $\forall (0 <<) \varepsilon \in \mathcal{B}, \exists u \in \mathfrak{N}$ such that

$C^S(q_{jk}, q_{jk}, \xi) << r + \varepsilon$ for all $j, k \geq u \rightarrow (*)$.

Let $E = \sum\limits_{j=1}^{k} \sum\limits_{k=1}^{k} C^S(q_{jk}, q_{jk}, \xi)$. Clearly $0 \leq E$ and using Theorem 1.3, we have $0 << E + \varepsilon$. For $j, k < u$, we have $E - C^S(q_{jk}, q_{jk}, \xi) \in \mathcal{O}$. Again since $0 << r + \varepsilon$, we have

$[E - C^S(q_{jk}, q_{jk}, \xi)] + (r + \varepsilon) \in int\mathcal{O}$,

that is, $(E + r + \varepsilon) - C^S(q_{jk}, q_{jk}, \xi) \in int\mathcal{O}$.

Hence

$$C^S(q_{jk}, q_{jk}, \xi) << (E + r + \varepsilon) \text{ for all } j, k < u \qquad \dots (1)$$

We have by $(*)$

$(r + \varepsilon) - C^S(q_{jk}, q_{jk}, \xi) \in int\mathcal{O}$ for all $j, k \geq u$

and also $E \in \mathcal{O}$. Hence

$E + [(r + \varepsilon) - C^S(q_{jk}, q_{jk}, \xi)] \in int\mathcal{O}$ for all $j, k \geq u$.

Therefore

$$C^S(q_{jk}, q_{jk}, \xi) << E + (r + \varepsilon) \text{ for all } j, k \geq u \qquad \dots (2)$$

Hence, from (1) and (2) we can write

$C^S(q_{jk}, q_{jk}, \xi) << E + (r + \varepsilon)$ for all $j, k \in \mathfrak{N}$.

Now for $,k,i,h \in \mathfrak{N}$, we have

$$C^S\left(q_{jk}, q_{jk}, q_{ih}\right) \leq C^S\left(q_{jk}, q_{jk}, \xi\right) + C^S\left(q_{ih}, q_{ih}, \xi\right) + C^S\left(q_{jk}, q_{jk}, \xi\right)$$

$$= 2C^S\left(q_{jk}, q_{jk}, \xi\right) + C^S\left(q_{jk}, q_{jk}, \xi\right),$$

that is,

$$2C^S\left(q_{jk}, q_{jk}, \xi\right) + C^S\left(q_{ih}, q_{ih}, \xi\right)] - C^S\left(q_{jk}, q_{jk}, q_{ih}\right) \in \mathcal{O} \qquad \ldots (3)$$

Also

$$(E + r + \varepsilon) - 2C^S\left(q_{jk}, q_{jk}, \xi\right) \in int\mathcal{O} \ , \ (E + r + \varepsilon) - C^S\left(q_{ih}, q_{ih}, \xi\right) \in int\mathcal{O}$$

and hence,

$$2(E + r + \varepsilon) - \left[2C^S\left(q_{jk}, q_{jk}, \xi\right) + d(q_{ih}, q_{ih}, \xi)\right] \in int\mathcal{O} \qquad \ldots (4)$$

From (3) and (4) we have

$$2(E + r + \varepsilon) - C^S\left(q_{jk}, q_{jk}, q_{ih}\right) \in int\mathcal{O}$$

and so $C^S\left(q_{jk}, q_{jk}, q_{ih}\right) << 2(E + r + \varepsilon)$. Then $\{q_{jk}\}$ is bounded.

Theorem 2.6

Assume that $\{q_{jk}\}$, $\{w_{jk}\}$ are two double sequences in $(\mathcal{T}, C^S)$ and $\{w_{jk}\}$ converges to $w \in \mathcal{T}$. If $\exists (0 <<) r \in \mathcal{B}$ that $C^S(q_{jk}, q_{jk}, w_{jk}) \leq r \ \ \forall j, k \in \mathfrak{N}$. So $\{q_{jk}\}$ is r-converges to w.

Proof.

Assume $(0 <<)\varepsilon$ and $\{w_{jk}\}$ is convergent to y, then $\exists m \in \mathfrak{N}$ such that

$$C^S(w_{jk}, w_{jk}, w) << \varepsilon \text{ for each } j, k \geq m$$

and hence $\varepsilon - C^S(w_{jk}, w_{jk}, w) \in intP\mathcal{O}$ for each $j, k \geq m$.

Also $\forall j, k \geq m$, we have

$$C^S(q_{jk}, q_{jk}, w_{jk}) \leq r, \text{ so } r - C^S(q_{jk}, q_{jk}, w_{jk}) \in \mathcal{O} \text{ for all } j, k \geq m.$$

Therefore by Theorem 1.3

$$(r + \varepsilon) - \left[C^S\left(q_{jk}, q_{jk}, w_{jk}\right) + C^S(w_{jk}, w_{jk}, w)\right] \in int\mathcal{O} \text{ for all } j, k \geq m.$$

Again since

$$C^S(q_{jk}, q_{jk}, w) \leq 2C^S(q_{jk}, q_{jk}, w_{jk}) + C^S(w_{jk}, w_{jk}, w) \quad \text{for} \quad \text{each} \quad j, k \in \mathfrak{N} \quad ,$$

$$\left[2C^S\left(q_{jk}, q_{jk}, w_{jk}\right) + C^S\left(w_{jk}, w_{jk}, w\right)\right] - C^S(q_{jk}, q_{jk}, w) \in P \text{ for each } j, k \in \mathfrak{N} .$$

Consequently for each $j, k \geq m$, we obtain

$$
\begin{aligned}
\Big[(r+\varepsilon) &- \big(C^S(q_{jk}, q_{jk}, w_{jk}) + C^S(w_{jk}, w_{jk}, w)\big)\Big] \\
&+ \Big[2\big(C^S(q_{jk}, q_{jk}, w_{jk}) + (w, w, w_{jk})\big) - C^S(q_{jk}, q_{jk}, w)\Big] \\
&\leq (r+\varepsilon) - 2C^S(q_{jk}, q_{jk}, w_{jk}) - C^S(w_{jk}, w_{jk}, w) + 2C^S(q_{jk}, q_{jk}, w_{jk}) \\
&+ C^S(w_{jk}, w_{jk}, w) - C^S(q_{jk}, q_{jk}, w) = (r+\varepsilon) - C^S(q_{jk}, q_{jk}, w) \\
&\in int\mathcal{O}
\end{aligned}
$$

for all $j, k \geq m$. Therefore $C^S(q_{jk}, q_{jk}, w) << r + \varepsilon$ for all $j, k \geq m$ and hence $\{q_{jk}\}$ r-converges to w.

Theorem 2.7

Let $\{q_{jk}\}$ be a double sequence in $(\mathcal{T}, C^S)$. Then there does not exists elements f, g in $LIM^r q_{jk}$ such that $C^S(f, f, g) > ar$, where $a > 2$.

Proof.

If possible let there exists elements $f, g \in LIM^r q_{jk}$ such that $C^S(f, f, g) > ar$ and $a > 2$.

Let $(0 <<)\varepsilon$ be arbitrary. Since $f, g \in LIM^r q_{jk}$, there exists a $i, n \in \mathfrak{N}$ such that

$$
C^S(q_{in}, q_{in}, f) << r + \frac{\varepsilon}{2},
$$

that is

$$
\left(r + \frac{\varepsilon}{2}\right) - C^S(q_{in}, q_{in}, f) \in int\mathcal{O} \qquad \qquad \text{... (1)}
$$

and $C^S(q_{in}, q_{in}, g) << r + \frac{\varepsilon}{2}$, that is

$$
\left(r + \frac{\varepsilon}{2}\right) - C^S(q_{in}, q_{in}, g) \in int\mathcal{O} \qquad \qquad \text{... (2)}
$$

Hence from (2) and (1) we can write

$$
(2r + \varepsilon) - [C^S(q_{in}, q_{in}, f) + C^S(q_{in}, q_{in}, g)] \in int\mathcal{O} \qquad \qquad \text{... (3)}
$$

Now $C^S(f, f, g) \leq C^S(q_{in}, q_{in}, f) + C^S(q_{in}, q_{in}, g)$, hence

$$
[C^S(q_{in}, q_{in}, f) + C^S(q_{in}, q_{in}, g)] - C^S(f, f, g) \in int\mathcal{O} \qquad \qquad \text{... (4)}
$$

So from (3) and (4),

$$
(2r + \varepsilon) - C^S(f, f, g) \in int\mathcal{O} \qquad \qquad \text{... (5)}
$$

Again

$$
C^S(f, f, g) - ar \in \mathcal{O} \qquad \qquad \text{... (6)}
$$

Hence from (5) and (6), we can write $(2r + \varepsilon) - ar \in int\mathcal{O}$. That is

$\varepsilon - r(a - 2) \in int\mathcal{O}$, which is valid for some $0 << \varepsilon$. Therefore, putting

$\varepsilon = r(a - 2)$, we obtain $0 \in int\mathcal{O}$. which is a contradiction.

Theorem 2.8

Suppose that $\{q_{jk}\}$ is r_1-convergent to ξ in $(\mathcal{T}, C^S)$. Thus $\{q_{jk}\}$ is r_2-convergent to ξ in $(\mathcal{T}, C^S)$ for $r_1 < r_2$.

Proof

It is clear.

Corollary 2.9

Suppose that $\{q_{jk}\}$ is r_1-convergent to ξ in $(\mathcal{T}, C^S)$ such that $r_1 < r_2$ for $0 << r_2$. Then $LIM^{r_1}q_{jk} \subset LIM^{r_2}q_{jk}$.

Definition 2.10

Assume $\{q_{jk}\}$ is a double sequence in a cone S-metric space $(\mathcal{T}, C^S)$, a point $b \in \mathcal{T}$ is called a cluster point of $\{q_{jk}\}$ if for each $(0 <<)\varepsilon \in \mathcal{B}$, $n \in \mathfrak{N}$ and $\exists n_1, n_2 \in \mathfrak{N}$ such that $n_1, n_2 > n$ with $C^S(q_{n_1 n_2}, q_{n_1 n_2}, b) << \varepsilon$.

Definition 2.11:[27]

The set $B(p, r)$ open ball centered at p with radius r is defined

$B(p, r) = \{x \in \mathcal{T} : C^S(x, x, b) \ll r\}$.

such that $0 << r$ and a fixed $p \in \mathcal{T}$.

Theorem 2.12

Suppose that $(\mathcal{T}, C^S)$ is a cone S-metric space, $c' \in \mathcal{T}$ and $0 << r$ such that for any $x \in \mathcal{T}$, moreover $C^S(x, x, d) \leq r$ or $r << C^S(x, x, d)$. If c' is a cluster point of a double sequence $\{x_{nm}\}$, thus

$LIM^r q_{jk} \subset B(d, r)$.

Proof.

Let $b \in LIM^r q_{jk}$ but $b \notin B(d, r)$. So $r << C^S(b, b, d)$. Let $\varepsilon' = C^S(b, b, d) - r \in intP\mathcal{O}$ and so $C^S(b, b, d) = r + \varepsilon'$, such that $0 << \varepsilon'$ and $\varepsilon = \frac{\varepsilon'}{2}$ and therefore we can inscribe $C^S(b, b, d) = r + 2\varepsilon$. Then $B(b, r + \varepsilon) \cap B(d, \varepsilon) = \emptyset$.

Otherwise if $a \in B(b, r + \varepsilon) \cap B(d, \varepsilon)$, then $C^S(a, a, b) << r + \varepsilon$ and $C^S(a, a, d) << \varepsilon$ and hence $(r + \varepsilon) - C^S(a, a, b) \in int\mathcal{O}$ and $\varepsilon - C^S(b, b, d) \in int\mathcal{O}$. So we have

$$(r + 2\varepsilon) - [C^S(a, a, b) + C^S(a, a, d)] \in int\mathcal{O} \qquad ... (1)$$

Again $C^S(b, b, d) \le C^S(b, b, a) + C^S(a, a, d)$, that is

$$[C^S(b, b, a) + C^S(a, a, d)] - C^S(b, b, d) \in \mathcal{O} \qquad ... (2)$$

Hence from (1) and (2) we can write $(r + 2\varepsilon) - C^S(b, b, d) = 0 \in int\mathcal{O}$, which is a contradiction with $0 \notin int\mathcal{O}$. Therefore $B(b, r + \varepsilon) \cap B(d, \varepsilon) = \emptyset$. But $b \in LIM^r q_{jk}$, for $0 << \varepsilon$, $\exists m \in \mathfrak{N}$ so that $C^S(q_{jk}, q_{jk}, b) << r + r + \varepsilon$ for all $j, k \ge m$. Also, but c is a cluster point of $\{q_{jk}\}$, for any $0 << \varepsilon$ and $m \in \mathfrak{N}$, there exists a $m_1, m_2 \in \mathfrak{N}$, with $m_1, m_2 > m$ such that $C^S(q_{m_1 m_2}, q_{m_1 m_2}, d) << \varepsilon$. So, $q_{m_1 m_2} \in B(d, \varepsilon)$.

Also, $C^S(q_{m_1 m_2}, q_{m_1 m_2}, b) << r + \varepsilon$. So $q_{m_1 m_2} \in B(b, r + \epsilon)$. Thus $q_{m_1 m_2} \in B(d, \varepsilon) B \cap B(b, r + \varepsilon)$. Which is a contradiction . Hence $b \in B(d, r)$.

References

[1] A. K. Banerjee , R. Mondal , *Rough Convergence of sequences in a Cone Metric Space*, arXiv:1805.10257v1 [math.MG] , 2018.

[2] P. Das, P. Malik: *On the statistical and I-variation of double sequences*, Real Analysis Exchange 33(351-364),2007.

[3] P. Das, P. Malik: *On extremal I-limit points of double sequences*, Tatra Mt. Math. Publ. 40(91-102),2008.

[4] P. Das, P. Kostyrko, W. Wilczynski, P. Malik: *I and I-convergence of double sequences*, Math. Slovaca 58(605-620),2008.

[5] D. Dhamodharan and R. Krishnakumar, Cone S-metric space and fixed point theorems of contractive mappings, Annals of Pure and Applied Mathematics 14 (237-243), no. 2, 2017.

[6] D. Dhamodharan and R. Krishnakumar, Fixed point theorems in normal Cone metric space, Internatiaonal J. of Math. Sci. Engg. Appls., 10(III)(213-224), 2016.

[7] W. S. Du, A note on cone metric fixed point theory and its equivalence, Nonlinear Anal. 72 (2259-2261), 2010.

[8] Z. Ercan, On the end of the cone metric spaces, Topology Appl. 166 (10-14), 2014.

[9] J. Fernandez, G. Modi and N. Malviya, Some fixed point theorems for contractive maps in N-cone metric spaces, Math. Sci. 9 (33-38), 2015.

[10] H. L. Guang and Z. Xian, Cone metric spaces and fixed point theorems of contractive mappings, J. Math. Anal. Appl. 332 (1468-1476),2007.

[11] A. Gupta, Cyclic contraction on S-metric space, Int. J. Anal. Appl. 3 (119-130), no.2, 2013.

[12] N. T. Hieu, N. T. Ly and N. V. Dung, A generalization of Ciric quasi-contractions for maps on S-metric spaces, Thai J. Math. 13 (369-380), no. 2, 2015.

[13] Z. Kadelburg, S. Radenovic and V. Rakocevic, A note on the equivalence of some metric and cone metric fixed point results, Appl. Math. Lett. 24 (370-374), 2011.

[14] M. Khani and M. Pourmahdian, On the metrizability of cone metric spaces, Topology Appl. 158 (190-193), 2011.

[15] P. Malik, and M. Maity, M. On rough convergence of double sequence in normed linear spaces, Bull. Allah. Math. Soc. 28(1), (89-99), 2013.

[16] P. Malik, and M. Maity, On rough statistical convergence of double sequences in normed linear spaces, Afr. Mat. 27, (141-148), 2016.

[17] N. Malviya and B. Fisher, N-cone metric space and fixed points of asymptotically regular maps, Filomat (in press).

[18] F. Moricz: *Tauberian theorems for Cesaro summable double sequence*, Studia Math. 110(83-96),1994.

[19] Murasaleen, O.H.H. Edely: *Statistical convergence of double sequence*, J. Math. Anal. Appl. 288(223-231), 2003.

[20] N. Y. Ozgur and N. Tas, Some new contractive mappings on S-metric spaces and their relationships with the mapping (S25), Math. Sci. (Springer),11, no.1,(7-16),2017.

[21] N. Y. Ozgur and N. Tas, Some fixed point theorems on S-metric spaces, mat.Vesnik,69(1)(39-52), 2017.

[22] R.F. Patterson: *Double sequence core theorems*, Int. J. Math. & Math. Sci. 22(4), 1999.

[23] H. X. Phu, Rough convergence in normed linear spaces, Numer. Funct. Anal. And Optimiz, 22: (199-222), 2001.

[24] H. X. Phu, Rough convergence in infinite dimensional normed spaces, Numer. Funct. Anal. and Optimiz, 24: (285-301), 2003.

[25] A. Pringsheim, *Zur theorie der zweifach unendlichen zahlenfolgen*, Math. Ann. 53 1900.

[26] S. Sedghi, N. Shobe and A. Aliouche, A generalization of fixed point theorems in S-metric spaces, Mat. Vesnik 64, no. 3 (258-266), 2012.

[27] N.Tas, On the Topological equivalence of S-Metric and Cone S-Metric Spaces, arXiv:1801.00024v1 [math.GN] 29 Dec, 2017.

[28] N. Tas and N. Y. Ozgur, New generalized fixed point results on sb-metric spaces, arxv: 1703.01868v2[math.gn] 17 , 2017.

STUDYING SOME PHYSICAL PROPERTIES OF NGC 34 IN THE SUBMILLIMETER AND INFRARED WAVELENGTHS

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Abstract:

Understanding the galaxy's center few hundred parsecs is important for knowing how galaxies form and evolve. Since molecular gas is the source of star formation, it is an essential part of the interstellar medium (ISM). In this work, we display high-resolution data from the Atacama Large Millimeter/Sub-millimeter Array (ALMA) of $^{12}CO(J = 6 - 5)$ emission line toward the center of the galaxy NGC 34 at the distance of 85.2 Mpc (1 arcsec = 412 pc). The center area of this galaxy has drawn in the CO emission line with a resolution of (0.27″ × 0.23″) as viewed by ALMA along with Spitzer 24 μm data. The CO and IR luminosities, molecular gas mass and density, and star formation rate (SFR) and density, have been calculated for this galaxy. The value of the molecular gas mass and the star formation rate SFR are found to equal 3.52×10^8 Mɵ and 1.72 (Mɵ/yr) respectively. The surface density values of molecular gas mass and SFR indicates that this is a starburst galaxy.

Key words: Galaxy, Star Formation, NGC 34 (NGC 17), ALMA.

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I. Introduction:

A galaxy known as a starburst galaxy is one that is experiencing tremendous star formation, often in the core region (1 kpc). These objects have strong star-formation rates (SFRs) in an area of (0.1–1 kiloparsec), above values seen in a comparable region in the Galactic core (Gusten 1989) or in normal galaxies (Heckman 2000). The chemical formation of a galaxy is significantly influenced by the star formation rate (SFR). Its value provides the total amount of gas transformed into stars over a certain time period, which may be influenced by a number of environmental factors.

As the fuel for star formation, molecular gas is a crucial component of the interstellar medium. Molecular hydrogen, or H_2, makes up the majority of the molecular gas mass in galaxies. The lowest ro-vibrational transmissions of H_2 are prohibited and have large excitation needs because they lack a permanent dipole moment ($T_{ex} \approx 500$ K, which is much more than kinematic temperatures in molecular clouds, $T_{kin} \approx 15\text{-}100$ K) (McKee & Ostriker 2007; Carilli & Walter 2013). Due to the fact that Carbon Monoxide is the second most common molecule in the universe after H_2 (Lee, Bettens, and Herbst 1996), the molecular phase is often traced using CO rotation transitions. With the advent of ALMA in recent years, it has been possible to target CO lines in the surrounding Universe with a high resolution of 50–100 parsecs (Zhao et al. 2016).

NGC 34 (commonly known as NGC 17) is a gas-rich merger that contains a powerful starburst and a faint active galactic nucleus, as shown by its optical, IR, and radio features, making it an excellent target for research. In this essay, we use a distance of 85.2 Mpc (Schweizer & Seitzer 2007). All of the characteristics we list have been adjusted for this distance. This manuscript presents ALMA observation of the CO (6-5) emission from the merging galaxy NGC 34 on angular scales (0.27 × 0.23 arcsec²). The essential goals of this manuscript are to explore the distribution of molecular gas in the galaxy NGC 34 at 500 pc resolution and to probe some physical properties of this galaxy at high spatial resolution. This essay has the following format. In Part 2, we describe the sub-millimeter and infrared data. In Part 3, we provide and discuss the findings. In Part 4, we write a summary & conclusion.

II. Sub-millimeter and Infrared Data Description

Regarding the CO(6-5) transition (ν_{rest} = 691.473 GHz), the NGC34 center area was seen with ALMA at Band 9 (λ ~ 0.4 mm) during the Early Science Cycle-0 in 2012 May (project 2011.0.00182.S, PI: C Kevin Xu). The ALMA data consist of six sets of

observations. The NGC 34 CO image's restoring beam measures $0.27'' \times 0.23''$. The distance of 85.2 Mpc and the systemic velocity of 5700 km/s was taken from (Schweizer & Seitzer 2007, Xu et al. 2014) respectively. The angular-to-linear scale is about 413 pc/$''$ at 85.2 Mpc. The data have an integration time of 2.25 hours, and a rms of 5.6 mJy/beam. The Common Astronomy Software Application was used to carry out the analysis (CASA). It is essential software for processing astronomical data from VLA and ALMA, however, it is commonly used with other radio telescopes as well.

We utilized 24 μm data from SPITZER (MIPS) to estimate the amount of star formation hidden by dust. The public archive was used to get the information (http://sha.ipac.caltech.edu/applications/Spitzer/SHA/). The MIPS band has a resolution element of $6''$ and pixels that are $2.55''$ in size.

III. Results and Discussion

We studied the spatially resolved characteristics of NGC34 at sizes 500 pc using the data presented in Section 2.

(1) CO(6 – 5) Maps

Figure 1 displays a collection of particular channel maps of our CO(6 – 5) emission line for the galaxy NGC 34 at resolution $0.27'' \times 0.23''$. We detect emissions starting at 5936.21 km/s and ending at 5462.01 km/s with 15 channels with a velocity resolution of 33.87 km/s. The channel map's root means square (rms) noise is 90.1 mJy/beam. Figure 2 shows the raster CO (6 – 5) moment zero map of the same galaxy. The central CO emission is apparent in this image and is centered at Right Ascension (R.A.)$_{(J2000)}$ = $00^h11^m06^s.537$, Declination (Dec.)$_{(J2000)}$ = -12° 06' 27".496. The total amount of flux found in the moment 0 map is 1142.47 Jy.km/s. The parameters of the observed data are listed in Table 1. The NGC34's center regions are shown to include a disk of molecular gas by the CO observations. We see emissions coming from the outer disk that encircles the nucleus.
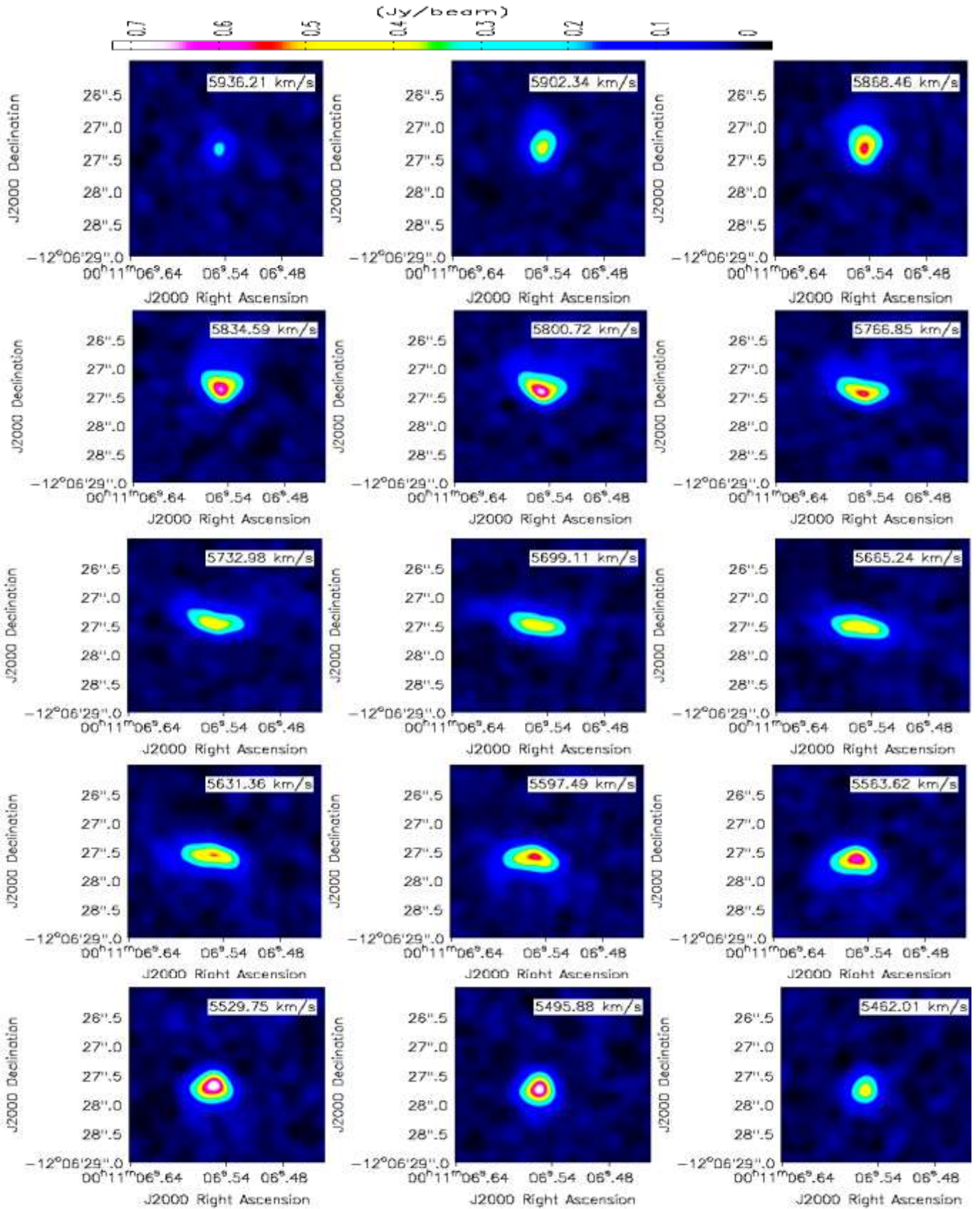
Figure (1): Velocity-channel map of the CO(6 – 5) emission in the center area of the galaxy NGC34.

Table 1: ALMA observational parameter

Sample	Value
Galaxy name	NGC 34, NGC 17, Mrk 938
Observing date	May 2012
R.A.(J$_{2000}$)	$00^h\ 11^m\ 06^s.537$
Dec.(J$_{2000}$)	$-12^o\ 06'\ 27".496$
Restoring beam	(major, minor, position angle) (0.27" , 0.23" , 46.25º)
Rest frequency	691.47 GHz
Velocity resolution	33.87 km/s
Distance	85.2 Mpc
Observation Time	2.25 Hr

(2) Molecular Gas Mass

CO traces the majority of molecular gas (Tsai et al. 2013). As a result, the molecular gas mass and surface density may be determined using the CO integrated intensity map. In this section, we calculate the molecular gas mass and density in the center region of the galaxy NGC 34. By estimating the CO flux using the CO-to-H$_2$ conversion factor, one may determine the molecular gas mass in the integrated intensity map (moment 0 map). The CO flux can be translated into the mass of the molecular hydrogen using equation (1) and (2) (Azeez et al. 201^), assuming the distance D = 85.2 Mpc:

$$\left(\frac{M_{H_2}}{M_\odot}\right) = \alpha_{CO} L'_{CO} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots(1)$$

$$L'_{CO} = 3.25 \times 10^7 S_{CO}\nabla v\ v_{obs}^{-2} D_L^2 (1+z)^{-3}\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots(2)$$

where α_{CO} is the CO-to-H$_2$ gas mass conversion factor which is equal to 0.8 M$_\odot$ (K . km / s . pc²)$^{-1}$ (Downes & Solomon 1998, Fernandez et al. 2014), L'_{CO} is the CO luminosity, $S_{CO}\nabla v$ is the flux density of ^{12}CO (J=6 - 5) in Jy. km / s, D_L is the luminosity distance in Mpc and v_{obs} is the observed frequency which is equal to 677.47 GHz, z is the redshift which is equal to 0.01962. The emission originates from an area having a diameter of 1.21 arcsec, or 500 pc on a physical scale. The CO luminosity, total molecular gas mass, and density for the central area are written in table 2.

(3) Star Formation Rate

We estimated the star formation rate SFR inside the central area of NGC34 using Spitzer archival data. First, we calculate IR luminosity at 24 μm using the following equation:

$$L_{24\,\mu m} = 4 \times \pi\, D_{Mpc}^2\, S_{24}(Jy)\ erg/s \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots(3)$$

where S_{24} is the integrated flux at 24 μm in the unit of Jy. Then, we calculated the SFRs using 24 μm luminosity in the methodology suggested by (Azeez 2022):

$$\frac{SFR}{M_\odot yr^{-1}} = \frac{v\, L_v[24\,\mu m]}{6.66 \times 10^8\, L_\odot} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots(4)$$

Where L_v is the IR luminosity at 24 μm. The values of IR luminosity, SFR and surface density in the central region are listed in table 2. We compare our results of $\Sigma M(H_2)$ and ΣSFR for this galaxy with the data in (Azeez et al. 2016) as shown in Figure 3. This figure illustrates the relationship between molecular gas surface density, $\Sigma M(H_2)$, and SFR surface density ΣSFR. The center areas of NGC 34 (black circles) have star formation rate surface densities that are significantly greater than those of normal galaxies (blue square) and comparable to those of starburst galaxies (green Triangle). This finding provides compelling evidence that a starburst is occurring in the inner 500 pc central region of the galaxy NGC 34.

Table 2: Values of Calculated Parameters

Region Area (arcsec^2)	1.2'" × 1.2'"
Region Area (pc^2)	500 pc × 500 pc
Flux Density (Jy. km/s)	906.17
L'_{CO} (K . km / s . pc^2)	4.39 × 10^8
M(H$_2$) (M$_\odot$)	3.52 × 10^8
$\Sigma M(H_2)$ (M$_\odot$/pc^2)	1406.14
L_v (erg/s)	3.46 × 10^{29}
SFR (M$_\odot$/yr)	1.72
ΣSFR (M$_\odot$/yr . kpc^2)	6.89
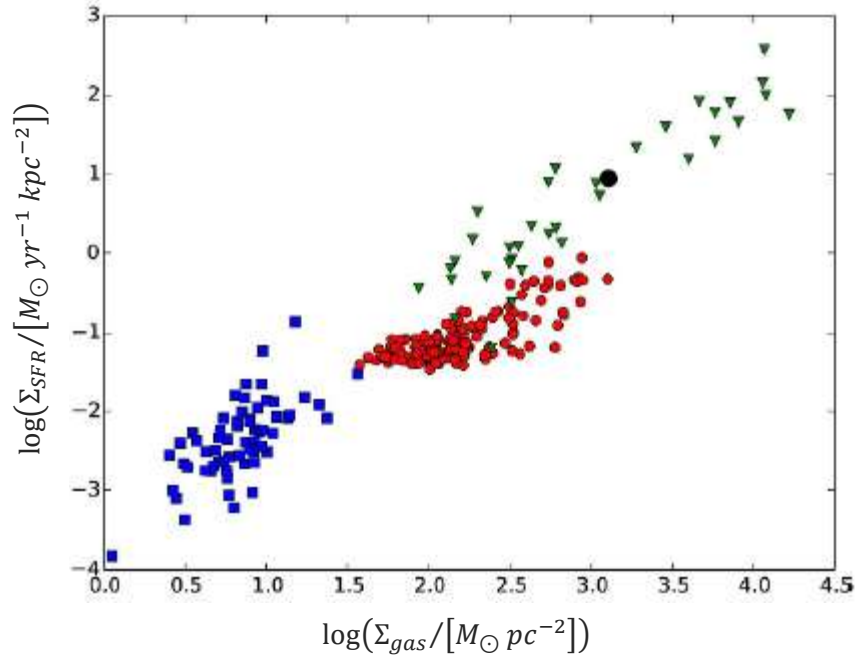
Figure (3): Relation between the molecular gas surface density and SFR surface density. These data taken from (Azeez et al. 2016)

IV. Summary and Conclusion

In this research, we investigate some of the physical characteristics of the galaxy NGC34, including molecular gas mass and surface density, star formation rate, and surface density at submillimeter and infrared wavelengths. We employed high-resolution ALMA data at the CO (6 - 5) emission line of the galaxy and IR data from the Spitzer space observatory at 24 μm. Following is a brief summary of our findings:

- According to our calculations, the CO flux is 906.17 Jy km/s, which yields a CO luminosity of 4.39×10^8 K . km / s . pc^2. To obtain the mass of molecular hydrogen in solar masses M_θ, we multiply this amount by α_{CO}. Here, we apply the common conversion factor for starbursting systems, α_{CO} = 0.8, and obtain an H_2 mass of 3.52×10^8 M_θ.

- We calculate the Infrared Luminosity at 24 μm from Spitzer Space Telescope which is equal to 3.46×10^{29} (erg/s), then we used this value to calculate the SFR and surface density in the inner 500 pc which are equal to 1.72 (M_θ/yr) and 6.89 (M_θ/yr . kpc^2) respectively.

- Lastly, we compare our results of surface densities of molecular hydrogen and SFR with the values for the normal and starburst galaxies from (Azeez et al. 2016) and we conclude that a starburst is affecting the interior region.

References:

1. Gusten, R., 1989, in IAU symp. 136, Center of the Galaxy, ed. M. Morris (Dordrecht:Kluwer), 89.

2. Heckman, T., 2000, Starburst Galaxies, Encyclopedia of Astronomy & Astrophysics.

3. McKee C. F., Ostriker E. C., (Theory of Star Formation), 2007, Annual Review of Astronomy and Astrophysics vol. 45, issue 1, pp. 565-687. https://doi.org/10.1146/annurev.astro.45.051806.110602

4. Carilli C. L., Walter F., (Cool Gas in High-Redshift Galaxies), 2013, Annual Review of Astronomy and Astrophysics, vol. 51, issue 1, pp. 105-161. https://doi:10.1146/annurev-astro-082812-140953

5. M Mingozzi, L Vallini, F Pozzi, C Vignali, A Mignano, C Gruppioni, M Talia, A Cimatti, G Cresci, M Massardi, (CO excitation in the Seyfert galaxy NGC 34: stars, shock or AGN driven?), 2018, Monthly Notices of the Royal Astronomical Society, vol. 474, Issue 3, , pp. 3640–3648, https://doi.org/10.1093/mnras/stx3011

6. Lee H.-H., Bettens R. P. A., Herbst E., (Fractional abundances of molecules in dense interstellar clouds: A compendium of recent model results), 1996, Astronomy and Astrophysics Supplement, vol. 119, pp.111-114.

7. Zhao Y. , Lu N., Xu C. K., Gao Y., Barcos-Munõz L., Díaz-Santos T., Appleton P., Charmandaris V., Armus L., van der Werf P., Evans A., Cao C., Inami H., and Murphy E., (ALMA Imaging of the co (6-5) Line Emission in NGC 7130), 2016, The Astrophysical Journal, vol. 820, p.p.118, https://doi.org/10.3847/0004-637X/820/2/118

8. Schweizer, F. & Seitzer, P., (Remnant of A "Wet" Merger: NGC 34 and its Young Massive Clusters, Young Stellar Disk, and Strong Gaseous Outflow), 2007, The Astronomical Journal, Vol. 133, pp. 2132–2155, https://doi.org/10.1086/513317

9. Xu, C. K. ; Cao, C. ; Lu, N. ; Gao, Y. search by orcid ; van der Werf, P. ; Evans, A. S. search by orcid ; Mazzarella, J. M. search by orcid ; Chu, J. ; Haan, S. ; Diaz-Santos, T. search by orcid ; Meijerink, R. ; Zhao, Y. -H. ; Appleton, P. search by orcid ; Armus, L. search by orcid ; Charmandaris, V. search by orcid ; Lord, S. ; Murphy, E. J. ; Sanders, D. B. search by orcid ; Schulz, B. ; Stierwalt, S., (ALMA Observations of Warm Molecular Gas and Cold Dust in NGC 34), 2014, The Astrophysical Journal, vol. 787, issue 1, article id. 48, https://doi:10.1088/0004-637X/787/1/48

10. Tsai, M., Hwang, C. Y., Matsushita, S., Baker, A. J. & Espada, D., (Interferometric CO(3–2) observations toward the central region of NGC 1068), 2013, The Astrophysical Journal, vol. 746, pp. 129–138. https://doi:10.1088/0004-637X/746/2/129

11. Azeez, J. H., Fadhil, S. A., Naser Alla, Z. K. & Abidin, Z. Z., (ALMA Study of the Lensed Galaxy SDP.81), 2018, Al-Nahrain Journal of Science, no. 1, pp. 69-71. https://doi:10.22401/ANJS.00.1.09

12. Downes, D., & Solomon, P. M., (Rotating Nuclear Rings and Extreme Starbursts in Ultraluminous Galaxies), 1998, The Astrophysical Journal, vol. 507, pp. 615 – 654.

13. Fernandez, X., Petric A. O., Schweizer, F., & van Gorkom, J. H., (Discovery of a Small Central Disk of CO and H I in the Merger Remnant NGC 34), 2014, The Astronomical Journal, Vol. 147, Issue 4, article id. 74. https://doi:10.1088/0004-6256/147/4/74

14. Azeez, J. H. (Dense Gas Properties in ARP 220), 2022, MINAR International Journal of Applied Sciences and Technology, Vol. 4, Issue 1, pp. 8 – 14. http://dx.doi.org/10.47832/2717-8234.10.2

15. Azeez, J. H., C-Y Hwang, Z. Z. Abidin, & Z. A. Ibrahim, (Kennicutt-Schmidt law in the central region of NGC 4321 as seen by ALMA), 2016, Scientific reports, Vol. 6, Article number: 26896, pp. 1 – 12. https://doi:10.1038/srep26896

CHARACTERIZATIONS OF PRECIPITATED ZINC PRODUCED BY DEZINCIFICATION OF BRASS WASTE IN HCL SOLUTION

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Abstract:

Dezincification is the selective corrosion of zinc in brass that leaves the copper behind and does not result in the full dissolving of the brass followed by copper redeposition. Both procedures may occur under different conditions. This work investigated the influence of concentration and applied potential on the characteristics of zinc powder (purity, apparent density, morphology, particle size distribution, and particle zeta potential) produced by the electrochemical process from waste brass. In the electrochemical process, we used hydrochloric acid HCl in three different concentrations (0.1, 0.2, and 0.3) M. The time of the electrochemical process was 30 min, and the distance between poles was 3cm for all experiments, With the pH scale of all solutions equal to 1. The voltages that were used were (1, 1.5, 2, 2.5, and 3) V. We made Fifteen experiments were conducted to obtain the best result for the highest solubility of zinc ion in an electrolyte. Atomic absorption spectrometry (AAS) analysis was used to determine the concentration of Cu++ and Zn++ ions that deposited in the electrolyte after electrodeposition, with the highest value of Zn obtained being 1500 ppm for a concentration of 0.3 M HCl in 1 V, rather than 736, 454 for 0.2 M in 2 V, and 0.1 M in 2.5 V, respectively. After knowing the most solutions that contain zinc ions by examining the AAS. We take the solutions and re-deposition them electrically using graphite electrodes for a period of 25 minutes, where the zinc is deposited on the graphite electrode in the form of silver-colored layers tilted to light gray. This precipitate is then scraped off on filter paper and weighed to determine the apparent density. In graphite cathode, the apparent density ranged from (0.89 - 0.42) gm./cm3 in 0.3M, (0.69 - 0.34) gm./cm3 in 0.2M, and (0.55 - 0.24) gm/cm3 in 0.1M. All results showed that the morphology of zinc powder analyzed by SEM was dendritic and mossy. purity of zinc produced were determined by XRF analysis for different

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concentrations, that increase with increased the concentration and applied potential from 1 to 3 V, the high value of purity of Zinc powder was %98.58 in 1V and 0.3M concentration for graphite cathode.

Key words: Dezincification, Apparent Density, Corrosion, DLS, Atomic Absorption Spectrophotometer.

1. Introduction:

Dealloying as a corrosion process has been recognized for almost a century, with dezincification being the classic example (i.e., leaving a copper-rich, mechanically weak layer, selective degradation of zinc from brass), De-alloying is most common in alloys with at least two components that have reasonably well-separated equilibrium potentials in the environment. When an alloy is polarized between these values, the less noble component is preferentially dissolved, leaving the remaining more noble component. [1,2] There has long been discussion about whether there is selective corrosion of the zinc in the brass, leaving the copper alone, or if there is full dissolving of the brass, followed by copper redeposition, Both procedures may occur under different conditions [3].

Dezincification can occur in a uniform or localized manner. Dezincification occurs uniformly in acid solutions in brasses with high zinc concentrations and locally in alkaline or neutral solutions in brasses with low zinc content. Dezincification can occur in certain areas of the brass, resulting in deep regions of spongy, brittle copper that look like red spots on the brass surface. This is referred to as "plug" dezincification. If the damaged portions penetrate deep enough into the metal to compromise mechanical integrity, plug dezincification can result in component failure. Dezincification may also attack brass surfaces more consistently, which is known as "layer" dezincification. This tends to produce shallow patches of porous copper with a characteristic uniform red color [4]. The tendency to dezincification rises directly with Zn concentration, with yellow brass, which contains 33% Zn, being among the most sensitive. Admiralty brass has a comparable composition (30% Zn) with 1% Sn added to particularly prevent dezincification. This rule extends to the alloy's microstructure, with the Zn-rich β' (Cu Zn) phase being the most susceptible to dezincification due to its high Zn concentration [5]. Dezincification is most common under mild circumstances, such as slightly acidic or alkaline solutions. However, with strong acids, both copper and zinc dissolve, and the surface is not richer in copper. As previously discussed [6,7], special precautions must be taken to avoid the dezincification of brass. In one case, the zinc corrodes preferentially and is removed from the alloy, leaving the copper behind. Both copper and zinc corrode and are removed from the alloy in the other, although copper ions in solution plate back onto the surface. In the first suggestion, the metal's surface should become porous after dezincification but otherwise remain the same. Although more complicated, the second proposal is required to explain cases where copper crystals develop on the surface following dezincification [8]. Recently, a third mechanism has

gained traction [9], In this method, the zinc dissolves from the brass, leaving behind the copper, and the copper then rearranges on the metal's surface, resulting in the formation of copper crystals. Because the copper on the surface is attracted by negative ions in the solution, this rearrangement is allowed. The attraction is not strong enough to dissolve the copper, but it does reduce the copper's binding to the surface, allowing the copper to migrate more quickly [10]. Zinc is an important basic metal used in a variety of industries [1]. Some zinc was recovered from secondary processes such as galvanizing, electric arc furnace flue dust and brass smelting, smelting, zinc dross, zinc ash, scrap recycling, casting, and automotive shredder waste. Zinc is found in secondary resources in metallic, oxide, and alloy forms. And it is associated with varying degrees of impurities depending on its source [3]. The materials may be used to recover metallic values, or they could be discarded. Dust particles have a chemical character; hence they are classified as hazardous waste. Brass is widely used in various industries due to its stability in aggressive environments, The environment in which chloride ions are present is one of these [11, 12], Also, it was proved that the dissolution of copper in chloride solutions depended largely on the concentration of chloride ions [13, 14] and corrosion processes in these environments are a major problem [15] But today, in our research, we will use this corrosion that occurs in brass to our advantage in extracting the most important minerals used in our daily lives because . In this paper, the dezincification phenomenon of Brass alloy waste has been studied in the present experiment by apparent density, dynamic light scattering, and Atomic Absorption Spectrophotometry, XRF. The aim of this paper is to examine the effect of applied potential and concentration of solutions on the dezincification of brass through the dissolution of zinc and copper.

2. Experimental Parts and procedures

The specimens of scrap material (brass waste) with dimensions of 4cm as width and 8cm as length were employed for corrosion dezincification tests. Samples were smoothed with a polishing paper composed of silicon carbide with a granular size of 150,200,500,800 microns. The specimens were rolled to a thickness of about 1 mm. Samples were washed with 96% ethanol using an ultrasound bath for 10 minutes and twice, after which the samples were washed. With distilled water use an ultrasound basin for 10 minutes once. Table (1-1) explains the chemical analysis of these specimens using the PMI-Master Pro OES spectrometer, which showed 35.4 % zinc content.

Table (1-1) the chemical analysis of brass waste

Continent	Percentages %
Cu	64
Zn	35.4
Pb	0.08
Sn	0.007
Mn	0.008
Fe	0.04
Ni	0.02
Si	0. 03
Mg	0.0021
Cr	0.01
Al	0.008
Ag	0.01
Be	0.0019
Co	0.154
Cd	0. 11
Zr	0.008
Se	0.02
Ti	0.001
Bi	0.005

2.1 Dezincification process

In this Dezincification process there is two stages: In the first stage of this process two poles were used one as cathode and the second as anode, the cathode we used stainless steel and anode is brass, the steady state of applied potential that used also are different (1,1.5, 2,2.5, and 3) V, it was expected that at these potentials dezincification occurs in which zinc leaves the brass alloy and zinc element begins to release as zinc ions. The time of zinc release is beginning after 30 min of reaching steady state potential with different rate at room temperature The device of dezincification consists from Pyrex cell   with dimensions (25, 12.5, and 6) cm. two parallel poles One is working as anode electrode and the other made from stainless steel working as cathode pole. The electrodes immersion in electrolyte solution with

distance 3 cm where through a holder bridge made from Teflon as shown in figure (1) And used power supply with variable voltage and current was attached the negative side was connected stainless steel pole, while specimen {anode pole) to the positive side by wires , When the potential was applied ,the electrochemical reaction begins between the anode (specimen) and the cathode (stainless steel) in the cell, at room temperature. The cathode was washed by the washing system   that consists of four stages, starting with washing the cathode in deionized water, then sodium tartrate, then sodium carbonate, and finally the deionized water in which contain the powder precipitated by dezincification from the anode to cathode .The deionized water containing the powder is filtered using a vacuum filter as shown in Figure (2) And drying the powder filtered on filter paper at a temperature of 45 °C, After completion of the filtration and drying process, The powder was taken for XRF analysis to determine the percentage of copper and zinc deposited on the cathode surface. In the second stage **,** After completing the XRF analysis and knowing the percentage of zinc and copper deposited on the surface of the cathode , It was found that the percentage of zinc is very low compared to copper, which means that the zinc was not deposited on the surface, but rather dissolved in the solution, according to the dezincification mechanism[16] , so we resort to the next step It is taking all the solutions in which the selective removal was done and repeating the process with a simple change in the circumstance such as using another cathode and the pH equation to obtain the dissolved zinc in the form of a powder and with high purity all the -electrolyte solutions are checked by atomic absorption AAS test as show as in table (1-2) to determine the best conditions for obtain pure zinc powder on the cathode as shown in the figure (3) by repeat the dezincification process and using graphite electrodes[17] , with scale the pH equation to a degree of 5.
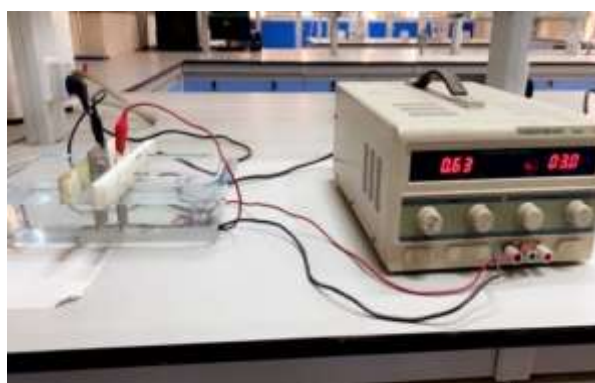
Figure 1:   shows the device used in dezincification process.
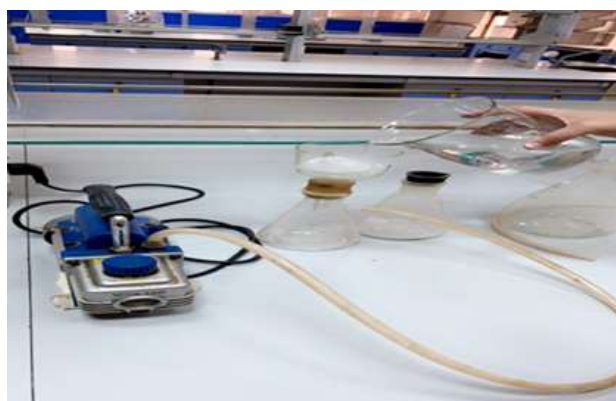
Figure 2: show the filtration system.

Table (1-2): show The values of zinc and copper for electrolytes in different concentrations

Samples, of concentration 0.1 HCl	Applied potential	Zn Results / unit of measure ppm	Cu Results / unit of measure ppm
1	1	145	93
2	1.5	181	156
3	2	409	159
4	2.5	454	125
5	3	345	278
Samples, of concentration 0.2 HCl	Applied potential	Zn Results / unit of measure ppm	Cu Results / unit of measure ppm
6	1	421	363
7	1.5	454	556
8	2	736	353
9	2.5	463	375
10	3	609	265
Samples, of concentration 0.3 HCl	Applied potential	Zn Results / unit of measure ppm	Cu Results / unit of measure ppm
11	1	1500	375
12	1.5	681	346
13	2	645	331
14	2.5	772	406
15	3	736	359

Figure 3: show the deposition of zinc on the graphite electrode

2.2 The electrolyte solution

The electrolyte solution is hydrochloric acid in different concentrations (0.1, 0.2, and 0.3) M, they are dissolved in (1000 ml) distilled water by continuous agitation with a magnetic stirrer, it was left until the temperature of the solution reached room temperature, after that, the solution was used in electrochemical dezincification cell.

2.3 Cathode washing process

The washing process is done by using deionized water, sodium tartrate, and sodium carbonate. Firstly, wash the cathode electrode with deionized water, secondly washed it by sodium tartrate to remove the remaining acid related to the cathode, washed by deionized water again to remove the remaining sodium tartrate, and after that impressed the cathode in sodium carbonate to remove the impurities, lastly washed cathode by deionized water to remove the remaining sodium carbonate.

2.4 Measurement of Apparent density

To determine the apparent density of the powder.it was poured into an empty container, whose size is known as the weight of the empty container as well as the weight, which is filled with powders, the apparent density is determined by using the equation 2.1.

$$\rho = (W_2 - W_1) / V \dots \dots \dots \dots \dots \dots \dots \quad \dots (2.1)$$

W_1= where an empty vessel weight gm.

W_2= where filled with the weight of the container gm.

V = volume of powder cm^3.

ρ = apparent density gm./cm^3.

2.5 The analysis of X-ray fluorescence

surface morphology of Zinc powders produced was noted by a scanning electron microscopy SPECTRO - model (XEPOS) – Germany types 76004814 with maximum power ~ 100 VA.

2.6 Scanning electron microscope and Energy Dispersive X-ray

to obtain images of high resolution (down to a few nm) for the morphology of the surface and very high focus depths, allowing imaging of very rough surfaces was observed by SEM model- INSPECT S-50- FEI, Model: 1450, Accelerating voltage range from (200 -30.000) V. This test was done in scanning electron microscopy(SEM) Lab in Department of Applied Sciences.

The chemical composition of a sample, identifying and quantifying elemental compositions in a very small sample of material (even a few cubic micrometers), and the analyzing composition of the surface of a specimen determined by the EDX model –BRUKER

2.7 Atomic absorption spectrometer

The quantitative of chemical elements in solution and the concentration of a particular element (the analyte) in a sample to be analyzed can be determined by the atomic absorption spectrometer AAS model (Phenix 980) / UK.AAS can be used to determine over 70 different elements in solution using the absorption of optical radiation.

3. Results and Discussion

Experiments of Zn electrodeposition are clearly shown in the Figure (4), in which several results were obtained, these results showed a change in the purity of zinc powder with voltages that used HCL solution with concentrations of (0.1, 0.2, 0.3) M in these studies five voltages were used (1, 1.5, 2,2.5, and 3) V. The apparent density

and shape of zinc powder grew as the voltages increased, the purity increased initially and then began to decrease in (2.5 and 3) V. The purity was reduced because there were impurities in the powder within the zinc powder, such as iron and oxides, and the apparent density increased due to a drop in particle volume, which resulted in the filling of the space between big particles by small particles [18].
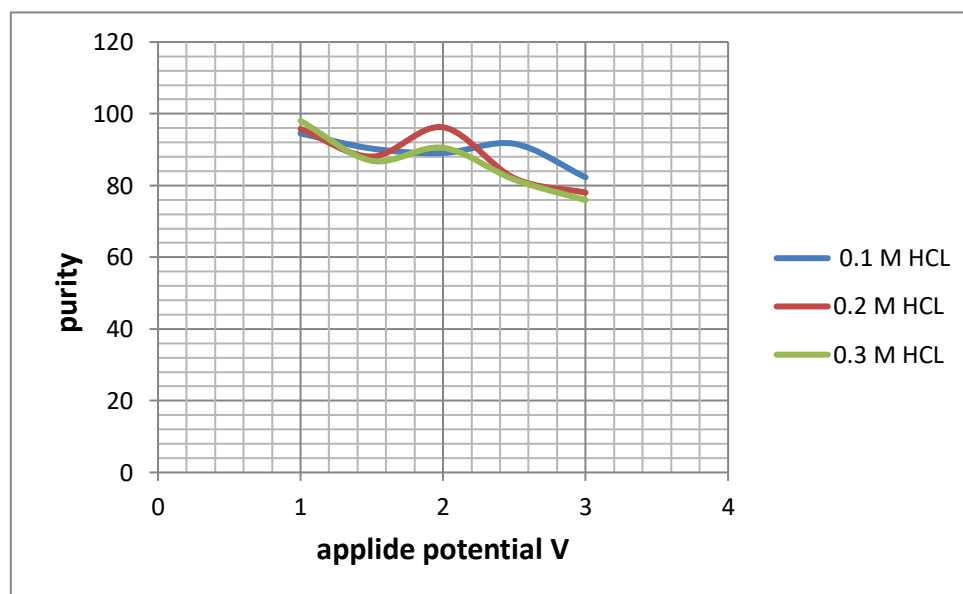
Figure 4. shows the effect of applied potential and concentration on purity

3.1 the Effect of voltages and concentrations on the purity of zinc powder

The purity of zinc powder was measured using an X-Ray fluorescence spectrometer after dezincification of brass waste in three different concentrations (0.1,0.2, 0.3) M. acidic bath of hydrochloric acid. The highest purity observed was 98.03 at 1v in 0.3M in graphite cathode, since the acid solution dissolves only zinc and trace quantities of other elements such as iron, calcium, phosphorus, sulfur, and silicon under these circumstances. The purity percentage values in different concentrations are (90.3, 88.06, and 86.89) percent for the volt (1.5) v in three concentrations (0.1, 0.2, and 0.3) M, respectively. Purities, when the potential reached 2 volts, were (89.04, 96.23, 90.52), and percent purities when the potential reached 2.5 volts were (91.63, 82.04, 81.64), while percent purities at potential 3 volts were (82.28, 78.01, 75.92). The presence of impurities would reduce the purity of the Zn compound. The effect of voltages has a different effect on purity, and in the first range of voltages there was an increase [19], but when the voltage reached 1V and 3V there was a decrease in purity because there was element reduction in these voltages with zinc powder, When the voltage was 2.5 V, some impurities such as Fe

and other elements were discovered in the XRF chart. These impurities reduced purity and may have returned to the washing process, thus we doubled the washing period. At 3 V, the impurities adhering to the cathode were gone.

3.2 Effect of voltages and concentrations changes on apparent density of zinc powder.

The apparent density increase with increasing concentrations the size of particles will decrease related to the relationship between the size of particles and apparent density that is reverse which is determined by the equation of apparent density and the figure (5) show the relationship between the apparent density and concentrations in graphite cathode, But the effect of voltages is when the voltages increased, the volume of particles will increase too that leads to decrease the apparent density because the particle size distribution increased due to the small particles trap between the large particles and to the equation of apparent density, the relationship between volume and the apparent density was reverse these effects.
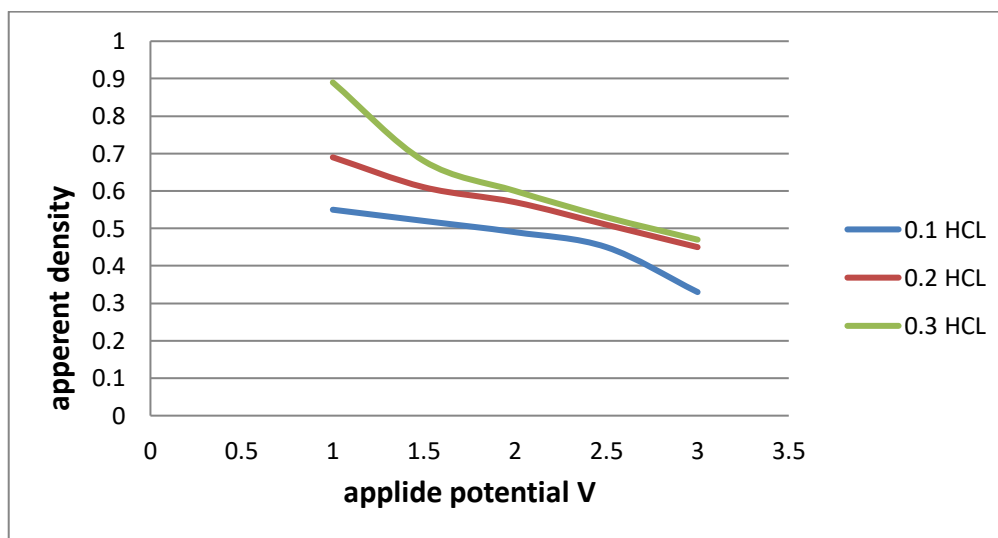
Figure 5: shows the relationship between apparent densities and different concentrations of HCL

3.3 Atomic Absorption Analysis

The concentration of Cu^{2+} and Zn^{2+} ions in hydrochloric acid solution produced by the dezincification of brass, are given in Table (1-2). It is evident from the results that both the copper and zinc are leached into the solution. The ratio of copper to zinc in the solution was found to be much smaller than in the alloy. After 25 min of exposure the concentration of Zn2+ was more than of Cu $^{2+}$. Copper is less leached

in the solution than zinc, because E^o (Cu^{2+}/Cu) for copper is positive with a value of +0.34 V against the value for zinc whose E^o (Zn^{2+}/Zn) is 0.76 and also diffusion depends on the size of the ion, and zinc (II) ion having an atomic radius of 0.074 nm diffuses faster than the copper (II) ion which has atomic radius of 0.096 nm.

3.4 morphology of zinc powder by SEM and EDX analysis

The SEM was used to see the details of zinc powders, Figure 6 shows the effect of concentration of HCL on the morphology of zinc powder in graphite cathode at 2.5 V in 0.1 M . Figure 7   shows the effect of 0.2 M concentration, at 2 V , Figure 8 shows the effect of 0.3 M concentration at 1 V , The general shape for all particles in all experiments is dendrite and flakes due to the release of hydrogen gas at the surface of the cathode, where a small part of it enters the structure of the powder layer and makes it irregular in nature, making the particles grow dendritic.33

Spectrum: Acquisition 4753

El	AN	Series	unn. C [wt.%]	norm. C [wt.%]	Atom. C [at.%]	Error (1 Sigma) [wt.%]
Zn	30	L-series	153.45	86.91	66.02	9.19
O	8	K-series	12.28	6.96	21.86	2.82
C	6	K-series	3.16	1.79	7.48	1.38
Mn	25	L-series	2.37	1.34	1.23	1.28
Co	27	L-series	1.93	1.09	0.93	0.80
Fe	26	L-series	1.71	0.97	0.87	0.96
Ni	28	L-series	1.65	0.94	0.80	0.76
		Total:	176.56	100.00	100.00	
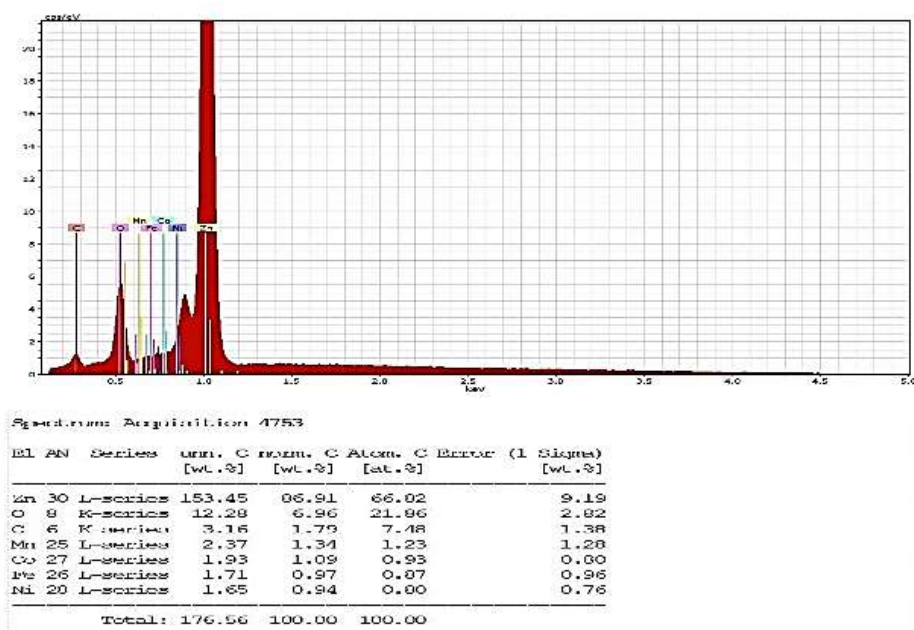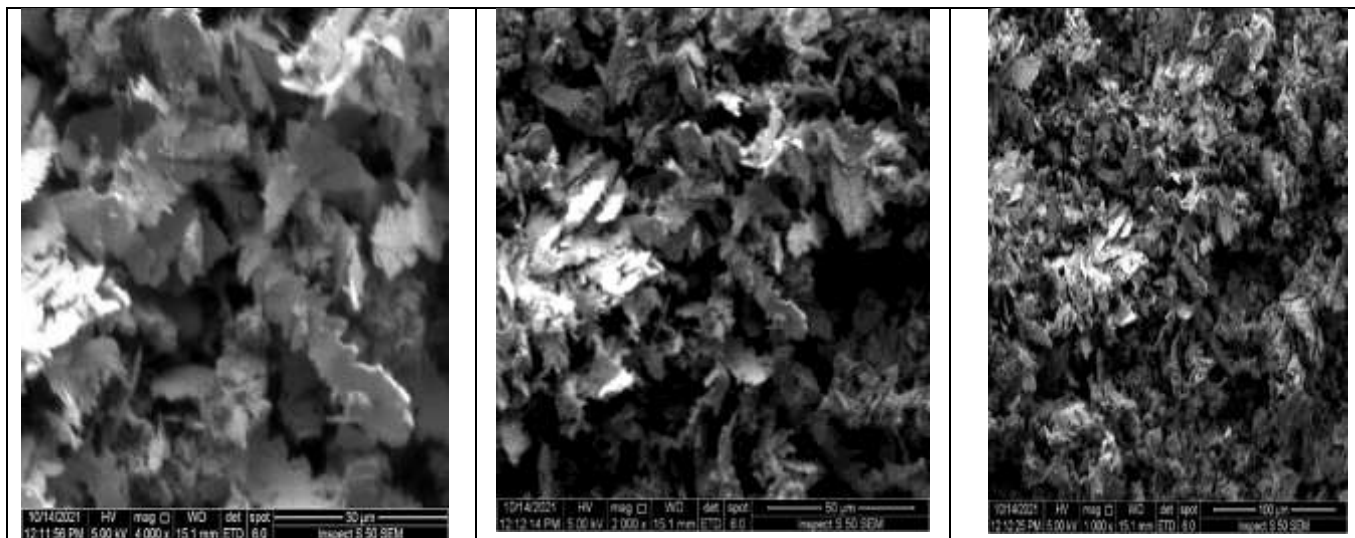
Figure 6: SEM &EDX for electrochemical process at 0.1 M HCl, 2.5 V

Spectrum: Acquisition 4751

El	AN	Series	unn. C [wt.%]	norm. C [wt.%]	Atom. C [at.%]	Error (1 Sigma) [wt.%]
Zn	30	L-series	101.17	91.68	70.50	6.19
C	6	K-series	7.39	6.70	28.03	2.16
Fe	26	L-series	1.79	1.62	1.46	1.02
Ni	28	L-series	0.01	0.01	0.00	0.06
		Total:	110.35	100.00	100.00	
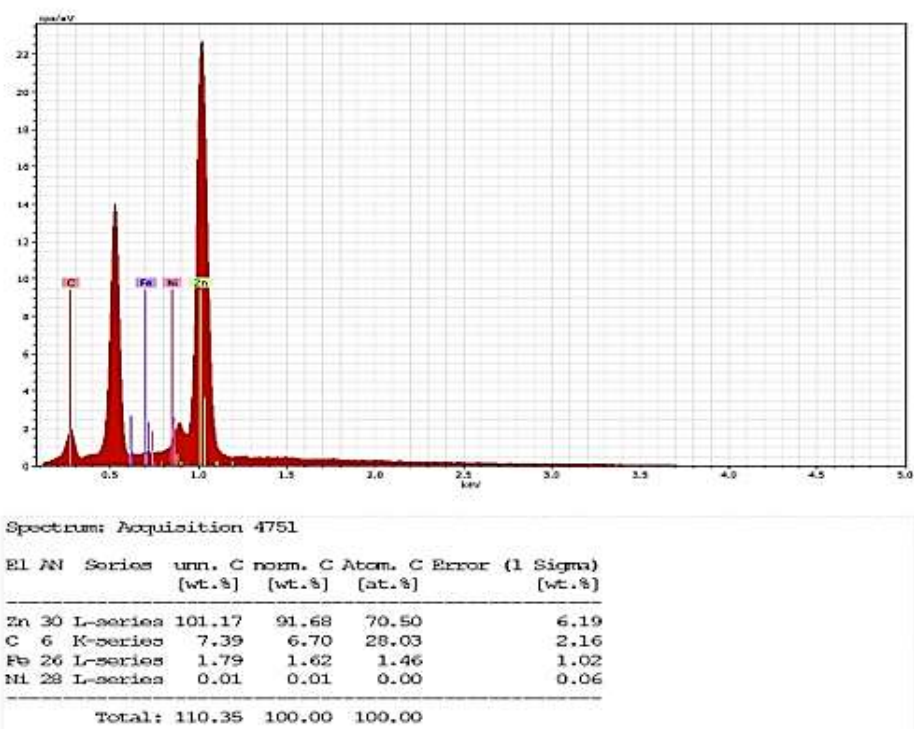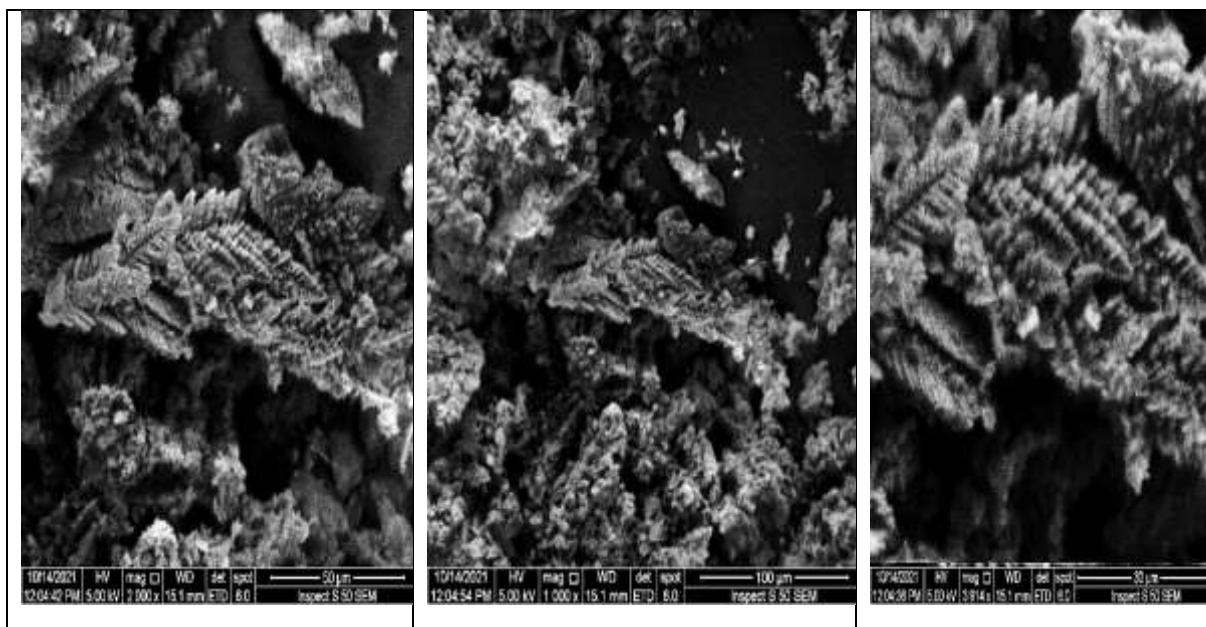
Figure7: SEM & EDX for electrochemical process at 0.1 M HCL , 2.5 V
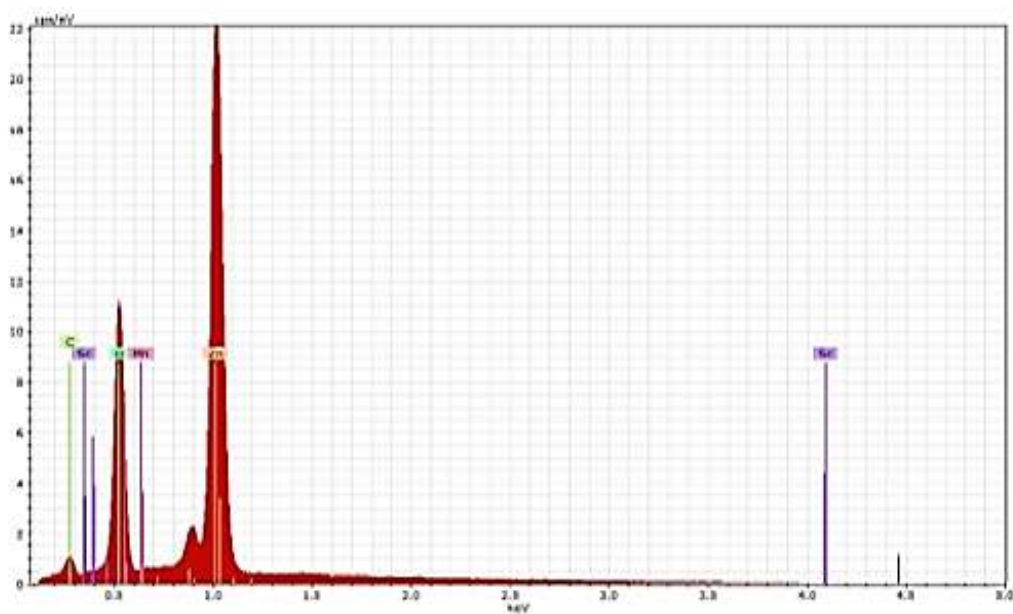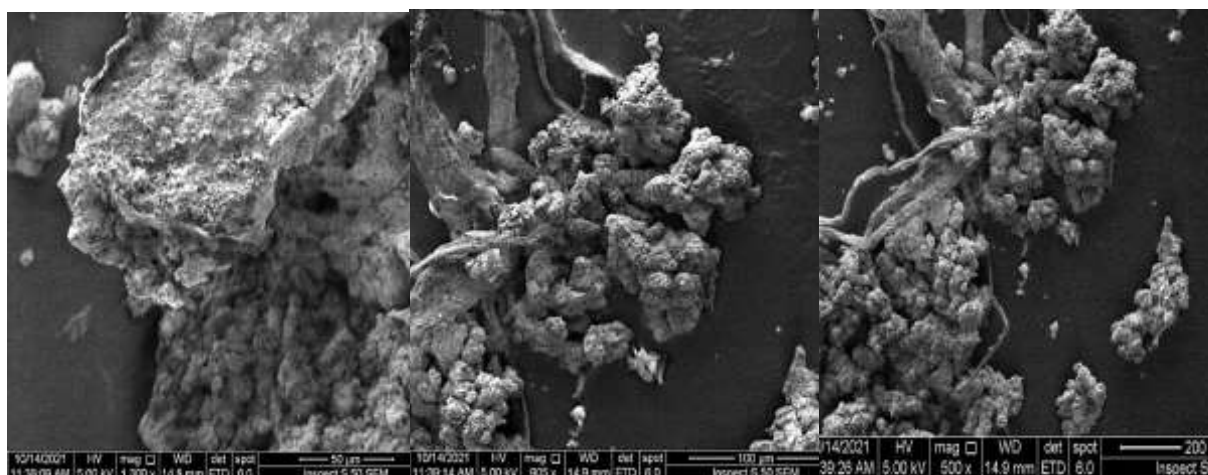
Spectrum: Acquisition 4745

El	AN	Series	unn. C [wt.%]	norm. C [wt.%]	Atom. C [at.%]	Error (1 Sigma) [wt.%]
Zn	30	L-series	89.15	63.34	32.39	5.30
O	8	K-series	36.06	25.62	53.56	5.33
So	21	L-series	6.12	4.35	3.23	2.04
Mn	25	L-series	5.05	3.59	2.18	1.56
C	6	K-series	4.36	3.10	8.63	1.22
		Total:	140.73	100.00	100.00	

Figure 8: SEM & EDX for Dezincification process at 0.3 M HCL , 1 V

Conclusions

from the results of this work, the following conclusion are obtained;

1- the purity of Zn powder increased, with increasing concentration and low applied potential

2- the apparent density of receipted Zn powder was increase, there are 0.89 and 0.42 gm./cm³ in 0.3M HCI, It ranged from 0.69 to 0.34 gm. /cm³ in 0.2M, and it ranged from 0.55 to 0.24gm. /cm³ in 0.1M respectively.

3- five different voltages used (1, 1.5, 2, 2.5, and 3) V, were utilized for each concentration (0.1,0.2,0.3) M, the purities (98.03, 96.23, and 96.23 were employed for (0.3 M ,1 V and 0.2 M, 2V and 0.1M , 2.5) respectively. the increased of voltages from 1V to 3 V was decrease the apparent density from 0.89 gm. /cm³ to 0.34gm./cm³.

4- The highest purity of Zn powder obtained from this study was 98.03 in 1V,

5- the morphology of zinc powder that is produced from the dezincification process, using cathode from graphite is dendritic for all experiments.

References:

1. S.B. Lyon, in Shreir's Corrosion , Corrosion and Degradation of Engineering Materials , 2010.

2. P. Zhou, K. Ogle, in Encyclopedia of Interfacial Chemistry, 2018

3. C.D.S. Tuck, ... J. Nuttall, in Reference Module in Materials Science and Materials Engineering, 2016

4. Yaofu Zhang , Marc A. Edwards , Chair Gregory D. Boardman Linsey C. Marr Dezincification and Brass Lead Leaching in Premise Plumbing Systems: Effects of Alloy, Physical Conditions and Water Chemistry , December 9, 2009

5. P. Zhou, K. Ogle, in Encyclopedia of Interfacial Chemistry, 2018

6. Malcolm J. Brandt BSc, FICE, FCIWEM, MIWater, ... Don D. Ratnayaka BSc, DIC, MSc, FIChemE, FCIWEM, in Twort's Water Supply (Seventh Edition), Specialized and Advanced Water Treatment Processes 2017

7. Weisser, T.S. "The De-alloying of Copper Alloys." Conservation in Archaeology and the Applied Arts. Preprints of the contributions to the Stockholm Congress, 2–6 June 1975. London, UK: International Institute for Conservation of Historic and Artistic Works, 1975, pp. 207–214.

8. Walker, G.D. "An SEM and Microanalytical Study of In-service Dezincification of Brass." Corrosion 33,7 (1977), pp. 262–264.

9. Weissmüller, J., R.C. Newman, H.-J. Jin, A.M. Hodge and J.W. Kysar. "Nanoporous Metals by Alloy Corrosion: Formation and Mechanical Properties." MRS Bulletin 34,8 (2009), pp. 577–586.

10. Erlebacher, J., R.C. Newman and K. Sieradzki. "Fundamental Physics and Chemistry of Nanoporosity Evolution During Dealloying." In A. Wittstock, J. Biener, J. Erlebacher and M. Bäumer, eds., *Nanoporous Gold: From an Ancient Technology to a High-Tech Material.* Cambridge, UK: Royal Society of Chemistry, 2012, pp. 11–29.

11. K. Ismail, "Evaluation of cysteine as environmentally friendly corrosion inhibitor for copper in neutral and acidic chloride solutions," *Electrochimica Acta*, vol. 52, no. 28, pp. 7811–7819, 2007.View at: Publisher Site | Google Scholar

12. S. Zaferani, M. Sharifi, D. Zaarei, and M. Shishesaz, "Application of eco-friendly products as corrosion inhibitors for metals in acid pickling processes—A review," *Journal of Environmental Chemical Engineering*, vol. 1, no. 4, pp. 652–657, 2013.View at: Publisher Site | Google Scholar

13. E. S. M. Sherif, R. M. Erasmus, and J. D. Comins, "Inhibition of copper corrosion in acidic chloride pickling solutions by 5-(3-aminophenyl)-tetrazole as a corrosion inhibitor," *Corrosion Science*, vol. 50, no. 12, pp. 3439–3445, 2008.

14. S. M. Milic and M. M. Antonijevic, "Some aspects of copper corrosion in presence of benzotriazole and chloride ions," *Corrosion Science*, vol. 51, no. 1, pp. 28–34, 2009.

15. G. Abd El-Hafez and W. Badawy, "The use of cysteine, N-acetyl cysteine and methionine as solutions, environmentally friendly corrosion inhibitors for Cu-10Al-5Ni alloy in neutral chloride," *Electrochimica Acta*, vol. 108, pp. 860–866, 2013.

16. V. F. Lucey The mechanism of dezincification and the effect of arsenic. II Pages 53-59 | Published online: 18 Jul 2013 .

17. Yaofu Zhang and Marc Edwards Effects of pH, chloride, bicarbonate, and phosphate on brass dezincification April 2011Journal - American Water Works Association 103(4):90-102

18. Oleg D. Neikov, Nikolay A. Yefimov, Powder Characterization and Testing in Handbook of Non-Ferrous Metal Powders (Second Edition), 2019

19. Aydin, A. "Recovery of Zinc and Lead from Cinkur Leach Resudies by using Hydrometallurgical Techniques." PhD diss., Thesis submitted to the Graduate School of Natural and Applied Sciences of Middle East Technical University, Turkey, 2007

HISTOPATHOLOGY OF POST IMMUNIZATION AND CHEMOTHERAPEUTIC TRIALS IN EXPERIMENTAL CYSTIC ECHINOCOCCOSIS

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Waheeda Rashid ALI [2]

Abstract:

The present study in mice concerned about the immunized mice by Hydatid cystic fluid (HCFAgs) and treated with three anthelmintic drugs alone Albendazole (ABZ), Oxfendazole (OFZ) and Praziquental (PZQ) or in combined ABZ+ PZQ, OFZ + ABZ and OFZ+PZQ. Treatment with OFZ shows 93.75% efficacy, but it's more effective in combination with PZQ (96.7%), but it lower in combination with ABZ 82.5% or ABZ combined with PZQ 77.5%.The sera of the mice were screened for the biochemical enzymes. Liver and spleen were processed and paraffin embedded tissue sections were examined by immunohistochemistry (IHC) for IFN-gamma from different study groups. After treatment, liver and spleen express an increased IFN-ɣ protein in treated groups and positive control group compared with control negative group. We have evaluated of the pathological changes in liver and spleen of mice after four months of the infection and treatment. The result showed satisfactory histopathological changes in comparison with positive control group.

Key words: Hydatid Cyst, Treatment, IFN-ɣ ,Immunohistochemistry.

Introduction:

Hydatid disease, Cystic Echinococcosis (CE) is important common disease through the world, around Arab countries and in Iraq [1]. The most problems with these parasites is immune surveillance and escape from immune response so the present researches used HCFAgs to induce Cellular and Humeral immune responses The drugs are the second choices for treatment of inoperative cases. These drugs are from the benzimidazoles family including albendazole and mebendazole [2,3],the Praziquantel is an isoquinoline that has been used in animal models, laboratory and human hydatid cyst recently [4]. It is important to compare the efficacy of drugs in the treatment of cystic echinococcosis. The effect of benzimidazole derivatives and other drug are due to their metabolites which reach a definite serum concentration and passes to the hydatid fluid. However, some of these metabolites are potentially toxic or cause transient abnormality of the liver function test[5] . Very few studies addressed that drugs can bias the local immune response, the majority used ELISA to evaluate serum level of cytokines. In human subjects undergoing chemotherapy treatment, an increasing Th1 cytokine profile, rather than a Th2. It may be one of the proposed killing mechanisms that set in during the later stages of infection. It can be hypothesized that the effective treatment will support cellular composition of inflammatory cytokines in liver and spleen. Accordingly, this first study was aimed to characterize the tissue expression of IFN-gamma proteins by IHC.

The aims of study:

- Immunization with HCFAgs that isolated from infected liver and lungs of sheep.
- Therapy with anthelminthic drugs.
- Histopathology examination of liver and spleen section in both immunized and treated animals.
- IHC to IFN-γ in liver and spleen of mice.

MATERALS AND METHOD

Animals: Sixty white males' mice strain Balb /C, aged 4-5 weeks; their weight ranged from 20 ± 5 g were bred and adapted at the animal.

Preparations of antigen:

Hydatid cysts of infected sheep were collected to prepare HCFAg according to [6], and select concentration 3.36 mg/ml according to the method of[7], and isolated protoscolices (PSCs) estimated viability and their number by [8], a single dose challenge (2000PSCs±5).

Preparation of drugs:

Three drugs prepared according [9] used in an attempt to treat hydatid cysts in mice are:

- OFZ a concentration of 30 mg/kg of body weight (BW), equivalent to 0.04 mg/ ml was obtained on the property locally (Synanthic ®, Fort, Dodge, Mexico).

- PZQ 40 mg/kg of BW, equivalent to 0.06 mg/ ml.

- ABZ 10 mg/kg of BW, equivalent to 0.01 mg/ ml.

Drugs given to mice groups in single dose or mixed, as follows: -

1- OFZ **2-** OFZ + ABZ **3-** OFZ + PZQ **4-** ABZ + PZQ

Experimental design:

Sixty mice were immunized at day 0 with 0.2 ml of HCFAg S/C after mixed with an equal volume of incomplete Freund adjuvant, after 21 days given booster dose consists of hydatid fluid 0.2 ml with an equal volume of complete Freund adjuvant, and with immunization the mice injected with 0.2 ml antioxidants (Pharmaton R, Switzerland) daily/orally for month. The challenge dose (2000 PSCs ± 5) I / P in day 30 of the first day of immunization and at the same time injected a group of positive control (15 mice) were injected with 0.2 ml phosphate buffer saline. The immunized group's mice administered 0.2 ml of the above drugs orally, one dose a week for four months. Four months post challenge dose sacrificed all the animals and histological examination of liver and spleen by haematoxylin and eosin by [10,20].

Examination of therapeutic index:

Hydatid cysts were collected for evaluation of their diameters and weight as well as their number. Therapeutic index based on calculation of mean number of cysts in control group-mean number of treated group/mean number of control group x100[11]. The effectiveness of liver enzymes (ALT, AST, ALP, DB and TB) was measured in the experimental mice by Accent 300, Cormay. The IHC were done according to manufacturer's Detection kit System, Rabbit, Mouse, (DakoRral TM).

Statistical analysis: Data were expressed as mean ± standard deviation (SD) and analysis of Variance (ANOVA) test was used for differences between groups. Values p< 0.05 was regarded as statistically significant.

RESULTS

1-Macroscopic appearance:

The post mortem examination of the positive control mice showed the presence of irregularly distributed secondary cystic sacs, single or in the form of transparent aggregates in spherical, oval and irregular forms (Fig-1), there were secondary cysts in some of them with overlapping cysts and very small cysts. (Fig-2, A,B ,C and D).
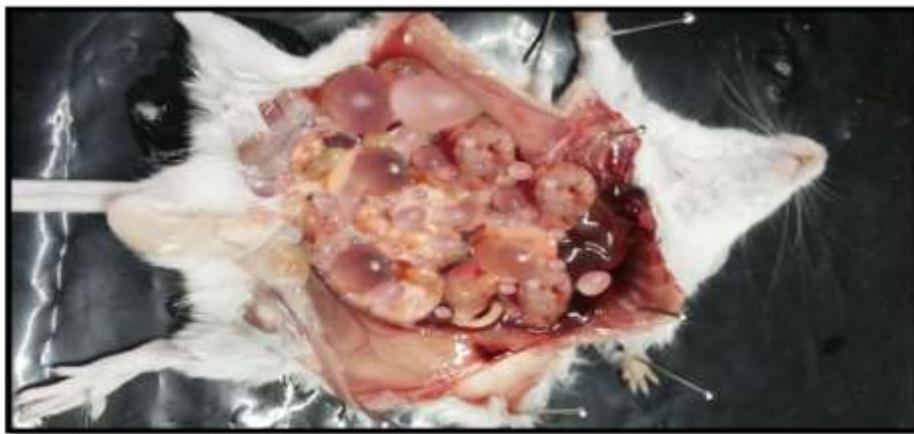
Figure(1) Image of positive control mouse infected with hydatid cyst showed multiple transparent and differs sizes in abdomen.
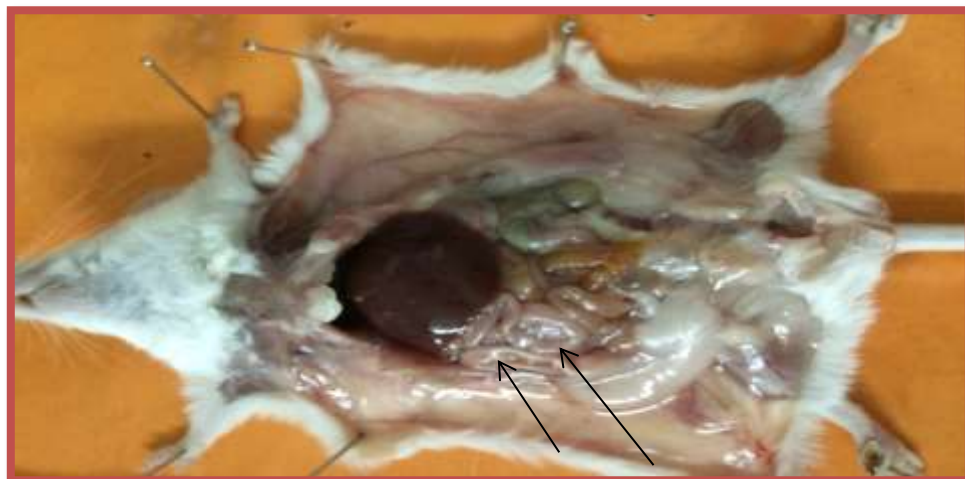
A: OFZ
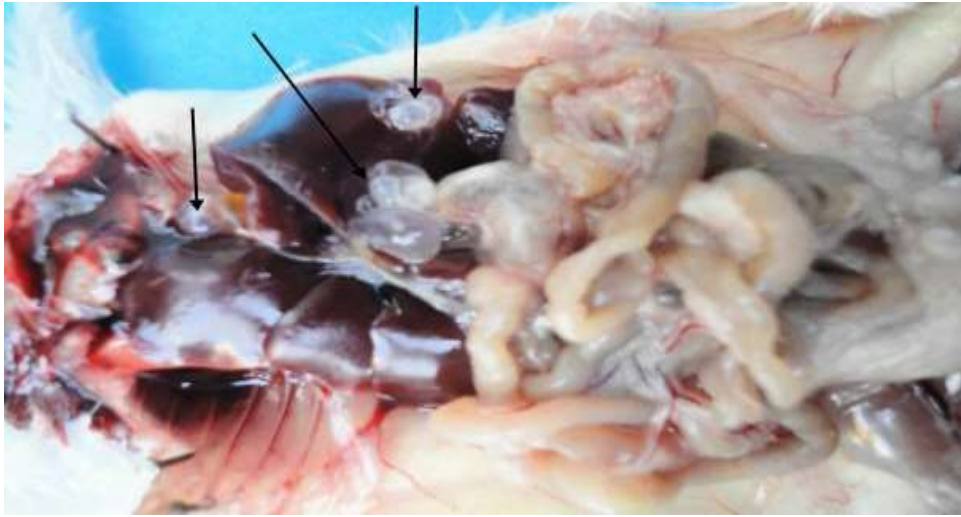
B: OFZ+ABZ
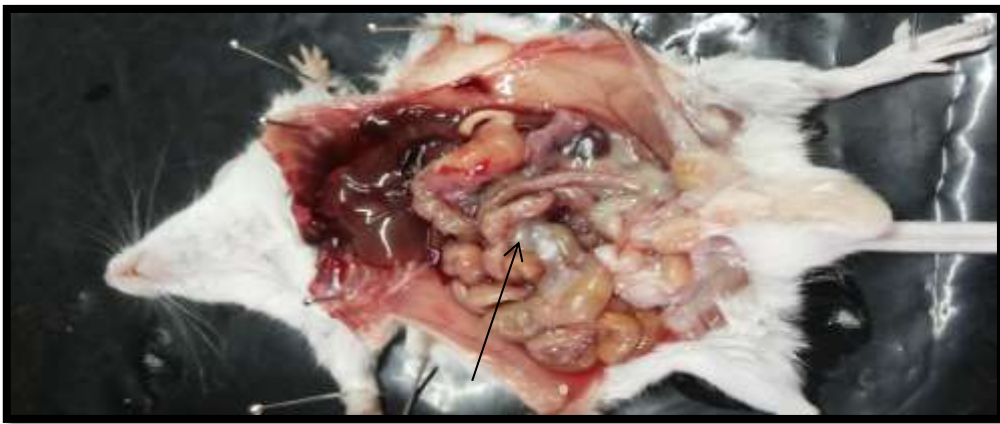
C: OFZ+ PZQ
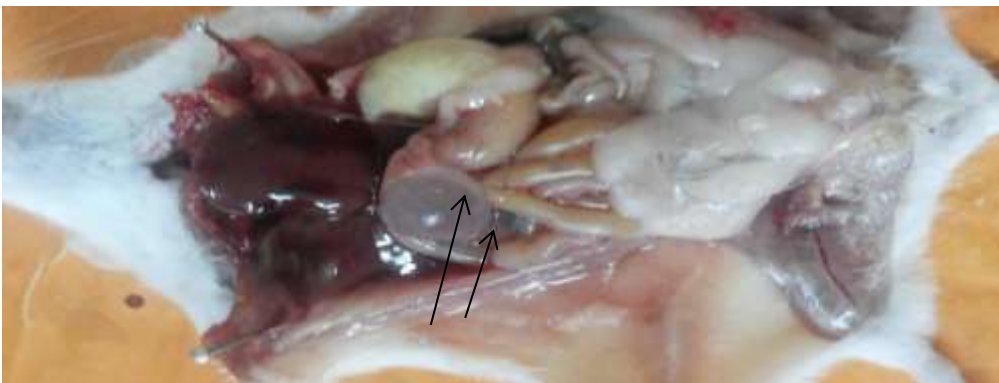
D: ABZ+PZQ

Figure-2: Gross Appearance of treated mouse infected with hydatid cyst with OXF (A), OFZ+ABZ (B), OFZ+ PZQ (C) and   ABZ+PZQ (D).

Estimation of therapeutic index among treated groups:

Mice treated with OFZ+PZQ showed higher percentage of therapeutic affect (96.7%), followed by mice treated with OFZ (93.75%), and mice treated with OFZ+ABZ (82.5%) and the lowest rate found in mice treated with ABZ and PZQ (77.5%) (Table -1).

Table- 1: Relative percentage of shrinkage cysts, number of cysts and therapeutic index among treated groups.

Groups	Percentage of shrinkage cysts	Number of cysts	Therapeutic index%
OFZ	50±14	2.5±12	93.75
OFZ+PZQ	75±15	1.3±0.94	96.7
OFZ+ABZ	28.4±14	7±1.3	82.5
ABZ+PZQ	37.4±8	9±2	77.5
Negative control	0	0	0
Positive control	0	29±8.3	0

2-Estimation of liver Enzyme among treated groups:

In Table -3 shows enzyme activity in the studied groups. After 4 months of infection, enzyme activity of ALT, AST and ALP in treated serum showed significant differences at $p \leq .0.001$ compared to the positive and negative control group. Two groups of mice treated OFZ and OFZ + ABZ showed a significant difference compared with positive control at a probability level ($p \leq .0.05$) about DB enzyme.

Table (2) Levels of liver enzymes and bilirubin for groups of rats after four months of   treatment compared to control group.

Groups	ALT U/L	AST U/L	ALP U/L	DB Mg/Dl	TB Mg/Dl
OFZ	11±42 a**,b**	1.4±50 a**,b**	21±47 a*,b**	0 aNS,b*	0 aNS,b*
OFZ+PZQ	32±55 a**,b**	74±88 a**,b**	33±55 a**,b**	0.1± 0.02 aNS,bNS	0 aNS,b*
OFZ+ABZ	80±12 a**,b**	43±187 a**,b**	74±192 a**,b**	0.1± 0.01 aNS,b*	aNS,b* 0.1± 0.01
ABZ+PZQ	11±82 a**,b**	73±200 a**,b**	21±147 a**,b**	0.1±0.01 aNS,bNS	0.1±0.01 aNS,bNS
Neg. control	15±59.4	22±86	9.8±24.36	0.0	0.0
Posit. control	23±83	74±203.2	80.4±200	0.01±0.5	0.03±0.5

a; comparison with negative group. b; comparison with positive group.

* Significant differences on (p≤ 0.05). **Significant differences on (p≤ 0.001).

NS: No significant (p≤.0.05).

Immunohistochemical expression of IFN-γ in liver and spleen:

The results describe the protein expression of **IFN-γ** in both liver and spleen of mice treated with different therapeutic regimens. **IFN-γ** protein expressions (Figure-3) were generally higher expression among treated groups than those negative and positive control groups. Except that OFZ+PZQ treated group was not significantly different from negative control group.

Table (1) Level of IFN -γ expression of IHC in spleen and liver of treated mice.

Groups	Expression of IFN -γ	
	Liver	Spleen
OFZ	35.8±12.9 a**,b**	12.9±6.5 a NS ,b*
OFZ+PZQ	23.2±7.1 aNS,b**	24.7±9.2 a*, b**
OFZ+ABZ	54.7±12.3 a**, b **	35.0±8.3a**, b**
ABZ+PZQ	28.7±8.8 a*, b **	23.4±6.2 a*, b**
Negative control	17.2±8.4	12.9±9.33
Positive control	8.3±5.4	5.3±2.2

a compare with –ve control group, b with positive control

NS: no significant difference on (p≤0.05)

**: high significant difference on (p≤0.001)

IFN-γ	Spleen	Liver
OFZ		
OFZ+PZQ		

OFZ+ABZ		
ABZ+PZQ		
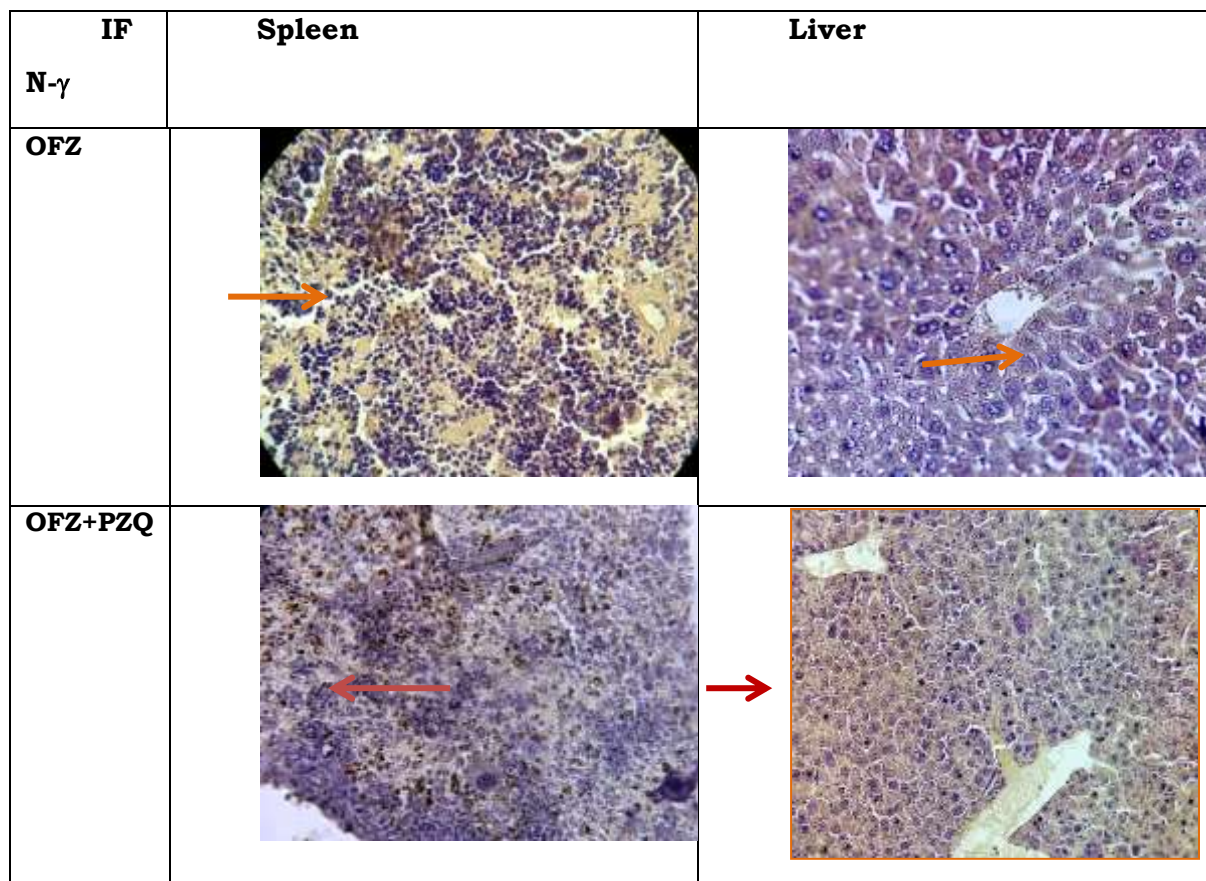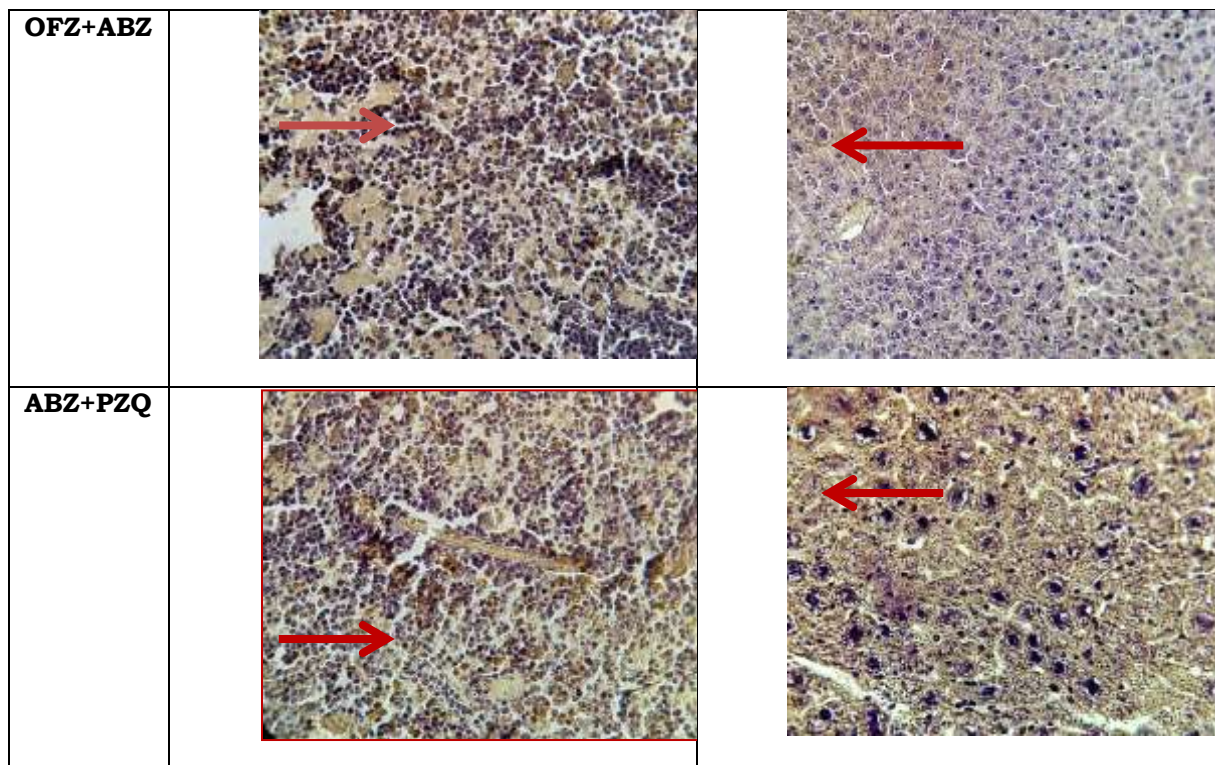
Figure (3): Immunohistochemical staining of IFN-γ protein in mice spleen and liver. Stained cell appears as dark brown color especially in white pulp of spleen while infiltrating lymphocytes in the liver stained moderately to faint brown staining(400X).

1- Histopathology examination of spleen:

Therapeutic group with OFZ their liver section showed dilated sinusoid and cytomorphological hepatocytic with degeneration changes. In the spleen has been congestion of blood vessels sinuses of red pulp and formed granulomatous lesions (Fig4). Therapeutic group with OFZ+PZQ show dilated central liver vein ,their splenic sections showed reactive hyperplasia of lymphoid follicles in white pulp (Fig 5) and in OFZ+ABZ there was infiltration of lymphocytes but in ABZ+PZQ the congestion of blood vessel sinuses (Fig 6) were prominent with presence of megakaryocytes (Fig7)**.** The animals infected with secondary scolices of hydatid cysts (positive control) showed atrophy of lymphoid follicles **(**Fig 8).

Spleen   liver

Figure (4): Photomicrograph in liver of immunized mice treated with OFZ shows; Enlarged sinusoid (SC): Degenerative changes (D); in spleen shows. A: Blood vessels Congestion (BV) Granulation and congestion with red pulp (GR) ((H&E stain, 250X).

Spleen   liver

Figure (5): Photomicrograph in liver of immunized mice treated with OFZ+PZQ; shows: Dilated central vein (CV); in spleen shows, moderate lymphoid follicle in white pulp (F),Enlarged sinusoid (S) (H&E stain, 100X).

Spleen   **liver**

Figure (6): Photomicrograph in liver of immunized mice treated with OFZ+ABZ shows: Dilated central vein (CV): Cytomorphological hepatocytic (C): Degenerative changes (D) (H&E stain, 400X); in spleen; showed congestion of red pulp (CR), (H&E stain, 10X).
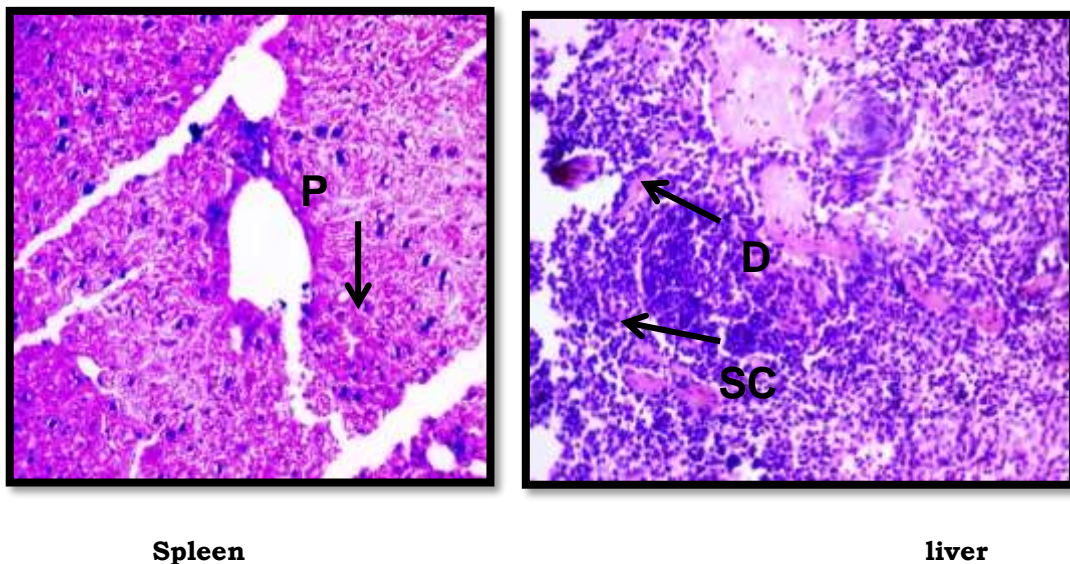
Spleen   **liver**

Figure (7): Photomicrograph in liver of immunized   mice treated with ABZ+PZQ shows   enlarged sinusoid (SC) Degeneration changes (D) (H&E stain, 250X); in spleen showed; Hypertrophy of fibrous trabeculae (P) (H&E stain, 10X).
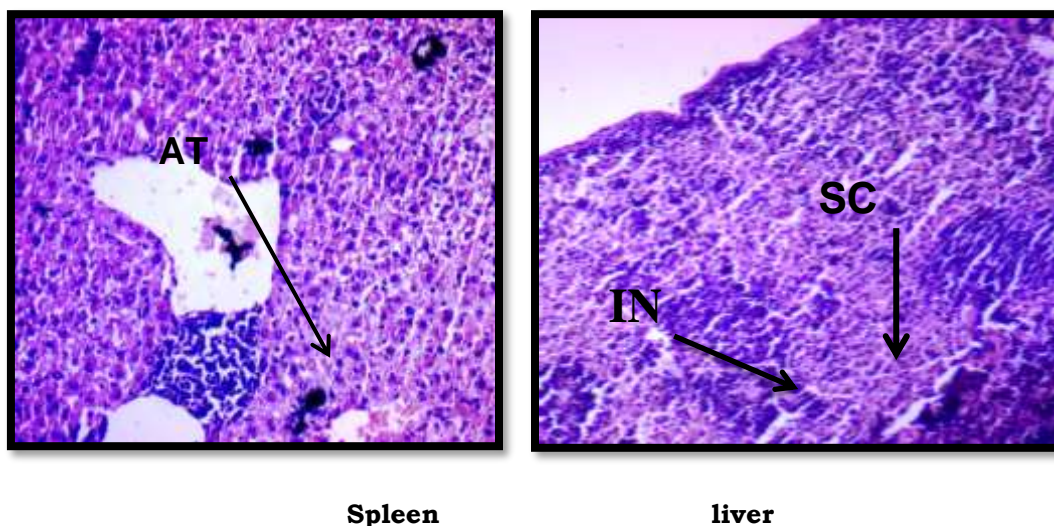
Spleen   **liver**

Figure (8): Photomicrograph in liver of   positive mice: Inflammation of inflammatory cells   (IN) Tightness of the sinusoid (SC) (H&E stain, 250X); in spleen showed; atrophy of lymphoid follicles (AT) (H&E stain, 10X).

DISCUSION

E. granulosus the primary host parasite of sheep and the most common species infected human beings which improved experimentally by infected lab animals mostly mice with protoscolices of parasites [12,13], recently the researches worked on the stimulation of immune response in infected host with hydatid cyst by antioxidants immunomodulators by HCF Ag beside the antioxidants which deleted the action of free radicles as the present study used three types of s anthelmintic drugs with antioxidants agreed with [14] .

The present study revealed that combination of both drugs OFZ + PZQ had high efficient degree in the treatment group of reduction numbers of growing hydatid cysts, then OFZ + ABZ and ABZ + PZQ or OFZ alone, due to the properties as effective drug in reducing the weight and diameter of contracted and fibrosis hydatid cysts [22]. The explanation for this may have been due to activation of both humeral and cell mediated immune responses that have led to the elevation of cysts. The OFZ alone was recommended by the WHO, as it led the drug current drug with doses of Benzimidazole derivatives and other drugs, they found that the combined effect of two drugs was stronger than single one. As compared with animals to each drug the process of absorption of glucose from the parasitic wall is reduced the stored glycogen and the occurrence of retrograde changes in the internal endothelial network and the mitochondria and adenosine tri- phosphates and increase the releasing of lytic bodies which destroy the cysts [15].

Serum liver enzymes activities are excellent markers of hepatocellular injury [1**6**]. Reports showed that any factor affecting the liver metabolism was found to cause an increase activity; a result agreed with [17] **.**The elevation of liver enzymes with large size cysts is more than in small cysts, this may be due to the heavy cyst pressure on the surrounding organs. Free radicals cause damage to the cell through the oxidation of lipids of the cell membrane lead to hepatic destruction and enzyme release**.**

The results "in particular" highlight the importance of use anthelminthic drugs in combination form to treat Echinococcosis in animals[20,21]. IFN-γ was Th1 cytokines required to mount an effective inflammatory action against CE infection [18] **.** the higher percentage of expression was found in OFZ+PZQ treated group (the highest therapeutic efficacy=96.7%) may explain the successful of this therapeutic combination in treating CE.

The histopathology examination of spleen sections from treated animal groups shows increased number of Megakaryocyte and dilation of sinusoids in mice of group (ABZ + PZQ), degeneration of hepatocytes. Congestion of blood vessels sinuses with Hemosiderin –laden macrophages [19] .The white pulp expands and decreases in the red pulp of the spleen. As   a result of activation of megakaryocytes due to lymphoid hyperplasia.

Conclusion:

HCF Ags possesses the contraindications and antioxidants are effective in stimulating the immune response, as a kind of promising chemical treatment in the treatment of Oxyfendazole dosing with praziquental (OFZ+PZQ) has a very strong effect through the shrinkage of hydatid cyst to loss of fluid in both liver and spleen compared with the control group. After successful treatment of CE will increase IFN-γ with reduction, this would support the hypothesis that restoration of the host cell-mediated response occurs after elimination of hydatid cyst.

REFRENCES:

[1**] Al-Naimi**, S. A.; Al-Kuraishi, A. H.; Khalil, H. I. (2012). Hydatid disease: A retrospective study of three hospitals in Baghdad during 2003- 2008. Iraqi J. Comm. Med., 1: 23-27

[2**] Fagiree**, E.I., Saad,B.M. and Elsadig, A.A. (2017) Effect of Albendazole and Mebendazole on hydatid cyst of mice. Open J. Epidemiol., 70:307-316.

[3**] Rahdar ,**   M.; Rafieia.,A.and Norouzi,R.V.(2018). Effects of Cytokine Therapy for treatment and prophylaxis of Hydatidosis in experimental animal model (Mice). Iran J. Parasitol., 13: 587-593.

[4**] Bygott**, J.M,and Chiodini ,P.L(2009).Praziquantel: neglected drug ? Ineffective treatment? or therapeutic choice in cystic hydatid disease? Acta Trop., 111(2):95-101.

[5**] Georgescu**, S. O. ; Dubei, L. ; Torcoveanu, E. ; Bradea, C. ; Lazescu, D. ; Crumpei, F. and Stratan, I. (2005) Minimally invasive treatment of hepatic hydatid cysts . Roman. J. Gastroenterol., **14**(3):349-352.

[6**] Al-Olayan,** E.M. and Helmy, H. (2012). Diagnostic value of different antigenic fractions of Hydatid cyst fluid from camels and sheep in Kingdom of Saudi Arabia. J. Saudi Chem. Soci., 16: 203-207.

[7**] Bradford,** M.W. (1976). A rapid and sensitive method for the quantitation of microgram quantities of protein utilizing the principle of protein- dye binding. Anal. Biochem., 72: 248-254.

[8**] Smyth,** J.D. and Barret, N. J.(1980). Procedures for testing the viability of human hydatid cysts following   surgical removal, especially after chemotherapy. Trans. Roy. Soc. Trop.Med. Hyg., 74(5): 649-652.

[9**] Perez-Molina,** J.; Menendoz, M.D.; Gallego,J.I.; Norman, F.; Monge-Maillo, B.; Avala,A.P. and Lopez-Velez, R. (2011). Evaluation of nitazoxanide for the treatment of disseminated cystic echinococcosis: Report of five cases and literature review. Am. J. Trop Med. Hyg., 84:351-356.

[10**] Bancroft,** J. and Stevens, A. (1982). Theory and practice of histological technique 2th ed. Churehill Livingstone Edinbrgh and London: 31- 38p.

[11**] Casado**, N.; Urrea-Paris, M. A.; Moreno, M. J. and Rodriguez-Caabeiro, F. (2001). Combined praziquantel and albendazole chemoprophylaxis in   experimental hydatidosis. Parasitol. Res., 87: 787-789.

[12] **Al-Kuraishi**,A.H.; El-Hashimi,W.K.;Mushrif,E.and Ad'hiah,.A.H.(2009). Histopathological Changes of Hydatidosis in the Liver and Spleen of Albino Mice Dose Effect Changes. Iraqi J. Comm. Med., JAN, 1: 59-64.

[13] **Ali,W.R;** Ibrahim, Z.I ;Ibrahim,A.A.J.(2015)**.** Study the histopathology of Immuno- therapy trail in mice infected with hydatid cysts .Int. J. Res. Stud. Biosc., 3(8):15-22.

[14]**Garcia-Liamazares**, J. L.; Merino-Pelaez, G.; Larrode-Pellicer,O.; Redondo-Carderia, P.A.; Prieto-Fernandez, J. G. and Alvarez-de- Felipe, A. I. (2001). Pharmacokinetics of netobimin and microsomal metabolism of albendazole in infected gerbils with *Echinococcus granulosus*. Parasitol. Res., 87: 107-111**.**

[15] **Siles-Lucas**, M.; Casulli, A.; Cirilli, R.and Carmena, D. (2018). Progress in the pharmacological treatment of human cystic and alveolar echinococcosis: Compounds and therapeutic targets. PLoS Negl Trop Dis 12(4): e0006422

[16]Rahimi ,M ;Kheirandish,F.; Arab-Mazar,Z.; Mirzapour,A.(2017). level of Liver Enzymes in Patients with Mono-Parasitic Infections. Infect. Epidemiol. Microbiol.,3: 137-142

[17] **Vatankhah**,A.; Gaffari,S. M. R.; Vatankhah,G.; Piurkó,V.; Tímár,J.; Avan , A.and Jazayeri.M.H.(2019).Characterization of cellular and humoral immune responses to alkaline phosphatase from fertile hydatid cysts in the human peripheral blood. J.Cell.Physiol., 234:2765-2777.

[18]**Naika** M.I., Tenguriaa, R.K. and Haq, E.(2016).Detection of serum cytokines before and after pharmacological and surgical treatment in patients with cystic echinococcosis. Helminthol., 90: 91-95.

[19] **D'Anna,** M. C.; Giorgi, G. and Roque, E. (2011). Immunohistochemical studies on duodenum, spleen and liver in mice: distribution of ferroportin and prohepcidin in an inflammation model. Int. J. Morphol., 29: 747-753.

[20] **Sadek,A.A**.(2022).Determining role of TGF-β3 in some treatment of albino mouse, *Mus musculus* Linnaeus, 1758 infected with hydatid cyst by using an immunohistoflourescent staining technique, Biol. Appl. Environ. Res., 6(1):58-67.DOI:10.51304/baer.2022.6.1.58.

[21] **Sadek,A.A**.and Al-Taie,T.A.H.(2022). Effect of some drugs on the viability of the protoscolices of *Echinococcus granulosus* in vitro. Biol. Appl. Environ. Res., 6(1): 14-22. DOI:10.51304/baer.2022.6.1.14.

[22] Hussein, T.W.; Ali, W.R.and Ghazi, H.F. (2020). Immunohistochemical Evaluation of Apoptotic Proteins Expression in Liver and Spleen after Treatment of Cystic Echinococcosis: An Experimental Study. Med. Toxicol. , 14(4) 1456-1461.

PREVALENCE OF SYPHILIS AMONG BLOOD VOLUNTEERS IN BAGHDAD PROVINCE / IRAQ

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Abstract:

The bacterium Treponema pallidum subspecies pallidum causes syphilis, a sexually and blood-transmitted illness (STD). The signs and symptoms of syphilis vary according on the stage of the illness (primary, secondary, latent, and tertiary). The goal of this study is to use serological and immunological testing to evaluate the prevalence of syphilis among blood donors in Baghdad province. The current study was done on a total of 28287 blood donors at the main blood bank in Baghdad who were tested between April 2020 and March 2021. They ranged in age from 20 to 75 years and were screened throughout the study period between April 2020 and March 2021. Serum, plasma and whole blood samples were collected, tested for IgG,IgA and IgM by ELISA. The results of the epidemiological study revealed that 200 instances of syphilis were found among 28287 blood samples donated by volunteers, with no signs of the disease. There were 189 men (94.5%) and 11 women (5.5%), resulting in a male to female ratio of 17:1. According to the findings of the current study, the incidence of syphilis among blood donors in both sexes varied in proportion to the donors' socio-demographic parameters, with a higher frequency in men. the study shows the following percentages: Unemployed / jobless 139 (69. 5 percent), governments 35 (17.5%), merchants 12 (6%), farmers 11 (5.5%), and students 3 (1.5%). The majority were 85 (42.5 percent), with primary study accounting for 75 (37.5%), secondary study 31 (15.5%), tertiary 6 (3%), and university graduates 3 (1.5%). The findings indicated that married people had 154 (77%) more infections than unmarried people 46 (23%). The individuals' ABO profiles were 92 (46%) O, 64 (32%) A, 33 (16.5%) B, and 11 (5.5%) AB. Syphilis serology had been performed and showed positive treponemal IgG, IgA & IgM by ELISA, The showed that results all 200 samples of donor's blood were positive for TPHA test.

Key words: Syphilis, Treponema, Tpha, Std

Introduction:

Transfusion of human blood is essential in medicinal and surgical procedures since no synthetic blood replacements exist **(1)** Blood transfusion is a life-saving operation that saves millions of lives every year all around the world, according to the World Health Organization. However, if the blood supply is contaminated, numerous blood-borne infectious organisms can be transmitted to recipients, leading to transfusion transmissible diseases (TTIs). Additionally, those infected with these agents have a higher chance of spreading TTIs to others, putting the whole community at risk **(2).**

A variety of viruses, germs, and parasites, including the hepatitis B virus (HBV), the hepatitis C virus (HCV), the human immunodeficiency virus (HIV), malaria, and syphilis, can be transmitted through blood or blood products **(3).** All given blood should be tested for (HBV), (HCV), and (HIV), as well as syphilis, according to the World Health Organization **(4).** In order to offer patients with safe, healthy and cost-effective therapies, it is essential to conduct comprehensive screening of donors and to keep the blood supply up to date. Blood grouping and storage maintenance are also important components of the process **(2).**

The fact that Iraq is subjected to bombs and terrorist assaults means that the country's demand for blood transfusions is constantly growing. The prevalence of syphilis in the Republic of Iraq varied between 2003 and 2014, according to statistics from the Ministry of Health, but it spiked substantially to 1354 cases in 2014. Between 2003 and 2014, males had a greater incidence of the disease than females, with 1220 cases compared to 134 cases in females **(5).**

Since the 15th century, the human species has been afflicted with syphilis **(6).** Infection with the bacterium Treponema pallidum subsp. pallidum causes syphilis, a congenital and sexually transmitted illness disseminated through sexual contact. The most common routes of transmission for the bacteria include accidental direct inoculation, transplacental transmission during pregnancy, and, in rare cases, blood transfusion **(7).** Every year, it affects more than 10 million individuals, and its prevalence has grown in North America, Central and Eastern Europe, and the Middle East in the last 15 years **(8).** Infected nerves, skin, skeleton, angiocarpy, mucous membrane, and other organs can be damaged by the pathogen (T. pallidum) (Tp), which can cause multisystem harm by invading them. Abortion, stillbirth, and congenital syphilis in the fetus are all possible outcomes. Additionally, syphilis has a synergistic effect with HIV and can increase the risk of HIV infection **(6).**

Syphilis is diagnosed based on clinical signs and symptoms, inspection of organisms under dark-field microscopy, and serological testing**(9).** Those with early

primary lesions are insensitive to serological testing, and patients with late disease may be insensitive to it as well. Interpreting the results for babies with suspected congenital syphilis and those who have had syphilis in the past can also be challenging in some cases. Although dark-field microscopy and immunological labeling are quite effective for fresh primary and secondary lesions, sensitivity declines with time as the lesions heal, and microscopic detection of T. pallidum is not useful for latent or tertiary lesions. Since T. pallidum does not have in vitro culture techniques or genetic systems, it has been exceedingly difficult to uncover virulence or regulatory factors that are involved in the pathogenesis of syphilis, as well as other diseases. The rabbit infectivity test, which is used to isolate T. pallidum, must be carried out after the material has been inoculated into susceptible rabbits, as previously stated (RIT) **(10).**

The present investigation is an endeavor to determine the prevalence of syphilis among blood donors at Baghdad province and Generate data on locations of infections in Baghdad province Determine the levels of immunoglobulin's (IgG, IgM& IgA) in volunteers sera or plasma.

Material and Methods

1. Specimens Collection

Blood samples were gathered from the blood of volunteer the National Blood Bank / Baghdadprovince/Iraq, A study was conducted in the period from April / 2020 to march / 2021.

2. Blood Volunteers Groups

A total of 28287 blood volunteer in National Blood Bank / Baghdad aged from 20-75 years both female and male .

3. Samples Preparation

From the blood bag of each participant who participated in this study, 5-10 milliliters of blood were taken. The blood was divided into two parts one placed in plastic disposable tubes (gel tube), and the other placed in EDTA tube. The first was left to stand at room temperature (20-25°C) to allow it to separate by centrifugation for 5 minutes at 2500 r.p.m then was stored at freeze till examination. Unless otherwise specified in the procedure, all sera, plasma, whole blood, and reagents were allowed to come to room temperature before use.

4. Epidemiology Study

The epidemiological study was conducted depending on the age, gender, occupations, donation, marital status, education and blood group.

5. Total Antibodies (IgG,IgA &IgM) Determination:

This test wascarried out by using commercial kit to detect *Treponema pallidum* according to the protocol of IgM, IgA & IgG Kit Kit for detection syphilis (IgM, IgA&IgG) Foresight /USA

6. TPHA

Principle of the Test

This was accomplished through the use of an antigen sandwich enzyme coupled immune sorbent test to detect anti-TP antibodies.

Result and discussion

1. Epidemiology

In the time of investigation, a total of 28287 blood donors from the National Blood Bank / Baghdad who were between the ages of 20 and 75 years old were screened. The research was carried out between April 2020 and the end of March 2021, with the results published in April 2020. Table 1 shows the number of volunteers that participated in each month (3.1). Unless the month of November, when the number of blood donors fell, the table reveals that the number of male donors remained stable throughout the months of January and March, while the number of female donors rose during the months of January and March.

Table 3.1. The number of volunteers that signed up to take part in the study on a monthly basis.

Months	Total donors	Males	Females
April	2479	2456	23
May	2730	2709	21
June	2189	2183	6
July	2086	2073	13
August	2379	2366	13
September	2246	2238	8
October	2662	2653	9
November	1772	1763	9
December	2609	2595	14
January	2412	2382	30
February	2271	2266	5
March	2452	2407	45
Total	28287	28191	196

A total of 200 (0.7%) instances of serologically positive syphilis were identified among 28287 blood donors who came to the blood bank to donate blood. They ranged in age from 20 to 75 years and were serologically positive for the disease (Table 3.2). There were 189 of them (94.5%) who were male and 11 (5.5%) who were female, resulting in a 17:1 male to female ratio. The results of the present study revealed a wide range in the percentage of infections among male and female donors. This results was identical to the findings of an investigation conducted in Pakistan by Nazir **(11)** who discovered that the prevalence of infections among male donors was high, 446 (3.1%), when compared with female donors, 3 percent (1.6%). But differ with Shrestha **(12)** in male 90 (0.48%) and female 16 (0.48%), and Vera **(13)** who reported that the prevalence of syphilis was similar in men and women and raised significantly with age ($P < 0.001$).

Table 3.2. Socio—demographic properties of blood donors at National Blood Bank / Baghdad through April 2020 to March2021.

Characteristic	Divisions	Frequency	Percent
Age groups	21-30	17	8.5
	31-40	62	3.1
	41-50	98	49
	51-60	20	10
	71-80	3	1.5
	Total	200	100
Gender	Male	189	94.5
	Female	11	5.5
	Total	200	100
Job	Government	35	17.5
	Merchant	12	6
	Famer	11	5.5
	Student	3	1.5
	Jobless	139	69.5
	total	200	100
Marital status	Married	154	77
	Unmarried	46	23
	Total	200	100
Educational background	Illiterate	85	42.5
	Primary	75	37.5
	Secondary	31	15.5
	Tertiary	6	3
	University	3	1.5
	Total	200	100
Blood group (ABO	A	64	32
	B	33	16.5
	AB	11	5.5
	O	92	46
	Total	200	100

The youngest competitor was 20 years old, while the oldest was 75 years old. The majority of the donors, 118 (59%), were between the ages of 42 and 63. The frequency and prevalence of syphilis in both volunteer and family/replacement blood donors is still high in many regions of the world **(13)**.

When compared to volunteer blood donors, family replacement blood donors had a higher frequency of syphilis infection **(14)**.

As far as the Socio-demographic properties of the donors are concerned; majority were Illiterates 85(42.5 %), primary 75(37.5%) secondary 31 (15.5%), tertiary 6(3%), university 3(1.5%),unemployed/ jobless 139 (69. 5%), governments 35 (17.5%), merchants 12 (6%), farmers 11(5.5%), students 3(1.5%). The distribution of syphilis patients by martial state is shown in Table 4.2. Married persons were found to be more infected than unmarried people, with a proportion of 77% (154) married to 46 (23%) single (Table 3.2 &fig 3.1.). The individuals' ABO profiles were 92 (46%) O, 64 (32 %) A, 33 (16.5%) B, and 11 (5.5 %) AB (Table 4.2).
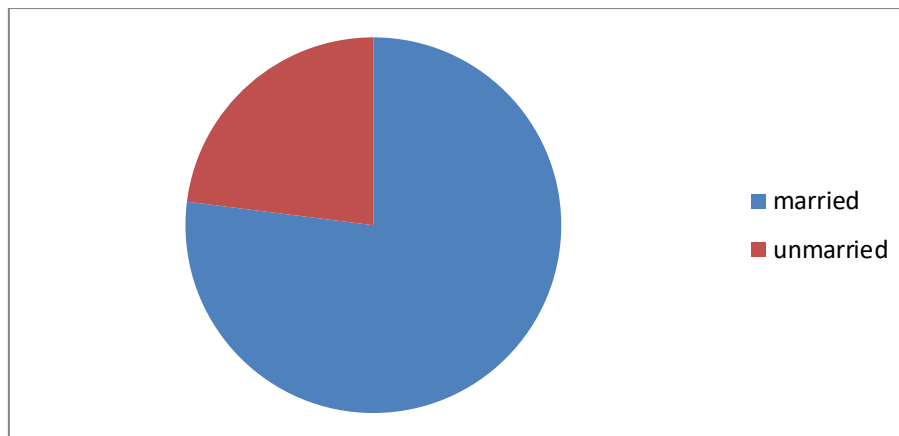
Figure 3.1. the proportion of infected married and unmarried people.

The prevalence of syphilis among blood donors varies across the world. Syphilis was found to be present in 0.67% of blood donors in this research. This conclusion matched the findings of a research done by Dhruva **(15)** at the Indian blood bank at Rajkot hospital from January to December 2013, which found a Seroprevalence of Syphilis of 0.065%. When compared to the findings of other writers, however, the results of this study reveal a low prevalence. 7.5 percent in Ghana, according to **(16, 17)**12.7% in Tanzania, **(18)** 0.89 percent in Islamabad, Pakistan, **(19)** 0.7% in India, Nwankwo **(4)** 7.5% in Nigeria, **(14)** 0.8% in Ethiopia, and Xu **(20)** 7.7% in China. However, the current study's findings were higher than those of El-Gilany and El-Fedawy **(21)** 0.05% in Egypt, Shrestha **(12)**0.48 percent in Nepal, Zulfikar **(22)** 0.12% in Pakistan, Attaullah **(23)** 0.43% in Pakistan, Lathamani **(24)** 0.09% in India, and **(14)** 0.031% in Italy.

Overall, the disparities in study findings between nations may be ascribed to variances in race, social circumstances, and social norms and customs among the peoples of various countries.

2. Serological Tests

Table (3.3.) showed that all samples were positive for the test, except two samples that were negative. These results agree with the results of other researchers **(25).** To find out whether or not a patient has a syphilis seropositivity, the VDRL lipoidal antigen test is commonly performed. However, an ELISA-based assay for identifying Tp0453 reactivity was shown to be more sensitive than the VDRL test **(26).** In comparison to lipoidal antigen-based and crude T. pallidum antigen tests for syphilis seroreactivity, the use of recombinant T. pallidum antigens offers several advantages. Lipoidal antigen-based screening misses up to 30% of sera from patients with extremely early and late syphilis, according to recent research **(27).** A group of sera was examined by **(25)** and it was discovered that there were four people with early primary syphilis who had no reactivity to the VDRL lipoidal antigen-based screening test but had high reactivity to the Tp0453 and Tp92 antigens when the group was tested.

Table 3.3. Results of ultra-rapid test for blood volunteers at baghdad Province.

Test	Number of Samples	Percentage
Positive	98	98 %
Negative	2	2 %
Total	100	100%

Rapid plasma recovery and Venereal Disease Research Laboratory (VDRL) testing are the most prevalent screening assays. Because neither test checks for syphilis-specific antibodies, both tests are for the existence of antilipoidal antibodies. Specificity and sensitivity are concerns with both tests. Antilipoidal antibodies may not have formed in early primary illness, and up to 30% of those with late syphilis (late latent and tertiary) may lack antilipoidal antibodies **(27).** Furthermore, because antilipoidal antibodies and false-positive findings can be caused by a number of diseases (e.g., lupus and advanced age), a confirmation test is frequently necessary. TPHA (T. pallidum hemagglutination assay) is one of them, and it uses crude T. pallidum antigens **(29).** Whole antigen extracts from T. pallidum and a range of T. pallidum recombinant protein tests **(28).**

The routine work that is applied in the blood banks is test of donor's blood before giving it to the patients. Among these tests is TPHA test, which is a special test for the syphilis and after checking for the infection with the use of the foresight kit, they are sent to the Central Public Health Laboratory at Baghdad for the purpose of carrying out the confirmation check by the fortress kit and Bio kit. The basis for this

test is that the samples that give results 1 or less than 1 are negative and the samples that give results greater than 1 are positive.

Table(3.4) reveals results of 200 samples of donor's blood examined by TPHA test, which 177 (88.5%) are positive and 23 (11.5%) are negative. The TPHA test can detect the infection whether it was in the first stage or late stages, or whether the patient took treatment or not. Patients in this study were in various stages of syphilis disease, and the findings are consistent with those of other studies **(25),** which found that Treponemal assays remain positive despite treatment and become reactive sooner, allowing for earlier detection of infection in the primary stage **(30).**

Table (3.4) Result of TPHA used ELISA.

References	Blood Samples										
	Negative		Positive								
0.012 Blank	0.988	0.983	1.037	1.760	1.900	1.710	1.620	1.120	1.208	1.690	1.720
0.032 negative	0.985	0.995	1.259	1.630	1.760	1.040	2.020	1.100	1.226	1.090	1.040
0.040 Negative	0.990	0.993	1.090	1.590	1.662	1.037	1.090	1.662	1.037	1.591	2.112
1.162 Positive	0.981		1.284	1.432	1.110	1.299	1.211	1.112	1.630	1.265	1.037
1.200 positive	0.911		1.178	1.280	1.440	1.353	1.400	1.100	1.230	1.352	1.353
	0.990		1.393	1.176	1.336	1.208	1.760	1.590	1.611	1.591	1.773
	0.980		1.068	1.535	1.200	1.150	1.400	1.601	1.100	1.690	1.820
	0.567		1.040	1.010	1.663	1.202	1.222	1.280	1.110	1.112	1.551
	0.995		1.299	1.790	1.221	1.213	1.222	1.199	1.301	1.180	1.345
	0.990		1.576	1.234	1.552	1.066	1.411	1.137	1.432	1.450	1.121
	0.995		1.100	1.766	1.768	1.456	1.456	1.300	1.345	1.456	2.122
	0.988		1.333	1.645	1.456	1.789	1.576	1.207	1.137	1.700	1.123
	0.346		1.233	2.135	1.321	1.907	1.098	1.567	1.456	1.980	2.233
	0.920		1.288	1.433	1.256	1.358	1.324	1.567	1.456	1.353	1.150
	0.995		1.190	1.233	1.567	1.377	1.956	1.578	0.567	1.780	1.123
	0.992		1.345	1.340	1.390	1.198	1.345	1.879	1.478	1.678	1.457
	0.957		1.111	1.830	1.22	1.233	1.540	1.040	1.350	1.080	1.400
	0.908		1.042	1.123	1.678	1.468	1.397	1.358	1.890	1.789	1.389
	0.999		1.601	1.900	1.430	1.765	1.879	1.467	1.789	1.789	1.341
	0.928		1.589	1.126	1.574	1.339	1.234	1.456	1.721		
Total	23		177								
Percentage (%)	11.5		88.5								

The current study has come out with the following conclusions:

1. The most cases of syphilis among blood volunteers at the age (third and fourth decades), unemployed, Illiterate and married.

2. Transfusion-transmitted of syphilis infections are major threats and important cause of morbidity blood transfusion.

3. For screening syphilis infections, a single test is insufficient, and all blood units should be tested with two different treponemal assays. That is, a TPHA total Ig ELISA ultra-rapid test.

REFRENCES:

1-Fessehaye, N.; Naik, D. and Fessehaye,T .(2011). Transfusiontransmitted infections–A retrospective analysis from theNational Blood Transfusion Service in Eritrea. Pan Afr Med. J., **9**(1): 40.

2-Ahmed, M.U.; Begum,H.A.; Hossain, T. and Chakraborty, P.(2009). Incidence of common transfusion transmitted diseases among blood donors. JAFMC Bangladesh, **5**(1): 4-6.

3-Kaur, G.; Basu, S.; Kaur ,R.; Kaur,P. and Garg,S.(2010). Patterns of infections among blood donors in a tertiary care centre: A retrospective study**.** The Nat. Med. J. of India, **23**(3):147 -149.

4-Nwankwo,E.; Momodu, I.; Umar,I.; Musa, B. and Adeleke, S. (2012). Seroprevalence of major blood-borne infections among blood donors in Kano, Nigeria.Turk. J. Med .Sci., **42** (2): 337-341.

5-Ministry of Health.(2017). Statistics of the Ministry of Health, Center for Transitional Diseases, Baghdad – Iraq.

6-Han, K. and Dai,Y-J.(2015). Molecular epidemiological research of *Treponema pallidum* infection in Haikou. Journal of Hainan Medical University,**2**:138-140.

7-Pickering, L. K. (2006). Syphilis, Red Book.Elk Grove Village, IL: American Academy of Pediatrics. pp. 631-644.

8-Ficarra,G. and Carlos, R. (2009). Syphilis: the renaissance of an old disease with oral implications. Head Neck Pathol .,**3**: 195–206 .

9-Larsen, S. A.; Steiner, B. M. and Rudolph, A. H. (1995). Laboratory diagnosis and interpretation of tests for syphilis. Clin. Microbiol. Rev., **8:**1–21.

10-Koek, A. G., S. M. Bruisten, M. Dierdorp, A. P. van Dam, and K. Templeton.(2006). Specific and sensitive diagnosis of syphilis using a real-time PCR for Treponema pallidum. Clin. Microbiol. Infect. **12**:1233–1236.

11-Nazir,S.; Khan, A.; Nazar, A.; Fayyaz, A.; Khan,M. S. and Ahmed, S.(2013). Prevalence of syphilis in Pakistani blood donors. Int. J . Advancement in life sciences, **1**(1):27-30.

12-Shrestha,A.C.; Ghimre, P.; Tiwari, B.R. and Rajkarnikar, M. (2009) . Transfusion-transmissible infections among blood donors in Kathmandu. J. Infect. Dev. Ctries., **3**(10):794-797.

13-Vera,L.; Milka,D.; Nurith,S-L. and Eilat,S.(2014). Prevalence and Incidence of Syphilis among Volunteer Blood Donors in (Israel). J. of B. Tran., **2014** Article ID 154048, 7 pages.

14-**Bonja,F.(2015).**   Prevalence of transfusion transmitted infections among blood donors at   Yirgalem hospital and   Hawassa blood bank center,Sidama zone, Snnprs, Ethiopia.MS.c.Thesis.Department of Medical Laboratory Sciences, Addis Ababa University: Ethiopia. 151.

15-**Dhruva,   G.A.;   Agravat,A.H.;   Dalsania,   J.D.;Katara,A.A.   and   Dave, R.G.(2014).**Transfusion Transmitted Diseases/Infections among Blood donors in a Tertiary Care Hospital at Rajkot, Gujrat, India. Int .Res. J. Medical Sci., **2**(4):16-19.

16-**Adjei,A,A.;   Kudzi,W.; Armah, H.; Adiku,T.; Amoah, A.G. and Ansah, J .(2003).**Prevalence of antibodies to syphilis among blood donors in Accra, Ghana.   J. Infect. Dis.,**56**(4):165-167.

17-**Matee,M.; Lyamuya, E.; Mbena, E.; Magessa .P.; Suffi, J.; Marwa, G., *et al*. (1999).**Prevalence of transfusion-associated viral infections and syphilis among blood donors in Muhmbili Medical Centre, Dares Salaam, Tanzania. East Afr. J .Med .,**76**:167–171.

18-**Khan, Z.T.; Asim,S.; Tariq,Z.; Ehsan, I.M.; Malik, R.A.; Ashfaq, B., *et al.*(2007).** Prevalence of transfusion transmitted infection in health blood donors RawaIpindi distrect pakistan a five year study. Int .J .path.,**5**(1):21-25.

19-**Kaur,P. and Basu,S.(2000).**Transfusion-transmitted infections: existing and emerging pathogens. J Postgrad Med.,**551**: 146-

20-**Xu,M.;Xie,Y.;Jiang,C.;Xiao,Y.;Kuang,X.;Zhao,F., *et al.* (2016) .** A novel ELISA using a recombinant outer membrane protein, rTp0663, as the antigen for serological diagnosis of syphilis.International Journal of Infectious Diseases,**4**3:51-57.

21-**El-Gilany,A.H. and El-Fedawy, S. (2006).**Blood borne infections among student voluntary blood donors in Mansoura University, Egypt. Eastern Mediterranean Health Journal,**12**(6):742-748.

22-**Zulfikar,A.; Umaru, N.and Shreesha,K. (2012).**Sero prevalence of transfusion transmitted infection among blood donors in mangalore. J. medica innovatica, **1**(2): 24-27.

23-**Attaullah, S.; Khan, S. and Khan, J. (2012).**Trend of transfusion. transmitted infections frequency in blood donors: provide aroad map for its prevention and control. J .Translational Med**10**:20-22.

24-**Lathamani,K.; Bhaktha, G.; Nayak, S.and Kotigadde,S. (2013).**Prevalence of HIV, HCV, HBV and Syphilis in Blood donors among the Dakshina Kannada District, India. Int. J.Curr. Microbiol.App.Sc., **2**(10): 249-252.

25-Walker, G.J.A.(2010). Antibiotics for syphilis diagnosed during pregnancy. Cochrane Database of Systematic Reviews, John Wiley and Sons, Ltd.

26-Van Voorhis,W.C.; Barrett,L.K.; Lukehart,S.A.; Schmidt,B.;Schriefer,M. and Cameron,C.E.(2003). Serodiagnosis Of Syphilis: Antibodies to Recombinant Tp0453, Tp92,and Gpd Proteins Are Sensitive and Specific Indicators of Infection by *Treponema pallidum* .J.Clin .Microbiol.

27-Young, H. (1998). Syphilis. Serology. Dermatol. Clin., **16**:691–698.

28-Rodriguez, I.; Alvarez, E. L. ; Fernandez, C.and Miranda, A.(2002). Comparison of a recombinant-antigen enzyme immunoassay with *Treponema pallidum* hemagglutination test for serological confirmation of syphilis. Mem. Inst. Oswaldo Cruz, **97**:347–349.

29-Larsen, S. A.; Hambie, E. A. ; Pettit, D. E. ; Perryman, M. W. and Kraus, S. J.(1981). Specificity, sensitivity, and reproducibility among the fluorescent treponemal antibody-absorption test, the icrohemagglutination assay for *Treponema pallidum* antibodies, and the hemagglutination treponemal test for syphilis. J. Clin. Microbiol., **14**:441–445.

30-Drago, F.; Cogorno, L.; Ciccarese,G .; Strada, P .; Tognoni,M.; Rebora, A., *et al* **.(2014).**Prevalence of syphilis among voluntary blood donors in Liguria region (Italy) from 2009 to 2013 .Intl. J. of Infec. Dis.,**28**: 45–46.

SAFETY AND MISUSE OF PRESCRIBED MEDICATIONS DURING PREGNANCY

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Abstract:

The unique nature and physiology of pregnancy represents a challenge for choosing suitable, efficacious and safe drug therapy. Pharmacokinetic of medicines is very complicated during pregnancy as many important physiological changes happen during this period. FDA classifies medicines used in pregnancy into five categories A, B, C, D and X. Category A is considered the safest category while X is absolutely contraindicated in pregnancy.

This a descriptive cross-sectional study aimed to demonstrate safety of prescribed drugs and the extent of drug misuse during pregnancy.

The results demonstrated that 82% of prescriptions lack the full scientific information and 75% of prescriptions containing drugs fall within C and D categories. Moreover, the results showed that 29% of drugs are category C (most commonly prescribed drug was hyoscin butylbromide), and 14% of drugs are category D (most commonly prescribed drug was phenoparbiton). A high percentage of prescriptions was seen with multiple items that can increase the associated side effects and about 22 % of prescriptions were refilled many times and more than half of this percentage used them without medical consultations; this indicates that many pregnant women may misuse these drugs.

From this study we concluded that there is a misuse of medicines during pregnancy and a high percentage of pregnant women have used unsafe medications. Therefore prescribing drugs during this period needs a special care as this issue can be dangerous for mother and her fetus.

Key words: Safety and Misuse of Prescribed Medications.

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Introduction:

Pregnancy is defined as the time during which a woman has one or more offspring that develops inside her body and also called gestation. Typically, birth happens after around forty weeks from the date of last menstrual cycle [1].

An embryo is the term describing the offspring's developing during the first eight weeks following fertilization, after that, the term "fetus" is used until childbirth [2].

Typically, pregnancy is divided into three trimesters. The first trimester is considered from the first to the 12th week including conception, a time when fertilization of the egg by sperm occurs [1]. This followed by traveling down of the fertilized egg through the fallopian tube, then attaching to the uterus from the inside forming the embryo and placenta. While the second trimester begins from week 13 through 28 and the third one is considered from 29th week through 40th week [1, 2].

1.1. Pharmacokinetics changes in pregnancy

Pharmacokinetics of a drug is concerning its absorption, distribution, metabolism and excretion in the body.

Pharmacokinetic of medicines is very complicated during pregnancy. Generally, the following pharmacokinetic parameters can affect the effective concentration of a medicine or its metabolites during this period:

- The pharmacokinetic of substances by the pregnant woman and also their passage and metabolism through the placenta and the yolk sac. The distribution and elimination of medicines increase during pregnancy leading to decrease their plasma concentrations.
- Distribution, metabolism and elimination of the medicines by the unborn.
- Re-absorption or even swallowing of medicines by the fetus from the amniotic fluid.
- Many important physiological changes happen during pregnancy. This includes changing in the activity of several enzymes, for instances, cholinesterases have lower activity, whereas maternal blood volume rises considerably during pregnancy by 40-50%, and the cardiac output also increases due to the production of some hormones by the placenta and the fetus, and also duo to the action of uteroplacental circulation to be as an arteriovenous shunt this all to support the developing fetus's requirements [3, 4].

Changing of some physiologic parameters during pregnancy that affecting the metabolism of substances are summarized in table 1.1 [5].

Table 1-1 Pharmacokinetic changes during pregnancy

Pharmacokinetic parameter	Effect of pregnancy	Potential impact on pharmacokinetics
Absorption	Decrease in gastrointestinal motility and gastric emptying time Increase in gastric pH Increase in gastrointestinal blood flow Alterations in enzymes and transporters involved in absorption of drugs	Increase or decrease in the rate of absorption Increase or decrease in bioavailability
Distribution	Increase in cardiac output Increase in total body water and fat Decrease in plasma protein binding	Increase in volume of distribution
Metabolism	Alterations of CYP and UGT enzyme activity Increase in hepatic blood flow	Increase or decrease in metabolism of substrates
Excretion	Increase in renal blood flow Increase in glomerular filtration rate Alterations of enzymes and transporters involved in tubular reabsorption and secretion	Increase in renal excretion Increase or decrease in tubular reabsorption and secretion

1.2. Safety of medications

It is well known that the developing fetus might be adversely influenced by exposure to medicines and other environmental substances [6].

It is suggested that a high percentage of pregnant women (more than 50%) take prescription or nonprescription (over the counter (OTC)) medicines or prohibited drugs or use other chemicals (such as alcohol and tobacco) during pregnancy, and this percentage of drug use during pregnancy is augmented. In fact, during pregnancy, medicines should not be used unless they are necessary as many of them could have harmful effect on the fetus. It is documented that 2 to 3% of birth defects is due to using drugs during pregnancy that may be taken to treat a disease or symptom.

In some instances, medications are essential for the pregnant health and the fetus. The pregnant woman should consult her physician or health care practitioner before taking any medication (including OTC drugs) or any dietary supplement or medicinal herbs. Certain vitamins and minerals may be recommended by health care practitioner to be taken during pregnancy. Information regarding the risks and benefits of taking these substances should be known and discussed [3, 6].

Medicines taken by a pregnant woman can reach the fetus mainly via crossing the placenta, a route by which oxygen and nutrients needed for the fetus's growth and development are from mother. Medicines taken during pregnancy by a pregnant woman can influence the fetus in several ways:

- A direct effect on the fetus, leading to damage and abnormal development (causing birth defects) or even death.

- Alteration of the function of the placenta, this can be occurred through constriction of blood vessels and in turn reducing the supply of nutrients and oxygen from the mother to the fetus. In some instances this can lead to underweight and underdeveloped baby.

- Causing contraction of the uterus muscles forcefully and indirect injury to the fetus via reducing the blood supply or promoting preterm birth delivery.

- Indirect effects on the fetus. For instance, several medicines can lower the pregnant's blood pressure thus lead to reduction in blood flow to the placenta and in turn the supply of nutrients and oxygen to the fetus are reduced [1, 7].

A study has found that more than 90% medications approved by FDA had no enough information about their risk or safety when taken during pregnancy. Therefore, it is difficult for health care providers and women to decide whether to use medications during pregnancy or not [8]

The medications that are contraindicated in pregnancy are demonstrated in table (1.2) [9].

Table 1.2: Contraindicated medications in pregnancy [9]

Drug	Comments
Vitamin A and its derivatives including isotretinein, accutane and etretinate.	Significant risk of spontaneous abortion[20] and risk of many significant anomalies[21]
ACE inhibitors	May cause kidney damage in the fetus when used in II and III trimester, decrease in the amount of amniotic fluid and deformities of face, limbs and lungs[7]
Anticoagulants- warfarin	Use during I trimester produces defects like nasal hypoplasia and a depressed nasal bridge; termed as Fetal warfarin Syndrome. Use during II and III trimesters is associated with increased risk of fetal malformations[8].
- Heparin	Safe but if taken for long time osteoporosis and decrease in number of platelets in pregnant women occurs[7].
Estrogen and Androgens	Genital tract malformations[8].
Thyroid preparations-	
Methimazole	Overactive and enlarged Thyroid gland
Carbimazole	Overactive and enlarged Thyroid gland
Radioactive iodine	Underactive Thyroid gland in fetus
Propylthiouracil	Safe[7].
Anticonvulsants-	
Carbamazepine	Risk of birth defects
Phenytoin, Phenobarbitone	Bleeding problem in the newborn which can be prevented if pregnant woman takes Vit. K by mouth every day for a month before delivery or if the newborn baby is given an injection of Vit. K soon after birth[7]. Risk of birth defects.
Trimethadione	Increased risk of miscarriage in the women
Sodium valproate	Increased risk of birth defects in fetus; including a cleft palate and abnormalities of the heart, face, skull, hands or abdominal organs[7].
Antidepressants- Lithium	Birth defects (mainly of the heart), lethargy, decreased muscle tone, underactivity of Thyroid gland and nephrogenic diabetes insipidus in the new born. Ebstein's anomaly (tricuspid valve malformation) has been reported in a number of foetuses exposed to this drug[7].
NSAIDs	
Aspirin and other Salicylates	Delay in start of labor, premature closing of ductus arteriosus, jaundice, brain damage in the fetus and bleeding problems in the woman during and after delivery and in the newborn[7].
Antibiotics- Tetracycline	Slowed bone growth, permanent yellowing of the teeth and increased susceptibility to cavities in the body[7].
Chloramphenicol	Gray Baby Syndrome[7].
Ciprofloxacin	Possibility of joint abnormalities (seen in animals)[7]
Kanamycin and Streptomycin	Damage to fetus's ear resulting in deafness (risk of ototoxicity)[7]
Sulfonamides	Jaundice and brain damage in newborn[7]
Antineoplastic agents-	
Busulfan	Birth defects such as less than expected growth before birth, underdevelopment of lower jaw, cleft palate, abnormal development of skull bones, spinal defects, ear defects and club foot[7].
Chlorambucil	
Cyclophosphamide	
Methotrexate	
Oral Hypoglycemic drugs	A very low level of sugar in the blood of newborn. Inadequate control of diabetes in the pregnant woman[7]
Chlorpropamide	
Tolbutamide	

1.3. Pregnancy category

"The pregnancy category of a medication is an assessment of the risk of fetal injury due to the pharmaceutical, if it is used as directed by the mother during <u>pregnancy</u>. It does not include any risks conferred by pharmaceutical agents or their metabolites in breast milk".

Every drug has specific information listed in its product literature. The British National Formulary (BNF) used to provide information for each drug to be avoided or used with caution in pregnancy [9].

To address the need for updated risk categories, the Food and Drug Administration (FDA) published a final rule entitled "*Content and Format of Labeling for Human Prescription Drug and Biological Products: Requirements for Pregnancy and Lactation Labeling*" table (1.3) [10, 11].

Table 1.3: Pregnancy category

Category	FDA Pregnancy Categories
A	Adequate and well-controlled studies have failed to demonstrate a risk to the fetus in the first trimester of pregnancy (and there is no evidence of risk in later trimesters).
B	Animal reproduction studies have failed to demonstrate a risk to the fetus and there are no adequate and well-controlled studies in pregnant women.
C	Animal reproduction studies have shown an adverse effect on the fetus and there are no adequate and well-controlled studies in humans, but potential benefits may warrant use of the drug in pregnant women despite potential risks.
D	There is positive evidence of human fetal risk based on adverse reaction data from investigational or marketing experience or studies in humans, but potential benefits may warrant use of the drug in pregnant women despite potential risks.
X	Studies in animals or humans have demonstrated fetal abnormalities and/or there is positive evidence of human fetal risk based on adverse reaction data from investigational or marketing experience, and the risks involved in use of the drug in pregnant women clearly outweigh potential benefits.

Source: Content and Format of Labeling for Human Prescription Drug and Biological Products: Requirements for Pregnancy and Lactation Labeling (Federal Register/Vol. 73, No. 104/Thursday, May 29, 2008)

2- Subjects and Method

This is a descriptive cross-sectional study on 250 consecutive prescriptions prescribed for pregnant women, in Babylon and Karbalaa. The prescriptions of pregnant women were collected from hospitals and private clinics in different locations. A questionnaire was constructed upon interview with pregnant women and included the following questions: age, trimester, healthy state, medicines used, whether it is prescribed by physician or used without prescription, frequent daily dose used, type and the dose of medicines in addition to the information from the prescriptions such as diagnosis, patient's obstetric history (GPA), and drug information.

3-Results and Discussion

Regarding the prescription information from the collected prescriptions and whether containing full information or not, the results (Figure 1) demonstrate that only 18% of prescriptions were scientifically or fully written, containing the basic information about patient and diagnosis and the rest were lack of these information. This could lead to many errors during dispensing drugs, therefore, pharmacists should seek the information either from physician or the patient to avoid any mistake could happen with dispensing medicines.
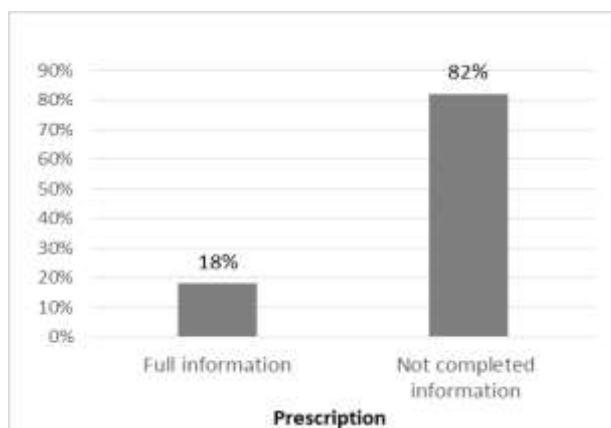
Figure 1: Percentage of prescriptions regarding information.
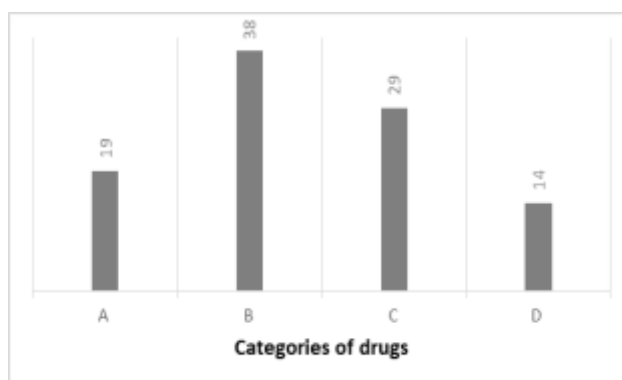
Figure 2: Percentages of drugs according to categories (A,B,C and D) in prescriptions.

Results also showed that category B was the highest percentage (38%) among the drugs categories in prescriptions whereas D was the lowest percentage (14%), while the drugs of category C represent 29% (Figure 2). This indicates that prescriptions containing a high percentage of drugs falling into unsafe categories.
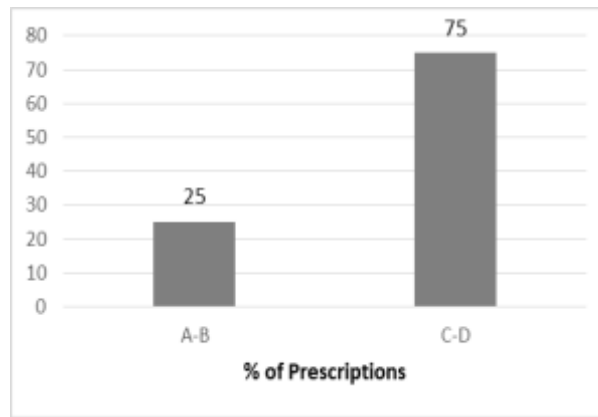
Figure 3: Percentages of prescriptions containing drugs of categories (A,B) and drugs of categories (C,D).

Moreover, the results showed that the number of prescriptions containing drugs of (C,D) categories, which are not save drugs, has the highest percentage 75%.

This may indicate that many prescriptions are containing unsafe drugs to be used by pregnant women.
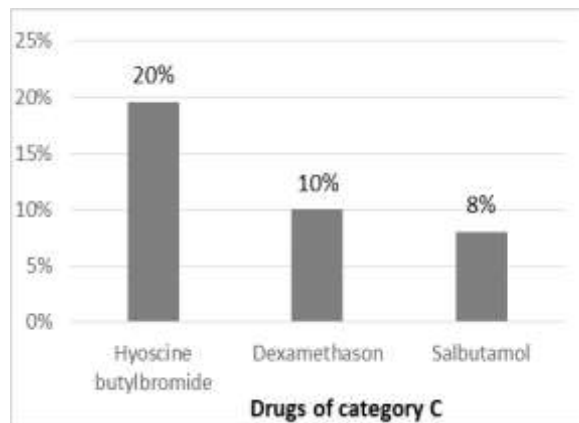
Figure 4: Comparison between common drugs of category C.

Furthermore, the results revealed that the most widely prescribed drugs in category C were hyoscin butylbromide (Buscopan®) with the highest percentage (20%) and then followed by dexamethasone (Decadron®) and salbutamol (Ventolin®) (Figure 4).
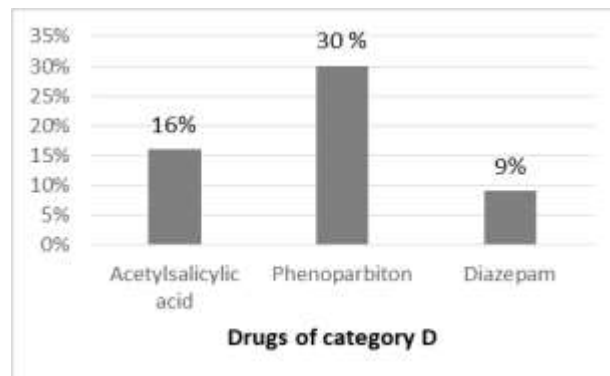
Figure 5: Comparison between drugs of category D.

Whereas the comparison regarding prescribed drugs of category D, the results demonstrated that phenobarbiton (Luminal®) has the highest percentage of drugs used (Figure 5) among others, such as acetylsalicylic acid (Aspirin®) and diazepam (Valium®).
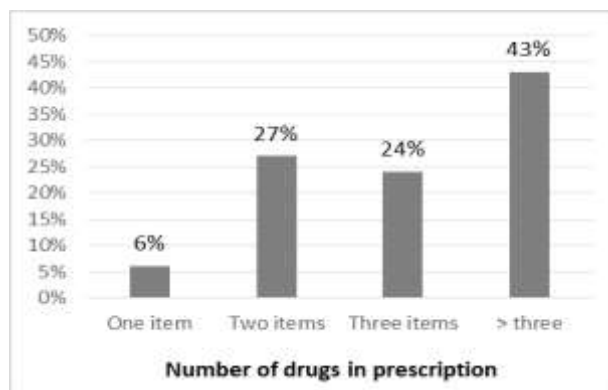
Figure 6: Numbers of items (drugs) in each prescription

The present study showed that data in figure 6 regarding the number of items that vary from prescription to another according to the pregnant condition and physician, the highest percentage was seen with more than 3 items that means many pregnant women may take unnecessary medications or their conditions were complicated. This can increase the side effects associated with using multiple drugs.

According to the results obtained from our study, several drugs of categories C and D were found to be commonly used in the prescriptions. Among these; Buscopan® (hyoscine butylbromide) is generally used for the relief of spasm related to the gastro-intestinal tract or genito-urinary tract and for the treatment of symptoms of irritable bowel syndrome [12], and it is suggested to be used here for abdominal pain associated with pregnancy.

Another drug that was found mostly prescribed is Plasil® (metoclopramide) is mostly used for stomach and esophageal problems [13], and it is suggested to be used here for treatment of vomiting during pregnancy especially in the first trimester.

Previous study has shown that using metoclopramide in first trimester of pregnancy was safe and not leading to the congenital malformations [14].

Stemetil® (procholrperazine) is another drug that found commonly in the prescriptions and it is used to treat vomiting, nausea and dizziness due to different causes, such as in migraine, and it is proposed to be used here for treatment of nausea during pregnancy. Domperidon® (motilium) its use is now restricted to the relief of nausea and vomiting [13], and it is suggested to be used here for nausea also.

Whereas Decadron® (dexamethasone) is used for the treatment of various conditions, including a number of skin diseases, severe allergies, rheumatic problems, asthma and pulmonary diseases, and it is suggested to be used here for preterm labor. Studies have shown that dexamethasone can accelerate maturation of fetal lungs, reduce the proportion of respiratory distress syndrome in neonates and improve survival in preterm delivered neonates [13, 15]. The lowest possible dose needed to treat disease must be used in pregnancy.

Another drug is Ventolin® (salbutamol) which is used for treatment of wheezing and shortness of breath caused by pulmonary problems [13], and it is suggested to be used here for uterine contraction. It is a β_2 adrenergic receptor agonist which acts by causing relaxation of smooth muscles.

Duvadilan® (isoxsuprine) (isoxsuprine hydrochloride) is another drug that has been recorded many times and it is used as a vasodilator [13], and it is suggested to be used here for uterine contraction.

Aspirin® (acetylsalicylic acid) which was recorded to be 16% of prescriptions, is used to lower fever and relieve mild to moderate pain from conditions such as headaches, common cold, toothaches, and muscle aches [13], and it is suggested to be used here for antiphispholipid syndrome that associated with some pregnancies.

Luminal® (phenobarbital) which is representing the highest percentage in prescriptions (30%), this drug is used to control seizures [13], and Valium® (diazepam) is used to treat anxiety and seizures and to relieve muscle spasms or promote sedation [16] and they are suggested to be used here for relief pain in threatened abortion and for uterine muscle relaxation.

According to responses from participants, about 22 % of prescriptions were refilled many times and more than half of this percentage used them without medical consultations; this indicates that many pregnant women may misuse drugs that could be harmful to herself and the fetus.

One of limitations associated with this study is the inability to estimate the extent of drugs misuse during each trimester of pregnancy due to the lack of information within the prescriptions.

Most of drugs in the prescriptions here were unsafe to be used during pregnancy and not prescribed according to the scientific bases and the specific conditions associated with pregnancy. This may due to the critical conditions of pregnant women that make the benefits of drugs more than their harmful effect. However some drugs used in the prescription have serious side effects may even lead to terminate pregnancy or getting birth to undeveloped or unhealthy baby such as antithyroid

drugs and antifungal drugs [17, 18]. In addition some herbals and oral antifungals used during first trimester by pregnant could be also harmful [19, 20].

Prescribing drugs during this period needs a special care as this issue can be dangerous for mother and her fetus.

4- Conclusion

The unique nature and physiology of pregnancy represents a challenge for choosing suitable and safe pharmaceuticals and treatment of acute and chronic disorders and for management of symptoms and complaints during pregnancy. It is the responsibility of health care providers including pharmacists to educate women about accurate and complete information and the risks and benefits of using medications during pregnancy. In addition, when selecting certain drug to be used in pregnancy effectively, it is often preferably to choose drugs that have been in use for a long time as their fetal safety had been established even though new alternative drugs are available.

From this study we concluded that there is a misuse of medications as 75% of prescriptions for pregnant women have used unsafe medications during pregnancy which in turn need more attention from medical staff.

5-Recommendations

- Before prescribing or purchasing any drug (even OTC drugs) or dietary supplement and medicinal herbs, a pregnant woman should be educated about her condition and consult her physician.
- Advising women to talk to her doctor or pharmacist about the risks and benefits of taking the drug.
- Holding scientific seminars and meetings among medical staff focusing on scientific use of specific drugs and preventing misuse or medication errors.

References:

1. Sachdeva, P., B.G. Patel, and B.K. Patel, *Drug use in pregnancy; a point to ponder!* Indian journal of pharmaceutical sciences, 2009. **71**(1): p. 1-7.

2. Blackburn, S., *Maternal, Fetal, & neonatal physiology-E-book: a clinical perspective.* 2017: Elsevier Health Sciences.

3. Cragan, J.D., et al., *Ensuring the safe and effective use of medications during pregnancy: planning and prevention through preconception care.* Matern Child Health J, 2006. **10**(5 Suppl): p. S129-35.

4. Whittlesea, C. and K.D. Hodson, *Clinical pharmacy and therapeutics e-book.* 2018: Elsevier Health Sciences.

5. Chaphekar, N., et al., *Maternal-Fetal Pharmacology of Drugs: A Review of Current Status of the Application of Physiologically Based Pharmacokinetic Models.* 2021. **9**.

6. Shanks, A., *Drugs in pregnancy and lactation: a reference guide to fetal and neonatal risk.* 2015, Oxford University Press.

7. Feghali, M., R. Venkataramanan, and S. Caritis, *Pharmacokinetics of drugs in pregnancy.* Seminars in perinatology, 2015. **39**(7): p. 512-519.

8. Andrade, S.E., et al., *Prescription drug use in pregnancy.* Am J Obstet Gynecol, 2004. **191**(2): p. 398-407.

9. Meadows, M., *Pregnancy and the drug dilemma.* FDA Consum, 2001. **35**(3): p. 16-20.

10. Pernia, S. and G. DeMaagd, *The New Pregnancy and Lactation Labeling Rule.* P & T : a peer-reviewed journal for formulary management, 2016. **41**(11): p. 713-715.

11. *Content and format of labeling for human prescription drug and biological products; requirements for pregnancy and lactation labeling. Final rule.* Fed Regist, 2014. **79**(233): p. 72063-103.

12. Juo, P.-S., *Concise dictionary of biomedicine and molecular biology.* 2001: Crc Press.

13. https://www.medscape.com/public/medscapeapp. 2020.

14. Sun, L., et al., *Use of metoclopramide in the first trimester and risk of major congenital malformations: A systematic review and meta-analysis.* 2021. **16**(9): p. e0257584.

15. Cheng, X., et al., *Dexamethasone use during pregnancy: potential adverse effects on embryonic skeletogenesis.* Curr Pharm Des, 2014. **20**(34): p. 5430-7.

16.Senczuk-Przybylowska, M., et al., *Diazepam and its metabolites in the mothers' and newborns' hair as a biomarker of prenatal exposure.* J Physiol Pharmacol, 2013. **64**(4): p. 499-504.

17.Taylor, P.N. and B.J.E.t.j. Vaidya, *Side effects of anti-thyroid drugs and their impact on the choice of treatment for thyrotoxicosis in pregnancy.* 2012. **1**(3): p. 176-185.

18.Moudgal, V.V. and J.D.J.E.o.o.d.s. Sobel, *Antifungal drugs in pregnancy: a review.* 2003. **2**(5): p. 475-483.

19.Leke, A.Z., et al., *Prevalence, determinants and attitude towards herbal medicine use in the first trimester of pregnancy in Cameroon: A survey in 20 hospitals.* 2022. **2**(8): p. e0000726.

20.Patel, M.A., et al., *Common antifungal drugs in pregnancy: risks and precautions.* 2021. **71**(6): p. 577-582.

EVALUATION OF INHIBITIVE ACTION OF BLACK TEA EXTRACTS ON THE CORROSION PROTECTION OF MILD STEEL IN ACIDIC SOLUTION

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Abstract:

It was examined to evaluate the effectiveness of extracted tea leaves as the green corrosion inhibitor that contains mild steel in acidic solvents. The test specimens were dissolved in an acidic solution with different concentrations of the extracted tea leaves. After 3 hours of immersion, the corrosion rate (CR) was measured. The results showed that a concentration of 1000 mg/l caused a significant inhibition in corrosion rate as compared to control. To see how black tea (BT) extract affected mild steel corrosion in 1 M HCl, it was subjected to a loss of weight procedure. The corrosion level and the inhibitor's performance were examined at five different BT extract concentrations that included 0.4, 1 , 1.4 , 2, and 2.4 g/l. According to the findings, an increase in BT concentration at every temperature decreased CR. As a result of the rise in kinetic activities of the metal surface interface, typically, temperature elevation leads to an increase in CR at every concentration of BT extract. The study's findings showed that adding 2.4 g/l of inhibition efficiency resulted in a temperature of 323 K, resulting in 84.95% inhibition efficiency. The small activation energy (Ea) of 8.74 and 11.45 kJ/mole reflected the barrier layer properties of BT extract and its chemical interactions on mild steel surfaces. The thermodynamic parameter revealed the spontaneous interaction between BT extract species and steel surface as kad rose from 0.929 to 1.728 $(g/l)^{-1}$.

Key words: Corrosion Rate, Mild Steel, İnhibitive Efficiency, Green İnhibitor, Thermodynamic Parameter.

Introduction:

Metallic equipment corrosion has always been the biggest challenge in any manufacturing industry. The metal component exposed to a corrosive environment attack may impact the performance of the overall process [1]. Steel is considered one of the most popular alloys used extensively in mechanical equipment and industries like heat exchanger, boiler , and pipelines. The degradation of metal results in economic cost and could cause plants to shut down due to the harmful effect of corrosion on the product quality [2]. Many industries and operations use highly acidic media, especially HCl [3]. Acidity conditions may decline the equipment's service life; therefore, various corrosion control and monitoring techniques are used to prevent component failure [2-4]. Corrosion inhibitors are an essential method commonly used in the aggressive environment to reduce, slow down or delay corrosion of the components [5]. The dosage of the chemical substance should be in a specified treatment to work as an inhibitor, which could significantly improve the corrosion resistance and is considered a good protection technique for mild steel in various acidic solutions [6]. Chemical inhibitors are either inorganic or organic compounds. As the literature describes, most effective inorganic inhibitors like the sodium salts of chromate, molybdate, and others naturally form a passivation film due to oxidation [4]. These inhibitors, which accumulated on the metal surface and create a barrier film, are primarily composed of oxygen, sulfur, nitrogen, alkenes, and phosphorous.

They are costly, dangerous, and may have devastating consequences for the ecosystem and physical health regarding chemical inhibitors. Green corrosion inhibitors have become popular recently because they are naturally safe, biodegradable, cost-effective, accessible, and free of harmful chemicals [7-9]. Various researchers have explored chemical inhibitors such as ferrous sulfate treatment [10], coating [11], seeds and leaves of plant extracts [12-17]. It was found that green inhibitors could successfully reducing the corrosion rate and impede the growth of various microorganisms and fungi. Previous studies using natural inhibitor shown that high level of extract concentration have no effect in eliminate corrosion. Thus, the black tea extract is applied as a green inhibitor to protect mild steel against corrosion in acid solution by measuring the rate of metal removal at different temperature and at low concentration of black tea extract from (0.4 to 2.4)g/l. The current approach includes the calculation of the kinetics and thermodynamics parameters with and without using inhibitor.

Experimental Work

Mild steel specimens and solution preparation

A mild steel plate was cut in half to create a standard 30 x 20 x 2 mm size. The findings were pulverized using silicon carbide abrasive paper of 320-1000 grades for the oxide film to be removed. After that, the specimens were cleaned with water, polished, acetone-dried, and kept at 25 degrees Celsius for weight loss checks. Also, aggressive solutions of 1 M hydraulic acid were produced by diluting 37% HCl with distilled water and used as electrolytes for measurements.

Preparation of BT solutions extract

The packaged tea was bought at a nearby market and used to make black tea. The solution of BT extract was prepared by an aqueous solvent technique. 6 grams of BT was dissolved in 800 milliliters of boiling distilled water for exactly 90 minutes. The extract solution was then filtered and concentrated under a vacuum at 40 degrees Celsius for two hours. The 40ml extract was stored in the refrigerator to keep for future use.

Weight loss measurements

An appropriate technique to assess corrosion is the analysis of loss of weight. A succession of emery papers was ground with mild steel coupons, then cleaned with acetone and dried at 25 degrees Celsius. The items were then weighted and put in a hundred milliliter of HCl, in the presence and absence of BT extract of different concentrations. A thermostatically regulated water bath was utilized to provide a steady temperature during the research at 293, 303, 313, 323, and 333 K. After three hours, the specimens were extracted and tested again using distilled water. Weight loss data was applied to determine the metal removal rate with Equation (1) [18].

$$CR(mm /y) = (87.6 W)/D.A.T \quad ....(1)$$

One mm/y denotes 39.37 mpy, and CR represents the rate of corrosion in millimeters/year. W represents mg of weight loss, A reflects the whole opened surface area of the coupon in cm^2, T refers to the time of immersion (hours), and D equals 7.86 g/cm^3 is the specimen density.

Inhibition efficiencies (IE %) were computed from Equation (2) [19].

$$IE\% = \frac{CR_o}{CR_o - CR_{inh}} \quad ....(2)$$

whereas CR_o, CR_{inh} are the corrosion rates in the absence and in the presence of an inhibitor.

Results and Discussion

The rate of corrosion

The explanatory information is listed in Table (1). The CR measured was reduced due to the BT extract concentration increased at all temperature. For example, the CR fell from 19.33 to 12.50 mm/y when 0.4 g/l BT extract was added to an empty acidic solution at 293 K. Also, in these experiments, the CR was clearly shown to be about five times lesser than in the used of 2.4 g/l BT. In addition, at all checked temperatures, the corrosion rate declines as the BT extract inhibitor concentration improves. As the BT concentration increases, the corrosion rate drops even at 293 K. In other words, when BT extract is introduced into an acidic solution to inhibit the corrosion process (to lower CR), it increases the protective effects on a steel surface. This confirms that BT extract has antimicrobial activity against various microorganisms and exerts a protective effect on metal surfaces [20]. In addition, when BT extract was present, a significant decline in CR was seen at elevated temperatures. The obtained results confirm the extract's 323 K high-temperature stabilities. This may be due to the high-temperature stability of the BT matrix [21], which resists degradation or interaction with other substances in the solution.

Table (1) The corrosion parameters were examined with and without different black tea extract concentrations levels after the weight loss was measured in 1 M Hydrochloric acid at different temperature.

BT(extract) Concentration (g/l)	Temperature									
	293		303		313		323		333	
	CR(mm/y)	IE%	CR(mm/y)	IE%	CR(mm/y)	IE%	CR(mm/y)	IE%	CR(mm/y)	IE%
Blank	19.33	-	23.52	-	30.22	-	36.01	-	40.22	-
0.4	12.50	35.33	14.24	39.47	15.35	49.22	16.68	53.66	19.84	50.66
1	11.05	42.82	12.08	48.62	13.40	55.64	15.69	56.42	18.42	54.20
1.4	8.79	54.52	10.50	55.34	10.99	63.62	11.66	67.61	15.96	60.31
2	6.67	65.49	7.24	69.20	8.39	72.23	9.27	74.25	11.95	70.27
2.4	4.33	77.56	4.68	80.08	5.25	82.61	5.41	84.95	8.24	79.51

The inhibition efficiency

Percentage inhibition efficiency data are presented in Figure (1) via the corrosion rate computation. The obtained results confirmed that IE % increased as the BT extract concentration rose. The absorption of BT extract onto mild steel surfaces, which stopped active metal sites and avoided the corrosive attack by acid solution, is the basis for this increase in the number of components in BT extract. In addition, a temperature increase from 293 to 323K resulted in a substantial boost in the, IE %

(77.56% - 84.95%), owing to thermal stability and inhibition performance of BT extract at high temperatures. Further increase in solution temperature to a value of 333 K led to reduction in IE % (79.51%) which was most closely related to the deterioration of BT extract substance at high temperature. The increased ionic mobility may have influenced the protective activity of BT extract at the metal/electrolyte interface, which was blocked at elevated temperatures [20]. However, the direct link between the inhibitor efficiency and BT extract concentration was seen in the medium of 1 M HCl aggressiveness.
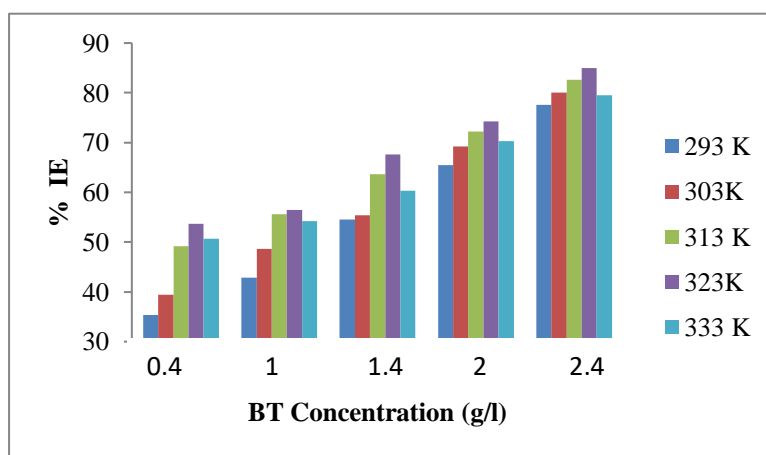
Figure (1) Variation of IE percentage with various BT concentrations and temperatures.

Kinetic and thermodynamic parameters:

To measure kinetic and thermodynamic properties, mild steel corrosion in differing concentrations of BT was employed at various temperatures. The Arrhenius Equation (3) [21] can be utilized to form kinetic information.

$$\ln (CR) = B - \frac{E_a}{RT} \quad \ldots\ldots\ldots(3)$$

B is the metal-dependent Arrhenius constant, whereas R is the 8.314 J/mol.k uniform gas constant. The activation energy (Ea) were computed from a slope of an ln CR against 1/T presented in Figure (2). The enthalpy (ΔH^o) and entropy (ΔS^o) were computed by the transition state Equation (4).

$$CR = \frac{RT}{Nh} \exp \left(\frac{\Delta S^o}{RT} \right) \exp \left(\frac{-\Delta H^o}{RT} \right) \quad \ldots\ldots (4)$$

N denotes Avogadro's number, as h refers to Planck's variable. After plotting ln (CR/T) versus 1/T, the magnitude of ΔH^o and ΔS^o were determined from a straight line with a slop and intercept as shown in Figure (4). Then, the obtained results are demonstrated by Table (2).
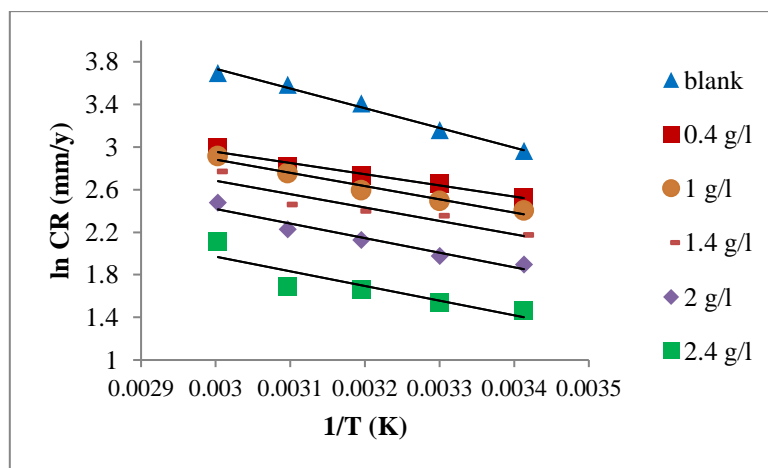
Figure (2) The Arrhenius plots of mild steel corrosion, alone and with conjunction of BTextract, in 1M HCl.
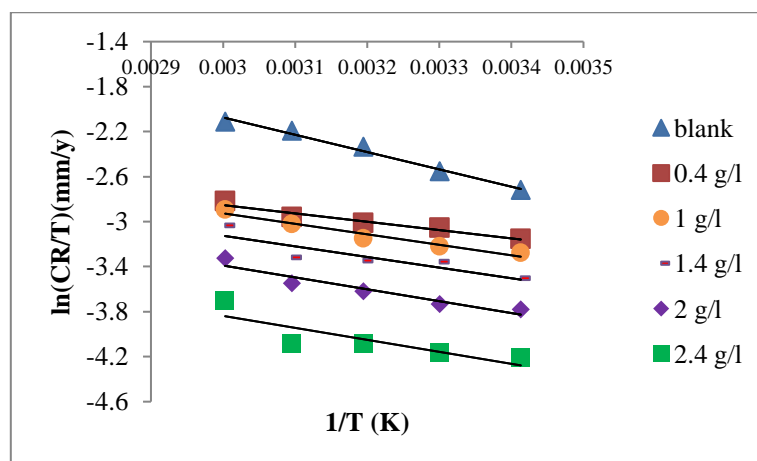
Figure (3) A graph of ln (CR/T) with 1/T with different concentrate levels of BT.

In the presence of BT extract, BT molecules absorbed on a metal surface[22] may require relatively low activation energy values. BT extract may also have antioxidant properties [22]. Furthermore, the decrease in Ea values observed in treated specimens was attributed to the coordination compound generated between metal and BT extract molecules. This action effectively ensured that the thick blocking layer was generated by BT extraction. A thick film hampered steel dissolution because of the hydrocarbon chains orientation to the acid solution [23,24].

Table (2) Thermodynamic parameters at various BT concentrations .

Conc. of BT(g/l)	E_a (kJ/mol)	ΔH^o (kJ/mol)	$-\Delta S^o$ (J/mol.K)
Blank	15.38	12.79	21.15
0.4	8.74	6.15	5.26
1	10.35	7.76	1.06
1.4	10.45	7.85	2.42
2	11.38	8.78	1.83
2.4	11.45	8.86	5.33

Adsorption isotherm and Gibbs energy:

For the corrosion inhibition tendency of organic molecules, meeting inhibitor particles and metal surface through the adsorption action can be imperative. The adsorbed film created at a specific temperature, dependent on concentration of BT extract, was computed using Surface Coverage (θ) Equation (5).

$$\theta = IE / 100 \qquad \ldots\ldots\ldots\ldots\ldots(5)$$

The surface coverage obtained was used to classify the fitted adsorption isotherm type BT extract's inhibitory properties may be explained by adsorption of BT extract onto mild steel surfaces, forming a passive film. The surface coverage θ increased as the extract concentration in all tested temperatures (293 to 333 K) rose. This indicates that BT extract adsorbs onto the surfaces of metal substrates. According to the plot C_{inh}/θ vs C_{inh} at different temperature as shown in Figure (4) a linear trend with slop and correlation coefficient R^2 approximately equal to one, the adsorption type was followed Langmuir adsorption isotherm as given in Equation (6) [26].

$$\frac{C_{inh}}{\theta} = \frac{1}{K_{ad}} + c_{inh} \qquad \ldots\ldots\ldots\ldots\ldots ..(6)$$

The adsorption constant is K_{ad}, while BT concentration is C_{inh}. By intercepting the lines with the x-axis, magnitude of K_{ad} and free standard energy ΔG are determined from Equation (7) [26].

$$K_{ad} = \frac{1}{55.5} \exp \left(\frac{\Delta G_{ad}}{RT}\right) \qquad \ldots\ldots\ldots\ldots\ldots (7)$$
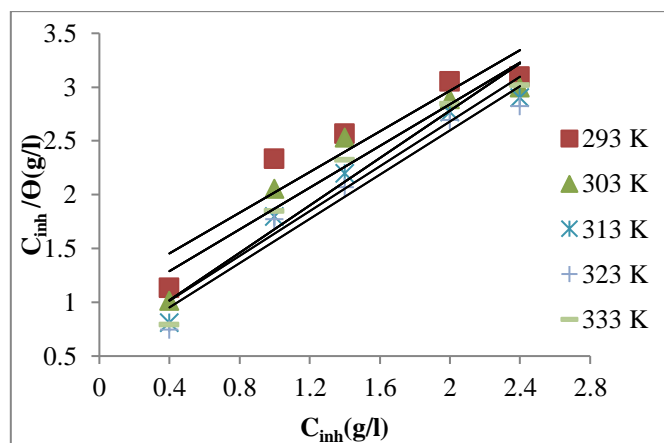
Figure (4) Isotherms mode of black tea extract at various temperature.

The modified Gibbs–Helmholtz Equations (8) [27] applied to compute the thermodynamic properties of adsorption, including enthalpy ΔH_{ad} (kJ/ mol) and entropy ΔS_{ad} (kJ/mol).

$$\Delta G_{ad} = \Delta H_{ad} - T.\Delta S_{ad} \ldots\ldots\ldots\ldots(8)$$

The parameter that had been obtained was listed in Table (3). It was deduced that increasing temperature from (293 to 333 K) led to k_{ad} increase from 0.929 to 1.728 $(g/l)^{-1}$. The term referred to the increase in interactions between BT molecules and a mild steel surface [28]

Table (3) The adsorption features of BT extract on a mild steel surface at multiple temperatures.

Temperature (K)	K_{ad} $(g/l)^{-1}$	ΔG_{ad} (kJ/mole)	ΔH_{ad} (kJ/mole)	ΔS_{ad} (J/mole. K)
293	0.929	-9.61		
303	1.095	-10.38	-14.014	0.0811
313	1.6736	-11.79		
323	1.848	-12.43		
333	1.728	-12.64		

When the ΔG_{ad} was about - 20 kJ/mol or even less, it implied a physisorption interaction, demonstrating the moves to the surface of the metal or charge sharing. The data decreased toward more negative values (9.61 to 12.64) kJ/mol as the temperature rose from 293 to 333 K. A protective passive layer in the acid medium was created when BT species adsorbed spontaneously on mild steel surfaces [30]. A linear trend with a coefficient of correlation of 0.9409 as shown by Figure (5), indicated the plot of ΔG_{ad} against the value of temperature. Also the slope and intercept of the linear relationship depicted by Table (3) have been applied to compute the standard (ΔH_{ad}) and (ΔS_{ad}). In the interaction between mild steel surface and BT extract molecules [28,29], the negative signal of (ΔH_{ad}) suggested an exothermic

adsorption procedure. Thus, mild steel dissolution was triggered by ionic species migration to the barrier layer. The study also assisted mild steel surface hydrophobization with a higher temperature and BT concentration [30,31]. The adsorption process of BT extracts on metal surface has resulted in an increase of the disorder which can be demonstrated by the obtained positive magnitude of the entropy (ΔS +0.0811). Concerning research, both chemisorption and physisorption are essential for the green inhibitor ability of BT extract on mild steel in 1 M HCl.
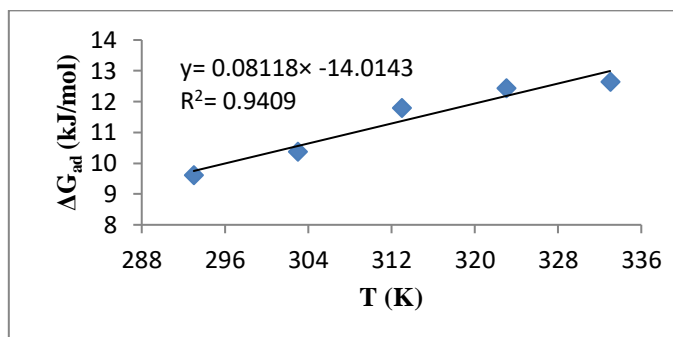
Figure(5) The variation of ΔG (kJ/mol) as a function of temperature (K) for mild steel in 1 M HCl.

Conclusion

❖ BT extract showed a significant inhibitory effect in the acid solution when the CR of mild steel decreased and IE % improved over all investigations. When the temperature was increased from 293 to 323 K, the IE % rose from 77.56% to 84.95%, with a highest extraction of 2.4 g/l. As the temperature was elevated to 333 K, the IE% decreased to 79.51%, suggesting that the barrier layer deteriorated. However, as the temperature was higher than 333 K, the corrosion rate began to increase; consequently demonstrating that the barrier layer had deteriorated slightly due to exposure to high temperatures.

❖ At ambient temperature and various BT concentration ranging from (0.4- 2.4 g/l), the results confirmed an enhancement in the IE % value from 35.33 % -77.51%.

❖ The adsorption of BT extract on mild steel follows the Langmuir adsorption isotherm.

❖ A spontaneously adsorbed of the BT particles on metal surface occurred according to negative magnitude of ΔG_{ad}.

❖ Due to the favorable kinetics and thermodynamic characteristics, the action of BT molecules implied chemisorption and physisorption processes on mild steel surfaces.

References:

[1] Yahaya, L.E, Aroyeun, S.O, Ogunwolu, S.O, Jayeola, C.O. & Igbinadolor, R.O., 2017. Green and Black Tea (Camellia sinensis) Extracts as Corrosion Inhibitor for Mild Steel in Acid Medium. World Applied Sciences Journal, 35(6), 985-992.

[2] Mohammed, S., Muhammad, S., Soofia, U., Izhar, M., Faisal A., & Kashif, D., 2019. Corrosion inhibition of mild steel in 1 M HCl by sweet melon peel extract. Journal of King Saud University Science 31, 1344-1351.

[3] Amitha Rani, B. E., & Bharathi Bai, J., 2012. Green Inhibitors for Corrosion Protection of Metals and Alloys: An Overview. International Journal of Corrosion.

[4] El-Etre, A.Y., 2006. Natural onion juice as inhibitor for zinc corrosion. Bulletin of Electrochemistry, 22(2), 75-80.

[5] Hamdan, A. B., Suryanto, & Haider, F. I., 2017. Study on tea leaves extract as green corrosion inhibitor of mild steel in hydrochloric acid solution. IOP Conference Series, Materials Science and Engineering, 290.

[6] Dakeshwar, K.V., & Fahmida K., 2015, Corrosion Inhibition of High Carbon Steel in Phosphoric Acid Solution by Extract of Black Tea. Advances in Research, 5(4), 1-9.

[7] Rakesh K., Nitin G., Nafees, S. M., & Kalpana, S., 2020. Inhibition of Mild Steel Corrosion in Hydrochloric Acid Solution by Leaves of Ziziphus jujube. Nature Environment and Pollution Technology An International Quarterly Scientific Journal, Vol. 19, 799-807.

[8] Yee, Y. J., 2004. Green inhibitors for corrosion control: a Study on the inhibitive effects of extracts of honey and rosmarinus officinalis L. (Rosemary), M.S. thesis, University of Manchester, Institute of Science and Technology.

[9] Sunday, J., Olusegun, J., Ibhadiyi A., Oyetunji D., 2017. Green inhibitors for corrosion protection in acidizing oilfield environment. Journal of the Association of Arab Universities for Basic and Applied Sciences, 24, 34-38.

[10] Wassan Abduallah, Nawal Jassim, Qais A.Hassan Control of Corrosion of Copper-Alloy Condenser Tubes by Chemical Treatment Engineering and Technology Journal 2012, Volume 30, Issue 17, Pages 2951-2965.

[11] Wasan Alkaron, Qais A. Reshack Protection of Copper Alloy Condenser Tubes by Coating Proceedings of 2nd International Multi-Disciplinary Conference Theme: Integrated Sciences and Technologies, IMDC-IST 2021, 7-9 September 2021, Sakarya, Turkey.

[12] Ekpe, U. J., Ebenso, E. E. & Ibok, U. J., 1994. Inhibitory action of Azadirachta indica leaves extract on the corrosion of mild steel in H_2SO_4. West African Journal of Biological and Applied Chemistry, vol. 37, pp. 13–30.

[13] Odiongenyi, A. O., Odoemelam, S. A. & Eddy, N. O., 2009. Corrosion inhibition and adsorption properties of ethanol extract of Vernonia Amygdalina for the corrosion of mild steel in H_2SO_4. Portugaliae Electrochimica Acta, vol. 27, no. 1, pp. 33–45.

[14] Okafor, P. C., Osabor, V. I. & Ebenso, E. E., 2007. Eco-friendly corrosion inhibitors: Inhibitive action of ethanol extracts of Garcinia kola for the corrosion of mild steel in H2SO4 solutions. Pigment and Resin Technology, vol. 36, no. 5, pp. 299–305.

[15] Hamad Zaid, A.K., Merajuddin, M.S.A., Mahmood, M.A., Abdullah, A.M., Ahmad, A.M. & Zeid, A.M.A., 2014. Launaea nudicaulis as a source of new and efficient green corrosion inhibitor for mild steel in acidic medium: A comparative study of two solvent extracts. Internl. J. Electrochem. Sci., 9, 870-889.

[16] Umoren, S.A., Eduok, U.M., Solomon, M.M. & Udoh, A.P., 2016. Corrosion inhibition by leaves and stem extracts of Sida acuta for mild steel in 1 M H_2SO_4 solutions investigated by chemical and spectroscopic techniques. Arabian J. Chem., 9, S209-S224.

[17] Alsabagh, A.M., Migahed, M. A., Abdelraouf, M. & Khamis, E.A., 2015. Utilization of Green Tea as Environmentally Friendly Corrosion Inhibitor for Carbon Steel in acidic media. International Journal of electrochemical science, 10, 1855 – 1872.

[18] Oparaodu K.O., & Okpokwasili G. C., 2014. Comparison of percentage weight loss and corrosion rate trends in different metal coupon from two soil environments. Int. J. Environ. Bioremed. Biodegr. 2(5), 243-249.

[19] Huiwen, T.,Weihua, L., Ang, L., Xiang, G., Peng, H., Rui, D., Cuizhen, Y.,& Dapeng, W., 2018. Controlled delivery of multi-substituted triazole by metal-organic framework for efficient inhibition of mild steel corrosion in neutral chloride solution. Corrosion Science, 131, 1-16.

[20] Yujie, Q., Shengtao, Z., Bochuan, T., & Shijin, C., 2018. Evaluation of Ginkgo leaf extract as an eco-friendly corrosion inhibitor of X70 steel in HCl solution. Corrosion Science, 133, 6-16.

[21] Schorr M., & Yahalom J., 1972. The significance of the energy of activation for the dissolution reaction of metal in acids. Corrosion Science 12, 867–868.

[22] Ali Reza, H. Z., Iman, D., Mohamad, H., 2013. Thermodynamic and Adsorption Behavior of Medicinal Nitramine as a Corrosion Inhibitor for AISI Steel Alloy in HCl Solution. Journal of Materials Science & Technology, 29 (9): 884-892.

[23] Hamdy, A., Nour, Sh.El-Gendy, 2013. Thermodynamic, adsorption and electrochemical studies for corrosion inhibition of carbon steel by henna extract in acid medium. Egyptian Journal of Petroleum, 22 (1), 17-25.

[24] panel T., Szauer A.Brandt, 1981. Adsorption of oleates of various amines on iron in acidic solution. Electrochimica Acta, 26 (9), 1253-1256.

[25] Kumari, P., Shetty, P., Rao, S.A., Sunil, D., 2017. Inhibition behavior of 2-[(2-methylquinolin-8-yl) oxy] acetohydrazide on the corrosion of mild steel in hydrochloric acid solution. Trans Indian Inst Met 70, 1139–1150.

[26] Rao, Y., Kumari, P., Sunil, D., Shetty, P., Rao, S.A., 2019. Attenuation of acid corrosion of mild steel using a novel organic dye: electrochemical and surface measurements, Surf Eng Appl Electrochem 55, 443–454.

[27] Saliyan, V.R., Adhikari, A.V., 2008 Quinolin-5-ylmethylene-3-{[8-(trifuoromethyl)quinolin-4-yl]thio} propanohydrazide as an efective inhibitor of mild steel corrosion in HCl solution. Corrosion Sci 50, 55–6.

[28] María,V., Fiori, B., Patricia, E., 2015. AlvarezabHugoVacaa, Claudio A.Gervasicd Corrosion inhibition of mild steel in HCL solution by pectin, Corrosion Science, 92, 192-199.

[29] Klodhi, M.J., Deen, K.M., Zia, U.R., Ameeq, F., Waseem, H., 2018. Electrochemical characterization and thermodynamic tendency of β-Lactoglobulin adsorption on 3D printed stainless steel, Journal of Industrial and Engineering Chemistry, 65, 180-187.

[30] Huiwen, T.,Weihua, Li., Ang, L., Xiang, G., Peng, H., Rui, D., Cuizhen, Y., Dapeng, W., 2018. Controlled delivery of multi-substituted triazole by metal-organic framework for efficient inhibition of mild steel corrosion in neutral chloride solution. Corrosion Science, 131, 1-16.

[31] Bothi Raja, P., Sethuraman, M.G., 2009. Strychnos nux-vomica an eco-friendly corrosion inhibitor for mild steel in 1 M sulfuric acid medium. Mater. Corrosion, 60 (1), 22–28.

THE PREVALENCE OF METABOLIC SYNDROME DURING QUARANTINE PERIOD DUE COVID-19 PANDEMIC

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Abstract:

Obesity, dyslipidemia, and insulin resistance are a cluster of Metabolic syndrome. Also, stress and In Iraqi, the percentage of metabolic syndrome increased due to the risk of depression. The aim of this study was early prediction and diagnosis of the metabolic syndrome, in addition, to determine the effect of quarantine due to the CORONA-19 pandemic on metabolic syndrome in Iraq. We investigated the physiological origins of this clinical observation linking metabolic syndrome with severity and adverse outcome of COVID-19. This cross-sectional study was conducted during the period from April to June 2020 in Iraq. This clinic was chosen for data collection as it introduces medical advice for weight management for large geographical areas in Iraq with different socioeconomic populations. The samples tested were (156) samples which divided to the male group were (56) samples and female group (100) A consecutive sample of adult of both sexes aged 11 to 60 years (with inclusion/exclusion criteria) was collected on a daily basis throughout the study period The result in this study exhibit the percentage of the subject with obesity elevated during the COVID-19 pandemic period. Also, the results reveal a statistically significant increase in BMI, Blood pressure, and the blood sugar of subjects during quarantine periods in comparison with periods before the COVID-19 pandemic period. In conclusion: the potential mechanisms of Metabolic syndrome during quarantine are complex and may involve several shared physiological pathways, such as obesity, an increase in blood pressure, and glucose. The prevalence of metabolic syndrome increase during quarantine due to the COVID-19 pandemic related to changes in their environment, behavior, and lifestyles that cause stress and depression.

Key words: Metabolic Syndrome, COVID-19, Glucose and Blood Pressure.

Introduction:

Metabolic syndrome (MetS) is a worldwide distributed public health problem and its incidence of increase. (MetS) is characterized by a clustering of several metabolic abnormalities, including central (intra-abdominal) obesity, dyslipidemia, hyperglycemia, and hypertension (Alwaid and Al-dujaili, 2019). There is a cluster of factors that elevated the risk of cardiovascular, atherosclerotic, and heart disease, also other forms of diabetes mellitus type 2 called Metabolic syndrome. Physical inactivity and obesity are driving forces (Aguilar-Salinas and Viveros-Ruiz, 2019; Saleh *et al.,* 2017). The central obesity(increase in body fat in the abdomen) is A basic component in MS which measured by waist circumference (WC) and is a more typical profile of the metabolic syndrome than body mass index (BMI) (Federation, 2006; Lee *et al.,* 2012).

metabolic syndromes can result from an increase in central adiposity that causes insulin resistance(IR) and hyperinsulinemia (Tenenbaum and Fisman, 2011; Ruderman *et al.,* 2013; Blaton *et al.,* 2008; Tao *et al.,* 2016).

At the time of this writing, The strain of coronavirus called COVID-19 disease caused the severe acute respiratory syndrome to reach pandemic levels and lead to threatening human life and limit the activity of worldwide (Dietz and Santos-Burgoa, 2020; Balla *et al.,* 2020; Puig-Domingo, *et al.,* 2020).

COVID-19 is frequently noticed in people with diabetes, obesity, and hypertension (Simonnet *et al.,* 2020), which are the main components of metabolic syndrome. Also, the mortality of infected patients with SARS-CoV-2 is more serious in cases that have a metabolic syndrome feature compared with cases that do not (Dietz, 2020; Lighter *et al.,* 2020; Kassir, 2020; Maddaloni *et al.,* 2020; Klonoff and Umpierrez, 2020; Hussein *et al.,* 2020).

Hospitalization, the patient with obesity (Ryan *et al.,* 2020; Simonnet *et al.,* 2020) and diabetes (Singh *et al.,* 2020) which are the main components of MS (Grundy *et al.,* 2005) are more usage of mechanical ventilation when admission to intensive care unit (ICU).

MS and diabetes mellitus appear to be important for the development of a more severely affected disease. (Zhu *et al.,* 2011; Reza *et al.,* 2019; Deane and Holers, 2019). The incidence of these disorders and their effect on the mortality rate are still uncertain, as previous disorders are not properly identified and may occur at the same time. For example, DM is most often linked to cardiac and hypertensive diseases (Mock *et al.,*

2011). In addition , in some cases, overweight (Klareskog *et al.,* 2009) and cigarettes (Zhu *et al.,* 2011).

The global incidence of DM is expected to increase to 4.4%. (366 million) in 2030 and the total number of people with DM is projected to increase to 42.3 million in China (Wild *et al.,* 2004). Although there was no cure method for diabetes, MetS, a cluster of medical conditions including central obesity, high blood pressure, hyperlipidemia, and dysglycemia have been identified in many clinical trials (Eckel *et al.,* 2005) were imbalanced, delayed, and controlled by early recognition of risk factors and diseases. Mets was a good DM incident predictor (Sacoet *et al.,* 2014), recorded by a median of 5 years to precede the probability of DM incidence (Klein *et al.,* 2002). However, the clinical use and practicality of MetS is discussed (Alberti *et al.,* 2008).

Several studies have shown convincingly in recent decades that people with obesity, prediabetes, diabetes, and MetS are at high risk of pulmonary failure, in particular, restrictive pulmonary mode. Chronic obstructive pulmonary disorders, typically detected by clinicians and the general population and generally assessed by decreased forced expiratory volumes in 1 s, may play a minor role in the physiology of reported impaired lung function in patients with MetS or diabetes (Li *et al.,* 2013).

Overweight and MetS have often been shown to be correlated with influenza A (H1N1) (Bijani *et al.,* 2016), although the actual nature has not been investigated. For this reason, it is appropriate to permit serious conditions and high morbidity in cases of COVID-19 complemented by MetS traits, since the lung is the primary target organ in SARSCoV-2 (Nakajima, 2020).

The prevalence of MetS and obesity is also well-recognized to be higher among Americans and Europeans than among Asians (Pan *et al.,* 2008) and may show some variations in frequency, hospitalization and morbidity and mortality of COVID-19 between European and western regions. MetS, on either side, is often more common in men than in women (Marhl *et al.,* 2020), is related to chronic renal failure (Ball *et al.,* 2020; Henry and Lippy, 2020). and would be triggered by the same mediated pathway referred to above. There is medical evidence that diabetic patients are at higher risk for diabetes. There is scientific evidence that diabetic patients are at significant risk Coronavirus 2019 (COVID-19) (Marhl *et al.,* 2020). It is also known that DM may be one of the main health conditions of COVID-19. 19 (YLiu *et al.,* 2020; Zhang *et al.,* 2020; Brake *et al.,* 2020; Fang *et al.,* 2020). It should be remembered that we are faced with the T2DM epidemic following the COVID-19 epidemic. The WHO Global Diabetes Report (Roglic, 2016).

Therefore, the aim of this study was to early prediction and diagnosis of the

metabolic syndrome in addition to Determine the effect of quarantine due to the CORONA- 19 pandemic on metabolic syndrome in Iraq. We investigated the physiological origins of this clinical observation linking metabolic syndrom with severity and adverse outcome of COVID-19.

2. MATERIALS AND METHODS:

This cross-sectional study was performed through the duration from April to June 2020 in Iraq. This clinic was chosen for data collection as it introduces medical advice for weight management for large geographical areas in Iraq with different socioeconomic populations.

2.1. Study Design:

The samples tested were (156) samples, which divided into the male group were (56) samples, and the female group (100). The sample of adults for both sexes aged 11 to 60 years (with inclusion/exclusion criteria) was collected on a daily basis throughout the study period.

2.2. Questionnaire:

The form of the questionnaire has been progressed by the researchers. Verbal consent was taken from each participant. This form including general information such as age, sex, physical activity, medical history, and smoking history which showed in table (1). In this study, the physiological examination was carried out for every respondent, including measuring weight, height, blood pressure, and biochemical measurement of fasting plasma glucose also done.

2.3. Body Mass Index (BMI)

Patient weights and lengths were assessed in light clothing. BMI was calculated with some well-calibrated digital weight and length-scale measurement method by dividing weight into kilograms by height square into meters, as in the formula: BMI = kilograms / height (meters)2. (Sahu *et al.,* 2007).

2.4. Glucose measurement:

Data were collected for each qualified participant for approval and then hands should be washed with healthy tap water and soap for blood glucose measurement during the COVID-19 quarantine pandemic. The blood glucose test procedure was extracted from the middle finger using a glucometer, including a capillary examination. Blood was systematically dropped on each test strip of glucometer and the results were recorded (Choukem *et al.,* 2019).

2.5. Blood pressure measurement

The mercury sphygmomanometer auscultatory approach was the reference standard for office BP calculation to all study participants. The mercury sphygmomanometer is relatively simple and does not experience major variance between versions produced by various manufacturers (Pickering, 2003).

2.6. Statistical Analysis:

The statistical analysis was performed with significant P<0.05 through the Spss program (SPSS version 23). The t-test was used to compare the two groups, while multivariate ANOVA has been used for the comparison among subdivided groups in the measured parameters.

3. RESULTS AND DISCUSSION:

3.1. Demographic Characteristics of study subject

In this study, a total of 156 cases consisting of 100 (64%) women and male 56 (36%) were examined. As shown in figure (1), The patients had ages ranging between 11 to 60 years. As illustrated in the same table, the subjects with BMI before the COVID-19 pandemic (normal weight 17% of the participants and about 55% suffered from overweight and of the 28% participants were obese subject. The data also, shows that 36% of the subject became suffered from obesity during the COVID-19 pandemic period.

3.2. The Comparisons of clinical characteristics between the two periods before and during COVID-19 pandemic

The mean values of BMI, Blood pressure and the blood sugar for two periods before and during the COVID-19 pandemic are shown in Figure (2, 3 and 4). The results reveal a statistically significant increase in BMI, Blood pressure and the blood sugar of subjects during COVID-19 pandemic periods compared with periods before COVID-19.

This result of a study similar to the study of Al-Bachir and Bakir, (2017) showed that concentrations of fasting blood sugar and the mean of blood pressure were significantly higher in the overweight and obese subject compared to the normal group. However, metabolic syndrome is A strong association with overweight and obesity and blood pressure(systolic and diastolic) was the main risk factor in the metabolic.

A previous study believed that a fat mass index was used in screening for the presence of Mets and also obesity is the main risk factor for cardiovascular disease (CVD) (Liu *et al.,* 2013). Another study suggested that Insulin resistance, which is associated with MS, causes disorders in glucose metabolism, elevated in blood pressure, and dyslipidemia (Haslam, 2005)So that depending on the result of the present study

and other previous studies we suggested that the metabolic syndrome in the Iraqi population increase during COVID-19 pandemic periods. However, this increase in the MS in the current study due to the study depending on three of the five symptoms such as obesity, high blood pressure, fasting blood sugar disorder (Gharipour *et al.,* 2006; Jang *et al.,* 2010).

3.3. The Comparisons of clinical characteristics between male and female

Figure (5, 6 and 7) shows the results of non-statistically significant in BMI and Blood pressure while, it is statistically significant (P<0.05) increase serum blood sugar in the male in compared with the female before and during COVID-19 pandemic periods.

The previous study suggested that the people Over the last 50 years have drastic changes in their lifestyle behavior, and environment. These changes cause elevated in the incidence of obesity and (Hossain *et al.,* 2007). Since it is the path of glucose in the body the same in men and women, therefore the proportion of glucose is almost identical in both sexes. However, this difference in the concentration of glucose between the sexes may be due to the difference in the gonadal hormones between the sexes in Glucose homeostasis. Also, menopausal estrogen therapy decline fasting glucose but impairing glucose tolerance (van Genugten *et al.,* 2006; Mauvais-Jarvis *et al.,* 2017). High glucose in older women was strongly linked with mortality risk (Kuk and Ardern, 2010).

Another study indicated that The prevalence of type 2 diabetes also depends on the sex differences, and there are more women with diabetes than men. This difference was depending on the reproductive life stage (Wild *et al.,* 2004); that is, Besides, the largest number of women with diabetes after the age of menopause and in older age, while there are more diabetic men before the age of puberty The explanation for this result is due to in most populations, the number of elderly women was greater than of men and the prevalence of diabetes increases with age (Wild *et al.,* 2004).

3.4. Comparison of clinical characteristics among different age groups:

The mean values of BMI and systolic blood pressure before and during the COVID-19 pandemic is shown in Figure (8) and (9), respectively. The results reveal a statistically significant increase in BMI when compared between age 11-20 and (31-40and 41-50) also when compared between age 21-30 and (31-40 and 41-50) before COVID-19 pandemic periods. Also, this figure reveals a statistically significant increase in BMI when compared between age 11-20, 21-30, with 31-40 during COVID-19 pandemic periods.

The result of the present study showed when compared with age before, and during COVID-19 pandemic periods in both systolic and diastolic pressure, we perceive that this pressure increase with age and we note it is non-significant the increase between

(11-20, 21-30) and (31-40) before COVID-19 pandemic while becoming significant between this age during COVID-19 pandemic. So that this study was similar to other earlier papers suggested that an increase in blood pressure is very common among the elderly, and the blood pressure increase with developing age (Saukkonen *et al.,* 2012).

Also, an increase in systolic blood pressure continues throughout life in contrast to diastolic blood pressure, which shows a reversed U-shaped trend with age (Burt,1988). The previous study has believed that the blood pressure level used in the definition of MetS should be altered to age (Gause-Nilsson *et al.,* 2006).

Resent study revealed that MS was found in 26% of younger (aged ≤65 years) and 55.0% of older (aged >65 years) participants. The most common metabolic syndrome combination presence in both older men (8.0%) and women (9.2%). the younger adults with all five metabolic syndrome factors were most strongly linked to mortality risk, while none of MS combinations were linked with mortality in older men. (Kuk and Ardern, 2010). However, the previous study believed that in addition to obesity, an increase in blood pressure was the most common disorder related to the prevalence of MS (van Vliet-O *et al.,* 2014).

Also, recent guidelines on the treatment of an increase in blood pressure show and age-adjusted blood pressure levels to start either a lifestyle or medical intervention (Mania *et al.,* 2014). A recent study suggested that the hyperinsulinemia with insulin resistance causes sodium reabsorption and sympathetic activity increases which leads to arterial pressure elevated. (Mendizábal *et al.,* 2013).

The results of Figure (10) indicate it is a statistically significant increase in diastolic blood pressure when compared between age 11-20, 21-30, and 31-40 when compared to 41-50 before COVID-19 pandemic periods. Also, there is a statistically significant increase in diastolic blood pressure between age 11-20, 21-30, when compared to (31-40 and 41-50) during COVID-19 pandemic periods.

Figure (11) explains the results of serum glucose level in all age groups before and during COVID-19 pandemic, these results mentioned significant (P<0.05) increase in glucose level of age group (31-40and 41-50) and when compared between age 11-20 before and during COVID-19 pandemic periods also when compared between age 21-30 and (31-40, 41-50 and 51-60) before COVID-19 pandemic periods

We suggested that the metabolic syndrome increased because of lifestyle differences, high stress, and depression during the quarantine. In addition, the previous study indicated that the prevalence of metabolic syndrome increase with Higher levels of stress. (Janczura *et al.,* 2015). Also, another study suggested a higher level of stress leads to hypertension (Candela *et al.,* 2008).

Depression is a second important disease for causing humanitarian and economic damage by 2020 (Noorbala *et al.,* 2011). However, depression was One factor that may be linked to metabolic syndrome (Vaccarino *et al.,* 2008).

Depression is a second important disease for causing humanitarian and economic damage by 2020 (Noorbala *et al.,* 2011). However, depression was One factor that may be linked to metabolic syndrome (Vaccarino *et al.,* 2008). So, depression was elevated the risk of MS in the general population by two times (Foley *et al.,* 2010). poor health-related behaviors are one of the causes that make People with depression are prone to metabolic syndrome (Kinder *et al.,* 2004). In some studies, there was no relationship between depression and metabolic syndrome (Demirci *et al.,* 2011), and in some studies, there was a relationship only between certain components to metabolic syndrome with depression (Miettola *et al.,* 2008), and in others, there was a relationship between the two variables (Puustinen *et al.,* 2011) On the other hand, patients with metabolic syndrome are prone to depression due to obesity (Pan *et al.,* 2012).

The relationship between depression and MetS may be induced Via many processes. First, depression was closely linked to overweight (Xu *et al.,* 2011), inflammation (Luppino et al., 2010) and resistance to insulin (Howren *et al.,* 2009) the etiological processes underlying MetS (McIntyre *et al.,* 2010). Second, the neuroendocrine influence of depression has been identified (e.g. Hypothalamic-pituitary-adrenocortic and sympathetic nervous system Activation (Mezuk *et al.,* 2008) that might affect the risk of MetS by influencing abdominal fat Accumulation, metabolism of glucose and regulation of blood pressure (Pan *et al.,* 2008).

Depressed persons tend to have poor diet and sleep disturbances and are less physically active (Anagnostis *et al.,* 2009), and the consequences of these habits are known MetS growth. Fourthly, conventional depression medications may have direct effects on various components of MetS and partially explain the correlation observed (Stine *et al.,* 2008).

4. CONCLUSIONS:

The potential mechanisms of Metabolic syndrome during quarantine are complex and may involve several shared physiological pathways, such as obesity, an increase in blood pressure, and glucose in the Iraqi population during a quarantine.the percentage of obesity among the Iraqi population increase during the quarantine due to COVID-19 pandemic. So, The prevalence of metabolic syndrome increase during quarantine due to the COVID-19 pandemic related to changes in their environment, behavior, and lifestyles that cause stress and depression.

In this study, also we conclusions

• the perceived stress and depression increased significantly a chance to MS prevalence.

• The central metabolic syndrome compound like high BMI Blood pressure and glucose rise in the Iraqi quarantine population connected to age.

• Younger age expected to develop quarantine hypertension during pandemic of the COVID-19.

• Medial age of the person with glucose growth during quarantine due to pandemic COVID-19.

REFERENCES:

1. Alwaid, S. H., and Al-dujaili, A. N. (2019). The Relation between Serum Concentration of Paraoxonase-1 Enzyme with Some Criteria in Metabolic Syndrome Patients. *Indian Journal of Public Health Research and Development*, *10*(8), 1085-1090. Article DOI : 10.5958/0976-5506.2019.02039.4

2. Aguilar-Salinas, C. A., and Viveros-Ruiz, T. (2019). Recent advances in managing/understanding the metabolic syndrome. F1000Research, 8.

3. Saleh, A. A., Hayawi, A. H., Al-Samarrai, A. Y., and Lafta, R. K. (2017). Metabolic syndrome among obese adults in Baghdad, Iraq. *Saudi Journal of Obesity*, *5*(1), 8.

4. Federation, I. D. (2006). The IDF consensus worldwide definition of the metabolic syndrome. *IDF Communications*, 1-24.

5. Lee, I. T., Chiu, Y. F., Hwu, C. M., He, C. T., Chiang, F. T., Lin, Y. C. and Sheu, W. H. (2012). Central obesity is important but not essential component of the metabolic syndrome for predicting diabetes mellitus in a hypertensive family-based cohort. Results from the Stanford Asia-pacific program for hypertension and insulin resistance (SAPPHIRe) Taiwan follow-up study. *Cardiovascular diabetology*, *11*(1), 43.

6. Tenenbaum, A., and Fisman, E. Z. (2011). " The metabolic syndrome is dead": These reports are an exaggeration. 1-4.

7. Ruderman, N. B., Carling, D., Prentki, M., and Cacicedo, J. M. (2013). AMPK, insulin resistance, and the metabolic syndrome. *The Journal of clinical investigation*, *123*(7), 2764-2772.

8. Blaton, V. H., Korita, I., and Bulo, A. (2008). How is metabolic syndrome related to dyslipidemia?. *Biochemia medica: Biochemia medica*, *18*(1), 14-24.

9. Tao, L. X., Yang, K., Liu, X. T., Cao, K., Zhu, H. P., Luo, Y. X., Guo, J., Wu, L.J., Li, X. and Guo, X. H. (2016). Longitudinal associations between triglycerides and metabolic syndrome components in a Beijing adult population, 2007-2012. *International journal of medical sciences*, *13*(6), 445.

10. Dietz, W., and Santos-Burgoa, C. (2020). Obesity and its Implications for COVID-19 Mortality. Obesity, 28(6), 1005-1005.

11. Balla, M., Merugu, G. P., Patel, M., Koduri, N. M., Gayam, V., Adapa, S., Naramala, S. and Konala, V. M. (2020). COVID-19, Modern Pandemic: A Systematic Review From Front-Line Health Care Providers' Perspective. *Journal of Clinical Medicine Research*, *12*(4), 215.

12. Puig-Domingo, M., Marazuela, M., and Giustina, A. (2020). COVID-19 and endocrine diseases. A statement from the European Society of Endocrinology. *Endocrine*, *68*(1), 2-5.

13. Simonnet, A., Chetboun, M., Poissy, J., Raverdy, V., Noulette, J., Duhamel, A.,

Labreuche, J., Mathieu, D., Pattou, F., Jourdain, M. and LICORN and the Lille COVID-19 and Obesity study group. (2020). High prevalence of obesity in severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) requiring invasive mechanical ventilation. *Obesity*.

14. Lighter, J., Phillips, M., Hochman, S., Sterling, S., Johnson, D., Francois, F., and Stachel, A. (2020). Obesity in patients younger than 60 years is a risk factor for Covid-19 hospital admission. *Clinical Infectious Diseases*.

15. Kassir, R. (2020). Risk of COVID-19 for patients with obesity. *Obesity Reviews*, *21*(6).

16. Maddaloni, E., and Buzzetti, R. (2020). Covid-19 and diabetes mellitus: unveiling the interaction of two pandemics. *Diabetes/Metabolism Research and Reviews*, e33213321.

17. Klonoff, D. C., and Umpierrez, G. E. (2020). COVID-19 in patients with diabetes: risk factors that increase morbidity. *Metabolism*.

18. Hussain, A., Bhowmik, B., and do Vale Moreira, N. C. (2020). COVID-19 and diabetes: Knowledge in progress. *Diabetes research and clinical practice*, 108142.

19. Ryan, D. H., Ravussin, E., and Heymsfield, S. (2020). COVID 19 and the patient with obesity–the editors speak out. *Obesity (Silver Spring, Md.)*.

20. Singh, A. K., Gupta, R., Ghosh, A., and Misra, A. (2020). Diabetes in COVID-19: Prevalence, pathophysiology, prognosis and practical considerations. *Diabetes and Metabolic Syndrome: Clinical Research and Reviews*.

21. Grundy, S. M., Cleeman, J. I., Daniels, S. R., Donato, K. A., Eckel, R. H., Franklin, B. A., Gordon, D.J., Krauss, R.M., Savage, P.J., Smith Jr, S.C. and Spertus, J. A. (2005). Diagnosis and management of the metabolic syndrome: an American Heart Association/National Heart, Lung, and Blood Institute scientific statement. *Circulation*, *112*(17), 2735-2752.

22. Zhu, T. Y., Tam, L. S., and Li, E. K. (2011). Societal costs of rheumatoid arthritis in Hong Kong: a prevalence-based cost-of-illness study. *Rheumatology*, *50*(7), 1293-1301.

23. Raza, K., Holers, V. M., and Gerlag, D. (2019). Nomenclature for the Phases of the Development of Rheumatoid Arthritis. *Clinical therapeutics*, *41*(7), 1279-1285.

24. Deane, K. D., and Holers, V. M. (2019). The natural history of rheumatoid arthritis. *Clinical therapeutics*, *41*(7), 1256-1269.

25. Mok, C. C., Kwok, C. L., Ho, L. Y., Chan, P. T., and Yip, S. F. (2011). Life expectancy, standardized mortality ratios, and causes of death in six rheumatic diseases in Hong Kong, China. *Arthritis and Rheumatism, 63*(5), 1182-1189.

26. Klareskog, L., Catrina, A. and Puget, S. (2009). Rheumatoid arthritis. *Lancet,* 373(9664),659–672.

27. Wild, S., Roglic, G., Green, A., Sicree, R., and King, H. (2004). Global prevalence of

diabetes: estimates for the year 2000 and projections for 2030. *Diabetes care*, *27*(5), 1047-1053.

28. Eckel, R. H., Grundy, S. M., and Zimmet, P. Z. (2005). The metabolic syndrome. *The lancet*, *365*(9468), 1415-1428.

29. Sacco, S., Comelli, M., Molina, V., Montrasio, P. L., Giani, E., and Cavanna, F. (2014). A simplified indication of metabolic syndrome to recognize subjects with a moderate risk to develop type 2 diabetes mellitus in a large Italian sample. *Acta diabetologica*, *51*(1), 35-41.

30. Klein, B. E., Klein, R., and Lee, K. E. (2002). Components of the metabolic syndrome and risk of cardiovascular disease and diabetes in Beaver Dam. *Diabetes care*, *25*(10), 1790-1794.

31. Alberti, K. G. M. M., and Zimmet, P. Z. (2008). Should we dump the metabolic syndrome? No. *Bmj*, *336*(7645), 641-641.

32. Li, Y., Saito, M., Tobimatsu, S., Oshida, H., Hori, Y., Fuchigami, H. and Nakajima, K. (2013). Prediabetes and impaired lung function in asymptomatic adults. *Diabetes research and clinical practice*, *100*(2), e51-e54.

33. Bijani, B., Pahlevan, A. A., Qasemi-Barqi, R., and Jahanihashemi, H. (2016). Metabolic syndrome as an independent risk factor of hypoxaemia in influenza A (H1N1) 2009 pandemic. *Le Infezioni in Medicina*.

34. Nakajima, K. (2020). Serious Conditions in COVID-19 Accompanied with a Feature of Metabolic Syndrome. *Journal of Clinical Medicine Research*, *12*(5), 273.

35. Pan, W. H., Yeh, W. T., and Weng, L. C. (2008). Epidemiology of metabolic syndrome in Asia. *Asia Pacific journal of clinical nutrition*, *17*.

36. Marhl, M., Grubelnik, V., Magdič, M., and Markovič, R. (2020). Diabetes and metabolic syndrome as risk factors for COVID-19. *Diabetes and Metabolic Syndrome: Clinical Research and Reviews*.

37. Henry, B. M., and Lippi, G. (2020). Chronic kidney disease is associated with severe coronavirus disease 2019 (COVID-19) infection. *International urology and nephrology*, 1-2.

38. YLiu, Z. F. Y. T. D. R. F. G. (2020). ZXiang JWang YSong BGu X et al. Clinical course and risk factors for mortality of adult inpatients with COVID-19 in Wuhan, China: a retrospective cohort study. *Lancet*, *395*, 1054-1062.

39. Zhang, C., Shi, L., and Wang, F. S. (2020). Liver injury in COVID-19: management and challenges. *The lancet Gastroenterology and hepatology*, *5*(5), 428-430.

40. Brake, S. J., Barnsley, K., Lu, W., McAlinden, K. D., Eapen, M. S., and Sohal, S. S. (2020). Smoking upregulates angiotensin-converting enzyme-2 receptor: a potential adhesion site for novel coronavirus SARS-CoV-2 (Covid-19).

41. Fang, L., Karakiulakis, G., and Roth, M. (2020). Are patients with hypertension and

diabetes mellitus at increased risk for COVID-19 infection?. *The Lancet. Respiratory Medicine*, *8*(4), e21.

42. Roglic, G. (Ed.). (2016). *Global report on diabetes*. World Health Organization

43. Sahu, M. T., Agarwal, A., Das, V., and Pandey, A. (2007). Impact of maternal body mass index on obstetric outcome. *Journal of Obstetrics and Gynaecology Research*, *33*(5), 655-659.

44. Choukem, S. P., Sih, C., Nebongo, D., Tientcheu, P., and Kengne, A. P. (2019). Accuracy and precision of four main glucometers used in a Sub-Saharan African Country: a cross-sectional study. *The Pan African medical journal, 32.*

45. Pickering, T. G. (2003). What will replace the mercury sphygmomanometer? *Blood pressure monitoring*, *8*(1), 23-25.

46. Al-Bachir, M., and Bakir, M. A. (2017). Predictive value of body mass index to metabolic syndrome risk factors in Syrian adolescents. *Journal of medical case reports*, *11*(1), 170.

47. Liu, P., Ma, F., Lou, H., and Liu, Y. (2013). The utility of fat mass index vs. body mass index and percentage of body fat in the screening of metabolic syndrome. *BMC public health*, *13*(1), 629.

48. Haslam D. W. and James W. P. (2005). Obesity. Lancet, 366, pp. 1197-209

49. Gharipour, M., Baghaei, A., Boshtam, M., and Rabiei, M. (2006). PREVALENCE OF METABOLIC SYNDROME AMONG THE ADULTS OF CENTRAL OF AREAS OF IRAN (AS PART OF : 56-62

50. Jang, S. Y., Kim, I. H., Ju, E. Y., Ahn, S. J., Kim, D. K., and Lee, S. W. (2010). Chronic kidney disease and metabolic syndrome in a general Korean population: the Third Korea National Health and Nutrition Examination Survey (KNHANES III) Study. *Journal of public health, 32*(4), 538-546.

51. Hossain, P., Kawar, B., and El Nahas, M. (2007). Obesity and diabetes in the developing world—a growing challenge. *New England journal of medicine, 356*(3), 213-215.

52. van Genugten, R. E., Utzschneider, K. M., Tong, J., Gerchman, F., Zraika, S., Udayasankar, J., Boyko, E.J., Fujimoto, W.Y., Kahn, S.E. and American Diabetes Association GENNID Study Group. (2006). Effects of sex and hormone replacement therapy use on the prevalence of isolated impaired fasting glucose and isolated impaired glucose tolerance in subjects with a family history of type 2 diabetes. *Diabetes*, *55*(12), 3529-3535.

53. Mauvais-Jarvis, F., Manson, J. E., Stevenson, J. C., and Fonseca, V. A. (2017). Menopausal hormone therapy and type 2 diabetes prevention: evidence, mechanisms, and clinical implications. *Endocrine reviews*, *38*(3), 173-188.

54. Kuk, J. L., and Ardern, C. I. (2010). Age and sex differences in the clustering of

metabolic syndrome factors: association with mortality risk. *Diabetes care*, *33*(11), 2457-2461.

55. Saukkonen, T., Jokelainen, J., Timonen, M., Cederberg, H., Laakso, M., Härkönen, P., Keinänen-Kiukaanniemi, S. and Rajala, U. (2012). Prevalence of metabolic syndrome components among the elderly using three different definitions: a cohort study in Finland. *Scandinavian journal of primary health care*, *30*(1), 29-34.

56. Burt, V. L. (1988). Whelton P, Roccella EJ, Brown C, Cutler JA, Higgins M, Horan MJ, and Labarthe D. *Prevalence of hypertension in the US adult population. Results from the Third National Health and Nutrition Examination Survey*, *1991*, 305-313.

57. Gause-Nilsson, I., Gherman, S., Dey, D. K., Kennerfalk, A., and Steen, B. (2006). Prevalence of metabolic syndrome in an elderly Swedish population. *Acta diabetologica*, *43*(4), 120-126.

58. van Vliet-Ostaptchouk, J. V., Nuotio, M. L., Slagter, S. N., Doiron, D., Fischer, K., Foco, L., Gaye, A., Gögele, M., Heier, M., Hiekkalinna, T. and Joensuu, A. (2014). The prevalence of metabolic syndrome and metabolically healthy obesity in Europe: a collaborative analysis of ten large cohort studies. *BMC endocrine disorders*, *14*(1), 9.

59. Mania, G., Fagard, R. Narkiewicz, K., Redon, J., Zanchetti, A., Boehm, M., Christians, T., Cifkova, R., De Backer, G.,and Dominica, A. (2014). ESH/ESC Practice Guidelines for the management of arterial hypertension. *Blood Pressure:* 233–16.

60. Mendizábal, Y., Llorens, S., and Nava, E. (2013). Hypertension in metabolic syndrome: vascular pathophysiology. *International journal of hypertension*, *2013*.

61. Janczura, M., Bochenek, G., Nowobilski, R., Dropinski, J., Kotula-Horowitz, K., Laskowicz, B. and Domagala, T. (2015). The relationship of metabolic syndrome with stress, coronary heart disease and pulmonary function-An occupational cohort-based study. *PLoS One*, *10*(8), e0133750.

62. Chandola, T., Britton, A., Brunner, E., Hemingway, H., Malik, M., Kumari, M., Badrick, E., Kivimaki, M. and Marmot, M. (2008). Work stress and coronary heart disease: what are the mechanisms?. *European heart journal*, *29*(5), 640-648.

63. Noorbala, A. A. (2011). The effect of emotional disclosure by writing on depression severity and defense mechanisms among depressed patients. *Daneshvar*, *18*(2), 1-10.

64. Vaccarino, V., McClure, C., Johnson, B. D., Sheps, D. S., Bittner, V., Rutledge, T., Shaw, L.J., Sopko, G., Olson, M.B., Krantz, D.S.and Parashar, S. (2008). Depression, the metabolic syndrome and cardiovascular risk. *Psychosomatic medicine, 70*(1), 40-48.

65. Foley, D. L., Morley, K. I., Madden, P. A., Heath, A. C., Whitfield, J. B., and Martin, N. G. (2010). Major depression and the metabolic syndrome. *Twin Research and Human Genetics*, *13*(4), 347-358.

66. Kinder, L. S., Carnethon, M. R., Palaniappan, L. P., King, A. C., and Fortmann, S. P. (2004). Depression and the metabolic syndrome in young adults: findings from the

Third National Health and Nutrition Examination Survey. *Psychosomatic medicine*, *66*(3), 316-322.

67. Demirci, H., Cinar, Y., and Bilgel, N. (2011). Metabolic syndrome and depressive symptoms in a primary health care setting in Turkey. *Klinik Psikofarmakoloji Bülteni-Bulletin of Clinical Psychopharmacology*, *21*(1), 49-57.

68. Miettola, J., Niskanen, L. K., Viinamäki, H., and Kumpusalo, E. (2008). Metabolic syndrome is associated with self-perceived depression. *Scandinavian journal of primary health care*, *26*(4), 203-210.

69. Puustinen, P. J., Koponen, H., Kautiainen, H., Mäntyselkä, P., and Vanhala, M. (2011). Psychological distress predicts the development of the metabolic syndrome: a prospective population-based study. *Psychosomatic Medicine*, *73*(2), 158-165.

70. Pan, A., Keum, N., Okereke, O. I., Sun, Q., Kivimaki, M., Rubin, R. R., and Hu, F. B. (2012). Bidirectional association between depression and metabolic syndrome: a systematic review and meta-analysis of epidemiological studies. *Diabetes care*, *35*(5), 1171-1180.

71. Xu, Q., Anderson, D., and Lurie-Beck, J. (2011). The relationship between abdominal obesity and depression in the general population: A systematic review and meta-analysis. *Obesity research and clinical practice*, *5*(4), e267-e278.

72. Luppino, F. S., de Wit, L. M., Bouvy, P. F., Stijnen, T., Cuijpers, P., Penninx, B. W., and Zitman, F. G. (2010). Overweight, obesity, and depression: a systematic review and meta-analysis of longitudinal studies. *Archives of general psychiatry*, *67*(3), 220-229.

73. Howren, M. B., Lamkin, D. M., and Suls, J. (2009). Associations of depression with C-reactive protein, IL-1, and IL-6: a meta-analysis. *Psychosomatic medicine*, *71*(2), 171-186.

74. McIntyre, R. S., Park, K. Y., Law, C. W., Sultan, F., Adams, A., Lourenco, M. T. and Yoon, J. (2010). The association between conventional antidepressants and the metabolic syndrome. *CNS drugs*, *24*(9), 741-753.

75. Mezuk, B., Eaton, W. W., Albrecht, S., and Golden, S. H. (2008). Depression and type 2 diabetes over the lifespan: a meta-analysis. *Diabetes care*, *31*(12), 2383-2390.

76. Pan, A., Ye, X., Franco, O. H., Li, H., Yu, Z., Zou, S. and Lin, X. (2008). Insulin resistance and depressive symptoms in middle-aged and elderly Chinese: findings from the Nutrition and Health of Aging Population in China Study. *Journal of affective disorders*, *109*(1-2), 75-82.

77. Anagnostis, P., Athyros, V. G., Tziomalos, K., Karagiannis, A., and Mikhailidis, D. P. (2009). The pathogenetic role of cortisol in the metabolic syndrome: a hypothesis. *The Journal of Clinical Endocrinology and Metabolism*, *94*(8), 2692-2701.

78. Strine, T. W., Mokdad, A. H., Dube, S. R., Balluz, L. S., Gonzalez, O., Berry, J. T. and Kroenke, K. (2008). The association of depression and anxiety with obesity and

unhealthy behaviors among community-dwelling US adults. *General hospital psychiatry, 30*(2), 127-137.

Table 1. Questionnaires of study

No. ( )	
Patient name:	
Address habitation	
Age of patient	
sex	
Do you have blood pressure?	
blood pressure before the COVID-19 pandemic	
blood pressure during the COVID-19 pandemic	
The percentage of sugar before quarantine	
The percentage of sugar during quarantine	
Do you have another disease?	
Do you practice sport?	
Do you smoke?	
Medical History	
Weight (kg)	
Length (m)	
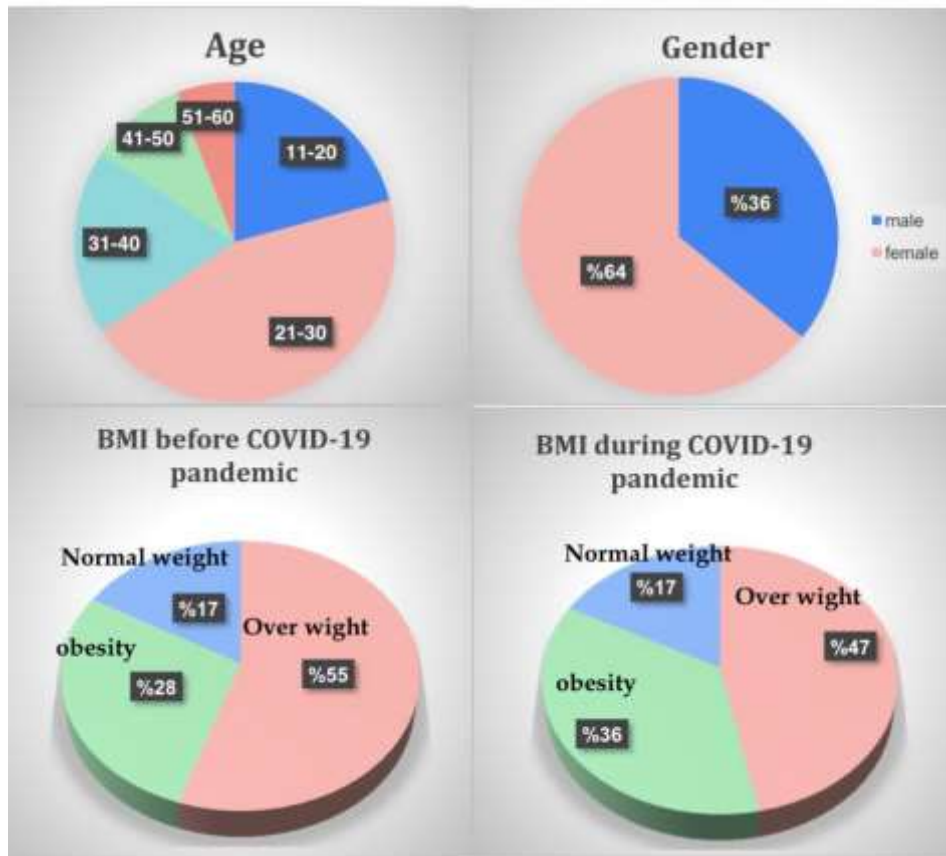
Figure 1. Demographic Characteristics of study subject
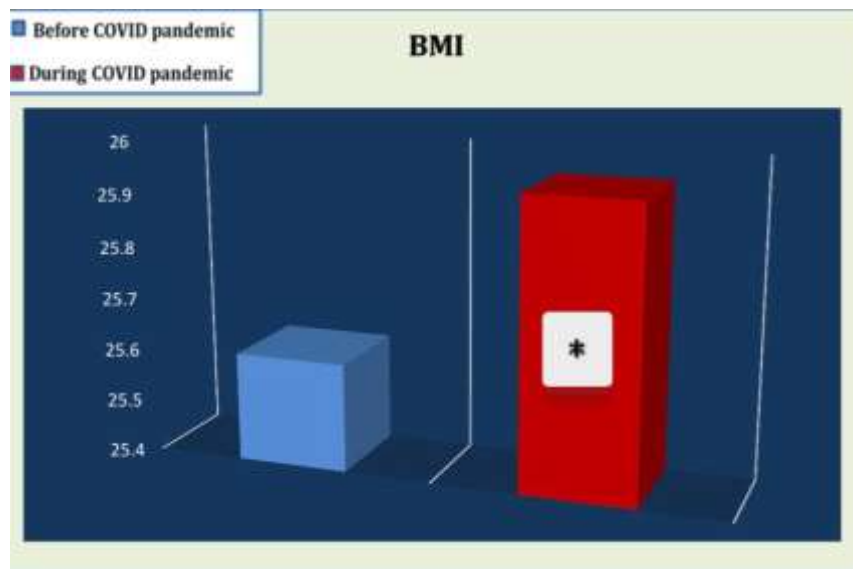
Figure 2. The Comparisons of BMI kg/m²between the two periods before and during COVID-19 pandemic
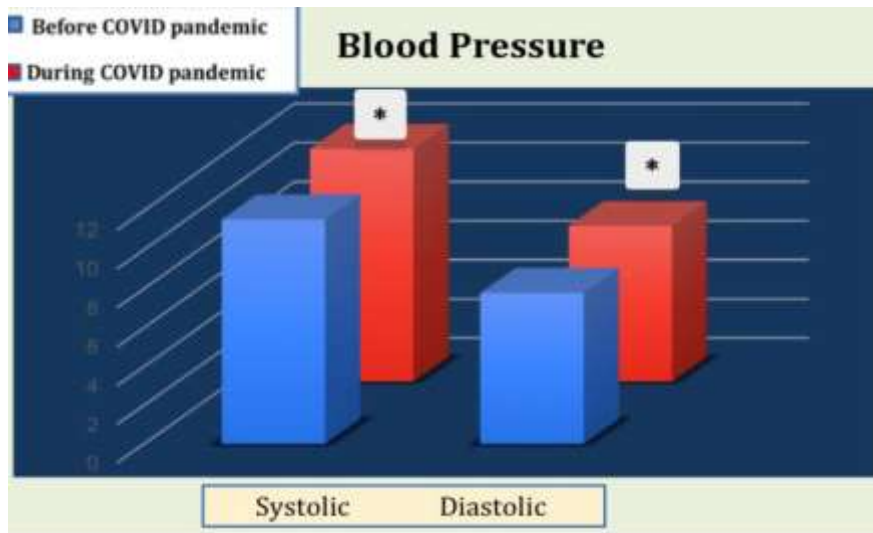
Figure 3. The Comparisons of blood pressure (mm Hg) between the two periods before and during COVID-19 pandemic
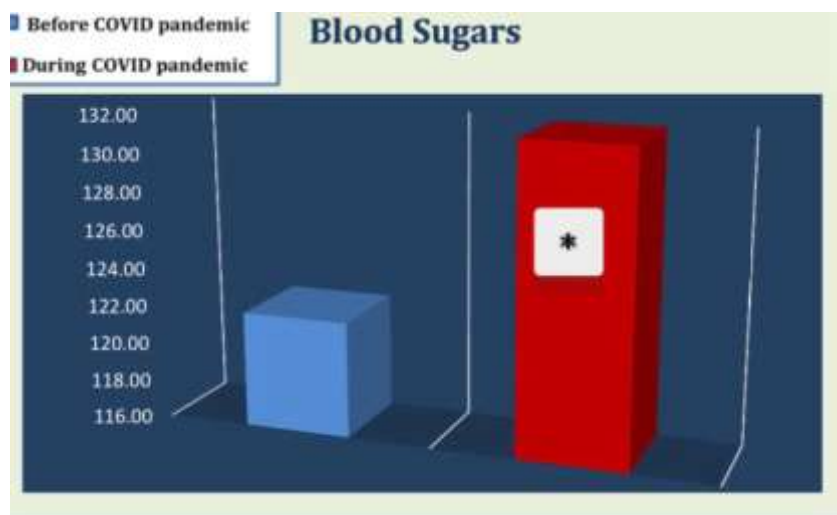
Figure 4. The Comparisons of the level of glucose mg/dLconcentration between the two periods before and during COVID-19 pandemic
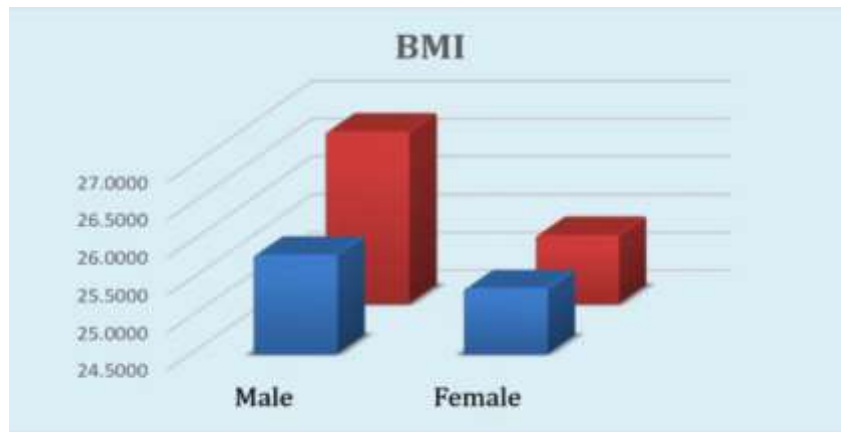
Figure 5. The Comparisons of BMI kg/m² between the gender for two periods before and during COVID-19 pandemic
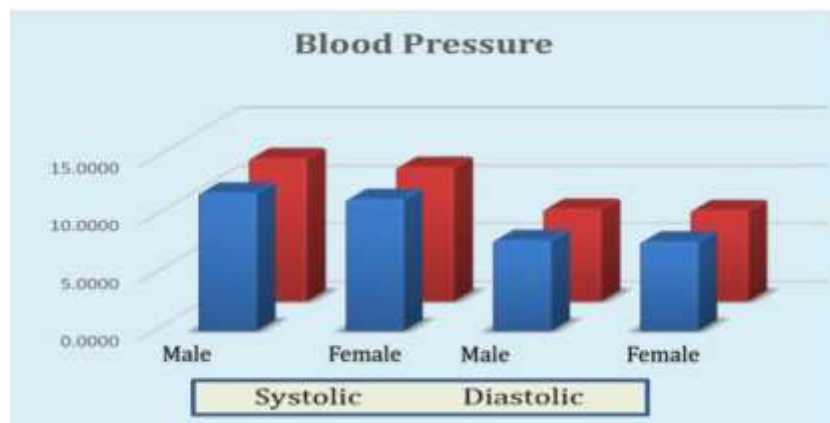
Figure 6. The Comparisons of blood pressure (mm Hg) between the gender for two periods before and during COVID-19 pandemic
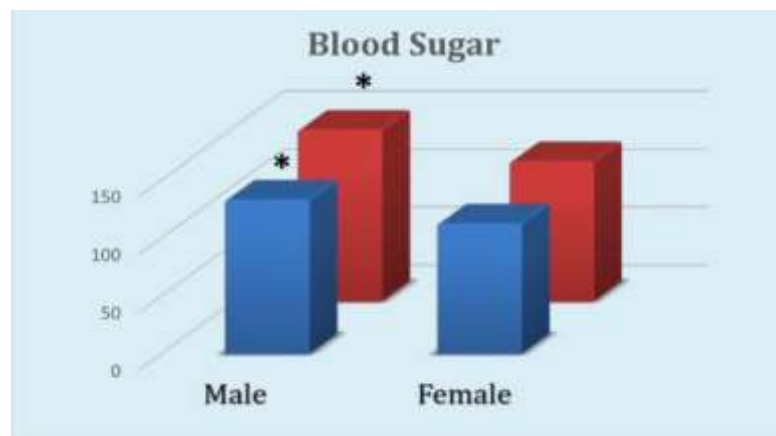
Figure 7. The Comparisons of blood glucose mg/dL between the gender for two periods before and during COVID-19 pandemic
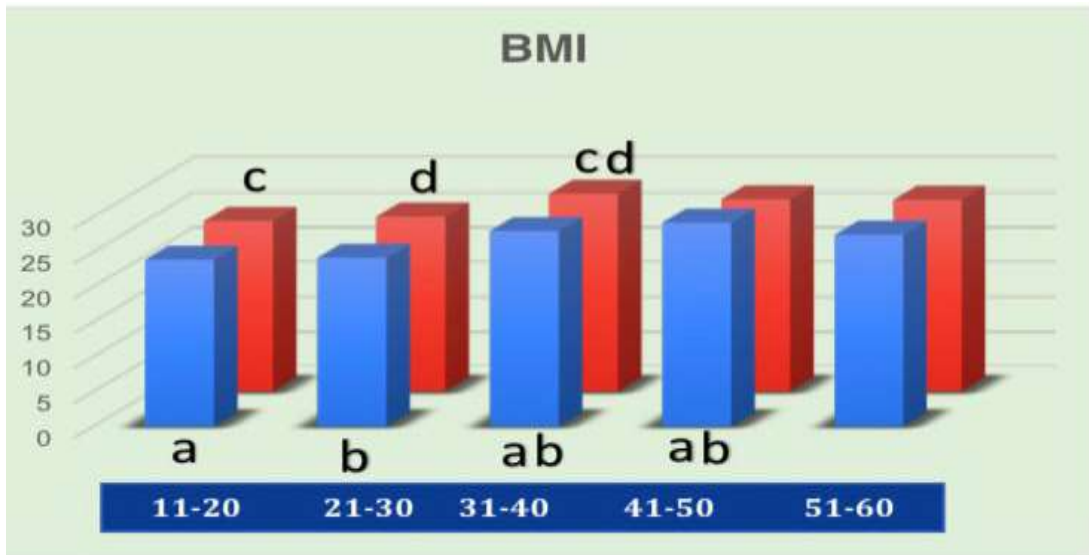
Figure 8. The Comparisons of BMI kg/m² among different age group for two periods before and during COVID-19 pandemic
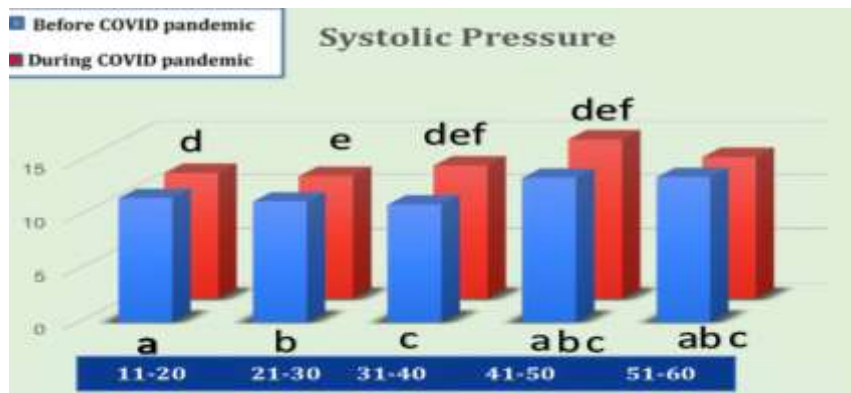
Figure 9. The Comparisons of systolic pressure (mm Hg) among different age group for two periods before and during COVID-19 pandemic
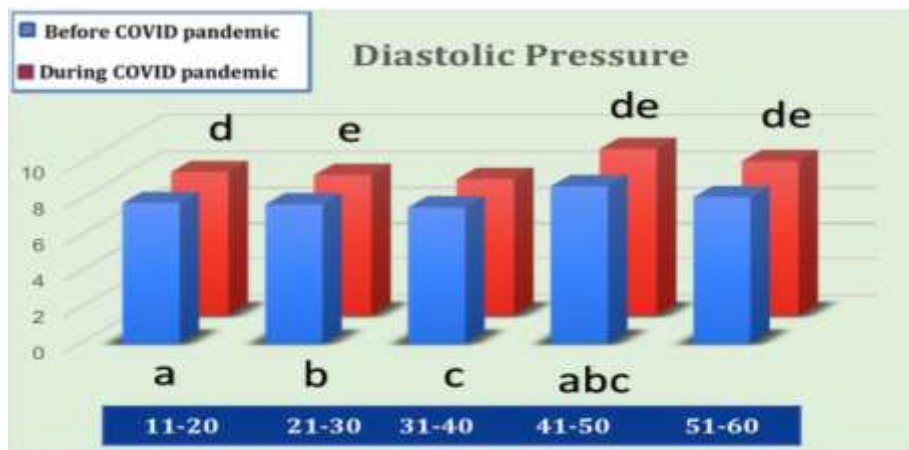
Figure 10. The Comparisons of diastolic pressure (mm Hg) among different age group for two periods before and during COVID-19 pandemic
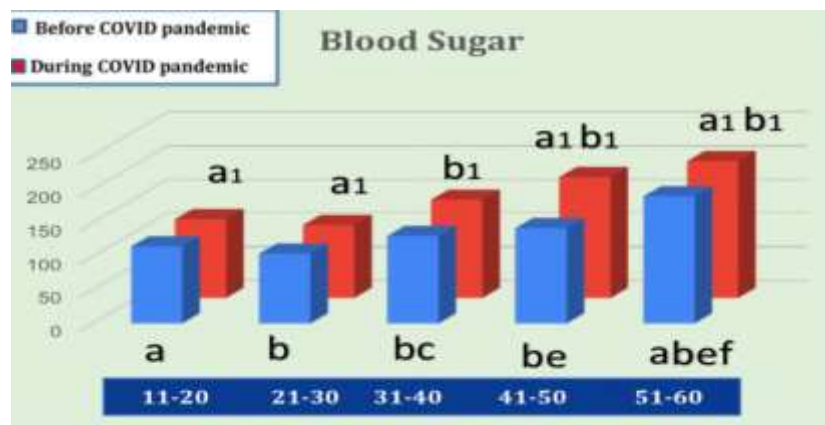
Figure 11. The Comparisons of sugar level mg/dLamong different age group for two periods before and during COVID-19 pandemic

ASSESSMENT THE RELATION BETWEEN PREOPERATIVE CANCER EMBRYONIC ANTIGEN LEVEL IN SERUM AND SOME CLINICAL PARAMETERS IN PATIENTS WITH COLORECTAL CANCER DISEASE

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Nooralhuda Ghanem AL-FATLAWI [2]
Shaymaa Hussein JABER[3]

Abstract:

Colorectal malignancy (CRC) is a significant worldwide medical problem which can effect on understanding bleakness and mortality. The essential point of this examination was to research whether a preoperative rise in serum CEA is an autonomous prognostic factor for colorectal cancer patients accomplice by the connection to certain boundaries. Method:The current investigation incorporate 50 patients(25 guys and25 females) .The samples were drawn from the patients when coming to AL-Forat Al-Awsat focus in AL-Najaf city for checking and treating during the period expanded from1/8/2020 to2/9/2020. The sound gathering as control was made out of ten (10) show up as solid were gathered from lab of obsessive breaks down in AL-Najaf AL-Ashraf in various occasions. (5 ml) of venous blood were drawn from colorectal malignant growth patients and solid gathering at 9-12 A.M from bet cubital venipuncture utilizing a dispensable needle and plastic syringes. Results:The flow study demonstrated critical increase ($P<0.05$) in CEA level in patients with colorectal malignant growth disease (9.87±4.321) ng/ml in contrasting and control group(3.19±0.792)ng/ml ,While no noteworthy differences($p>0.05$) in this examination in CEA level between male (9.18±3.176)ng/ml in contrasting and female group(10.56±5.199)ng/ml. Additionally in this investigation demonstrated there was no critical differences($p>0.05$) in serum CEA level between two gatherings of ages include: ages under or equal 60 (9.11±4.318)ng/ml and ages more than 60 (11.43±3.478)ng/ml ,While serum examination of CEA in patients with colorectal malignancy malady as per stage showed there was huge increment P(<0.05) in CEA

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level in patients with stage3(14.221±1.366)ng/ml in contrasted and stage2(12,31±3,618)ng/ml and stage1(7±5,366)ng/ml.

Key words: Colorectal Cancer Disease, Cancer Embryonic Antigen.

Introduction:

Colorectal malignancy (CRC) is a significant worldwide medical problem which can effect on understanding bleakness and mortality [1]. It is assessed to be the third most regularly analyzed kind of malignant growth in Australia and the subsequent driving reason for disease passing. In 2018, it is assessed that 12.3% of all new malignancies analyzed and 8.5% of all disease passing inside Australia will be optional to CRC [2]. The endurance of CRC is significantly reliant on the phase of malignant growth at conclusion, with the long term endurance rate at around 90% for restricted sickness, 70% for territorial infection, and just 13% for indirectly metastatic CRC2 . All in all, CRC isn't the unexpected sores in the colorectal mucosa, yet through an arrangement of advancement as "ordinary mucosa - adenoma - cancer"[3],[4] . Because of the moderate and dynamic nature of CRC, most of this illness has been appeared as preventable and conceivably reparable by early discovery and the expulsion of precancerous polyps or beginning phase tumors[5],[6] , Therefore, early location of CRC is critical to diminish occurrence and mortality related with the ailment. Carcinoembryonic antigen (CEA) is a readily available tumour marker to assist in the management of colorectal cancer. CEA has been used postoperatively to guide cancer surveillance and higher preoperative CEA levels have been identified as an independent predictor of both overall and disease-free survival rates [7–9]. The use and prognostic value of CEA in various tumor stages[10] led to a recommendation by the Colorectal Working Group of the American Joint Committee on Cancer (AJCC) that elevated CEA levels (defined as ≥5 ng/ml) at presentation should be differentiated from normal levels of CEA (defined as <5 ng/ml) by the modification of the TNM stage grouping [10].

Material and subjects

A sum of 50 patients with histologically analyzed CRC were remembered for this examination between 1/8/2020 to 2/9/2020. The samples were drawn from the patients when coming to AL-Forat Al-Awsat focus in AL-Najaf city for checking and treating. Ages were partitioned into two gatherings include :ages less or equivalent 60 and ages more than 60 . Likewise the patients were partitioned into two gatherings(25males and 25females) and into three phases include:stage1,stage2and stage3 agreement with TMN[11]. We explored the relationship between preoperative serum level malignant growth early stage antigen and some clinical boundaries in patients with colorectal sickness. Patients meeting the accompanying standards were barred from this examination: a) Patients with repetitive CRC or with a 5-years history

of another danger. b) Patients who had gotten chemotherapy, with hepatic, pancreatic, biliary, aspiratory or inammatory entrail sickness and c) patients with unrespectable CRC.

Collection of Blood samples

Fringe blood 2mL samples were gathered preoperatively the day preceding medical procedure from the cubital vein Blood was left at room temperature for 10 minutes to clump in the gel tube. The serum was secluded after centrifugation at 3000 run for each moment for 15 minutes and afterward serum was isolated and shipped into new expendable cylinders Eppendorf tube by micropipette and put away at - 20°c.

Biomarker assay

Estimation of serum cancer embryonic antigen level(CEA)

Specific kit for measuring human cancer embryonic antigen level in serum was supplied by CalBio,china

Statistical analysis

SPSS statistics v23 windows software package was utilized for the analysis of this research's data (Version23.01, 2016) for windows 2010. The data have been ordered as the Mean ± SD (i.e. the Standard deviaion), independent samples t -test has been utilized for the comparison between two All figures had been constructed with the use of the EXCEL software from the Microsoft Office 2010. The value of P less than 00.05 has been utilized as a statistically significant level.

Results

Comparison between cancer embryonic antigen level in colorectal cancer patients and healthy group (control)

The results of figure(1) indicated significant increase(P<0.05) in CEA level in patients with colorectal cancer disease(9.87±4.321) in comparing with control group(3.19±0.792).
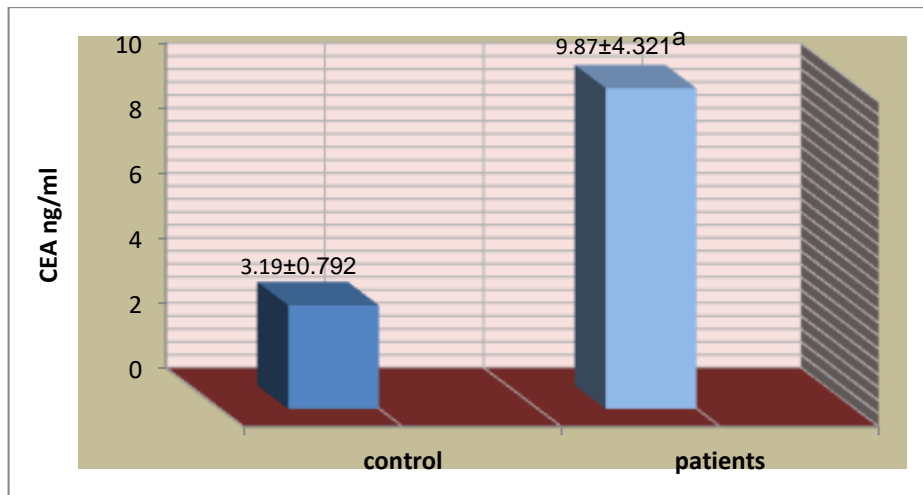
Figure(1) Caner embryonic antigen level in patients with colorectal cancer disease and control group

Comparison between CEA level in colorectal cancer patients according to gender

The results presented in figure(2) revealed no significant differences(P>0.05) in CEA level in both males(9.18±3.176) and females (10.56±5.199)in patients with colorectal cancer.
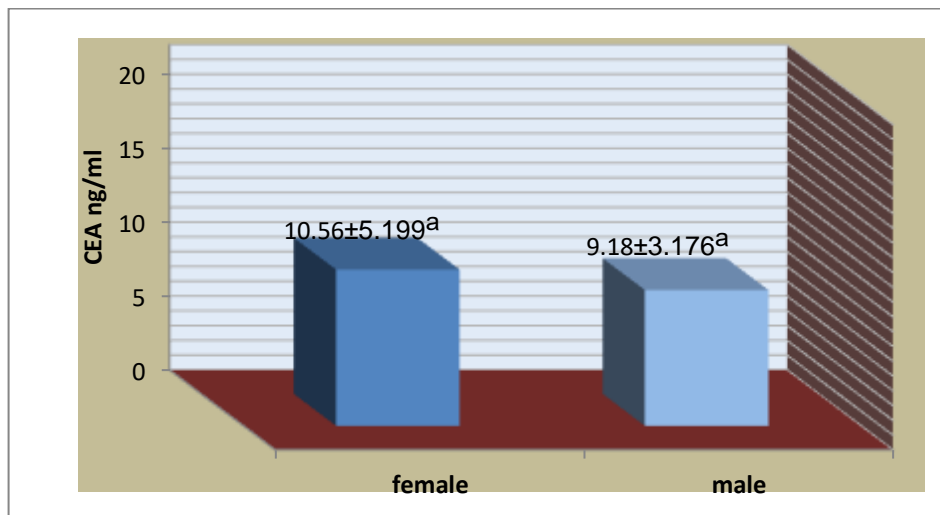
Figure(2) Cancer embryonic antigen level in both males and females patients with colorectal disease

Comparison between cancer embryonic antigen level in patients with colorectal cancer according to ages

Figure(3)showed comparison between CEA level in the groups of patients with colorectal cancer according to their ages. This result pointed out no significant differences (p>0.05) in serum CEA1level between different ages.
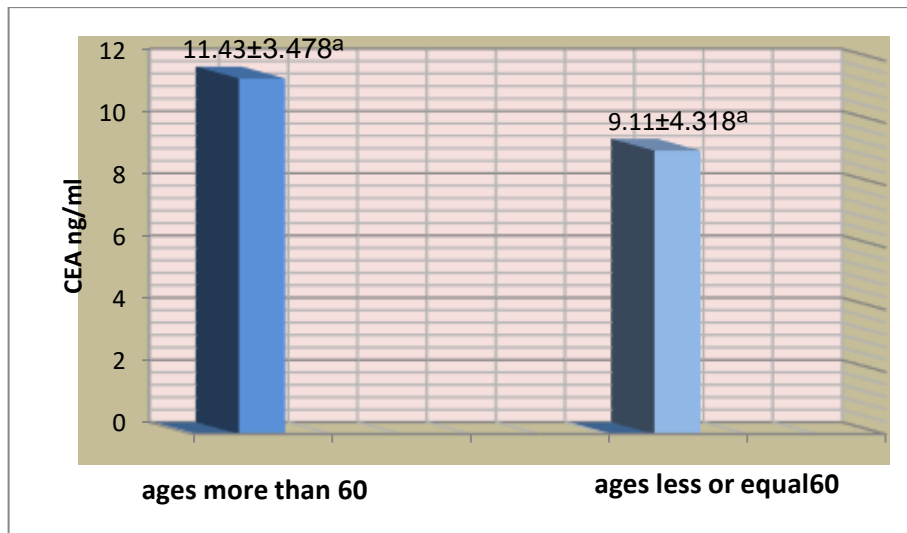
Figure(3) Comparison between CEA levels in colorectal cancer patients according to ages

Comparison between cancer embryonic antigen level in colorectal cancer patients according to stages

Figure(4) showed comparison of CEA level in patients with colorectal cancer disease according to their stages. There was significant increase in the levels of CEA ($P<0.05$) in stage 3 (14.22 ± 1.366) ng/ml in comparing with stage1 (7 ± 5.366) ng/ml but no significant differences($P>0.05$) in CEA level between stage3 and stage2,also significant differences ($p<0.05$) in CEA level between stage 2 and stage 1.
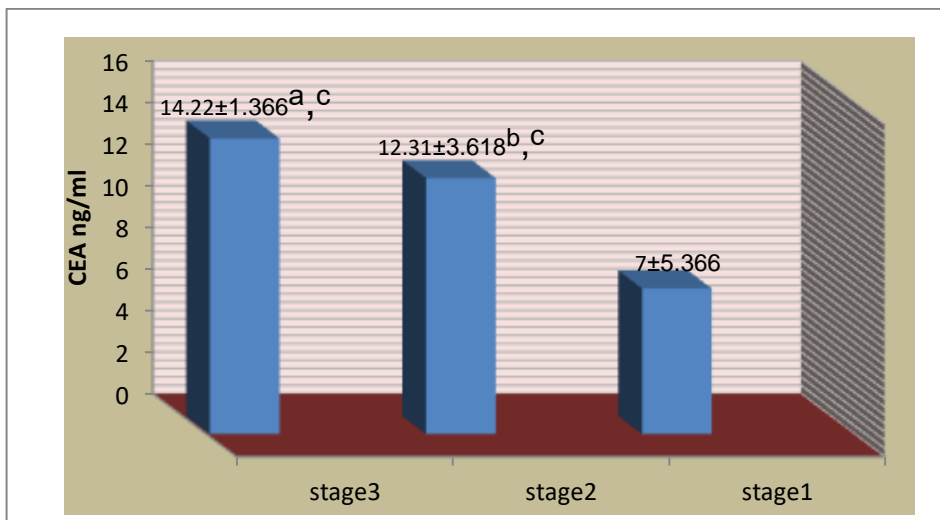
Figure(4) Comparison between CEA levels in colorectal patients according to stages

DISCUSSION

The aftereffects of this examination indicated exceptionally critical in serum preoperative malignant growth undeveloped antigen level in patients with colorectal malignant growth sickness contrasted and solid benchmark group in figure(1) These outcomes satisfactory with the outcomes of[12] clarified the CEA creation can be expanded in colorectal disease patients because of the blend of this marker with different markers, for example, thymidine kinase 1 (TK1), CA 19-9 and CA 72-4,these markers focus was essentially higher in patients with colorectal malignancy than in sound controls.[13] showed high preoperative and catch up serum CEA levels were autonomous prognostic elements for tumor repeat. Study of[14] showed to expanded benchmark CEA was related with shorter endurance. Another pursuit of[15] demonstrated to positive relationship between preoperative malignancy undeveloped antigen level and helpless tumor separation, higher tumor attack, more noteworthy level of stomach lymph hub metastasis, and higher TNM and Dukes stage tumors. Another examinations uphold this finding[16],[17]. high preoperative CEA levels corresponded with greater tumor size , the connection among CEA and tumor mass may clarify our perceptions, tumor markers are created by tumor cells following unusual oncogene articulation. More prominent tumor size inferred higher number of tumor cells recommending a likely connection between's CEA levels and tumor mass[18]. The hemodilution impact from expanded plasma volume may represent the diminished CEA fixations saw in patients with higher BMI[19].Study of [20] indicated a raised preoperative serum level of CEA and high articulation of Ki67 in tumor tissue were indicators of helpless visualization for patients with stage IIA colon disease. The consequences of figure (2) demonstrate no noteworthy differences(p>0.05) in CEA level as per sexual orientation. These outcomes concur with study of[21] no affiliation was seen between the serum CEA level and sex. A few examinations backing such finding[22],[23],[24].In figure(3) in flow study demonstrated no noteworthy differences(P>0.05) in patients with colorectal malignant growth sickness as indicated by ages. These outcomes satisfactory with the aftereffects of [25] indicated no factual contrasts between the youthful and old gatherings in the outflow of CEA. Another examination [26] indicated serum CEA level was essentially connected with tumor size, T classification, N classification, number of lymph hubs recovered, and employable strategy; be that as it may, no affiliation was seen between the serum CEA level and age. As opposed to another studies[27] uncovered the relationship of preoperative serum CEA level and age with endurance of CRC patients going through careful treatment, which is adjuvant to customary UICC arranging framework. Investigation of [28] demonstrated CEA was related with more established age (middle

65 years old), and multivariate examination showed the pre-medical procedure levels of just CEA connected with generally speaking endurance. The figure (4) in the momentum study demonstrated huge differences($p<0.05$) in CEA level in patients with colorectal malady as per stages, noteworthy increment in CEA level in stage 4 in contrasting with stage 1.These outcomes concur with study of[29] indicated high serum levels of CEA level related with an expanded illness stage. Also, they mirror a negative impact on tolerant endurance during development. Another investigation by[30] indicated that patients with illness stage I have significantly lower levels of serum CEA, when contrasted with patients with further developed phases of CRC. [31]explained that preoperative estimations of serum CEA was essentially higher in stages III than in stage I. For CEA to be productively utilized in colorectal malignant growth organizing, these boundaries need to improve the current prognostic munititions stockpile, and ought to be advantageous regarding operational definition and clinical assessment[32].

CONCLUSION

The present study showed positive correlation between cancer embryonic antigen level and stages of patients and it can used CEA marker as independent prognostic factor for colorectal cancer patients.

REFERENCE:

1- R.L. Siegel, K.D. Miller, A. Jemal, Cancer statistics, Ca - Cancer J. Clin. 65 (2015) 5–29 2015.

2- Australian Institute of Health and Welfare, Colorectal and Other Digestive-Tract Cancers. Cancer Series No. 114. Cat. No. CAN 117, AIHW, Canberra, 2018.

3- Mughal, S. & Filipe, M. I. Ultrastructural study of the normal mucosa-adenoma-cancer sequence in the development of familial polyposis coli. Journal of the National Cancer Institute 60, 753–768 (1978).

4- Contasta, I., Berghella, A. M., Pellegrini, P. & Adorno, D. Passage from normal mucosa to adenoma and colon cancer: alteration of normal sCD30 mechanisms regulating TH1/TH2 cell functions. Cancer biotherapy & radiopharmaceuticals 18, 549–557, https://doi. org/10.1089/108497803322287628 (2003).

5- Platz, E. A. et al. Proportion of colon cancer risk that might be preventable in a cohort of middle-aged US men. Cancer causes & control: CCC 11, 579–588 (2000).

6- Levin, B. et al. Screening and surveillance for the early detection of colorectal cancer and adenomatous polyps, 2008: a joint guideline from the American Cancer Society, the US Multi-Society Task Force on Colorectal Cancer, and the American College of Radiology. Gastroenterology 134, 1570–1595, https://doi.org/10.1053/j.gastro.2008.02.002 (2008).

7- R. Takagawa, S. Fujii, M. Ohta, et al., Preoperative serum carcinoembryonic antigen level as a predictive factor of recurrence after curative resection of colorectal cancer, Ann. Surg. Oncol. 15 (2008) 3433–3439.

8- W.S. Wang, J.K. Lin, T.J. Chiou, et al., Preoperative carcinoembryonic antigen level as an independent prognostic factor in colorectal cancer: taiwan experience, Jap. J. Clin. Oncol. 30 (2000) 12–16.

9- S. Wiratkapun, M. Kraemer, F. Seow-Choen, Y.-H. Ho, K.W. Eu, High preoperative serum carcinoembryonic antigen predicts metastatic recurrence in potentially curative colonic cancer: results of a five-year study, Dis. Colon Rectum 44 (2001) 231–235.

10- Compton, C., Fenoglio-Preiser, C. M., Pettigrew, N., and Fielding, L. P. American Joint Committee on Cancer Prognostic Factors Consensus Conference: Colorectal Working Group. Cancer 88: 1739, 2000.

11-AJCC (American Joint Committee on Cancer) cancer staging manual, 7th ed, Edge, SB, Byrd, DR, Compton, cc, et al (EDS), Springer, New York 2010. P 143.

12- Ning, S., Wei, W., Li, J., Hou, B., Zhong, J., Xie, Y., ... & Zhang, L. (2018). Clinical significance and diagnostic capacity of serum TK1, CEA, CA 19-9 and CA 72-4 levels in gastric and colorectal cancer patients. Journal of Cancer, 9(3), 494.

13- Park, I. J., Choi, G. S., Lim, K. H., Kang, B. M., & Jun, S. H. (2009). Serum carcinoembryonic antigen monitoring after curative resection for colorectal cancer: clinical significance of the preoperative level. *Annals of surgical oncology*, *16*(11), 3087-3093.

14- Aggarwal, C., Meropol, N. J., Punt, C. J., Iannotti, N., Saidman, B. H., Sabbath, K. D., ... & Miller, M. C. (2013). Relationship among circulating tumor cells, CEA and overall survival in patients with metastatic colorectal cancer. *Annals of oncology*, *24*(2), 420-428.

15- Zhong, W., Yu, Z., Zhan, J., Yu, T., Lin, Y., Xia, Z. S., ... & Chen, Q. K. (2015). Association of serum levels of CEA, CA199, CA125, CYFRA21-1 and CA72-4 and disease characteristics in colorectal cancer. *Pathology & Oncology Research*, *21*(1), 83-95.

16- Gao, Y., Wang, J., Zhou, Y., Sheng, S., Qian, S. Y., & Huo, X. (2018). Evaluation of serum CEA, CA19-9, CA72-4, CA125 and ferritin as diagnostic markers and factors of clinical parameters for colorectal cancer. *Scientific reports*, *8*(1), 1-9.

17- Basbug, M., Arikanoglu, Z., Bulbuller, N., Cetinkaya, Z., Aygen, E., Akbulut, S., & Satici, O. (2011). Prognostic value of preoperative CEA and CA 19-9 levels in patients with colorectal cancer. *Hepato Gastroenterology-Current Medical and Surgical Trends*, *58*(106), 400.

18- Wang, J., Wang, X., Yu, F., Chen, J., Zhao, S., Zhang, D., ... & Peng, Z. (2015). Combined detection of preoperative serum CEA, CA19-9 and CA242 improve prognostic prediction of surgically treated colorectal cancer patients. *International journal of clinical and experimental pathology*, *8*(11), 14853.

19- Park, J. S., Choi, G. S., Jang, Y. S., Jun, S. H., & Kang, H. (2010). Influence of obesity on the serum carcinoembryonic antigen value in patients with colorectal cancer. *Cancer Epidemiology and Prevention Biomarkers*, *19*(10), 2461-2468.

20- Huh, J. W., Oh, B. R., Kim, H. R., & Kim, Y. J. (2010). Preoperative carcinoembryonic antigen level as an independent prognostic factor in potentially curative colon cancer. *Journal of surgical oncology*, *101*(5), 396-400. Sun, L. C., Chu, K. S., Cheng, S. C., Lu, C. Y., Kuo, C. H., Hsieh, J. S., ... & Wang, J. Y. (2009).

21-Preoperative serum carcinoembryonic antigen, albumin and age are supplementary to UICC staging systems in predicting survival for colorectal cancer patients undergoing surgical treatment. *BMC cancer, 9*(1), 288.

22- Lou, Z., Meng, R. G., Zhang, W., Yu, E. D., & Fu, C. G. (2013). Preoperative carcinoembryonic antibody is predictive of distant metastasis in pathologically T1 colorectal cancer after radical surgery. *World journal of gastroenterology: WJG*, *19*(3), 389.

23- Li, M., Li, J. Y., Zhao, A. L., He, J. S., Zhou, L. X., Li, Y. A., & Gu, J. (2009). Comparison of carcinoembryonic antigen prognostic value in serum and tumour tissue of patients with colorectal cancer. *Colorectal Disease*, *11*(3), 276-281.

24- Li, Y., Liu, J., Zhao, Z., Wen, L., Li, H., Ren, J., & Liu, H. (2018). Correlation between circulating endothelial progenitor cells and serum carcinoembryonic antigen level in colorectal cancer. *Acta biochimica et biophysica Sinica*, *50*(3), 307-312.

25- Li, M., Li, J. Y., Zhao, A. L., & Gu, J. (2011). Do young patients with colorectal cancer have a poorer prognosis than old patients?. *Journal of Surgical Research*, *167*(2), 231-236.

26- Huh, J. W., Oh, B. R., Kim, H. R., & Kim, Y. J. (2010). Preoperative carcinoembryonic antigen level as an independent prognostic factor in potentially curative colon cancer. *Journal of surgical oncology*, *101*(5), 396-400. 27- Sun, L. C., Chu, K. S., Cheng, S. C., Lu, C. Y., Kuo, C. H., Hsieh, J. S., ... & Wang, J. Y. (2009). Preoperative serum carcinoembryonic antigen, albumin and age are supplementary to UICC staging systems in predicting survival for colorectal cancer patients undergoing surgical treatment. *BMC cancer*, *9*(1), 288.

28- Zhong, W., Yu, Z., Zhan, J., Yu, T., Lin, Y., Xia, Z. S., ... & Chen, Q. K. (2015). Association of serum levels of CEA, CA199, CA125, CYFRA21-1 and CA72-4 and disease characteristics in colorectal cancer. *Pathology & Oncology Research*, *21*(1), 83-95.

29- Basbug, M., Arikanoglu, Z., Bulbuller, N., Cetinkaya, Z., Aygen, E., Akbulut, S., & Satici, O. (2011). Prognostic value of preoperative CEA and CA 19-9 levels in patients with colorectal cancer. *Hepato Gastroenterology-Current Medical and Surgical Trends*, *58*(106), 400.

30- Lalosevic, M. S., Stankovic, S., Stojkovic, M., Markovic, V., Dimitrijevic, I., Lalosevic, J., ... & Krivokapic, Z. (2017). Can preoperative CEA and CA19-9 serum concentrations suggest metastatic disease in colorectal cancer patients?. *Hell J Nucl Med*, *20*(20), 41-5.

31-Jeon Bg, Shin R, Chung Jk et al. . Individualized cuto value of the preoperative carcinoembryonic antigen level is necessary for optimal use as a prognostic marker. Annals of Coloproctology 2013; 29 (3):106- 14.

32- Lindmark, G., Bergstrom, R., Pahlman, L., and Glimelius, B. The association of preoperative serum tumour markers with Dukes' stage and survival in colorectal cancer. Br. J. Cancer 71: 1090, 1995.

DETECTION OF BIOFILM FORMATION AND RESISTANCE TO SOME ANTIBIOTICS OF ESCHERICHIA COLI

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Ihsan Ali RAHEEM [2]
Batool Abd Al Ameer BAQER [3]

Abstract:

The study included twenty isolates of Escherichia coli isolated from different disease samples. It was diagnosis by microscopic methods, culture and biochemical tests and confirmed by Vitek 2 system. The ability of the isolates to produce protease showed that (9) isolates out of a total of (20) isolates with a percentage of 45% were protease -producing and 55% not producing. Biofilm formation by MTP method (15) isolates showed a percentage of 75% of a positive result for biofilm formation, while the percentage of negative isolates was 25%. The sensitivity study was conducted for the isolates against five antibiotics, and it was found that the isolates have multi drug resistance. All clinical isolates of E.coli were shown (100 %) resistant to piperacillin and ceftazidime. Bacteria for the rest of the antibiotics showed the least resistance to meropenem . All ten isolates were subjected to a beta-lactamase production test. Six were enzyme-producing, while four were non-enzyme producing. In addition, the minimum inhibitory concentration (MICs) for isolates were determined to five antibiotics included (Piperacillin, Ceftazidime, Azithromycin, imipenem and meropenem). The values of (MICs) for the two antibiotics ranged between (64-512) μg/ml, Piperacillin and Ceftazidime, While the meropenem(MIC) value ranged between(4-32) μg/ml.

Key words: Biofilm, Escherichia Coli, Antibiotics, Microtitration Plate.

Introduction:

Escherichia coli are a bacterial group that establishes naturally in the digestive system of humans and animals. It contributes in the synthesis of some vitamins and digestion. Presently, 171 bodily antigens (O), fifty-five flagellin (H) and eighty antigens (K) have been recognized and more than 160 serotypes of *E coli* [1]. Greatest of this bacteria are opportunistic pathogens and related with chronic infection,causing complicated in gastrointestinal infections, hemolytic-uremic syndrome, infection of urinary tract (UTI), sepsis, nosocomial-acquired pneumonia (NAP), and infection of surgical site (SSI) [2]. About 80% of clinical *E.coli* isolates formed biofilm [3]. Bacteria in the biofilms could be persisting in a different environment and are resistant to antibiotics [4]. Antibiotic resistance can be developed in biofilms due to antibiotics cannot penetrate biofilms layer, the metabolism and physiological effectiveness of bacteria are different between layers of biofilm [5], as well antibiotics resistance plasmid can transfer between the biofilm layer[6]. *E.coli* is a Gram negative in the model of organism in laboratory analysis of biofilm formation on non-living surfaces [7]. *E. coli* contains a large number of protease which involved in regulation of the most physiological functions in the bacterial cell and increase the pathogen ability to evade the cells and tissues [8]. Numerous components of the surface of cell, for example flagella first kind of fimbria, the outer membrane and proteins, have been create to donate to the formation of the biofilm of strains throughout conditions of static growth [9]. Additional passageways that boost formation of biofilm are specified via occasional studies using environments of hydrodynamic, categorized by augmented forces of shear. Wherever, the first expression of coiled fibers [10] or the clear barley coded with plasmid [11].

Material and Methods

Bacterial strains

In this study, 20 isolates of *Escherichia coli* isolated from different disease states were used as follows: (9) isolates from UTI samples, (6) isolates from stool, (5) isolates from ear swab, as samples were obtained from laboratories of some hospitals in Baghdad. The isolates grown in Blood and MacConkey medium were identified based on biochemical tests, Gram reaction, morphological characteristics of colonies, and final supplementary examination using VITEK 2 compact system [12].

Biofilm Formation and Protease Activity

The method presented in (13) was followed to investigate the ability of the isolates to form biofilm, which is the Microtitration plates method, and were grown on skim milk agar plates. To detect the ability of bacteria to produce the protease (14).

Production of β-lactamase test

The EDTA method was used to identify the capability of bacteria to β-lactamase production[15].

The sensitivity of isolates to five β-lactam antibiotics

The sensitivity test was conducted for the biofilm-forming isolates against (5) different antibiotics, including the most important used tablets (Bio analyse/Turke).

sensitivity to Piperacillin (PRL 30μg), Meropenem (MPM 10μg), Imipenem (IPM 30μg), Azithromycin (AZM30μg), Ceftazidime (CAZ30μg) .The test was carried out using Mueller-Hinton agar, and the standard diameters were adopted according to what was stated in CLSI (16).

Determination of the minimum inhibitory concentrations of five β-lactam antibiotics

Two fold dilution method was used on Mueller-Hinton agar for determinate MIC_s of five antibiotics [17].

Results and discussion

Twenty isolates of *E.coli* were obtained from different disease source, and it was possible to establish the cultivar characteristics of the colonies, and the microscopic characteristics of the bacterial cells, and then they were diagnosed using the Vitek2 figure(1).
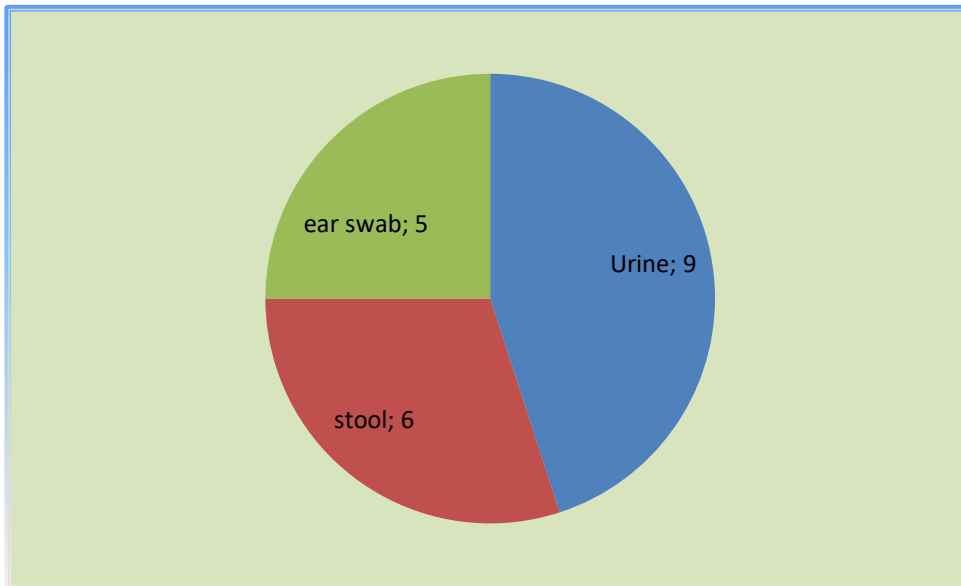
Figure (1) Number of *E.coli* isolates isolated from different sources

The results of the study for isolates of *E.coli* bacteria after the incubation period showed that (9) isolates out of a total of (20) isolates with a percentage of 45% were protease producing, when they appeared on skim milk agar clear colonies and (12) 55% not producing enzyme. Numerous factors disturbing the production of protease such as the presence of enhancers, metals and time of incubation. Moreover, several immune cells and immunoglobulins can cleavage by protease [18]Figure (2).
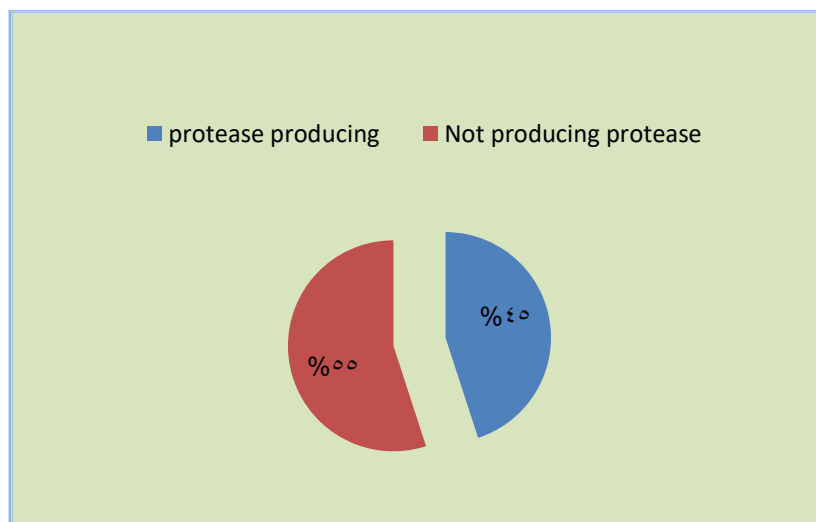
Figure (2): Percentage of the isolates ability to protease production

Microtitration plate (MTP) and after subtracting the value of the negative control reading rate from the average absorbance readings of the isolates, (15) isolates showed a percentage of 75% of a positive result for biofilm formation, while the percentage of negative isolates was 25%

showed [19&20] the Congo red agar method should not be used as a test to measure biofilm formation because it gives false results. The MTP method was used in the study to notice the capacity of isolates to arrangement slime layer as a standard technique for the speed of cell adhesion and biofilm formation in various types of microorganisms, as shown in Figure (3&4).
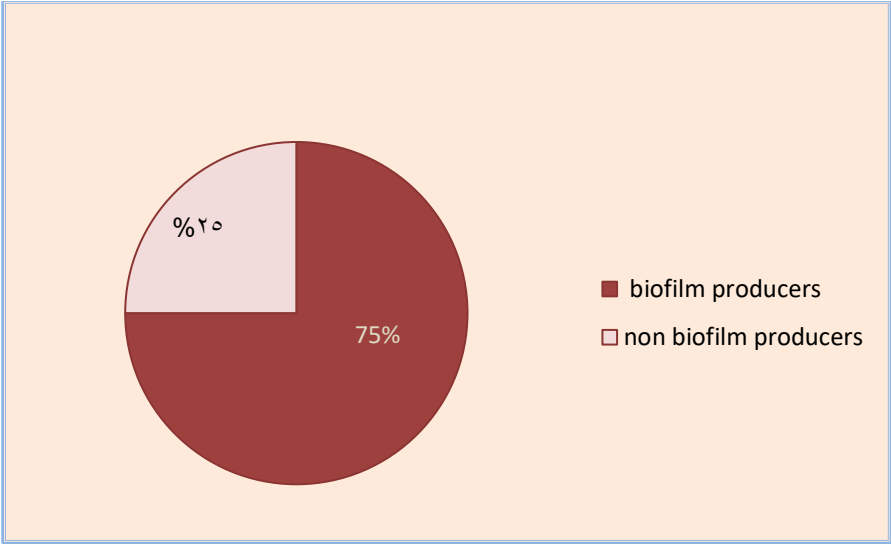
Figure (3) : Percentage of the isolates ability to form biofilm using the micro titration method.
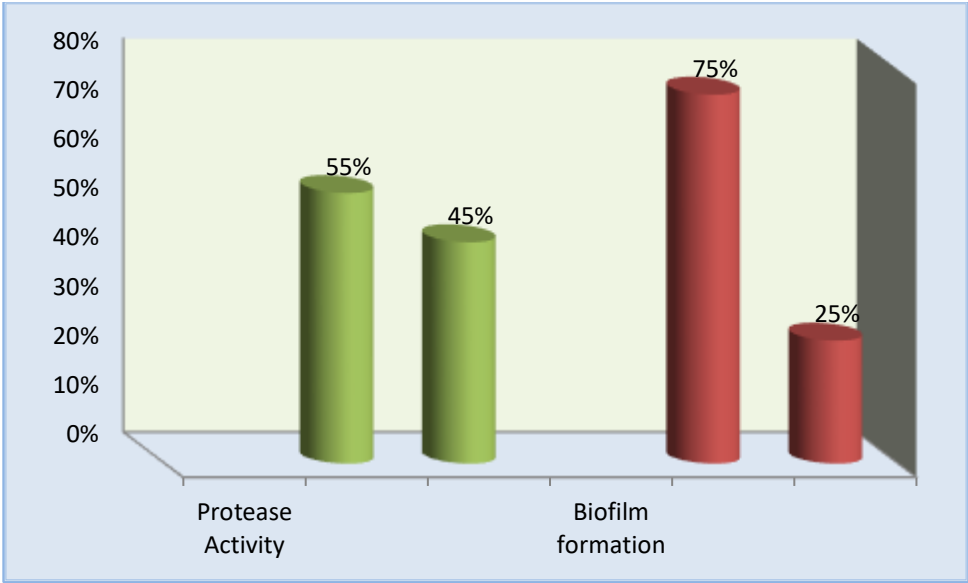
Figure (4): Ability of *E.coli* to produce biofilms and proteases

The sensitivity of (10) isolates of *E.coli* bacteria under study that forms the biofilm was tested against, five β-lactam antibiotics and the results were determined by describing the bacteria R-resistant or S-susceptible by measuring the diameter of

the inhibition zone and comparing it with what was stated in CLSI [15]. The results showed the following In Figure (5) there is a discrepancy in the resistance of the isolates under study towards the antibiotics used. The results showed that all 1 bacteria were resistant to (Piperacillin and Ceftazidime) at 100%, while they were resistant to (imipenem and meropenem) at 50%, 30% respectively, and resistant to Azithromycin 80%.

Table 1: Sensitivity of the 10 *E.coli* isolates to five β-lactam antibiotics

No. of Isolates	Antibiotics*					No. of Antibiotics resistance group
	Piperacillin	Ceftazidime	Azithromycin	imipenem	meropenem	
E.coli 1	R	R	R	R	S	4
E.coli 2	R	R	R	S	S	3
E.coli 3	R	R	R	R	R	5
E.coli 4	R	R	S	R	S	3
E.coli 5	R	R	R	R	S	4
E.coli 6	R	R	R	S	S	3
E.coli 7	R	R	S	S	R	3
E.coli 8	R	R	R	S	S	3
E.coli 9	R	R	R	S	R	4
E.coli 10	R	R	R	R	S	4

S= sensitive; R= resistant
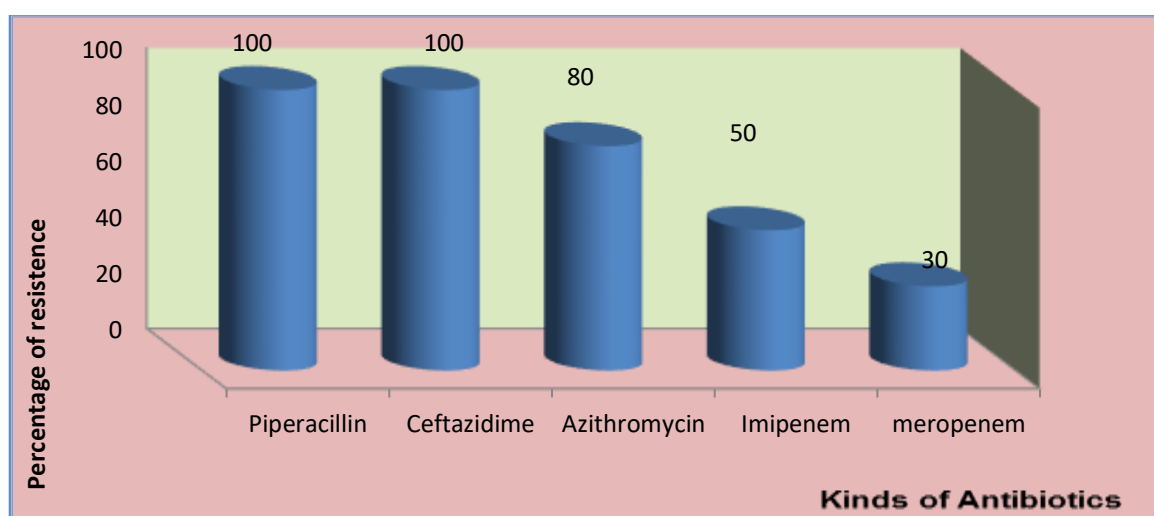
Figure 5: The percentage of β-lactam antibiotics resistance of *E.coli* isolates

The biofilm-forming bacteria possess protection from the host's immune means and antibiotics, and this is a key characteristic in the continuation of infection, and these organisms show high resistance to treatment, which leads to creating a big

problem, and in order for these antibiotics to be effective against these germs, it is necessary to use higher concentrations (500- 2000) times those required to kill non-biofilm-forming bacteria of the same type [21].

The MIC was determined for isolates of *E.coli* towards five antibiotics. The values of (MICs) for the two antibiotics ranged between (64-512) µg/ml, Piperacillin and Ceftazidime , While the Azithromycin (MIC) value ranged between(16-512) µg/ml, all isolates were subjected to this. As well as, imipenem antibiotics, the MICs ranged (8-128) µg/ml, and (4-64) µg/ml to meropenem Table (2).

Table 2: The values of the minimum inhibitory concentration(MICs) of 10 *E.coli* isolates for antibiotics

No. of Isolates	Piperacillin	Ceftazidime	Azithromycin	imipenem	meropenem
E.coli 1	512	265	265	64	4
E.coli 2	265	64	64	16	8
E.coli 3	265	128	129	64	32
E.coli 4	128	64	16	16	4
E.coli 5	64	64	512	128	4
E.coli 6	512	128	128	16	8
E.coli 7	512	265	16	8	32
E.coli 8	128	265	64	8	8
E.coli 9	128	128	512	64	16
E.coli 10	128	265	128	128	8

The bacteria produced β-lactamase were twelve isolates with a percentage of 60%, while, the unproductive bacteria were eight with a percentage of 40%. All ten isolates of bacteria were beta-lactamase-producing enzymes. This was confirmed by the results of the high resistance of this bacteria to the old beta-lactams, which are widely used and randomly. The isolated *E.coli* from various infections resistant to different kinds of antibiotics and overexcited using of these antibiotics in dealing of infection outcome in the resistant due to bacterial modification as well as, attendance of plasmid of resistant or communal between chromosome and plasmid of bacteria done conjugation and transformation [23].
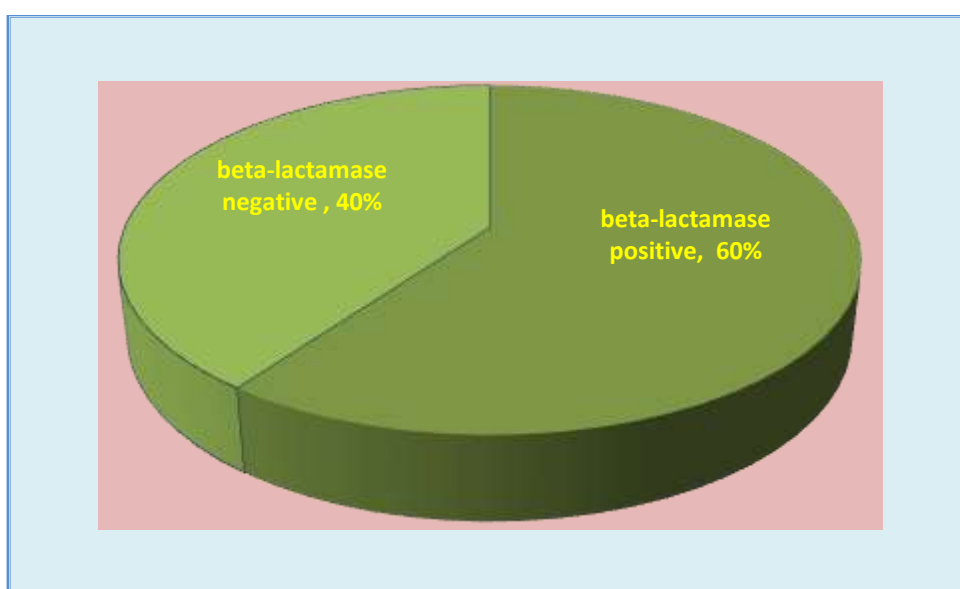
Figure (6) Ability to produce the enzyme β-lactamase by *E.coli*

Conclusion:

From this study, it was found that the biofilm-forming bacteria *Escherichia coli*, protease enzyme and beta-lactamase are the most resistant to antibiotics. Therefore, the treatment of diseases caused by these bacteria is not easy and requires long periods.

References:

1. MÁRIALIGETI, K. (2011). 16th International Congress of the Hungarian Society for Microbiology Commemorating the 60th Anniversary of the Organization's Foundation. *Acta Microbiologica et Immunologica Hungarica, 58,* 117-240.

2. Riley, L. W. (2020). Distinguishing pathovars from nonpathovars: Escherichia coli. *Microbiology Spectrum, 8*(4), 8-4.

3. Aditya, V., Kotian, A., Saikrishnan, S., Rohit, A., Mithoor, D., Karunasagar, I., & Deekshit, V. K. (2022). Effect of ciprofloxacin and in vitro gut conditions on biofilm of Escherichia coli isolated from clinical and environmental sources. *Journal of Applied Microbiology, 132*(2), 964-977.

4. Abebe, G. M. (2020). The role of bacterial biofilm in antibiotic resistance and food contamination. *International journal of microbiology, 2020.*

5. Uruén, C., Chopo-Escuin, G., Tommassen, J., Mainar-Jaime, R. C., & Arenas, J. (2020). Biofilms as promoters of bacterial antibiotic resistance and tolerance. *Antibiotics, 10*(1), 3.

6. Wu, S., Wu, Y., Cao, B., Huang, Q., & Cai, P. (2022). An invisible workforce in soil: The neglected role of soil biofilms in conjugative transfer of antibiotic resistance genes. *Critical Reviews in Environmental Science and Technology, 52*(15), 2720-2748.

7. Jian, H. J., Yu, J., Li, Y. J., Unnikrishnan, B., Huang, Y. F., Luo, L. J., … & Huang, C. C. (2020). Highly adhesive carbon quantum dots from biogenic amines for prevention of biofilm formation. *Chemical Engineering Journal, 386,* 123913.

8. Rowlett, V. W., Mallampalli, V. K., Karlstaedt, A., Dowhan, W., Taegtmeyer, H., Margolin, W., & Vitrac, H. (2017). Impact of membrane phospholipid alterations in Escherichia coli on cellular function and bacterial stress adaptation. *Journal of bacteriology, 199*(13), e00849-16.

9. Blackburn, S. A., Shepherd, M., & Robinson, G. K. (2021). Reciprocal Packaging of the Main Structural Proteins of Type 1 Fimbriae and Flagella in the Outer Membrane Vesicles of "Wild Type" Escherichia coli Strains. *Frontiers in microbiology, 12,* 557455.

10. Scharping, R. J. (2020). *The Ecology and Conservation of an Urban Karst Subterranean Estuary* (Doctoral dissertation, University of South Florida).

11. Bieri, S., Potrykus, I., & Fütterer, J. (2003). Effects of combined expression of antifungal barley seed proteins in transgenic wheat on powdery mildew infection. *Molecular Breeding, 11*(1), 37-48.

12. Forbes, B. A., Daniel F. S., and Alice S. W. (2016), Study Guide for Bailey and Scott'sDiagnostic Microbiology-E-Book. Elsevier Health Sciences

13. Abdul, F. R., Subhi,H. T. , Taher, N.T , Raheem, I. A.(2019). Activity of Iron oxide nanoparticles on bacterial biofilm formation. /J. Pharm. Sci. & Res. Vol. 11(3), 2019, 1126-1130.

14. Baron ,E.,J;and Fingold ,S.M.(1999).Diagnostic Mirobiology .9th ed. Baily and Scotts.The C.V. Mosby company.

15. WHO (1978) Techniques for the detection of B-Lactamase producing strains of Neisseria gonorrhoea., 616:137-43 .

16. (CLSI) Clinical Laboratory Standards Institute. (2011). Performance Standards for Antimicrobial Disk Susceptibility Test.

17. Alalem ,A.M. (2008). Antibiotic resistant *S.aureus* infection studies in hospitals .Ph.D, Middle East Technical University.Turkey.

18. Atshan, S. S., Shamsudin, M. N., Thian Lung, L. T., Sekawi, Z., Ghaznavi-Rad, E., & Pei Pei, C. (2012). Comparative characterisation of genotypically different clones of MRSA in the production of biofilms. *Journal of Biomedicine and Biotechnology, 2012*.

19. Barrs, R. W., Jia, J., Silver, S. E., Yost, M., & Mei, Y. (2020). Biomaterials for bioprinting microvasculature. *Chemical reviews*, *120*(19), 10887-10949.

20. Bozkurt, H. ; Kurtoglu, M.G. ;Bayram, Y. ;Kesli , R. and Berktas , M.(2009). Correlation of slime production investigated via three different methods in coagulase-negative Staphylococci with crystal violet reaction and antimicrobial resistance. J. Int .Med. Res.,37(121-128).

21. Seebach, E., & Kubatzky, K. F. (2019). Chronic implant-related bone infections—can immune modulation be a therapeutic strategy?. *Frontiers in immunology*, *10*, 1724.

22. Iroha, I. R., Oji, A. E., & Esimone, C. O. (2008). Antimicrobial resistance pattern of plasmid mediated extended spectrum beta-lactamase producing strain of Escherichia coli. *Sci Res Essay*, *3*(Suppl 6), 215-218.

23. Ayobola, E. D., Oscar, W. O., & Ejovwokoghene, E. F. (2021). Plasmid-mediated quinolone resistance genes transfer among enteric bacteria isolated from human and animal sources. *AIMS microbiology*, *7*(2), 200.

SIMILARITY AND DISSIMILARITY OF PHENOTYPIC AND GENOTYPIC CHARACTERISTICS OF PRUNUS DEMOSTICA (L.) ROSACEAE IN NORTH OF IRAQ (NINAVAH)

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Abstract:

Prunus domestica is recognized as a species of fruit tree grown all over the world. It is used locally for various commercial purposes. In this research, we determined of the morphological and genetic diversity present for 5 samples of P. domestica cultivars from the governorate of Ninavah (Northern,Iraq).Five categorical fruit properties assist us to detect the varieties under phenotypic study. Five plum cultivars identified, they referred by P. domistica Santa Rosa(SR),P. domistica,Black Diamond(BD);P. domistica, Black Beauty(BB);P. domistica Angeleno(AG) and P. domistica Red Heart(RH). Morphological diagnosis were included shape, diameter, color and indumentum for fruits were depended to differentiate among the cultivars in this study, molecular diversity was detected by using universal primers represent mtK(Maturase) gene. The results showed that there were significant difference among the specimens morphologically, whereas alleles of maturase K(matK)gene, revealed significance outcomes for detection of each cultivar with specific amplification products(BD-mtK414bp.,SR-mtK344bp.,AG-mtK271 bp., RH-mtK263bp.andBB-mtK 258bp).We concluded that molecular screening is a significance diagnostic and confirmative tool for classify of economic fruited trees.

Key words: Morphological and Molecular İnvestigation, Prunus Domestica, PCR, Fingerprint Genotyping.

Introduction:

Plum is an important fruit tree crop. They are a group of stone fruits with edible fleshy mesocarp produced by large globally distributed species *Prunus* genus belong to family Rosaceae (Faust and Surányi,1999). Popular plum cultivars belong to the hexaploid (2n=6x=42) European origin, *P. domestica* L. (Cosmulescu and Botu,2012). *P. domestica* (Plum from Europe) *P. salicina* (Japanese plum) are common species. (Faust and Surányi,1999). For a multipurpose, as fruit, prunes, distilling, and as refined additive ingredients, they are commercially grown globally. They known as "European plums" or "prune plums" is differentiate from the big round diploid "Japanese plums" (*P. salicina*), which are commonly cultivated for market consumption (Dorota, 2008 ; Ertekina *et al.*, 2006 ; Bhutani and Joshi , 1995). Identification of taxa is of major importance for classification, ecological, and conservation studies, with distinct morphological features. Taxonomic keys have been developed and broadly applied (Lindbladh *etal.*,2002). According to the morphological study of Van Zeist and Woldring (2000). Due to a very broad variation spectrum and transitional states between and within various taxa, the identification of *Prunus* groups at the subspecies or variety level is complicated. These researchers explain this by noting that with so many overlapping characteristics, *P. insititi* and *P. domestica* comprise such a wide variety of morphological types, It is hardly possible to assign diagnostic characteristics which clearly distinguish the two species. For specimens exhibiting characteristics of both *P. insititi* and *P. spinosa*. The classical methods used for the identification of plum cultivars are generally based on morphological and physiological traits like leafs or and tree shapes (Depypere *et al.*,2007;Gleason,1958). Availability of molecular information regarding to *P. domestica* (L.) as an economic interest products is an essential for better use of genetic resources in breeding and conservation strategies (Decroocq *etal.*, 2004; Manco *et al.*,2019 ; Ramantha, and Hodgkin (2002). In this context, chloroplast DNA based molecular methods of valuable plum depend on modern methods (Genotype fingerprinting) is a goal for categorized Iraq distribution plums (Katayama and Uematsu, 2005).

2.Materials and Methods

2.1.Plant materials

All of five plum cultivars analyzed in this study (Table1): they referred by *P. domistica* Santa Rosa(SR), *P. domistica* Black Diamond(BD), *P. domistica* Black Beauty (BB), *P. domistica* Angeleno(AG) and   *P. domistica* Red Heart(RH), *Prunus*

specimens (leaves)were collected after fruits maturing in Iraq from Ninavah Horticulture Station in Mosul city during June till end September 2019.

2.2. Phenotypic properties

Shape, diameter, color and indumentum for fruits were depended to differentiate among the cultivars in this study (Gleason, 1958).

2.3. Molecular diversity of *P. demostica* cultivars.

Extraction of genomic DNA was conducted as that detailed by promega company, gDNA concentration and purity were carried out by nano-spectrophotometer, Template integrity was estimated via electrophoresis according to that documented by Sambrook and Russel(2001). Molecular diversity was detected by using universal primers represent *mtK*(Maturase) gene as detailed in table one, the primers were designed in this study.

Table 1:Primers of *mtk* gene as molecular markers for differentiate among *P. demostica* L.

Gene		Sequence (5'- 3').	Amplicon size(bp.).	Accession No.(NCBI).
SR-mtK	F	CTGGCTTCGAAGGATACCCC	344	HQ.235145
	R	AAATCCGATGAATCCGCCCA		
BD-mtK	F	TCCGGCCTCCATCTTATGGT	414	JN.894829
	R	AAATCCGATGAATCCGCCCA		
BB-mtK	F	TATGTGTGGTCTCAACCGGG	258	JN.895842
	R	AAATCCGATGAATCCGCCCA		
AG-mtK	F	TTATGTGTGGTCTCAACCGGG	271	HQ.235142
	R	AAAATCCGATGAATCCGCCC		
RH-mtK	F	GGTCTCAACCGGGAAGGATTT	263	HQ.235144
	R	AAAATCCGATGAATCCGCCCA		

SR(Santa Rosa),BD(Black Diamond),BB(BB),AG(Angelino)and RH(Red Heart).

Amplification program included 95 $^{\circ}$ C as DNA unwinding for 180sec and 35 times of each of denaturation 94 $^{\circ}$ C for 30sec, hybridization 55 $^{\circ}$ C(respectively) for 30sec, extension72 $^{\circ}$ C for 30sec, in addition to final extension72 $^{\circ}$ C for 180sec, for each primer sets(Sambrook and Russel,2001).

2.4. Genotyping outcomes analysis

All amplification products were detected and photographed using gel documentary system, CS-software(ATTA,Japan).The specificity and sensitivity of the results were also calculated sensitivity using spss statistical analysis program.

3.Results

3.1.Morphological characteristics

Five local cultivars of *P. domistica* were collected, classical diagnosis were carried out depending on morphological appearance of maturing fruits, as detailed in table two. This information was similar to that reported by Yazbek(2010), who depended on the shape of laeves for morphologically classification of *P. domistica* (L.) Cultivars, another study conducted by Konarska(2015), who was categorized this fruits on the basis of some anatomical properties such as crystalline wax, micro cracks number and stomata present on their surface. Morphological classification of economical deciduous trees is an essential for disseminate favorable cultivars, especially those able to adapt with environmental biotic and abiotic criteria (Skene,1963).

Table 2: Mature Prune fruits characteristics of *P. domistica* (L.)

P. domistica cultivars	shape	Diameter(mm.)	color	Indumentum
BD	Spherical	65-85	black	Waxy smooth skin
SR	Spherical	40-65	Red	Waxy dotted smooth skin
AG	Spherical or Ovoid	60-85	Bright red	Foggy wax smooth
RH	Spherical	30-60	Bright pink or red	Waxy smooth
BB	Spherical	55-70	Dark red	Shiny smooth skin

(milimeter).

3.2.Molecular confirmative screening

Alleles of maturase K(*matK*)gene, that were used as genetic markers to differentiated among the collected *P. domistica* cultivars, revealed significance outcomes for detection of each cultivar with specific amplification products, which includesBD-*mtK*414bp.,SR-*mtK*344bp.,AG-*mtK*271bp.,RH-*mtK*263bp.andBB-*mtK* 258bp.(Figure1).Many studies were carried out in this field like Potter *etal.*, (2002), who was used a molecular level to detect genetic relationships in Rosaceae utilizing chloroplast *matK* and *trnL-trnF* nucleotide sequence data. Another study was achieved by Reales *et al.*,(2010),who documented the Phylogenetic of Eurasian plums, *Prunus* (L.) Rosaceae , according to coding and noncoding chloroplast DNA sequences.
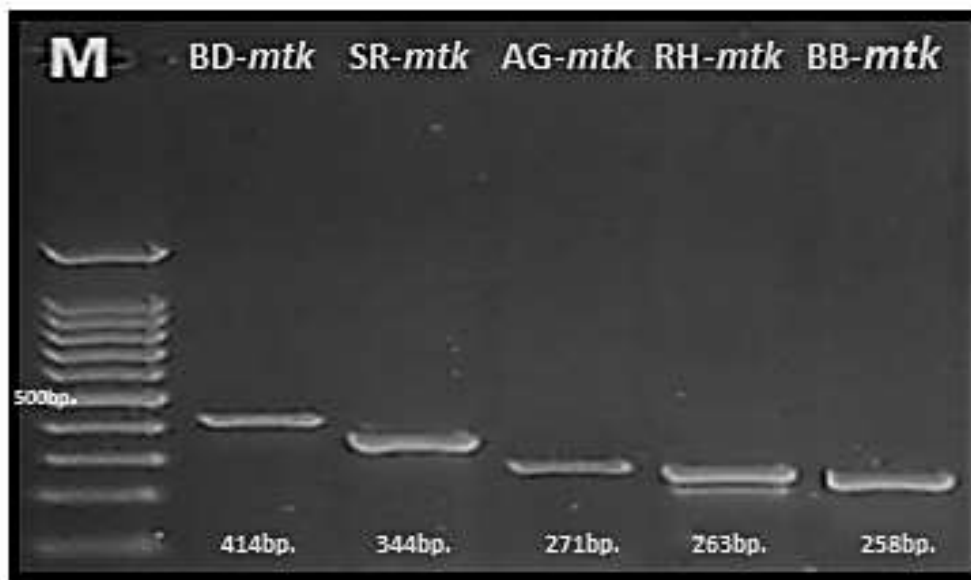
Figure 1: Amplicons of matK gene of P.domistica L. ine M is a DNA marker (100bp), lines 2-6 arreBD-matK(414)SR-matk(344\0,AG-matK(271),RH-matk(263)and BB-matk(258)bp respectiv-ely.

3.3. Phenotypic and genotypic relationship

Morphological and molecular investigation revealed optimum matching (100%) for classification of cultivars under study, as that documented in the table (3), whereas the difference was documented among *P. demostica* cultivars using the same diagnostic procedures.

Table 3: Specificity and sensitivity of molecular screening in comparison with phenotypic investigation.

Tests		PCR				Total
		Positive		Negative		Total
		No.	%	No.	%	
Morphological appearance	+ve 5	5	100	0	0	5
	-ve 0	0	0	0	0	

Our outcomes were agreed with that reported by Rosanna (2019), who found a significance relationship between phenotypic and molecular screening during diagnosis of cultivars of *P. domistica*.

4.Conclusion and Recommendation

We concluded that molecular screening is a significance diagnostic and confirmative tool for classify of economic fruited trees, to form a local database in this field includes, detection their distribution in governorates and provinces and import most appropriate cultivars to our environmental conditions, in order to increase botanical biodiversity, agricultural products and other purposes.

References:

1. **Bhutani V.P , Joshi, V.K (1995).** Plum, In Fruit Science and Technology, Production, Composition, Storage and processing. Marcel Dekker, Inc., New York, pp.: 203-241.

2. **Cosmulescu S, Botu M (2012).** Walnut biodiversity in south-western Romania-resource. *Pakistan Journal of Botany* 44(1): 307-311.

3. **Decroocq V, Hagen L.S , Favé M.G *et al* (2004).** Microsatellite markers in the hexaploid *Prunus domestica* species and parentage lineage of three European plum cultivars using nuclear and chloroplast simple-sequence repeats. Kluwer Academic Publishers, Molecular Breeding 13: 135–142.

4. **Depypere L, Chaerle P, Vander M. K. *et al* (2007).** Stony endocarp dimension and shape variation *Prunus* L. section *Prunus*. Ann. Bot. 100: 1585-159.

5. **Dorota W.T (2008)**. Characteristics of plums as a raw material with valuable nutritive and dietary properties-a review. Polish Journal of Food and Nutrition Sciences 58: 401-405.

6. **Ertekina C, Gozlekcib S, Kabasa O *et al* (2006).** Some physical ,pomological and nutritional properties of two plum(*Prunus domestica* L.) cultivars. Journal of Food Engineering 75: 508-514.

7. **Faust M, Surányi D (1999).** Origin and dissemination of plums. Horticultural Review 23: 179 - 231.

8. **Gleason H.A (1958).** Illustrated Flora, Lancaster Press, Lancaster, Great Brit Hanelt. Vol 2.(Cited by) European wild relatives of *Prunus* fruit crops. Bocconea 7: 401-40.

9. **Katayama H, Uematsu C (2005).** Structural analysis of chloroplast DNA in *Prunus* (Rosaceae): evolution, genetic diversity and unequal mutations. *Theoretical and Applied Genetics* Ill:1430-143.

10. **Konarska A (2015).** Characteristics of Fruit *Prunus domestica* (L.) Skin: Structure and Antioxidant Content. International Journal of Food Properties. International Journal of Food Properties, 18:11, 2487-2499.

11. Lindbladh M, O'connor R.M , Jacobson G (2002). Morphometric analysis of pollen grains for paleoecological studies: classification of Picea from eastern North America. *American journal of botany, 89 9*, 1459-67 .

12. **Manco R, Basile B, Capuozzo, C *et al* (2019).**Molecular and Phenotypic Diversity of Traditional European Plum (*Prunus domestica* L.) Germplasm of Southern Italy. Sustainability, 11, 4112

13. **Niazi A. D (2000).** Statistical Analysis in Medical Research. Republic of Iraq. Al-Nehrein University. P.148 .

14. **Potter D, Gao F, Bortiri P.E *et al* (2002)**. Phylogenetic relation-ships in Rosaceae inferred from chloroplast *matK* and *trnL-trnF* nucleotide sequence data. *Plant* Systematics and *Evolution* 231, 77– 89.

15. **Rallo P, Jiménez M. R, Casanova L *et al* (2019).** Genetic Diversity of Stone Fruit Cultivars Preserved On Farm in Southern Spain. *Journal of Agricultural Science* and *Technology* 21, 943–955.

16. **Ramantha R. V, Hodgkin T (2002).** Genetic diversity and conservation and utilization of plant genetic resources. Plant cell Tissue Organ Culture, 68.

17. **Reales A, Sargent D.J, Tobutt K.R *et al* (2010).** Phylogenetic of Eurasian plums, *Prunus* L. section *Prunus* (Rosaceae), according to coding and noncoding chloroplast DNA sequences. Tree Genet. Genomes 6, 37–45.

18. **Rosanna M, Boris B, Claudio C.*et al* (2019).** Molecular and Phenotypic Diversity of Traditional European Plum (*Prunus domestica* L.) Germplasm of Southern Italy, Sustainability. Open Access Journal, vol. 11(15), 1-14.

19. **Sambrook J, Russel D. W (2001).** Molecular cloning: A laboratory manual. (3rd ed). Cold Spring Harbor, USA.

20. **Skene D.S (1963).** The fine structure of apple, pear, and plum fruit surfaces, their changes during ripening, and their response to polishing. Annals of Botany. 27, 581–587.

21. **Van Zeist W, Woldring H (2000).** Plum (*Prunus domestica* L.) varieties in late- and post-medieval Groningen: The archaeo-botanical evidence. Alaeo-historia, 39(40):563-576.

22. **Yazbek M, Oh S.H (2013).** Peaches and almonds: Phylogeny of *Prunus* sub g. Amygdalus (Rosaceae) based on DNA sequences and morphology. Plant systematic evolution.299, 8:1403-1418.

SATELLITE IMAGERY MONITORS SEASONAL VARIATIONS IN THE ECOLOGY OF AL-HAMMAR MARSH, SOUTHERN IRAQ

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Abstract:

The Al-Hammar wetland in Iraq is notable for having the highest densities of coastal migratory birds along the Arabian Gulf-Mediterranean Sea migration line. Despite the importance of these birds, there is no complete evaluation of their dynamics. The six migrating bird species (Mallard duck, Graylag geese, White pelican, Barn swallow, Common gull, White stork) were studied in the area, and the data were compiled and analyzed. Migration patterns have changed over the last two decades, as shown by changes in land cover between October 2000 and 2020 and in bird populations every ten years during the same period. A decrease in the remaining kinds of migrating birds was seen in total numbers between the years 2000 and 2020. Observing trends was impossible due to the extreme disparity between the data sets' respective sizes. A multivariate analysis shows a decrease in the number of species that rely on wetland habitats for food and breeding in the sublittoral and offshore zones of the study area. In comparison to total NDVI values, which decreased by 5%, 3.5%, and 15.6%, total NDWI values increased by 7.8%, 21.0%, and 62.6%. During the research phase. The qualitative characteristics of waterbodies and vegetation have been extensively measured using remote sensing and Gis techniques.

Key words: Wetland. Environment. NDVI. Migratory Birds. Plant Cover. Landsat İmages.

Introduction:

Many birds are found in Iraq, which has a remarkable biodiversity in general. Aside from Iraq's geographic location, this area serves as a haven for birds due to the easy availability of food. In Iraq, on their way from Siberia and Europe to Africa and the Arabian Peninsula, these birds stop to rest. Given that birds fear traversing bodies of water as large as the sea, Iraq makes up half of the corridor via which they are confined between the Gulf of Aden and the Mediterranean. In addition, Iraq's position at the warm-line junction between the north and south would attract a diversity of bird species to the area. (Cookson and Stirk, no date). Iraqi wetlands are an important bird habitat on a national, regional, and global scale. We discover that these waterways are home to a lot of little birds of global endangered kinds, some of which are endangered and only found in this region of the globe, since the water is so pure. It is also important to maintain the diversity of resident and migratory bird populations in Iraq, since the country has a wealth of water and natural regions where many ducks and birds migrate to the marshes. Regardless of the season, the marshes are home to a variety of birds, including mallards, geese, swans, and others. Only 134 of the 287 bird species found in the marshes of southern Iraq have been seen for an extended period of time. (Afroz, Mia and Islam, 2020). Migratory birds are impacted by climate change, which alters land cover and alters the availability of food, and these changes are brought on by human activities. Because birds are more sensitive to changes in climate than different types of land cover, their migration patterns will change. Geographic information systems (GIS) and remote sensing (RS) are used a lot because they can be used in many different fields. GIS is used for change detection, monitoring, and analysis of the LULC of an ecosystem (Lin et al., 2021). Temporal and geographical information may provide the capacity to forecast changes in LULC, which can be used to generate more accurate maps of a region. Therefore, Remote sensing data from Landsat pictures taken between 2000 and 2020 may be used to track changes in vegetation and water bodies, and Gis technology is well-suited for this purpose. This data may be obtained by using Landsat photographs, which are capable of accurately mapping both the vegetation and the water bodies. (Al-Gburi, Al-Tawash and Al-Lafta, 2017).

Materials and Methods

1-The study region

In Iraq, Al Hammar Marsh is a vast wetland. It is a component of the Tigris-Euphrates system. According to estimates, the permanent wetland area of the Al Hammer marsh is between 2,800 and 4,400 km2. Zone 38 N is situated to the right of the river Euphrates between 634,272 and 3,413,985 metres east and 758,945 and 3,388,386 metres north. From Nasiriyah in the west to Al Basra's Shatt al-Arab River neighborhood in the east, the marsh extends. (Fig. 1) (Dhaidan, Alwan and Al-Khafaji, 2022). The marshesstretch for around 120 kilometres in length and 25 kilometres in width, and their average depth ranges from 1.8 metres to 3 metres. (A. K. Mohammed Ali and Mashee Al Ramahi, 2020). This marsh may be divided into two parts: the first is in Al-Nasiriyah, which has multiple rivers feeding its water supply; the second is in Al-Basra, which receives its water supply from the Shatt Al-Arab sea's periodic tidal fluctuations. In the marsh, the eastern and western regions are separated by the Al Hammer Dike. All of the marsh's edges will be connected by the Al Hammar Barrage in future projects. A wide variety of natural features may be found in the marsh, such as wetlands, greenery, and several dykes. Because the marsh's water volume fluctuates throughout the year, the feeding and irrigation systems are always in flux, adding to the complexity.(A. Mohammed Ali and Mashee Al Ramahi, 2020).
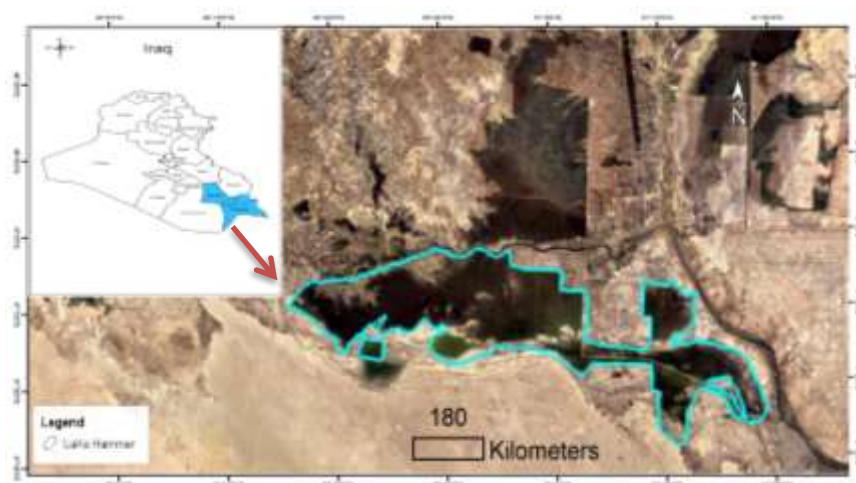
Figure (1): Shows Al-Hammar Marsh's location in Iraq.

2-Data sources and method

Landsat 5 TM (thematic mapper) and Landsat 8 OLI (operational land imager) data for the years 2000-2020 were taken from the website https://livingatlas2.arcgis.com/landsatexplorer/. Table 1 was used in the

creation of LULC maps; the spatial resolution for sensors is the same as and equivalent to (30 m).(Huang et al., 2021). A shapefile was prepared for the

categorization of the research region using Google Earth Pro. Ground reference data was acquired through visual interpretation of maps of the research region,

which is mostly made up of water and vegetation. Using the programmer ArcGIS 10.2, all of the processes of data processing and categorization were successfully performed. During the processing stages, steps like setting up the coordinate system, stacking the different bands of the datasets into layers, and separating the pictures by the shape of the research area were completed. A single coordinate system, UTM (zone 38N), and the WGS 84 datum were utilised for all of the data. LULC maps were created using supervised classification methods and a maximum likelihood-based algorithm.(Zurell et al., 2018).

Table (1): Includes scenes of Landsat 5 and 8 images used.

Data type	Sensor	Scene	Acquisition Date	Source
remote sensing	Landsat-5 TM	scene one scene two	2000/10/19	Landsat Explorer
	Landsat-5 TM	scene one scene two	2010/10/16	Landsat Explorer
	Landsat-8 OLI	scene one scene two	2020/10/23	Landsat Explorer

3-Climate and migratory birds

Migratory birds will be impacted in a variety of ways by climate change, including shifts in where they choose to dwell and how far they travel. Phenology, as well as the timing of migration and the commencement of mating, the type of population and gender relations, and the linkage of migratory bird populations with seasonal temperature changes, might all assist in forecasting how they will react to climate change in the long

range.(Patterson et al., 2021). It is expected that precipitation changes, particularly in the winter and spring, affecting breeding migratory bird populations in temperate areas at crucial levels and abundances. However, it is possible that precipitation changes, particularly in the spring, will have an impact on the survival and population dynamics of migratory birds. For example, it has been shown that higher yearly precipitation in Iraq's southern breeding zone has a good effect on both adult survival and recruitment. (Al-Musawi, Al-Obaidi and Al-Rubaie, 2018). Migrating birds' reproductive performance was highly linked to Seasonal rainfall, and variety diversity and breeding migratory bird population were reduced with rising dryness, notably with decreasing precipitation. Precipitation is likely connected to primary productivity, which is linked to the amount of arthropods, plant cover, and water bodies that are nesting supplies for migrating birds. The temperature of the air may also impact the amount of breeding migratory birds that are there (Seri and Rahman, 2021). Migratory birds were shown to be poorly prepared for the effects of increasing temperatures in previous studies. In temperate regions, both population growth and a decline in the survival of adults have been seen. Even in species that have evolved to thrive in hot, dry areas, survival rates may fall as aridity rises. High temperatures can also reduce the nesting activities of migrating birds in dry regions, even when precipitation levels rise. In semiarid settings, evapotranspiration increases may reduce early production, although it is difficult to estimate these effects. Temperature rises may cause invertebrate food sources and bird breeding operations to be out of sync. (Fogarty et al., 2020).

4-Land cover and migratory birds

Many migrating wild bird species travel vast distances in their annual migration (Fig. 2). In the fall, when the cold and fewer daylight hours in the northern hemisphere make for poor food conditions, migratory bird patterns are most prevalent. Because of this, these birds fly to warmer places before mating season so they can eat better (Xi et al., 2021). The genetic composition of birds has the capacity to vary in terms of migration time and path, and this may be influenced by ecological factors, including the lengthening or shortening of days. (Howard et al., 2020). Wildlife relies on the marshes and wetlands of southern Iraq as a resting area. In addition to providing warmth and shelter, it also serves as a food

source for migrating birds. There is a lot of greenery, water, and a few birds of prey. Birds from all across Europe and North America flock to this area during the winter months for these reasons. There are an estimated 158–134 water bird species around the globe, according to the convention for the Safeguard of African-European Migratory Water birds (WAAE). Including those that reach Iraqi wetlands (Juliev et al., 2019). Migratory birds are losing more of their populations owing to human activity and climate change than their resident counterparts, and land cover is a component of this worldwide trend. One of the greatest threats to world biodiversity and the ecological benefits it provides is the loss of migrating species. Many vertebrates migrate great distances in order to locate food and a comfortable environment. (Auteri, 2022). His difficulty in determining the cause of the fall in migratory bird populations is due to the fact that these birds need a wide range of habitats, from lakes to marshes to wetlands, even in breeding and non-breeding areas, for shelter and food. They are more susceptible to environmental changes than their resident counterparts because they are more reliant on numerous places and on the phonological events that take place there. It is necessary to determine which of the several stages of an organism's annual life cycle the population is severely confined to, which further complicates determining their demographic variation. There is a possibility that the population is decreasing due to changes in the environment and in the habitat that have been caused by people, in addition to other factors such as increased hunting and persecution. (Knudsen et al., 2011).

| Common gull | Mallard duck | White stork | White pelican | Barn swallow | Greylag goose |
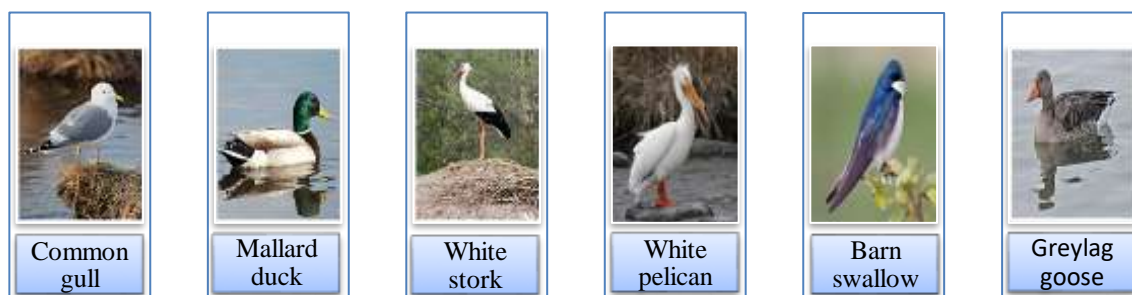
Figure (1): Shows some types of migratory birds that reach the marshes of Iraq.

Results

1-Vegetation changing trend analysis based on NDVI

Between 2000 and 2020, the NDVI was calculated using Landsat (5, 8) satellite data, using equation (1), after the Landsat data had been processed to ensure precise NDVI rates were available. Digital signal processing was used to figure out this number from reflectance data in the (NIR) and (RED) wavelength bands (Zhao and Liu, 2021). Red-light absorption by chlorophyll and near-infrared reflection by mesophyll tissue in leaves causes brightness levels acquired by Landsat sensors in these bands to be varied. This would be due to the fact that the leaves contain both of these pigments. The non-vegetation regions, which include areas of urbanisation, water bodies, and soil, would not have a significant percentage figure (minimum). On the other hand, in the region characterised by abundant vegetation and favourable environmental circumstances, the proportion between the two bands would be quite high (maximum). The statistical analysis of the index showed that the percentage of vegetation in the year 2000 was 5%. This percentage went down by 3.5% in the year 2010, and it went up by 15.6% in the year 2020. (Fernandes et al., 2015). As shown in (Table 2 and Figs. 3 - 4).

$$NDVI = \frac{NIR-RED}{NIR+RED} \quad \dots\dots\dots\dots\dots\dots (1)$$

Table (2): The vegetation values alter over the research interval.

year	Vegetation (m²)	% Area	Non Vegetation (m²)	% Area
2000	105484708.1	5.0%	2009687231	95.0%
2010	74694241.16	3.5%	2040389936	96.5%
2020	330849909	15.6%	1784234268	84.4%
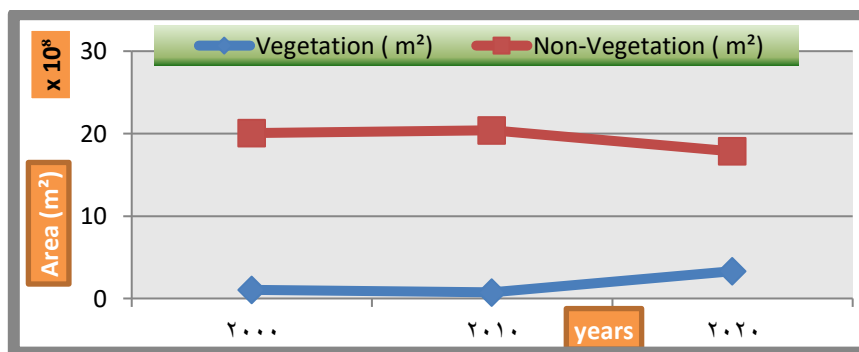
Figure (3): The change in NDVI area between 2000 to 2020.
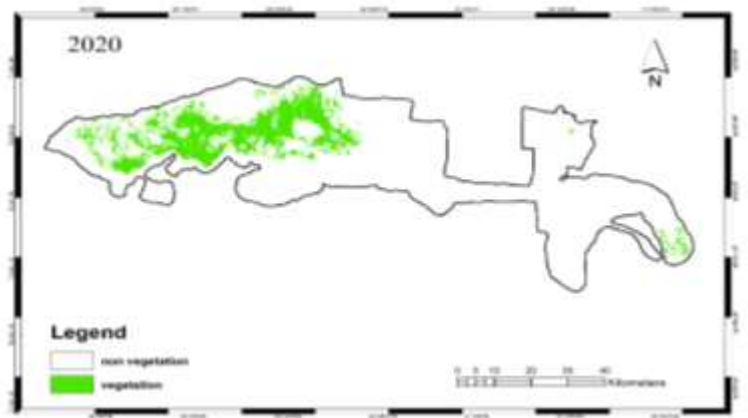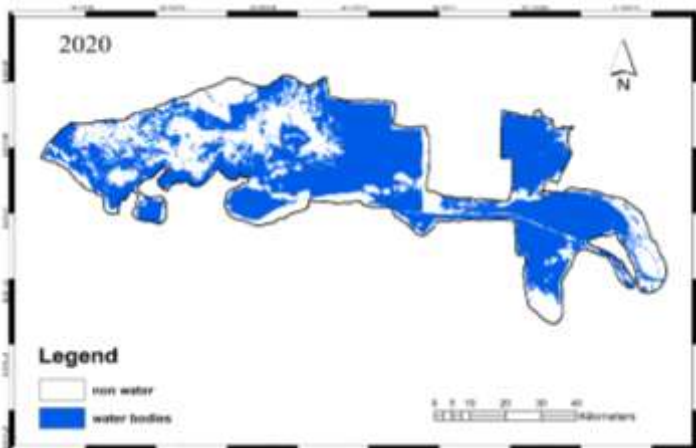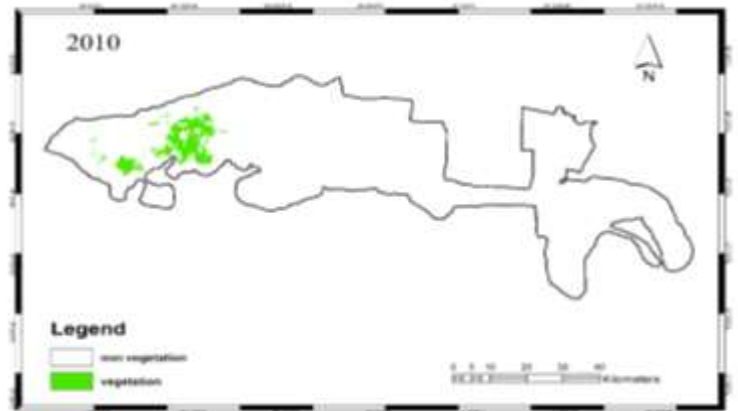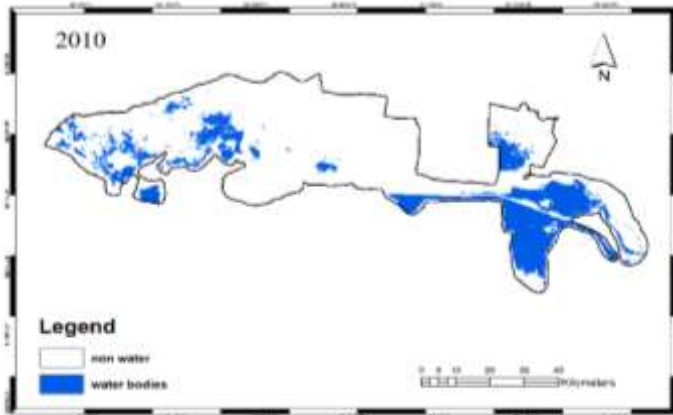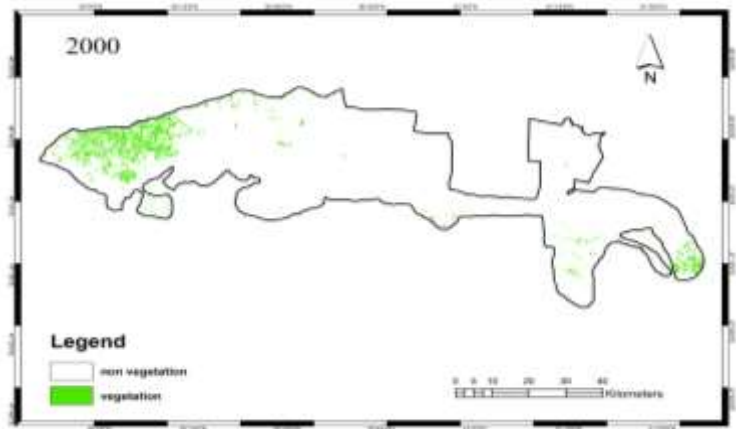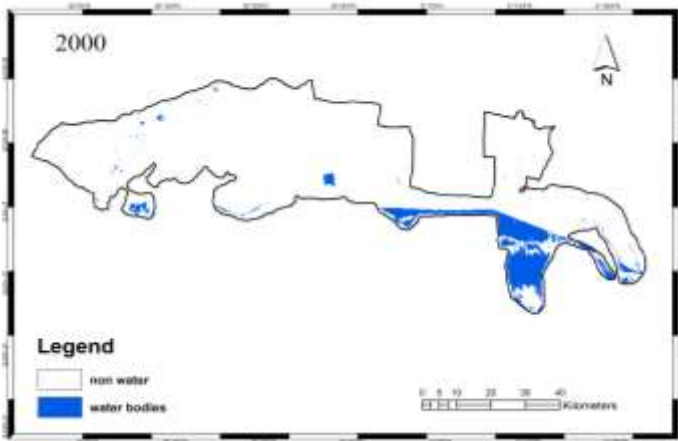
Figure (4): Landsat images' NDVI and NDWI from 2000 to 2020.

2- Water changing trend analysis based on NDWI

NDWI was used on Landsat images from 2000 to 2020 to categories the area's significant bodies of water. The goal of the NDWI calculation was to find out what had changed in the water bodies in the study area. NDWI mapping was able to find the "water bodies." Using equation (2), two types of NDWI were defined: areas with no water (NDWI < 0) and areas with water (NDWI > 0). (Ali K. Mohammed Ali, 2019) . According to the findings of the NDWI, Between the years 2000 and 2020, the number of bodies of water has continuously grown. In the years 2000, 2010, and 2020, water bodies accounted for 7.8%, 21.0%, and 62.6% of the total area of study, respectively (Figure 4). On the other hand, throughout the course of the research, the amount of land that was devoid of water fell precipitously to around 92.2%, 79%, and 37.4%. This data was extracted by ArcGIS version 10.2 (Miranda et al., 2017). These are the results (Table 3 and Figs. 5 - 4).

$$MNDWI = \frac{GREEN - MIR}{GREEN + MIR} \quad \ldots\ldots\ldots\ldots\ldots (2)$$

Table (3): The rates of water bodies fluctuate over the research interval.

year	water bodies	% Area	Non water	% Area
2000	164141292.6	7.8%	1950105714	92.2%
2010	443737743.5	21.0%	1671346434	79.0%
2020	1324906544	62.6%	790177633.6	37.4%
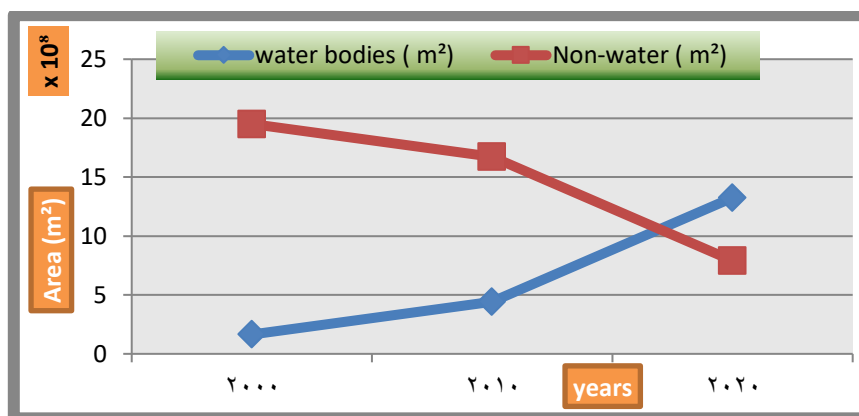
Figure (5): The NDWI area's variance from 2000 to 2020.

Discussion

The findings of the research indicated that the number of migrating birds in Iraq has dropped from October 2000 to October 2020. Especially during the years 2000 and 2010, this loss is attributed to a decrease in migratory species depending on water bodies and plant cover for food and favorable meteorological conditions for the nesting of migratory birds, whereas an overall rise occurred in 2020. The amount of plant cover and bodies of water was 15.6% and 62.6%, respectively. In contrast, Investigators found that the numbers of mallards, barn swallows, white storks, and common goslings rose between the years 2000 and 2020. However, the losses in other species, such as the Graylag geese and the white pelican, were not considerable. As a result, some birds have fled the area in search of better food and weather conditions elsewhere. Variations in the number of migrating birds in Al-Hammar marsh imply this approach has limited potential due to fluctuations in migratory bird distribution in the investigated area and high sample error in the subpart itself. Through long-term evaluations of the system's functioning and a rise in the amount of counts (e.g., of seagrass and fish), we will get a better understanding of the causes of the general shift in migrating bird populations. In addition, a yearly census would necessitate the daily inspection and verification of all ecological zones, thus enhancing the ability to identify large population declines.

Conclusions

From 2000 to 2020, we used satellite images to assess the effects of LULC change on the Al-Hammar Marsh Environment in southern Iraq. Total NDVI values went down by 5%, 3.5%, and 15.6% between 2000 and 2020, while total NDWI values went up by 7.8%, 21.0%, and 62.6%. This change in land cover has had the most significant impact on the environment of the marshes because it has led to a reduction in the variety and number of migratory birds that used to arrive in the region throughout the year. This decline is a direct result of human activities as well as the poor management practices of previous governments. A greater focus should be made on monitoring the area that is impacted in order to ensure the preservation of the natural resources found in the region under investigation. In the years to come, this will have the effect of lowering the negative consequences that challenged environments have.

References:

1) Afroz, R., Mia, M. B. and Islam, M. S. (2020) 'Evaluation and Monitoring of Water Quantity and Quality of the Buriganga River in Bangladesh using Multi-temporal Landsat Images', The Dhaka University Journal of Earth and Environmental Sciences, 8(1), pp. 61–69.

2) Al-Gburi, H. F. A., Al-Tawash, B. S. and Al-Lafta, H. S. (2017) 'Environmental assessment of Al-Hammar Marsh, Southern Iraq', Heliyon, 3(2), p. e00256.

3) Al-Musawi, N. O., Al-Obaidi, S. K. and Al-Rubaie, F. M. (2018) 'Evaluating water quality index of al Hammar Marsh, south of Iraq with the application of GIS technique', Journal of Engineering Science and Technology, 13(12), pp. 4118–4130.

4) Ali K. Mohammed Ali, F. K. M. A. R. A.-R. B. A. (2019) 'Evaluation of impact of vegetation decrease on precipitation rates in Baghdad City using remote sensing technique', BIOTECHNOLOGY & ENVIRONMENTAL SCIENCE Eco. Env. & Cons, 25(November), pp. S44–S50.

5) Auteri, G. G. (2022) 'A conceptual framework to integrate cold-survival strategies: Torpor, resistance and seasonal migration', Biology Letters, 18(5).

6) Cookson, M. D. and Stirk, P. M. R. (no date) Evaluation of impact of vegetation decrease on precipitation rates in Baghdad City using remote sensing technique. The Ministry of Environment ,Iraq.

7) Dhaidan, B. A., Alwan, I. A. and Al-Khafaji, M. S. (2022) 'Spatiotemporal Evaluation of Eutrophication State in the Hammar Marsh Using A Satellite-Based Model', IOP Conference Series: Earth and Environmental Science, 961(1).

8) Fernandes, M. R. M. et al. (2015) 'Land use and land cover changes in the Sergipe semiarid region', Floresta e Ambiente, 22(4), pp. 472–482.

9) Fogarty, F. A. et al. (2020) 'Associations of breeding-bird abundance with climate vary among species and trait-based groups in southern California', PLoS ONE, 15(3), pp. 1–16.

10) Howard, C. et al. (2020) 'Disentangling the relative roles of climate and land cover change in driving the long-term population trends of European migratory birds', Diversity and Distributions, 26(11), pp. 1442–1455.

11) Huang, C. ying et al. (2021) 'Remotely sensed assessment of increasing chronic and episodic drought effects on a Costa Rican tropical dry forest', Ecosphere, 12(11).

12) Juliev, M. et al. (2019) 'Analysis of land use land cover change detection of Bostanlik

district, Uzbekistan', Polish Journal of Environmental Studies, 28(5), pp. 3235–3242.

13) Knudsen, E. et al. (2011) 'Challenging claims in the study of migratory birds and climate change', Biological Reviews, 86(4), pp. 928–946.

14) Lin, Y. et al. (2021) 'Long-term remote sensing monitoring on LUCC around Chaohu Lake with new information of algal bloom and flood submerging', International Journal of Applied Earth Observation and Geoinformation, 102, p. 102413.

15) Miranda, A. et al. (2017) 'Native forest loss in the Chilean biodiversity hotspot: revealing the evidence', Regional Environmental Change, 17(1), pp. 285–297.

16) Mohammed Ali, A. K. and Mashee Al Ramahi, F. K. (2020) 'A study of the effect of urbanization on annual evaporation rates in Baghdad city using remote sensing', Iraqi Journal of Science, 61(8), pp. 2142–2149.

17) Mohammed Ali, A. and Mashee Al Ramahi, F. (2020) 'The Study Air temperature Annual Rates Effect for Urban of Baghdad City by Using Remote Sensing Data Techniques', Engineering and Technology Journal, 38(2B), pp. 66–73.

18) Patterson, A. et al. (2021) 'Northwest range shifts and shorter wintering period of an Arctic seabird in response to four decades of changing ocean climate', Marine Ecology Progress Series, 679, pp. 163–179.

19) Seri, N. A. and Rahman, A. A. (2021) 'Impact of climate change on migratory birds in asia', Pertanika Journal of Science and Technology, 29(4), pp. 2937–2965.

20) Xi, J. et al. (2021) 'Migration routes, behavior and protection status of Eurasian Spoonbills (Platalea leucorodia) wintering in China', Avian Research, 12(1), pp. 1–17. doi: 10.1186/s40657-021-00302-4.

21) Zhao, X. and Liu, J. (2021) 'Quantifying urban vegetation coverage change with a linear spectral mixing model: A case study in Xi'an, China', Ecological Chemistry and Engineering S, 28(1), pp. 87–100.

22) Zurell, D. et al. (2018) 'Do long-distance migratory birds track their niche through seasons?', Journal of Biogeography, 45(7), pp. 1459–1468.

INVESTIGATION AND ISOLATION OF BIOFILM GROW IN REFRIGERATORS

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Abstract:

Many people are often suffering from food poisoning and other health diseases. The isolation of pathogens from domestic refrigerators was performed to determine the prevalence of pathogenic microorganisms. Samples were obtained from domestic refrigerators of various parts of Mosul city. The swabs were inoculated onto Mannitol salt agar, EMB agar, MacConkey agar and were incubated for 24 hours at 37C. After incubation 10 bacterial cultures were obtained using various cultivation medium. Gram's staining revealed 10 isolates were Gram negative. For the Gram negative isolates biochemical tests were performed. Catalase test showed positive results for all the isolates. From the morphological and biochemical characteristics the isolates were identified as Salmonella sp., Citrobactor sp., Proteus sp., E. coli. These findings underline the need for greater consumer's education regarding proper cleaning of their refrigerators and safe food handling practices.

Key words: Isolatıon of Varıous Bacteria, Grow in Refrigerators.

Introduction:

Microorganisms are ubiquitous occurring nearly everywhere in nature. They occur most abundantly in the presence of nutrients, moisture, and temperature suitable for their growth and multiplication (1).Microorganisms are found in everywhere , they are found in the air, food, and on our body surfaces and other close environments. Different effects that could be useful or harmful for microorganisms to presence and many ways of resisting invasion (2).

Refrigerators form as one of the most important link appliances found in homes used in storing and keeping food products so as to prolong the shelf life of the foods. It is a wide chain of cross-contamination kitchen, which leads to the outbreak of domestic food borne disease or illness. Science domestic refrigerators known as " house hold refrigerators" a low temperature appliance used in homes for the preservation and storage of food products (3). The most widely methods of controlling microbial growth of perishable products by refrigeration in (4-5) degree (4). By controlling the rate of certain chemical and enzymatic reactions as well as the rate of growth of food microorganisms (5). As molecular motion slows food spoilage slow down and inhibit microorganisms that cause spoilage food.

Many domestic refrigerators are incorrectly adjusted operating above the recommended temperature and are therefore capable of supporting sub-optimum but significant growth of mesophilic organisms such as *Staphylococcus aureus* and *Salmonella* spp. (6). These bacteria are constitute potential hazards in refrigerated foods , particularly in in products eaten without subsequent cooking. these pathogens are widely distributed in many environments and are known to survive under refrigerated conditions (7). *Listeria monocytogenes* is also known to adhere to different surface materials normally in contact with foods such as stainless steel, glass, and polypropylene which can subsequently colonize refrigerators (8).

Bacteria can colonize a range of food preparation on surfaces, utensils, domestic dish cloths, sponges and other cleaning materials(9), from which they can be transferred into food (2).

Bacterial contamination are attributable to improper food storage,lack of safe food handling procedures, poor cleanliness, and refrigerator managements (10).

There is however , little information on their spread to and persistence on the interior surface of domestic refrigerators making it difficult to quantify the true burden of such pathogens in these environments, or estimate the risks they pose to consumers. Therefore, this study was carried out and examined the incidence of pathogen on the surface of domestic refrigerators in selected houses in Mosul city

as a local study to provide insights and the risk posed by these pathogens in domestic refrigeration system.

Materials and Methods

Collection of samples from home refrigerators:

Samples were collected from (50) random domestic refrigerators in Mosul city. Samples were taken from base, shelves and sides of the refrigerators using sterile swabs sticks moisten in sterile N. broth and transported back to the laboratory for analysis within one hour of collection.

Culture Media:

Different culture media were prepared, *Salmonella Shigella* Agar (SSA) , Eiosin Methylene Blue Agar (EMB) , macconky Agar andMannitol Salt agar were used for the isolation of pathogens.

Morphological Characterization:

The isolates were characterized based on morphological and biochemical analysis. Gram staining, IMViC tests, TSI, Urease and Oxidase. From the biochemical analysis pathogens were identified by comparing the results with Bergeys manual.

Results and Discussions

Bacterial cultures were isolated from different media. Two sampling locations were chosen for the study and from both the locations five bacterial strains were isolated, respectively (11).

Morphological characterization In the morphological characterization from both the sampling location, five bacterial colonies were isolated.

Biochemical Characterization Location 1 In the biochemical characterization, five strains were negative for the Indole test and VP test.For the MR test all five strains were shown the positive result. In the citrate test two strains were shown the negative result. For the TSI test four strains were shown the positive results and for the Catalase test allthe strains were shown the positive result and for the Mannitol motility test two strains were showing the negative result (12).

The gram negative strains were identified by the IMVIC tests. In the Indole test two strains were shown the positive result. For the MR test all the strains were shown the positive results where as in the VP test all the strains were shown the negative results. In the Citrate test two of the strains were shown negative result.

For the TSI test one strain was showing the negative result and for the Catalase test all bacterial strains were shown the positive results and for the Mannitol motility test all the strains were shown the positive result.

In this study *Salmonella* sp. was detected in many of the refrigerators which were observed previously15. The morphological and biochemical characterization shows the presence of one isolates of *Shigella* sp., six isolates of Salmonella sp. and two isolates of E. coli were identified.

E.coli and Salmonella sp. were detected in the refrigerator examined by various or different morphological and biochemical characterization. Salmonella sp. was the most frequently recovered from domestic refrigerator in this study. Few *Shigella* sp. and *Citrobactor* sp. were also recovered from refrigerator surface (12). It can be understand that different types of strains are shown with different type of activity.. Five Salmonella sp. were detected in most of the refrigerators sampled. In a study by (13) reported the failure to detect these pathogens, not only in refrigerator, but in a wide range of sites examined in domestic kitchens. However, *Salmonella* sp. was found to be easily spread throughout the domestic environment (14). *E. coli* was identified in this study, which is relatively rare occurrence of the low infective dose pathogens in the human food chain and its ability to form viable non-culturable forms16,17. E. coli strains were isolated from almost every refrigerator

surface. These result supported the report of (15) that such organisms are common contaminant in refrigerators18. Additional bacteria identified, but not quantified included *Klebsiella* sp., *Citrobactor* sp. (*Citrobacter freuundii, Citrobacter diversus*) and *Shigella* sp.

Salmonella sp. is a frequent contaminant of many retail foods, and public health challenges in terms of potential cross contamination to food and food preparation surfaces during routine food preparation. *Salmonella* sp. are equally easily spread through the domestic environment where they can persist for up to four days. Surface associated Salmonella sp. still because a significant cross contamination risk, means this pathogen can multiply under condition of mild temperature abuse in cross contaminated foods (16).

E. coli was identified in this study, which is much unexpected pathogen which founds in mainly meat products and raw food contact surfaces. The levels of contamination observed in domestic refrigerators are likely to be influenced by a range of factors (17).

including the nature and levels of initial contamination introduced on contaminated foods, the presence and absence of effective packaging, the hygiene

of those preparing and placing foods into the refrigerators and the efficiency and frequency of refrigerator maintenance and cleaning.

E. coli is widely accepted indicator of fecal contamination suggesting that the refrigerator internal surfaces are frequently contaminated by import of contaminated raw foods or by poor personal hygiene (18).

It is impossible to completely exclude food pathogens from the kitchens; however their spread, growth in survival can be controlled with correct food storage and preparation of practices and regular cleaning and disinfection of food contact site (19). As we rely more and more on refrigeration as a means of food preservation it is crucial to aware the public about the refrigeration better handlings. The importance of temperature control and regular efficient cleaning should be communicated to the public (20).

Conclusions

The major factor contributing to food borne illness, especially in the home, is the mishandling of food in the final preparation steps. This study

has shown that the pathogenic bacteria can survive in refrigerator surfaces and can cause cross contamination. Thus a number of undesirable pathogens such as Salmonella sp., Citrobacter sp., Shigella sp., and Proteus sp., were isolated from the refrigerators of Vellore district.

REFERENCES:

1. Sheard JB. Food poisoning in England and wales during 1983. A newtitle but still the same problem. Environ Health Perspect 1986;94 :57-61.

2. Borneff J, Singer HR, Wittig J, Harder ER. Distribution of microorganisms in household kitchens. 2. Critical-evaluation of the results and conclusions. Zbl Bakt Mik Hyg B 1988; 186 :30–44.

3. Ryan MJ, Wall PG, Gilbert RJ, Griffin M, Rowe B. Risk factors for outbreaks of infectious intestinal disease linked to domestic catering.CDR Review 1996; 13 :179–182.

4. Flynn OMJ, Blair I, McDowell D. The efficiency and consumer operation of domestic refrigerators. Int J Refrig 1996; 15 :307–312.

5. Michaels B, Ayers T, Celis M, Gangar V. Inactivation of refrigerator biofilm bacteria for application in the food service environment. Food Sci Technol 2001; 1 :169–179.

6. Scott E, Bloomfield SF, Barlow CG. An investigation of microbial contamination in the home. J Hydrol 1982; 89:279–293.

7. Spiers JP, Anderton A, Anderson JG. A study of the microbial content of the domestic kitchen. Int J Environ Health Res 1995; 5:109–122.

8. Rusin P, Orosz Coughlin P, Gerba C. Reduction of faecal coliform, coliform and heterotrophic plate count bacteria in the household kitchen and bathroom by disinfection with hypochlorite cleaners. J Appl Microbiol 1998; 85 : 819–828.

9. Sharp K, Walker H. A microbiological survey of communal kitchens used by undergraduate students. J Consumer Stud 2003; 27 :11–16.

10. Rusin P, Maxwell S, Gerba C. Comparative surface-to-hand and Wngertip-to-mouth transfer efficiency of gram-positive bacteria,gram-negative bacteria, and phage. J Appl Microbiol 2002; 93 : 585–592.

11. Milligan P, Njie A, Bennet,. Food borne illness. Int J Epidermology 2004; 33: 469-476.

12. Cogan TA, BloomWeld SF, Humphrey TJ. The effectiveness of hygiene procedures for prevention of cross-contamination from chicken carcases in the domestic kitchen. Lett Appl Microbiol 1999; 29 : 354–358.

13. Gilbert RJ, McLauchlin J, Velani, SK. The contamination of pate by Listeria monocytogenes in England and Wales in 1989 and 1990. Epidemiol Infect 1993; 110 :543–551.

14. Griffin PM, Tauxe RV. The epidemiology of infections caused by Escherichia coli O157:H7, other enterohemorrhagic E. coli, and the associated hemolytic uremic syndrome. Epidemiol Rev 1991; 13:60–98.

15. Spiers JP, Anderton A, Anderson JG. A study of the microbialcontent of the domestic kitchen. Int J Environ Health Res 1995; 5:109–122.

16. Dillon RM, Patel TR. Listeria in seafoods. J Food Prot 1992; 55:1009-1015.

17. Uyttendare M, Taverniers I, Debevare J. Analysis of food bornepathogens. Int J Food Microbiol 2001; 66 :31-37.

18. Scott E, BloomWeld SF, Barlow CG. An investigation of microbialcontamination in the home. J Hyg 1982; 89: 279–293

19. Pini PN, Gilbert R. Different bacterial species found in processedfood. Int J Food Microbiol 1998; 7 :317-326

20. Kennedy J, Jackson V, Blair IS, McDowell DA, Cowan C, Bolton D. Food safety knowledge of consumers and the microbiological andtemperature status of their refrigerators. J Food Protect 2005; 68:1421–1430.

THE PREVALENCE OF SIDE-EFFECTS AFTER BNT162B2/PFIZER, AZD1222/ASTRAZENECA, AND BBIBP-CORV/SINOPHARM VACCINES AMONG IRAQI RESIDENTS

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Abstract:

Since the first confirmed COVID-19 case in Iraq in February 2020, Iraq has continued to suffer severe waves of COVID-19 infections and deaths. Three vaccines are available in Iraq namely: BNT162b2/Pfizer–BioNTech (PB), AZD1222/AstraZeneca (AZ), and BBIBP-CorV/Sinopharm (SP). This study investigates the prevalence of side effects after the first and second doses of the three vaccines. A cross-sectional study was carried out from May 1, 2021 to February 15, 2022 in the main vaccination center in Al-Muthanna Province, southern Iraq, during the administration of the second dose of the vaccine. The study included 8710 participants (4990 males and 3720 females) aged ≥ 18 years. It was found that PB have fewer side effects than AZ and SP, with rates of 57%, 97.9%, and 98.7%, respectively. There was no significant difference between AZ and SP, with an increased risk of side effects in males after PB and SP and in females after AZ. The presence of chronic diseases increased postvaccine symptoms of the three vaccines, while previous COVID-19 infection increased symptoms among males only after the first shot of AZ. Furthermore, there was no clear evidence that symptoms were more severe after the first dose than after the second, or vice versa. In addition, there was no particular age group that experienced more side effects. Although 72% (6237/8710) of participants experienced mild to moderate postvaccine symptoms, only 11% (687/6237) requested temporary rest, particularly among chronic patients. No severe symptoms or hospitalizations have been reported following administration of any of the three vaccines.

Key words: Post-Vaccine Symptoms, Covıd-19 Infectıon, Chronic Disease.

Introduction:

Since the first COVID-19 case was reported on December 31, 2019 in the city of Wuhan, Hubei province, of the People's Republic of China, the world has been suffering from an outbreak of the novel severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), responsible for the COVID-19 pandemic (Velavan and Meyer, 2020). According to the available statistics of the last century, the COVID-19 pandemic ranks second after the Spanish flu pandemic in terms of mortality rate and surpasses other previous pandemics such as the Asian flu, Hong Kong flu, and Swine flu (Huremović, 2019). On January 30, 2020, the World Health Organization (WHO) Emergency Committee declared a global health emergency due to increasing infections in China and many other countries (Velavan and Meyer, 2020). According to the WHO's Coronavirus (COVID-19) Dashboard, as of March 28, 2022, more than 527 million infections and 6.2 million deaths has been recorded worldwide, including more than 2.3 million infections and 25,000 deaths in Iraq (WHO, 2022a, 2022b). The COVID-19 infection poses a serious public health challenge as there is no agreed treatment protocol that can be followed in all countries, the severity of the infection varies from person to person and from country to country (Wang *et al.*, 2021). To combat the pandemic, many vaccines such as BNT162b2/Pfizer–BioNTech (PB), AZD1222/AstraZeneca (AZ), BBIBP-CorV/Sinopharm (SP), mRNA-1273/Modena, and Ad26.COV2.S/Janssen (with effectiveness ranged from 70% to 95%), have been manufactured and billions of doses administered. Iraq is one of the least vaccinated countries with only 17 million doses administered to date (WHO, 2022b). Rumours, conspiracy theories, and misinformation have adversely affected vaccination rates worldwide (Islam *et al.*, 2021). Three vaccines have been supplied to Iraq: AZ, PB, and SP, despite the ease of the vaccination process, free of charge vaccination, and an intense advertising campaign to encourage people to get vaccinated, millions of Iraqis have refrained from receiving the vaccine. They believe and baselessly argue that vaccines cause infertility, alter the recipient's genetic information, or even carry microchips to control humans (Sallam *et al.*, 2021). Obtaining the anti-SARS-CoV-2 vaccine is a top priority to protect society. At a time when many countries have announced a fully vaccinated population of almost 100%, Iraq lags behind with a vaccination rate of no more than 18% (Ritchie *et al.*, 2022). For this reason; there is an urgent need to increase scientific efforts to clarify the actual prevalence, severity, and types of postvaccine symptoms, to help people remove suspicions and recognize myths and misinformation surrounding the vaccine. This study aimed to compare the prevalence of symptoms after two doses of PB, SP, and AZ vaccines and to

investigate the effects of previous COVID-19 infection and the presence of chronic diseases on postvaccine symptoms among Iraqi people.

2: Methods

2:1: Study Design and Population

A prospective cross-sectional survey-based study was carried out from May 1, 2021 to February 15, 2022 to evaluate risk factors associated with side effects following the three COVID-19 vaccines PB, AZ, and SP among residents of Al-Muthanna province, southern Iraq. A total of 8955 eligible persons were enrolled in this study including 5013 males and 3942 females. During the second dose administration, an in-person-administered survey was carried out in the main vaccination center at Al-Hussien Teaching Hospital, to inquire about previous postvaccine symptoms following the first dose. Participants were also kindly asked to be contacted via WhatsApp, Viber, Facebook Messenger, or SMS two days after receiving the second dose. Participants were asked about their most common symptoms, including arm soreness, fever, internal fever, headache, chills, muscle pain, joint pain, and fatigue. In addition, they were asked to report any other symptoms such as (abdominal pain, anorexia, stomach hold, coughing, sneezing, runny nose, chest pain, difficulty breathing, frequent urination, and allergies). The rest of the information, such as age, chronic diseases, and previous COVID-19 infection, was extracted from the vaccination records after participant's consent.

2:2: Eligibility Criteria

The study enrolled individuals 18 years and older of both genders who adhered to reasonable health precautions per CDC standards (CDC, 2021a), such as: drinking plenty of water after vaccination and not taking painkillers or antipyretics before receiving the vaccine. Participants with previous positive COVID-19 test results were required to have passed at least three months after receiving their first dose of the vaccine. Those who had confirmed or suspected COVID-19 infection before receiving the second dose were excluded.

2:3: Statistical Analysis

The raw data was arranged and coded in Excel to create categorical data. Participants were divided into four age groups: ≤30, 31-40, 41-50, and ≥51 years, with sequential ID numbers starting with 0001. Participants information was coded as follows: gender (male = 0, female = 1), chronic disease (with chronic disease = 0, without chronic disease = 1), previous COVID-19 infection (infected = 0, uninfected = 1), age groups (≤30 = 0, 31-40 = 1, 41-50 = 2, ≥51 = 3), and vaccine (PB = 0, AZ = 1,

SP= 2). The raw data contingency tables were generated using Jamovi (version 1.6) to calculate the numbers and percentages of participants in addition to the 95% confidence interval of the proportions. Odds ratios and 95% confidence intervals of first and second dose symptoms stratified by gender, age, chronic disease, and previous COVID-19 infections were calculated using MedCalc (version 15.8) and SPSS Statistics 23. A chi-square test of difference in proportions using MedCalc (version 15.8) was performed to estimate the effects of chronic diseases and previous COVID-19 infection on postvaccine symptoms. A statistically significant odds ratio and proportion difference was determined with a p-value ≤ 0.05.

2: 4: Ethical views

The study was carried out under the permission and supervision of the Health Directorate of Al-Muthanna Province/Ministry of Health/Iraq, and in addition to the verbal consent of all participants. This study did not affect the vaccination procedures, and no physical intervention was performed.

3: Results

Of the 8955 cases collected, who received two doses of any of the three vaccines, 245 individuals, mostly females, were excluded according to the study exclusion criteria. The total number of cases considered for investigation was 8710 (4990 males; 3720 females); of those, 5717, 2279, and 714 individuals received PB, AZ, and SP, respectively (Table I).

Table I: Numbers and percentages of study participants by age, gender, chronic disease, and previous COVID-19 infection

Group (year)	Age (year) mean ±SD	Previous COVID-19 Infection N (%)		Chronic Disease N (%)	
		Infected	Not-infected	With	Without
≤30	24.31±3.4	633 (53)	562 (47)	86 (7.2)	1109 (92.8)
		659 (68.4)	304 (31.6)	37 (3.8)	926 (96.2)
31-40	35.43±2.94	746 (57.6)	550 (42.4)	196 (15.1)	1100 (84.9)
		541 (49.9)	543 (50.1)	88 (8.1)	996 (91.9)
41-50	45.5±2.87	624 (61.1)	398 (38.9)	431 (42.2)	591 (57.8)
		343 (66.1)	176 (33.9)	223 (43)	296 (57)
≥50	60.3±5.81	698 (47.3)	779 (52.7)	1016 (68.8)	461 (31.2)
		655 (56.8)	499 (43.2)	560 (48.5)	594 (51.5)

Gray-highlighted cells represent males

Different proportions of chronic diseases were recorded among the participants according to the age group and gender, including heart failure, chronic stroke, diabetes, arthritis, osteoporosis, chronic kidney disease, chronic obstructive pulmonary disease (COPD), asthma, ischemic heart disease, hypertension, and high cholesterol. Regardless of age, chronic disease, and previous COVID-19 infection; first-dose symptoms (FDS) were significantly higher among males after receiving the PB and SP vaccines, but significantly lower than in females after receiving AZ, while second-dose symptoms (SDS) were significantly higher among males after the PB vaccine only, as shown in Table II.

Table II: The odds ratio of FDS and SDS of males after PB, AZ, and SP vaccines

Vaccine	FDS N (%)		OR 95%[CI]	*P* value	SDS N (%)		OR 95% [CI]	*P* value
	Yes	No			Yes	No		
PB	1555 (49.3)	1601 (50.7)	1.4 [1.24-1.53]	< 0.001	1424 (45.1)	1732 (54.9)	1.14 [1.02-1.3]	0.02
	1059 (41.4)	1502 (58.6)			1074 (41.9)	1487 (58.1)		
AZ	1252 (93.6)	86 (6.4)	0.63 [0.43-0.93]	0.02	1256 (93.9)	82 (6.1)	1.16 [0.83-1.62]	0.39
	902 (95.9)	39 (4.1)			875 (93)	66 (7)		
SP	473 (95.4)	23 (4.6)	7.3 [4.35-12.2]	< 0.001	469 (94.6)	27 (5.4)	0.66 [0.29-1.5]	0.32
	161 (73.9)	57 (26.1)			210 (96.3)	8 (3.7)		

Gray-highlighted cells represent males

Females is a reference category to calculate odds ratio

Participants were less likely to develop post-PB symptoms compared to participants who received AZ and SP at 57% (95% CI 56-59), 97.9% (95% CI 97-98), and 98.7% (95% CI 97.6-99) respectively, with no significant difference between SP and AZ, as 2417/5717, 47/2279, and 9/714 reported no side effects after receiving PB, AZ, and SP respectively. Based on the data in Table II, a cross-comparison of FSD and SDS was performed between the three vaccines. PB was found to have significantly lower FDS and SDS amongst males and females than AZ and SP. There was no statistically significant difference in FDS and SDS among males after AZ and SP, while a high FDS was noted in females after AZ compared to SP (Table III).

Table III: Comparison of FDS and SDS between the three vaccines

Gender	Comparison	FDS OR 95% [CI] P value	SDS OR 95% [CI] P value
Male	PB vs. AZ*	0.07 [0.05-0.08] **< 0.001**	0.05 [0.04-0.67] **< 0.001**
	PB vs. SP*	0.05 [0.03-0.07] **< 0.001**	0.05 [0.03-0.07] **< 0.001**
	AZ vs. SP*	0.7 [0.44-1.14] 0.15	0.88 [0.6-1.4] 0.58
Female	PB vs. AZ*	0.03 [0.02-0.04] **< 0.001**	0.05 [0.04-0.07] **< 0.001**
	PB vs. SP*	0.25 [0.18-0.34] **< 0.001**	0.03 [0.01-0.06] **< 0.001**
	AZ vs. SP*	8.1 [5.3-12.7] **< 0.001**	0.5 [0.24-1.07] 0.07

*reference category

The rate of symptoms after vaccination did not show a consistent pattern of increase or decrease between the age groups of both genders. FDS in males for the age group (≥51 years) was highest after PB and AZ, while males for the age group (31-40 years) showed the highest FDS after SP. SDS among females was almost equal to the FDS after PB, while it was lower than FDS after AZ and higher than FDS after SP (Figure I).
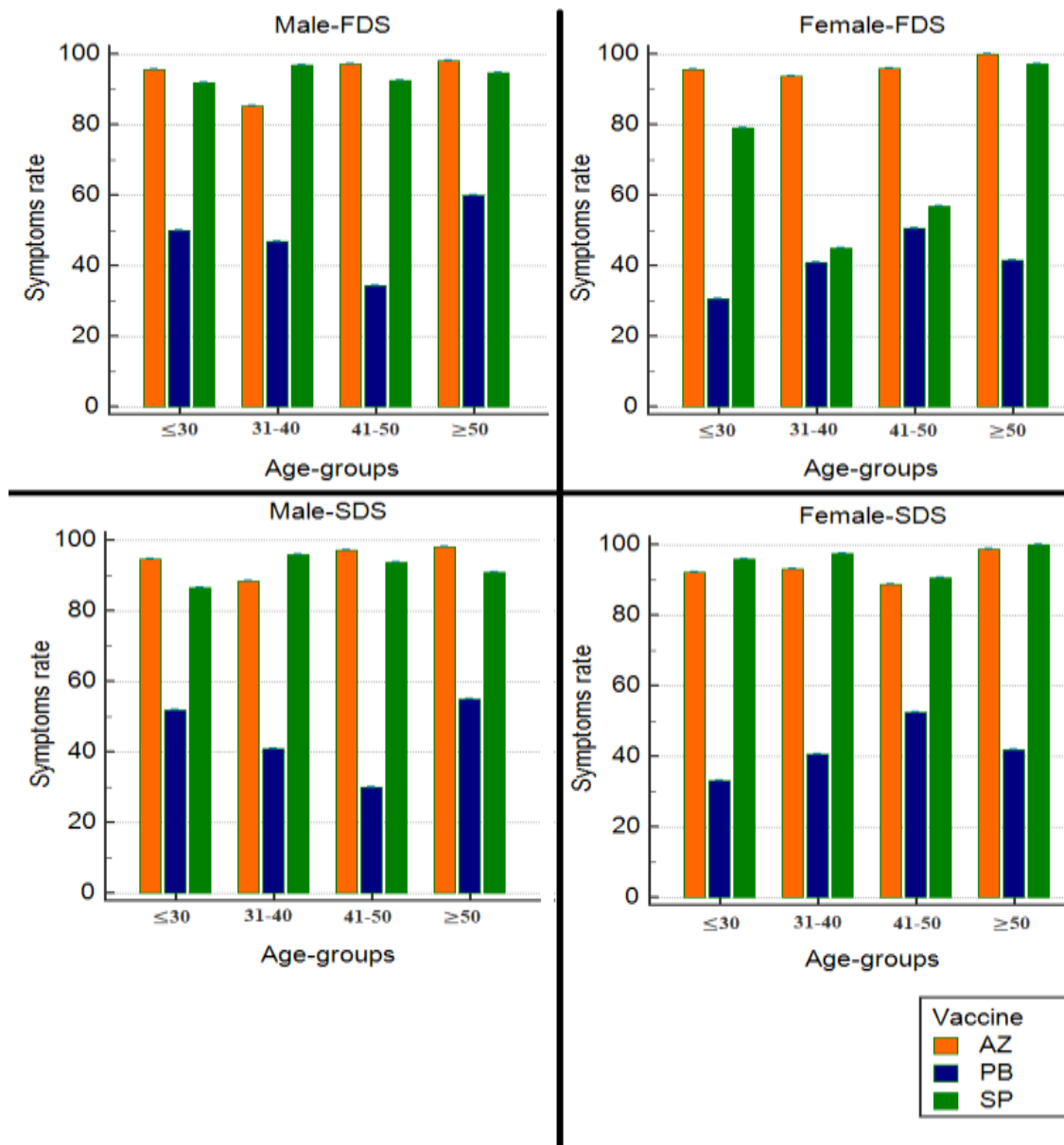
Figure I: The percentage of FDS and SDS after PB, AZ, and SP for males and females among four age groups.

It was found that previous infection with COVID-19 did not affect the postvaccine side effects, except in uninfected males who received AZ, which showed more side effects after the first dose. Males and females with chronic diseases had more side effects after two doses of PB but were significantly lower than symptoms among chronic patients receiving AZ and SP. In comparison, only males with chronic disease had more side effects after two doses of AZ. The first dose of SP caused more side effects in females with chronic diseases (Table IV).

Table IV: Proportions comparison of FDS and SDS among participants stratified by chronic disease and COVID-19 infection

Vaccine	Gender	Previous COVID-19 infection					With and without chronic diseases					
		First-dose Symptoms N (%)		Proportion difference % 95% Confidence Interval P-Value	Second-dose Symptoms N (%)		First-dose Symptoms N (%)		Proportion difference % 95% Confidence Interval P-Value	Second-dose Symptoms N (%)		Proportion difference % 95% Confidence Interval P-Value
		Yes	No		Yes	No	Yes	No		Yes	No	
PB	Male	834 (48)	903 (52)		792 (45.6)	945 (54.4)	799 (58)	573 (41)	15.8 12.3-19.3 P < 0.001	750 (54.7)	622 (45.3)	16.9 13.4-20.4 P < 0.001
		721 (50.8)	698 (49.2)		632 (44.5)	787 (55.5)	756 (42.4)	1028 (57.6)		674 (37.8)	1110 (62.2)	
	Female	534 (39.6)	816 (60.4)		541 (40.1)	809 (59.9)	431 (58.7)	303 (41.3)	24.3 20- 28.5 P < 0.001	424 (57.8)	310 (42.2)	22.2 17.9-26.4 P < 0.001
		525 (43.4)	686 (56.6)		533 (44)	678 (56)	628 (34.4)	1199 (65.6)		650 (35.6)	1177 (64.4)	
AZ	Male	536 (91.6)	49 (8.4)	3.5 0.72-6.42 P = 0.013	540 (92.3)	45 (7.7)	236 (99.2)	2 (0.8)	6.8 4.2-8.7 P = 0.0002	233 (97.9)	5 (2.1)	4.9 1.8-7.1 P = 0.007
		716 (95.1)	37 (4.9)		716 (95.1)	37 (4.9)	1061 (92.4)	84 (7.6)		1023 (93.0)	77 (7.0)	
	Female	694 (96.1)	28 (3.9)		679 (94)	43 (6)	149 (98)	3 (2)		146 (96.1)	6 (3.9)	
		208 (95)	11 (5)		196 (89.5)	23 (10.5)	753 (95.4)	36 (4.6)		729 (92.4)	60 (7.6)	
SP	Male	361 (95.3)	18 (4.7)		361 (95.3)	18 (4.7)	110 (92.4)	9 (7.6)		109 (91.6)	10 (8.4)	
		112 (95.7)	5 (4.3)		108 (92.3)	9 (7.7)	363 (96.3)	14 (3.7)		360 (95.5)	17 (4.5)	
	Female	92 (73)	34 (27)		121 (96)	5 (4)	21 (95.5)	1 (4.5)	24.1 4.8-32.3 P = 0.03	22 (100.0)	0 (0.0)	
		69 (75)	23 (25)		89 (96.7)	3 (3.3)	140 (71.4)	56 (28.6)		188 (95.9)	8 (4.1)	

Different mild to moderate symptoms were reported by vaccinated individuals and mainly included arm soreness, fever, feeling of internal fever, headache, chills, muscle pain, joint pain, and fatigue at rates of (100%, 57%, 77%, 65%, 32%, 14%, 23%, and 61%), respectively. No allergies, life-threatening symptoms, or abnormal changes in blood sugar or blood pressure have been reported particularly in chronically ill patients. In most cases, more than one symptom was reported and only 2473 (28.4%) of the participants did not report any symptoms except for arm soreness that all participants suffered after receiving the first and second doses of the three vaccines. About 89% (5550/6237) of the participants who had postvaccine symptoms continued activities of daily living (ADL) almost as usual, while 11% (687/6237) were temporarily unable to do ADL or taking time or days off from work. Although postvaccine symptoms were generally mild to moderate, they may disrupt daily activities, partially or for an entire day, especially among chronically ill seniors, at 14.4%, 13.2%, and 8.3% for AZ, SP, and PB, respectively. None of the participants required outpatient care or hospitalization due to postvaccine symptoms.

4: Discussion:

Since the end of 2019, the world has been going through difficult times due to the COVID-19 pandemic. People have been experiencing a difficult health situation that they have never experienced before. Scientific disagreements about the origin of

this novel virus and the spread of unscientific information and rumors about the origin, effectiveness, and goals of COVID-19 vaccines have left millions of people reluctant to receive the vaccine. The biggest obstacle to the vaccination process in Iraq is the fear of postvaccine symptoms. About 83.5% of the population did not receive any COVID-19 vaccine and 51.4% of them refused to take any type of vaccine (Abdulah *et al.*, 2021). In a survey involving 36,220 citizens from different Arabic countries, including Iraq, public fear of the COVID-19 vaccine ranged from 28% to 60% (Qunaibi *et al.*, 2021). Public health awareness in Iraq is very low and the refusal to receive vaccines not only relates to the COVID-19 vaccine but even extends to other vaccines such as the seasonal influenza vaccine (Saod *et al.*, 2016). This is supported by the fact that the number of people who generally reject or fear vaccinations has increased noticeably in the last two decades (Dub *et al.*, 2015).

The current study found that males experienced more side effects, which was in contrast to other studies that found that females after PB, AZ, and SP were more likely to develop postvaccine symptoms (Alghamdi *et al.*, 2021; Cuschieri *et al.*, 2021; El-Shitany *et al.*, 2021; Hoffmann *et al.*, 2021; Saeed *et al.*, 2021). It seems that females experience more symptoms after vaccination, even after receiving other COVID-19 vaccines (not PB, AZ, and SP), such as the Sinovac-CoronaVac vaccine (Riad *et al.*, 2021). The above studies compared postvaccine symptoms between males and females without stratifying by other factors such as previous COVID-19 infection or chronic disease, which could explain the discrepancy between the current results and the results of previous studies. From Table 1 it can be noted in Table I that males had higher levels of chronic disease than females, and this may have contributed to an increased prevalence of side effects among males.

The side effects of the PB vaccine were lower than the side effects of other vaccines in both genders. Almufty *et al.* (2021) and Elgendy *et al.* (2022) also came to the same conclusions (Almufty *et al.*, 2021; Elgendy *et al.*, 2022). However, the results are in contrast to previous studies conducted among healthcare workers, indicating that the side effects of AZ were highest, but PB side effects were higher than SP (Abu-Halaweh *et al.*, 2021; Abu-Hammad *et al.*, 2021; Hatmal *et al.*, 2021). In addition, the AZ vaccine was found to cause moderate to severe symptoms compared to PB and SP (Hatmal *et al.*, 2021). AZ vaccinated people reported a higher prevalence of local and systemic side effects than PB vaccinated people (Abu-Hammad *et al.*, 2021; Andrzejczak-Grządko *et al.*, 2021; Alhazmi *et al.*, 2021; Kim *et al.*, 2021). In a study comparing postvaccine symptoms after PB and AZ, it was concluded that systemic symptoms were 1.6 times more likely after AZ, while local symptoms were 2.9 times more likely after PB (Menni *et al.*, 2021). PB vaccine was mainly associated with local

side effects, while AZ was mainly associated with systemic side effects (Klugar *et al.*, 2021). All local and systemic symptoms recorded in this work were within the normal limits of symptoms reported by vaccine developers, indicating that the body interacts and responds to vaccines and builds protection against COVID-19 infection (WHO, 2021).

An interesting finding of the present study is that previous COVID-19 infection did not affect postvaccine side effects. However, individuals with no history of COVID-19 infection showed more postvaccine FDS after AZ. Menni *et al.*, (2021) reported that more systematic and local side effects were experienced among individuals with previous COVID-19 infection after receiving AZ (Menni *et al.*, 2021). Previous COVID-19 infection played a role in increasing the severity of symptoms after PB (El-Shitany *et al.*, 2021; Ossato *et al.*, 2021). These findings were further supported by Tissot *et al.*, (2021) who argued that people with a history of COVID-19 infection reported higher postvaccine symptoms than reported by primary naïve patients (Tissot *et al.*, 2021). Almufty *et al.*, (2021) reported that side effects increased after the three vaccines, PB, AZ, and SP, in people previously infected with COVID-19 (Almufty *et al.*, 2021). The nature of the immune response to SARS-CoV-2 infection can determine the side effects after vaccination. Post-vaccine symptoms were more prominent in group with prior COVID-19 infection after the first dose but were similar to the uninfected group after the second dose (Ebinger *et al.*, 2021).

This study found that people with chronic diseases experienced more side effects after receiving PB, AZ, or SP vaccines. Some chronic diseases may have played a role in increasing the side effects of the vaccines. For example, diabetic patients developed more adverse reactions after AZ vaccination (Lee *et al.*, 2021), while the side effect profile was similar in cancer patients and healthy controls after PB vaccination (Waissengrin *et al.*, 2021). About 72% of the participants in this study suffered from mild to moderate symptoms. The severity of symptoms was similar between the three vaccines, for both the local symptoms (e.g. redness and pain at the injection site) and systemic symptoms (e.g. fever, fatigue, and joint pain). The high rates of side effects recorded among some groups were not related to the severity of the symptoms, but to the frequency with which they occurred among the participants. Intense fear and sleep disturbance were some of the symptoms reported by older people, especially before the first dose. Within hours after the first dose, their impression improved and it was found that they had encouraged friends and relatives to take the vaccine.

Many variants of SARS-CoV-2 have emerged, with many indications of the constant evolution of the virus (Fontanet *et al.*, 2021). The emergence of the SARS-

CoV-2 variants poses a real challenge on several levels and can affect the effectiveness of vaccines (Ren *et al.*, 2022) and the accuracy of PCR tests. Omicron (B.1.1.529) and Delta (B.1.617.2), variants of concern with a large number of mutations, have resulted in exacerbation of COVID-19 infection even in fully or partially vaccinated populations (CDC, 2022b; ECDC, 2022; WHO, 2022c). At a time when professional centers are recommending the third booster dose of the COVID-19 vaccine, Iraq's vaccination campaign may face additional obstacles from those who refuse to take the vaccine, citing its ineffectiveness.

5: Limitations:

The scope of this study was limited in terms of the difficulty of accessing some details, including the type of treatments (e.g., antipyretic and pain reliever) used after the vaccine, which may affect the prevalence of side effects. Furthermore, it is unfortunate that the study did not conduct direct contact with most female participants due to religious considerations. No routine blood tests were performed on the participants before or after vaccination, nor were any organ function tests (e.g. liver, kidney, and thyroid) performed.

6. Conclusions:

The PB vaccine caused significantly fewer postvaccine symptoms than SP and AZ, while no significant difference was detected between SP and AZ. Males were more prone to symptoms after the PB and SP vaccines but less than females after the AZ vaccine. The presence of chronic diseases increased the likelihood of symptoms after PB, AZ, and SP vaccines, while previous COVID-19 infection increased symptoms of AZ in males only after the first dose. All three vaccines did not cause any serious or long-lasting side effects.

DATA AVAILABILITY STATEMENT

The raw data of this study is available through the following link.

https://drive.google.com/drive/folders/1slNmiQ7gtoXuICgTk-E2aQQI6NSUaj9y?usp=sharing.

1. References:

2. Abdulah, D. M. (2021). Prevalence and correlates of COVID-19 vaccine hesitancy in the general public in Iraqi Kurdistan: A cross-sectional study. *Journal of Medical Virology*, *93*(12), 6722-6731.

3. Abu-Halaweh, S., Alqassieh, R., Suleiman, A., Al-Sabbagh, M. Q., AbuHalaweh, M., AlKhader, D., and Bsisu, I. (2021). Qualitative Assessment of Early Adverse Effects of Pfizer–BioNTech and Sinopharm COVID-19 Vaccines by Telephone Interviews. *Vaccines*, *9*(9), 950.

4. Abu-Hammad, O., Alduraidi, H., Abu-Hammad, S., Alnazzawi, A., Babkair, H., Abu-Hammad, A., and Dar-Odeh, N. (2021). Side effects reported by Jordanian healthcare workers who received COVID-19 vaccines. *Vaccines*, *9*(6), 577.

5. Alghamdi, A., Ibrahim, A., Almutairi, R., Joseph, M., Alghamdi, G., and Alhamza, A. (2021). A cross-sectional survey of side effects after COVID-19 vaccination in Saudi Arabia: Male versus female outcomes. *Journal of Advanced Pharmacy Education & Research| Apr-Jun, 11*(2).

6. Alhazmi, A., Alamer, E., Daws, D., Hakami, M., Darraj, M., Abdelwahab, S., and Algaissi, A. (2021). Evaluation of side effects associated with COVID-19 vaccines in Saudi Arabia. *Vaccines*, *9*(6), 674.

7. Almufty, H. B., Mohammed, S. A., Abdullah, A. M., and Merza, M. A. (2021). Potential adverse effects of COVID19 vaccines among Iraqi population; a comparison between the three available vaccines in Iraq; a retrospective cross-sectional study. *Diabetes & Metabolic Syndrome: Clinical Research & Reviews*, *15*(5), 102207.

8. Andrzejczak-Grządko, S., Czudy, Z., Donderska, M. (2021). Side effects after COVID-19 vaccinations among residents of Poland. *Eur Rev Med Pharmacol Sci*, *25*(12), 4418-4421.

9. Centers for Disease Control and Prevention. Preparing for Your COVID-19 Vaccination. (2021). Retrieved 1 June 2021, from https://www.cdc.gov/coronavirus/2019-ncov/vaccines/prepare-for-vaccination.html

10. Centers for Disease Control and Prevention. (2021b, January 27). What You Need to Know About Variants. 2021. https://www.cdc.gov/coronavirus/2019-ncov/variants/about-variants.html

11. Cuschieri, S., Borg, M., Agius, S., Souness, J., Brincat, A., and Grech, V. (2021). Adverse reactions to Pfizer-BioNTech vaccination of healthcare workers at Malta's state hospital. *International Journal of Clinical Practice*, *75*(10), e14605.

12. Dubé, E., Vivion, M., and MacDonald, N. E. (2015). Vaccine hesitancy, vaccine refusal and the anti-vaccine movement: influence, impact and implications. *Expert review of vaccines*, *14*(1), 99-117.

13. Ebinger, J. E., Fert-Bober, J., Printsev, I., Wu, M., Sun, N., Prostko, J. C., and Sobhani, K. (2021). Antibody responses to the BNT162b2 mRNA vaccine in individuals previously infected with SARS-CoV-2. *Nature medicine*, *27*(6), 981-984.

14. Elgendy, M. O., El-Gendy, A. O., Mahmoud, S., Mohammed, T. Y., Abdelrahim, M. E., & Sayed, A. M. (2022). Side Effects and Efficacy of COVID-19 Vaccines among the Egyptian Population. *Vaccines*, *10*(1), 109.

15. El-Shitany, N. A., Harakeh, S., Badr-Eldin, S. M., Bagher, A. M., Eid, B., Almukadi, H., and El-Hamamsy, M. (2021). Minor to moderate side effects of Pfizer-BioNTech COVID-19 vaccine among Saudi residents: a retrospective cross-sectional study. *International journal of general medicine*, *14*, 1389.

16. European Centre for Disease Prevention and Control. SARS-CoV-2 variants of concern as of 16 December (2021). Retrieved 16 December 2021, from https://www.ecdc.europa.eu/en/covid-19/variants-concern.

17. Fontanet, A., Autran, B., Lina, B., Kieny, M. P., Karim, S. S. A., and Sridhar, D. (2021). SARS-CoV-2 variants and ending the COVID-19 pandemic. *The Lancet*, *397*(10278), 952-954.

18. Hatmal, M. M. M., Al-Hatamleh, M. A., Olaimat, A. N., Hatmal, M., Alhaj-Qasem, D. M., Olaimat, T. M., and Mohamud, R. (2021). Side effects and perceptions following COVID-19 vaccination in Jordan: a randomized, cross-sectional study implementing machine learning for predicting severity of side effects. *Vaccines*, *9*(6), 556.

19. Hoffmann, M. A., Wieler, H. J., Enders, P., Buchholz, H. G., and Plachter, B. (2021). Age-and Sex-Graded Data Evaluation of Vaccination Reactions after Initial Injection of the BNT162b2 mRNA Vaccine in a Local Vaccination Center in Germany. *Vaccines*, *9*(8), 911.

20. Huremović, D. (2019). Brief history of pandemics (pandemics throughout history). In *Psychiatry of pandemics* (pp. 7-35). Springer, Cham.

21. Islam, M. S., Kamal, A. H. M., Kabir, A., Southern, D. L., Khan, S. H., Hasan, S. M., ... & Seale, H. (2021). COVID-19 vaccine rumors and conspiracy theories: The need for cognitive inoculation against misinformation to improve vaccine adherence. *PloS one*, *16*(5), e0251605.

22. Kim, T., Park, S. Y., Yu, S., Park, J. W., Lee, E., Jeon, M. H., and Choo, E. J. (2021). Impacts of side effects to BNT162b2 and the first dose of ChAdOx1 Anti-SARS-CoV-2 vaccination on work productivity, the need for medical attention, and vaccine acceptance: a multicenter survey on healthcare workers in referral teaching hospitals in the Republic of Korea. *Vaccines*, *9*(6), 648.

23. Klugar, M., Riad, A., Mekhemar, M., Conrad, J., Buchbender, M., Howaldt, H. P., and Attia, S. (2021). Side effects of mRNA-based and viral vector-based COVID-19 vaccines among German healthcare workers. *Biology*, *10*(8), 752.

24. Lee, S. W., Lee, H., Lee, S. K., Moon, J. Y., Moon, S., Chung, S. J., and Kim, S. H. (2021). Risk Factors for Grade 3 to Grade 4 Adverse Reactions to the ChAdOx1 nCoV-19 Vaccine (AZD1222) Against SARS-CoV-2. *Frontiers in medicine*, *8*.

25. Menni, C., Klaser, K., May, A., Polidori, L., Capdevila, J., Louca, P., and Spector, T. D. (2021). Vaccine side-effects and SARS-CoV-2 infection after vaccination in users of the COVID Symptom Study app in the UK: a prospective observational study. *The Lancet Infectious Diseases*, *21*(7), 939-949.

26. Ossato, A., Tessari, R., Trabucchi, C., Zuppini, T., Realdon, N., and Marchesini, F. (2021). Comparison of medium-term adverse reactions induced by the first and second dose of mRNA BNT162b2 (Comirnaty, Pfizer-BioNTech) vaccine: a post-marketing Italian study conducted between 1 January and 28 February 2021. *European Journal of Hospital Pharmacy*.

27. Qunaibi, E. A., Helmy, M., Basheti, I., & Sultan, I. (2021). A high rate of COVID-19 vaccine hesitancy in a large-scale survey on Arabs. *Elife*, *10*, e68038.

28. Ren, S. Y., Wang, W. B., Gao, R. D., and Zhou, A. M. (2022). Omicron variant (B. 1.1. 529) of SARS-CoV-2: Mutation, infectivity, transmission, and vaccine resistance. *World Journal of Clinical Cases*, *10*(1), 1.

29. Riad, A., Sağıroğlu, D., Üstün, B., Pokorná, A., Klugarová, J., Attia, S., and Klugar, M. (2021). Prevalence and risk factors of CoronaVac Side effects: an independent cross-sectional study among healthcare workers in Turkey. *Journal of clinical medicine*, *10*(12), 2629.

30. Ritchie, H., Mathieu, E., Rodés-Guirao, L., Appel, C., Giattino, C., and Ortiz-Ospina, E. Coronavirus Pandemic (COVID-19). (2022). Retrieved 1 June 2022, from https://ourworldindata.org/coronavirus.

31. Saeed, B. Q., Al-Shahrabi, R., Alhaj, S. S., Alkokhardi, Z. M., and Adrees, A. O. (2021). Side effects and perceptions following Sinopharm COVID-19 vaccination. *International Journal of Infectious Diseases*, *111*, 219-226.

32. Sallam, M., Dababseh, D., Eid, H., Al-Mahzoum, K., Al-Haidar, A., Taim, D., ... & Mahafzah, A. (2021). High rates of COVID-19 vaccine hesitancy and its association with conspiracy beliefs: a study in Jordan and Kuwait among other Arab countries. *Vaccines*, *9*(1), 42.

33. Saod, M. K., & Alkhudhairi, J. M. (2016). Medical Staff Knowledge about Seasonal Influenza Vaccine in Karbala Hospitals-Iraq. *Dentist*, *32*, 11.

34. Tissot, N., Brunel, A. S., Bozon, F., Rosolen, B., Chirouze, C., and Bouiller, K. (2021). Patients with history of covid-19 had more side effects after the first dose of covid-19 vaccine. *Vaccine*, *39*(36), 5087-5090.

35. Velavan, T. P., & Meyer, C. G. (2020). The COVID-19 epidemic. *Tropical medicine & international health*, *25*(3), 278.

36. Waissengrin, B., Agbarya, A., Safadi, E., Padova, H., and Wolf, I. (2021). Short-term safety of the BNT162b2 mRNA COVID-19 vaccine in patients with cancer treated with immune checkpoint inhibitors. *The Lancet Oncology*, *22*(5), 581-583.

37. Wang, Y. Y., Huang, Q., Shen, Q., Zi, H., Li, B. H., Li, M. Z., and Jin, Y. H. (2021). Quality of and recommendations for relevant clinical practice guidelines for COVID-19 management: a systematic review and critical appraisal. *Frontiers in medicine, 8*, 703.

38. World Health Organization. Side Effects of COVID-19 Vaccines. (2021). Retrieved 19 December 2021, from https://www.who.int/news-room/feature-stories/detail/side-effects-of-covid-19-vaccines

39. World Health Organization. Coronavirus (COVID-19) Dashboard. (2022a). Retrieved 1 June 2022, from https://covid19.who.int/

40. World Health Organization. (2022b, June 1). WHO Coronavirus (COVID-19) Dashboard. 2022b. Retrieved 1 June 2022, from https://covid19.who.int/region/emro/country/iq

41. World Health Organization. Classification of Omicron (B.1.1.529): SARS-CoV-2 Variant of Concern (2022c). Retrieved 25 January 2022, from https://www.who.int/news/item/26-11-2021-classification-of-omicron-(b.1.1.529)-sars-cov-2-variant-of-concern

A TAXONOMIC STUDY OF THE CARNIVOROUS *PLANT Nepenthes* alata AND THE POSSIBILITY OF USING IT AS AN ALTERNATIVE TO CHEMICAL PESTICIDES

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Abstract:

This study was conducted to identify the genus Nepenthes alata or what is known as an insect-hunting plant. the study will deal with a detailed classification of this species and its environmental distribution in Iraq and in other regions of the world. a home experiment was conducted to ascertain the success of this plant in catching insects and some results were obtained that confirmed this. these results will also be discussed and some special recommendations will be made that may help some farmers or those interested in the field of Agriculture to get rid of the danger of insects on agricultural crops in general and to dispense with toxic pesticides in particular.

Key words: Carnivorous Plant, *Nepenthes Sp.,* Monkey Jar, Alternative To Pesticides.

Introduction:

Why are they called carnivores? Just as there are many animal species, there are also plant species that are different and defined as omnivores - that is, they feed on insects and other small animals to be an essential source of nutrients and minerals for growth. Carnivores obtain them in different ways, depending on the type of plant. As for the classification of the plant, it is classified as follows:

The plant ***Nepenthes alata*** belongs to the "***Nepenthaceae***" **family** and its **scientific name** is known as **"*Nepenthes* species"** and its **common name** is "**Tropical pitcher plant**", The common name for *Nepenthes* in some regions is "**monkey mugs**". The truth of this nickname goes back to monkeys who were observed drinking rainwater from the plant's tube traps. Many species belonging to *Nepenthes* sp. have been discovered, including (***Nepenthes. distillatoria, N. mirabilis, N. madagascariensis***, ***N. gymnamphora***, ***N. ampullaria***, ***N. alata***, ***N. bongso, N. boschiana, N. maxima, N. Hookeriana***, ***N. albomarginata***, ***N. pervillei***, ***N. Trichocarpa, N. edwardsiana)*** and we will talk in detail about *Nepenthes alata*, and its common name Is monkey jar [1].

Species belonging to *Nepenthes* sp.

They generally grow in poorly developed soils and make up for their lack of key nutrients by catching their prey. They produce extra nitrogen. The most well-known and leading pitcher plants are *"Nepenthaceae* and *Sarraceniaceae"* Which are considered (The two largest groups of pitcher plant families). Mechanistic involvement and digestion are related to these two major families. The leaf is modified into a pitcher lid, to elucidate the mechanism of insect trapping in carnivorous plants ، where the top of the leaf is modified to the pitcher lid. After the insects are trapped, they are digested by the enzymes secreted by the glands and absorbed by the pitcher [2,3]. Carnivorous plants consist of six basic traps mechanisms (between genera or represented species). Adhesive trap, Pitfall trap, Lobster pot trap, Pigeon trap, snap trap, suction trap. In the future, these plants can replace pesticides that have many

negative effects on crops and human health; These plants can be planted among other crops in order to trap pests and other insects primarily responsible for crop extermination[4]. The importance of this research is due to society as a whole as it recommends growing plants that help get rid of insects and animals and secure their health from the risk of using pesticides. that harms human health, eliminates many crops, and cultivates these plants that reduce pesticide use and may be completely dispensed with in the future.

Materials and Methods

In this paragraph, the morphological description of the plant *Nepenthes alata* and its ecological distribution will be dealt with as follows:

First, Morphological Description:

Nepenthes alata is a semi-woody plant that does not have a stem to support it, it is unable to stand upright and needs an external support to climb on, all species belonging to the *Nepenthes.* sp need lighting, as they thrive and grow in such high conditions of lighting, so we find that they always climb to the highest areas when growing in forests in search of light. Some basal lateral shoots appear from axillary buds along the spreading stems across the soil surface and it is through these first shoots that *Nepenthes* plants are able to reproduce asexually (Fig. 1.2). *The shallow root system of its genus sets off a climbing stem with alternate, sword-shaped leaves. The tendril extends from the tip of the leaf. The pitcher initially grows as a small bud at the end of tendrils and then morphs into a ball or tube-shaped trap (Fig. 1). A short stem or peduncle grows from the center of the leaf of the plant, the tip of which mutates to grow what is known as a pitcher* [5]. Due to the huge development in the science of structural bioengineering that contributes to the manufacturing process of manufacturing technical bio-mimetic materials, the microstructure of the pitcher surface has aroused the interest of various scientists to study it, through the parameters acquired from the surface has contributed an active role in the science of structural bioengineering, including these parameters: the pitcher lid, the peristome, the waxy zone and the digestive zone (Fig. 1.1), The zone was discovered that mediates both the waxy zone and the digestive zone, namely (the transitional zone), according to the designation of Gaume [6]. In the upper parts of the smooth transition zone there are Some isolated scale-like waxy crystals (with a width of 1.5-5 mm). It is clear from the previous data that the average length of the alata pitcher is 68.9 ± 14.7 mm, while the waxy zone constitutes about half the pitcher height, which is (51.3 ± 2.8%), the length of the transitional zone (5.1 ± 0.9%), and for the digestive zone it

consists of the remaining part (fig. 1.1) [7,8], Hence we will explain in detail the role of each component of pitchers of *Nepenthes* as follows:
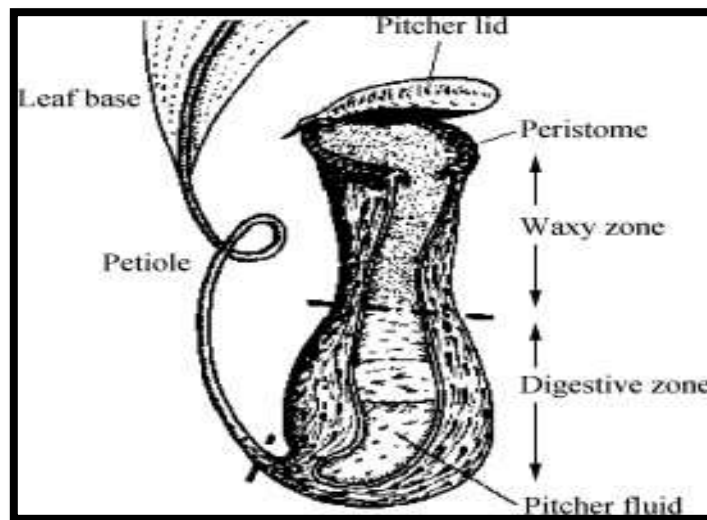
(Fig. 1.1) The illustration shows the different zones of the Pitcher of *Nepenthes alata* .plant [9].

1. Pitcher lid and peristome

   This cover (Its average diameter is about 3.4 mm : 17.4 mm) resembles leaves in shape, acts as a disk, reduces the evaporation of the pitcher fluid, keeps the inner lid from contamination with rainwater, dust, and other contaminants[10].

2. Waxy zone

   This zone, called the waxy zone, which is located below the peristome, has a crucial role in successfully catching prey and preventing it from escaping[11].

3. Digestive zone

   From what appeared in the microstructure of this zone as well as its chemical role, it turned out that it helps in the use of prey, carrying out the digestion and absorption process, as well as the transfer of nitrogen compounds derived from insects[12, 13, 14].

   The common name for fairies in some regions is "monkey mugs". The truth of this nickname goes back to monkeys who were observed drinking rainwater from the plant's tube traps.
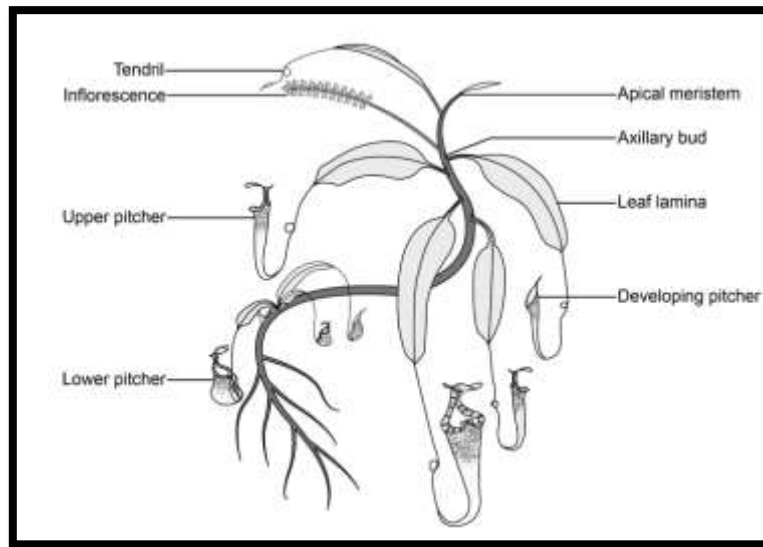
(Fig. 1) Morphological form of *Nepenthes alata.*[15]

(Fig. 1.2) *Nepenthes* basal sprouts from dormant axillary buds in an old stem [16].

Second, We'll Talk About Distribution of Pitcher Plants: -

Nepenthes plants evolved separately in many families. Nearly 600 *Nepenthes species* have been discovered, belonging to six subclasses of angiosperms, Which includes monocotyledons and eudicotyledon [17,18]. About 600 species fall under these species that attract and hunt insects, secrete digestive enzymes, absorb the resulting nutrients and feed on them to compensate for the lack of nitrogen elements in the growth soil. Carnivores spread worldwide, but grow abundantly in wet, open and nutrient-poor habitats. Examples of those areas include: Guyana Highlands, Southeastern United States and Western Australia [19]. Recently, a great diversity of

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Nepenthes plants has been discovered in moist, treeless, ephemeral plants on rocky and gneiss outcrops in parts of West Africa [20,21]. The first empirical evidence detecting carnivores in a number of plant species was first discovered by Darwin (1975) and also conclusively demonstrated that true heterotrophic calyces are found in an autotrophic kingdom[22]. Insect plants belong to nine families from the angiosperms kingdom[23]. Monkey Jars is generally known as the jar. Although you may not have heard of this genus before, you have probably heard of carnivores. Well, that's exactly *Nepenthes*. We find that these climbers grow in abundance in tropical rainforests such as those in Borneo. It has the ability to grow easily, reaching a height of fifteen meters. These tropical plants can also be found in the Netherlands and are grown in hot and humid greenhouses all over the country. Monkey Jars need up to two years in a greenhouse before they are available in stores. They can easily survive and thrive in a regular living room and indoors, especially if they are irrigated with water as needed. *Nepenthes alata* thrives in a wide variety of habitats, including the open to disturbed areas of the Luzon highlands. It effectively colonizes mafic and ultramafic substrates, occurs in both closed and open vegetation types, grows on the ground or as a vegetation[24]. *Nepenthes alata* grows most widely in the Luzon Mountains, north of Manila. Contrary to what is known to be confined mostly to the Cordillera Central, with a few records from other ranges, it has been discovered in supermafic pillars in the Sierra Madre mountains north of Dinalungan in Aurora Province; This is a great extension[25]. It can be said that this plant is also cultivated in Iraq, not wild, it is also cultivated in greenhouses, it can be grown easily in homes because it can grow in any kind of soil. It's a property to grow in a soil that lacks nitrogen elements, as we mentioned before, and to feed it and make up for that lack of elements by being able to hunt insects.

Results

through the researcher's experiment with growing *Nepenthes alata* at home, the common name for it is monkey jar. Experience has shown that this plant is imported and available for sale in the markets of Baghdad. It was acquired and cared for and grown for three years and was placed in the kitchen inside the house. The place of growth was hot and humid (the high temperature in the kitchen with rising steam inside) near the window, but direct sunlight is for a short period of time per day, only one hour in the morning. Irrigation periods continued with a small amount of water in the summer and were between one day and a day in the winter, and the fertilizer used was peat moss, which was placed directly on the soil with stirring once every month. Periods of growth continued throughout the year. The production of new jars

was very little, and all dependence on the first jars to grow, then the pods began to gradually dry out and produce new ones, but less in size than the first. The researcher measured the length of the leaf and it was about 15 cm and the length of the pitcher was about 11 cm, while the Root was 10 cm long (fig. 1.3). According to the results of this experiment, this plant was a very good hunter for household insects (flies, bugs and flea) and very effectively, as well as It was distributed in the cities of Anbar, Diwaniyah and Basra and also gave good growth and results despite the difference in the environment and temperatures in these cities, ranging from good tomoderateto hot to very hot respectively. The great majority of this plant is concentrated at the global distribution level in Southeast Asia, with Borneo, the Philippines and Sumatra home to the largest number of species. Many jar species are highland species with very limited geographical ranges [26,27,28,29,30].

(Fig. 1.3) Fresh measurements of the home-grown plant *Nepenthes Alata*.

Discussion

The study highlighted the importance of a plant that was not known by many people despite its effective role in getting rid of insects and sometimes helping to get rid of some animals such as mice that threaten many agricultural crops, and we find most farmers use pesticides to exterminate these insects which affects these crops directly and indirectly on human health. *The tendril extends from the tip of the leaf. The pitcher initially grows as a small bud at the end of tendrils and then morphs into a ball or tube-shaped trap. the shallow root system of its genus sets off a climbing stem with alternate, sword-shaped leaves.* The study also showed that it can be grown

easily and in a safe way at home, and the period of cultivation continues throughout the year. No specific climatic conditions are required. This study recommended the cultivation of insectivorous or carnivorous plants in homes in living rooms or in balconies as an alternative to using pesticides to get rid of annoying insects. It also recommended planting them in places where agricultural crops are grown to protect them from rodents and insects.

REFERENCES:

(1) Barthlott, W., Porembski, S., Seine, R., & Theisen, I. (2007). The Curious World of Carnivorous Plants: A Comprehensive Guide to Their Biology and Cultivation. Retrieved from https://www.amazon.com/Curious-World-Carnivorous-Plants-Comprehensive/dp/0881927929

(2) Ellison, A., M., Butler, E., D., Hicks, E., J., Naczi, R., F., Calie, P., J., Bell, C., D., & Davis, C., C. (2012). Phylogeny and biogeography of the carnivorous plant family Sarraceniaceae. *PLoS One,* 6(7). Retrieved from https://uknowledge.uky.edu/regulatoryservices_facpub/

(3) Cheek, Martin, Young, & Malcolm. (1994). Carnivorous Plant Newsletter. 23, 95-96.

(4) McPherson, S., Fleischmann, A., & Robinson, A. (2011). *Carnivorous Plants and Their Habitats* (Vol. 1). Retrieved from.https://www.researchgate.net/publication/262079865 Carnivorous_plants_and_their_habitats_Vol_1_vol_2_by_S_McPherson_A_Fleischmann_A_Robinson

(5) Schulze, W., Schulze, E. D., Pate, J. S & Gillison, A. N. (1997). The nitrogen supplies from soils and insects during growth of the pitcher plants *Nepenthes* mirabilis, Cephalotus follicularis and Darlingtonia californica. Oecologia, 112: 464–471.

(6) Gaume, L., Gorb, S., Rowe, N. (2002). Function of epidermal surfaces in the trapping efficiency of *Nepenthes alata* pitchers. *New Phytol*; 156:476–89.

(7) Waltraud, S., Wolf, B. F., John, M. W. (1999). Transporters for ammonium, amino acids and peptides are expressed in pitchers of the carnivorous plant nepenthes. *Plant J*; 17(6):637–46.

(8) Gaume, L., Gorb, S., Rowe, N. (2002). Function of epidermal surfaces in the trapping efficiency of *Nepenthes alata* pitchers. *New Phytol*; 156:476–89.

(9) Waltraud, S., Wolf, B., F., John, M., W. (1999). Transporters for ammonium, amino acids and peptides are expressed in pitchers of the carnivorous plant nepenthes. *Plant J*; 17(6): 637-46.

(10) Gaume, L., Gorb, S., Rowe, N. (2002). Function of epidermal surfaces in the trapping efficiency of *Nepenthes alata* pitchers. *New Phytol*; 156:476–89.

(11) Gaume, L., Perret, P., Gorb, E. (2004). How do plant waxes cause flies to slide? Experimental tests of wax-based trapping mechanisms in three pitfall carnivorous plants. *Arth Struct Dev*; 33:103–11.

(12) Waltraud, S., Wolf, B., F., John, M., W. (1999). Transporters for ammonium, amino acids and peptides are expressed in pitchers of the carnivorous plant nepenthes. *Plant J*; 17(6):637–46.

(13) An CI., Fukusaki, E. I., Kobayashi, A. (2001). Plasma-membrane H +-ATPases are expressed in pitchers of the carnivorous plant *Nepenthes alata Blanco*. *Planta*; 212:547–55.

(14) Owen, T. P., Lennon, K. A., Santo, M. J., *et al.* (1999). Pathways for nutrient transport in the pitchers of the carnivorous plant *Nepenthes alata. Ann Bot*; 84:459–66.

(15) Leong, F. W. S., Lam, W. N & Tan, H. T. W. (2018). A dipteran larva–pitcher plant digestive mutualism is dependent on prey resource digestibility. Oecologia, 188: 813–820.

(16) Lam, W. N & Tan, H. T. W. (2020). Chapter 1: Introduction. In: Lam, W. N & Tan, H. T. W (eds.) The Pitcher Plants (*Nepenthes* Species) of Singapore. Lee Kong Chian Natural History Museum, National University of Singapore, Singapore, pp. 3–8. http://doi.org/10.26107/LKCNHM-EBOOK-2020- 0001 (Accessed).

(17) Albert, V. A., Williams, S. E., & Chase, M. W. (1992). Carnivorous Plants: Phylogeny and Structural Evolution. *257*(5076), 1491-1495.

(18) Ellison, A. M., &Gotelli, N. J. (2001). Evolutionary ecology of carnivorous plants. *16*, 623-629.

(19) Givnish, T. J., Burkhardt, E. L., Happel, R. E., &Weintraub, J. D. (1984). The American Naturalist. *124*, 479-497.

(20) Porembski, S., Seine, R., &Barthlott, W. (1997). Inselberg vegetation and the biodiversity of granite outcrops. *the Royal Society of Western Australia, 80*, 193-199.

(21) Seine, R., Porembski, S., &Barthlott, W. (1996). A neglected habitat of carnivorous plants. *Botancial Taxonomy and Geobotany, 106*, 555-562. Retrieved from https://doi.org/10.1002/fedr.19961060525

(22) R., D. C., & Murray, J. (1875). Insectivorous Plants.

(23) Ismail, I. Y. H., (2009). Insect Pest management. Uni. Al Mosul. Baghdad. Iraq.

(24) *The IUCN Red.* (2022). Retrieved from *Nepenthes alata*: https://www.iucnredlist.org/species/49120197/143972386

(25) Clarke, C. (2018). *Nepenthes alata. The IUCN Red List of Threatened Species™*. Retrieved from http://dx.doi.org/10.2305/IUCN.UK.2018-

(26) Clarke, C. M., Schlauer, J., Moran, J. & Robinson, A. (2018). Systematics and evolution of *Nepenthes*. In: Ellison, A. M. & Adamec, L. (eds.) Carnivorous Plants: Physiology, Ecology, and Evolution. Oxford University Press, Oxford, pp. 58–69.

(27) McPherson, S. (2009). Pitcher Plants of the Old World (2 Vols.). Redfern Natural History Productions, Poole, 1399 pp.

(28) McPherson, S. (2010). Carnivorous Plants and Their Habitats (2 Vols.). Redfern Natural History Productions, Poole, 1442 pp.

(29) McPherson, S. (2011). New *Nepenthes*, Volume One. Redfern Natural History Productions, Poole, 596 pp.

(30) van der Ent A., Sumail, S. & Clarke, C. M. (2015) Habitat differentiation of obligate ultramafic *Nepenthes* endemic to Mount Kinabalu and Mount Tambuyukon (Sabah, Malaysia). Plant Ecology, 216: 789– 807. http://doi.org/10.1007/s11258-015-0468-6.

HISTOLOGICAL AND PHYSIOLOGICAL ASSESSMENT OF ENDOTHELIN-1 AND CHOLESTEROL IN BREAST CANCER OF WOMEN

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Abstract:

Both histological and physiological factors were examined in this investigation. From May 1 to October 2, 2019, researchers collected blood samples from 75 women with breast cancer and 15 healthy women as controls, as well as tissue biopsy from the mammary glands of women whose blood samples had already been collected. The women in the study, who ranged in age from 38 to 68 and had been diagnosed with breast cancer, took part in the study. Gland tissue and the owner of those tumors swelling of the axillary lymph nodes. Another cancer that was found was papillary carcinoma, where epithelial hyperplasia appeared in the form of large papillae that filled the cavity of the gland. There is a large number of white blood cells and severe hematoma. Another type of gland cancer discovered is cribriform carcinoma, which is a rare case. Invasive cancer is the most dangerous, as it is observed in the glandular tissue with the presence of agglutination and crowding of tumor cells and tumor cysts. Endothelin-1 concentrations in the blood of women with breast cancer group 5 and group 4 were significantly higher than in the control group as a normal case ($P \leq 0.01$), while the concentration of Endothelin-1 in women with breast cancer in groups 3, 2 and 6 was significantly higher than in the control group ($P \leq 0.05$). The cholesterol levels of women with breast cancer in groups 5 and 6 fell significantly ($P \leq 0.05$) compared to the control group, while it reduced significantly ($P \leq 0.01$) in group 4. Breast cancer has a negative impact on the histological structure of breast tissue, which affects the lymph nodes, ducts, and cells' ability to function.

Key words: Breast Cancer, Endothelin-1, Cholesterol.

Introduction:

Cancer is an abnormal growth of cells. Instead of replacing only damaged cells, the cells increase dramatically and without stopping, overwhelming the affected organ, forming what is called a tumor. causing a malfunction in the body's internal regulating system, resulting in uncontrolled cell development [1]. Despite the fact that it is the second leading cause of death after lung cancer in the United States, Western Europe, Australia and New Zealand, breast cancer has a high prevalence in Iraq and the Arab world [2]. Cancer of the breast affects more than 5.3 million individuals in the world each year, and it affects both men and women equally when they become fifty [3,4]. It is one of the most serious illnesses in the globe affecting breast tissue in women and is most commonly found in the ducts and the milk glands of the breasts [5]. It accounts for 18% of all female tumors and is the third most widely distributed disease in the world [6]. Approximately 150,000 women in the UK die each year from breast cancer, and another 25,000 are diagnosed each year. More than half of the injuries occur between the ages of 64 and 50, and this varies globally according on the location of the western countries. On a global basis, breast cancer has the highest rates of infection, but it is lower in Asia and Africa due to the severity of environmental variables [7]. One million new cases of the disease are diagnosed each year, which has prompted scientists to explore for novel ways to diagnose and cure the disease, as well as study the variables and causes that lead to its spread [2].

Breast cancer is classified as either a benign tumor or a malignant tumor if it spreads to the lymph nodes or other parts of the body, but if the tumor stays in place, does not invade the surrounding platelets or other body parts, and does not spread to other parts of the body, it can be classified as a malignant tumor or a benign tumor. Breast cancer claimed the lives of more than 571,000 women in 2015, outnumbering the 8.8 million women worldwide who were diagnosed with the disease [8]. Almost a third of women's malignancies in Iraq are breast cancers, according to the most recent Iraqi cancer registry, which means that breast cancer is the second biggest cause of cancer deaths in Iraq [9]. Around 15% of all female cancer fatalities occurred as a result of this disease in 2018, according to current estimates. Some assume that breast cancer is a disease confined to the developed world, despite the fact that the incidence is higher among women in more developed areas [10]. Endothelin-1 (ET-1) has been shown to exhibit mitogenic properties and to regulate several physiologic functions, including salt and water homeostasis, vascular tone, and inflammation [11]. ET-1 is one of three known isoforms of endothelin, each encoded by a distinct peptide, but produced via a similar two-step metabolic pathway. Endothelins act through two seven transmembrane G-protein coupled receptors, endothelin receptor

A (ETA) [12] and endothelin receptor B (ETB) [13], to exert their effects on physiological and pathological processes.

The study aimed to assess the role of endothelin-1 and cholesterol in women with breast cancer and to demonstrate the effect of breast cancer on the histological composition of breast tissue.

Materials and methods

From May 1 to October 2, 2019, researchers collected 75 samples of blood from women with breast cancer and 15 samples from healthy women to serve as a control group. All samples had a volume of 5 milliliters. The research was done at the Teaching Oncology Hospital/Medical City. Blood was taken using a 5 milliliter medical syringe, the samples were transferred to clear and dry plastic tube (Gel Tubes), and the tubes were allowed to stand at room temperature before being centrifuged for 10 minutes at 3000 RPM (Rotate per minute) in order to separate the serum. Finally, the serum samples were divided into small quantities and stored at (-40°C) until physiological tests could be performed, in addition to collecting tissue biopsy from the mammary glands of some women, ages 38 to 68, from whom blood samples had been drawn, by needle or surgical removal of tumors for the purpose of confirming the diagnosis, as these samples were taken as part of this process [14]. Each sample was distributed to one of the following groups: The first group of 15 samples includes healthy women and those who have not been diagnosed with cancer, which is the control group. In the second group of 16 samples, which includes women who have recently been diagnosed with breast cancer and are undergoing their first round of evaluation, the apparent appearance symptoms, such as red spots on the skin of the breast and around the nipple, dreamy secretions and others that indicate breast cancer, were observed. When it comes to breast cancer, the third group (15 samples) is comprised of women who have a lump in their breasts, as well as those who show signs of early disease progression, such as armpit swelling and axillary discomfort prior to treatment. Women who have been infected with HIV and those undergoing chemotherapy (up to five doses) make up the fourth group, which consists of 15 samples (without spread). 17 samples from the fifth group (infected women and those having chemotherapy, seven or more doses and radiation therapy) (without spread). When it comes to infection, Metastasis (the spread of an infection to other organs), this is the sixth group of 12 samples, which is regarded the most advanced group in terms of infection.

Using a ready-made test kit from the Chinese company SunLong and following the manufacturer's instructions [15], researchers were able to determine the levels of

Human Endothelin-1 (ET-1) and Total Serum Cholesterol in women's blood (Human, INF-1001701-Germany) using the method described in the study [15,16].

Statistical analysis

Minitap Ver-17 statistical program was used to conduct the ANOVA test and compare the arithmetic mean to the Duncan polynomial test at a probability level of P< 0.05 for the findings [17].

Results and discussion

Symptoms of breast cancer patients

For women with breast cancer, the total number of observations and changes, and the evaluations of the Teaching Oncology Hospital as follows:

1. Note the appearance of a sold mass or thickening in the breast and on the armpits level that differs from the surrounding tissues, as the cancerous lumps are distinguished from others by their solid strength and rough surface at most women.
2. The occurrence of general inactivity and weakness in the bodies of women with breast cancer, as well as some biochemical changes and anemia, and the weakness was more severe in the advanced group of the infection, i.e. those who had a previous injury and then moved to other organs, through their observation, and when measuring the control group as a normal case.
3. A dreamy discharge was observed, i.e. the appearance of a transparent or blood-like (bloody) discharge from the nipple without pressure on the breast, due to the appearance of the tumor in the breast (breast cancer itself) or the presence of papilloma's, which were tumors that increase the risk of breast cancer.
4. There were cases of deformities in the nipple that were represented by relapses and changes at the nipple level, the nipple retracted into the breast, and its deep vacuoles (as if inverted nipple).

Microscopic and Histological changes

The results of the microscopic examination showed the presence of invasive breast carcinoma, the study revealed the presence of large numbers of tumor cells in different shapes and sizes in the gland tissue and many of these tumor cells were large with huge numbers of inflammatory white blood cells on the opposite side of the gland, as well The tumor cells infiltrated the numbers of those white blood cells, as shown in picture 1.
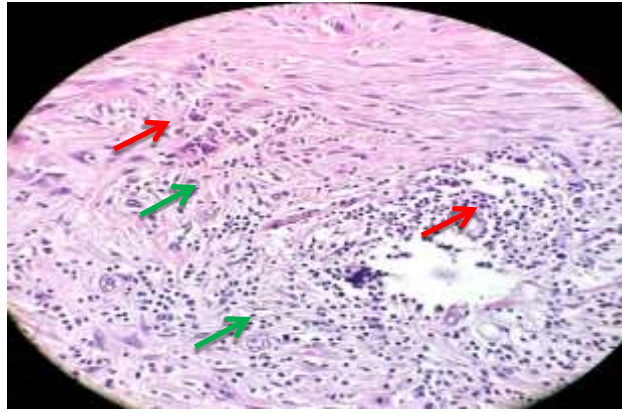
Picture (1) cross section in the breast tissue showing breast cancer, invasive type G3, characterized by the presence of tumor cells different sizes (⟋) in the gland tissue with the presence of numbers of inflammatory white blood cells (⟋), the color of H&E, the zoom power (200).

Where other advanced studies have shown that the incidence of these tumors in the breast in women may be attributed to many reasons, including environmental, nutritional factors, poor health awareness, exposure to radiation hazards (uranium in particular), and this was documented by [18]. As most of the cases that have been observed upon review to the Teaching Oncology Hospital were swelling in the armpits where a person has been diagnosed by specialists with the presence of swelling of the axillary lymph nodes, where their enlargement was an indication of the relationship with the mammary gland tumor through the flow of lymph from the gland to the axillary lymph nodes, as It was observed through the questionnaire form for patients that they did not want to eat food because of the psychological condition that accompanied the injury, as well as taking anti-cancer drugs among some of them after the diagnosis that weakens the appetite with anemia and this corresponds to what he mentioned [19].

The results of the microscopic examination also showed another type of breast cancer, which was papillary carcinoma, as the gland tissue contains epithelial cell hyperplasia, as it appeared in the form of large papillae that filled the gland cavity, where each lobule formed from the infiltration of huge numbers of metastatic tumor cells. Which were formed from cells of different shapes, some small and large from the same papilla and surrounding atrophic lumbar ducts, and there was limited lymphocytic infiltration at the extremities of papillae as in picture2.
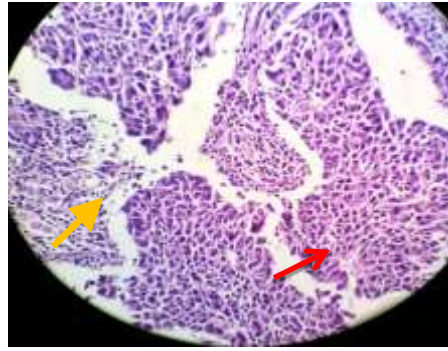
Picture (2) section in the breast tissue showing papillary breast cancer (type NOS) G3, showing that gland tissue containing epithelial hyperplasia ( ) and the presence of limited lymphocytic infiltration ( ), color H&E, zoom power (400).

As papillary carcinoma was observed through the results of the study, it had a wide spread in the gland tissue, and tumor cells were different forms of heterogeneity, which means excessive activity of these cells and their invasion of the tissue of the gland was considered to be of the third grade (G3), and this correspond to What he mentioned [20,21].

The results of the microscopic examination also showed lobular and ductal epithelial hyperplasia, where a massive leaching of metastatic cells in lobules of the lymph nodes and ducts was observed with the presence of large numbers of white blood cells between them, and severe hyperemia was found in the blood vessels in the gland with increasing vessel size The hematoma and its expansion, and the presence in the lumen of some alveolar glands, a homogeneous, leaky red color in the lumen of those alveoli, and as shown in picture 3.
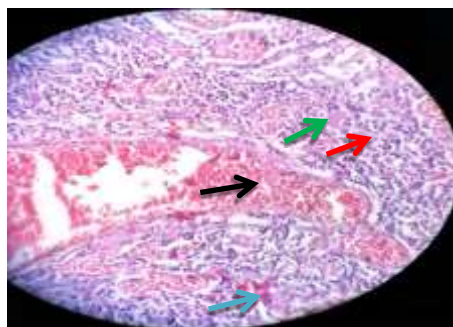
Picture (3) the section showing breast cancer, G3, notice the transfusion of tumor metastatic cells in a tumor ( ), with a large infiltration of white blood cells ( ) and the presence of hyperemia in the blood vessels. ( ), and notice the presence of a homogeneous red color leak in the alveoli cavities ( ), a color with H&E, the zoom power (200).

As the emergence of ductal lobular hyperplasia coincided with the presence of blood congestion and hyperemia in the blood vessels, which means that the blood

plays an essential role in carrying white blood cells to help curb the tumor, as well as it may have a role in the transfer of tumor cells to other areas of the body and this corresponds to what was mentioned before [22].

The results of the histological examination also showed the presence of a type of breast cancer, which was the cribriform carcinoma, where the epithelium tumor cells were found in many of the acini, where it emerged as contiguous holes with each other and spaced out, which is surrounded by the areolar tissue. The dense and numbers of white blood cells, especially lymphocytes in a leaky form, spread around many acini, as adipose tissue surrounding the end of the gland and fatty cells appeared degenerated and some of them were removed from the walls where the cells communicated with each other to appear as alveoli as in the picture 4.
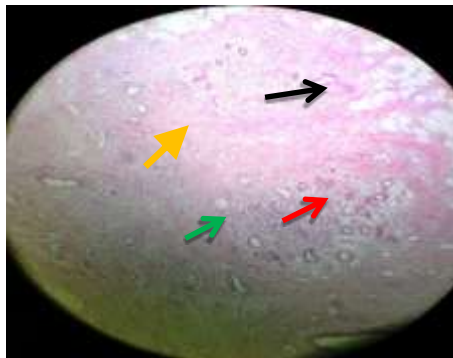
Picture (4) section of the breast tissue showing the cribriform carcinoma of breast cancer, G2, which is characterized by the presence of epithelial and tumor cells ( ) and white lymphocytes ( ), the presence of degenerative fat cells ( ), fibrosis ( ), H&E color, zoom power (100).

In the results of the previous image above, another tumor type of breast cancer appeared, which is Cribriform Carcinoma, and this is one of the rare cases of breast cancer. The reason may be attributed to the spread of tumor cells through the spreading duct system at different parts of the gland, and this is consistent with the study [23].

The results of histological examination showed the presence of the most dangerous type of breast cancer, Invasive Carcinoma (which is characterized by its breakage of the basal membrane and the colloid of other tissues), where the emergence of huge numbers of epithelial cells with large nuclei of these cells together with each other, with the presence of reduction in some of the cytoplasm, with the edges of these tumor epithelial cells appearing in the form of tapered-shaped heads toward the depth of the areolar tissue of the gland, in addition to the accumulation of tumor cysts (adenoid cysts) in the gland board with small masses of degenerated cells surrounded by gaps or fossils with borders Clear, as noted The disintegration of

the fibrous tissue due to the degeneration of some colloidal fibers and the infiltration of some white blood cells, especially the lymphocytes, into the spaces and vacuole in the tissue, as shown in picture 5.
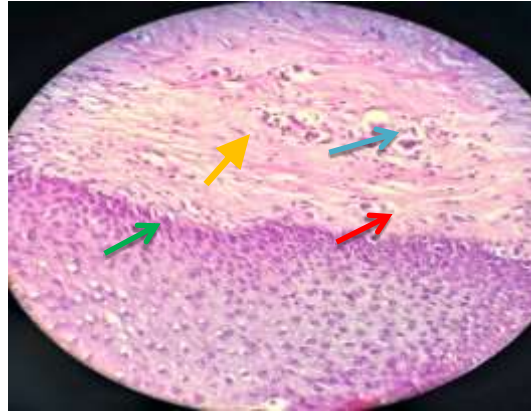
Picture (5) section of the breast tissue showing breast cancer invasive carcinoma, G2, where the number of invasive tumor cells (↗) is shown in the tissue with the edges of these tumor cells appearing in the form of gas pointed heads (↗) and tumor adenoid cysts (↗) with infiltration of white lymphocytes (↗), H&E color, zoom power (200).

The results of histological examination also showed the presence of lobular adenocarcinoma, as this type is distinguished by the appearance of epithelial adenocarcinoma cells in different forms and with large nuclei and a large mass compact with each other adjacent to the fibrous tissue at the other end of the gland, in which a number of lymphocytes and cells appeared. A limited tumor around the glandular duct, as cellular necrosis appeared in small ducts, as in picture 6.
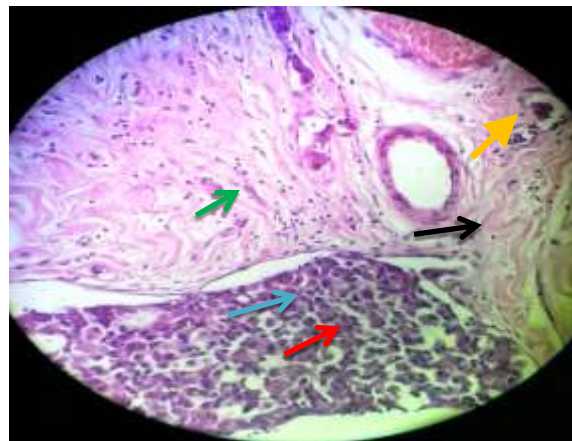
Picture (6) section of the breast tissue showing lobular carcinoma (adenocarcinoma) G2, where it shows the emergence of cancerous epithelial cells (↗) with large thickening nuclei (↗) and the spread of lymphocytes (↗) and the presence of cellular necrosis (↗), fibrosis (↗), H&E color, zoom power (400).

As the results of the histological examination also indicated the presence of one or more lobes in which there was an unpublished cellular and tumor transformation into other lobules, and the reason may be attributed to the role of the immune system as well in limiting the spread of the tumor, as this may mean an early stage of the spread of this tumor to other lobules, and this was also noticeable before [23], and a picture above 6 shows that.

Physiological variation in breast cancer patients

The current study showed, as shown in Figure 1, the significantly higher concentration of endothelin-1 (P≤ 0.01) in the blood of women with breast cancer group 5 at a rate of (101.59±4.058)pg/ml and group 4 at a rate of (97.63±4.77)pg/ml, compared to the control group as a normal case, as it was at a rate (72.29±6.08)pg/ml, while a significant increase (P≤ 0.05) occurred in the concentration of endothelin-1 in affected women in group 3, 2 and 6 at a rate of (91.3±6.44)pg/ml, (79.56±9.76)pg/ml, (79.42±6.34)pg/ml, respectively, compared to the control group at the rate of (72.29±6.08)pg/ml. This may be due to the spread of injury outside the breast tissue, i.e. to the axillary region, the current results were in agreement with the results of the [24], which showed an increase in the levels of endothelin-1 in breast cancer patients, and this increase included an increase in the number of lymph nodules in conjunction with the progression of the infection. In blood vessels [25], it is secreted in response to shear stress cases [26]. Endothelin-1 was known as a mitogenic factor for smooth muscle cells [25] and cancer cells) [27]. Endothelin-1 was expressed in excessive quantities in carcinoma of the breast, and this term is associated with invasion and spread of the lymph nodes [28]. The mechanism by which endothelin increases the invasion process includes two Autocrine and Paracrine mechanisms that increase the Chemotaxis of tumor cells and the production of proteases [29].
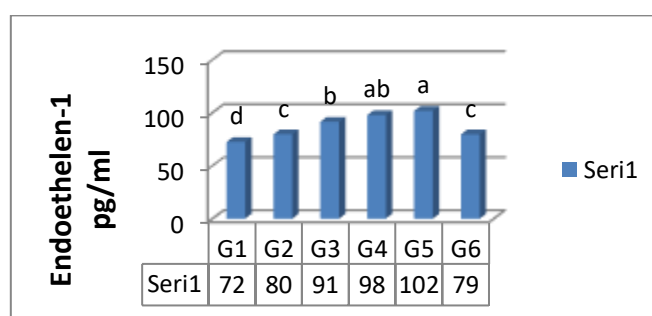
Figure (1): Shows the changes in the concentrations of endothelin-1 among different injury groups of women with breast cancer, compared to the control group as a normal case.

In recent days, it was found that the pathway of endothelin is involved in the carcinogenic process by activating the Proliferation, migration of invasive cells (that is, it helps to invade) and the formation of blood vessels, where advanced studies indicated that endothelin (ET-1) enhances the progression of breast cancer, and quantities of increasing of this peptide in the process of invasion and metastasis [30]. It was found that women with breast cancer show a significantly higher statistical expression of endothelin-1 compared to women who do not suffer from breast cancer, although the physiological role of ET-1 in human breast cancer has not been well known, but its increased level has implications for Tumor growth and cell growth, works by ETA and ETB receptors [31]. The current study showed high levels of ET-1 in the blood serum of women with breast cancer, and this result indicates that the presence of the tumor causes an increase in ET-1 levels. As previous studies did not find any correlation between breast cancer warning factors such as tumor size, lymph nodes and ET-1 level, there are also other studies that conducted measuring ET-1 levels in patients with liver cancer, where there was a significant increase in levels and concentration of this peptide also, in colon and rectal cancer, there was a rise in its levels, and that increased production is more likely to epithelial cancer cells, as it was found in these patients with diffuse cancer that the percentage of this peptide was much higher than others with local infection [31]. By contrast, in the current study, its rate was higher in the early stages of infection, and they underwent early eradication operations and their treatment with specific therapeutic doses compared to patients who had advanced injury and metastases to other regions, and this difference may be due to the effect of topical treatment and systemic anti-tumors given to treating cancer Breast at ET-1 levels in these patients, and this may indicate that levels of this peptide appear to change with treatment and progression of infection. [32] signal that the expression of ET-1 receptors (ETA and ETB) is associated with expression of the vascular endothelial factor and the generation of new vessels, and thus ET-1 affects the possibility of metastasis to cancer cells by stimulating them to form new blood vessels.

Where clinical studies have demonstrated the role of endothelin in the growth of malignant cells as well as tumor invasion and vascular generation [33], in relation to breast cancer, as the expression of ET-1 and its receptors was associated with the conversion of normal cells into malignant cells [34]. The results of the current study indicate a gradual increase in the levels of expression of ET-1 in patients with breast cancer depending on the development of the disease and this corresponds to [33]. described elevated peptide ET-1 in samples from women with malignant breast cancer compared to the moderate level of healthy and benign women. It should be

noted that the Angiogenesis process is a fundamental process related to the natural history of tumor growth. Therefore, anti-vascular therapy has a benefit in curbing breast cancer. The vascular endothelial growth factor (VEGF) is one of the most important factors involved in vascular activity and formation in breast cancer, and therefore the effect of ET-1 and its receptors on the formation of blood vessels for rising cancer may be achieved in cooperation with the term VEGF [33].

There was a significant decrease (P≤ 0.01) in cholesterol concentration in women with breast cancer in groups 5 and 6 (160.61±6.34mg/dl and 160.9±5.22mg/dl, respectively, when compared to the control group, which was at a level of (201.13±1.435) mg/dl, while in group 4 it decreased significantly (P≤ 0.05) at a level of (169.69±3.731)mg/dl. According to the data revealed by the body's own tests, this is perfectly normal [35]. As they indicated in their results that the percentage of cholesterol has no effect on breast cancer and its survival within the normal range.
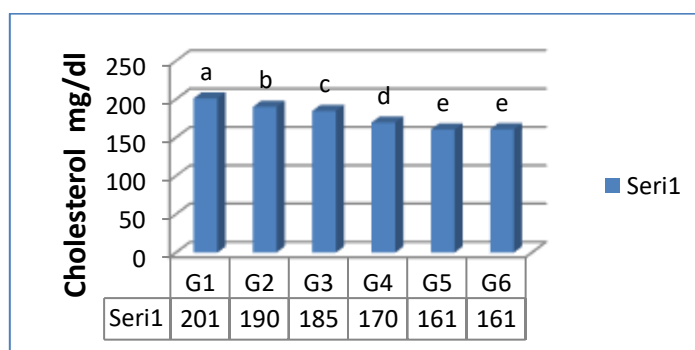
Figure (2): The changes in cholesterol concentrations in different groups of women with breast cancer, compared to the control group as a normal case.

Where [36] found an increase in the concentration of cholesterol and lipid in women with breast cancer compared to the control group, this difference can be attributed to the fat metabolism between breast cancer patients and the control group, and this is contrary to the results of the current study. [37] stated that chemotherapy significantly changes plasma fat in breast cancer patients. the [38] found that many chemotherapy drugs for cancer patients show some change in the features of the lipid substance, although this mechanism is unknown, as they studied the levels of lipids in the blood serum of breast cancer patients, as their results showed a significant decrease in the level of cholesterol and fat after patients took chemotherapy, they attributed the reason to the fact that the chemical compounds used in the treatment affect the genes responsible for the metabolism of lipids in the liver cells, with a difference in the effect of a compound from another. Some previous

studies assume that changes in the serum lipid concentration in breast cancer patients can lead to increased production of tumor necrosis factor [39].

Conclusions

Using the findings of the current study, we conclude that breast cancer has a direct detrimental influence on women since it causes them to become inactive and weak and, in some cases, to die. Numerous biochemical factors are affected by breast cancer, including anemia and multiple histological changes (necrosis, congestion, and multiple inflammation). The histological examination also showed the presence of various forms of malignant tumors, among them lobular and ductal epithelial hyperplasia of breast cancer, papillary tumor, and cribriform carcinoma. Women with breast cancer who had significant concentrations of Endothelin-1 in their blood were found to have a lower cholesterol level than the typical range of their body's cholesterol levels, which is a sign of how much the blood vessel walls had been damaged by disease or treatment.

References:

1. Takimoto, C.H. and Calvo, E. (2008). Principles of oncologic pharmacotherapy. Ch3 Appendix 3, in pazdur, R.; Wagman, L.D.; Comphausen, K.A.; Hoskins, W.J. (Eds). Cancer management: A multidisciplinary approach, 11th.edition.

2. Parkin, D.M.; Whelan, S.L.; Ferlay, J.; Raymond, L. and Young, J. (1997). Cancer Incidence in Five Continents Vol. Vll. (eds), IARC Scientific Publications no 143, Lyon. ISBN 9283221435.

3. Li, C.I.; Daling, J.R. and Malone, K.E. (2005). Age-specific incidence rates of in situ breast carcinomas by histologic type, 1980 to 2001. Cancer Epidemiol Biomarkers Prev, (4):1008-1011.

4. Ries, L.A.G.; Melbert, D. and Krapcho, M. et al., (2006) eds. SEER Cancer Statistics Review, 1975-2004, National Cancer Institute. Bethesda, MD, http://seer.cancer.gov/csr/1975_2004/.

5. Sariego, J. (2010). Breast cancer in the young patient. Pup med, 76 912; 1397-400".

6. Clinton, S.K.; Beason R.L.; Bryant S. and Johson J.T. (2003). Comparative study of four serological tumor markers for the detection of breast cancer. *J. Bio. Med. Sci. Instrum.* 39: 14-408.

7. Siegel, R.; Miller, K. and Jemal, A. (2018). Cancer statistics. CA Cancer J. Clin. 68(1): 7–30.

8. International Agency for Research on Cancer (2015).

9. Saaed, A.M.; Sheikha, A.K.; Mohammed S.; Ameen, H.A.M.; Sheet, mand Khasraw, S.Y. (2011). A survey of suspected familial breast cancer in Iraqi Kurdish women." Clin. Oncol; 29; (Supple; abstr 1602).

10. World Health Organization Report (WHO). (2018).

11. Kohan DE, et al (2011). Regulation of blood pressure and salt homeostasis by endothelin. *Physiological Reviews*.91(1):1–77.

12. Arai, H. et al (1990). Cloning and expression of a cDNA encoding an endothelin receptor. *Nature.* 348(6303):730–2.

13. Masaki T. (2004). Historical review: Endothelin. Trends Pharmacol Sci. 25(4):219–24.

14. Bancroft, J.D. and Stevens, A.A. (1996). Theory and practice of Histological Techniques, 1stedn., Churehill Livingstone, Edinburgh, London. pp: 236-370.

15. Davenport, A.S.; Hyndman, K.A.; Dhaun, N.; Southan, C.; Kohan, D.E.; Pollock, J.S.; Pollock, D.M.; Webb, D.J. and Maguire, J.J. (2016). Endothelin Pharmacological Reviews. 68 (2): 357-418.

16. Lian, K.; Zhang, P.; Wang, W.; Dai, Li, T.E. (2014). Determination of total cholesterol in serum by gas chromatography-mass spectrometry. *Asian J Chem*, 26, pp. 2646-2648, 10.14233/ajchem.2014.15780.

17. Duncan, R.C.; Knap, R.G. and Miller, M.C. (1983). Introductory biostatistics for the health sciences, A Wiley Medical publication, John Wiley and Sons, London. pp: 161-179.

18. Lam, W.W.; Tang, A.P.; Tse, G. and Chu, W.C. (2005). Radiology-Pathology conference: Papillary carcinoma of the breast. Clin Imaging. 29(6):396-400. (PMID: 16274892).

19. Dawson, A. and Mulford, D.K. (1994). Benign versus malignant papillary neoplasms of the breast. Acta Cytol. 38(1):23–28. (PMID: 8291351).

20. Bhosale, S.J.; Kshirsagar, A.Y.; Sulhyan, S.R.; Jagtap, S.V. and Nikam, Y.P. (2010). Invasive Papillary Breast Carcinoma, Case Report in Oncology. Krishna Institute of Medical Sciences University, Karad, India.

21. Elston, C.W. (2005). Classification and grading of invasive breast carcinoma. *Verh Dtsch Ges Pathol.* 89:35-44.

22. Liu, Y.L.; Choi, C. and Lee, S. M. (2018). Invasive lobular breast carcinoma: pleomorphic versus classical subtype, associations and prognosis, *Clinical Breast Cancer*, vol. 18, no. 2, pp. 114–120.

23. Jaffer, Sh. and Bleiwiss, I.J. (2002). Histologic Classification of Ductal Carcinoma in Situ. Microscopy Research and Technique 59:92–101.

24. Tamkus, D.; Sikorskii, A.; Gallo, K.A.; Wiese, D.A.; Leece, C.; Madhukar, B.V.; Chivu, S.C.; Chitneni, S. and Dimitrov, N.V. (2013). Endothelin-1 Enriched Tumor Phenotype Predicts Breast Cancer Recurrence. *ISRN Oncology*,7 Article ID: 385398.

25. Kedzierski, R.M. and Yanagisawa, M. (2001). Endothelin system: the double-edged sword in health and disease. Annu Rev. Pharmacol Toxicol 41:851–876.

26. Malek, A.M.; Greene, A.L. and Izumo, S. (1993). Regulation of endothelin-1 gene by fluid shear stress is transcriptionally mediated and independent of protein kinase C and cAMP. Proc Natl Acad Sci U.S.A 90:5999–6003.

27. Rosano, L.; Spinella, F. and Bagnato, A. (2013). Endothelin 1 in cancer: biological implications and therapeutic opportunities. Nat Rev Cancer 13(9):637–651.

28. Grimshaw, M.J.; Hagemann, T.; Ayhan, A.; Gillett, C.E.; Binder, C. and Balkwill, FR. (2004). A role for endothelin-2 and its receptors in breast tumor cell invasion. Cancer Res. 64:2461–8.

29. Wilson, J.L.; Burchell, J. and Grimshaw, M.J. (2006). Endothelins Induce CCR7 Expression by Breast Tumor Cells via Endothelin Receptor A and Hypoxia-Inducible Factor-1. www.*aacrjournals*.org.

30. Gampenrieder, S.P.; Hufnagl, C.; Brechelmacher, S.; Huemer, F.; Hackl, H.; Rinnerthaler, G.; Romeder, F.; Monzo Fuentes, C.; Morre, P.; Hauser-Kronberger, C.; Mlineritsch, B. and Greil, R. (2016). Endothelin-1 genetic polymorphism as predictive marker for bevacizumab in metastatic breast cancer. *The Pharmacogenomics Journal*, 1–7.

31. Yildirim, Y.; Gunel, N. and Coskun, U. (2008). Serum big endothelin-1 levels in female patients with breast cancer. *Int Immunopharmacol*, 8:1119-23.

32. Wulfing, P.; Diallo, R. and Kersting, C. (2004). Endothelin-1, Endothelin-A-, and Endothelin-B-receptor expression in preinvasive and invasive breast disease. Oncol Rep. 11:791–6.

33. Kalles, V.; Papapanagiotou, I.; Matiatou, M.; Georgiou, G.; Theodoropoulos, C.; Triantafyllou, T.; Zografos, E.; Mitrousias, A.; Provatopoulou, X. and Michalopoulos, N.V. (2019). Evaluation of plasma and tissue expression levels of Endothelins (ET-1, Big ET-1) and VEGF in lobular neoplasia of the breast. *JBUON*, 24(5): 1913-1919.

34. Bagnato, A.; Spinella, F. and Rosano, L. (2008). The endothelin axis in cancer: the promise and the challenges of molecularly targeted therapy. *Can J Physiol Pharmacol*, 86:473- 84.

35. Riley, G.; Landrum, M.j.; Lee, J.M.; Benson, M.; Brown, G.; Chao, C.; chitipralla, S.; Gu, B.; Hart, j.; Hoffman, D.; Hoover, j.; Jang, W.; Katz, K.; ovetsky, M.; Seth, A.; Tully, R.; Villa marin-Salomon, R.; Rubinstein, W. and Maglott, D.R. (2016). Vlinvar: Public archive of inter pretations of clinicaly relevant variants. Nucleic Acids Res44: D862-8.

36. Haritwal, A.K.; Chourasia, R.K. and Ojha, S. (2016). A comparative study of serum lipid profile and glucose level between breast cancer patients and controls at tertiary care hospital in India. *Inter J Medical Sci.* Res Prac, 2(1):16-19.

37. Sharma, M.; Tuaine, J. and McLaren, B. (2016). Chemotherapy Agents Alter Plasma Lipids in Breast Cancer Patients and Show Differential Effects on Lipid Metabolism Genes in Liver Cells. *PLoS ONE* 11(1):137-145.

38. Monika, S.; Tuaine, B. and McLaren, H. (2016). Chemotherapy Agents Alter Plasma Lipids in Breast Cancer Patients and Show Differential Effects on Lipid Metabolism Genes in Liver Cells. *PLoS One.* 11(1): e0148049.

39. Kamil, A.N.; Saleh, B.O. and Alani, K.H. (2018). Dyslipidemia and CA15-3 serum level in Iraqi Women with Breast Tumor: A Comparative Study. *J. Fac Med Baghdad.*Vol.60 No.3.

EFFECT OF NANO SILICA ON PROPERTIES OF CONCRETE

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Abstract:

This study presents experimentally the collective consequence of using nano silica (NS) on mechanical properties of tough concrete. NS is cast-off as partial cement substitution by 1,1.5,2 wt% . Mechanical properties of hardened concrete are assessed expending different mixtures between NS. Important enhancement in the mechanical properties of concrete is experiential with NS due to its high pozzolanic activity approving the creation of advanced quantity of C–S–H gel in the existence of nanoparticles. Employing 2 wt% NS due to to improves properties of hardened concrete in increasing compressive strength, splitting strength, modulus of elasticity and flexural strength compared to samples without either NS.

Key words: Nano Silica, Steel Fiber, Splitting Strength, Compressive Strength, , Flexural Strength, Modulus of Elasticity.

Introduction:

Many investigators involved in assess the consequence of using Nano Silica (NS) on physical, durability of concrete and mechanical properties. nano materials no performance only as pozzolanic improver but too as fillers developing the pore structure of concrete and densifying the microstructure of cement paste [1– 6].

The mechanical behavior of concrete materials depends to a excessive amount on structural elements and phenomena which are active on a micro- and nano scale. The aptitude to board material alteration at the nano structural level promises to deliver the optimization of material performance and act wanted to advance expressively the mechanical show, volume change properties, durability, and sustainability of concrete. This synopsis is inscribed to contribution in the identification of hopeful new investigation and innovations in concrete materials using nanotechnology that can effect in enhanced mechanical properties, volume change properties, durability, and sustainability. The mechanical behavior of concrete materials depends to a great extent on structural elements and phenomena that are effective on a micro- and nanoscale. The size of the calcium silicate hydrate (C-S-H) phase, the main constituent accountable for strength and other properties in cementitious systems, lies in the few nanometers range. The structure of C-S-H is much like clay, with thin layers of solids separated by gel pores filled with interlayer and adsorbed water . Hence, nanotechnology may have the potential to engineer concrete with superior properties concluded the optimization of material behavior and show required to suggestively develop mechanical act, durability, and sustainability.

The quantity of C–S–H gel is improved due to high pozzolanic achievement of fine particles and also mineral admixtures with fine particles can increase the filler result. Microstructure in the interfacial transition zones enhanced with low water cement ratio [7]. Nano silica, due to its high unusual surface, is expressively reactive [8], and products C-S-H reduced gel as a product of reaction with CH.

Compressive strengths of hardened cement paste and bond strengths of paste–aggregate are improved by including NS, and NS can advance the interface structure more efficiently than incorporating silica fume [9]. Filler consequence of fine nanoparticles developed the rheological properties by increasing nanoparticles percentage [10].

Adding of variable ratios of nano-silica expressively enhanced the overall show of concrete [11]. The attendance of steel fibers at several volume fractions give great improvement in compressive strength, splitting tensile strength and

modulus of rupture of high strength concrete [12].

The durability and mechanical properties of self-compacting cement are meaningfully enhanced with using both Nano Silica and fibers in best percentages; however toughness is reduced by increase Nano Silica more than 2 wt% [13].

In this study several mechanical properties of concrete are explored and estimated experimentally by using different combinations of nano silica and steel fibers in concrete to attain concrete with high characteristics compared with normal concrete.

2. MATERIAL AND METHODS

2.1Cement

the main cementing material used in this study is Ordinary portland cement (OPC). It submits with the Iraqi Standard Specification [14] as received from the companies, the cement is Iraqi ordinary Portland cement (Taasluja) Type (I). The general chemical properties of the OPC is exemplified in table 1.

2.2. SiO2 nanoparticles

Nano SiO2 (NS) with regular particle size about (9 to 20) nm is cast-off as recognized from physical laboratory at housing and building national research centre . XRD test shows the amorphous structure of NS (exemplified in Fig. 1). As it shown, the XRD patterns illustration an about broad peak centered 2θ ≈ 22° which demonstrates the amorphous structure of utilized NS [1].

2.3. Aggregates

Two kinds of aggregates are used in the concrete mixture: fine and coarse aggregates. Fine aggregates are locally offered natural sand. Fine aggregates pass from 4.75 mm (No. 4) sieve and retain in 75 lm (No. 200)sieve [15]. particle size of Coarse aggregates not exceed 14 mm.

2.4. Superplasticizer

A high performance concrete superplasticizer based on polycarboxylic technology. Glenium 51 primarily developed for requests in the premixed and precast concrete businesses where performance and the highest durability is

required. Glenium 51 is free chlorides and complies by ASTM C494 type a [1]. Table (2**)** demonstrations the properties of Glenium 51[16].

2.5. Mix proportioning

A overall of twenty mixtures are prepared in the laboratory. Device mix is primed by NS or SF, additional mixtures are organized using NS as partial cement replacement by 1, 1.5, 2wt%, the mixtures proportions are presented in Table (3).

2.6. Mixing process and Treatment

Nano Silica is practical for 10 minutes of ultra-sonication investigation to be vibrated in very high speed to avoid collection and more effective in dissolving NS shown in Fig. 4.

The dry materials are first mixed without using fibers to avoid fiber balling for 1min at little speed to reach a homogenous mixture, after that wet varied at low speed for additional minute, then colloidal NS is additional to avoid any agglomeration which might happened and finally (SF ,SP) are added and mixed at intermediate speed to 3 minutes, therefore respectable workability concrete of uniform material is created [12].

Once the mixing procedure is concluded, the samples are located into molds and reserved under laboratory condition for 24 h. They were then removed from the molds and kept in 22–25 °C water until the suitable age for each investigate. All mixing design contains three 150 mm diameter cylinders molds with 300 mm height for splitting test.

2.7. Test methods

Split tensile test was approved out in agreement with the ASTM C 496 [16] standard. After curing period was over, the concrete cylinders were exposed to split tensile test by using universal testing machine. Tests were approved out on triplicate specimens and average split tensile strength values were achieved. ASTM C 469 [17] for the static modulus of elasticity. Experienced samplings are showing to uniaxial compression capacity expending universal testing machine. After 28 days of curing determined the stress-strain features. Flexural tests are achieved in agreement with the ASTM C293 [18] . Established specimens are showing at mid-span to one point load. Then, flexural tests are approved out on triplicate samples

and average flexural strength values are achieved.

Concrete mix design in this study uses the w/c = 0.38. The composition of the concrete mixtures is given in table (3).

Table 1: Chemical composition of OPC (wt%).

Material	SiO_2	Al_2O_3	Fe_2O_3	CaO	MgO	SO_3	Na_2O	K_2O	L.
O.I Cement	21	4.04	3.01	62.235	1.66	3.34	0.46	4.05	0.37

Table (2): Properties of Glenium51.

Form	Viscous Liquid
Commercial name	Glenium 51
Chemical composition	Sulphonated melamine and naphthaline formaldehyde condensates
Subsidiary effect	Increased early and ultimate compressive strength
Form	Viscous liquid
Color	Light brown
Relative density	1.1 gm/cm^{3}at 20 ºC
pH	6.6
Viscosity	128 ± 30 cps @ 20º C
Transport	Not classified as dangerous
Labeling	No hazard label required
Chloride content	None

Table 3: Mixture proportions of NS blended concretes.

Mix symbol	NS (%)	Cement (kg/m³)	Nanosilica (kg/m³)	Water (kg/m³)	Sand (kg/m³)	Gravel (kg/m³)	Superplasticizer (kg/m³)
NC	0	450	0	175	675	1115	9
NS1	1	445.5	4.5	175	675	1115	9
NS2	1.5	443.25	6.75	175	675	1115	9
NS3	2	441	9	175	675	1115	9

3. Mechanical Properties of Hardened

Control samples are cast from the same mixtures used for the SCC beams. Four mechanical properties are assessed here: compressive strength (f'c) , modulus of rupture (fr), splitting tensile strength(ft) and modulus of elasticity(Ec). Three samples used for each test of any stuff and the average value of the three results are adopted, the results are shown in table (4).

Table (4): Properties of Concrete at 28 days.

Mix symbol	Compressive strength(MPa)		Fr (MPa)	ft (MPa)	Ec (GPa)
	Cube 150x150 Fcu	Cylinder 150x300 f_c'			
NC	68.23	55.34	7.60	5.29	35.121
NS1	88.15	70.45	8.44	6.12	40.389
NS2	98.17	78.88	9.45	6.51	42.496
NS3	104.34	83.47	9.58	6.69	43.198
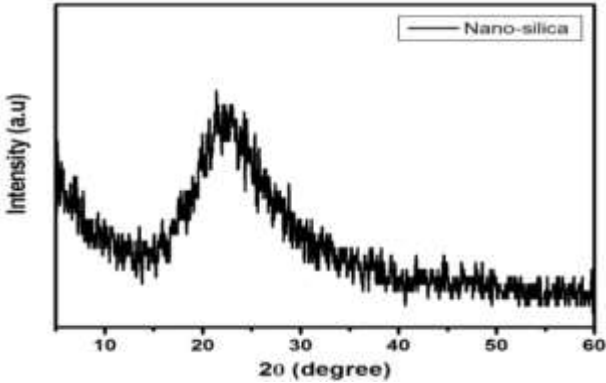
Figure 1. XRD of SiO2 nanoparticles with particle size of (9-20) nm.

4. EXPERIMENTAL RESULTS AND DISCUSSION

4.1. Compressive Strength

The compressive strength test, as presented in figure (2) was determined according to BS 1881: part 116[21] , using Cubes of (150×150×150) mm tested by a hydraulic compression machine of (2000) kN. The SCC samples were cast without compaction. Using three specimens as average testing is taken, Test was conducted at ages 28 days.
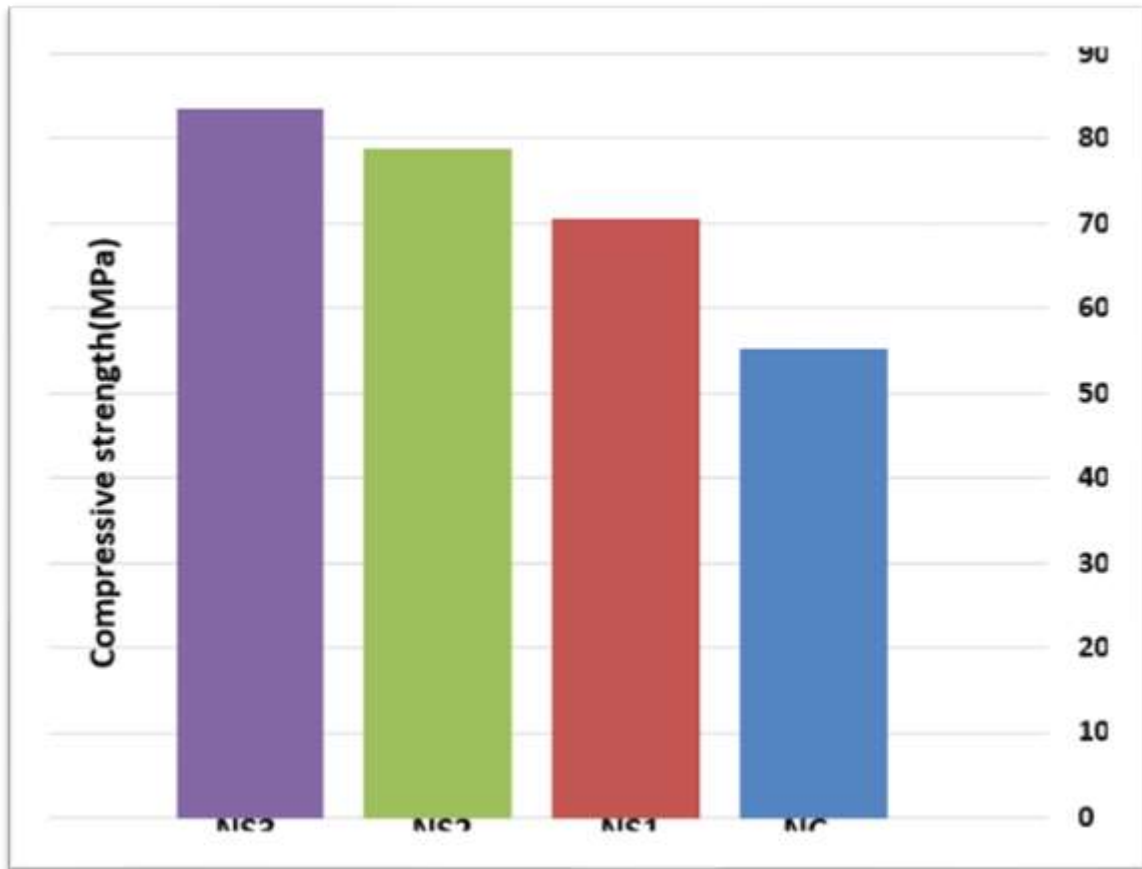
Figure (2): Compressive strength

4.2. Flexural strength

The regular experiment effects of flexure strength of SF and SiO2 nanoparticles concretes for each mix is offered in Fig. 3. It is originate that rise in the quantity of SF enhanced the flexural strength. Flexural strength test (modulus of rupture) is carried out by using (100 x 100 x 500 mm) prisms, by using hydraulic machine of 2000 kN capacity. According to ASTM C78-02 [22],by three concrete prisms and take the average of three results.
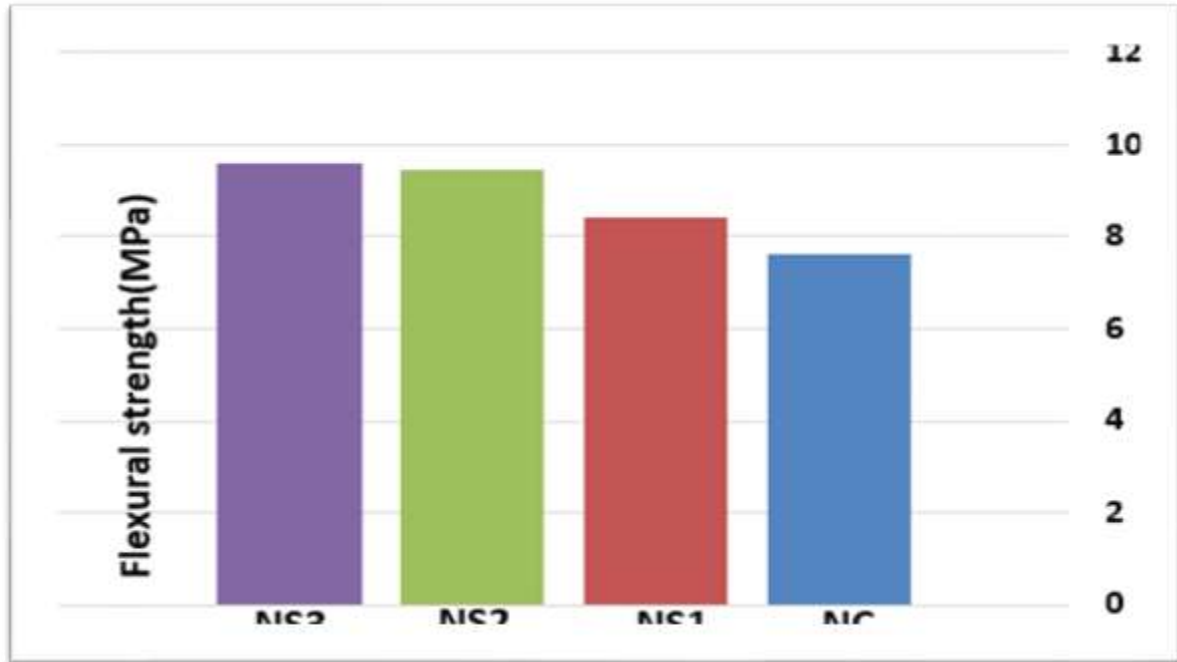
Figure (3): Flexural strength

4.3. Splitting tensile strength

Experiment effects of splitting strength of SF and SiO2 nanoparticles concretes for every mixture is obtainable for each group with percentages of gain in Fig. 4. When NS and SF content i n c r e a s i n g, the splitting strengths of all concretes rise that approving the creation of higher amount of C–S–H gel in the presence of nanoparticles. Splitting tensile strength test is done by a (150×300) mm concrete cylinder with ASTM C496-04[23]. Three cylinder specimens are tested at age of 28 days and the average value of these specimens is determined and recorded.
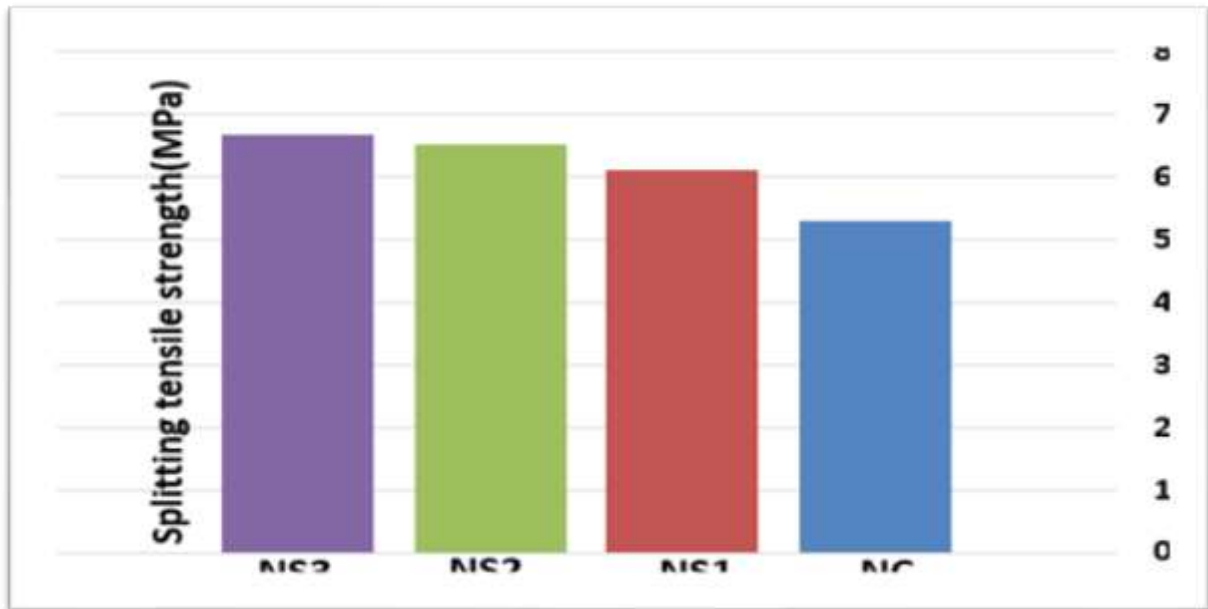
Figure (4): Splitting strength

4.4. Modulus of elasticity

Consequences of modulus of elasticity and improvement percentages offered in fig. 5. It is establish that with addition SF considerably rise modulus of elasticity. It is experiential rise also by adding of NS in concrete, this is in respectable arrangement [19, 20].

After SF satisfied rises to the value of 0.9% optimal modulus of elasticity is reached for the samples with all NS content. Addition NS by 2 wt% increases modulus of elasticity about 5% associated to samples without NS at 0.9% SF.The optimum ratios of NS and SF are recognized in 2 wt% and 0.9% respectively; later that leading to improvement in modulus of elasticity connected to samples without either NS or SF is about 94% according to ASTM C469-02[24]. by technique of secant modulus.
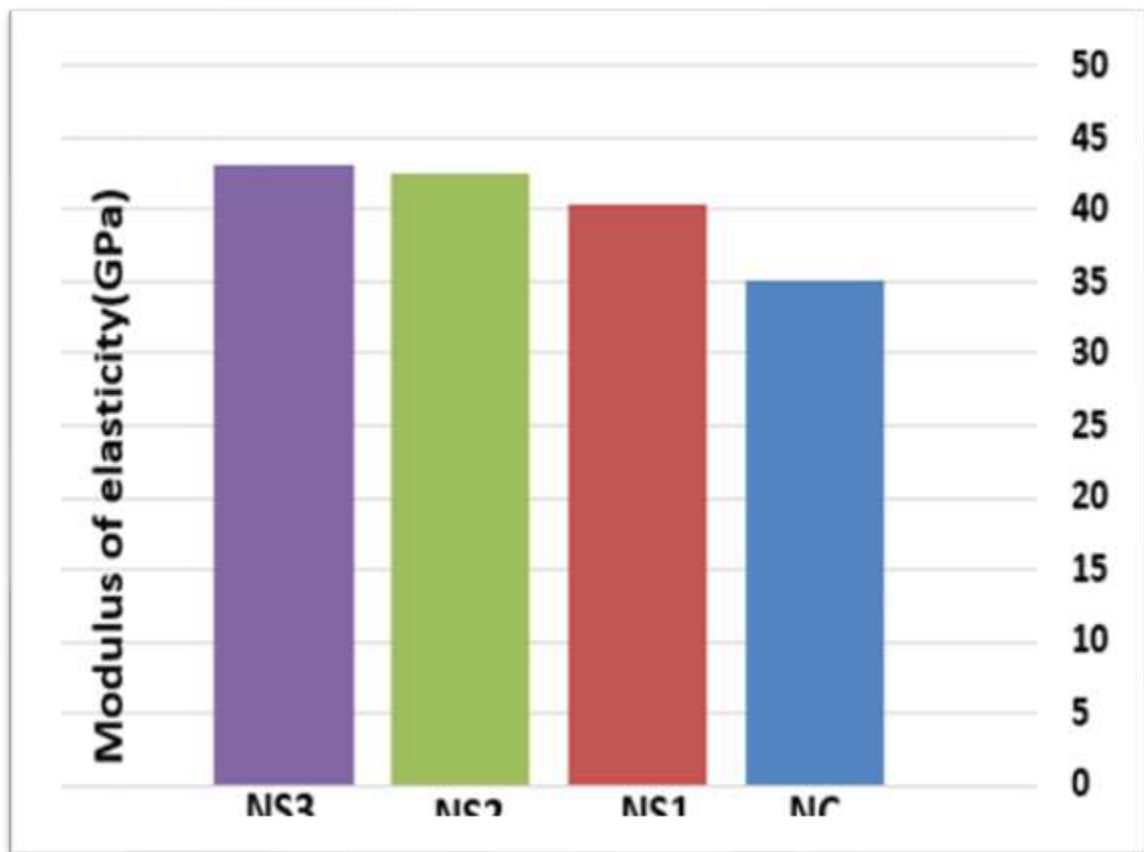
Figure 5 Modulus of elasticity

5. CONCLUSIONS

The following outcomes can be pointed out:

1.By using nano silica as cement replacement leads to great improvement on mechanical properties of concrete due to its high pozzolanic activity offers huge amount of CSH with decreasing the amount of crystalline CH.

2.Best content of NS is 2wt% increases compressive strength with 1, 1.5, 2 wt% respectively associated to samples without either NS. And can be exhibited that, the compressive strength increase by increasing percentage either NS , using 2wt% of NS 1, 1.5, 2 wt% NS can improve compressive strength about 27.30%, 42.53% and 66.29 % respectively associated to samples without NS

3.The optimum content of NS is 2 wt% increases flexural strength for samples with 1, 1.5, 2 wt% NS can improve flexural strength about 11.05%, 24.43% and 26.60 % respectively associated to samples without NS

4.Best content of NS is 2 wt% increases splitting strength for samples with 1, 1.5, 2 wt% NS can improve splitting strength about 15.68%, 23.06% and 26.46 % respectively associated to samples without NS

5.The best ratios of NS was decided to be 2 wt% leading to improving the modulus of elasticity about 22.99% compared with samples without NS.

REFERENCES:

[1] Alireza Najigivi , Alireza Khaloo , Azam Iraji zad , Suraya Abdul Rashid. Investigating the effects of using different types of SiO2 nanoparticles on the mechanical properties of binary blended concrete. Composites: Part B 54 (2013) 52–58.

[2] Hala Elkady, Mohamed I.Serag, Muhammad S. Elfeky. Effect of Nano Silica De-agglomeration, and Methods of Adding Super-plasticizer on the Compressive Strength, and Workability of Nano Silica Concrete. Civil and Environmental Research ISSN Vol.3, No.2, 2013.

[3] Mohamed I. Serag, Hala El-Kady, Muhammad S. El-Feky. The Coupled Effect of Nano Silica and Superplasticizer on Concrete Fresh and Hardened Properties. International Journal Of Modern Engineering Research (IJMER). Vol. 4, Iss.12, Dec. 2014.

[4] Mohamed I. Serag, Hala El-Kady, Muhammad S. El-Feky. The Effect of Indirect Sonication on the Reactivity of Nano Silica Concrete. International Journal of Scientific and Engineering Research (IJSER). Vol. 5, Iss 12, 2014.

[5] El-Sayed Abdel Raouf, Hala Elkady, Mohamed Ragab, Amr H. Badawy. Investigation on Concrete Properties for Nano Silica Concrete by using Different Plasticizers. Civil and Environmental Research ISSN. Vol.6, No.9, 2014.

[6] Peng-kun Hou, Shiho Kawashima , Ke-jin Wang, David J. Corr , Jue-shi Qian , Surendra P. Shah. Effects of colloidal nanosilica on rheological and mechanical properties of fly ash–cement mortar. Cement & Concrete Composites 35 (2013) 12–22.

[7] Alireza Naji Givi, Suraya Abdul Rashid, Farah Nora A. Aziz, Mohamad Amran Mohd Salleh. The effects of lime solution on the properties of SiO2 nanoparticles binary blended concrete. Composites: Part B 42 (2011) 562–569.

[8] Byung-Wan Jo, Chang-Hyun Kim, Ghi-ho Tae b, Jong-Bin Park. Characteristics of cement mortar with nano-SiO2 particles. Construction and Building Materials 21 (2007) 1351–1355.

[9] Ye Qing, Zhang Zenan, Kong Deyu, Chen Rongshen. Influence of nano-SiO2 addition on properties of hardened cement paste as compared with silica fume. Construction and Building Materials 21 (2007) 539–545.

[10] Mostafa Jalal, Ali A. Ramezanianpour, Morteza Khazaei Pool. Split tensile strength of binary blended self compacting concrete containing low volume fly ash and TiO2 nanoparticles. Composites: Part B 55 (2013) 324–337.

[11] A.M. Said, M.S. Zeidan, M.T. Bassuoni, Y. Tian. Properties of concrete incorporating nano-silica. Construction and Building Materials 36 (2012) 838–844.

[12] P.S. Song, S. Hwang. Mechanical properties of high-strength steel fiber-reinforced concrete. Construction and Building Materials 18 (2004) 669–673.

[13] Morteza H. Beigi, Javad Berenjian, Omid Lotfi Omran, Aref Sadeghi Nik, Iman M. Nikbin. An experimental survey on combined effects of fibers and nanosilica on the mechanical, rheological, and durability properties of self- compacting concrete. Materials and Design 50 (2013) 1019–1029.

[14] Iraqi Standards No.5/1984, "Ordinary Portland cement", Ministry of Housing and Construction, Baghdad, 2004.

[15] Iraqi Standards No.45/1984, "Aggregate from Natural Sources for Concrete and Construction", Ministry of Housing and Construction, Baghdad, 2004.

[16] Standard Specification for Chemical Admixtures for Concrete. ASTM-C494-05, American Society for Testing and Material, (2005).

[17] ASTM C469. Standard test method for static modulus of elasticity and poisson's ratio of concrete in compression of concrete. Philadelphia (PA): ASTM; 2001.

[18] ASTM C293. Standard test method for flexural strength of concrete (using simple beam with center-point loading).Philadelphia (PA): ASTM; 2001.

[19] Jaleel Kareem Ahmed, Mohammed H. Al-maamori, Hajir Mohammed Ali. Effect of nano silica on the mechanical properties of Styrene-butadiene rubber (SBR) composite. International Journal of Materials Science and Applications Vol. 4, No. 7, 2015.

[20] Abbas AL-Ameeri. The effect of steel fiber on some mechanical properties of self compacting concrete. American Journal of Civil Engineering Vol. 1, No. 3, 2013.

[21]B.S. 1881: Part 116(1983), "Methods for Determination of Compressive Strength of Concrete Cubes", January 1983, pp. 1-8.

[22]ASTM C78-02, "Standard Test Method for Flexural Strength of Concrete (Using Simple Beam with Third-point Loading)", Vol. 4.2, (2002), pp. 1-3.

[23]ASTM C496/C496M-04, "Standard Test Method for Splitting Tensile Strength of Cylindrical Concrete Specimens", Vol. 4.2, (2004), pp. 1-5.

[24]ASTM C469-02, "Standard Test Method for Static Modulus of Elasticity and Poisson's Ratio of Concrete in Compression", Vol. 4.2, (2002), pp. 1-5.

AN EVALUATION STUDY OF THE THIRD-GRADE MATHEMATICS TEXTBOOK INTERMEDIATE IN LIGHT OF GLOBAL STANDARDS (NCTM 2000) (STRENGTHS, WEAKNESSES AND RECOMMENDATIONS)

Najat Jalil NOON[1]

Abstract:

The study aimed to evaluate the content of the mathematics book for the third grade the new curriculum in the first and second part of the academic year 2018-2019 in light of the international standards issued by the National Council of Teachers of Mathematics (NCTM2000) to find strengths and weaknesses in it and make recommendations that contribute to the development of the content of the book. We relied on descriptive analytical methodology of the book and the tool was built to analyze content in four areas (number and operations, algebra, relations and functions, geometry and measurement, data analysis and probabilities).

Key words: Evaluation Study, Mathematics Book, the Third-Grade Mathematics, Global Standards, NCTM 2000.

دراسة تقويمية لكتاب رياضيات الصف الثالث المتوسط في ضوء المعايير العالمية (NCTM 2000) (نقاط القوة والضعف والتوصيات)

نجاة جليل نون [2]

ملخص

تهدف هذه الدراسة إلى تقويم محتوى كتاب رياضيات الصف الثالث المتوسط المنهج الجديد بجزأيه الأول والثاني للعام الدراسي 2018-2019 وفق المعايير الدولية الصادرة عن المجلس الوطني الأمريكي لمدرسي الرياضيات (NCTM 2000) لإيجاد نقاط القوة والضعف فيه، وتقديم التوصيات التي تساهم في تطوير محتوى الكتاب، وقد اعتمدنا على الأساليب الوصفية والتحليلية والتقييمية للكتاب، مع أدوات تحليل المحتوى المبنية على أربعة مجالات هي (الأعداد والعمليات عليها، الجبر والعلاقات والدوال، الهندسة والقياس، تحليل البيانات والاحتمالات).

الكلمات المفتاحية: دراسة تقويمية، كتاب الرياضيات، الصف الثالث المتوسط، المعايير العالمية، NCTM 2000.

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أولاً: مشكلة البحث

" تعتبر الرياضيات من أصعب المواد في التعلم والتعليم بسبب تسلسلها المنطقي، وتجريد المفاهيم والعلاقات، وتراكمها من الموضوعات المنظمة بإحكام، أي صعوبة الوصول لمستوى من دون المرور بالمستويات السابقة، كذلك فإن الفروقات الفردية للمتعلمين تزيد من صعوبة التعليم والتعلم للرياضيات." (الشارف، ١٩٩٦: 38).

" يجب أن تواكب الكتب المدرسية بما في ذلك الرياضيات وتيرة التطور، والتكيف مع مرحلة التدريس، والتنسيق مع اتجاه التعليم الحديث، والتكيف مع متطلبات واحتياجات العصر، والتطوير والتحسين باستمرار." (ابو زينة،1982 : 85).

" أصبح تحليل وتقييم المحتوى للموضوعات الرياضية المدرسية أمرًا ضروريًا إذا أردنا أن يعمل منهجنا كما ينبغي. حيث أن نشاطات التعديل المتواصلة للمناهج ضرورية ومفيدة للتطوير التربوي للمناهج، لهذا، من اللازم الأخذ بنظرة المتخصصين، واصحاب الخبرة عند التقييم، إذ يمكن التحديث والتغيير للمناهج بالمسار الصحيح، كخطة أو قيد التنفيذ." (الوالي، 2006: 8).

" شهد المجلس الوطني لمدرسي الرياضيات بتجارب علمية رائدة في مجال وضع معايير معينة للرياضيات، لذلك من المهم مقارنتها بالممارسات والمعايير المطبقة بمناهجنا لمعرفة مدى التوافق، لأنها عالمية واتجاهات ذات طبيعة تعليمية دولية." (محمد وريم، 2011: 18).

من خلال لقاءاتنا مع بعض الطلبة والمدرسين الذين يدرسون كتاب رياضيات الصف الثالث المتوسط المنهج الجديد وعدد من المشرفين التخصصين وبعض من أولياء أمور الطلبة وجد أن هناك ضعف عام ونفور لدى العديد من الطلبة من الكتاب المدرسي الجديد، مما جعلنا نفكر في دراسة تقويمية لمحتوى كتاب رياضيات الصف الثالث المتوسط وفق المعايير العالمية الأمريكية (NCTM 2000) للوقوف على نقاط القوة والضعف للكتاب وتقديم التوصيات والمقترحات المناسبة لهذه الدراسة، في عملية التقويم فإن تبني المعايير العالمية تشكل قاعدة مهمة وأساسية لواضعي المنهج والتي تعمل على توحيد الطرائق والأساليب والأهداف المستخدمة من أجل تجويد وتحسين نوعية التعليم مع مراعاة الفروق الفردية بين الطلبة والبيئة التعليمية المحيطة بهم وإن إهمال أي من هذه المعايير يسبب غياب الهدف والرؤية لمنهج علمي سليم.

ثانياً: أهمية البحث

" إن عملية تحليل وتقييم الكتب المدرسية هي عملية تشخيص ومعالجة تؤدي إلى تطوير المنهج وتحسين الكتب المدرسية من خلال الحذف والإضافة والمراجعة، حيث ان عملية التحليل تفيد في فهم محتوى هذه الكتب وتفسيرها من خلال الوسائل والأنشطة الامر الذي يزيد من فعاليتها في العملية التدريسية." (التميمي، 2009: 247).

" ان أهمية دور الرياضيات المدرسية في تحسين قدرة الطلاب لمواجهة تحديات العصر. بسبب هذه الأهمية، أنشأت مجموعة من المدرسين في الولايات المتحدة ما أصبح يُعرف باسم المجلس الوطني لمدرسي الرياضيات، والذي تولى تطوير تعليم الرياضيات ونشأ من وثائق المجلس (NCTM 2000) مجموعة مبادئ ومقاييس والتي شكلت طرقًا ومسارات لتطوير منهج الرياضيات."(بدوي، 2003: 168–171).

تتجلى أهمية البحث في الآتي

●أهمية كتاب الرياضيات للصف الثالث المتوسط بالنسبة الطلبة والمجتمع وارتباط العلوم الأخرى به.

●لا توجد دراسة تناولت تقويم وتحليل محتوى كتاب الرياضيات للصف الثالث المتوسط المنهج الجديد للعام الدراسي 2018–2019 في ضوء المعايير العالمية (NCTM 2000) (حسب علمنا).

●توجيه أنظار مخططي وواضعي مناهج الرياضيات في وزارة التربية إلى جوانب القوة والضعف في محتوى كتاب الرياضيات للصف الثالث المتوسط المنهج الجديد للعام الدراسي 2018–2019 في ضوء معايير (NCTM2000).

●تقديم توصيات ومقترحات قد تُساهم في تطوير وتحسين محتوى كتاب الرياضيات للصف الثالث المتوسط المنهج الجديد للعام الدراسي 2018–2019.

ثالثاً: أهداف البحث

يهدف البحث الحالي إلى دراسة تقويمية لكتاب رياضيات الصف الثالث المتوسط المنهج الجديد بجزئه الأول والثاني للعام الدراسي 2018–2019 في ضوء المعايير العالمية (NCTM 2000) لإيجاد نقاط القوة والضعف فيه وتقديم التوصيات والمقترحات التي قد تُساهم في تطوير محتوى الكتاب.

رابعاً: حدود البحث

تقتصر دراستنا الحالية على:

1– كتاب رياضيات الصف الثالث المتوسط المنهج الجديد بجزئه الأول والثاني للعام الدراسي 2018–2019 الصادر عن وزارة التربية /المديرية العامة للمناهج في العراق (الطبعة الأولى، 2018).

2– معايير المجلس القومي لمدرسي الرياضيات الأمريكي (NCTM 2000).

خامساً تحديد مصطلحات

1– التقويم

●عرفه (عودة، 1985) على انه " عملية منظمة لجمع وتحليل البيانات لغرض تحديد مدى تحقيق الأهداف وأخذ القرارات بخصوصها. " (عودة، 1985: 29).

●عرفه (ابو زينة، ١٩٨٧) على انه " إصدار أحكام على قيمة اسلوب أو مادة لغرض محدد وفقًا لبعض المعايير التي يمكن استخلاصها أو إعطاؤها لها." (ابو زينة، ١٩٨٧: 231).

● عرفه (Hamilton،2000) على انه "عملية تستطيع بواسطتها تحسين او تقدير قيمة الشيء" Hamilton ، 2000:
(30)

التعريف الاجرائي لتقويم كتاب رياضيات الصف الثالث المتوسط: عملية منظمة تهدف إلى إصدار أحكام بما يتعلق بمدى توافر المعايير العالمية (NCTM 2000) في كتاب رياضيات الصف الثالث المتوسط المنهج الجديد بجزأيه الأول والثاني للعام الدراسي 2018–2019 بعد جمع البيانات والمعلومات وتحليلها لتحديد مدى تحقق هذه المعايير وإيجاد نقاط القوة والضعف فيه وتقديم المقترحات والتوصيات التي قد تُساهم في تطوير محتوى الكتاب.

2– المعايير

● عرفها المجلس القومي لمعلمي الرياضيات (NCTM 2000) بأنها "مجموعة من المبادئ تستند إلى رؤية واسعة ومترابطة للتدريس، ويتم أعداد كل معيار، لذلك فهو يحدد أولاً ما يجب أن يتضمنه منهج الرياضيات، ثم يصف الأنشطة الطلابية المصاحبة لذلك المحتوى، ثم ينتقل إلى تضمين معلومات حول هذا المحتوى ومناقشة أمثلة عملية " (NCTM 2000:29).

● عرفها (مينا، 2006) بأنها " عبارة تبين ما هو واجب على المتعلم تحقيقه من حيث المعرفة والمهارات والقيم بعد تعلم المحتوى في كل مجال. " (مينا، 2001: 84).

● عرفها (محمد وريم،2011) بأنها "عبارات تُعبر عن ما ينبغي أن يعرفها الطلاب من المعرفة والمعلومات والمهارات فهي تحدد المستوى المطلوب الوصول اليه بالمهارات والعمليات والقيم والسلوكيات المكتسبة خلال فترة تعليمية معينة وبالمجالات المعرفية المحددة"(محمد وريم، 2011: 19–20).

التعريف الاجرائي للمعايير: مجموعة شروط تم اعتمادها لتحديد ما يجب ان يتضمنه محتوى كتاب الصف الثالث المتوسط المنهج الجديد بجزئه الأول والثاني للعام الدراسي 2018–2019، وتلك الشروط المعتمدة تم اصدرها من قبل المجلس القومي لمعلمي الرياضيات (NCTM 2000).

الخلفية النظرية

تقويم الكتاب المدرسي

"يعد التقويم من مقومات العملية التربوية برمتها والتي تأتي للحكم على مدى النجاح في تحقيق الأهداف التربوية، ويعد التقويم ايضاً مدخلاً رئيسياً لتطوير العملية التعليمية لكونه عملية علاجية وتشخيصية في آن واحد فهو يهدف إلى الكشف عن مواطن الضعف في عملية التعلم والتعليم لمعالجتها وتطويرها للأفضل، ويعتبر التقويم عنصر مهم من عناصر العملية التعليمية، ولا يستغنى عنه أي عنصر من عناصرها، فالمنهج وتطويره وتخطيطه والمعلم وأعداده والمتعلم واستعداده وطرائق التدريس وكل ما يرتبط بعناصر العملية التعليمية لابد من التقويم." (حمادنة وعبيدات، 2012: 103).

" في عام 1986، شكلت مجموعة عمل مكونة من مديري المجلس الوطني لمدرسي الرياضيات (NCTM) مجموعة لتطوير معايير تعليم الرياضيات بهدف تحسين جودة الرياضيات في المدارس، وكذلك لتقييم مناهج التعليم بطرق مناسبة. في عام 1989، أنشأت اللجنة وثيقة "معايير منهج وتقويم للرياضيات المدرسية". ثم تم تحديث هذه المعايير وتغييرها حتى عام 2000، حيث تم نشر الوثيقة المنقحة " مبادئ ومعايير الرياضيات المدرسية ". وتعتبر هذه الوثيقة الحجر الأساس في تحسين وتطوير المنهج الرياضي لتحقيق أهداف تعليم الرياضيات التي يرغب فيها كل متعلم لما لها من خصائص واقعية ودقيقة. " (العاصي، 2018:26).

أهمية المعايير العالمية

1- "المعايير مقدمة للحكم على المستوى الخاص بالجودة في مجال معين من الدراسة عن طريق معرفة جودة المناهج والأهداف والأنشطة والتقييمات."

2- "تتيح المعايير مقاييس للحكم على تحقيق الغايات وتوفر نظرة شاملة للتعليم والتعلم."

3- " توفر المعايير إمكانية التعاون والتنسيق لتحسين عمليات التدريس والتعلم."

4- "تسهم المعايير في تطوير المقررات الدراسية من خلال تبني سياسات معينة."

5- "توفر المعايير بيئة فاعلة للتعلم والتقدم والتميز، وتوحيد ا واتساق ا في الأحكام."

6- " تحقق المقاييس التربوية مبادئ التميز والمساواة وكذلك التكافؤ بالفرص."

7- " يتضمن الوضع التعليمي الذي توفره المعايير استمرارية للخبرة من مستوى تعليمي إلى آخر ومن مدرسة إلى أخرى."

8- " تمنح المقاييس التربوية فرصًا لمساندة تمكُّن المدرسين على معاونة الدارسين على ربط الخبرات السابقة بالتعلم الجديد، وتكون بمثابة معيار لتقييم أبعاد التدريس والتعلم." (محمود، 2005: 252-254)

يهدف مشروع تطوير مناهج الرياضيات إلى تطوير تعليم الرياضيات بالاعتماد على مواءمة مواد تعليمية عالمية أثبتت فاعليتها في تحسين التعليم. لذا فإن أهمية هذه الدراسة تتجلى في تقويم محتوى كتاب رياضيات الصف الثالث المتوسط المنهج الجديد بجزئه الأول والثاني للعام الدراسي 2018–2019 في ضوء المعايير العالمية (NCTM 2000) لكشف جوانب الضعف ومعالجتها وجوانب القوة لتعزيزها لتطوير وتحسين العملية التعليمية.

سمات ومميزات وثيقة (NCTM)

1- "استعمال التقنية في تعليم وتعلم الرياضيات باعتبارها هدفاً أساسياً لتعليم وتعلم الرياضيات حيث عكست المعايير رغبة الدولة ورغبة التربويين في تحقيق تعليم أفضل في الرياضيات."

2- "إعطاء الطلاب فرصة في تعلم الرياضيات كل بحسب رغبته وحاجته."

3- "الاهتمام بالاكتشاف والبحث والاستقصاء وحل المشكلات والاتصال."

4- " تزويد المناهج بأسس التغيير والتحديث ونوعية المقررات وتطويرها وأبداع برامج جديدة تلبي احتياجات المتعلم ."

5- " وصف لطرق التدريس للتأثير على عملية التعلم المرغوبة في سلوك المتعلم ولإظهار زيادة حقيقية في القدرة الرياضية."

6– " تحفيز تفكير المتعلم وإنماء إمكانياته على التفكير وازدياد رغبته في التعلم وحب الاستكشاف وتحسين قدرته على تكوين وفهم العلاقات وحل المشاكل وتوسيع معرفته بالرياضيات الوظيفية وتعزيز تقديره للرياضيات في تقدم العلوم ودور التكنولوجيا في التنمية." (عبد اللطيف، 2011: 45).

المعايير العالمية (NCTM 2000)

تضمنت المعايير العالمية للمجلس القومي لمعلمي الرياضيات ((NCTM 2000 عشرة معايير للصفوف من رياض الأطفال حتى الصف الثاني عشر وهي معايير العمليات والمحتوى الرياضي (Process and Content Standards) كالآتي:

1–الأعداد والعمليات (Number and Operations)

- التعرف على الأعداد وكيفية تمثيلها وكيفية ارتباط الأعداد ببعضها البعض وأنظمتها.

- التعرف على ما تعنيه العمليات وكيفية الترابط ببعضها البعض.

- سهولة إجراء الحسابات وتقديم تقديرات معقولة.

2- الجبر (Algebra)

1- التعرف على الانماط والعلاقات والاقتران.

2- استعمال الرموز الجبرية لتحليل وتمثيل المواقف الرياضية.

3- استخدام النماذج الرياضية لفهم وتمثيل العلاقات الكمية.

4- تحليل التغيرات في السياقات المغايرة.

3– الهندسة (Geometry)

1- تحليل وفحص خصائص وصفات الأشكال الهندسية ثنائية وثلاثية الأبعاد وتطوير الحجج الرياضية للعلاقات الهندسية.

2- استخدام هندسة الإحداثيات وأنظمة التمثيل الأخرى لتحديد المواقع ولوصف العلاقات المكانية.

3- تطبيق التحويلات واستخدام التماثل لفحص المواقف الرياضية.

4- استعمال التفكير والتصور المكاني والنمذجة الهندسية لإيجاد حل المشكلات.

4– القياس (Measurement)

1- التعرف على إمكانية قياس الأشكال والوحدات والأنظمة وإجراءات القياس.

2- تنفيذ الاساليب والأدوات وكذلك الصيغ المناسبة لتعيين القياسات.

5– تحليل البيانات والاحتمالات (Data analysis and probabilities)

1- طرح أسئلة يمكن معالجتها بالبيانات، وجمع المعلومات وتنظيمها وتقديمها للإجابة عن الأسئلة.

2– اختيار واستخدام الطرق الإحصائية المناسبة لتحليل وفحص البيانات.

3– تحديث التقييم القائم على البيانات بالاستدلال والتنبؤ.

4– أدرك وتنفيذ المفاهيم اللازمة للاحتمالات.

6– حل المسألة (Problem solving)

1– إنشاء معرفة رياضية حديثة عن طريق حل المسألة.

2– حل المسائل التي تنشأ في الرياضيات وغيرها من السياقات.

3– تطبيق وتعديل مجموعة من التّخطيطات الموائمة لحل المسائل.

4– الرصد والتفكير في الإجراءات العملية لحل المسألة.

7–التعليل والبرهان (Reasoning and proof)

1– إدراك التعليل والبرهان كعناصر أأساسية للرياضيات.

2– تكوين التخمينات الرياضية والتحقق منها.

3– تطوير وتقويم الحجج والبراهين الرياضية.

4– اختيار واستخدام أنماطا متنوعة من التفكير وطرق البرهان.

8–التواصل (Communication)

1– ترتيب وتعزيز التفكير الرياضي عن طريق التواصل.

2– إيصال تفكيرهم الرياضي بطريقة مترابطة وواضحة مع أقرانهم ومعلميهم وغيرهم.

3– تحليل وتقويم التفكير الرياضي والاستراتيجيات التي يستخدمها الاخرين.

4– التعبير عن الأفكار الرياضية بلغة رياضية دقيقة.

9–الترابط (Connections)

1– التعرف على الترابط خلال الافكار الرياضية واستخدامه.

2– فهم كيفية الترابط وإنشاء وجهات النظر الرياضية لإنتاج عمل مترابط.

3– التعرف على الرياضيات وتطبيقها في سياقات غير رياضية.

10–التمثيل (Representation)

1– تكوين واستخدام التمثيلات لتنظيم وتسجيل وتواصل الأفكار الرياضية.

2– اختيار وتطبيق وترجمة عبر التمثيلات الرياضية لحل المسائل.

3– استخدام التمثيلات لنمذجة وتفسير الظواهر الطبيعية والاجتماعية والرياضية.

دراسات السابقة

دراسة (Kulm، others &، USA، 2000) هدفت الدراسة لتحليل مجموعة من كتب الجبر على نطاق واسع وفقًا لمعايير (NCTM) في جميع المستويات التعليمية في الولايات المتحدة الأمريكية بالاعتماد على مقياس الجبر لفحص محتوى الكتب. تلخصت نتائج الدراسة على أن الكتب تعمل بشكل جيد من خلال الوسائل والأنشطة في ربط الطلاب بمسائل ذات قيمة، وأنها تعمل على تمثيل الكميات وتطور العلاقات الجبرية. أوصت الدراسة باعتماد كتب الجبر التي توافق متطلبات (NCTM).

دراسة (صبيح، الاردن، 2004) اجريت الدراسة لتحليل وتقييم محتوى كتب الرياضيات للمرحلة الثانوية وفق المعايير العالمية (NCTM) ومدى توافق المحتوى والمعايير الذي يتراوح ما بين كبير ومتوسط وقليل، كذلك فإن بعض المعايير لا يوجد لها ذكر في المحتوى وان وحدات الهندسة والقياس الواردة في الكتب استعملت مقياس حل المسألة بدرجة اقل، في حين ان مقياس الترابط والتمثيل الرياضي ذات درجة معتدلة.

دراسة (العنزي، الكويت، 2007) هدفت الدراسة إلى تحليل كتب الرياضيات للصف السادس الأساسي وفقاً للمعايير العالمية (NCTM) ومنها معايير حل المسألة والاحصاء والاحتمالات، حيث كان التوزيع متوازن في صفحات الكتاب بين صفحات الشرح وصفحات المسائل وتنويع الكتاب في استراتيجيات حل المسألة ولكن لم تظهر طرق متنوعة للتأكد من صحة الحل وكان محتوى الكتب مراعي لمعيار الاحصاء والاحتمالات.

دراسة (حمدان، فلسطين، 2010) اجريت الدراسة للتعرف على مدى تطابق المفاهيم الرياضية للمعايير العالمية (NCTM) في كتب الرياضيات للمنهاج الفلسطيني في المراحل الأساسية (6-8)، تمثل الجانب الأول في مدى توافر المفاهيم الرياضية في كتب المراحل الواردة أعلاه لخمسة مستويات هي: الأعداد، والقياس، والهندسة، والجبر، والإحصاء والاحتمالات، تمثل للجانب الثاني في معرفة مدى تطابق طرق العرض والتقديم للمفاهيم الرياضية الخاصة مع معايير (NCTM) في تلك الكتب للطلاب، اعتمدت هذه الدراسة المنهج الوصفي التحليلي، لمناسبته لأغراض الدراسة، أُعدت ثلاث أدوات للدراسة هي: أداة تحليل المحتوى، وقائمة المفاهيم الرياضية وفقاً للمعايير العالمية (NCTM) ، واستبيان موجه إلى المعلمين حول الطرق المعروضة للمفاهيم في محتوى كتب المراحل التي هي قيد الدراسة، وتوصلت الدراسة إلى ان المفاهيم الرياضية في كتب المراحل المدروسة قد توفرت بدرجة عالية بينما لم تتوفر تلك المفاهيم بدرجة مقبولة في مستويي الجبر والهندسة.

دراسة (جواد، العرق، 2016) هدفت الدراسة لتحليل محتوى كتاب رياضات الصف الرابع العلمي وفق المعايير (NCTM) وتكون مجتمع البحث وعينته من كتاب الرياضات للصف الرابع العلمي وتم بناء اداة التحليل المحتوى على اربع مجالات هي الأعداد والعمليات عليها، الجبر والعلاقات والدوال، الهندسة والقياس، تحليل البيانات والاحصاء والاحتمالات، وقد خلصت الدراسة على توافر نسبة قليلة من المعايير في اغلب الاحيان وان بعض المعايير لم تجدها موضع ذكر وافتقار المناهج العراقية للمعايير العالمية (NCTM).

التعقيب على الدراسات السابقة

تتفق دراستنا الحالية مع الدراسات السابقة على ضرورة الاعتماد على المعايير العالمية (NCTM) في تحليل وتقويم كتب الرياضيات لمعرفة نسبة توافر هذه المعايير التي تعتمد عليها الدول المتقدمة لتضمينها بكتب الرياضيات لمواكبة التطور الحاصل في العالم.

مدى الإفادة من الدراسات السابقة

أفادت الدراسات السابقة الدراسة الحالية في صياغة مشكلة الدراسة وبناء أداة الدراسة من الأدوات المستعملة في تلك الدراسات لجمع المعلومات والبيانات وبنائها باستخدام المنهج الوصفي القائم على طريقة تحليل المحتوى، وتحديد الأساليب الإحصائية المناسبة، وكيفية تحليل نتائج الدراسة واهم المصادر والمراجع العلمية المعتمدة.

إجراءات الدراسة:

1– منهج الدراسة

تم استخدام المنهج الوصفي من خلال تحليل محتوى كتاب رياضيات الصف الثالث المتوسط المنهج الجديد بجزأيه الأول والثاني للعام الدراسي 2018 – 2019 (الطبعة الأولى، 2018) في ضوء المعايير العالمية (NCTM 2000) وقد تم استخدام منهج البحث لإيجاد النسب المئوية ومعدلات التكرار للمحتوى لمعرفة مدى توافقه مع المعايير العالمية وتحديد نقاط القوة والضعف فيه وتقديم التوصيات والمقترحات التي تساهم في تطوير محتوى الكتاب.

2– مجتمع الدراسة وعينتها:

تكوّن مجتمع الدراسة من كتاب الرياضيات للصف الثالث المتوسط المنهج الجديد بجزئه الأول والثاني للعام الدراسي 2018 –2019 ويتألف من ستة فصول هي (العلاقات والمتباينات في الأعداد الحقيقية، المقادير الجبرية، المعادلات، الهندسة الاحداثية، الهندسة والقياس، الاحصاء والاحتمالات).

3– أداة تحليل المحتوى:

لتحقيق أهداف الدراسة تم بناء أداة تحليل المحتوى والتي تتضمن قائمة بالمعايير العالمية National Council of Teachers of Mathematics) (NCTM2000) حيث تمت ترجمتها وعرضها على متخصصين في اللغة الإنجليزية وطرق تدريس الرياضيات (ملحق 1) للتأكد من صحة الترجمة علمياً ولغوياً، وتضمنت عينة التحليل الفصول الستة لكتاب الرياضيات للصف الثالث المتوسط المنهج الجديد بجزئه الأول والثاني للعام الدراسي 2018 – 2019، تم اعتماد الدرس كوحدة للتحليل واعتبار كل تعليق يتصل بالفكرة المطروحة فقرة .

4– صدق أداة تحليل المحتوى:

بعد تحديد المعايير العالمية لمحتويات مناهج الرياضيات وترجمتها والتأكد من صحتها، تم عرض أداة التحليل وعينة التحليل ووحدة التحليل على مجموعة من المختصين بمناهج وطرائق تدريس الرياضيات وطرائق التدريس العامة والارشاد التربوي والنفسي لتحديد مدى وملاءمتها لعملية تحليل المحتوى (ملحق 1).

5– ثبات أداة تحليل المحتوى:

تم حساب نسبة الاتفاق بين تحليل الباحثة مع المحكمين المختصين بمناهج وطرائق تدريس الرياضيات وطرائق التدريس العامة والإرشاد التربوي والنفسي (ملحق 1) باستخدام معادلتي هولستي كما موضح في الجدول (1).

جدول (1) نسبة الاتفاق بين الباحثة والخبراء المحكمين

معامل الاتفاق	الإجراءات
93%	الباحثة والمحلل [3]
98%	الباحثة والمحلل [4]
93%	الباحثة والمحلل [5]
98%	الباحثة والمحلل **[6]**
97%	الباحثة والمحلل [7]
92%	الباحثة والمحلل [8]

يبين الجدول اعلاه ان التحليل على درجة عالية من الثبات، اذ ان نسبة الثبات تقبل اذا كانت بين (60% – 85%) فأكثر وبالإمكان الاعتماد عليها (الكبيسي، 2007:201).

6– الأساليب الإحصائية المستخدمة:

تم الاستعانة في المعالجة الإحصائية للنتائج بالأساليب الآتية: التكرار والنسب المئوية ومعادلة كوبر.

عرض النتائج

تم تحليل محتوى كتاب الرياضيات للصف الثالث المتوسط المنهج الجديد بجزئه الأول والثاني للعام الدراسي 2018 – 2019 في ضوء المعايير العالمية(NCTM 2000) باستخدام اداة التحليل المعدة لهذا الغرض وجدول (2) يوضح نتائج التحليل حيث تم حساب النسب المئوية للمحتوى بالشكل التالي:

$$\text{النسبة المئوية} = \frac{\text{مجموع تكرارت كل المجال}}{\text{مجموع التكرارات الكلي للمجالات الاربعة}} \times 100.$$

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[3] د. عبد الواحد محمود محمد

[4] د. عياد اسماعيل صالح

[5] د. نداء محمد باقر

[6] د. زينب فالح سالم

[7] د. ميساء عبد حمزه محسن

[8] د. نبيل كاظم فير

جدول (2) التكرارات والنسب المئوية لكل مجال في محتوى كتاب الرياضيات

%	عدد التكرارات	حل المسألة — حل المسائل التي تنشأ في الرياضيات والسياقات الاخرى	حل المسألة — الرصد والتفكير في عملية حل المسائل الرياضية	تمرينات الفصول (الاختيار من متعدد)	اختبار الفصل	تمارين	الاختبار القبلي	الشروحات مقرونة بالتوضيح والأمثلة	المعايير	المجال
									فهم معاني العمليات وكيفية ارتباطها مع بعضها البعض	
	67	1	–	8	4	21	24	9	1- الجمل العددية التي تحتوي على اعداد حقيقية باستعمال ترتيب العمليات	الأعداد والعمليات عليها
	27	2	–	4	3	9	–	9	2- استعمال الحاسبة والتقريب لتبسيط جمل عددية	
%3،7	94	76						18	مجموع تكرارات المجال	
									فهم الانماط والعلاقات والاقترانات	
	42	3	–	8	5	16	–	10	1- التعرف إلى التطبيق وانواعه وكيفية تمثيله بياناً في المستوي الاحداثي والتعرف على تركيب التطبيقات	الجبر والعلاقات والدوال
	83	3	–	9	13	39	–	19	2- التعرف إلى المتتابعة والمتتابعة الحسابية وخواصها	
		1- استعمال استراتيجية فهم المسألة							تمثيل وتحليل المواقف والتراكيب الرياضية باستخدام الرموز الجبرية	
	89	3	2	11	14	41	6	12	1- حل المتباينات المركبة وتمثيلها على مستقيم الاعداد	
	92	3	3	10	14	48	–	14	2- حل المتباينات التي تحتوي على القيمة المطلقة	
		2- استعمال استراتيجية							3- ضرب المقادير الجبرية	

مجموع		الخطوات الاربع لحل المسألة						المجال
146	3	3	14	18	49	31	28	
95	3	1	9	14	41	15	12	4– تحليل المقدار الجبري باستعمال العامل المشترك الاكبر
134	3	–	12	21	59	12	27	5– تحليل المقدار الجبري بالمتطابقات (الفرق بين مربعين والمربع الكامل)
119	3	–	12	13	59	12	20	6– تحليل المقدار الجبري من ثلاثة حدود بالتجربة
108	3	1	10	12	53	–	29	7– تحليل المقدار الجبري مجموع مكعبين او الفرق بين مكعبين
82	3	–	11	9	37	6	16	8– تبسيط المقادير الجبرية (اجراء عمليات الجمع والطرح والضرب القسمة على المقادير الجبرية النسبية بأبسط صورة)
60	3	–	10	9	28	–	10	9– حل نظام من معادلتين خطيتين بمتغيرين بيانياً وبالتعويض وبالحذف
106	3	–	15	10	56	–	22	10– حل المعادلة بتحليل الفرق بين مربعين وخاصية الجذر التربيعي
97	3	5 (3– استعمال استراتيجية كتابة معادلة لحل مسألة)	14	10	51	–	14	11– حل المعادلات التربيعية المؤلفة من ثلاث حدود بالتحليل بالتجربة
80	3	–	14	8	45	–	10	12– حل المعادلات التربيعية بطريقة المربع الكامل
75	5	–	10	10	39	–	11	13– حل المعادلات من الدرجة الثانية بالقانون العام
56	3	–	11	7	28	–	7	14– حل المعادلات الكسرية من الدرجة الثانية
1464		1203					261	مجموع تكرارات المجال

%58،2									
									تحليل خصائص الاشكال الهندسية ثنائية وثلاثية الابعاد وتطوير حجج رياضية عن العلاقات الهندسية
	50	4	–	8	13	11	–	14	1- النسب المثلثية (التعرف إلى النسب المثلثية الأساسية وايجاد قيم وعبارات تتضمن زوايا خاصة)
	50	3	–	7	3	22	–	15	2- المثلثات (التعرف إلى منصفات الزوايا والقطع المتوسطة للمثلث وكيفية تشابه مثلثين واستعمال التشابه في حل المسائل)
	42	3	–	6	2	16	4	11	3- التناسب والقياس في المثلثات
	62	2	–	7	4	28	–	21	4- الدائرة (ايجاد قياس الاقواس والزوايا المركزية للدوائر والتعرف إلى المماس والمماس المشترك)
	46	3	–	8	5	18	–	12	5- استعمال خصائص المحاور ومنصفات الزوايا لرسم الدائرة المحيطة والدائرة المحاطة في مثلث وايجاد اطوال القطع المستقيمة التي يحددها قاطعان على دائرة
	57	3	–	8	3	21	3	19	6- الزوايا والدائرة (ايجاد قياس الزوايا المحيطية والمماسية وقياسات زوايا تتقاطع اضلاعها مع دائرة)
			4- استعمال استراتيجية الرسم						**استخدام التصور والتفكير المنطقي المكاني والنمذجة الهندسية لحل المسائل**
	70	3	5	9	4	18	16	15	1- المضلعات والمجسمات (ايجاد محيط ومساحة المضلعات المنتظمة والحجم

المجال								
								والمساحة الكلية للهرم المخروط)
								تحديد المواقع ووصف العلاقات المكانية باستخدام الهندسة وانظمة التمثيل الاخرى الاحداثية
85	4	–	7	8	37	17	12	1– تمثيل المعادلة الخطية والتربيعية في المستوي الاحداثي
75	2	–	8	7	43	2	13	2– ايجاد الميل والمقطع السيني والصادي للمستقيم
66	5	–	8	8	28	–	17	3– ايجاد معادلة المستقيم
48	3	–	7	7	20	_	11	4–التمييز بين المستقيمات المتوازية والمتعامدة
		5– استعمال تحديد معقولية الاجابة في حل المسألة	7	5	16	_	11	5– التعرف وتطبيق قانون المسافة بين نقطتين ونقطة المنتصف
46	2	5						
697			526			171		مجموع تكرارات المجال
%27،7								
								صياغة اسئلة يمكن التعامل معها بالبيانات وجمع وتنظيم وعرض البيانات الملائمة للإجابة عنهما

تحليل البيانات والاحتمالات

المجال / الفقرة					6- استعمال خطة انشاء نموذج لحل المسألة			
1- تصميم دراسة مسحية وتحليل النتائج	16	4	17	7	8	–	4	56
2- تمييز البيانات المظللة والاحصاءات المظللة	7	–	12	4	4		4	31
فهم وتطبيق المفاهيم الأساسية في الاحتمالات								
1- التباديل والتوافيق (التعرف إلى مضروب العدد والتبادل والتوافيق)	22	1	31	10	8	5	7	84
2- حساب الاحتمال التجريبي و النظري	10	2	17	10	6	–	4	49
3- الاحداث المركبة (حساب احتمال الاحداث المستقلة والمترابطة)	11	6	12	3	6	–	2	40
مجموع تكرارات المجال	66		194					260
								%10.3
المجموع الكلي للتكرارات	516		1999					2515 / %100

كما تم ترتيب نسبة توافق محتوى كتاب الرياضيات مع المعايير العالمية (NCTM 2000) لكل مجال من المجالات الاربعة (الأعداد والعمليات عليها، الجبر والعلاقات والدوال، الهندسة والقياس، تحليل البيانات والاحتمالات) ترتيباً تصاعدياً كما مبين في الجدول (3) وكما موضح في الشكل (1).

جدول (3) النسب المئوية لكل مجال مرتبة ترتيباً تصاعدياً

النسبة المئوية لكل مجال	المجال	الرتبة
% 3.7	الأعداد والعمليات عليها	1
% 10.3	تحليل البيانات والاحتمالات	2
% 27.7	الهندسة والقياس	3
% 58.2	الجبر والعلاقات والدوال	4

شكل (1) النسب المئوية للمجالات المتضمنة في محتوى كتاب الرياضيات

النسب المئوية لكل مجال
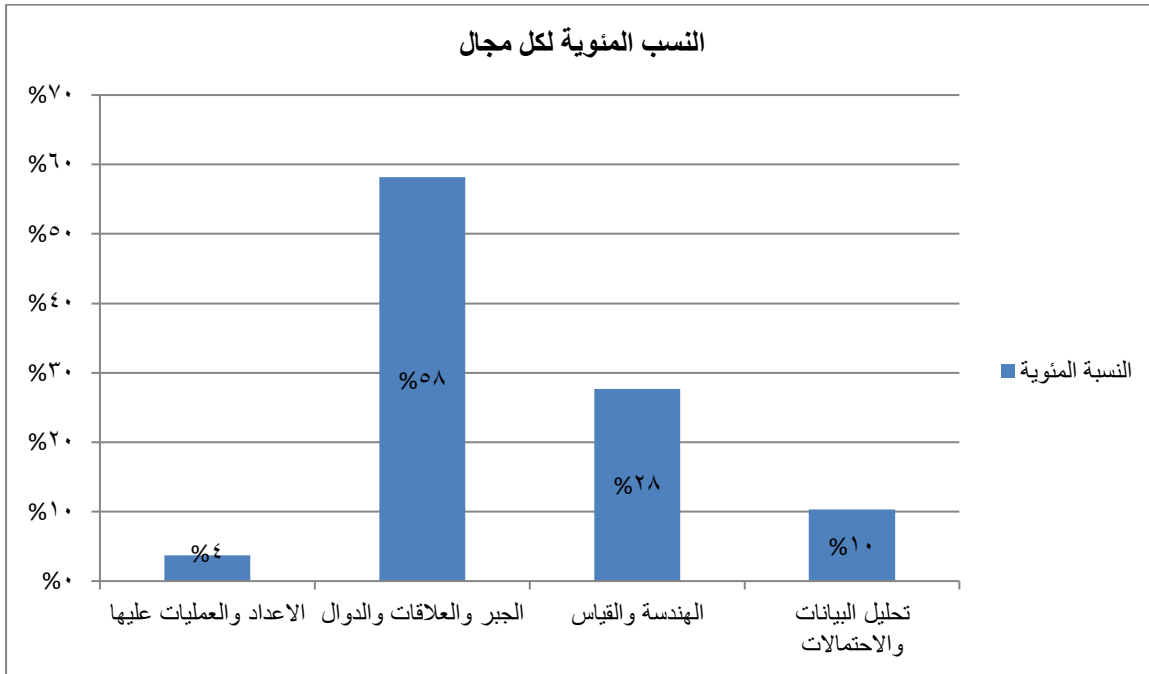
كذلك تم حساب النسب المئوية للأمثلة والاختبارات والتمارين المتضمنة في محتوى كتاب الرياضيات لكل مجال من المجالات الاربعة كما بين في الجدول (4) وكما موضح في الشكل (2) حيث تم حساب النسب المئوية بالشكل الآتي:

$$\text{النسبة المئوية} = \frac{\text{مجموع تكرارات الأمثلة او الاختبارات والتمارين في كل مجال}}{\text{مجموع التكرارات الكلي لكل مجال}} \times 100.$$

جدول (4) النسب المئوية للأمثلة والاختبارات والتمارين لكل مجال في محتوى كتاب الرياضيات

نسبة الاختبارات والتمارين لكل مجال %	نسبة الأمثلة لكل مجال %	المجال
%80.85	%19.14	1- الأعداد والعمليات عليها
%82.17	%17.82	2- الجبر والعلاقات والدوال
%75.46	%24.53	3- الهندسة والقياس
%74.61	%25.38	4- تحليل البيانات والاحتمالات

شكل (2) النسب المئوية للأمثلة والاختبارات والتمارين لكل مجال في محتوى كتاب الرياضيات
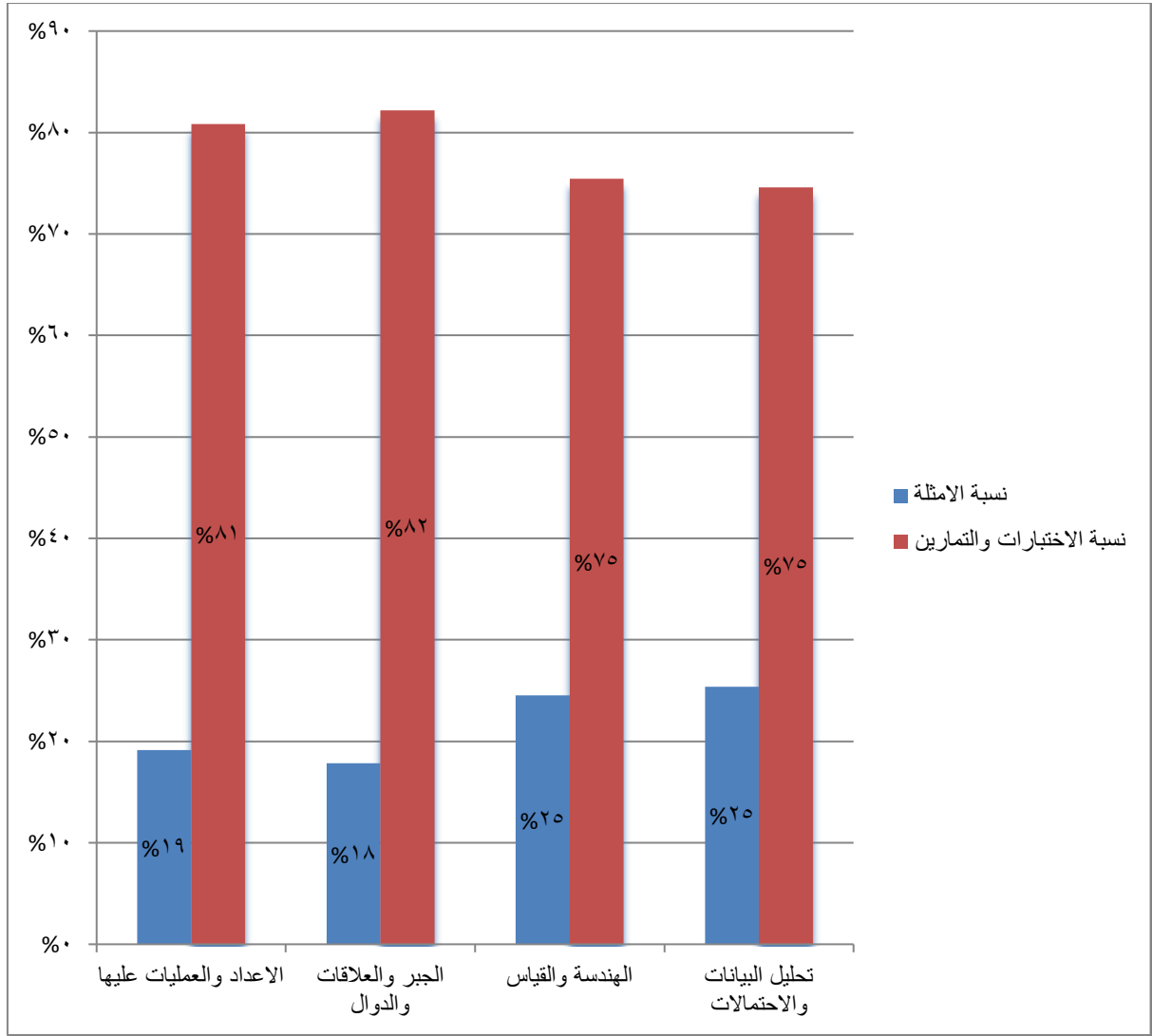
جدول (5) يوضح عدد المعايير المتوفرة في محتوى كتاب الرياضيات لكل مجال من المجالات الاربعة في ضوء المعايير العالمية (NCTM 2000) وكذلك النسب المئوية لدرجة توافر هذه المعايير حيث تم حساب النسب المئوية بالشكل الآتي:

$$\text{النسبة المئوية} = \frac{\text{عدد المعايير المتوفرة في محتوى كتاب الرياضيات في كل مجال}}{\text{عدد المعايير العالمية لكل مجال}} \times 100.$$

%	عدد المعايير العالمية (NCTM) لكل مجال	عدد المعايير المتوفرة في محتوى كتاب الرياضيات	المجالات	
% 33.3	3	1	الأعداد والعمليات عليها	1-
% 50	4	2	الجبر والعلاقات والدوال	2-
% 50	6	3	الهندسة والقياس	3-
% 50	4	2	تحليل البيانات والاحتمالات	4-

جدول (5) يوضح عدد المعايير المتوفرة والنسب المئوية لكل مجال في محتوى كتاب الرياضيات

جدول (6) يوضح الأمثلة والتمارين المتكررة في موضوعات محتوى كتاب الرياضيات وكذلك المتشابهة تماماً لسياق المثال او التمرين ماعدا اختلاف واحد وهو بينهما تسمية المتغيرات في المثال او التمرين المتشابه.

جدول (6) يبين الأمثلة والتمارين المتكررة والمتشابهة في مواضيع كتاب الرياضيات

التشابه	التكرار	السؤال	المواضيع	المجال
–	1- تمرين 37	1- مثال 4 (iv)	ضرب المقادير الجبرية	
2- مشابه اختبار الفصل	–	2- مثال 5 (ii)		
10+اختيار من متعدد12	–	3- مثال 5 (v)		
3- تمرين 42	4- مراجعة الفصل تدريب	4- مثال 5 (vi)		
–	(ii) 2	5- تمرين 3		
5- اختبار الفصل 3	–	6- تمرين 18		
6- اختبار الفصل 12	–	7- اختبار الفصل 1		
	7- اختيار من متعدد 1			
1- تمرين 44		1- مثال 4(i)	تحليل المقدار الجبري بالمتطابقات	الجبر والعلاقات والدوال
	1- تمرين 8	1- مثال 3(iii)		
	2- تمرين 9	2- مثال 3(v)		
	3- تمرين 32	3- تمرين 5	تحليل المقدار الجبري من ثلاثة حدود بالتجربة	
	4- تمرين 33	4- تمرين 6		
	5-تمرين 34	5- تمرين 7		
–	1- مراجعة الفصل مثال 1	1- مثال 2(i)		
2- اختيار من متعدد 2	–	2- مثال 2(iii)		
–	3- تمرين 8	3- مثال 2(v)		
4- اختيار من متعدد 3	4- تمرين 7	4- مثال 2(iv)		
–	5- تمرين 10	5- مثال 2(vii)		
–	6- تمرين11	6- مثال 2(viii)		

تحليل البيانات والاحتمالات	التباديل والتوافيق	النسب المثلثية	التمثيل البياني للمعادلات في المستوي الاحداثي	حل المعادلات التربيعية بالمربع الكامل	حل المعادلات التربيعية بالتجربة	حل المعادلات التربيعية بمتغير واحد	تبسيط المقادير الجبرية النسبية	تحليل المقدار الجبري مجموع مكعبين او الفرق بين مكعبين

الجدول (مستمر):

عمود (يمين / أمثلة)	عمود (وسط)	عمود (يسار)	الموضوع
7- مثال 2(ix) 8- مثال 4(ii) 9- مثال 4(iii) 10- مثال 4(iv) 11- تمرين 42 12- مراجعة الفصل تدريب 2(i)	7- تمرين 12 8- تمرين 38 – – – 12- اختيار من متعدد 7	– 8- مراجعة الفصل تدريب 2(i) 9- تمرين 39 10- تمرين 40 11- اختيار من متعدد 9	تحليل المقدار الجبري مجموع مكعبين او الفرق بين مكعبين
1- مثال 4 (ii)	1- مراجعة الفصل تدريب 2		تبسيط المقادير الجبرية النسبية
1- مثال 3(ii) 2- تمرين 2 3- تمرين 25	– 2- اختبار الفصل 14 3- اختبار الفصل 13	1- اختبار الفصل 10 – 3- مراجعة الفصل تدريب 2	حل المعادلات التربيعية بمتغير واحد
1- مثال 2(i) 2- تمرين 5 3- تمرين 6	1- اختيار من متعدد 7	– 2- تمرين 40 3- تمرين 41	حل المعادلات التربيعية بالتجربة
1- مثال 1 2- تمرين 9 3- اختبار الفصل 25	– 2- اختيار من متعدد 4	1- تمرين 20 – 3- اختيار من متعدد 2	حل المعادلات التربيعية بالمربع الكامل
1- تمرين 21	1- اختبار الفصل 1(iv)		التمثيل البياني للمعادلات في المستوي الاحداثي
1- مراجعة الفصل مثال 1	1- اختيار من متعدد 2		النسب المثلثية
1- مثال 3 (iv)	1- تمرين 19		التباديل والتوافيق

تفسير النتائج

من الجدول الثاني والثالث يتضح لنا ان المعايير العالمية (NCTM 2000) توافرت بنسب قليلة في بعض المجالات حيث كان لمجال الأعداد والعمليات عليها النسبة الاقل في حين كانت النسبة الأكثر هي لمجال الجبر والعلاقات والدوال، اما الجدول الرابع فيوضح نسب الأمثلة والتمارين لكل مجال حيث نلاحظ ان نسب الأمثلة كانت قليلة مقارنتاً مع نسب التمارين للمجالات الاربعة، اما في الجدول الخامس فنلاحظ ان في كل المجالات الاربعة لم تتوفر كل المعايير المذكورة انفاً في معايير الرياضيات المدرسية (NCTM 2000)، الجدول السادس يوضح الأمثلة والتمارين المتكررة في موضوعات محتوى كتاب الرياضيات وكذلك المتشابهة تماماً لسياق المثال او التمرين ماعدا اختلاف واحد بينهما وهو تسمية المتغيرات في المثال او التمرين المتشابه، حيث نلاحظ الحصة الأكثر كانت لمجال الجبر والعلاقات والدوال، اذ ان هذا النوع من التكرارات والتشابه لا يُثري او يُعزز فهم الطالب بقدر ما يُربكه بداعي التداخل في محتوى ومضمون العرض المقدم اليه وفي الوقت ذاته، لابد من الإشارة إلى ان عامل الزمن الذي يتضمنه العام الدراسي بعدد الايام والساعات والحصص فضلا عن كثرة العطل الرسمية لا يتناسب ايجابياً مع كثرة التمارين لا سيما وانها تمارين يشوبها التكرار والتشابه والتقارب .

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الاستنتاجات

1- ان درجة توافر المعايير العالمية في بعض المجالات كانت بنسب قليلة حيث كان لمجال الأعداد والعمليات عليها النسبة الاقل.

2- ان في كل المجالات الاربعة لم تتوفر كل المعايير المذكورة في المعايير العالمية (NCTM 2000).

3- إن نسب الأمثلة كانت قليلة مقارنةً مع نسب التمارين للمجالات الأربعة.

4- هناك أمثلة وتمارين متكررة وكذلك متشابهة تماماً في بعض المجالات.

التوصيات

1- الأخذ بنظر الاعتبار المعايير غير المتوفرة حسب نتائج بحثنا

2- النظر بفارق النسب بين الأمثلة التوضيحية والتمارين

3- حذف الأمثلة التمارين المتكررة والمتشابهة في مواضيع الكتاب.

المقترحات

1- اجراء دراسات مماثلة لتقويم كتب الرياضيات للصف الأول والثاني المتوسط المستحدثة في ضوء المعايير العالمية (NCTM 2000) للوقوف على جوانب القوة والضعف فيها وتقديم المعالجة المناسبة لها.

2- إ جراء دراسات تقويمية مستمرة لكتب الرياضيات للمراحل الدراسية المختلفة في ضوء المعايير العالمية (NCTM 2000).

3- إجراء دراسات مقارنة لمناهج الرياضيات المستحدثة في العراق للمراحل المختلفة مع مناهج عالمية أو عربية طورت مناهجها في ضوء المعايير العالمية (NCTM 2000).

المصادر

1- ابو زينة، فريد كامل (١٩٨٢): الرياضيات – مناهجها واصول تدريسها، ط ١، عمان.

2- ابو زينة، فريد كامل (1987): الرياضيات مناهجها واصول تدريسها، دارالفرقان للنشر، الاردن.

3- التميمي، عواد جاسم محمد (2009): المنهج وتحليل الكتاب، ط1 دار الكتب والوثائق، بغداد.

4- الشارف، أحمد العريفي (1996): المدخل لتدريس الرياضيات،الجامعة المفتوحة، طرابلس.

5- العاصي، اسلام مؤمن محمود (2018): مدى تضمن كتب الرياضيات المطورة للصفين الثالث والرابع الأساسي لمعايير المجلس الوطني لمعلمي الرياضيات NCTM، رسالة ماجستير، الجامعة الاسلامية، غزة.

6- العنزي، عمار (2007): تحليل كتب الرياضات المرحلة المتوسطة في الكويت في ضوء معايير المجلس القومي لمعلمي الرياضيات في امريكا، رسالة ماجستير، جامعة عمان العربية للدراسات العليا.

7- الكبيسي، عبد الواحد حميد، (2007): القياس والتقويم، تحديدات ومناقشات، ط1، دار جرير للنشر والتوزيع، عمان .

8- الوالي، مها (2006): مستوى جودة موضوعات الإحصاء المتضمنة في كتب رياضيات مرحلة التعليم الأساسي بفلسطين في ضوء معايير المجلس القومي لمعلمي الرياضيات، رسالة ماجستير، كلية التربية، الجامعة الإسلامية.

9- بدوي، رمضان مسعد (2003): استراتيجيات في تعليم وتقويم تعلم الرياضيات، ط1 دار الفكر، عمان.

10- جواد، سمر عادل(2016): تحليل كتاب الرياضيات للصف الرابع علمي في ضوء معايير NCTM،مجلة الفتح، العدد 68.

11- حمادنة، محمد محمود وخالد حسين عبيدات (2012): مفاهيم التدريس في العصر الحديث طرائق، اساليب، استراتيجيات، عالم الكتب للنشر والتوزيع، اربد.

12- حمدان، عماد الدين (2010): مدى مطابقة المفاهيم الرياضية المتضمنة في كتب الرياضيات في المرحلة العليا في فلسطين للمعايير الدولية NCTM، رسالة ماجستير، كلية التربية، جامعة الأزهر، غزة.

13- صبيح، أماني ضرار (2004): تحليل وتقويم كتب الرياضيات المدرسية وفق نموذج طور في ضوء معايير المحتوى والعمليات الأمريكية، اطروحة دكتوراه جامعة عمان العربية للدراسات العليا.

14- عبد اللطيف، احمد حسني (2011)، مستوى جودة محتوى موضوعات الجبر المتضمنة في كتب الرياضيات المدرسية بفلسطين في ضوء معايير المجلس القومي لمعلمي الرياضيات (NCTM)، جامعة الازهر، غزة.

15- عودة، احمد سليمان (1985): القياس والتقويم في العملية التدريسية، ط ١، دار الأمل للنشر والتوزيع.

16- محمد، وائل عبد الله وريم احمد عبد العظيم (2011): تصميم المنهج المدرسي، دار المسيرة للنشر والتوزيع، عمان.

17- محمود، – حسين بشير (2005): مناهج التعليم والمستويات المعيارية، المؤتمر العلمي السابع عشر، يوليو2005 ، مجلة الجمعية المصرية للمناهج وطرق التدريس، المجلد الأول.

18- مينا، – فايز (2006): قضايا في تعليم الرياضيات، القاهرة: مكتبة الأنجلو.

19- Kulm, & others (2000). " Rating Algebra Textbooks Council Of Teachers of Mathematics, Chicago, Rebort professor Texas University.

20– Hamiltion (2000) Nor , Mark. New Teohniguess for Effective school Administaration ,West Nyact N.y Darker.

21– National council of Teachers of Mathematics(2000): principles and standers for school Mathematics Restion ,VIRJ.

علاقة مخاطر جرثومة *Listeria monocytogenes* في الأغذية بمناعة الأشخاص الأصحاء والإجهاض المتكرر عند النساء الحوامل وذات السحايا للأطفال

خلود عبدالكريم حسين [1]

سندس باقر داود [2]

ملخص

تعود بكتريا *Listeria monocytogenes* إلى مجموعة العصيات الموجبة لصبغة كرام وهي متحركة، درجة الحرارة المثلى لنموها 25 درجة مئوية، غير مكونه للأبواغ، الوسط الملائم لنموها يحتوي على دم إنسان بنسبة 5% وعموماً تسبب الانحلال لخلايا الدم الحمراء وتنتشر بشكل واسع في البيئة بسبب مقاومتها للظروف البيئية الصعبة مثل التراكيز العالية من الملح ومدى واسع من الأس الهيدروجيني (PH) وبإمكانها ان تتضاعف في درجة حرارة الثلاجة لذا تدعى بالبكتريا الصارمة كما يتطلب استخدام أوساط انتقائية لعزلها من العينات السريرية والبيئية ومن صفات جنس Listeria ايضا انها سلبيه لاختبار الاوكسيديز، ايجابيه لأختبار الكتاليز ومحللة للأسكيولين. تعد بكتريا *Listeria monocytogenes* من أنواع البكتريا الممرضة التي تسبب الكثير من الأمراض الخطيرة للإنسان في كل انحاء العالم مثل التهاب السحايا Meningitis وتسمم الدم Septicemia في الاطفال حديثي الولادة وكذلك الإجهاض المتكرر عند النساء الحوامل، عدوى الجهاز العصبي المركزي (CNS) وتتمثل إصابة الأصحاء بالتهابات معوية بشكل اسهال وتقيؤ، وتنتقل البكتريا بشكل رئيسي عن طريق الغذاء الملوث بها،وتسبب حالات وفاة عالية وقد تظهر في خمس مظاهر سريرية مختلفة، الاكثر شيوعاً منها هي Encephalitides تليها الإجهاض في الثلث الاخير من الحمل وحالات أخرى مثل تسمم الدم في حديثي الولادة نتيجة لالتهاب الرحم، التهاب الضرع، التهاب القرنية والملتحمة والتهاب القزحية في بعض الاحيان، حدوث العدوى ممكن وقد تؤدي إلى انتشار العوامل الممرضة بدون أعراض و دون ملاحظتها عن طريق نواقل للمرض مثل الغذاء أو عن طريق براز الحيوانات التي تبدو سليمة اذ تشكل خطراكبيرا على تلوث علف الحيوانات والبيئات الزراعية والمنتجات الخام وكذلك للإنسان، حيث تحدث العدوى في الغالب بسبب استهلاك الاعلاف والأغذية الملوثة. تمتلك بكتريا Listeria monocytogenes العديد من الخصائص المهمة التي جذبت انتباه الباحثين منذ اكتشاف البكتريا ولحد الان ومنها الطريقة التي تستخدمها البكتريا للانتقال داخل خلايا المضيف وانتشارها في الجسم فضلا عن عوامل الضراوة الناتجة عنها) حددت خلوياً ووراثيا حسب اختلاف السلالات لهذا النوع من البكتريا (والتي مكنتها من تحليل غشاء خلية المضيف والتكاثر داخلها وأثارة استجابة مناعية u1601 في جسم المضيف . ان بكتريا *Listeria monocytogenes* تعد من أهم أنواع البكتريا التي

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تسبب تلف اللحوم اثناء الحفظ بالتبريد والتجميد والتمليح لكوفا من الاحياء المجهرية المقاومة للبرودة اذ تنمو بدرجة حرارة°4– 2 م فضلا عن افا تقاوم الملوحة بنسبة 18% – 20% وبدرجة °4م لمدة ثمانية اسابيع، وتعد لحوم الدواجن من المسببات المهمة لحالات اللستريوسز حيث أشارت العديد من الدراسات إلى ان لحوم الدواجن الطازجة وغير المطبوخة جيداً تشكل حوالي % 20– %5 من الأغذية المسببة لحالات اللستريوسز. تصيب البكتريا حوالي 37 نوعاً من اللبائن ومنها الإنسان و 17 نوعاً من الطيور فضلاً عن الاسماك والقراد، وفي حين ان البكتريا لم تأخذ أهميتها في السابق بسبب عدم التركيز على عزلها من الأغذية ولعدم وجود أعراض مرضية مميزة للمرض، إلا انه في الآونة الأخيرة زاد الاهتمام بها وذلك بسبب ارتفاع حالات الإصابة باللستريوسز.

الكلمات المفتاحية: *Listeria monocytogenes*، تأثير صحي ومناعي، الأغذية.

المقدمة

ظهرت بكتريا *Listeria monocytogenes* في عام 1924 م اذ عزلت وشخصت كوفا من أهم العوامل المسببة لحالات التسمم في الارانب وخنازير غينيا في كامبريدج، و تعود تسميتها بهذا الاسم إلى احتوائها على خلايا وحيدة النواة (*Monocyt (Monocytogenes bacterium* وقت اكتشاف الأمراض التي تسببها هذه البكتريا (1).

وفيما بعد عزلت البكتريا من كبد حيوان الجربوع (Gerbils) المصاب في جنوب افريقيا وتم تسميتها أولاً بـ Tiger river bacillus ثم استبدلت تسميتها لاحقاً إلى *Listeria monocytogenes* نسبة إلى الجراح لستر(2).

كما عزلت البكتريا من سائل النخاع الشوكي لجندي فرنسي لم تشخص حالته في وقتها وحفظت البكتريا بمعهد باستور في باريس لمدة عشرين سنه حيث تم تشخيصها على افا بكتريا *Listeria*، وسجلت أول حالة بشرية في الدنمارك عندما عزلها Nyfelt عام 1929 من دم ثلاثة أشخاص مصابين بـ (Infectious mononucleosis like disease) وكان أول من اشار إلى إصابة الحيوان بهذا المرض هو الباحث Gill عندما عزل البكتريا من دماغ اغنام مصابه في نيوزلندا في عام 1931– 1933، وفي عام 1933 شخص Burn البكتريا بوصفها عاملا مسبباً للالتهابات قبل الولادة، اما في عام 1950 – 1951 فقد شخص Poter حالات عده من أمراض Listeriosis في اطفال حديثي الولادة في شرق المانيا واطلق عليها اسم (*Granulomatosis infantiseptica*) نسبة إلى التغيرات النسيجية المميزة لها . لم يطرأ اي تغيير على تسمية البكتريا منذ اكتشافها عام 1926 ولغاية 1940 حين غير اسمها الباحث Pierie إلى *Listeria monocytogenes* بدلاً من *Listerella hepatolytica* لكون الاسم استخدم لنوع من الاعفان المخاطيه (3) .

وصفت البكتريا *Listeria monocytogenes* بأفا من البكتريا الممرضه للإنسان والحيوان وخاصة عند الأشخاص الذين لديهم نقص مناعي ومن أهم الأمراض التهاب اغشية الدماغ Meningitis، والإجهاض، التهاب شغاف القلب، التهاب ملتحمة العين و التهاب العين الداخلية فضلاً عن حالات التسمم الدموي، كما تسبب مرض الدوار والتهاب الضرع في المجترات، فضلاً عن أعراض عصبية وحالات اسهال (4).

الخصائص الفسيولوجية:

يطلق على بكتريا *Listeria monocytogenes* بالـ Super Bacterium وذلك لأنها تقاوم الظروف البيئية اذ تنمو بدرجات حرارية (2-45) °م و الدرجة المثلى لنموها هي 37 درجة مئوية، تقاوم الحرارة والجفاف نسبياً اذ تبقى حيه بدرجة 60 درجه مئوية لمدة عشر دقائق وتقاوم البسترة بدرجة 72،2 لمدة 15 ثانيه اذ انها من الجراثيم داخل الخلوية كما تتميز البكتريا بصفة خاصة وهي النمو بدرجة حرارة التبريد 4 درجة مئوية وان أفضل نسبة عزل للبكتريا من النسيج يمكن الحصول عليها عند تحضينها عدة أيام بدرجة 4°م بوسط مغذي قبل تلقيحها على الأوساط الزرعية مما يسهل عزلها، فضلا عن أن البكتريا تتحمل ظروف النمو المختلفة مثل النمو في وسط الاس الهيدروجينيPH له بين 5،5 – 6،9 وبتركيز عال من الملوحة يصل إلى اكثر من 10% كلوريد الصوديوم بالإضافة إلى كلوريد الليثيوم والاكريفلافين وتيليوريت البوتاسيوم، تستخدم هذه المواد كعوامل انتخابية في الأوساط الزرعية لعزل وتنمية البكتريا (5) .

تمتاز البكتريا بأنها هوائية ويمكن ان تنمو في نسبة من CO2 تصل إلى 10% فضلا عن قدرتها على حل الاسكولين، تنمو البكتريا على وسط Blood agar وتتميز مستعمراتها بحجمها الصغير جدا، وتوصف بأنها بقدر رأس الدبوس وتكون المستعمرات ملساء شفافة مرتفعة عن الوسط وتحلل الدم تحليلا تاما Beta Hemolysis وخاصة المرضية منها عند نموها على الأوساط المحضرة من دم الاغنام والخيول والإنسان، وبعض عزلاتها غير محلله للدم وخاصة الغير ممرضة، كما تنمو البكتريا على الأوساط الغنية مثل Trypticase Soy Agar و Trypton soy Agar فضلا عن الأوساط الانتخابية المستخدمة في تشخيصها كوسط Oxford Agar وPalcam Agar (6) .

الخصائص المظهرية:

تتصف خلايا بكتريا *Listeria monocytogenes* بأنها:-

1– عصيات قصيرة مدورة الحواف وموجبة لصبغة كرام (شكل A. 1)

2– تظهر بأشكال مختلفة polymorphic تحت المجهر فقد تكون بشكل ازواج أو منفردة على شكل حرف Y وأحيانا تبدو بشكل مكورات عصوية في المسحات المأخوذة من الأوساط الزرعية الصلبة (شكل B.1).

3– غير مكونة للأبواغ

4– درجة الحرارة المثلى لحركتها 25 °م (7)

A

B

شكل 1: الخصائص المظهرية لبكتريا *Listeria monocytogenes*

السموم البكتيرية وأنواعها:

أظهرت الدراسة ان بكتريا *Listeria monocytogenes* تمتلك العديد من التأثيرات الضارة وان العديد من الدراسات تبحث للوصول إلى أفضل النتائج التي تدل على تسببها بالأمراض كما انها تمتلك العديد من السموم (8) وهي:

أ–   سموم اللستريولايسين (LLO) Lesteriolysin toxin O O

تعد سموم البكتريا مهمة فلها دور كبير في مقاومة البكتريا وتكاثرها داخل الخلايا البلعومية، كما انها تقي البكتريا من عملية البلعمة و هي من أهم عوامل المقاومة ضد الاجسام الغريبة من خلال تكوين فتحات في جدار الخلايا البلعمية وبذلك يساعد البكتريا على التخلص من عملية البلعمة ولهذا يطلق على هذا النوع من السموم ب Pore forming Toxin كما ان الفتحات تساعد البكتريا على اختراق خلية بلعمية أخرى مما يساعد في انتقال البكتريا من خلية لأخرى في خلايا المضيف. يعد

LLO البروتين الوحيد الذي يتكون من 529 حامض اميني والذي يتكون خارج الخلية البكتيرية مما تبقى البروتينات الاخرى مرتبطة بالخلية كما انها من السموم المتغيرة بالحرارة لأنها بروتين متعدد الببتيد وزنه الجزيئي 58000 دالتون وهو المسؤول عن فعالية التحلل الدموي التام Beta Hemolysis على وسط اكار الدم لذا يسمى بالـ Hemolysin، وتقاس فعالية LLO بوحدة التحلل الـ Unit للتعبير عن كمية LLO اللازم لتحرير 50% من الهيموكلوبين من كريات الدم الحمر، كما يطلق عليه احيانا بالـ Cytolysin لقدرته على تمزيق اغشية الخلايا حقيقية النواة مثل خلايا اللبائن(9) .

أشارت الدراسات السابقة إلى عدم وجود علامات ضارة للبكتريا في الحيوانات المختبرية المحقونة بسلالات غير محلله للدم في حين أظهرت بحوث أخرى دور الهيمولايسين في تعزيز ضراوة البكتريا في الحيوانات المختبرية من خلال حقنها بسلالات البكتريا المحللة للدم في الفئران الحوامل وبالتالي وصولها إلى المشيمة والجنين وبقية الاعضاء بفترة زمنية اقل بكثير من السلالات غير المحللة للدم، ان انتاج الهيمولايسين في السلالات المرضية والمعزولة من حالات مرضية وخاصة حالات التسمم الدموي يكون اكثر مقارنة لانتاجه من سلالة غير مرضية لذلك فأن السلالات المرضة تمتلك الهيمولايسين عكس السلالات غير المرضة اذ يعد عامل لتشخيص *Listeria monocytogenes* عن باقي أنواع جنس *Listeria* (10).

أشارت الدراسات ايضا ان الفئران المحقونة بالسلالات المنتجة للسموم LLO والمضعفة تعمل على تحفيز الاستجابة المناعية الخلوية T – Cell للفئران تجاه البكتريا ولهذا فهو يصلح ان يكون لقاحا مستقبليا، اما الدراسات الوبائية فقد أشارت إلى ان التعرض للصدمة الحرارية تؤثر على فعالية سموم LLO حيث ان التعرض إلى درجة حرارة 48 °م لمدة ساعة واحدة يؤدي إلى فقدان فعالية التحلل الدموي للسموم كما ان الكولسترول ايضا يقلل من فعالية السموم ويكون معقد من – Cholesterol SH – Cytolysin يمنع وصول سموم LLO إلى غشاء الخلية الهدف لان هذه السموم تعود إلى مجموعة المتحللات الخلوية المعتمدة على الكولسترول Cholesterol Dependent Cytolysins (CDCs) ويعرف انه يرتبط مع الكولسترول الموجود على سطح الخلية ويكون ثقوبا على شكل حلقة في غشاء الخلية وتكبح فعالية التحلل الخلوي CDCs بالمعالجة بكمية قليلة من الكولسترول الحر، وان سموم LLO تتأثر بالرقم الهيدروجيني وان الوسط الحامضي يحفز انتاج وفعالية سموم LLO في الجسم اما الوسط القاعدي يقلل من السلالات التي تقاوم عملية البلعمة (11).

ب– البروتينات السطحية Surface protein

1– بروتين الانترنالين (Int) Internalin protein:

وهو بروتين يساعد البكتريا في اختراق خلايا المضيف كما يقوم بتحفيز الخلايا الغير متخصصة مثل الخلايا الظهارية و الخلايا البطانية (Epithelial and Endothelial cells) لعملية البلعمه وهي على قسمين (3):

● بروتين انترنالين (أ) Internalin A protein

يتكون من 710 حامض اميني الذي يساعد في اختراق البكتريا للخلايا غير المتخصصة للبلعمة حيث يرتبط Int A الموجود على سطح خلايا البكتريا مع البروتين السطحي E–Cadherin على سطح خلايا المضيف ويوجد هذا المستقبل على الخلايا الكبدية والخلايا البطانية للدماغ والخلايا الظهرية للأمعاء فضلا عن زغابيات المشيمة وهذا الارتباط يحفز عملية البلعمة وبعد حصول عملية البلعمة تنتج LLO الذي له القدرة على تحليل جدار الخلية فتخرج البكتريا إلى سايتوبلازم خلايا المضيف (12).

- **بروتين انترنالين (ب) Internalin B protein**

يعتبر هذا البروتين عاملا مهما اذ يخترق جدار الخلايا البكتيرية في الكبد(11).

2– بروتين أكتا – أ– Acta A protein:

يتكون من 610 حامض اميني ويتكون من اجزاء رئيسية وظيفية هي:

- منطقة نهاية N N– Terminal Region
- المنطقه الوسطيه Central proline rich Region
- منطقة نهاية C C–Terminal Region

ان منطقة N الوسطى ضرورية لحركة البكتريا من خلية إلى أخرى في جسم المضيف فضلا عن بلمرة الاكتين حيث يتم تحفيز بلمرة جزيئات الاكتين الكروية (Globular Actin (G– actin) وتحويلها إلى خيوط الاكتين البلمرة فضلا عن ان هذه الخيوط تكون بروزات في الغشاء مكونة تراكيب مشابهة للأقدام الكاذبة ثم تبدأ البكتريا بالتحرك على طول هذه التراكيب وبهذا يكون Acta A المسؤول عن حركة البكتريا (3&11).

3– بروتين: P104

اكتشف هذا البروتين حديثا وله دور مهم في عملية الالتصاق على خلايا المضيف (13).

4– بروتين P60 :

بروتين يوجد في كل أنواع جنس اللستريا لكنه يختلف في تسلسل الاحماض الأمينية من نوع إلى أخر، ويمكن تمييزه بواسطة تقنية ال PCR وطرائق الكشف المناعية، وقد وجد ان الجين الخاص بهذا البروتين له دور في عملية بلعمة البكتريا كما أشارت الدراسات إلى دور P60 في اختراق البكتريا للأمعاء ومقاومتها لمحيط الامعاء، وفي السنوات الأخيرة لوحظ ان P60 يعد المستضد الرئيسي في حماية الجسم ضد بكتريا *Listeria monocytogenes* اي يمكن استخدامه كلقاح مستقبلا (14) .

ج–الانزيمات Enzymes :

هناك نوعان مهمان من الانزيمات للبكتريا:

1– Atpase

2– CL protein (CLP)

حيث تقاوم البكتريا *Listeria monocytogenes* الظروف البيئية من درجة الحرارة و ال PH والضغط الازموزي بمساعدة اللانزيمات التي تنتجها البكتريا وهي Atpase و (CLP) CL protein ولهما دور مهم في نقل الأمراض عن طريق البكتريا ويعد (CLP) CL protein محلل للكازائين ويقسم إلى عدة اقسام:

- CL protein C (CLP C) : يساعد بروتين Act A في انتقال البكتريا من خلية إلى أخرى فضلا عن اته يساعد انزيم ATPase في نقل الأمراض

●(CLP E) CL protein E يساعد الـ ATPase في نقل الأمراض كما يعمل بصورة تعاضدية معه

●(CLP P) CL protein P : وزنه الجزيئي 21.6 كيلو دالتون ويساعد البكتريا في مقاومة الظروف البيئية فضلا عن انه يساعد سموم LLO في التخلص من عملية البلعمة .

اثبتت الدراسات ان حقن الحيوانات المختبرية بأعداد عالية من البكتريا الميتة والحاملة لـ CL protein P (CLP P) أدى إلى تحفيز انتاج سموم LLO وبكمية كبيرة وبالتالي يكون مناعة ضد البكتريا، كما ان غياب CL protein P (CLP P) يقلل من انتاج سموم LLO وهذا يوضح سبب ضعف السلالة الطافرة غير الحاوية على (CL protein P (CLP P داخل الخلايا البلعمية Microphage في الوسط الزرعي لنخاع العظم خارج الجسم in vetro (15) .

د– انزيم الفوسفولاييبز Phospholybase Enzyme :

يتكون من نوعين هما:

1– phosphatidylinositol – specific phospholipase (PI-PLS)

2– Phosphatidylcholin – specific phospholipase (PC-PLS)

يعمل هذان الانزيمان سويا لاختراق البكتريا إلى داخل خلايا المضيف فضلا عن انهما يساعدان البكتريا في انتقال من خلية إلى أخرى، أظهرت الدراسات ان كل نوع له وظيفه بايولوجية حيث ان الانزيم PI-PLS يساعد في التخلص من عملية البلعمة من خلال تحطيم دهون الغشاء وبالتالي عمل فتحات تساعد في التخلص من عملية البلعمة اما الانزيم PC-PLS فأنه يساعد في انتقال البكتريا من خليه إلى أخرى في جسم المضيف (16) .

pathogenesis:

تعد جرثومة *Listeria monocytogenes* النوع الوحيد لجنس .Listeria spp الممرض للإنسان والحيوان، اما بقية الأنواع فهي غير ممرضة . ولقد لخص الباحث Mortin في عام 2004 أمراضية البكتريا بالمراحل التالية:

● التصاق البكتريا على خلايا المضيف

● هروب البكتريا من حويصلات الخلايا المضيف

● تكاثر البكتريا داخل سايتوبلازم خلايا المضيف

● حركة البكتريا داخل سايتوبلازم الخلية واتجاهها نحو سطح الخلية وتكوين تراكيب شبيهة بالأقدام الكاذبة بعدها التهام هذه التراكيب من قبل الخلايا المجاورة وانتقال البكتريا إلى خلية مجاورة أخرى (17) .

وبالرغم من ان نسبة الإصابة بالبكتريا لا تعد عالية إلا ان الخطورة تكمن في ان المرض مميت وخاصة في حالات ضعف المناعة حيث تصل نسبة الوفيات إلى (20– 30%) بسبب ضراوتها التي تتمثل بـIntracellular pathogens اذ تحمي نفسها من الوسائل الدفاعية في الجسم فضلا عن قدرتها على انتاج سموم LLO والذي يساعدها على التخلص من عملية البلعمة، كما تنتج بروتين الالتصاق Listeria Adhesion protein (LAP) فضلا عن انتاج بروتين Internalin الذي يساعدها

في الاختراق والغزو وإنتاج انزيمات الكاتاليز Catalase الميتالوبروتييز Metalloproteases، الفوسفولاييز phospholipaseوبهذا تستطيع البكتريا الالتصاق والاستيطان وغزو الأنسجة.(17).

وتعتبر بكتريا *L. monocytogenes* من البكتريا الخطرة على الصحة العامه لأسباب عديدة منها:

- توجد في امعاء الإنسان والحيوانات الحاملة لها دون ظهور أعراض
- تتكاثر وتنتقل في خلايا المضيف
- الانتشار الواسع للبكتريا في الطبيعة ومقاومتها للظروف البيئية يجعلها من البكتريا الخطرة

تتمكن من النمو بمدى واسع من درجات الحرارة والأس الهيدروجيني وهذا ما يسهل نموها في الغذاء تحت ظروف مختلفة وبهذا وصف الغذاء انه أهم ناقل للبكتريا. وأوضحت بعض الدراسات ان البكتريا الممرضة المعزولة من الغذاء لها علاقة وثيقة بالسلالات المعزولة من العينات السريرية ومن أهم الأمراض التي تسببها البكتريا هي:

1- التهاب الدماغ والسحايا Encephalomeningitis .

تعد البكتريا من الجراثيم المسؤولة عن الإصابة بالتهاب الدماغ وعلى الرغم من ان حالات التهاب الدماغ الناجم عنها من حالات غير الشائعة لكن مع ذلك فأن الاطفال حديثي الولادة والنساء الحوامل والأشخاص الذين تكون مناعتهم ضعيفة معرضين للإصابة، ففي دراسة إحصائية سجل باحثون سابقون عام 1997 انها البكتريا المسؤولة عن حوالي 1850 حالة إصابة سنويا في الولايات المتحدة وان الإصابة بالتهاب الدماغ في الأشخاص البالغين تحدث نتيجة تناول الغذاء الملوث بالبكتريا وعادةً تكون الإصابة فردية، حيث سُجلت حالة إصابة بالتهاب الدماغ في امرأة بعمر اربعين سنة ناجمة عن تناول الجبن الملوث ببكتريا *L monocytogenes* كانت تعاني من ارتفاع درجة الحرارة 39،5 م وتصلب الرقبة بعدها تم عزل البكتريا من سائل النخاع الشوكي، كما سُجلت عدد من الحالات الاخرى للالتهاب بالدماغ في البالغين . اما في حديثي الولادة فتحدث الإصابة نتيجة لتلوث قناة الولادة حيث تنتقل البكتريا من الام إلى الجنين خلال المشيمة وان هناك صورتين للمرض في الاطفال حديثي الولادة وهو الحدوث المبكر Early onest ويحدث في اليوم الاول إلى الخامس من عمر الجنين، اما الحدوث المتأخر Last onest فيحدث بعمر 1-4 اسابيع، وان 24% من الاصابات تحدث في الفترة المبكرة من عمر الجنين (18 &17)

لوحظ ان بكتريا *L monocytogenes* لها القدرة على اختراق حاجز دماغ – الدم (Blood –Brain Barrier) من خلال قدرة البكتريا على اختراق الخلايا الباطنية للأوعية الدموية الدقيقة للدماغ عن طريق بروتين Internalin B كما لها القدرة على الحركة على طول الاعصاب الحسية وهذا ما أكده الباحثون عند تجريع الفئران بالمعلق الجرثومي لـ *L.monocytogenes* حيث لوحظ قدرة البكتريا على الانتقال من الاعصاب المحيطية إلى طول نهايات الاعصاب الحسية للعصب القحفي إلى الجهاز العصبي المركزي وبالتالي حدوث الإصابة بالتهاب الدماغ (19).

اما في المجترات فيتميز المرض بحدوث شلل في العصب القحفي في جهة واحدة Unilateral مما يسبب في مايعرف بمرض الدوار Circuling disease، طريقة انتقال المسبب لألتهاب السحايا الناجم عن بكتريا *L. monocytogenes* في الحيوانات هو مشابه لما يحدث في الإنسان اي ان الغذاء هو المسؤول عن حدوث التهاب السحايا، وأشار الباحثون باعتماد التنميط

الرابع Ribotypes. ان السلالة المسؤولة عن التهاب الدماغ في الماعز نوع (dd0566) هي نفس السلالة المعزولة من العلف الملوث بالبكتريا الذي تناولته الحيوانات (8) .

2– الإجهاض   Abortion

تسبب بكتريا *L. monocytogenes* حالات إجهاض أو ولادات ميتة Still birth أو ولادة اجنة غير ناضجة في الإنسان والمجترات منها الاغنام والابقار حيث تتميز البكتريا بان لها القدرة على اختراق حاجز المشيمة الدموي Blood placenta barrier من خلال اختراق الخلايا البطانية للأوعية الدموية لحاجز المشيمة وبعدها تصل إلى زغابيات المشيمة Placenta villi ومنها إلى المجرى الدموي للجنين ومن المعروف ان السائل المحيط بالجنين يقتل أو يوقف نمو الجراثيم إلا ان الباحثين وجد وان هذا السائل لا يستطيع التأثير على جرثومة *L. monocytogenes* وبهذا تصل البكتريا للجنين، كما أشاروا ان البكتريا *L. monocytogenes* تخترق المشيمة في الحيوانات الحوامل وتخترق الجنين خلال 24 ساعة من وصولها للدم وتسبب تقرحات وتنخر في المشيمة ثم حدوث إجهاض بعد 5 – 10 أيام من الإصابة (20).

Food borne Listeriosis–3

بسبب انتشار البكتريا في المحيط كالتربة والخضروات فمن السهل دخول البكتريا للإنسان وتكاثرها بسرعة في الغذاء، عزلت البكتريا من الغذاء حيث سجلت أول حالة اصابه في كندا باللستريوسز نجمت عن تناول اللهانة المزروعة في حقول مسمده بسماد حاو على فضلات الاغنام المصابه بالبكتريا *L. monocytogenes*، كما سجل أول اندلاع لمرض اللستريوسز الناجم عن الغذاء في عام 1981 في اسكتلندا بسبب تناول سلطة اللهانة الملوث بالبكتريا وكان عدد الأشخاص المصابين 41 كان منهم 34 غير بالغين و7 بالغين، كما اشاروا ايضا ان هناك أغذية منها الخضروات الطازجة والحليب والاجبان واللحوم خاصة لحوم الدواجن وهذا ما أظهرته دراسات في كوريا اذ تمكن من عزل البكتريا من الأغذية المجمدة ولحوم الابقار ولحوم الدواجن والحليب الطازج والآيس كريم بالنسب الأتية 9,8%، 3%، 26%، 2%، 8%، على التوالي كما اشار إلى ان حالات اللستريوسز التي حدثت في المكسيك كان سببها تناول الحليب من ابقار مصابه ببكتريا *L. monocytogenes* وفي عام 1983 سجلت اصابه في كل من شمال امريكا وأوربا ناجمة عن تناول الحليب، كما سجلت حالات فرديه اللستريوسز ناجمة عن تناول السمك الملوث بالبكتريا، وفي عام 1992 ان 4% من حالات اللستريوسز في ايطاليا، تطورت إلى حالة تسمم الدم في اربعة أشخاص مصابين حيث عزلت البكتريا من الدم وكان سبب تناول السلطة الملوثة وعصير الفاكهة الطبيعي الملوث (20&21).

لاحظ الباحث Bushan (23) ان الشخص المصاب يعاني من أعراض مشابهه لأعراض الأنفلونزا والتي تتمثل بحرارة وتصلب العضلات مع صداع وفقدان توازن وتشنج وفي بعض الاحيان فأن الإصابة باللستريوسز تسبب أعراضا مشابهه لأعراض التسمم الغذائي منها إسهال وارتفاع درجات الحرارة وغثيان إلا ان هذه الحالة غير شائعة وقد يعزى ذلك إلى فترة حضانة البكتريا التي تصل من (1–90) يومياً ولهذا من الصعب تحديد الإصابة. ان الأغذية المبردة تحتل نسبه عالية بين الأغذية المسببة لحالات اللستريوسز وذلك لمقاومة البكتريا لدرجة حرارة التبريد، بعد تناول الغذاء الملوث تبدأ خطوه حدوث الأمراض المنقولة عن طريقها وهي الالتصاق البكتريا بنسيج الخلايا الظهارية من خلال المستقبلات Receptor الموجود على جدار خليه البكتريا هو عبارة عن سكر Alpha –D–galactose وهذا السكر غير موجود في السلالات الغير ممرضه، وبعد عملية الالتصاق سوف تلتهم البكتريا

من قبل البلاعم الكبيرة Macrophages وعن طريق اللمف تصل إلى العقد اللمفاوية وعند فشل البلاعم في قتل البكتريا سوف تصل إلى الدم وتتكاثر وتنتشر إلى باقي اعضاء الجسم، منها الكبد والطحال والمشيمة والجهاز العصبي المركزي(24&25)

وأكدت العديد من الدراسات ان اللستريوسز الناجم عن الغذاء يحدث بشكل فردي Sporadic أو بشكل وباء Epidemic وان السلالة 4b هي المسؤولة عن الحالات الفردية وكذلك الحالات الوبائية للإصابة في الإنسان والحيوان، حيث تم التسجيل ان النمط 4b هو المسؤول عن حالات الإصابة الوبائية باللستريوسز الناجمة عن تناول الجبن الملوث في كاليفورنيا سنة 1987 كما ان النمط نفسه كان السبب لحالات الإصابة باللستريوسز في فرنسا عام 1986 وكما سجلت 1500 حالة سنويا في الولايات المتحدة منها 250 – 500 حالة موت بسبب تناول أغذية مختلفة ملوثه، وكذلك ان الجبن الملوث مسؤول عن العديد من الحالات الفردية الوبائية للبكتريا، وان لحوم الدواجن تسبب أغلب حالات اللستريوسز (26&27)

تواجد البكتريا في الأغذية :

تعد اللحوم وسط جيد لنمو الكثير من البكتريا الناقلة للأمراض التي تنمو خلال عملية الحفظ ومنها البكتريا L.monocytogenes ومن اجل ذلك اتجهت العديد من الدراسات إلى البحث عن مواد حافظه للسيطرة على البكتريا أو الحد من نموها في اللحوم ومنها لحوم الدواجن، وبعض هذه المواد المعروفة منذ القدم مثل الملح أو مواد حديثه تستخدم لوحدها أو تخلط مع مواد أخرى لتعطي التأثير الفعال ضد البكتريا، كما استخدمت العديد من المنظفات والمعقمات لتنظيف ادوات جزر اللحوم في المجازر مثل المركبات الايودين والكلورين ومركبات الامونيوم الرباعية Bille et al.(2006) بالرغم من مقاومة البكتريا للملح فقد استخدم الملح ليؤثر على الضغط الازموزي وذلك من خلال التقليل من فعالية الماء ووجد ان البكتريا تقاوم عند تغطيس اللحوم في المحلول الملحي بتركيز 6،16- 26 % وبدرجة حرارة 10 م لمدة 6 ساعات (28).

وأشارت الدراسات إلى ان مادة فوسفات ثلاثي الصوديوم (TSP) Trisodium phosphate تستخدم لإزالة التلوث من ذبائح الدواجن الملوثة ب L.monocytogenes كما وجد ان فوسفات ثلاثي الصوديوم يقلل من نسبة التلوث بالبكتريا Log 2-1 إلا انه وجد ان البكتريا تبدأ بالنمو في اليوم السابع من الخزن بالتبريد، وان تغطيس اللحوم ب 10% من TSP لمدة 15 ثانيه تزيل 18 – 39 % من بكتريا L.monocytogenes عند درجة الحرارة 4-10 م هـ وقد استنتج ان استخدام الحوامض العضويه يعطي تأثيرا مثبطا للبكتريا في الأوساط الزرعية واعزى ذلك إلى ان الوسط الحامضي يثبط من فعاليتها وان تأثير الحوامض العضوية تختلف في ما بينها حيث وجد ان أعلى تأثير مثبط للبكتريا هو حامض الخليك Acetic Acid بتركيز 3% ثم يليه حامض اللاكتيك Lactic acid وكذلك حامض الهايدروكلوريك HCL بنفس التركيز كما لوحظ ان وجود الملح يسهل ويعزز من تأثير الاحماض العضوية ويثبط من نمو البكتريا في منتجات اللحوم كالصوصج (29).

ان رش لحوم الابقار ب2% من حامض الخليك كاو حامض اللاكتيك يقلل من نمو البكتريا L. monocytogenes ب Log 2-3 خليه بكتيرية / غرام في تلك اللحوم في حين ان غمر لحوم الدواجن ب 1% من حامض اللاكتيك وحامض الخليك لمدة دقيقتين يؤدي إلى تقليل Log 1-2 خليه بكتيرية / غرام من بكتريا L monocytogenes اما الجراثيم المقاومة سوف تبدأ بالنمو في مرحلة الخزن بالتبريد، بينما تغطيس لحوم الدواجن ب 5% من حامض اللاكتيك وحامض الخليك لا يقتل

البكتريا فقط وإنما يمنع نموها خلال 90 يوما خزن، كما ان استخدام الصوديوم 4،8% من لاكتات الصوديوم Sodium lactate و 0،25% من صوديوم ثنائي الاستيت Sodium Diacetate يثبط نمو البكتريا في لحوم الدواجن، كما وجد ان تأثير لاكتات الصوديوم والصوديوم ثنائي الاستيت يكون اقل على السطوح ولهذا يستخدم بتراكيز أعلى حيث ان استخدام 6% من لاكتيت الصوديوم و 3% من الصوديوم ثنائي الاستيت لمدة 5 ثواني يثبط من نمو البكتريا على السطوح (27)

حساسية بكتريا *L. Monocytogenes* للمضادات الحيوية:

تشير الدراسات ان أغلب عزلات بكتريا *L.monocytogenes* والمعزولة من الحالات السريرية وحالات اللستريوسز الناجم عن الغذاء فضلا عن العزلات المعزولة من المحيط تكون حساسة للمضادات الحيوية الفعالة ضد الجراثيم الموجبة لصبغة كرام، لغاية عام 1980 لم تكن هناك مشكلة طبية في مقاومة أنواع بكتريا اللستريا منها *L.monocytogenes* ولكن بسبب الاستخدام الواسع للمضادات الحيوية في المجال الطبي والبيطري فضلا عن إضافة بعض المضادات الحيوية كإضافات علفية أدى إلى ظهور حالات مقاومة للمضادات الحيوية .

سجلت أول عزلة سريرية لـ *L. monocytogenes* لها مقاومة متعددة للمضادات الحيوية في عام 1988 في فرنسا حيث عزلت من شخص مريض عمره 84 عاما يعاني من حالة التهاب الدماغ، وكانت العزلة مقاومه للمضادات الحيوية كلورامفينيكول، تتراسايكلين، اريثرومايسين والستربتومايسين، ثم سجلت عزلات من *L.monocytogenes* المعزولة من الغذاء والمحيط ومن حالات اللستريوسز الناجم عن الغذاء وكانت هذه العزلات مقاومه لواحدة أو اكثر من المضادات الحيوية (30) .

بصورة عامه تعد عزلات أنواع اللستريا منها *L monocytogenes* حساسة لعدد كبير من المضادات الحيوية ماعدا مضادات ال الفوسفومايسين و سيفالوسبورين وان الاختيار الاول للعلاج هو الامبيسيلين أو البنسلين مع مضادات حيوية أخرى من مجموعة Aminglycosides وخاصة الجنتامايسين، اما الاختيار الثاني للعلاج فيتمثل بإعطاء ترايمثبرين مع مركبات سلفوناميد Sulfonamide مثل Sulfa Methoxazole وخاصة في الأشخاص الذين يعانون من الحساسية للمضادات البنسلين . (30&31)

مصادر تلوث الأغذية Food Contamination sources

تتلوث الأغذية بالبكتريا *L. monocytogenes* عن طريق مصادر عديدة تتمثل بالتربة،الماء، الهواء، النباتات، الفضلات، الإنسان والحيوانات فضلا عن القوارض وأدوات المعاملة كما في الشكل 2 (32) :
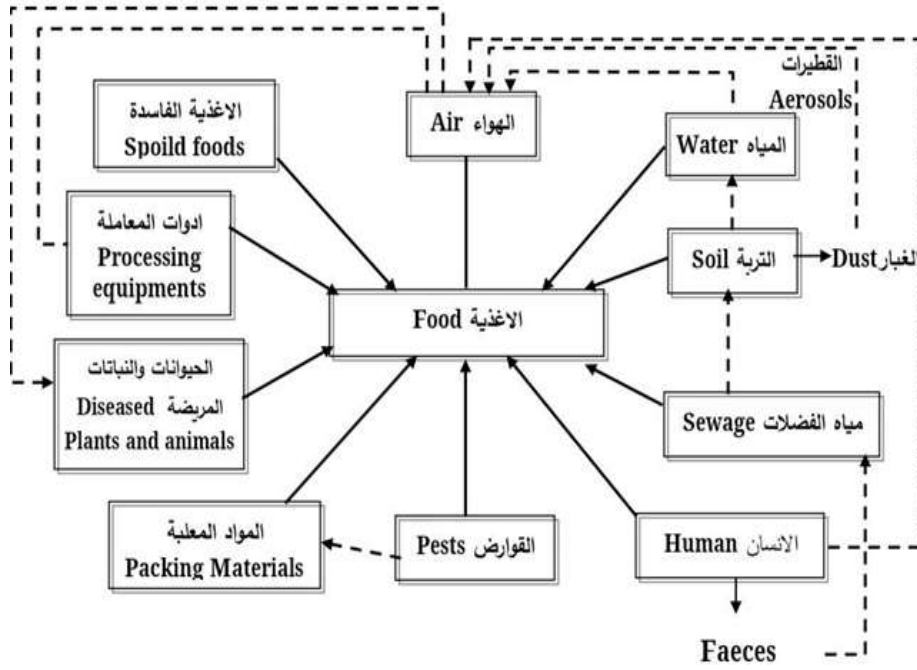
شكل 2: مصادر تلوث الأغذية

أكدت الدراسات السابقة انه تم عزل جرثومة من مجازر الدواجن وحقول الابقار والأغنام والماعز حيث عزلت البكتريا من التربة وبراز الحيوانات وأعلافها، وتشير أغلب الدراسات إلى ان مصدر تلوث اللحوم الدواجن يأتي في اثناء عملية جزر اللحوم ومعاملتها، حيث ان أعلى نسبة تلوث اللحوم الدواجن تحدث في اثناء معاملة اللحوم من خلال اجهزة الجزر ومنها السكاكين ومنضدة الثرم وخاصة الخشبية التي تشكل أعلى نسبة تلوث لاحتوائها على الكثير من الخدوش والحفر التي تحتمي بها الكثير من الملوثات فضل عن ايدي العمال وماء الغسل، ولوحظ ان نسبة التلوث في اللحوم الغير مطبوخة تزداد مع زيادة تلوث المجازر بمخلفات الذبائح من دم وشعر وأحشاء الحيوانات(33) .

وتعد الطيور والحشرات والقوارض واحده من أهم النواقل المهمة التي تنقل البكتريا إلى اللحوم،كما تعتبر الأشخاص ذات التماس مباشر مع اللحوم كالأطباء البيطريين وعمال المجازر والقصابين مصدرا من مصادر التلوث اللحوم بالأحياء المجهرية المرضية وبالتالي حصول حالات الإصابة الناجمة عن تناول الغذاء الملوث(33).

وبالرغم من ان طرائق الإصابة بالبكتريا عديدة إلا ان الغذاء الملوث يعد واحدا من أهم طرق الإصابة، حيث اشار الباحثون 1989 ان اكثر الأغذية المسببة لحالات الإصابة باللستريوسز هي منتجات اللحوم والحليب بالإضافة إلى الخضروات واعزى ذلك إلى احتواء هذه الأغذية على نسبة مرتفعة من الحديد الذي يعد عامل مساعد لنمو البكتريا وهذا ما أكده الباحثون عندما وجد ان الفئران المغذاة على عليقه فيها املاح الحديد تؤدي إلى ان البكتريا تنمو بسرعة اكبر في كبد وطحال الفئران المعاملة بالحديد مقارنه بالفئران الغير معامله وفي دراسة الباحثين في سنة 1989 قاموا بعزل البكتريا من 9 عينات لحم من مجموع 21 عينه تضمنت لحوم الاغنام ولحوم الدواجن فضلا عن الهمبركر والصوصج، واستنتجوا بأن الأغذية الغير مطبوخة أو المعاد تدفئتها تسجل نسبة اصابه مرتفعة، وسجل الباحثون عام 1990 حالات اصابه باللستريوسز ناجمة عن تناول البيض واللحوم ومنها لحوم الدواجن كما سجل الباحثون عام 1990 حالات اصابه ناجمة عن تناول لحوم الصوصج الطازجة (34).

ان اكثر المجاميع عرضه للإصابة باللستريوسز هم الأشخاص ضعيفي المناعة حيث اشار الباحثون انهم يشكلون 70 % من الأشخاص المصابين باللستريوسز كمرضى الايدز AIDS ومدمني على الكحول ومرضى الجهاز القلبي الوعائي وكبار السن وأطفال الحديثي الولادة فضلا عن النساء الحوامل الذين يشكلون نسبه 27 % من حالات الإصابة وان 22% من هذه الحالات تؤدي إلى إجهاض أو ولادة اجنه ميتة، اما الامهات فأنهن يقاومن الإصابة (35).

الاستنتاج:

ان *Listeria monocytogenes* هي بكتريا موجبة لصبغة كرام متحركة وغير مكونة للابواغ تعيش في مدى واسع من البيئة وذلك لمقاومتها الظروف البيئية القاسية مثل الملوحة والبرودة والحرارة والجفاف وتعيش في مدى واسع من الاس الهيدروجيني كما انها تقاوم عملية البسترة. تعيش البكتريا في ظروف هوائية إضافة لإمكانيتها للنمو في وجود نسبة 10% من CO2، وتنمو مستعمراتها بشكل مفضل على وسط Blood agar المحتوي على دم الإنسان حيث تكون مستعمراتها صغيرة ملساء شفافة ومرتفعة عن الوسط وهي تسبب تحللا للدم من نوع Beta Hemolysis . تنتج البكتريا العديد من السموم التي لها اهمية في مقاومة البكتريا وتكاثرها كم تعتبر هذه السموم سببا للأمراض التي تحدثها البكتريا للإنسان والحيوان مثل التهاب اغشية الدماغ، والإجهاض، التهاب شغاف القلب، التهاب ملتحمة العين والتهاب العين الداخلية فضلاً عن حالات التسمم الدموي وكذلك الدوار والتهاب الضرع في المجترات، فضلاً عن أعراض عصبية وحالات اسهال. وقد تنتشر عواملها الممرضة بدون ظهور أعراض عن طريق نواقل للمرض مثل الغذاء أو براز الحيوانات التي تبدو سليمة وذلك عند استهلاك الاعلاف والأغذية الملوثة. ولكون البكتريا مقاومة للبرودة والملوحة فانها تسبب تلف للحوم التي يتم حفظها بالتبريد والتجميد والتمليح لذ فهي تعتبرمن المسببات الرئيسة لارتفاع حالات الإصابة بمرض اللستريوسز .

References:

1.E. G. D. MurrayR. A. Webb،M. B. R. Swann، A disease of rabbits characterised by a large mononuclear leucocytosis، caused by a hitherto undescribed bacillus Bacterium monocytogenes (n.sp.) First published: 1926. The Journal of Pathology and Bacteriology . Volume 29، Issue 4 p. 407–439

https://doi.org/10.1002/path.1700290409

: Citations: 429

2. José Pierre dedicated the texts of his Le Ça *ira* (1967) to Benjamin Péret. The French text bears this title in English، apparently borrowed from a film in several sequences made by Hans Richter according to suggestions by a number of artists: Man Ray، Marcel Duchamp، and Max Ernst. For details on this movie، completed during the mid-forties، see Ado Kyrou، *Le Surréalisme aucinéma* (1953) (rev. ed. 1963)، pp. 198–200.

3. Dhama، K.، Karthik، K.، Tiwari، R.، Shabbir، M. Z.، Barbuddhe، S.، Malik، S. V. S.، & Singh، R. K. (2015). Listeriosis in animals، its public health significance (food-borne zoonosis) and advances in diagnosis and control: a comprehensive review. *Veterinary Quarterly*، *35*(4)، 211–235.

4. Clark، R. G.، Gill، J. M.، & Swanney، S. (2004). Listeria monocytogenesgastroenteritis in sheep. *New Zealand veterinary journal*، *52*(1)، 46–47.

5. CZUPRYNSKI C.J.، KATHARIOU S. & POULSEN K. (2010). Chapter 10: Listeria. In: Pathogenesis of Caterial Infections in Animals، Fourth Edition، Gyles C.L.، Prescott J.F.، Songer J.G.، & Thoen C.O.، eds. Blackwell Publishing، US

6. Walland، J.، Lauper، J.، Frey، J.، Imhof، R.، Stephan، R.، Seuberlich، T.، & Oevermann، A. (2015). Listeria monocytogenes infection in ruminants: is there a link to the environment، food and human health? A review. *Schweizer Archiv für Tierheilkunde*، *157*(6)، 319–328.

7. Roberts، A. J.، & Wiedmann، M. (2003). Pathogen، host and environmental factors contributing to the pathogenesis of listeriosis. *Cellular and Molecular Life Sciences CMLS*، *60*(5)، 904–918

8. WHITMAN K.J.، BONO J.L.، CLAWSON M.L.، LOY J.D.، BOSILEVAC J.M.، ARTHUR T.M. & ONDRAK J.D. (2020). Genomicbased identification of environmental and clinical Listeria monocytogenes strains associated with an abortion outbreak in beef heifers. BMC Vet. Res.، 16، 70.

9. Buchanan، R. L.، Gorris، L. G.، Hayman، M. M.، Jackson، T. C.، & Whiting، R. C. (2017). A review of Listeria monocytogenes: An update on outbreaks، virulence، dose-response، ecology، and risk assessments. *Food control*، *75*، 1–13.

10. Charlier, C., Perrodeau, É., Leclercq, A., Cazenave, B., Pilmis, B., Henry, B., ... & Beaune, B. (2017). Clinical features and prognostic factors of listeriosis: the MONALISA national prospective cohort study. *The Lancet Infectious Diseases*, 17(5), 510–519.

11. Jadhav, S., Bhave, M., & Palombo, E. A. (2012). Methods used for the detection and subtyping of Listeria monocytogenes. *Journal of microbiological methods*, 88(3), 327–341

12. Campero, C. M., Odeón, A. C., Cipolla, A. L., Moore, D. P., Poso, M. A., & Odriozola, E. (2002). Demonstration of Listeria monocytogenes by immunohistochemistry in formalin fixed brain tissues from natural cases of ovine and bovine encephalitis. *Journal of Veterinary Medicine, Series B*, 49(8), 379–383.

13. Orsi, R. H., & Wiedmann, M. (2016). Characteristics and distribution of Listeria spp., including Listeria species newly described since 2009. *Applied Microbiology and Biotechnology*, 100(12), 5273–5287

14. Thouvenot, P., Vales, G., Bracq-Dieye, H., Tessaud-Rita, N., Maury, M. M., Moura, A., ... & Leclercq, A. (2018). MALDI-TOF mass spectrometry-based identification of Listeria species in surveillance: a prospective study. *Journal of microbiological methods*, 144, 29–32

15. Aguilar-Bultet, L., Nicholson, P., Rychener, L., Dreyer, M., Gözel, B., Origgi, F. C., & Falquet, L. (2018). Genetic separation of Listeria monocytogenes causing central nervous system infections in animals. *Frontiers in cellular and infection microbiology*, 8, 20.

16. GRAVES L.M., SWAMINATHAN B. & HUNTER S.B. (2007). Subtyping Listeria monocytogenes. In: Listeria, Listeriosis, and Food Safety, Third Edition, Ryser E.T. & Marth E.H., eds. CRC Press, Taylor & Francis Group, Boca Raton, Florida, USA, 283–304.

17. Moura, A., Criscuolo, A., Pouseele, H., Maury, M. M., Leclercq, A., Tarr, C., & Brisse, S. (2016). Whole genome-based population biology and epidemiological surveillance of Listeria monocytogenes. *Nature microbiology*, 2(2), 1–10.

18. Chen, Y., Luo, Y., Carleton, H., Timme, R., Melka, D., Muruvanda, T., ... & Brown, E. W. (2017). Whole genome and core genome multilocus sequence typing and single nucleotide polymorphism analyses of Listeria monocytogenes isolates associated with an outbreak linked to cheese, United States, 2013. *Applied and Environmental Microbiology*, 83(15), e00633–17

19. Ruppitsch, W., Pietzka, A., Prior, K., Bletz, S., Fernandez, H. L., Allerberger, F., ... & Mellmann, A. (2015). Defining and evaluating a core genome multilocus sequence typing scheme for whole-genome sequence-based typing of Listeria monocytogenes. *Journal of clinical microbiology*, 53(9), 2869–2876

20. Lee، S. H. I.، Barancelli، G. V.، de Camargo، T. M.، Corassin، C. H.، Rosim، R. E.، da Cruz، A. G.، ... & de Oliveira، C. A. F. (2017). Biofilm-producing ability of Listeria monocytogenes isolates from Brazilian cheese processing plants. *Food Research International*، *91*، 88-91

21. Uhitil، S.، Jakšić، S.، Petrak، T.، Medić، H.، & Gumhalter-Karolyi، L. (2004). Prevalence of Listeria monocytogenes and the other Listeria spp. in cakes in Croatia. *Food Control*، *15*(3)، 213-216.

22. Jeffers، G. T.، Bruce، J. L.، McDonough، P. L.، Scarlett، J.، Boor، K. J.، & Wiedmann، M. (2001). Comparative genetic characterization of Listeria monocytogenes isolates from human and animal listeriosis cases. *Microbiology*، *147*(5)، 1095-1104

23. [14th AG Busan 2002"](). OCA. Archived from [the original]() on 2011-12-08. Retrieved 2010-11-20

24. Okwumabua O.، O'connor M.، Shull E.، Strelow K.، Hamacher M.، Kurzynski T.، WAarshauer D. Characterization of *Listeria monocytogenes* isolates from food animal clinical cases: PFGE pattern similarity to strains from human listeriosis cases. FEMS Microbiol Letters. 2005;249:275-281.

25، Ragon، M.، Wirth، T.، Hollandt، F.، Lavenir، R.، Lecuit، M.، Le Monnier، A.، & Brisse، S. (2008). A new perspective on Listeria monocytogenes evolution. *PLoS Pathogens*، *4*(9)، e1000146

26. Kathariou، S. (2002). Listeria monocytogenes virulence and pathogenicity، a food safety perspective. *Journal of food protection*، *65*(11)، 1811-1829

27. Barancelli، G. V.، Silva-Cruz، J. V.، Porto، E.، & Oliveira، C. A. F. (2011). Listeria monocytogenes: occurrence in dairy products and its implications in public health. *Arquivos do Instituto Biológico*، *78*(1)، 155-168.

28. Swaminathan B.. Listeria monocytogenes. In: Doyle، M.P.; Beuchat، L.R.; Montville، T.J. Food microbiology، fundamentals and frontiers (2nd ed). Washington، DC: ASM، 2001:383-409

29.Ryser، E. T.، & Marth، E. H. (2007). The genus Listeria and Listeria monocytogenes: phylogenetic position، taxonomy، and identification. In *Listeria، listeriosis، and food safety* (pp. 19-38). CRC Press

30. Sauders، B. D.، Overdevest، J.، Fortes، E.، Windham، K.، Schukken، Y.، Lembo، A.، & Wiedmann، M. (2012). Diversity of Listeria species in urban and natural environments. *Applied and environmental microbiology*، *78*(12)، 4420-4433.

31. Painter J.، Slutiker L.. Listeriosis in humans. In: Ryser، E.T.; Marth، E.H. Listeria، listeriosis and food safety. 3rd ed. Boca Raton، FL: CRC Press. 2007: 85–109.

32. Jarvis، N. A.، O'Bryan، C. A.، Ricke، S. C.، Johnson، M. G.، & Crandall، P. G. (2016). A review of minimal and defined media for growth of Listeria monocytogenes. *Food Control*، *66*، 256–269.

33 Juneja، V. K.، & Eblen، B. S. (1999). Predictive thermal inactivation model for Listeria monocytogenes with temperature، pH، NaCl، and sodium pyrophosphate as controlling factors. *Journal of Food Protection*، *62*(9)، 986–993.

34. Kazmierczak، M. J.، Mithoe، S. C.، Boor، K. J.، & Wiedmann، M. (2003). Listeria monocytogenes σB regulates stress response and virulence functions. *Journal of bacteriology*، *185*(19)، 5722–5734.

35. Kendall H، Kuznesof S، Seal C، Dobson S and Brennan M، 2013. Domestic food safety and the older consumer: a segmentation analysis. Food Quality and Preference، 28، 396–406. https://doi.org/10.1016/j.foodqual.2012.11. 006

INFLAMMATORY MARKERS AND SOME BIOCHEMICAL PARAMETERS IN FEMALE RATS TREATED WITH QUERCETIN

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Abstract:

The objective of this study was to determine whether quercetin, a polyphenol, could protect rats from nitrite's harmful effects.

Methodologies: During the course of this investigation, twenty-one albino female rats have been used. The animals were placed in one of the three groups, which each had a total of seven rats. The groups were selected at random. Group, I received water throughout the duration of the experiment and was regarded as the healthy control group. The animals in Group II were given a solution containing 50 milligrams of sodium nitrite per kilogram of body weight via a gavage needle For the whole period of the study while those in Group III were given a solution containing both 50 milligrams of sodium nitrite per kilogram of body weight and 100 milligrams of quercetin per kilogram of rat weight. Blood samples were analyzed inflammatory markers including interleukin-1, interleukin-6, and tumor necrosis factor-alpha, as well as biochemical markers including liver enzymes , urea, and serum creatinine.

Key words: Querceti, Sodium Nitrite, Leukocytic Pyrogen, Proinflammatory Il-6, And Tnf-A Cytokines.

Introduction:

Sodium nitrite is an inorganic salt that has numerous uses in the Food industry including as a colour fixative, a preservative antibacterial agent, an enhancer of flavour, and prolongs the storage life of the animal and marine Products (1,2). A rise in the rate of Lipid oxidation and an increase in the permeability of the mitochondria are both caused by exposure to nitrite, leading to the activation of pro-apoptotic factors, particularly CASP which in turn leads to the release of pro-apoptotic factors and the activation of caspase-3 (3). Nitrite exposure produces oxidative stress because the production of oxygen radicals and other reactive species (ROS) has been boosted. In rats, exposure to sodium nitrite has been shown to increase the expression of inflammatory markers proteins NF- α, IL-6, and IL-1 whic are examples of such proteins. Since sodium nitrite is extremely reactive with hemoglobin, it promotes the process by which iron ions in oxyhemoglobin are converted to methemoglobin (5).

Quercetin is a flavonol, which is a group within the flavonoid family. The flavonol category contains the most prevalent flavonoid, quercetin (3, 3', 4', 5, 7-pentoxyhydroxyflavone). Quercetin is found in broccoli, onions, shallots, tomatoes, berries red grapes, cherries, and blueberries, as well as in numerous seeds, nuts, flowers, tea, and olive oil (6). Recent research has shown that quercetin effectively reduces drug-induced toxicity and oxidative stress (7) and possesses therapeutic potential against various illnesses, including those related to the cardiovascular system, renal injury, and liver disorders (8). What makes quercetin beneficial is that it can neutralize free radicals and reduce inflammation (9). It's possible that quercetin can reduce inflammation by mopping up free radicals, which induce transcription factors to create cytokines that promote inflammation (10). It has anti-inflammatory actions on animal and human cells such as by stopping macrophages from making TNF-a in response to lipopolysaccharide and by controlling the release of NO, IL-6, and TNF-a (11,12,13). Inflammation-causing enzymes cyclooxygenase (COX) and lipoxygenase (LOX) are inhibited by quercetin (13).

This investigation's goal was to gain a better understanding of how the naturally occurring antioxidant quercetin might affect inflammatory markers and some changes in biochemical parameters that happen when female albino rats are exposed to high levels of sodium nitrite.

MATERIALS AND METHODS

Chemicals:

The powdered form of 5,7,3′,4′-flavon-3-ol were sourced from Sigma-Aldrich (United States) and sodium nitrite ($NaNO_2$) was supplied by BDH Laboratory reagent chemicals Ltd. of Poole, England.

Experimental design:

The Veterinary College of the University of Mosul provided 21 white Albino rats weighing 190-200 gr An enclosed space served as animal housing in a temperature-lighting and humidity-controlled environment. The animals (7 total) were split into three groups and given the following regimens for 30 days:

1. Group I: During the course of the experiment rats in Group I received only water to consume; this group served as the "healthy control."

2. Group II: The animals in Group II were given drinking water containing sodium nitrite orally through a gavage needle at a dose of 50 mg.kg^{-1} body weight throughout the entirety of the experiment. This group was considered an infected group

3. Group III: The animals in this group were given drinking water containing sodium nitrite orally at a level of 50 mg.kg^{-1} and quercetin at 100 mg.kg^{-1} of rat weight throughout the entire trial. This group was considered an infected group treated by Quercetin.

Collection of blood:

Animals' blood was taken in zero time before treatment and after 30 days of treatment Blood was drawn from the orbital sinus (intraorbitally) and placed in plain tubes before being centrifuged at 4000 X g for 15 min to purge the clot. The serum was then used within 2 days to estimate levels of biochemical paramerters.

Analytical biochemical techniques:

1-Estimation of IL-6, IL-1, and TNF-a levels:

A kit for enzyme-linked immunosorbent assay (ELISA) (IBL International GmbH, Germany) was used to measure the levels of IL-6, IL-1, and TNF-a in rat serum.

2-Estimating the activity of serum aminotransferase:

Reitman and Frankel's techniques were used to test ALT and AST in serum. [14].

3- Estimation of serum urea and creatinine:

Using an enzyme-based method, the concentration of urea in the serum (15) was determined. The colorimetric method (16) was used to determine creatinine concentrations with commercially available kits.

Analysis of statistics

The results were analyzed statistically by used (t-test) comparing two variables and find the difference between the values that appeared through the P-value (which occurs at $P \leq 0.05$), a significant difference.

Results and discussion

The serum concentrations of IL-1, IL-6, and TNF- α were significantly higher in Group II sodium nitrite-treated animals than in Group I healthy controls (figure 1,2,3). These results align with (17), In 2013, study of sheriff et al.found that administering sodium nitrite orally increased oxidative stress, leading to a twofold and fourfold increase, respectively, TNF- α and IL-1β. Similarly, A study in 2017 by Al-Rasheed et al. found that hypoxia caused by sodium nitrite exposure is linked to the release of cytokines, which are systemic inflammatory markers. They also found that hypoxia caused kidney failure in rats, which was shown by the increase in the release of TNF-a and IL-6 (18). In addition, Sun et al., 2006, discovered that exposure to sodium nitrite led to an increase in both IL-6 and TNF-a concentrations in human gastric cells (19). This increase is because sodium nitrite causes an uptick in oxidative stress and activation of proinflammatory cytokines. Pro-inflammatory cytokines, such as TNF- α, can be upregulated by numerous stimuli via oxygen radical stress and NF-kB activating stimulation (4).
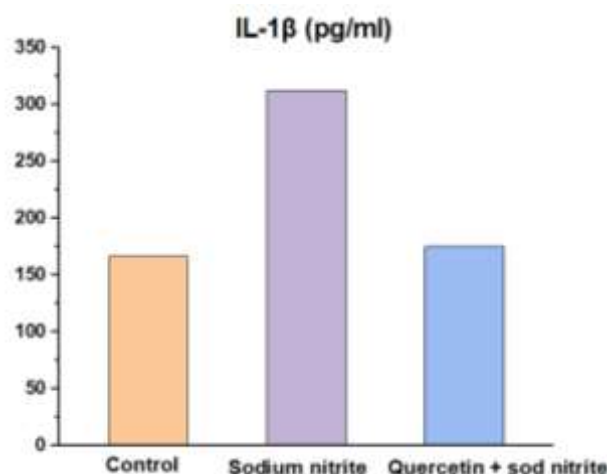
Figure1: How NaNO₂ and quercetin affect Serum IL-1 in female Albino rats

IL-6 (pg/ml)
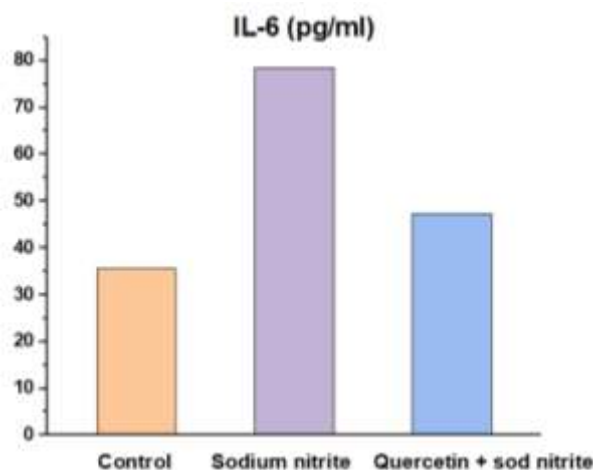
Figure2: NaNO$_2$ and quercetin's impact on Albino female IL-6

TNF-α (pg/ml)
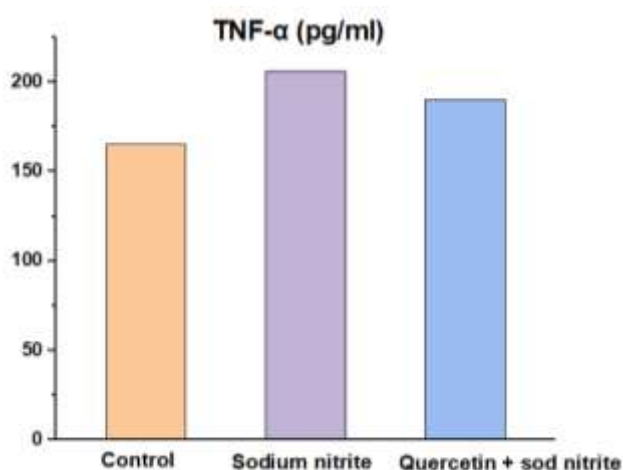
Figure 3: NaNO$_2$ and quercetin's effects on Serum inflammatory markers (TNF-a) in females Albino rats

Quercetin pretreatment prevented the toxic influences caused by NaNO$_2$ and the concentration of the compound eventually returned to normal. All abnormal pro-inflammatory cytokines were brought back to normal by quercetin treatment.

The use of quercetin in therapeutic levels of 100 mg.kg^{-1}/day had a considerable effect on lowering IL-1, IL-6, and TNF-α concentrations in the blood. These findings are consistent with those found in (17,20). which provide further evidence that quercetin may reduce the toxin-causing actions of sodium nitrite via inhibiting IL-6 and TNF production.

Quercetin is an antioxidant that works by neutralizing oxygen-containing reactive species, blocking lipid oxidative degradation, and reducing the activity of xanthine oxidase (21). It promotes vasodilation by increasing endothelial nitric oxide and relaxing smooth muscle. quercetin had been tried out as treatment for Ischemia

and myocarditis in clinical trials (22). The inhibition of the enzymes lipoxygenase and cyclooxygenase is the mechanism through which quercetin exerts its anti-inflammatory actions (23). Through regulation of NF-κB and IκB, quercetin suppresses gene expression and the generation of TNF-in human mononuclear cells isolated from peripheral blood (20, 24). In stimulated macrophages, quercetin also affects nitric oxide metabolism, implying that it may have an impact on protecting cells from necrosis and apoptosis (25). Researchers have found that quercetin inhibits the mitochondria-dependent caspase pathway and apoptosis, preventing ischemia-reperfusion injury in rats (25).

Effect of sodium nitrite and quercetin on liver function:

Figure 4,5 demonstrates that the serum ALT and AST activities were considerably higher following sodium nitrite treatment (p 0.05), which is in accordance with a previous investigation (2, 26). The ALT and AST activities were lower in the group I control group than they were in the group II sodium nitrite group.
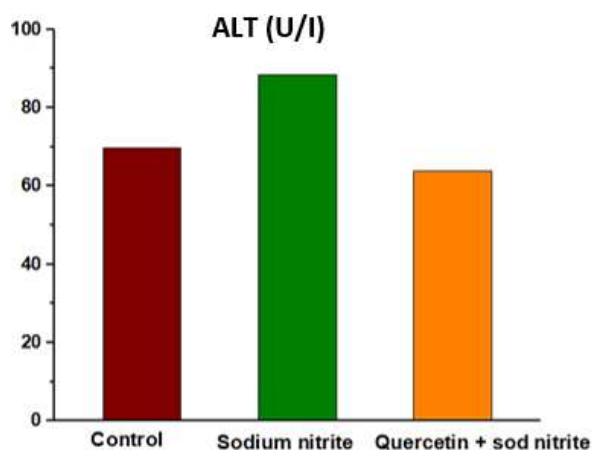
Figure 4: Effects of sodium nitrite and quercetin on serum ALT in females albino rats
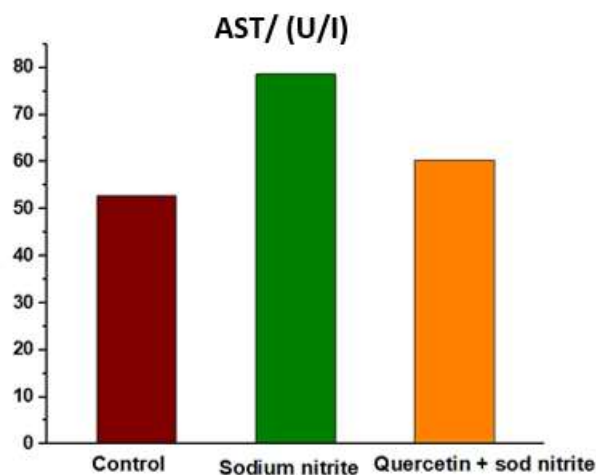
Figure 5: Effects of sodium nitrite and quercetin on serum AST enzymes in females albino rats

quercetin on serum AST enzymes in females albino rats An increase in liver enzymes (ALT, AST, and ALP) suggests liver dysfunction, which may be related to hepatic tissue damage or cell permeability changes. Since sodium nitrite causes necrosis and damage in the liver's membranes, the liver's enzymes ALT and AST are released into the bloodstream. and their activity increase in serum of rats treated with sodium nitrite

. These enzymes are kept inside cells and don't get into the bloodstream until the cells die (27),Furthermore, high enzyme activity is linked to elevated oxidative stress due to the production of more oxidant compounds as a result of sodium nitrite exposure, which in turn can harm cells and tissues in the liver and heart (2,28). Experiments demonstrate that sodium nitrite promotes reactive species containing oxygen and nitric oxide (NO), the NO molecule potentially reacting with the anion radical, forming the highly reactive ONOO-ion, which have numerous toxic effects, such as hepatotoxicity, nephrotoxicity, dysregulation of inflammatory responses, and tissue injury (28). Rats given sodium nitrite may have had hepatic necrosis due to the harmful effect of nitroso-compounds generated in the stomach's acidic environment (29).

Significantly lower ALT and AST activities were observed in the group III quercetin-treated group compared to the group II sodium nitrite-treated group. This

result is consist with (30), which demonstrated that quercetin repaired the damage caused by sodium nitrite.

This reduction in leakage of the intracellular enzyme after quercetin treatment may be attributable to membrane-stabilizing activities. This was consistent with the widely held belief that liver cells regenerate, liver parenchyma recovers, and serum aminase levels return to normal levels after treatment (31). Quercetin has antioxidant properties by eliminating radicals and blocking the oxidation of different molecules. It does this by interfering with the formation of free radicals at three distinct points: during initiation (via interaction with superoxide anions), hydroxyl radical formation (via chelation of iron ions), and lipoperoxidation (via reaction with peroxide radicals of lipids) (32). The "sweeping" action of quercetin on free radicals results in a diminished oxidative and cytotoxic effect. Thus, quercetin was effective in reducing their levels to normal.

Sodium nitrite and quercetin's effect on renal function:

Figure 6 and 7 demonstrates that sodium nitrite administration caused a statistically meaningful increase in the levels of creatinine and urea in group II experimental animals compared to controls. and this result is consistent with the previous research indicating that nitrite impairs kidney function, (33).
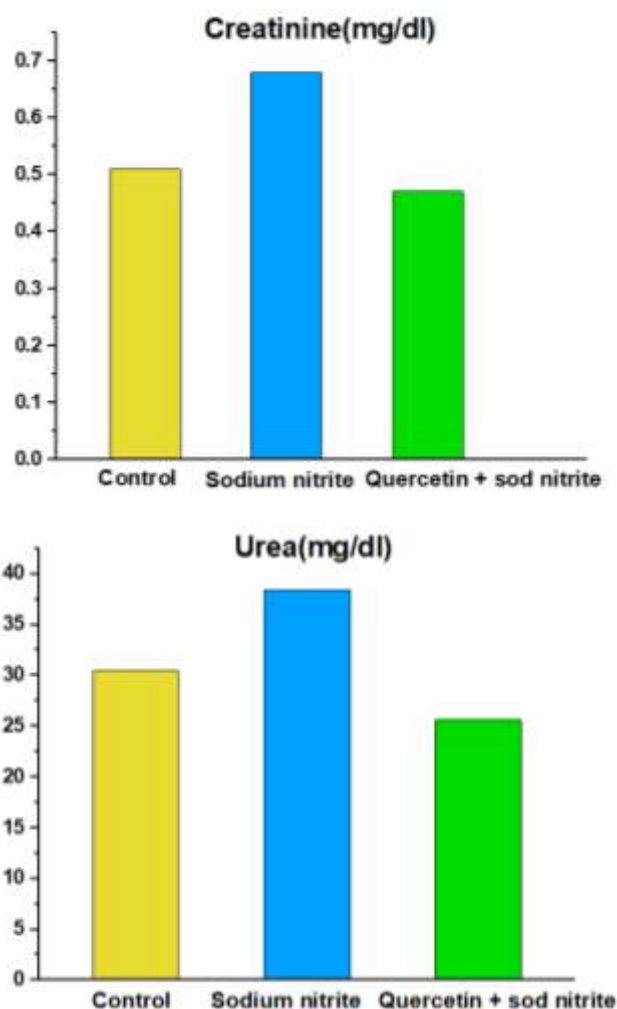
Figure 6: sodium nitrite and Quercetin's impact on creatinine in female albino rats

According to Kohn et al. (2002), Sodium nitrite treatment reduces the glomerular filtration rate and increases blood flow to the kidneys (34). When nitrites in food react with amines and amides, nitrosamines and nitroamides are produced, which are the toxic byproducts that are responsible for NaNO2's toxic effects (35). The Products, nitrosamines and nitroamides, cause severe kidney damage (36). In addition, nitric oxide (NO) formation, which leads to kidney dysfunctions may be responsible for sodium nitrite's effects on kidney function(37,38), The flavonoids' ability to make things better shows that they can get rid of free radicals, act as antioxidants, and reduce inflammation. This may be Explain why these kidney function markers were already high as a result of NaNO2 toxicity (39).

Similar to the previous studies (40,41) quercetin treatment at doses of 100 mg/kg/day significantly decreased serum urea and creatinine in group III NaNO2- and quercetin-treated rats compared to group II NaNO2-treated test animals. This decrease can be Due to the existence of phenolic hydroxyl groups within quercetin, as well as the compound's potent antioxidant properties, which include a very

powerful capacity for scavenging free radicals and acting as a metal chelator (41). It prevents renal cell injury including tubular necrosis, an irreversible form of cell damage, by mopping up harmful oxygen radicals and nitrogen oxides and increasing endothelial nitric oxide (42, 44). In a 2018 Alidadi et al., found that Quercetin inhibited cellular inflammation by reducing the infiltration of mononuclear leukocytes and reducing the swelling of endothelium lining the glomerular tufts (45). By changing the lipid packing order and decreasing membrane fluidity, quercetin may be able to alter peroxidation kinetics, which would then severely limit the diffusion of free radicals and the rate at which they can undergo peroxidative reactions (46)

Results:

Numerous inflammation biomarkers, including interleukins (IL-1), (IL-6), and (TNF- α and liver enzymatic activities AST, ALT, urea, and serum creatinine, were increased in the sodium nitrite group compared to the control group; however, quercetin markedly reduced these effects by inhibiting IL-1, IL-6, and TNF- α levels. In addition, levels of urea and creatinine dropped, as did those of AST and ALT, all of which are liver enzymes.

Conclusion:

The results of this study show that quercetin protectsrats against the harmful effects of nitrite by lowering levels of inflammatory markers, liver marker enzymes including alanine aminotransferase (ALT and AST) and kidney function tests including urea and creatinine.

REFERENCES:

1. Al-Gayyar MM, Youssef AA, Sherif IO, Shams ME, Abbas A.(2014) Protective effects of arjunolic acid against cardiac toxicity induced by oral sodium nitrite: effects on cytokine balance and apoptosis. Life Sci.;111(1-2):18–26.

2. Salama M, Abbas A, Darweish M, El-Hawwary A, AlGayyar M. (2013) Hepatoprotective effects of cod liver oil against sodium nitrite toxicity in rats. Pharmaceutical Biol (51: 1435-43

3. Abdul-Ameer, H. A. and Abed, A.J. (2012). The prophylactic role of garlic oil against deleterious effects of sodium nitrite (NaNo2) in Male Mice. Al-Anbar J. Vet. Sci. 5 (1):7-14.

4. Sherif, I. O.; Al-Gayya, M. M. H. (2013). Antioxidant, anti-inflammatory and hepatoprotective effects of silymarin on hepatic dysfunction induced by sodium nitrite. European Cytokine Network. 24 (3)114-21.

5- Rahman, M.,S. J. Kim, G. B. Kim, C. U. Hong, Y. U. Lee, S. Z. Kim, J. S. Kim and H. S. Kang, (2009) Nitrite induced methemoglobinaemia affects blood ionized and total magnesium level by hydrolysis of plasma adenosine triphosphate in rat, Basic Clin. Pharmacol. Toxicol. 105 294–30

6-D'Andrea G (2015) Quercetin: a flavonol with multifaceted therapeutic applications? Fitoterapia 106:256–271

7-- Kandaswamy, S., Senthamilselvan, B., Sekaran, S., Firdous, A., Gunasekaran, K., Jagadeesan, A. (2013) Effect of Quercetin on Haematobiochemical and Histological Changes in the Liver of Polychlorined Biphenyls-Induced Adult Male Wistar Rats. J. of Biomar., 1-12.

8 - Gupta,A. Birhman, K. Raheja, I. Sharma ,S.K,. Kar, H.K (2016) Quercetin: a wonder bioflavonoid with therapeutic potential in disease management, Asian Pac. J. Trop. Dis. 248–252

9-Hamza, R.Z.; Hillal, E.A.; Abdulkader, S.O. (2019) The Antioxidant Activity of Quercetin and its Effect on Acrylamide Hepato-toxicity in Liver of Rats. Lat. Am. J. Pharm. 38, 2057–2062

10-S.Y. Cho, S.J. Park, M.J. Kwon, T.S. Jeong, S.H. Bok, W.Y. Choi. (2003) Quercetin suppresses proinflammatory cytokines production through MAP kinases and NF-kappaB pathway in lipopolysaccharide-stimulated macrophage Mol Cell Biochem, 243 (pp. 153-160

11- Martinez-flores SG, Sanchez-camps S, Gonzalez-gallego. (2005)Quercetin prevents nitric oxide production and nuclear factor kappa B activation in interlekin 1-β activated rat hepatocytes. J Nutr.;135:1359–65

12- Liu J, Li X, Yue Y, Li J, He T, He Y. (2005)The inhibitory effect of quercetin on IL-6 production by LPS-stimulated neutrophils. Cell Mol Immunol;2:455–460

13-V. García-Mediavilla, I. Crespo, P.S. Collado, A. Esteller, S. Sánchez-ampos, M.J. Tuñón (2007)The anti-inflammatory flavones quercetin and kaempferol cause inhibition of inducible nitric oxide synthase, cyclooxygenase-2 and reactive C-protein, and down-regulation of the nuclear factor kappaB pathway in Chang Liver cells. Eur J Pharmacol, 557 , pp. 221-229

14-Reitman S and Frankel A. (1957) Colorimetric method for determination of serum glutamate oxaloaectate and glutamic pyruvate transaminase. Amer J Clin Pathol; 28: 56-58.

15-Tietz,NM.Textbook of clinical chemistry.,(1999),3P rdPED.Burtis CA.,Ashwood ,WB.,SaundersWB

16- Mazeikiene ,A., Kaminskas,A.(2012).Biochemistry laboratory manua arvyol as Kaminskas, Asta, Mazeikiene, Vilnius University, pp.28,1,11 , 34, 30, 32.

17-Alshanwani R. , Shaheen,S, Faddah, L., Alhusaini, A., Ali,H(2020) Manipulation of Quercetin and Melatonin in the Down-Regulation of HIF-1, HSP-70 and VEGF Pathways in Rat's Kidneys Induced by Hypoxic Stress , An International Journal July-September 2020:1-8

18-Al-Rasheed , N. M. (2017) Pulmonary prophylactic impact of melatonin and/or quercetin: A novel therapy for inflammatory hypoxic stress in rats, Acta Pharm. 67 125–135.

19-Sun J, Aoki K, Wang W, Guo A, Misumi J. (2006) Sodium nitrite-induced cytotoxicity in cultured human gastric epithelial cells. Toxicol In Vitro; 20: 1133-8

20- Nair MP, Mahajan S, Reynolds JL, Aalinkeel R, Nair H, Schwartz SA, Kandaswami C. (2006) The flavonoid quercetin inhibits proinflammatory cytokine (tumor necrosis factor alpha) gene expression in normal peripheral blood mononuclear cells via modulation of the NF-kappa beta system. Clin Vaccine Immunol ; 13(3):319-328

21- M. Milenkovic, R. N. Arsenovic, V. Z. Stojic, B. Bufan, D. Vucicevic and I. Jancic, (2010) Quercetin ameliorates experimental autoimmune myocarditis in rat, J. Pharm. Pharm. Sci. 13 311–319

22- Roslan, J., Giribabu, N., Karim, K. and Salleh, N. (2017): Quercetin ameliorates oxidative stress, inflammation and apoptosis in the heart of streptozotocin-nicotinamideinduced adult male diabetic rats. Biomed Pharmacother., 86: 570-582.

23. Kim H, Mani I, Iversen L, Ziboh V. (1998) Effects of naturally-occurring flavonoids and biflavonoids on epidermal cyclooxygenase and lipoxygenase from guinea-pigs. Prostaglandins Leukot Essent Fatty Acids; 58: 17-24.

24. Cho SY, Park SJ, Kwon MJ, Jeong TS, Bok SH, Choi WY, Jeong WI, Ryu SY, Do SH, Lee CS, Song JC, Jeong KS. (2003) Quercetin suppresses proinflammatory cytokines production through MAP kinases and NF-kappaB pathway in lipopolysaccharide-stimulated macrophage. Mol Cell Biochem; 243(1-2):153-160.

25- Arash K. Protective effect of quercetin against necrosis and apoptosis induced by experimental ischemia and reperfusion in rat liver. Afr J Pharm Pharmacol 4(1): 22-26

26- Abdul-Ameer, H. A. and Abed, A.J. (2012). The prophylactic role of garlic oil against deleterious effects of sodium nitrite (NaNo2) in Male Mice. Al-Anbar J. Vet. Sci. 5 (1):7-14

27- Bansal, A. K.; Bansal, M.; Soni, G. and Bhatnagar, D. (2005). Protective role of Vitamin E pre-treatment on N-nitrosodiethylamine induced oxidative stress in rat liver. Chem Biol Interact.156(2-3):101-11.

28- Ansari, F. A. & Mahmood, R. (2016) Sodium nitrite enhances generation of reactive oxygen species that decrease antioxidant power and inhibit plasma membrane redox system of human erythrocytes. Cell Biol. Int. 40, 887–894.

29-Sherif IO, and Al-Gayyar MMH. (2013) Antioxidant, antiinflammatory and hepatoprotective effects of silymarin on hepatic dysfunction induced by sodium nitrite. Eur. Cytokine Netw.; 24(3): 114-121

30- El-Shafey MM, Abd-Allah GM, Mohamadin AM, Harisa GI, Mariee AD. (2015) Quercetin protects against acetaminophen-induced hepatorenal toxicity by reducing reactive oxygen and nitrogen species. Pathophysiol; 22: 49–55

31. Alrawaiq N.S., Abdullah A. A Review of Flavonoid Quercetin: Metabolism, Bioactivity and Antioxidant Properties. *Int. J. PharmTech Res.* 2014;6:933–941.

32- Afanas'ev IB, Dorozhko AI, Brodskii AV, Kostyuk VA, Potapovitch AI. (1989) Chelating and free radical scavenging mechanisms of inhibitory action of rutin and quercetin in lipid peroxidation. Biochem Pharmacol; 38: 1763-9

33- Hassan HA, El-Agmy SM, Gaur RL, Fernando A, Raj MHG, and Ouhtit A. (2009) In vivo evidence of hepato- and reno-protective effect of garlic oil against sodium nitriteinduced oxidative stress. Inter J Biol Sci; 5(3):249- 255

34-Kohn MC, Melnick RL, Ye F, Portier CJ. (2002) Pharmacokinetics of sodium nitrite-induced methemoglobinemia in the rat. Drug Metab Dispos.;30(6):676-683

35- El-Sheikh, N.M. Khali, F.A. (2011). L-Arginine and Lglutamine as immunonutrients and modulating agents for oxidative stress and toxicity induced by sodium nitrite in rats. Food and Chemic.Toxico. J. 49: 758–762

36-Choi SY, Chung MJ, Sung NJ. (2002) Volatile N-nitrosamine inhibition after intake of Korean green tea and Maesil extracts with an amine-rich diet in subjects ingesting nitrate. Food Chem Toxicol.;40(7):949–57

37-Ahmed, H.H., Mannaa, F. (2000). Protective effect of vitamins C and E against the toxic action of drinking sodium nitrate-contaminated water in adult male rats. Egypt. Germ. Soci. Zool. J. 32(A): 165-185.

38-Ismail, A.M., Mostafa, A.M. Abd El-Rahman, G.B. (2003). Microscopic studies of the effects of some food additives on the kidney of albino rat. The Egypt. J. Hospit. Med. 12: 12-27

39-Abdel-Raheem, I. T., Abdel-Ghany, A. A., and Mohamed, G. A. (2009). Protective effect of quercetin against gentamicin-induced nephrotoxicity in rats. Biological & Pharmaceutical Bulletin, 32(1), 61–67

40-Murakami, Y., Kawata, A., Ito, S., Katayama, T., & Fujisawa, S. (2015). Radical-scavenging and Antiinflammatory Activity of Quercetin and Related Compounds and Their Combinations Against RAW264.7 Cells Stimulated with Porphyromonas gingivalis Fimbriae. Relationships between Antiinflammatory Activity and Quantum Chemical Parameters. In Vivo, 29(6), 701–71032-

41-Afanas'ev IB, Dorozhko AI, Brodskii AV, Kostyuk VA, (1989) Potapovitch AI. Chelating and free radical scavenging mechanisms of inhibitory action of rutin and quercetin in lipid peroxidation. Biochem Pharmacol; 38: 1763-9

42- Liu CM, Sun YZ, Sun JM, Ma JQ, Cheng C. (2012) Protective role of quercetin against lead-induced inflammatory response in rat kidney through the ROS-mediated MAPKs and NF-kB pathway. Biochim Biophys Acta.;1820(10):1693-1703.

43- Anjaneyulu M, Chopra K. (2004) Quercetin, an anti-oxidant bioflavonoid, attenuates diabetic nephropathy in rats. *Clin Exp Pharmacol Physiol.* ;31:244–48

44-Allam A, Elsadek BE, Abd Alaziz MA, El Deeb TS. (2015) Ameliorative potential of quercetin and berberine on experimentally induced nephrotoxicity in rats. Al Azhar Assiut Med J; 134

45-Alidadi H, Khorsandi L, Shirani M. (2018) Effects of Quercetin on Tubular Cell Apoptosis and Kidney Damage in Rats Induced by Titanium Dioxide Nanoparticles. Malays J Med Sci; 25: 72-81

46-Abdelhalim MAK, Qaid HA, Al Mohy Y, Al Ayed MS. (2018) Effects of quercetin and arginine on the nephrotoxicity and lipid peroxidation induced by gold nanoparticles in vivo. Int J Nanomedicine; 13: 7765-7770

THE CONTRACTION PROPERTY AND THE EQUIVALENC OF (LIPSCHITZ AND ARCWISE COMPLETENESS)

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Abstract:

Researchers investigate the completeness and shrinkage properties in metric spaces in this paper as well as demonstrate that the shrinking characteristic entails Lipschitz- wholeness or arswise- wholeness in metric spaces. The contraction feature, on the other hand, does not entail completion in metric spaces. We demonstrate that a locally Lipschitz-linked metric area has the shrinkage characteristic if it is Lipschitz- whole and an arswise-linked metric area is arswise- entire if X has the intense shrinkage characteristic.

The method applied by Borwein to generate a shrinkage map is crucial for showing Lipschitz-completeness of the space.

Key words: The Contraction Property, Lipschitz and Arcwise Completeness.

Introduction:

Several researchers have examined the topological description and equivalence of the shrinkage characteristic; for example, Kirk (see [7]) fixed point theory of The Caristi is only valid in a whole metric system, as proven, and Sullivan presented that the Ekeland standard is reasonable. Naturally, this begs the question of whether or not a full metric space with the shrinkage characteristic exists. Providing the intriguing conclusion that an equally Lipschitz-linked (like convex subset of a normed area) has the shrinkage characteristic if the subgroup is whole, a normed area is whole if all shrinkage on the area has a fixed point.

In the following examples illustrate show that it is impossible to hope to expand this result much farther.

Example 1.1.[1][1]

A non-uniformly Lipschitz-linked group of the Euclidean space appears when the shrinkage characteristic is present.

Let

$$C = \{(x,y)/0 < x \le 1, y = \sin(1/x)\}.$$

Example 1.2.[1][1]

The Euclidean plane has an imperfect star shaped subset with the contraction property.

Let

$$C = \cup \{L_k/k \in N\},$$

Where

$$L_k = \mathrm{conv}\{(o,0), (1, 2^{-k})\}.$$

2- SOME CONTRACTION PROPERTIES PRELIMINARIES

Many more general definitions of the equivalence of completeness are given below.

Assumption 2.1. [5].

Let $g_1, g_2 \colon [0,1] \to C g_1, g_2 \colon [0,1] \to C$ be Lipschitz arcs using $g_1(1) = g_2(0)$. $g_1(1) = g_2(0)$. then

$$g(t) = \begin{cases} g_1(2t), & 0 \le t \le \dfrac{1}{2}, \\[2mm] g_2(2t-1), & \dfrac{1}{2} \le t \le 1, \end{cases}$$

Is as well a Lipschitz arcs.

Proof: Let s,t $\in [0,1].\in [0,1].$ For s,t $\in \left[0,\frac{1}{2}\right]\in \left[0,\frac{1}{2}\right]$ There is a constant that persists $L_1 > 0 L_1 > 0$ such that

$$d\big(g(s),g(t)\big) = d\big(g_1(2s),g_1(2t)\big) \le L_1|s-t|,$$

and for s,t $\in \left[\frac{1}{2},1\right],\in \left[\frac{1}{2},1\right],$ There is a constant that persists $L_2 > 0 L_2 > 0$ such that

$$d\big(g(s),g(t)\big) = d\big(g_2(2s),g_2(2t)\big) \le L_2|s-t|.$$

For s $\in \left[0,\frac{1}{2}\right]\in \left[0,\frac{1}{2}\right]$ and $t \in \left[\frac{1}{2},1\right]$, we have $t \in \left[\frac{1}{2},1\right]$, we have

$$d(g(s),g(t) \le d\left(g(s),g\left(\tfrac{1}{2}\right)\right) + d(g\left(\tfrac{1}{2}\right),g(t)) \le L_1\left|s-\tfrac{1}{2}\right| + L_2\left|\tfrac{1}{2}-t\right|$$

$$\le L_1\left(\tfrac{1}{2}-s\right) + L_2\left(t-\tfrac{1}{2}\right) \le L_1(t-s) + L_2(t-s)$$

$$\le L_1\left(\tfrac{1}{2}-s\right) + L_2\left(t-\tfrac{1}{2}\right) \le L_1(t-s) + L_2(t-s)$$

$$= (L_1+L_2)|t-s|.$$

$(L_1+L_2)|t-s|.$

This reveals gg is a Lipschitz arc . ■■

Assumption 2.2.[7].

Let C $= \cup\{L_\alpha : \alpha \in I\}, \cup\{L_\alpha : \alpha \in I\},$ where $\{L_\alpha : \alpha \in I\}\{L_\alpha : \alpha \in I\}$ is a family of Lipschitz-linked subset of a metrical area.

For random $L_\beta, L_\gamma \in \{L_\alpha : \alpha \in I\}, L_\beta, L_\gamma \in \{L_\alpha : \alpha \in I\},$ there exist $L_\beta = L_0, L_1, \dots, L_k, L_{k+1} = L_\gamma, L_\beta = L_0, L_1, \dots, L_k, L_{k+1} = L_\gamma$ such that $L_i \cap L_{i+1} \ne \emptyset$ $L_i \cap L_{i+1} \ne \emptyset$ for i=0, 1,…, k.

At that time C is Lipschitz-linked

Proof: **Assume** $x_0 \in L_\beta, x_1 \in L_\gamma x_0 \in L_\beta, x_1 \in L_\gamma$, for $x_0, x_1 \in C. x_0, x_1 \in C.$ There exist $L_\beta = L_0, L_1, \ldots, L_k, L_{k+1} = L_\gamma L_\beta = L_0, L_1, \ldots, L_k, L_{k+1} = L_\gamma$ such that $L_i \cap L_{i+1} \neq \emptyset.$ $L_i \cap L_{i+1} \neq \emptyset.$

By **Assumption** (2.1) $L_0, L_1 L_0, L_1$ are Lipschitz-linked and $\bigcup_{i=0}^{k+1} L_i$ is $\bigcup_{i=0}^{k+1} L_i$ is also Lipschitz-linked and there is Lipschitz arc $x_0, x_1 \in C x_0, x_1 \in C$ then C Lipschitz-linked ■■

Remark 2.1.

Lipschitz-connected subsets are shown in Cases 1.1 and 1.2, and A Lipschitz-linked subset is also shown in the given example.

Case 2.1

Assume C be a subgroup of a normed area characterized by

$$C = \left\{ (t, 0) : t \in [0,1] \cup \left(\bigcup_{k=0}^{\infty} \left\{ (2^{-k}, t); t \in [0,1] \right\} \right) \right\}$$

$$\left\{ (t, 0) : t \in [0,1] \cup \left(\bigcup_{k=0}^{\infty} \left\{ (2^{-k}, t); t \in [0,1] \right\} \right) \right\}.$$

By **Assumption** 2.2   C is Lipschitz-linked.

Explanation 2.1 [4][4]

Assume X be a metrical area,

$g :(0,1] \to C] \to C$ is named a semi-closed arc if for individually $\varepsilon > 0 \varepsilon > 0$ there occurs some $\delta > 0 \delta > 0$ like that $d(g(s), g(t)) < \varepsilon$ for all $0 \leq s < t$ $d(g(s), g(t)) < \varepsilon$ for all $0 \leq s < t$.

A semi-closed arc g is named Lipschitz semi-closed arc if g contents the Lipschitz situation.

Explanation 2.2. [4][4]

Assume X be a metrical area

(1)   X is said to be arcwise-compete if for each semi-closed arc $g:(0,1] \to X, \lim_{s \to 0} g(s)$ exists in X;] $\to X, \lim_{s \to 0} g(s)$ exists in X;

(2)   X   is said to be Lipschitz- whole if for each Lipschitz semi-closed arc

$$g:(0,1] \to X, \lim_{s \to 0} g(s) \text{ exists in } X.] \to X, \lim_{s \to 0} g(s) \text{ exists in } X.$$

Remark 2.2.

Even in an arcwise linked area, arcwise completeness, like Lipschitz-wholeness, is weaker than normal completeness. Lipschitz-wholeness is clearly weaker than Arcwise wholeness, as the definitions show.

Property 2.1 [6]

Assume X be a metrical area.

X is arcwise-participate if $\cap F_n \neq \emptyset \cap F_n \neq \emptyset$ at any time $\{F_n : n \in N\}\{F_n : n \in N\}$ is a arrangement of arcwise linked and closed non-empty subgroup of X with $F_{n+1} \subset F_n F_{n+1} \subset F_n$ and $\sup (F_n) = 0 F_n) = 0$

Proof: Assume X be an arcwise-participate area.

$\{F_n : n \in N\}\{F_n : n \in N\}$ Is a series of arcwise linked and non-space locked subsets of X with $F_{n+1} \subset F_n F_{n+1} \subset F_n$ and $\sup (F_n) = 0 F_n) = 0$.

For each $F_n F_n$ choose $x_n \in F_n x_n \in F_n$. Define g is follows:

$$g(s) = g_n(2^{n+1}s - 1), \forall \frac{1}{2^{n+1}} < s < \frac{1}{2^n}, n = 1,2,\dots$$

Where $g_n : [0,1] \to F_n g_n : [0,1] \to F_n$ such that $g_n(0) = x_{n+1}, g_n(1) = x_n$. $g_n(0) = x_{n+1}, g_n(1) = x_n$ since $\sup (F_n) = 0, F_n) = 0,$

g is semi-closed in X and $\lim_{s \to 0} g(s) = \bar{x} \in X$ (by arcwise − competeness of X). $\lim_{s \to 0} g(s) = \bar{x} \in X$ (by arcwise − competeness of X).

$g(s) \in F_n \in F_n$ for totally $s \in \left(0, \frac{1}{2^n}\right], \bar{x} \in F_n$ (since F_n is closed) $\in \left(0, \frac{1}{2^n}\right], \bar{x} \in F_n$ (since F_n is closed) this implies that $\cap F_n \neq \emptyset \cap F_n \neq \emptyset$ ■■

3- THE LIPSCHITZ-COMPLETENESS PROPERTY AND THE CONTRACTION PROPERTY

[1] [1]Borwein pointed out that the shrinkage characteristic captures in some insufficient metric area with some cases. We can now see that while the shrinkage things cannot guarantee ordinary wholeness, it can guarantee Lipschitz-wholeness.

Assumption 3.1.[3]

Assume that X is a metrical area. X is Lipschitz-complete if it has the shrinkage things.

Proof: Assume $\bar{X}\bar{X}$ be the conclusion of X and $g[[0,1] \to X] \to X$ be a Lipschitz semi-locked arc. Then

$$d\big(g(s),g(t)\big) \le L|s - t|, \qquad \forall 0 < s, t \le 1.$$

Set $\lim_{s \to 0} g(s) = \bar{x} \in \bar{X}$ and let $h:X \to [0,1]$ be given by

$\lim_{s \to 0} g(s) = \bar{x} \in \bar{X}$ and let $h:X \to [0,1]$ be given by

$$H(x) = \frac{d(x,\bar{x})}{2L(1+d(x,\bar{x}))} \frac{d(x,\bar{x})}{2L(1+d(x,\bar{x}))}.$$

Define $g(0)$ $=$ $\bar{x} \in \bar{X}$ and $X' = X \cup \{\bar{x}\}$, and let $T:X' \to X'$ by $T = gOh$.

$\bar{x} \in \bar{X}$ and $X' = X \cup \{\bar{x}\}$, and let $T:X' \to X'$ by $T = gOh$.

To prove T is a metrical shrinkage (with shrinkage constant $\frac{11}{22}$)

$$d(Tx,Ty) = d\big(g\big(\frac{d(x,\bar{x})}{2L(1+d(x,\bar{x}))}\big), g\big(\frac{d(y,\bar{x})}{2L(1+d(y,\bar{x}))}\big)\big)$$

$$\le L\left|\frac{d(x,\bar{x})}{2L(1 + d(x,\bar{x}))} - \frac{d(y,\bar{x})}{2L(1 + d(y,\bar{x}))}\right|$$

$$\le \frac{1}{2}|d(x,\bar{x}) - d(y,\bar{x})|$$

$$\le \frac{1}{2}d(x,y).$$

Note that

$$\bar{x} = g(0) = g\big(h(\bar{x})\big) = T(\bar{x}).$$

$\bar{x}\bar{x}$ is the exclusive fixed point of T in $\acute{X}\acute{X}$. Assume that T: $X \to X \to X$ and t is also metrical contraction on X,

We have the exclusive fixed point $\bar{x}\ \bar{x}$ of T is in X

∎

Under weaker completeness, the following theorem can be thought of as a simplification of the Banach shrinkage standard.

Assumption 3.2 [3][3] If a locally Lipschitz-linked metric space is Lipschitz-complete, it has the shrinkage things.

Assumption 3.3 [7][7] If a star shaped subgroup of a normed space is Lipschitz- whole, it has the shrinkage things.

Lipschitz-complete.

Remark 3.1 The subsections in Examples 1.1 and 1.2 have the shrinking characteristic according to theorems 3.1 and 3.2, because they are Lipschitz-complete.

4- COMPLETENESS AND CONTRACTION PROPERTY ARE EQUIVALENTS.

The uniformity link between wholeness and the shrinking characteristic in the sense of the uniformity metric is discussed in this section.

Assumption 4.1 [8][8] Let T function on a metric area $(X, \rho)\rho)$. There happens thrived metric $\sigma\sigma$ consistently equal to $\rho\rho$ on X such that T is a Banach shrinkage under $\sigma\sigma$ if and only if T is equally constant and diam($T^nX) \to 0.T^nX) \to 0$.

Assumption 4.2 [2][2]

Assume (X,d) be a metric area.

If X has the strong shrinking characteristic, then X is arcwise- whole.

Proof:

Assume $\overline{XX}$ be the conclusion of X, g (o, $1] \to X] \to X$ be a semi-closed arc and $\bar{x} = \lim_{s \to 0} g(s).\ \bar{x} = \lim_{s \to 0} g(s).$ Set g (0) = $\bar{x}$ and $X' = X \cup \{\bar{x}\}$. $\bar{x}$ and $X' = X \cup \{\bar{x}\}$. Then g constantly covers to a mapping on $[0,1][0,1]$.

Notice that g(s) $\to \bar{x}$ as $s \to 0 \to \bar{x}$ as $s \to 0$. For each number sequence $\{\epsilon_k\}_{k=1}^{\infty}$ $\{\epsilon_k\}_{k=1}^{\infty}$ with $1 = \epsilon_0 > \epsilon_1 > \epsilon_2 > 1 = \epsilon_0 > \epsilon_1 > \epsilon_2 > \ldots$ and $\epsilon_k \to 0$ as $k \to \infty$, $\epsilon_k \to 0$ as $k \to \infty$, there exists a sequence $\{\delta_k\}_{k=1}^{\infty}\{\delta_k\}_{k=1}^{\infty}$ such that $0 \leq \delta_{k+1} < \delta_k \leq \epsilon_k$ and$0 \leq \delta_{k+1} < \delta_k \leq \epsilon_k$ and

$$d\left(g(t'),g(t'')\right) < \epsilon_k, \quad \forall 0 \leq t',t'' < \delta_k$$

(4,1)

$$d\left(g(t'),g(t'')\right) < \epsilon_k, \quad \forall 0 \leq t',t'' < \delta_k .$$

Let $\bar{d}(x,y) = \frac{d(x,y)}{1+d(x,y)}$ and $h: X' \to [0,1]$ be given by

$$\bar{d}(x,y) = \frac{d(x,y)}{1+d(x,y)} \text{ and } h: X' \to [0,1] \text{ be given by}$$

$$h(x)= \begin{cases} \frac{\delta_{k+1}}{2^{k+1}} \cdot \frac{\bar{d}(x,\bar{x})-\epsilon_{k-1}}{\epsilon_k-\epsilon_{k-1}} + \frac{\delta_k}{2^k} \cdot \frac{\epsilon_k-\bar{d}(x,\bar{x})}{\epsilon_k-\epsilon_{k-1}}, & \epsilon_k < \bar{d}(x,\bar{x}) \leq \epsilon_{k-1}, k=1,2,\dots \\ 0, & x=\bar{x} \end{cases}$$

$$\begin{cases} \frac{\delta_{k+1}}{2^{k+1}} \cdot \frac{\bar{d}(x,\bar{x})-\epsilon_{k-1}}{\epsilon_k-\epsilon_{k-1}} + \frac{\delta_k}{2^k} \cdot \frac{\epsilon_k-\bar{d}(x,\bar{x})}{\epsilon_k-\epsilon_{k-1}}, & \epsilon_k < \bar{d}(x,\bar{x}) \leq \epsilon_{k-1}, k=1,2,\dots \\ 0, & x=\bar{x} \end{cases}$$

Define $T: X' \to X'$ by $X' \to X'$ by

$T=g \; O \; h \; O \; h$.

each $x \in X', \in X',$ we have

$$|h(x) - 0| = \left| \frac{\delta_{k+1}}{2^{k+1}} \cdot \frac{\bar{d}(x,\bar{x})-\epsilon_{k-1}}{\epsilon_k-\epsilon_{k-1}} + \frac{\delta_k}{2^k} \cdot \frac{\epsilon_k-\bar{d}(x,\bar{x})}{\epsilon_k-\epsilon_{k-1}} \right| \leq \frac{\delta_{k+1}}{2^{k+1}} + \frac{\delta_k}{2^k} < \delta_k$$

$$|h(x) - 0| = \left| \frac{\delta_{k+1}}{2^{k+1}} \cdot \frac{\bar{d}(x,\bar{x})-\epsilon_{k-1}}{\epsilon_k-\epsilon_{k-1}} + \frac{\delta_k}{2^k} \cdot \frac{\epsilon_k-\bar{d}(x,\bar{x})}{\epsilon_k-\epsilon_{k-1}} \right| \leq \frac{\delta_{k+1}}{2^{k+1}} + \frac{\delta_k}{2^k} < \delta_k .$$

By (4,1)

$$d(Tx,\bar{x}) = d\left(g(h(x))\right),g(0) < \epsilon_k \quad d(Tx,\bar{x}) = d\left(g(h(x))\right),g(0) < \epsilon_k .$$

Assume $\epsilon_{k'+1} < \bar{d}(Tx,\bar{x}) \leq \epsilon_{k'} \quad \epsilon_{k'+1} < \bar{d}(Tx,\bar{x}) \leq \epsilon_{k'}$ where $k' \geq k \quad k' \geq k$ .Then

$$|h(Tx) - 0| = \left| \frac{\delta_{k'+2}}{2^{k'+2}} \cdot \frac{\bar{d}(x,\bar{x})-\epsilon_{k'}}{\epsilon_{k'+1}-\epsilon_{k'}} + \frac{\delta_{k'+1}}{2^{k'+1}} \cdot \frac{\epsilon_{k'+1}-\bar{d}(x,\bar{x})}{\epsilon_{k'+1}-\epsilon_{k'}} \right| \leq \frac{\delta_{k'+2}}{2^{k'+2}} + \frac{\delta_{k'+1}}{2^{k'+1}} < \delta_{k+1}$$

$$|h(Tx) - 0| = \left| \frac{\delta_{k'+2}}{2^{k'+2}} \cdot \frac{\bar{d}(x,\bar{x})-\epsilon_{k'}}{\epsilon_{k'+1}-\epsilon_{k'}} + \frac{\delta_{k'+1}}{2^{k'+1}} \cdot \frac{\epsilon_{k'+1}-\bar{d}(x,\bar{x})}{\epsilon_{k'+1}-\epsilon_{k'}} \right| \leq \frac{\delta_{k'+2}}{2^{k'+2}} + \frac{\delta_{k'+1}}{2^{k'+1}} < \delta_{k+1} .$$

By (4.1)

$$d(T^2x,\bar{X}) = d(g(h(Tx),g(0))) < \epsilon_{k+1}$$

$$d(T^2x,\bar{X}) = d(g(h(Tx),g(0))) < \epsilon_{k+1} .$$

We get $d(T^n x,\bar{x}) < \epsilon_k(n-1) \leq \epsilon_n, \forall x \in X' \quad d(T^n x,\bar{x}) < \epsilon_k(n-1) \leq \epsilon_n, \forall x \in X' .$

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Hence $\mathrm{diam}(T'(X')) \to 0$ as $n \to \infty$ and the conditions of Theorem 4.1 are satisfied $T'(X')) \to 0$ as $n \to \infty$ and the conditions of Theorem 4.1 are satisfied.

By **Assumption** 4.1, there is a metric d^*d^* equally comparable to d like that $T:X' \to X'T:X' \to X'$ is a Banach shrinkage mapping with respect to d^*d^*. Thus $\overline{xx}$ is the exclusive fixed point of T in $X'X'$. Finally notice that $T:X \xrightarrow{\to\to} X$ and X has the strong shrinkage things .

■■

Assumption 4.3 [9][9]

Assume (X,d) be an arcwise-linked metric that is locally linked. X has the strong shrinkage attribute if it is arcwise-complete.

Proof: Assume d^*d^* be a metric regularly equal to d, $T:X \xrightarrow{\to\to} X$ a metric shrinkage under d^*d^* with shrinkage constant $0 \le h < 10 \le h < 1$.

Reminder that T is contractive and d^*d^* is regularly equal to d .Choice, as we may $,x_0 x_0$ in X with $d(x_0, Tx_0) < \delta d(x_0, Tx_0) < \delta$ and arc $g_0: [0,1] \to X$ which connect x_0 and $Tx_0 g_0: [0,1] \to X$ which connect x_0 and Tx_0 .For each $k \in$ N, define $g_k:[0,1] \to X$ by $g_k(s) = T^k g_0(s)$ for all $s \in [0,1]$ $g_k:[0,1] \to X$ by $g_k(s) = T^k g_0(s)$ for all $s \in [0,1]$ .Then $g_k g_k$ connects $x_k = T^k(x_0)$ and $x_{k+1} = T^{k+1}(x_0)$ for each $k \in N$ $x_k = T^k(x_0)$ and $x_{k+1} = T^{k+1}(x_0)$ for each $k \in N$ .Now $\{T^n x_0\}\{T^n x_0\}$ is a Cauchy arrangement under d^*d^* ,so that it is also a Cauchy arrangement under d.

Define $g(0,1] \xrightarrow{} X$ by $\xrightarrow{} X$ by

$$g(s) = g_k(2^{k+1}s - 1), \quad \forall \frac{1}{2^{k+1}} < s \le \frac{1}{2^k}, g(s) = g_k(2^{k+1}s - 1), \quad \forall \frac{1}{2^{k+1}} < s \le \frac{1}{2^k},$$

k=1,2,...

since T is a metric shrinkage ,it follows that g is a semi-closed arc, $g(s) \to x^* \in X$ as $s \to 0 \to x^* \in X$ as $s \to 0$ and $\{T^n x_0\} \to x^* \{T^n x_0\} \to x^*$ .Finally, observe that $\{T^n x_0\}\{T^n x_0\}$ is a Cauchy arrangement under d .Then $x^* x^*$ is the fixed point of T .

■■

Under weaker completeness, **Assumption** 4.3 can be thought of as an extension of the Banach shrinkage standard.

We may get the following theorems by linking **Assumption** 4.2 and 4.3.

Assumption 4.4

Assume X be a metric area that is locally arcwise linked. If and only if X possesses the strong shrinkage things, then it is arcwise-complete.

Because the subgroups in Examples 1.1, 1.2 have arcwise-wholeness, they do not exhibit the strong contraction feature.

REFERENECESE

1. J. M. Borwein, Completeness and contraction principle, Proc. Amer. Math. Soc. 87 (1983), 246-250. MR0681829 (84a:54080)

2. J. R. Jachymski, Equivalence of some contractivity properties over metricl structures, Proc. Amer. Math. Soc.125(1997),2327-23350MR1389524 (97j:54047)

3. J. R. Jachymski, short proof of the coverse to the contraction principle and some related results, Topol.Methods Nonlinear Anal.15(2000),179-1860 MR1786260 (2001h:54071)

4. L.Janos,A coverse of Banach contraction theorem , Proc. Amer. Math. Soc. 18(1968),287-289. MR0208589 (34:8398)

5. L.Janos, On pseudo-complete space , Notices . Amer. Math. Soc. 18(1971), 97-163.

6. L.Janos, The Banach contraction mapping principle and cohomology, Comment. Math. Univ.carolinae, 43:3(2000),605-610. MR1795089 (2001m:54039)

7. W. A. Kirk, Caristi fixed point theorem and metric space convexity, Collg. Math. 36(1976),81-86. MR0436111 (55:9061)

8. S. Leader, Atopological characterization of Banach contractions, Pacific J. Math. 69:2(1977),461-466. MR0436093 (55:9044)

9. F. Sullivan, A characterization of complete metric space, Proc. Amer. Math. Soc.83(1981),345-346. MR0624927 (83b:54036)

ACALYPHA AUSTRALIS PLANT PROMISING TREATMENT AGAINST BACTERIA

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Abstract:

The research aimedtoevaluate theantibacterial effect of ethanol extract of Acalypha australisagainst eightbacterialstrains (Staphylococcus aureus, Enterococcus faecalis, Escherichia coli, Klebsiella pneumonia, Pseudomonas aeruginosa, Actinomyces, Proteus mirabilis and Streptococcus pneumonia) with concentrations ranged from 3.90 to 2000 μg/ml. The sensitivity of bacterial isolates to various antibiotics was tested by VITIK2 Densi-Check equipment. The xtricate was made by a soaked powder of Acalypha australis with 80%ethanol in the unit of soxhlet extractions and after that was aseptically sifted. The antibacterial effects of theextricate were surveyed utilizing the agar dissemination strategy and the broth microdilution-method, which was utilized to gauge the extract's minimal inhibitory concentration (MIC). Results appearedthat the ethanol-extricate has antibacterial action in a concentration-dependent way, with the normal distance across zone of hindrance watched against bacterial segragates extending from 15±0.5 mm to 25±0.5 mmThe xtract had the greatest effectagainst E. coli, followed by P. aeruginosa, and the least effect against P. mirabilis. The extract's minimal inhibitory concentration varies from one species to another, ranging from 31.25 to 250 μg/ml.

Key words: Acalypha Australis Plant, Staphylococcus Aureus.

Introduction:

Bacterial Resistance to high numbers antimicrobial agents has gotten to be risk to human and animal life. In this manner, activities must be taken to decrease this issue, for case, to control the utilize of anti-microbial, create inquire about to superior get it the hereditary components of resistance, and to proceed thinks about to create unused drugs, either engineered or characteristic. The extremeobjectiveisto offer suitable and effective antimicrobial drugs to the understanding (1, 2). A long period of time, plants have been a profitable source of common items for keeping up human wellbeing, particularly within thefinal decade, with more seriously considers for characteristic treatments. The utilize of plant compounds for pharmaceuticalpurposes has steadily expanded in Brazil. Concurring to World Wellbeing organization (3)medicinalplants would be the most excellent source to get a assortment ofdrugs. Around 80% of people from created nations utilize conventional medication, which has compounds determined from therapeutic plants in a safe mannaer, (3).

Acalypha australis is an annual herb, belong to the Euphorbiaceae, commonly known as Asian copperleaf, native to East Asia: the Russian Far East, Japan, Korea, China, Vietnam, Philippines. As an alien plant, it is known from the European part of Russia, Ukraine, Italy, Caucasus, Australia, USA, India, and the Asiatic part of Turkey (1, 2). In most of those areas it is considered naturalized.

traditional herbal medicine routinely used in China, ***Acalypha australis*** is also used for treating different infectious and non-infectious diseases like diarrhea and snakebite. It also can be used as a medicine for recovering different body dysfunction diseases such as anti-inflammatory (6), anti-apoptosis (7), detoxification, and cough relieving (8).

Utilize of plant extricates and phytochemicals, both with known antimicrobial features, can be of awesome centrality in therapeutic medications. Within the final long time, a number of projects have been carried out in numerous nations to demonstrate such productivity numerous plants have been utilized because of their antimicrobial characteristics, which are because of the compounds built within the secondary metabolism of the herbs. These items have dynamic substances, for case, the phenolic compounds which are portion of the fundamental oils (13), and in tannin (4). The antimicrobial characteristics of herb has been explored by a number of investigators around the world, particularly in South America. In Argentina, a investigate tried 122 plant species utilized for helpful medications (4). It was archived that among the molecules extricated from these herbs, twelve reduce the growth of Staphylococi bacteria, and *Escherichia coli* and 400 *Aspergillus niger* isolated

additionally detailed that was investigated by different investigators. The aim of the present study is to highlight the antibacterial activity of *Acalypha australis* ethanolic extract against eight bacterial isolated investigated by using concentrations ranging from 3.90 to 2000 µg/ml. that opens the door to the possibility of using this extract as an alternative treatment for different diseases associated with bacterial infectious diseases.

Materials and Methods

Preparation of plant extract

Acalypha australis leaves were collected from the Jadriya campus garden /University of Baghdad, and verified by Baghdad University Herbarium (BUH). The ethanolic extract produced by mixing 550 ml of 80 percent ethanol with 50 g of fine powder of *Acalypha australis* dried leaves in a Soxhlet extraction unit. At 40°C, extraction proceeded for six hours (1) The plant extracts were then concentrated usingavacuum rotary evaporator at 35°C and maintained at 4°C in autoclaved screw class tubes after being filtered by filter paper (Whatman No. 42). The dried extract was sterilized using a membranefilter (0.22 m) and 1 g mixed with ten mlof dimethyl sulfoxide (DMSO) before to antibacterial testing as a stock solution (1, 9).

Microorganisms (Isolation and identification)

Fromthe Department of Biology,College of Science, University of Baghdad'sMicrobiology Laboratory, eight isolates of pathogenic bacteria were obtained (*Staphylococcus aureus, Enterococcus faecalis, E. coli, Klebsiella pneumonia, Pseudomonas aeruginosa, Actinomyces, Proteus mirabilis* and *Streptococcus pneumonia)*. These isolates were initially collected from several collections of specimens. And then were identified using microscopic examination, and laboratory testing, VITEK 2 fluorescence system (IDGNB cards) was used to confirm these identification (5). The lab team placed these isolates in glycerol vials and stored them in deep free.

Antibiotic susceptibility

VITEK2 DensiCheckinstrument (bioMe´rieux)was used to check the thesusceptibilityof isolated bacteria to the differentantibiotics (Cefotaxime,Ampicillin,amoxicillin/Clavulanic acid,ampicillin/Sulbactam, Piperacillin/Tazobactam,cefazolin,ceftazidime, ceftriaxone, cefepime, imipenem,gentemicin, tobramycine, ciprofloxacin,levofloxacin, nitrofurantoin, trimethoprim/sulfmethoxazole, tricarcillin, amikacin) (Mazzariol *et al.,* 2008).

Bacterial suspension preparation

The following steps were taken to prepare the inoculate: a little number of colonies were collected from 18 h bacterial growth cultures and added to five milliliters of sterile phosphate buffer saline (PBS). The number of bacteria was adjusted to 1.5×10^8 CFU/ml.

Antibacterial assay

Diffusion method

Antimicrobial effect of Acalypha *australis* were evaluated by measuring their inhibition clear zone against high resistance eight bacterial isolate.

Microdilution method

Minimum inhibition concentration (MIC) of ethanolic extract of *Acalypha australis* leaves determined according the technique outlined by Andrews *et al* was used two fold dilutions of alcoholic extract (ethanol) started from 3.90 to 2000 µg/ml using Mueller Hinton broth (MHB). Additionally, 100 µl of each dilution was divided into aliquots and placed in microtiter plates. Growth medium free of microorganisms and DMSO were used in control wells. A bacterial inoculum ($1.5\ 10^8$ CFU/ml) was added to each well in an amount of 10µl. There were three duplicates of each trial. The microtiter plats wereincubated for24 hat 37 ° C.

Results and discussion

Antibiotic susceptibility

Thepresent study showed that the antibacterial effects of antibiotics were different dependent on bacterial species that used and that linked with clinical cases and species and species of clinical bacterial isolalates (Leekha *et al.,* 2011) that covered in the study. Determination the effect of *Acalypha australis* leaves ethanolic extract on bacterial isolates was investigated clearly here. Theresults of presentstudy showed that the alcoholic extract of *Acalypha australis* leaves appears the high antimicrobial effects in a concentration-dependent manner against bacteria isolates that used in the present study. The various amounts of ethanolic extract showed high inhibitory effects against all studied isolates, ranging from 15±0.5 mm to 25±0.5 mm.

Determination of MICs of ethanolic extract

The MIC method was used to check the anti-microbial effect of alcohol phase of *Acalypha australis* herbal extract against different clinical isolates of *S. aurous*, *E. faecalis*, *E. coli, K. pneumonia, P. aeruginosa, Actinomyces, P. mirabilis* and *S. pneumonia.* The present study showed that the lowest MIC was seen in case of E. coli with 32.125 µg/ml followed by *P. aeruginosa* (64.5 µg/ml). The present study showed the highest values of MIC was seen in case of P. mirabilis (250 µg/ml). The MICs values of *S. aurous* (125 µg/ml) *E. faecalis* (125 µg/ml), *K. pneumonia (64.5* µg/ml)*, P. aeruginosa, Actinomyces (125* µg/ml)) and *S. pneumonia* (125 µg/ml).

Conclusion:

The current study reveals antimicrobial effect of alcohol extract of *Acalypha australis* against different clinical isolates of pathogenic bacteria and that may help in designing alternative treatment strategies for infectious diseases that cause by bacterial isolates.

References

1- Kravchenko, O. 2010. Acalypha australis L. – In: AgroAtlas. Interactive agricultural ecological atlas of Russia and neighboring countries: Economic plants and their diseases, pests and weeds (online database). University of St. Petersburg. http://www. agroatlas.ru/ [Accessed 2nd December 2016].

2- Asenov, A. 2010. Reports 2–26. – In: Vladimirov, V. & al. (comp.), New floristic records in the Balkans: 14. – Phytol. Balcan., 16(3): 415-445.

3- Ellof, J.N. Which extractant should be used for the screening and isolation of antimicrobial components from plants? J. Ethnopharmacol 60, 1-6, 1998.

4- Tamokou Jde, Kuiate JR, Tene M, Kenla Nwemeguela, Tane P. The Antimicrobial Activities of Extract and Compounds Isolated from Brillantaisia lamium. Iran J Med Sci. 2011;36:24–31. PubMed PMID: 23365474; PubMed Central PMCID: PMC3559120. [PMC free article] [PubMed] [Google Scholar]

5- 20. Gatsing D, Tchakoute V, Ngamga D, Kuiate JR, Tamokou JD, Nji-Nkah BF, et al. In vitro antibacterial activity of Crinum Purpurascens Herb. leaf extract against the Salmonella species causing typhoid fever and its toxicological evaluation. Iran J Med Sci. 2009;34:126–36. [

6- Ellof, J.N. Which extractant should be used for the screening and isolation of antimicrobial components from plants? J. Ethnopharmacol 60, 1-6, 1998.

7- Tamokou Jde, Kuiate JR, Tene M, Kenla Nwemeguela, Tane P. The Antimicrobial Activities of Extract and Compounds Isolated from Brillantaisia lamium. Iran J Med Sci. 2011;36:24–31. PubMed PMID: 23365474; PubMed Central PMCID: PMC3559120. [PMC free article] [PubMed] [Google Scholar]

8- 20. Gatsing D, Tchakoute V, Ngamga D, Kuiate JR, Tamokou JD, Nji-Nkah BF, et al. In vitro antibacterial activity of Crinum Purpurascens Herb. leaf extract against the Salmonella species causing typhoid fever and its toxicological evaluation. Iran J Med Sci. 2009;34:126–36. [

9- 1 Harborne, J.B. 1973. Phytochemical Methods. Halasted press. Johnwiely and Sons, New York, pp: 178.

10- Kim HJ, Joe HI, Zhang Z, Woo Lee S, Lee KY, Kook YB, et al. Anti-inflammatory effect of Acalypha australis L. via suppression of NF-kappaB signaling in LPS-stimulated RAW 264.7 macrophages and LPS-induced septic mice. Mol Immunol 2020; 119: 123–31. doi: 10.1016/j.molimm.2020.01.010

11- Shin JA, Kim JJ, Choi ES, Shim JH, Ryu MH, Kwon KH, et al. In vitro apoptotic effects of methanol extracts of Dianthus chinensis and Acalypha australis L. targeting specificity protein 1 in human oral cancer cells. Head Neck-J Sci Spec 2013; 35(7): 992–8. doi: 10.1002/hed.23072

12- Li H, Ding Z, Sun L, Zeng J. Experimental study on antitussive and expectorant effects of Acalyph Aaustralis L. Lishizhen Med Mater Med Res 2009; 4: 856–7. doi:10.3969/j.issn.1008-0805.2009.04.046

13- Andrews, J. M. 2001. Determination of minimum inhibitory concentration. J Antimicrob Chemother, 48(Suppl.S1): 5-16

STUDY THE ROLE OF ADENINE SULFATE, SUCROSE AND PLANT GROWTH REGULATORS FITTED TO THE MEDIA PHYSIOLOGICALLY IN MICRO PROPAGATION OF MELISSA OFFICINALIS L. IN VITRO

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Abstract:

Susceptibility of a number of factors were tested in the stage of propagation of the lemon balm plant Melissa officinalis under controlled conditions in the laboratory of plant tissue, Horticulture and Gardening department , Agriculture college, Karbala university, shoots culture of Melissa were received from planting the ends of the branches with a length one cm on MS medium that have been prepared with different concentrations (0.0, 0.5, 1.0, 2.0) mg l-1 of adenine sulfate and (0.0, 1.0, 2.0, 3.0) mg l-1 of benzyl adenine with fixed con. 0.5 mg l-1 of IBA, The rooting experiment included the cultivation of vegetative branches with a length of two cm obtained from the multiplication stage on a nutrient medium prepared for rooting, which includes different con. (20, 30, 40) g/l of sucrose and (0.0, 0.5, 1.0, 1.5) mg l-1 of IBA with a constant conc 0.5 mg l-1 IBA, results indicated that superiority of adenine sulfate at conc one mg l-1 in investigation the top average length of vegetative branches was 5.40 cm, while the con. two mg l-1 was superior in achieving the highest average of shoot number, fresh and dry weight of total shoot was 31.75 branches plant-1, 4.51 and 0.95 mg consecutively, and about the influence of BA on the average of the studied traits of the vegetative group, it was superior at the conc two mg l-1   in achieving the highest average length of branches and dry weight of total vegetative was 3.61 cm. and 0.80 mg consecutively. Whereas the con. of 3 mg l-1 achieved the highest average branches number and the fresh weight of the vegetative total was 30.24 branches plant-1 and 4.19 mg, respectively, and on the effect of sucrose on the studied root traits characteristics, the conc 40 g l-1 exceeded in height average, roots number, wet and dry weight of rooting group reached 4.00 cm and 27.03 roots branches-1 , 2.35 and 0.57 mg respectively, as the results indicated the superiority of the IBA with a conc of 1 mg . l-1 in the mean root mean rate was 4.00 cm, 24.66 roots branches-1, 2.34 and 0.51 mg, respectively.

Key words: Melissa Officinalis, Micro Propagation, Adenine Sulfate, Sucrose, Growth Regulators, in Vitro.

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Introduction:

Lemon balm or honey plant, or it is sometimes known as Melissa, or aching herb, is a perennial herbaceous plant, belongs to the family of Lamiaceae. and about the name of Melissa, it is a Greek word meaning bees. This name is due to the ability of this plant to attract bees to it (1), the plant reaches a height of approximately 1 cm, its soft leaves with a light fluff are cardiac in shape with serrated edges and white flowers that are composed in simple flowering clusters (`2), the regions of southern Europe, North Africa, and the Mediterranean are the original home of this plant and currently it is grown all over the world for its medicinal importance as the plant contains many secondary metabolism compounds, where the sources indicated the presence of both phenolics compounds, volatile oils, flavonoids, triterpines, tannins and alcoholic glycosides . And other substances of pharmaceutical interest (3 and 4), lemon balm was used in the treatment of bedsores resulting from severe cold (5) and in the treatment of depression and anxiety and rapid heartbeat and is useful in cases of Stomach and stomach cramping disorder (6), as used as a bacterial, viral, anti-inflammatory and antioxidant (7), and its leaves were used in the manufacture of spices, drinks, perfumes and cosmetics because they contain volatile oils with a very acceptable lemon scent (8). the increasing use and great trend in recent years of the use of herbs, medicinal substances with its urgent need become a major threat to plants and natural resources, as a result of their removal and sabotage of the environment, so, attention in practical applications of biotechnology has increased. Tissue culture is one of the more important and developed of them, and it depends on simple methods that do not require complicated and expensive laboratory equipment. It also has many applications, the most important of which is the laboratory vegetative propagation, that is, the production of plants in the laboratory instead of the field through the development of tissue or individual plant cells on a suitable sterile food environment, and researchers have a great interest in the field of vegetative propagation of plants by this technology, due to the scarcity of some of them, or of its nutritional value, or the ability of some to produce substances of high pharmacokinetic value in the production of prescription drugs (9, and 10), so, this biotechnology is an indispensable way to produce medicinal substances derived from plants, it also has great benefits in terms of type, quantity and controlled production without being restricted by environmental conditions (11), The growth and disclosure of plant tissues in the laboratory can be controlled by the type and structure of the medium, growth regulators are among the critical components of the media that have a direct impact on the growth and development of the planted plant part, as they play a role in increasing cell division and multiplication and then increasing the

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production of metabolic compounds (12), Several researchers also stressed the importance of adding Adenine sulphate to the nutritional medium in order to obtain the best growth for plant parts growing in vitro due to its positive role in stimulating and regulating growth, so it was widely used for the purpose of increasing and elongating the multiplying branches (13). From the above, and given the lack of studies on the accurate multiplication of the lemon balm plant, the study aimed to employment tissue culture technology in the plant's micropropagation, and to study the effect of adding both adenine sulfate and sucrose and growth regulators in different concentrations to the medium in the stages of plant propagation *in vitro*.

Materials and methods

Sample preparation

The seeds of Melissa were sterilized after soaking them with a conc of 3% of commercial minor NaOCl for 10 minutes, after that it was washed with sterile water 3 times to get rid of the effect of the sterilization substance, then transferred to culture tubes equipped with solid food medium (MS)(14) free of growth regulators, the plants were kept in the growth room at a temperature of 25°C with a luminous intensity 1000 lux for 16 hours day^{-1}.

Multiplication experiment

culturing the shoot tips with a length one cm received from initiation stage on MS medium prepared with different cons (0, 1, 2, 3) mg l^{-1} of BA **(Benzyl Adenine)** and adenine sulfate in cons (0, 0.5, 1, 2) In the presence of a fixed conc of 0.5 mg l^{-1} IBA (**Indole Butric Acid**), the plants were incubated in the same storage conditions as before, study indicators were taken after 30 days, that include average number and length of branches , average Fresh and dry weight ratio of shoot, the rooting experiment included: Cultivation of branches obtained from the multiplicity stage with a length of 2 cm on media prepared with various cons(20, 30, 40) g l^{-1} sucrose and different cons (0, 0.5, 1, 1.5) mg l^{-1} IBA with fixed con 0.5 mg l^{-1} BA, the cultures were incubated in the same conditions as before, and the study indicators were taken after 30 days of storage in the incubation room, that included average number and length of roots, fresh and dry weight of roots system, this study was carried out as factorial experiments using the complete random design (CRD), then the averages of the coefficients were compared according to the LSD test under the probability level of 0.05 (15) with ten replications.

Results and discussion

Laboratory culture using plant tissue culture techniques in vegetative propagation has previously been shown as the best way to obtain homogeneous vegetative strains away from genetic differences between members of the resulting offspring, in addition to obtaining high yields for propagation compared to traditional methods. In order to reach this level and for this method to be economically feasible, all stages of propagation must be successful, and this depends on the materials added to the food medium, as the effectiveness of these materials varies according to their type, concentration and interaction with each other. The outcomes recorded in the table 1 indicate that con of adenine sulfate has significant effect on rate of branches length, as the conc 1 mg l^{-1} achieved the highest rate of 5.40 cm, then the response decreased by increasing the conc to 2 mg l^{-1}, which amounted to 4.17 cm, Whereas, the neutral experience achieved the lowest rate was 2.19 cm, the results of the same table also showed the superiority of the conc of 1 mg l^{-1} of BA in achieving the highest average length of the vegetative branches of 5.10 cm, then the response decreased by increasing the concentration to 2 and mg l^{-1}, which amounted to 3.61 and 3.49 cm, sequentially, the neutral experience achieved the lowest rate, which was 2.86 cm, As for the effect of the interaction, the nutritional medium with a conc. of 1 mg l^{-1} of adenine sulfate and benzyl adenine outperformed in achieving a highest rate of 6.85 cm, Whereas the neutral treatment gave a lowest conc. was 1.20 cm. The increase in BA concentrations in the food media to more than 1 mg l^{-1} led to a decrease in the average length of branches, the reason may be attributed to the fact that the increase in cytokinein concentrations in the food media reduces the role of auxien accumulated inside the branch responsible for elongating stem cells towards the longitudinal axis and then reducing the length of the branch (16), the result agreed with the findings (17) when high con. of BA supplied to media prepared for propagation of Melissa plant. Regarding the effect of adenine sulfate and BA con. on the average number of branches, the data indicated in Table (2) showed that the conc of 2 mg l^{-1} adenine sulfate achieved the highest rate of 31.75 branches /plant, which differed significantly from the other concentrations, while the control treatment gave the lowest rate was 15.04 branches plant^{-1}, the conc 3 mg l^{-1} of BA achieved an average was 30.24 branches plant^{-1}, which did not differ significantly from the conc of 2 mg l^{-1}, which gave an average was 29.09 branches plant^{-1}, whereas the control treatment gave a lowest was 17.25 branches plant^{-1}. As for the effect of the bilateral interaction, the media supplied with a conc 2 mg l^{-1} adenine sulfate and benzyl adenine outperformed in achieving a highest rate of 35.17 branches plant^{-1}, Whereas, the neutral treatment gave the least average was 1 branch plant^{-1} .The reason for the

increase in the number of branches when a increment the con of benzyl adenine supplied to the media and to reach the optimum con, maybe come back to the stimulatory action of Cytokinines in urging cells to divide and differentiate, and this results in the differentiation of the buds grown *in vitro* vegetative branches. Many researchers pointed to the role that Cytokinines play in appropriate concentrations in tissue culture in terms of breaking the apical dominance and creating areas of attraction in the lateral buds, and this stimulates the speed of the transfer of nutrients to them, which results in stimulating the growth of buds (18), these results are in agreement with (19) when micro propagation of *Ziziphora canescens* and with (20) when propagating vegetative branches of *Catharanthus roses* in vitro.

Table (1): Effect of adenine sulfate , benzyl adenine cons and the interference between them on average of branch length (cm).

Adenine sulfate cons (mg l^{-1})	Cons of BA (mg l^{-1})				
	0.00	1.00	2.00	3.00	mean
0.0	1.20	2.65	1.80	3.14	2.19
0.5	2.17	4.70	2.50	3.86	3.30
1.0	4.20	6.85	5.90	4.65	5.40
2.0	3.88	6.21	4.25	2.34	4.17
L.S.D ≤0.05	1.12				1.05
mean	2.86	5.10	3.61	3.49	
L.S.D ≤0.05	1.02				

Table(2): effect of adenine sulfate , benzyl adenine cons and the interference between them on average of branches number (branch plant⁻¹).

Adenine sulfate cons (mg l⁻¹)	Cons of BA (mg l⁻¹)				
	0.00	1.00	2.00	3.00	mean
0.0	1.00	15.70	18.30	25.18	15.04
0.5	18.40	20.98	32.15	30.45	25.50
1.0	22.50	22.13	30.75	30.23	26.40
2.0	27.12	29.60	35.17	35.12	31.75
L.S.D ≤0.05	1.66				1.20
mean	17.25	22.10	29.09	30.24	
L.S.D ≤0.05	1.36				

As for the role of adenine sulfate in the soft rate of the vegetative total, the data recorded in Table (3) indicated that there is a plus in average when increased the cons fitted to the media, reaching the conc 2 mg l⁻¹, that gave a significant superiority was 4.51 mg, whereas control experiment gave the least average was 1.15 mg, the data of the same tables showed that BA was significantly superior at conc 3 mg l⁻¹ in giving highest average was 5.19 mg compared to other con. except the conc 2 mg l⁻¹ that gave average was 4.11 mg, whereas the control experiment gave the least average was 1.69 mg, regarding the effect of the interaction, the media supplemented with a conc. 2 mgl⁻¹ adenine sulfate and benzyl adenine in achieving a highest fresh weight rate of 5.65 mg compare with control experiment gave the least average was 0.10 mg.

The outcomes of Table(4) indicated that the various con of adenine sulfate had a superiority effect in dry weight rate of shoot, where the conc of 2 mg l⁻¹ excelled in giving the highest amended was 0.95 mg compare with control experiment that gave the lowest average was 0.19 mg, and the effect of BA at conc of 2 mg l⁻¹ was superior in achieving a highest rate was 0.80 mg and did not differ significantly on the conc of 3 mg l⁻¹ that gave average was 0.78 mg, whereas the control treat gave a lowest rate was 0.32 mg, and about the interaction effect, the conc was 2 mg of adenine sulfate was superior with BA the highest rate of 1.35 mg was achieved, while the lowest rate was achieved when the control treatment was 0.03 mg. The reason to excel of benzyl adenine treatment in a average of branches number, it may be due to

the increase in the live mass, which was reflected in the fresh and dry weight of this mass, the reason for the increase in multiplication and then the increase in the rates of fresh and dry weight may be due to the important role of cytokinein in cell division, especially in the case of its presence with auxien, which means that the effect increases when they are present together (21), these results are agree with the findings of (22) and with (23) when conducting the vegetative multiplication experiment of *Melissa officinalis* and measuring the soft and dry weight of vegetative shoots. It was also shown from the results presented in the previous tables on the effect of BA on the rate of the studied traits that the comparison treatment achieved the lowest average of the concentrations mentioned above. Vascular connection between the vascular tissues of the axillaries buds and the vascular tissues of the stem, which leads to the lack or lack of passage of nutrients from the stem tissues to the buds, and then the lack of their growth and elongation (24), or the reason may be due to the role of auxien in encouraging apex dominion and preventing a growth of side branches (25), it was also noted from the results of Tables 1 to 4 that the presence of adenine sulfate in the food media had a clear and positive effect on the average length and number of branches, which was reflected on the average fresh and dry weight of the shoot, the reason may be due to the fact that adenine sulfate contains the nitrogenous base (adenine), which is naturally involved in the synthesis of Cytokinines, in addition to its entry into the construction of nucleic acids, DNA and RNA, forming proteins and enzymes, while also entering into the construction of energy compounds such as ATP and ADP, and all this will have effect on the process of cell division, increasing its size and differentiation, and then increasing the number of branches formed (26), or, the reason may be due to the role of indirect adenine sulfate in stimulating cell division and stimulating the formation of vascular tissue for shoots and branches, facilitating the transfer of water and nutrients, which leads to an increase in the length of branches (27), therefore, this substance was used in interaction with Cytokinines and within certain concentrations in several studies conducted in the field of tissue culture and on different plants for the purpose of increasing and raising the level of vegetative multiplication, such as the study conducted by((28) when propagating the branches of *Dahlia variabilis*, and the study done by (29) when propagating *Phaseolus vulgaris* and (30) when propagating *Stevia rebaudiana in plant tissue culture.*

Table (3): Effect of adenine sulfate , benzyl adenine cons and the interference between them on the average of fresh weight (mg).

Adenine sulfate cons (mg l^{-1})	Cons of BA (mg l^{-1})				
	0.00	1.00	2.00	3.00	mean
0.0	0.10	1.08	1.18	2.26	1.15
0.5	1.23	1.13	4.60	4.75	2.92
1.0	2.04	2.10	5.01	4.60	3.43
2.0	3.40	3.83	5.65	5.17	4.51
L.S.D ≤0.05	0.56				0.22
mean	1.69	2.03	4.11	4.19	
L.S.D ≤0.05	0.28				

Table (4): Effect of adenine sulfate, benzyl adenine cons and the interference between them on a average of dry weight (mg).

Adenine sulfate cons (mg l^{-1})	Cons of BA (mg l^{-1})				
	0.00	1.00	2.00	3.00	mean
0.0	0.03	0.11	0.20	0.45	0.19
0.5	0.29	0.24	0.73	0.80	0.51
1.0	0.38	0.40	0.93	0.70	0.60
2.0	0.60	0.68	1.35	1.17	0.95
L.S.D ≤0.05	0.22				0.18
mean	0.32	0.35	0.80	0.75	
L.S.D ≤0.05	0.16				

The results shown in Table (5) indicate the effect of sucrose and IBA concentrations and the interaction between them on the average root length. It was noted that the concentration was 40 g of sucrose gave the highest rate of root length was 4.00 cm, which was significantly superior to the other concentrations, whereas control treat gave a lower in rate was 2.19 cm. It is also noted from same data that the con. of IBA had active influence on rate of root length, where the conc 1 mg l-

[1]outperformed in achieving the highest rate was 4.00 cm, which did not differ significantly from the conc 1.5 mg l^{-1}, which achieved a rate was 3.79 cm, while the control treatment achieved the lowest average was 2.44 cm, as for the influence of the interference between the con. of sucrose and IBA, it is noted from the data of the same table that the medium prepared for rooting with concentrations of 30 gm of sucrose and 1.5 mg l^{-1}of IBA was significant in a average length of root was 4.85 cm compare with control treat that gave the lower average was 1.43 cm. Regarding the impact of sucrose with IBA con on a average of roots number, the data referred to in table (6) showed that the conc of 40 g of sucrose was superior in achieving the highest rate was 27.03 roots plant[-1], which significantly differ from other con, while a control treatment achieved the lowest rate was 13.60 roots plants[-1], at the same time, the con 1 mgl[-1] of IBA had significant influence on the rate of roots number, which significantly differ from other con, amounting was 24.66 roots plant[-1], while comparison experience gave the lowest rate was 16.46 root.plant[-1]. 40 gm of sucrose and 1 mg.l^{-1} IBA achieved the highest rate was 31.11 root. Plant[-1], while the control treatment achieved the lowest rate was 10.13 root.plant[-1].

Table(5): Effect of sucrose , IBA cons and the interference between them on average of root length (cm)

Sucrose cons (gl[-1])	Cons of IBA (mgl[-1])				
	0.00	0.50	1.00	1.50	mean
20	1.43	2.08	2.60	2.66	2.19
30	2.25	2.17	4.80	4.85	3.51
40	3.64	3.91	4.60	3.86	4.00
L.S.D ≤0.05	0.44				0.20
mean	2.44	2.72	4.00	3.79	
L.S.D ≤0.05	0.28				

Table (6): Effect of sucrose, IBA cons and the interference between them on average of root number (root plant^{-1})

Sucrose cons (gl^{-1})	Cons of IBA (mgl^{-1})				
	0.00	0.50	1.00	1.50	mean
20	10.13	13.27	20.70	10.33	13.60
30	20.75	18.30	22.17	26.87	22.02
40	18.50	30.02	31.11	28.52	27.03
L.S.D $\leq_{0.05}$	2.01				1.17
mean	16.46	20.53	24.66	21.90	
L.S.D $\leq_{0.05}$	1.24				

And about the effect of sucrose cons added to the medium prepared for rooting on the characteristic of the fresh weight rate of the root group, the data recorded in Table (7) indicated that there is a increment in average when increasing the con additive to the media, reaching the conc of 40g, which gave a significant superiority was 2.35 mg, whereas the control treat gave the less average was 1.29 mg, also the same table data showed the significant superiority of IBA at the conc of 1 mgl^{-1} in achieving the highest rate was 2.34 mg compared to other concentrations, whereas the control treat gave less average was 1.49 mg, and about the impact of interaction, the prepared medium with 40 g sucrose and 1 mg.l^{-1} IBA achieved the highest fresh weight rate was 3.09 mg compared with the control treatment that achieved the lowest rate was 1.10 mg.

The results of Table (8) also showed that the presence of sucrose in the food media with its different concentrations had an superior impact on a rate dry weight of root system, where the conc of 40 g was superior to achieving the highest rate was 0.57 mg in comparison with the control treat that gave the lowest average was 0.16 mg, either regarding the effect of IBA, the con of 1 mgl^{-1} was superior in achieving a highest rate was 0.51 mg, whereas control treat that gave the lowest average was 0.21mg, and regarding the effect of the interaction, the food medium prepared with a conc of 40 g of sucrose was outperformed by the interaction with IBA at 1 mg.l^{-1} in the highest rate was 0.93 mg, while the lowest rate was achieved when the control treatment was 0.10 mg. From the foregoing presentation of the results shown in the rooting tables, the increase in sucrose cons led to the improvement of rooting of the

branches, and this may be due to the fact that carbohydrates are a source of energy and carbon as well as they regulate the osmosis in the medium, and the conc of 40 g . l^{-1} was optimal in increasing the formation and growth of roots (31), this result was agreement with (32) when rooting the shoot of *juvenile avocado* and (33) when rooting the shoot of *Lilium longiflorum*, as well as (34) when rooting the shoot of *Billbergia zebrine in vitro*. The results of the table probably interpreted depends on the IBA is one of the auxien which encourages the division and elongation of cells, and then stimulates the formation of roots in the cut areas, and that the addendum of plant growth perform to a plus in the rates of length and root number to get optimal con and any increase in con over that may be leads to opposite effects. (35), the reason for rooting in control plants may be due to the plant's internal content of hormones, including auxin (36), the result agreed with (37) when rooting the shoot of *Santalum album* and with (38) when rooting the branches of *Ocimum basilicum* and with (39) when rooting the shoot of *Melissa officinalis in vitro*.

Table (7): Effect of sucrose , IBA cons and the interference between them on average of fresh weighing of root system (mg)

Sucrose cons (gl^{-1})	Cons of IBA (mgl^{-1})				
	0.00	0.50	1.00	1.50	mean
20	1.10	1.15	1.83	1.11	1.29
30	2.00	1.25	2.12	2.28	1.91
40	1.37	2.70	3.09	2.25	2.35
L.S.D ≤**0.05**	0.80				0.20
mean	1.49	1.70	2.34	1.88	
L.S.D ≤**0.05**	0.22				

Table (8): Effect of sucrose , IBA cons and the interference between them on average of dry weighing of root system (mg)

Sucrose cons (gl-1)	Cons of IBA (mgl-1)				
	0.0	0.5	1.0	1.5	mean
20	0.10	0.18	0.28	0.10	0.16
30	0.30	0.20	0.33	0.45	0.32
40	0.25	0.66	0.93	0.44	0.57
L.S.D ≤0.05	0.10				0.06
mean	0.21	0.34	0.51	0.33	
L.S.D ≤0.05	0.04				

Conclusion

It was found through the research that was conducted on the propagation of lemon balm plant *in vitro*, that the addition of adenine sulfate and cytokinein to the medium prepared for micro propagation had an effective role in stimulating the axillaries and transverse buds within appropriate concentrations, and it was also found that the addition of sucrose and auxien to the rooting medium had an effective effect. In the emergence of adventitious roots, so it is possible to rely on the technique of plant tissue culture with the addition of these materials for the purpose of improving the efficiency of vegetative propagation of ornamental and medicinal plants for pharmaceutical purposes.

Reference:

1. Chevallier, A. 2001. The encyclopedia of medicinal plants. First edition, Dorling Kindersley. London.

2. Moradkhani, H.; E. Sargsyan; H. Bibak; B. Naseri; M. Sadat-Hosseini; A.Fayazi-Barjin and H.Meftahizade. 2010. *Melissa officinalis* L. a valuable medicine plant: A Review. Journal of medicinal plants research, Vol.4(25): pp. 2753-2759.

3. Weitzel, C. and M. Petersen. 2011. Cloning and characterization of rosmaric acid syntheses from *Melissa officinalis* L. Photochemistry, 72: 572-578.

4. Sharopov, F.; M. Wink; D.R. Khalifaev and W.N. Setzer. 2013. Composition and bioactivity of the essential oil of *Melissa officinalis* L. growing wild in Tajikistan. International journal of traditional and natural medicines, 2(2): 86- 96.

5. Abdel Rahman, Sahera and Alwan, Ikhlas Hussein. 2012. Atlas of Iraqi Medicinal Plants. part One. Iraqi National Herbarium. Iraq.

6. Ince,A.E.; S.Sahin and S.G. Sumnu. 2013. Extraction of phenolics compounds from Melissa using microwave and ultrasound. Turk. J. Agric., 37: 69-75.

7. Park, S.U.; M.R. Uddin; H. Xu Y. K. Kim and S.Y. Lee. 2008. Biotechnology application for rosmaric acid production in plant. African journal of biotechnology, Vol.7 (25): pp. 4959-4965.

8. Sharafzadeh, S. and M. Zare. 2011. Influence of growth regulators on growth and secondary metabolites of some medicinal plants from lamiaceae family. Advances in environmental biology, 5(8): 2296- 2302.

9. Al-Hadidi, Muhammad Ali Hussain (2002). Experiments in tissue culture. Dar Al-Fikr for printing, publishing and distribution, Amman, Jordan.

10. Karuppusamy, S. (2009). A Review on Trends in Production of Secondary Metabolites From Higher Plants by *In vitro* Tissue. Organ and Cell Culture. J. Med. P. Res. 3: 1222-1239.

11. Zhou, L. G. and Wu. J. Y. (2006). Development and Application of Herbal Medicine in China. Nat. Prod. Rep. 23. 789-810.

12. Huichao, L. 2006. Tissue culture and Rabid propagation of *Melissa officinalis*. Journal of Anhui Agriculture Science .34. 19: 4882p.

13. Mohd, K. K.; P.K. Shukla and P.W. Ramteke. 2014. Effect of adenine sulfate on in vitro mass propagation of stevia rebaudiana Beroni, Jornal of medicinal plant research, Vol.8(13), pp: 543-549.

14. Murashige, T.and F.Skooge.1962. A revised medium for rapid growth and bioassays with tobacco tissue culture. Physiol. Plant 15:473-479.

15. Alsahookie, M.M. and K. M. Wuhaib. 1990. Application on design and analysis of experiment. Univ. of Baghdad, pp: 488.

16. George, E.F.(2008). The components of plant tissue culture media, organic adition, osmotic and PH effects. Plant propagation by tissue culture 3 rd Edition, 115-173.

17. Al-Obaidi, Maysa Hamed Ahmed. 2014. The effect of some stimuli on the production of phenolic compounds of Melissa plant ex vivo. PhD thesis, College of Agriculture, University of Baghdad, Iraq.

18. Devlin, R.M. and F.H.Witham.(1998).Plant Physiology. Forth ed. Wadsworth Publishing Company Belmont California.

19. Dakah, A. K, M. Suleiman and S. Zaid. 2015. Study the effect of some growth regulators and number of subcultures on micropropagation of medicinal plant *Ziziphora canescens* Benth. Damascus University Journal of Basic Sciences, volume (31), first issue.

20. Al-Mukhtar, S. A.and M. Abd Ali. 2019. Effect of growth regulator in micropropagation of *Catharanthus* roses in vitro. IOP Conf. Series: Journal of Physics: Conf. Series 1294.

21. Mangena. P. 2019. Benzyl adenine in plant tissue culture-succinct analysis of the overall influence in soybean [Glycine max (L.) Merrill.] seed and shoot culture establishment, Journal of Biotech Research 11(1):23-34.

22. Meftahizade, H.; E.Sargsyan and H. Moradkhani. 2010. Investigation of antioxidant capacity of *Melissa officinalis* L. essential oil. Jornal of medicinal plant research. Vol.4(14): pp.1391-1359, 18.

23. Muhammad, A.; B. Kahveci; E. Korkmaz; F. Doğanay; Ş. Bakırcı and C. Sevinc. 2018. TDZ-IBA induced adventitious shoot regeneration of water balm (*Mellisa officinalis* L.), J. Glob. Innov. Agric. Soc. Sci., 6(2):35-39

24. Phillips, I.D.J. 1996. Apical dominance in physiology of plant growth and development, ed.M.B.Wilkins. pp:161-202.

25. Muhammad, Abd al-Azim Kazem and al-Yunus, Mu'ayyad Ahmad. (1991). Fundamentals of plant physiology. The third part, College of Agriculture - University of Baghdad.

26. Sonnali, J. and G.S.Shekhawat. 2011. Plant growth regulators, adenine sulfate and carbohydrates regulate organogenesis and in vitro flowering of *Anethumgra veolens.* Acta Physiologiae Plantarum volume 33, pages 305 –311.

27. Taiz,L. and E. Zeiger.(2006). Plant physiology 4th. Sinaure Assciates, Inc. Publishers. Sunderland.

28. Al-Ahmar, Shaima Muhammad Saeed. (2000). Propagation of Dahlia hybrids grown *in vitro* using the tips of the branches. Master Thesis, College of Agriculture, University of Baghdad.

29. Andrés, M. and G. Arias. 2010. In vitro plant regeneration system for common bean (*Phaseolus vulgaris*): effect of N^6-benzylaminopurine and adenine sulphate. Electron. J. Biotechnol. v.13 n.1

30. Mohd. K. ; P. Misra. T. Sharma; P. K. Shukla and P. W. Ramteke. 2014. Effect of adenine sulphate on *in vitro* mass propagation of *Stevia rebaudiana* Bertoni. Journal of Medicinal Plant Research, Vol. 8(13), pp. 543-549

31. Ramawat, K. G. (2004). Plant Biotechnology. S. Chand and Company LTD, Ram Nagar, New Delhi. India. Pp: 50-62.

32. Premkumar, A. (2019). Influence of sucrose concentration on in vitro rooting, growth, endogenous sugars and in vitro survival of juvenile avocado, Journal of Horticultural Science and Biotechnology, 41(3): 11-22.

33. Amin, Sami Karim and Taha, Fadia Hisham and Muhammad, Haider Imad. (2011). Micropropagation of Lilium longiflorum ex vivo, Diyala Journal of Agricultural Sciences, 3(1): 252-268.

34. Martins, J.P.; M.Pasqual; A. Martins and S.Ribeira. 2015. Effects of salts and sucrose concentrations on *in vitro* propagation of *Billbergia zebrina* (Herbert) Lindley (Bromeliaceae), Australian journal of crop science, 9(1): 85-91.

35. Hartmann, H.T.; D.E.Kester and R.L.Geneve.(2002). Plant Propagation Principles and Practices. 7th.ed. Perntice Hall. Inc. New Jersey. USA.

36. Hopkins,W.G. and N.P.A. Huner.(2004).Introduction to plant physiology.3rd. John Wiley and Sons, New Yourk.

37. Janarthanam, B. and E. Sumathi. (2011). High frequency shoot regeneration from internodal explant of *Santalum album* L. . International Journal of Botany 7(3): 249-254.

38. Shahzad, A.; M. Faisal; N. Ahmad; M. A. A. Alatar and A. A. Hend. (2012). An efficient system for *In vitro* multiplication of *Ocimum basilicum* through node culture. African Journal of Biotechnology. 11(22): 6055-6059.

39. Sevik, H. and K. Guney. 2013. Effects of IAA, IBA, NAA, and GA3 on rooting and morphological features of Melissa officinalis L. Stem cuttings.The Scientific World Journal, 13(1): 54-61.

STUDY THE EFFECT OF ADDING ALCOHOLIC AND AQUEOUS EXTRACT OF TURMERIC TO PROCESSED CHEESE AS NATURAL ANTIOXIDANT AND IN IMPROVING ITS PHYSICOCHEMICAL PROPERTIES

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Abstract:

In order to test the effect of adding an alcoholic and aqueous extract of turmeric as natural antioxidants that improve sensory qualities and prolong the shelf life of processed cheese, the current study was conducted and represented by the manufacture of four different treatments of cheese, in which alcoholic and aqueous extract was added at a concentration of 10 mg/100gm cheese represented by treatments T1 and T2 respectively. In addition to the treatment of processed cheese, which Butylated Hydroxy Toluene (BHT) was added at concentration of 100 ppm represented by T3 treatment, in addition to the control treatment in which the processed cheese was made without any additional treatment (C). The results of the sensory evaluation of the different cheese treatments that were conducted immediately after processing showed that there were no significant differences in the color, texture, bitterness, taste and flavor between the cheese of the control treatment (C) and the cheese of the different treatments, where the cheese of all treatments was sensory acceptable to the consumer. On the other hand, during storage period, treatment T1 and T2 was significantly outperformed over T3 and C treatment in all abovementioned sensory characteristics, and stay more acceptable in all periods of storage. The lipid oxidation which expressed as peroxide number (POV) and the rancidity which expressed as acid degree value (ADV) during cheese storage at $5°C1±$ was at least in cheese of treatment T1 followed by treatment T2 and above in processed cheese of control treatment. Alcoholic and aqueous extract of Curcumin showed higher antibacterial activity against, Escherichia coli, Staphylococcus aureus and Pseudomonas aeruginosa strains.

Key words: Processed Cheese, Alcoholic Extract, Aqueous Extract, Turmeric, Rancidity, Antioxidant.

Introduction:

Turmeric is a member of the *Zingiberaceae* family and it is a group of rhizomes belonging to the genus *curcuma*, where this genus contains 70 species, and the most common of these species is *curcuma longa* (Amalraj *et al*, 2016). Turmeric is cultivated locally and all over the world, especially India and Southeast Asia. Turmeric roots are used after crushing as spices, flavoring materials and coloring agents (Afshariani *et al*, 2014). Previous studies investigated the physicochemical properties and pharmacological effects of turmeric on various diseases such as diabetics' nephropathy, cardiovascular diseases, anti-inflammatory properties in addition to investigation of turmeric ability to improve the immune system, fighting cancer, rheumatoid arthritis, inflammatory bowel disease (IBD), Alzheimer, periodontal disease and wound healing (Rahimi *et al* , 2016). The magnificent nutritional and medicinal value of curcumin made it a good substitutional to some conventional drugs and food flavouring or colouring agents (Zabihi *et al*, 2015). Turmeric is an herbal medicine with a wide band of pharmacological activities, such as antioxidant activities in vivo and in vitro. The antimicrobial activity of turmeric is attributed to its high-water solubility in the aqueous phase and its low dispersibility (Rajasekar, 2015). Another important possible use of turmeric in food industry is as a substitute for synthetic pigments, turmeric has three main pigments: Among the important uses of turmeric in the food industry is as an alternative to synthetic food colorants, due to its high content of curcumin, beside other two derivatives; the dimethoxy curcumin and methoxy curcumin (Sheikh *et al* ,2017).

Cheese is one of the most common types of food products in the world and is a traditional dish in many societies. The demand for processed cheese, a jelly-like dairy product, is constantly increasing for several reasons such as its low price compared to other types of cheese, in addition to its commercial availability with multiple flavors, consistency, and functional properties (Talbot-Walsha, *et al*, 2018). Processed cheese differs from natural cheese in that milk is not directly used in its production (El-Sayed *et al*, 2020). In recent years, the increased use of bioactive compounds in fortification of processed cheeses, such as the use of dried materials, essential oils, carrot paste, apricot pulp, tomato juice and medicinal herbs extract, improved nutritional and sensory properties, and in return reduced the deterioration process (Mohamed *et al*, 2016 and Mehanna *et al*, 2017).

Ratiba, *et al* (2006) studied the effect of three types of spices represented by cardamom, cloves and thyme on the composition and quality of soft cheese made from goat's milk. Results demonstrated that these spices significantly reduced the proteolysis of dissolved nitrogen, expressed as the percentage, from total nitrogen as

well as the lipolysis of free fatty acids, expressed as the percentage. The researchers recommended adding cardamom, cloves and thyme as natural preservatives and flavor enhancers and to improve the flavor of cheese. Krumov, *et al* (2010) also used *piper nigrum* L. (black pepper) and *Satureja hortensis L.* (Summer savory) in the form of raw powders as well as in the form of spices extract to improve the quality of processed cheese. Samples stored at a temperature of 5 ± 1°C for 10 days showed evident results compared to the control treatment, and no significant differences were observed in the chemical composition of the tested cheese types in terms of pH, acidity, % moisture, fat, protein and salt content, whereas psychrophilic bacteria were 10 times lower than control. In addition, researchers reported that the addition of the spice's *piper nigrum* L. and *Satureja hortensis* L. or their extracts significantly improved sensory and microbiologically processed cheese properties despite of many doubts regarding the safety of cheese. Industrial antioxidants from a health point of view can be carcinogenic and may have toxic effects; therefore, attention has been focused on the use of natural sources of antioxidants, mainly phenolic compounds, which are among the most prominent of these materials. In view of the scarcity of studies conducted on the topic of adding natural extracts of spices to dairy products as preservatives, and in addition to their role as flavoring materials, especially turmeric, the current study was conducted to investigate the effect of adding aqueous and alcoholic extracts of turmeric in organoleptic properties of processed cheese during storage at 5 ±1°C and its role in reducing the oxidation and rancidity of the fat after storage for 30 days, as well as studying its role in limiting the growth of some types of pathogenic bacteria.

Material and Methods

Raw Materials

Turmeric powder was obtained from local markets of Baghdad city. Soft cheese (60% Moisture, 18 % protein, 18% fat, 2% ash and 2% carbohydrate) and (82%) fat butter from were obtained from the dairy factory located in College of Agricultural Engineering, University of Baghdad and from local markets. Emulation salts were obtained from local markets.

Methods

Preparation of Aqueous extract of Curcumin

10 grams of turmeric plant was weighed in a clean, dry 100 ml cup, then 100 ml of distilled water was added to it, mixed well and left for 24 hours at room

temperature, then the mixture was filtered through Whatman No. 1 filter paper and then evaporated in arotary evaporator at 40°C.

Preparation of alcoholic extract of Curcumin:

10 grams of turmeric plant powder was weighed in a dry and clean 100 ml beaker, 100 ml of ethyl alcohol 99% concentration was added to it, mixed well and left for 24 hours at room temperature, then filtered the mixture through Whatman filter paper No. 1 Then the filtrate was evaporated in rotary evaporator a temperature of 40 °C.

Antimicrobial Activity of Curcumin

Three strains; *Staphylococcus aureus, Escherichia coli* and *Pseudomonas aeruginosa* were obtained from the department of food science/ college of agriculture, university of Baghdad. For the determination of antimicrobial activity of curcumin against pathogenic bacteria, agar well diffusion assay was applied (Hamad, *et al*, 2017). A nutrient broth was prepared and kept at 37°C for 24 h for the growth of bacterial strains. In brief, 100 µl of each active pathogenic strain of bacteria (106 CFU/mL) incubated overnight was spread on sterilized nutrient agar plates. 100 µL of both aqueous and alcoholic extracts (100 µg/mL) were added to each agar well individually for minimum inhibitory concentration (MIC) determination. Subsequently, agar plates were incubated at 37°C for 18 hrs and the formed zones free of bacterial growths were measured and recorded. The zones where bacterial growth inhibition occurs were calculated by measuring the diameter of the inhibition zone (mm) around the well together with the well diameter. Readings were taken in three different static directions in all duplicates and the average values were scheduled.

Preparation of Processed Cheese

A method described by (Muira,1999) was applied for the preparation of processed cheese with some modifications. Iraqi soft cheese manufactured in the dairy factory/College of Agricultural Engineering Sciences/University of Baghdad, in addition to a variety of soft cheese types available in the local markets, were used in the manufacture of processed cheese. (60°C) distilled water was added to maintain moisture content of the processed cheese at approximately 60 ± 1.0% (w/w). Cooking was carried out at 86°C with constant stirring for 4 minutes. Four treatments have been getting the first without addition, which was the control treatment (C). the

second treatment 10mg of aqueous extract of turmeric was added /100 g of cheese, and the third section was added 10mg of alcoholic extract of turmeric / 100 g of cheese, and the fourth treatment was added the industrial antioxidant Butylated Hydroxyl Toluene (BHT) at a concentration of 100ppm /100gm cheese and. After the cooking and filling process, the samples were kept in the refrigerator at a 5 ± 1 °C until conducting the subsequent tests at times 0, 3, 7, 12 and 30 days, which are represented by sensory evaluation, Peroxide Value (POV) and Acid Degree Value (ADV).

Physicochemical Analysis of Processed Cheese

Analysis of White and Processed Cheese:

Horwitz & Latimer, (2005) procedure was applied for the chemical analysis of processed cheese for the determination of protein, fat, ash and pH.

Sensory evaluation:

Organoleptic characteristics (taste and flavor, texture, color and bitterness) of the processed cheese samples were evaluated following the forma described by (Nelson and Trout, 1964) at zero time and during after 2, 5, 12 and 30 days of storage at 5±1°C.

Acid Degree Value determination:

(ADV) was done by following the method of Burea of Dairy Industry (BDI) mentioned by Deeth and Fitz-gerard (2006).

Determination of the peroxide number (POV):

The peroxide number was estimated according to the method mentioned in AOAC (2005).

Determination of the amount of total phenols:

The amount of phenols in the aqueous and alcoholic extract of turmeric was determined according to the method mentioned by Slinkard and Singleton (1997) which involves the dissolving of 1g of the extract in 46 ml of distilled water followed by adding 1ml of Folin-Ciocalteu reagent (FCR). The mixture was mixed for 3 minutes and then 3ml of turmeric was added to it. Sodium carbonate solution with a concentration of 2% and the mixture is left for two hours with intermittent shaking, then, the light absorption was measured at a wavelength of 760 nm and the amount of phenols was calculated depending on the graphic relationship between the concentration of gallic acid GA and the absorbency using a standard solution of gallic acid with concentrations ranging from 0-100 mg / 1ml.

Determination of the amount of total flavonoids:

The aluminum chloride method mentioned by Huang *et al* (2004) was followed by dissolving 1 g of the extract in 5.1 ml of ethanol and an equal volume of aluminum chloride of 2% dissolved in methanol was added to it. The mixture was shaken well and after 10 minutes the light absorption was measured at a wavelength of 367 nm and the amount of flavonoids was calculated, based on the graphic relationship between the concentration of Rutin and the absorbance at the same wavelength.

Statistical analysis:

All data were analyzed using Statistical program (SAS, 2004) Statistical Analysis System).

Results and Discussion

Chemical composition of processed cheeses (PC)

The chemical compositions of all PC treatments C, T1 ,T2 and T3 at zero time have the same percentage of moisture , protein , fat and ash which was illustrated in Table (1) while during storage % moisture for all treatments were reduced this may be belonged to evaporation happened during storage, and on this basis, the percentage of protein, fat and ash will increase in all PC treatments.

Table1: The chemical composition of processed cheese treatments during storage period 30 day.

Characteristics	Storage time	Treatments			
		C	T1	T2	T3
Moisture %	Zero time	59.63±0.32aA	59.63±1.16aA	59.63±0.42aA	59.63±0.30aA
	30 days	56.69±0.18bB	58.69±0.45aA	58.83±0.62aA	58.3±0.30aA
Protein%	Zero time	9.83±0.55aB	9.81±0.25aA	9.80±0.15aA	9.80±0.15aA
	30 days	10.73±0.25aA	9.91±0.30bA	9.88±0.19bA	9.85±0.15aA
Fat %	Zero time	22.80±0.07aB	22.99±0.05aA	23.00±0.02aA	22.95±0.05aA
	30 days	24.28±0.50aA	23.15±0.12bA	23.05±0.15bA	23.08±0.15bA
Ash%	Zero time	4.10±0.066aB	4.08±0.057aA	4.05±0.092aA	4.08±0.057aA
	30 days	4.67±0.158aA	4.15±0.050bA	4.09±0.058bA	4.17±0.050bA
pH	Zero time	5.77±0.012aA	5.77±0.015aA	5.85±0.010aA	5.85±0.020aA
	30 days	5.74±0.050aA	5.75±0.050aA	5.74±0.052aA	5.80±0.030aA

Antimicrobial Activity of curcumin

Table (2) demonstrates the curcumin antibacterial activity against pathogenic bacteria. Results demonstrate that Curcumin is effective against *Escherichia coli, Staphylococcus aureus, and Pseudomonas .aeruginosa* at concentration 1000ppm/mL, on the other hand, a concentration of 2000 ppm /ml showed more effectiveness and this appeared through the diameter of inhibition. These results are consistent with a study conducted by (Negahdari *et al*, 2020) which showed that curcumin, in a concentration of (60 mg/mL), caused inhibited the growth of *E. coli* ATCC25922, *S. aureus* ATCC6538, and *E. faecalis* ATCC29212 strains. In accordance with prior studies, the antimicrobial activity of curcumin can be attributed to its content of phenolics and flavonoids compounds, which can disrupt the functions of the cell membrane via high affinity binding to the surface of cell membranes. Table

(2) shows the rates of the diameter of the inhibition zones for the growth of the test bacteria. From the results noted that the diameter of the inhibition zones increases with increasing in concentration of both the alcoholic and aqueous extract of turmeric towards the bacteria under study, but the degree of inhibition varies according to the type and concentration of the extract, as the alcoholic extract showed a high inhibition effect compared to the aqueous extract, and this is evident by measuring the diameters of inhibition, where *E.coli* bacteria were the most affected and *S. aureus* at second order, while *P. aeruginosa* showed resistance to the action of the mentioned turmeric extracts this results agree with Mahmoud and Thanaa, (2021).

Table 2: Antimicrobial activity of curcumin against pathogenic strains.

Pathogenic strains	Inhibition zone diameter(mm)			
	Aqueous extract		Alcoholic extract	
	1000 ppm	2000 ppm	1000 ppm	2000 ppm
Escherichia coli	13	16	18	21
Staphylococcus aureus	13	16	14	16
Pseudomonas aeruginos	9	13	10	14

Organoleptic Evaluation of Processed Cheese

The rise in consumers' demands for healthy food encourages producers and food industry to search for new and advanced strategies in order to provide food products containing bioactive compounds whose main objective is to enhance health and wellness (Cerqueira *et al*, 2013).

Table 3: The sensory evaluation of processed cheese treatments during storage at 5 ± 1°C for 30 days.

Storage time (days)	Properties	C	T1	T2	T3
0	Taste and flavor	42	43	44	42
	Texture	33	34	35	33
	Color	10	10	10	10
	Bitterness	10	10	10	10
	Total Summation	95	97	99	95
2	Taste and flavor	39	42	43	40
	Texture	30	33	34	31
	Color	9	9.5	10	9
	Bitterness	10	10	10	10
	Total Summation	88	94.5	97	90
7	Taste and flavor	36	40	41	38
	Texture	27	30	32	28
	Color	7	9	9	8
	Bitterness	8	9	9	8
	Total Summation	78	88	91	82
15	Taste and flavor	34	38	39	35
	Texture	23	27	28	25
	Color	6.5	8	8.5	6
	Bitterness	6	7	8	5
	Total Summation	69.5	80	83.5	71
30	Taste and flavor	26	30	32	29
	Texture	15	21	24	20
	Color	4	5	7	5
	Bitterness	3	5	6	4
	Total Summation	48	61	69	58
L.S.D					

The evaluation of organoleptic properties of the processed cheese resulted from aqueous and alcoholic extracts of curcumin after 0, 2, 7, 14 and 30 days of storage at 5 ±1°C are shown in Table (3). There were no significant differences (P>0.05) between the control and T1, T2 and T3 treatments immediately after manufactured and after 2 days of storage in terms of taste and flavor, texture ,color, and bitterness and overall acceptability scores This confirms the acceptability of cheese with aqueous and alcoholic extract by the consumers , and the turmeric extracts did not show any undesirable sensory effect in all treatments. After 7days of storage, treatment T2 significantly(P<0.05) outperformed the control treatment, as it obtained the highest degrees of sensory evaluation in terms of flavor, Texture and bitterness, followed by treatment T1 and then treatment T3, while the sensory evaluation scores decreased for the cheese of the control treatment. The reason for this due to the chemical changes that occur on the fat of the control treatment, (fat rancidity), which occurs by the action of the bacterial lipase, which is produced by psychrophilic bacteria, which was characterized by being one of the enzymes resistant to the pasteurization treatment that takes place in the cheese manufacturing process, where this enzyme works to break the ester bonds of fatty acids which bind to the glycerol molecule in the triglycerides, thus producing short chain free fatty acid (volatile fatty acids). The presence of some of them in a very low concentration was sufficient to give the rancid flavor, which is unfavorable by consumers, as well as the oxidation of fats, which is accompanied by the accumulation of byproducts unwanted oxidation that greatly affects the taste. Meanwhile these changes did not appear in the cheese of other treatments to which turmeric was added T1 and T2, this was due, to the fact that turmeric contains biologically active compounds called curcumin, as well as flavonoid compounds that act in addition to being natural antioxidants as anti-bacterial that prevent the growth of microorganisms, especially psychrophilic bacteria .Which is the main responsible for the rancidity of cheese fat during storage due to its production of the lipase which was resistant to pasteurization (Kifah,2014). As for the subsequent storage periods, it was noted that the processed cheese treatments behaved the same as the previous time period until the 30th day of storage. This mean that the processed cheese treatments to which aqueous or alcoholic turmeric extract has been added has retained its validity until the 30th day of storage, as it outperformed the control treatment and the processed cheese added to it with the industrial antioxidant BHT, because it obtained higher degrees in the sensory evaluation than its counterparts in the same time period, and accordingly it

is recommended to add turmeric extracts to the processed cheese Without the need to add industrial antioxidants to extend the shelf life.

Peroxide value (POV):

Table (4) shows the values of the peroxide number of the treatments cheese compared to the control cheese immediately after manufacturing and during storage at a temperature of 5±1°C for 30 days. Results indicate that there were no significant differences in the values of the peroxide number between the cheese of the different treatments immediately after manufacturing, which amounted to 6.00 meq/kg fat, which was within the acceptable limits mentioned by the Iraqi standard, which states that it does not exceed 10 meq/kg fat. While After 3 days of storage, there was a development in the values of the peroxide number in the cheese of all the treatments except for the cheese of the T2 treatment. A slight increase in the values of the cheese of the treatments T1, T2 and T3 was noticed, and the highest development was in the control cheese, this is due, to the role played by the alcoholic extract of turmeric, which contains the biologically active substances in it (curcumin), which have the ability to reduced free radicals resulting from the oxidation process and thus limit the process of successive splitting of unsaturated bonds through the formation of compounds stable.

The cheese models to which turmeric extracts were added showed a lower development in the values of the peroxide number compared with the cheese treatments to which the industrial antioxidant was added for the same storage period, which encourages the use of turmeric extracts as natural alternatives to industrial antioxidants. The results of this study agree with the findings of Krumov *et al* (2010) and Ratiba *et al* (2006) about the role of spices as antioxidants when added to dairy products.

Table 4: The degree of peroxide number of the processed cheese treatments during storage at 5± 1ºC 30 day.

Treatments	Peroxide number (meq/1 kg)				
	Period of storage (Days)				
	0	2	7	14	30
C	1.4	2.1	2.76	5.34	10.75
T1	1.4	1.57	2.10	2.86	4.64
T2	1.4	1.23	1.95	2.08	2.88
T3	1.4	1.70	2.39	3.95	7.35
LSD	NS	*1.21	*1.05	*4.67 *	*7.50

NS=No Significant   * (P≤0.05) Significant

Fat hydrolysis or Acid Degree Value (ADV)

The measurement of the fat acidity (ADV) is usually used to express the degree of lipolysis in milk and its products, whether by the action of the naturally occurring lipoprotein lipase enzyme in milk, whose activity is evident before the pasteurization process or the lipases produced by psychrophilic bacteria that are characterized by their ability to resist high heat treatments and work on the lipolysis after manufacturing (Cogan, 1980). Table (5) shows the values of ADV of the control cheese and the treatments cheese during storage at (5 ± 1) ºC. The results showed that there was no significant differences in the initial values of ADV between all treatments while after 3 days of storage there was a development in these values and the highest was in the control cheese and lowest in the cheese of T2, followed by T1. When referring to the approved BDI method for accepting or refused cheese according to what Deeth and Fitz-Gerald (2006) mentioned, which states that cheese was acceptable when ADV values are less than 2.0 meq/100g fat. Therefore, it can be said that the cheese of the control treatment has become refused after7 day of storage. The lipolysis of the control cheese was attributed to the action of the lipases of psychrophilic bacteria originally present in the milk before pasteurization process, which was characterized by its resistance to pasteurization treatments (Cogan, 1980). The contamination that occurred during or after processing, which led to an increase in the value of ADV in the cheese during storage. As for the values of lipolysis in the cheese of treatments, it was less than 2 meq/ 100 gm, and this was due to bioactive compound in turmeric extracts which was characterized by containing phenols and flavonoids, which was characterized by having an anti-bacterial action,

thus limiting the development in the values of lipolysis by the action of lipolytic enzymes produced by these bacteria, and this was discussed in Table (5). As for the subsequent storage periods, it is also noted that there was a development in ADV values in all the cheese treatments, however, in T1 and T2 cheese treatments they remained within the acceptable limits depending on the scale adopted for the BDI method even after 30 days of storage while to T3 which became refused after 30 days. From the overall results, it can be said that a cheese with a high storage validity can be manufactured using the natural extracts found in turmeric.

Table 5: The acidity of the ADV fat for a sample of processed cheese for treatments during storage at a temperature of 5 ±1ºC for 30 days.

Treatment	ADV(meq/100gm oil) during storage				
	0	2	7	15	30
C	0.4	1.10	1.30	2.75	4.89
T1	0.4	0.69	0.86	1.32	1.83
T2	0.4	0.64	0.68	1.03	1.53
T3	0.4	0.81	0.95	1.83	2.13

Turmeric content of Phenolic compounds and Flavonoids:

Table (6) shows the aqueous and alcoholic turmeric extract content of phenolic and flavonoid compounds. The results showed that the alcoholic extract was superior to the aqueous extract in its content of phenolic compounds and flavonoids over the aqueous extract with a value of 62.00 and 30.80%, respectively, while it reached to 42.59 and 28.00 for the aqueous extract.

Table (6): Amount of phenolic and flavonoid compounds in the aqueous and alcoholic extract of turmeric.

Type of extract	%Phenolic compound	%Flavonoid compound
queous	42.59	28.00
alcoholic	62.00	30.80

References

Afshariani, R., Farhadi, P., Ghaffarpasand, F., & Roozbeh, J. (2014). Effectiveness of topical curcumin for treatment of mastitis in breastfeeding women: a randomized, double-blind, placebo-controlled clinical trial. *Oman Medical Journal*, *29*(5), 330.

Amalraj, A., Pius, A., Gopi, S., & Gopi, S. (2017). Biological activities of curcuminoids, other biomolecules from turmeric and their derivatives–A review. *Journal of traditional and complementary medicine*, *7*(2), 205-233.

Cerqueira, M. A., Bourbon, A. I., Pinheiro, A. C., Silva, H. D., Quintas, M. A., & Vicente, A. A. (2013). Edible nano-laminate coatings for food applications. *Ecosustainable Polymer Nanomaterials for Food Packaging: Innovative Solutions, Characterization Needs, Safety and Environmental Issues*, *221*.

Cogan, T. M. (1980). [Heat resistant lipases and proteinases and the quality of dairy products [enzymes, milk]]. *International Dairy Federation*.

Deeth, H. C., & Fitz-Gerald, C. H. (2006). Lipolytic enzymes and hydrolytic rancidity. In *Advanced dairy chemistry volume 2 lipids* (pp. 481-556). Springer, Boston, MA.

El-Sayed, M. I., & Shalaby, T. I. (2021). Production of processed cheese supplemented with curcumin nanoemulsion. *AJCN*, *9*, 96-105.

El-Sayed, M. I., Ibrahim, A. A., & Awad, S. (2020). The effect of storage conditions on the physicochemical, microbial and textural properties of UHT-processed cheese. *Acta Scientific Nutritional Health*, *4*(7), 76-85.

Hamad, G. M., Darwish, A. M., Abu-Serie, M. M., & El Sohaimy, S. A. (2017). Antimicrobial, antioxidant and anti-inflammatory characteristics of combination (Cassia fistula and Ocimum basilicum) extract as natural preservative to control & prevent food contamination. *J. Food Nutr. Res*, *5*(10), 771-780.

Horwitz, W., & Latimer, G. (2005). Official methods of analysis of AOAC International. 18th edGaithersburg. *AOAC International: Rockville, MD, USA*.

John, N. C. (2014). An introduction to the physical chemistry of food. *Food Science Text Series*, *159*.

Kifah, S. Doosh., and Sajid, O. M. (2013). Effect of alcoholic extract of rosemary leaves and borage addition as natural antioxidants in improving the sensory evaluation of processed cream. *Egyptian J. Nutrition and Feeds (2013), 16(2) Special Issue: 129-138.*

Kifah S. Doosh and Sawsan M. Abdul-Rahman .(2014).Effect of Lysozyme Isolated from Hen Egg White in Elongation the Shelf Life of Iraqi Soft Cheese Made from Buffalo Milk. *Pakistan Journal of Nutrition 13 (11): 635-641, 2014.*

Mehanna, N. S., Hassan, F. A., El-Messery, T. M., & Mohamed, A. G. (2017). Production of functional processed cheese by using tomato juice. *Int. J. Dairy Sci, 12,* 155-160.

Mohamed, A. G., Shalaby, S. M., & Gafour, W. A. (2016). Quality characteristics and acceptability of an analogue processed spreadable cheese made with carrot paste (Daucus carota L.). *Int. J. Dairy Sci, 11*(3), 91-99.

Muir, D. D., Tamime, A. Y., Shenana, M. E., & Dawood, A. H. (1999). Processed cheese analogues incorporating fat-substitutes 1. Composition, microbiological quality and flavour changes during storage at 5 C. *LWT-Food Science and Technology, 32*(1), 41-49.

Negahdari, R., Ghavimi, M. A., Barzegar, A., Memar, M. Y., Balazadeh, L., Bohlouli, S., ... & Maleki Dizaj, S. (2021). Antibacterial effect of nanocurcumin inside the implant fixture: an in vitro study. *Clinical and Experimental Dental Research, 7*(2), 163-169.

Rahimi, H. R., Nedaeinia, R., Shamloo, A. S., Nikdoust, S., & Oskuee, R. K. (2016). Novel delivery system for natural products: Nano-curcumin formulations. *Avicenna journal of phytomedicine, 6*(4), 383.

Rajasekar, A. (2015). Facile synthesis of curcumin nanocrystals and validation of its antioxidant activity against circulatory toxicity in Wistar rats. *Journal of nanoscience and nanotechnology, 15*(6), 4119-4125.

Ratiba, B .A; A.M. Wedad; O. Mohamed and H. M. Abd El-Baky (2006) Effect of Cardamom, Thyme and Clove powder on the composition and quality of white soft cheese made from goats' milk. Assiut Journal of Agricultural Science, 37 (4) (139-157).

SAS Institute. (1987). SAS/STAT guide for personal computers, version 6.

Sheikh, E., Bhatt, M. L., & Tripathi, M. (2017). Role of nano-curcumin: A treatment for cancer. *J. Med. Plants, 5,* 394-397.

Talbot-Walsh, G., Kannar, D., & Selomulya, C. (2018). A review on technological parameters and recent advances in the fortification of processed cheese. *Trends in Food Science & Technology, 81,* 193-202.

Zabihi, F., Xin, N., Jia, J., Cheng, T., & Zhao, Y. (2015). Preparation of nano-curcumin with enhanced dissolution using ultrasonic-assisted supercritical anti-solvent technique. *International Journal of Food Engineering, 11*(5), 609-617.

VITAMIN D AND PHYSICAL ACTIVITY: REVIEW

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Abstract:

Vitamin D is one of the necessary substances that must be available in food, and it can be made through the exposure of the skin to ultraviolet rays found in sunlight. Vitamin D has a significant role in metabolic processes and physiological functions, and has an effect to avoid damage to muscles and recovery processes. It also has a role in regulating calcium, as there is a strong relationship between vitamin D and bone health, as well as a role in muscle function and immune responses in athletes and normal people. This article focuses on the role of vitamin D for athletes and non athletes naturally and when it is taken as a dietary supplement by increasing their overall effectiveness and athletic performance. It was concluded that taking vitamin D as a nutritional supplement for athletes depending on the type of sports activity they perform and their continuity of sports training.

Key words: Vitamin D, Performance, Physical Activity, Supplementation, Athletes.

فيتامين د والنشاط الرياضي: مقال مراجعة

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ملخص

يعتبر فيتامين د من مواد الضرورية التي يجب ان تتوفر في الغذاء، ويمكن أن يصنع من خلال تعرض الجلد للأشعة فوق البنفسجية الموجودة في أشعة الشمس.

ولفيتامين د له دور كبير في العمليات الايضية والوظائف الفسيولوجية، و له تاثير في تجنب حدوث الضرر للعضلات و كذلك في عمليات الاستشفاء. كما له دور في تنظيم الكالسيوم، إذ هنالك علاقة قوية بين فيتامين د وصحة العظام، كما له دور في وظيفة العضلات والاستجابات المناعية للأشخاص الرياضيين والعاديين. ويركز هذا المقال على دور فيتامين د للرياضيين وغير الرياضيين وعند أخذه كمكمل غذائي من خلال زيادة فعاليتهم وأدائهم الرياضي. وتم الاستنتاج ان أخذ فيتامين د كمكمل غذائي للرياضيين يعتمد على نوع النشاط الرياضي الذي يؤدونه واستمراريتهم بالتدريب الرياضي.

الكلمات المفتاحية: فيتامين د، الأداء، النشاط البدني، المكملات، الرياضيون.

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–المقدمة:

1–1 فيتامين د:

صنف العلماء فيتامين د على انه المادة التي دور كبير لتجنب الإصابة بالكساح قبل أكثر من 100 سنة، وفي بداية قرن العشرين فقد وجد ان لفيتامين د وظائف متعددة داخل الجسم وان نقصانه قد يسبب خلل في وظائف الجسم المختلفة (1).

ان تسمية فيتامين د بهذا الاسم هي تسمية عامة لمجموعة من مركبات دهنية ذائبة تكون ضرورية للمحافظة على توازن الأملاح المعدنية داخل الجسم. لقد تم تحديد التركيب الكيميائي لفيتامين د عام 1930، والشكل السائد له هو فيتامين D2 وهو مركب (ergocalciferol) ومنشأه نباتي موجود في النباتات والخمائر والفطريات، والشكل الاخر فيتامين D3 وهو مركب (cholecalciferol) ذو منشأ حيواني (2) موجود في لحوم الأسماك خاصة التونة والسلمون وفي صفار البيض والجبن (3)، أما اللحوم الحمراء فتحتوي على كميات جدا قليلة لكنها تعتبر احد المصادر المهمة للفيتامين (4).

يختلف فيتامين D2 و D3 عن بعضهما البعض فقط في المجموعة الطرفية، وهذا الاختلاف لا يؤثر على عملية الايض (كالتنشيط والتحول والفعالية) وكلاهما لهما نفس الوظيفة. الا ان فيتامين D3 هو من له القابلية على ان يخلق عند تعرض الجلد للأشعة فوق البنفسجية نوع B الموجودة في أشعة الشمس(5).

1–2 امتصاص وإنتاج فيتامين د

يمكن ان يزود الجسم بفيتامين د من خلال تعرض الجلد للأشعة فوق البنفسجية نوع B أو من الغذاء أو من خلال المكملات الغذائية، وفي كل هذه المصادر فان فيتامين د يكون بشكل غير فعال (اما D2 أو D3) لذا يجب ان يمر بتفاعلات انزيمية هيدروكسيلية تحدث داخل الكبد والكليتين(6).

يمتص فيتامين د بشكليه (D2 أو D3) الموجود في الغذاء في الامعاء الدقيقة بنفس طريقة امتصاص الدهون. فتتواجد الدهون في الامعاء يحفز كيس الصفراء على إفراز أملاح الصفراء والتي بدورها تعمل على بدء عملية الاستحلاب Emulsification وأيضاً تساعد في تكوين حاملات الدهون lipid containing micelles وهذه الاخيره لها القابلية على الانتشار عبر الخلايا المعوية (7).

وبعد الامتصاص فان فيتامين د سوف يرزم داخل تركيب يسمى الكايلوميكرونchylomicron التي تنتقل عبر الأوعية اللمفاوية وتقوم بايصالها إلى الأوعية الدموية لتنقلها بالتالي إلى الكبد(8). وعند وصول هذي الكايلوميكرون للكبد فتوجد هنالك حاملات بروتينية ترتبط مع فيتامين د لتسهل من دخوله إلى الخلايا الكبدية وإلى أنسجة الجسم المختلفة التي تحتاج إلى فيتامين د ويمكن ان يخزن الجسم هذا الكايلوميكرون الحاوية على فيتامين د داخل الأنسجة الدهنية والعضلات الهيكلية(5).

اما بالنسبة لتخليق فيتامين د عند تعرض الجلد لأشعة الشمس، فان مركب فيتامين D3 الابتدائي الذي يسمى 7– dehydrocholesterol سوف يحول إلى فيتامين D3 بشكل precalciferolعند تعرضه للأشعة فوق البنفسجية نوع B الموجودة في أشعة الشمس أو من خلال عمليات الاشعاع radiation (9). ان مركبprecalciferol سوف يحول بعد ذلك بواسطة الازمرة الحراريةthermal isomerization إلى فيتامين D3 في الجلد. ان مركب precalciferol في بعض

الحالات يمكن ان يحول ضوئيا إلى شكل غير فعال له تاثيرات بيولوجية مختلفة عن فيتامين د ، اذ ان عملية تخليق فيتامين د عن طريق الجلد تعتمد على عوامل مختلفة منها وجود مركب 7-dehydrocholesterol في الخلايا الجلدية، وكذلك المدة الضوئي و نوع الأشعة فوق البنفسجية التي يتعرض لها الجلد(10). وهنالك عامل مهم اخر هو نوع الجلد فالأشخاص الذين يمتلكون بشرة غامقة اللون يمتص جلدهم أشعة فوق بنفسجية بكميات أقل بسبب وجود مادة الميلامين ببشرتهم بنسبة أكبر والتي تعيق امتصاصها من أولئك الذين تكون بشرتهم بيضاء اللون(11).

1-3 أيض فيتامين د

فيتامين د (ان كان مصدره من الغذاء أو ضوئيا عن طريق الجلد) فبكل حالاته سوف تحصل له عملية إضافة مجموعة هيدروكسيل إلى مركب precalciferol بمساعدة انزيم 25-hydroxylase كي يتكون مركب 25-hydroxy vitamin D ويطلق عليه كالسيديول Calcidiol ويرمز له 25(OH)D (12). اذ يعتبر الشكل الرئيسي لفيتامين د في مجرى الدم(2). وبعد انطلاقه من الكبد لمجرى الدم فان هذا المركب يحتاج إلى عملية إضافة مجموعة هيدروكسيا ثانية تحدث في الكلية في النبيبات الكلوية ليتحول إلى الشكل الفعال والذي يعرف ب(كالسيترول calcitriol ويرمز له 25(OH)2 D (5)، ومخطط رقم (1) يوضح ماسبق. ويعتبر الكالسيترول هو الشكل المسؤول عن الاحتياجات الوظيفية الحيوية لفيتامين د من قبل أنسجة الجسم المختلفة(2).

مدة بقاء وفاعلية مركب calcitriol حوالي 3 أسابيع، وهي السبب في اعطاء هذا المركب أهمية كبيرة والذي يعتبر تواجده ومستواه في مجرى الدم كمؤشر لكمية فيتامين د المخزون والمتواجد في الجسم(5).
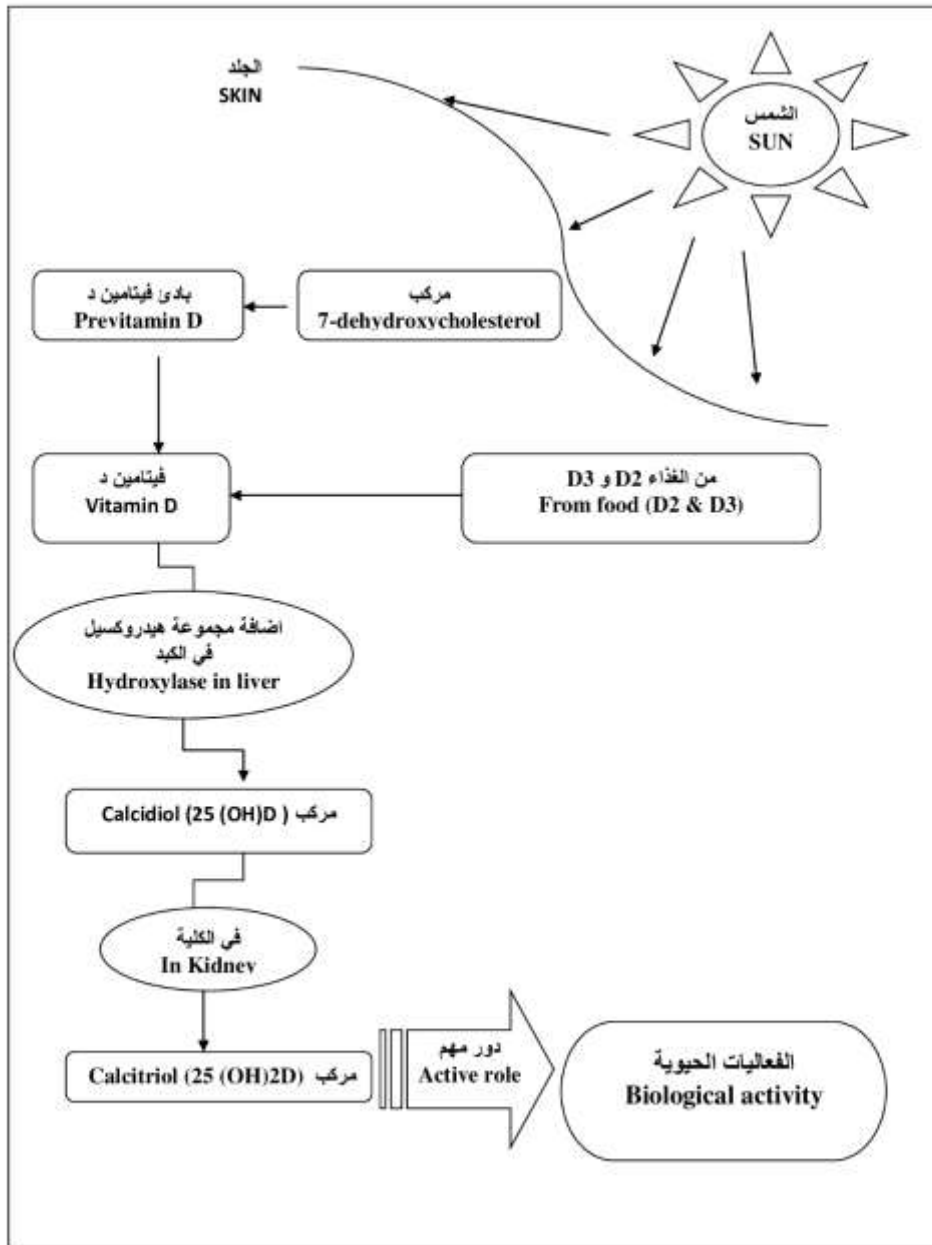
مخطط (1) امتصاص وانتاج وايض فيتامين د

يمكن ان يخزن فيتامين د داخل الأنسجة الدهنية، وقابلية خزنه تكون اعلى في الأشخاص الذين يعانون من السمنة من أولئك الذين يمتلكون وزن طبيعي، إلا ان كمية خزنه لاتعطي بالضرورة ان ليس هنالك نقص في فيتامين د ان هذا المخزون قد لا يتحرر ولا يمكن استعماله وقت الحاجة (13).

4–1 نقص فيتامين د

نقص فيتامين د أصبح ظاهرة منتشرة في كل دول العالم، ويحدث نقص فيتامين د لسببين مهمين: أما بسبب نقص تواجده في الغذاء بالمقدار الذي تحتاجه الكائنات الحية، والسبب يعود إلى أخذه بكمية أقل من المستويات الموصى بها. كما ان هنالك بعض الأشخاص لديهم حساسية الحليب أو حساسية من اللاكتوز، إضافة للأشخاص النباتيين أو الذين يتبعون حمية غذائية يحدث لهم

نقص في مستوى فيتامين د (14) . كما وجد ان فيتامين د يكون مستواه منخفض للنساء اللواتي يعانين من السمنة (15) . أما السبب الاخر والمهم لنقص فيتامين د فهو عدم التعرض لأشعة الشمس بسبب طبيعة الطقس في بعض بلدان العالم بسبب الامطار المستمرة أو الطقس الغائم بصورة شبه مستمرة على طول فصول السنة، أو بسبب التلوث خاصة في المدن الصناعية بالتالي فان سكان هذه المناطق لايتعرضون للشمس بالتالي لايمتصون الكمية الكافية من الأشعة فوق البنفسجية. وبالنتيجة فان الكبد والكليتين غير قادرين على تحويل مركب 7-dehydrocholesterol إلى الشكل الفعال لفيتامين د(16).

وان الأطفال أيضاً لديهم نقص في مستوى فيتامين د، ففي دراسة على أطفال مدينة الموصل شمال العراق تتراوح اعمارهم بين 6-12 سنة، وجد ان نسبة 6.3% من الأطفال لديهم نسبة طبيعية من فيتامين د (17). والدراسات في العراق كلها تؤكد ان هنالك نقص في فيتامين د عن مستواه الطبيعي وان الإناث هن الأكثر نسبة من الذكور(18-24).

1-5 دور فيتامين د

لفيتامين د دور كبير وفعال في الأنشطة الحيوية للجسم، لقد كان يقتصر دوره ولسنين عديدة في المحافظة على مستوى الكالسيوم والفسفور في الجسم، الا انه بعد اكتشاف المستقبلات الخاصة بفيتامين د لخلايا الجسم المختلفة (كخلايا الجلد و اللمفاوية وخلايا الغدة الجنب الدرقية والنخامية وخلايا البنكرياس وغيرها) فقد اكتشف ان له دورا حيويا مهما في العديد من العمليات الفسيولوجية مثل تكاثر الخلايا والتمايز والتعديل المناعي (25، 26) . كما ان لفيتامين د دورا مهما في بعض الأمراض المزمنة كالسكري اذ انه يوفر الحماية للكبد والكليتين لأداء وظيفتهما بصورة سليمة عند أخذه كمكمل غذائي (27). كما استخدم مؤخرا احد العلاجات لمكافحة وباء كوفيد COVID-19 (28) . والجدول ادناه يوضح ذلك (29).

جدول (1) دور فيتامين د في العمليات الفسيولوجية والأمراض

تاثير فيتامين د	العمليات الفسيولوجية
من خلال تعديل العمليات المختلفة بما في ذلك موت الخلايا المبرمج، تقدم دورة الخلية، والتمايز بطريقة خاصة بالخلية، ويحدث أما مباشرة بارتباط مستقبلات الفيتامين بمواد مهمه في في تنظيم جين نمو الخلية أو بصورة غير مباشرة من خلال تحفيزه لمنظمات عمليات الترجمة للجين.	تكاثر الخلايا وتمايزها Cellular Proliferation and Differentiation
اما من خلال دور المستقبلات لفيتامين د في تمايز الخلايا المناعية، أو من خلال قدرة الخلايا المناعية على تاييض فيتامين د واستخدام المركبات الناتجة من هذه العملية في مقاومة الجسم لغزو البكتريا والفيروسات	تنظيم المناعة Immune Regulation
له تأثير واضح جدا عن طريق منع تكاثر الخلايا السرطانية وتكوينها وتنقلها بالأوعية الدموية وأيضاً من خلال تثبيط التمايز لهذه الخلايا	السرطان Cancer
بالنسبة للنوع الاول فان الدراسات إلى أن تناول فيتامين (د) بمراحل مبكرة يرتبط بانخفاض مخاطر الإصابة بداء السكري النوع الاول اما للنوع الثاني فانه يقلل من مقاومة الجلوكوز والأنسولين في البلازما	داء السكري Diabetes
يحسن من وظيفة البطانة الداخلية للأوعية الدمويه ويقلل من تكوين الجذور الحرة ROS	ارتفاع ضغط الدم hypertension
تبين أن العمل المضاد للالتهابات لفيتامين د في الخلايا البطانية يمنع بدء أو تطور تصلب الشرايين أو من خلال تثبيطه لعملية تحول الخلايا البلعمية macrophage إلى خلايا رغويةfoam cell والحث على استرخاء الأوعية الدموية	الأمراض الوعائية القلبية cardiovascular
من خلال تثبيطه للخلايا المناعية الذاتية التي تسبب هذه الأمراض	الأمراض المناعية الذاتية Auto-immune
ينظم العديد من العمليات الفسيولوجية في الجلد مثل تكاثر الخلايا الكيراتينية وتمايزها واستماتتها والحفاظ على حواجز الجلد الطبيعية وجهاز المناعة	الأمراض الجلدية Dermatological Diseases

2- النشاط الرياضي Physical activity

ان أي حركة يقوم بها الشخص يحدث بها تقلص وانبساط عضلات جسمه ويقوم بصرف الطاقة بنسبة أكبر مايصرفها في وقت الراحة يسمى نشاطا رياضيا أو بدنيا (30). وقد تم استخدام النشاط الرياضي كأحد الوسائل العلاجية لأمراض العصر المزمنة والشائعة كالسكري والضغط وغيرها (31). ويعتبر الشخص خاملا ان لم يؤدي على الاقل 150 دقيقة من النشاط الرياضي في الأسبوع الواحد (32) .

يمكن ان يؤدى النشاط الرياضي دون التعرض لأشعة الشمس مباشرة كغرف البيوت والقاعات المغلقة، أو في الخارج بالحدائق العامة أو الملاعب المفتوحة وتحت أشعة الشمس (33)، وان أنشطة المشي التي يمارسها كبار السن احد الامثلة على ذلك. ان الهدف الرئيسي من أداء هذه الأنشطة البسيطة هو تحسين الحالة الصحية وتجنب الإصابة بالأمراض(34) .

1-2   تاثير النشاط البدني على فيتامين د

أ- غير الرياضيين

إن نقص فيتامين د قد يسبب هشاشة العظام للكبار والكساح للصغار (35) . هنالك دراسات وتقارير عديدة بينت ان هنالك علاقة بين فيتامين د والنشاط الرياضي، وأغلب هذه الدراسات تم اجرائها على كبار السن وأشخاص اعمارهم أقل من 65 سنة (36) وكذلك الشباب والبالغين (37،38) والمراهقين وصغار السن (39).

فقد وجد ان أداء الأطفال بعمر 7-14 سنة للأنشطة الرياضية تحت أشعة الشمس في المدارس رفع من مستوى فيتامين د لديهم وان هنالك علاقة وطيدة بين النشاط الرياضي ومستوى فيتامين د (40) واتفقت هذه الدراسة مع دراسة اخرى لذكور وإناث يؤدون نشاطات رياضية اعمارهم مابين 21-28 سنة، اذ وجد ان هنالك تحسن في مستوى فيتامين د لديهم بعد المواظبة على أداء الأنشطة الرياضية (41) . لكن هنالك دراستين اكدتا ان أداء النشاط الرياضي يزيد من مستوى فيتامين د حتى وان تم تادية هذه الأنشطة داخل اماكن مغلقة (42،43). كما وجد ان أداء النشاط الرياضي لكبار السن (85 سنة) ذكور وإناث كان له علاقة بمستوى فيتامين د اذ ان الأشخاص الذين لديهم نقص في فيتامين د لم يستطيعوا ان يؤدوا الاختبارات الرياضية الخاصه بالدراسة (44-46) . كما ان الأشخاص باعمار أكثر من 65 سنة كان هنالك علاقة ارتباط بين تحسن مستوى فيتامين د وقابلية الأشخاص على أداء اختبارات البدنية الخاصة بالدراسة (47). بينما للنساء اللواتي انقطعت عنهن الدورة الشهرية باعمار 71 سنة وجد ان لفيتامين د علاقة مع قابلية النساء على أداء الاختبارات البدنية عندما يكون مستوى الفيتامين أكثر من 20 نانوغرام/مل (48) .

ويتضح من الدراسات ان أداء النشاط الرياضي قد حسّن من مستوى فيتامين د، كما زاد من قوة العضلات ومدى تحملها، إضافة لذلك فان الأشخاص قد زاد من قابليتهم على أداء كل أنواع الأنشطة الرياضية. ان قدرة الجسم على أداء أي نشاط رياضي يعتمد على عدة عوامل منها قوة العضلات وتحمل العظام وصحة الجهاز الوعائي القلبي، ومن خلال الدراسات فقد وجد ان لفيتامين د دور فعال في تحسن هذه العوامل وبالتالي مقدرة الجسم على أداء النشاط الرياضي. أي ان لفيتامين د دور فعال في تنظيم قوة وطاقة العضلات، وازالة الدهون وترشيحها من منطقة العضلات. كما اثبتت الدراسات ان أداء النشاط الرياضي سوف يرفع من مستوى فيتامين د ان كان مستوى هذا النشاط عالي أو متوسط أو منخفض الشدة (49) .

ان فيتامين د ومستواه الكافي وبالمقدار المطلوب يرتبط بالصحة النفسية للانسان بسبب وجود مستقبلات لهذا الفيتامين في خلايا الدماغ (50،51). وقد اثبت ان انخفاض مستوى فيتامين د عن الحد الطبيعي له علاقة مع تدهور الادراك المعرفي للأشخاص فوق عمر 65 عاما (52). ان كلا من النشاط الرياضي ومستوى فيتامين د لهما صلة و دور للحد من الأمراض التي تصيب خلايا الدماغ أو الأمراض التي تسبب اضطرابات عقلية كالزهايمر 53)،(50 .

ب – الرياضيين

ان أداء الرياضيين للأنشطة الرياضية يساعد في زيادة مستوى فيتامين د بسبب تعرضهم لأشعة الشمس، اذ ان 90% من فيتامين د داخل الجسم ياتي من التعرض لأشعة الشمس (14). وان أداء الأنشطة الرياضية داخل الاماكن المغلقة أو في الهواء الطلق لايشكل فرق من حيث تحسن فيتامين د، فمستواه يصل إلى المعدل العالي عندما يزداد مستوى التدريب والتمارين الرياضية (54) . وقد وجدت الدراسات ان الأنشطة الرياضية التي تؤدى بالاماكن المغلقة ككرة السلة والجمناستك أو الجمباز فان هؤلاء الأشخاص يعانون من نقص بفيتامين د تصل نسبته 88% (56،55)

ووجد ان هنالك علاقة بين فيتامين د ومدى تحسن الأداء للرياضيين. اذ هنالك تحسن باللياقة البدنية وعمل الجهاز الوعائي القلبي ومدى التحمل للعضلات وخاصة بعد التعرض للأشعة فوق البنفسجية (57) . ففي دراسة اجريت على لاعبي كرة القدم بعد متابعتهم لمدة 6 أسابيع ان هنالك علاقة بين فيتامين د ومؤشرات الأداء لهم اذ لوحظ تحسن الحد الأقصى لاستهلاك الأوكسجين لهم (58)، كما ان فيتامين د في دراسة اخرى وجد ان له علاقة مع تحسن الأداء ومدى التحمل البدني لمجموعة من الذكور والإناث يؤدون نشاط رياضي بصورة مستمرة عند أداء بعض الاختبارات والقياسات لهم، كما وجد ان هنالك علاقة طردية بين فيتامين د والحد الأقصى لاستهلاك الأوكسجين (59) . أما لاعبي الهوكي عند إجراء دراسة عليهم فلم توجد أي علاقة بين فيتامين د وتحسن الأداء لهم(60).

3– فيتامين د كمكمل غذائي:

يتم تحديد مستوى فيتامين د في الدم بواسطة المركب 25(OH)D (كما موضح في جدول 2)، يعتبر مستوى فيتامين د 50 نانومول / لتر (20 نانوغرام / مل) أو أعلى منه هو المستوى الكافي لمعظم الناس للحفاظ على صحة العظام والصحة بصورة عامة، واذا أصبح مستواه 30 نانومول / لتر (12 نانوغرام / مل) أو أقل من ذلك فقد يؤثر ذلك على العظام والصحة، أما اذا بلغ مستواه فوق 125 نانومول / لتر (50 نانوغرام / مل) فان مستواه مرتفع جدا وقد يسبب مشاكل صحية (64).

بعض الدراسات تؤكد ان هنالك نقص في مستوى فيتامين د للأشخاص الذين يؤدون ويداومون على أداء النشاط الرياضي ويشمل الرياضيين وغير الرياضيين. فقد وجد ان 81% من الرياضيين يعانون من نقص في مستوى فيتامين د (وكان أكثر انخفاضا في الامريكين الافارقة مقارنة بالأشخاص ذوي البشرة البيضاء) حسب تقرير اعدته New York Giants للاعبي كرة القدم خلال فصل الربيع بالموسم التدريبي (61).

ان وصول مستوى فيتامين د للرياضيين لاقل من 30 نانوغم/مل فهم يحتاجون إلى اعطائهم 50000 وحدة عالمية من فيتامين د كمكمل غذائي أسبوعيا لمدة 8 أسابيع (61) وقد يصبح فيتامين د بالمستوى الطبيعي بعد 90 يوم من الاستمرار على

أخذ فيتامين د كمكمل غذائي للرياضيين (63) . أما للمراهقين والبالغين فان 4000 وحدة عالمية هو مقدار فيتامين د عند أخذه كمكمل غذائي للأشخاص غير الرياضيين (64).

جدول (2) مستوى فيتامين د الطبيعي في الدم

المستوى لفيتامين د		معدل فيتامين د في الدم
مستوى منخفض		30 نانومول / لتر (12 نانوغرام / مل) أو أقل
مستوى طبيعي	غير الرياضيين	50 نانومول / لتر (20 نانوغرام / مل) أو أكثر
	الرياضيين	95 نانومول/لتر (30 نانوغرام/مل) أو أكثر
مستوى مرتفع		125 نانومول / لتر (50 نانوغرام / مل) أو أكثر

إن أخذ فيتامين د كمكمل غذائي (5000 وحدة عالمية باليوم) لمدة 8 أسابيع يحسن من الأداء العضلي لرياضي كرة القدم ذوي التدريب العالي ومن النخبة، اذ زاد مستوى فيتامين د بمعدل (29-103) نانومول/لتر (65) . كما وجد ان أداء التوافق العضلي العصبي قد تحسن عند أخذ فيتامين د كمكمل غذائي لراقصي البالية اذ زاد قوة العضلات والقفز لمستوى اعلى، كما ان معدل الإصابة لديهم أصبح أقل (66).

كما وجد تحسن في مستوى الأداء للاختبارات والقياسات البدنية لمجموعة من الرياضيين الذين يؤدون ألعاب رياضية مختلفة عند اعطائهم فيتامين د كمكمل غذائي لمدة 12 أسبوع (67). وفي دراسة اجريت على لاعبي كرة القدم باعطائهم فيتامين د كمكمل غذائي (5000 وحدة عالمية باليوم) وجد تحسن في الأداء وقدرتهم على التدريب بصورة أكبر لهم (68).

ان ميكانيكية عمل فيتامين د ودوره في تحسن الأداء الرياضي قد اقترح عدد من الآليات لتاثيره منها ان فيتامين 25(OH)D لديه مستقبلات لنواة خلايا العضلات الهيكلية وله دور في تنظيم عمل العضلات وعمليات إنتاج البروتين العضلي والتنسيق للسيطرة العضلية العصبية (69)، كما انه يسيطر على انتشار ايون الكالسيوم داخل الشبكة الاندوبلازمية العضلية لاتمام عملية التقلص العضلي (70) أي انه يحسن من وظيفة العضلات بالتقلص والانبساط واعطاء قوة أكبر. كما انه قد يحسن من مستوى الحد الأقصى لاستهلاك الأوكسجين من خلال زيادة ارتباط الهيموغلوبين بالأوكسجين أي زيادة الألفة بينهم للارتباط في الدم (71).

اما للأشخاص غير الرياضيين، فقد أجمعت الدراسات ان فيتامين د يؤخذ كمكمل غذائي لكبار السن وباعمار 50 سنة فما فوق وللنساء خاصة (72-75) . وهنالك بعض الاستثناءات للأشخاص الذين لديهم خلل في عمليات الايض والتي تؤثر على مستوى فيتامين د اذ وضعت مستويات لاخذ فيتامين د كمكمل غذائي كلا حسب فئته العمرية (64) وكما موضح بجدول 3.

جدول (3) فيتامين د الموصى بأخذه حسب الفئات العمرية

فيتامين د (وحدة عالمية)	الفئة العمرية (سنة)
2500	**3–1**
3000	**8–4**
4000	**18–9**
4000	**50–19**
4000	**50<**
5000	**الرياضيين**

4–الاستنتاج:

لفيتامين د دور كبير داخل الجسم ونقصه يسبب مشاكل كثيرة خاصة لكبار السن كهشاشة العظام وعدم القدرة على أداء اعمالهم اليومية البسيطة وقد يؤثر ذلك على ادراكهم العقلي، كما ان الصغار والمراهقين والبالغين لا يستثنون من هذه الأمور الا انهم يكونون بنسبة أقل. وان أداء نشاط رياضي بسيط يوميا والمداومة عليه قد يجنبهم ما ذكر سابقا، إضافة إلى انه يزيد من الشعور بالارتياح في أداء افعالهم الحياتية. أما بالنسبة للرياضيين فمستوى فيتامين د قد يقل لديهم بسبب استمرارهم على أداء الأنشطة الرياضية التي من الممكن ان تكون ذات شدة عالية وعدم انتقائهم الاغذية الغنية به بالتالي فان اللجوء إلى المكمل الغذائي يكون للضرورة وحسب النشاط الرياضي الذي يؤدونه.

المصادر:

1- Driskell Judy A. & Ira Wolinsky. Sports nutrition : vitamins and trace elements.2nd ed.، Nutrition in exercise and sport series، Taylor & Francis Group.LLC، 2006،Pp.175

2- Spitzer V. & Schweigert F. Vitamin Basics: The Facts about Vitamins in Nutrition. 3rd ed.، Nutritional Products Ltd.2007،Pp.22.

3- FDA (Food and Drug Administration). Agency information collection activities; submission for office of management and budget review; comment request; food labeling regulations. *Federal Register.* 2009;74(201):53743–53746.

4- Anderson PH، May BK، Morris HA. Vitamin D metabolism: new concepts and clinical implications. *Clin Biochem Rev.* 2003;24(1):13–26.

5- Gil Á، Plaza-Diaz J، Mesa MD. Vitamin D: Classic and Novel Actions. Ann Nutr Metab. 2018;72(2):87–95.

6- Lips P، Hosking D، Lippuner K، Norquist JM، Wehren L، Maalouf G، et al. The prevalence of vitamin D inadequacy amongst women with osteoporosis: An international epidemiological investigation. J Intern Med. 2006;260:245–54.

7- Mulligan GB، Licata A: Taking vitamin D with the largest meal improves absorption and results in higher serum levels of 25-hydroxyvitamin D. J Bone Miner Res 2010;25:928–930

8- Compston JE، Merrett AL، Hammett FG، Magill P: Comparison of the appearance of radiolabelled vitamin D3 and 25-hydroxy-vitamin D3 in the chylomicron fraction of plasma after oral administration in man. Clin Sci (Lond) 1981;60:241–243

9- Valero-Zanuya M، Hawkins-Carranza F: Metabolism، endogenous and exogenous sources of vitamin D. Rev Esp Enferm Metab Oseas 2007;16:63–70.

10- Cisneros C، Thompson T، Baluyot N، Smith AC، Tapavicza E: The role of tachysterol in vitamin D photosynthesis – a non-adiabatic molecular dynamics study. Phys Chem Chem Phys 2017;19:5763–5777.

11- Rostand SG. Ultraviolet light may contribute to geographic and racial blood pressure differences. Hypertension. 1997;30:150–6.

12- Jones G: Pharmacokinetics of vitamin D toxicity. Am J Clin Nutr 2008;88:582S–586S

13- Savastano S، Barrea L، Savanelli MC، Nappi F، Di Somma C، Orio F، Colao A: Low vitamin D status and obesity: role of nutritionist. Rev Endocr Metab Disord 2017;18:215–225.

14- Holick MF. Sunlight and vitamin D for bone health and prevention of autoimmune diseases، cancers، and cardiovascular disease. *Am J Clin Nutr.* 2004;80(6 suppl):1678S–1688.

15- Abdulkader HD، Al-Saffar AJ. Assessment of vitamin D level in a sample of Iraqi obese women. Iraqi JMS. 2021; 19(2): 172-181.

16- Mawer EB، Davies M. Vitamin D nutrition and bone disease in adults. *Rev Endocr Metab Disord.* 2001;2(2):153–164.

17- Aljammas Elham Kh، Nashwan M Al-Hafidh، Humam Ghanim I. Zubeer. Vitamin D Deficiency Among Primary School Children in Mosul City، Northern Iraq. Mal J Med Health Sci، (2021) 17(3): 112-117.

18- Abdulrahman MA، Suad Yousif Alkass and Noor Isam Mohammed. Total and free vitamin D status among apparently healthy adults living in Duhok Governorate. Scientifc Reports، (2022) 12:1778

19- Hussein I H، Abbas Ali Mansour، Hussein Ali Nwayyir، Ammar Mohammed Saeed Abdullah Almomin، Nassar Taha Yaseen Alibrahim، Haider Ayad Alidrisi، Dheyaa Kadhim Jabbar Al-Waeli، Ibrahim Abbood Zaboon،Rudha Naser Hussein، Adel Gassab Mohammed، Muayad Baheer Kadhim and Ali Hussain Ali Alhamza. Real-Life Data on Total Vitamin D3 (25-Hydroxyvitamin D) Concentrations in Basrah، Iraq. *Biomedical & Pharmacology Journal.* 2021: Vol. 14(4)، p. 2191-2198.

20- Abdullah، S. A.، Abdulrahman، R. M. & Omer، K. A. Vitamin D level study within the population in Sulaymaniyah City Iraq. Int. Conf. Pure Appl. Sci. 1، 32–35 (2018).

21- Abdulrahman، R. M. & Abdulrahman، B. M. Prevalence of vitamin D level in the serum of patients living in Erbil city، Iraq، referred to private clinical laboratory and efect of age and sex on it. J. Biol. Res. 91، 6916 (2018).

22- Al-Hilali، K. A. Prevalence of Hypovitaminosis D in adult Iraqi People including postmenopausal women. Sci. Res. J. 4(6)، 56–62 (2016).

23- Issa، A. M. & Ibraheem، S. A. Alteration of vitamin "D" level in Sera of Iraqi population. J. Kerbala Univ. 5(1)، 58–64 (2007).

24- Aziz H A and Azeez D A. Vitamin D deficiency: A review of the relationship between vitamin D Deficiencies with Some Disease as Obesity، Diabetes and Cardiovascular in Al-Muthanna Province – Iraq. International Journal of Psychosocial Rehabilitation، (2020) Vol. 24، Issue 09. 4984– 4989.

25- Jones، G.; Strugnell، S.A.; DeLuca، H.F. Current understanding of the molecular actions of vitamin D. Physiol. Rev. 1998، 78، 1193–1231.

26- Holick، M.F. Vitamin D deficiency. N. Engl. J. Med. 2007، 357، 266–281.

27- Nabeel Mahdi Abed. Effect of Vitamin D3 on Liver and Kidney Function of Diabetes Mellitus Male Rats. The 4th Scientific Conference of Science College/ University of Thi-Qar، Volume (7)، No.2: 80-83.(2020)

28- Albergamo A، Apprato G، Silvagno F. The Role of Vitamin D in Supporting Health in the COVID-19 Era. *International Journal of Molecular Sciences*. 2022; 23(7):3621

29- Umar M.، Konduru S. Sastry and Aouatef I. Chouchane. Role of Vitamin D Beyond the Skeletal Function: A Review of the Molecular and Clinical Studies. Int. J. Mol. Sci. 2018، 19، 1618.

30- Bjørgen K. Physical activity in light of affordances in outdoor environments: qualitative observation studies of 3-5 years old in kindergarten. Springerplus. 2016; 5(1):950.

31- Matsudo SM، Matsudo VKR، Barros Neto TL. Atividade física e envelhecimento: aspectos epidemiológicos. Rev Bras Med Esporte. 2001; 7(1):2-13

32- Rogerson M، Gladwell VF، Gallagher DJ، Barton JL. Influences of green outdoors versus indoors environmental settings on psychological and social outcomes of controlled exercise. Int J Environ Res Public Health. 2016; 13(4):363

33- Fernandes MR and Barreto Junior WR. Association between physical activity and vitamin D: A narrative literature review. Rev Assoc Med Bras 2017; 63(6):550-556.

34- Ory MG، Towne Jr SD، Won J، Forjuoh SN، Lee C. Social and environmental predictors of walking among older adults. BMC Geriatr. 2016; 16(1):155

35- Bouillon R، Verstuyf A: Vitamin D، mitochondria، and muscle. J Clin Endocrinol Metabol. 2013;98(3):961-3.

36- Redzic M، Lewis RM، Thomas DT: Relationship between 25-hydroxyvitamin D، muscle strength، and incidence of injury in healthy adults: a systematic review. Nutr Res. 2013;33(4):251-8.

37- Ward KA، Das G، Berry JL، Roberts SA، Rawer R، Adams JE، Mughal Z: Vitamin D status and muscle function in post-menarchal adolescent girls. J Clin Endocrinol Metab. 2009;94(2):559-63.

38- Foo LH، Zhang Q، Zhu K، Ma G، Hu X، Greenfield H، Fraser DR. Low vitamin D status has an adverse influence on bone mass، bone turnover، and muscle strength in Chinese adolescent girls. J Nutr. 2009;139(5):1002-7

39- Al-Othman Abdulaziz، Sara Al-Musharaf، Nasser M Al-Daghri، Soundararajan Krishnaswamy، Deqa S Yusuf، Khalid M Alkharfy، Yousef Al-Saleh، Omar S Al-Attas، Majed S Alokail، Osama Moharram، Shaun Sabico and George P Chrousos. Effect of physical activity and sun exposure on vitamin D status of Saudi children and adolescents. BMC Pediatrics 2012، 12:92.

40– Pagels P، Wester U، Soderström M، Lindelof B، Boldemann C. Suberythemal sun exposures at Swedish schools depend on sky views of the outdoor environments – Possible implications for pupils' health. Photochem Photobiol. 2016; 92(1):201–7.

41– Valtueña J، Dominguez D، Til L، González-Gross M، Drobnic F. High prevalence of vitamin D insufficiency among elite Spanish athletes: the importance of outdoor training adaptation. Nutr Hosp. 2014; 30(1):124–31

42– Scott D، Ebeling PR، Sanders KM، Aitken D، Winzenberg T، Jones G. Vitamin D and physical activity status: associations with five–year changes in body composition and muscle function in community–dwelling older adults. J Clin Endocrinol Metab. 2015; 100(2):670–8.

43– Scott D، Blizzard L، Fell J، Ding C، Winzenberg T، Jones G. A prospective study of the associations between 25–hydroxyvitamin D، sarcopenia progression، and physical activity in older adults. Clin Endocrinol (Oxf). 2010; 73(5)581–7.

44– Houston DK، Tooze JA، Davis CC، Chaves PH، Hirsch CH، Robbins JA، Arnold AM، Newman AB، Kritchevsky SB: Serum 25-hydroxyvitamin D and physical function in adults of advanced age: the CHS All Stars. J Am Geriat Soc. 2011;59(10):1793.

45– Matheï C، Van Pottelbergh G، Vaes B، Adriaensen W، Gruson D، Degryse JM: No relation between vitamin D status and physical performance in the oldest old: results from the Belfrail study. Age Ageing. 2013;42(2):186–90.

46– Moon H، Ko H and Kim A. The Relationship Between Serum 25–Hydroxyvitamin D Levels and Physical Performance in Community–Dwelling Older Adults. Ann Geriatr Med Res 2019;23:9–15.

47– Tieland M، Brouwer-Brolsma E، Nienaber-Rousseau C، van Loon L، De Groot L: Low vitamin D status is associated with reduced muscle mass and impaired physical performance in frail elderly people. Eur J Clin Nutr. 2013;67(10):1050–5.

48– Mastaglia SR، Seijo M، Muzio D، Somoza J، Nuñez M، Oliveri B: Effect of vitamin D nutritional status on muscle function and strength in healthy women aged over sixty five years. Nutr Health Aging. 2011;15(5):349–54.

49– Fernandes MR and Barreto Junior WR. Association between physical activity and vitamin D: A narrative literature review. Rev Assoc Med Bras 2017; 63(6):550–556.

50– Buchebner D، McGuigan F، Gerdhem P، Ridderstråle M، Akesson K: Association between hypovitaminosis D in elderly women and long- and short-term mortality- results from the osteoporotic prospective risk assessment cohort. J Am Geriatr Soc. 2016;64:990–7

51– Scino Y، Ishizuka S، Shima M، Tanaka H: Vitamin D in bone formation. Osteoporosis Int. 1993;Suppl. 1:S196–198

52- Friedl KE، Evans RK، Moran DS: Stress fracture and military medical readiness: bridging basic and applied research. Med Sci Sports Exerc. 2008;40 (11 Suppl):S609–22.

53- Willis KS: Vitamin D. Status and immune system biomarkers in athletes. Laramie: University of Wyoming; 2008. p. 85

54- Marawan A، Kurbanova N، Qayyum R. Association between serum vitamin D levels and cardiorespiratory fitness in the adult population of the USA. *European Journal of Preventive Cardiology*. 2019;26(7):750–755.

55- Lovell G. Vitamin D status of females in an elite gymnastics program. *Clin J Sport Med*. 2008;18(2):159–161

56- Willis KS، Peterson NJ، Larson–Meyer DE. Should we be concerned about the vitamin D status of athletes? *Int J Sport Nutr Exerc Metab*. 2008;18(2):204–224

57- Cannell JJ، Hollis BW، Sorenson MB، Taft TN، Anderson JJ. Athletic performance and vitamin D. Med Sci Sport Exer. 2009;41:1102–10.

58- Koundourakis NE، Androulakis NE، Malliaraki N، Margioris AN: Vitamin D and exercise performance in professional soccer players. PLoS ONE. 2014;9(7):e101659

59- Forney LA، Earnest CP، Henagan TM، Johnson LE، Castleberry TJ، Stewart LK: Vitamin D status، body composition، and fitness measures in college-aged students. J Strength Cond Res. 2014;28(3):814–24.

60- Fitzgerald JS، Peterson BJ، Warpeha JM، Wilson PB، Rhodes GS، Ingraham SJ: Vitamin D status and V[combining dot above]O2peak during a skate treadmill graded exercise Vitamin D and Physical Activity http://dx.doi.org/10.5772/65103 45 test in competitive ice hockey players. J Strength Cond Res. 2014;28(11):3200–5

61- Shindle MK، Voos JE، Gulotta L، et al. Vitamin D status in a professional American football team [ID 46–9849]. AOSSM Annual Meeting; San Diego، CA; 2011

62- Holick MF. Vitamin D deficiency. *N Engl J Med*. 2007;357(3):266–281

63- Heaney RP، Davies KM، Chen TC، Holick MF، Barger–Lux MJ. Human serum 25–hydroxycholecalciferol response to extended oral dosing with cholecalciferol. *Am J Clin Nutr*. 2003;77(1):204–210

64- News from the National Academies IOM report sets new dietary intake levels for calcium and vitamin D to maintain health and avoid risks associated with excess. http://www8.nationalacademies.org/onpinews/newsitem.aspx?RecordID=13050 Accessed January 22، 2012

65- Close GL، Russell J، Cobley JN، Owens DJ، Wilson G، Gregson W، Fraser WD، Morton JP: Assessment of vitamin D concentration in non-supplemented professional athletes and healthy

adults during the winter months in the UK: implications for skeletal muscle function. J Sports Sci. 2013;31(4):344–53.

66- Wyon MA، Koutedakis Y، Wolman R، Nevill AM، Allen N: The influence of winter vitamin D supplementation on muscle function and injury occurrence in elite ballet dancers: a controlled study. J Sci Med Sport. 2014;17(1):8–12.

67- Close GL، Leckey J، Patterson M، Bradley W، Owens DJ، Fraser WD، Morton JP: The effects of vitamin D(3) supplementation on serum total 25[OH]D concentration and physical performance: a randomised dose–response study. Br J Sports Med. 2013;47:692–6

68- Jastrzębska، Maria; Kaczmarczyk، Mariusz; Jastrzębski، Zbigniew Effect of Vitamin D Supplementation on Training Adaptation in Well–Trained Soccer Players، Journal of Strength and Conditioning Research: September 2016 – Volume 30 – Issue 9 – p 2648–2655

69- Książek A، Dziubek W، Pietraszewska J، Słowińska-Lisowska M. Relationship between 25(OH)D levels and athletic performance in elite Polish judoists. *Biol Sport.* 2018;35:191–6.

70- Seo MW، Song JK، Jung HC، Kim SW، Kim JH، Lee JM. The associations of vitamin D status with athletic performance and blood–borne markers in adolescent athletes: a cross–sectional study. *Int J Environ Res Public Health.* 2019;16:3422.

71- Ardestani A، Parker B، Mathur S، Clarkson P، Pescatello LS، Hoffman HJ، Polk DM، Thompson PD. Relation of vitamin D level to maximal oxygen uptake in adults. *Am J Cardiol.* 2011;107:1246–9.

72- Zhu K، Austin N، Devine A، Bruce D، Prince R: A randomized controlled trial of the effects of vitamin D on muscle strength and mobility in older women with vitamin D insufficiencyž J Am Geriatr Soc. 2010;58(11):2063–8.

73- Pfeifer M، Begerow B، Minne H، Suppan K، Fahrleitner-Pammer A، Dobnig H: Effects of a long-term vitamin D and calcium supplementation on falls and parameters of muscle function in community-dwelling older individuals. Osteoporos Int. 2009;20:315–22.

74- Janssen HC، Samson MM، Verhaar HJ: Muscle strength and mobility in vitamin Dₒ̄ insufficient female geriatric patients: a randomized controlled trial on vitamin D and calcium supplementation. Aging Clin Exp Res. 2010;22(1):78–84.

75- Brunner RL، Cochrane B، Jackson RD، Larson J، Lewis C، Limacher M، Rosal M، Shumaker S، Wallace R; Women's Health Initiative Investigators. Calcium، vitamin D supplementation، and physical function in the Women's Health Initiative. J Am Diet Assoc. 2008;108(9):1472–9.

EFFECT OF NITROGEN FERTILIZER AND ROW SPACING ON GROWTH AND GREEN FORAGE YIELD AND DRY MATTER OF SORGHUM

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Abstract:

The study was carried out at the experimental farm at college of Agricultural science, university of Baghdad during the period from beginning of April to mid of September of 2020 to investigate the effect of row spacing and levels of nitrogen fertilization on growth green forage yield and dry matter production of sorghum(Var. Bohooth.70). The layout of the experiment was R.C.B.D. with three replicates arranged in split – plots. Row spacing (30, 40, 50) cm and Broadcasting (this is the local farmer sowing method practice, and was considered as the control treatment) were taken as main – plots, while levels of nitrogen (0 , 150 , 300) kg N ha-1 were taken as sub – plots Results showed, that Row spacing at 30cm gave highest mean at plant height (201.9, 207.7, 201.2) cm, leaf area (2628, 2727, 2671) cm2, green forage yield (47.62, 50.61, 52.28) t ha-1 and dry matter yield (11.35, 13.18, 14.65) t ha-1 for three cuts respectively. Addition of nitrogen at level 300 kgN ha-1 gave highest plant height (212.5, 209.2, 207.3) cm, leaf area (2801, 2874, 2850) cm2, green forage yield (50.55, 55.05, 58.48) t ha-1 and dry matter yield (11.32, 13.85, 16.03) t ha-1 and dry matter yield (11.32, 13.85, 16.03) t ha-1, for three cuts respectively. It can be concluded from this study, that the best row spacing for sowing this variety to obtain high forage and dry matter yield is 30 cm with addition of N at rate 300kgN ha-1.

Key words: Nitrogen, Row Spacing, Sorghum.

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تأثير مسافات الزراعة والتسميد النتروجيني في نمو وحاصل العلف الأخضر والمادة الجافة للذرة البيضاء

رزان زهير البيروتي [2]

ملخص

أجريت هذه الدراسـة في حقل التجارب — كلية علوم الهندسـة الزراعية / جامعة بغداد خلال الفترة من بداية شـهر نيسـان إلى منتصف شهر أيلول 2020 وذلك لمعرفة تأثير مسافات الزراعة بين الخطوط ومستويات التسميد النتروجيني في نمو وحاصل العلف الأخضـروالمادة الجافة للذرة البيضـاء (صـنف بحوث 70) نفذت التجربة وفق تصـميم القطاعات الكاملة المعشـاة وبترتيب الالواح المنشقة بثلاث مكررات.

خصصت الالواح الرئيسية لمسافات الزراعة (30 , 40 , 50) سم بين الخطوط بالإضافة إلى معاملة المقارنة (نثراً) فيما خصصت الالواح الثانوية لمستويات التسميد النتروجيني (0 , 150 , 300) كغمN هـ$^{-1}$. أظهرت النتائج تفوق الزراعة على خطوط ولمسافة 30 سم عن باقي المعاملات في صفة ارتفاع النبات (201.9 , 207.7 , 201.3) سم والمساحة الورقية (2628 , 2727 , 2671) سم^2 وحاصل العلف الأخضر (47.62 , 50.61 , 52.28) طن هـ$^{-1}$ وحاصل المادة الجافة (11.35 , 13.18 , 14.65) طن هـ$^{-1}$ وللحشات الثلاث بالتتابع في حين وجد ان إضافة النتروجين بمستوى 300 كغمN هـ$^{-1}$ قد اعطى أعلى متوسط لارتفاع النبات (212.5, 207.3 , 209.2) سم والمساحة الورقية (2801 , 2874 , 2850) سم^2 وحاصل العلف الأخضر (50.55 , 55.05 , 58.48) طن هـ$^{-1}$ وحاصل المادة الجافة (11.32 , 13.85 , 16.03) طن هـ$^{-1}$ وللحشات الثلاث بالتتابع، تم الاستنتاج من هذه الدراسة إلى ان افضل مسافة لزراعة هذا الصنف للحصول على أعلى حاصل من العلف الأخضر والجاف هي 30 سم بين الخطوط وتسميد المحصول بمستوى 300 كغمN هـ$^{-1}$.

الكلمات المفتاحية: نيتروجين، مسافات زراعة، ذرة بيضاء.

أولاً: مشكلة البحث

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تعد الذرة البيضاء Sorghum bicolor (L) Moench من أهم محاصيل العلف النجيلية الصيفية في العراق، وتتميز بقدرتها على تحمل مدى واسـع من ظروف التربة والمناخ وتحمل درجات الحرارة المرتفعة والجفاف، ولها القدرة على تحمل الملوحة وتزداد عدد حشاتها بارتفاع درجة الحرارة صيفاً Prakash و اخرون, 2010 (. و(الجنابي، 2016 (قد وصف هذا المحصول من قبل بعض الباحثين بأنهُ المحصول الحولي ذات الإنتاجية العالية والنوعية الجيدة(Banks,2005) و (**Teutsch,2002** *).*

تستعمل الذرة البيضاء اماكعلف أخضـر أو تصنع على شـكل دريس أو سـيلاج أو ان تستخدم حبوبها لتغذية الحيوان والدواجن وذلك لارتفاع نسبة الكاربوهيدرات والبروتين(Ellen and spiertz, 1987). يلاحظ تحت الظروف العراقية وخاصـة الفترة الممتدة من منتصف شهر مايس إلى منتصف تموز بوجود عجز واضح في توفر الاعلاف الخضراء لسد حاجة الثروة الحيوانية، لذلك فأن محصـول الذرة البيضـاء يمكن ان يسـهم في حل جزء من هذهِ المشـكلة وفي سـياق هذا الحديث تم إنتاج صـنف من الذرة البيضاء العلفية مؤخراً بجهود مشتركة بين قسم المحاصيل الحقلية / كلية علوم الهندسة الزراعية / جامعة بغداد ودائرة البحوث الزراعية العراقيـة يتميز هـذا الصـنف بتفوقه على الصـنف المحلي كـافير في إنتاج العلف الأخضـر(خريط وجاسـم،2015) و(Kumari,2016) وتم تسجيل واعتماد هذا الصنف كأفضل صنف علفي في العراق للعلف الأخضر أُطلق عليهِ (بحوث. 70) لذلك فان هذا الصنف يحتاج إلى المزيد من الدراسات العلمية لتطوير زراعته تحت الظروف العراقية.

وتعد العمليات الزراعية مثل طريقة الزراعة والتسـميد النتروجيني من العوامل المهمة والمؤثرة في إنتاجية المحصـول. ان فهم أداء أي محصول تحت ظروف بيئية معينة يساهم في رفع إنتاجيتهُ ومنها مسافات الزراعة التي تعطي توزيعاً مناسباً للنباتات في وحدة المسـاحة والتي تحدد قابلية هذا الصـنف في كيفية استغلال الموارد الأساسية المتاحة للنبات من إضاءة وعناصر غذائية وماء، لأنها تعتبر ذات أهمية كبيرة في التحكم في نسـبة وكفاءة اعتراض الاشـعة الفعالة بعملية التركيب الضـوئي وقلة التنافس بين النباتات في وحدة المساحة مما ينعكس على حاصل العلف الأخضر ونوعيتهُ.

ان من أهم العمليات الزراعية لنمو المحصول هي إضافة الأسمدة وخصوصا في محاصيل العلف النجيلية المتعددة الحشات مثل الذرة البيضـاء والشـعير، حيث تعتبر الذرة البيضـاء من أكثر المحاصـيل اجهاداً للتربة لذا فأن توفير عنصـر النتروجين يعد امراً ضرورياً لنمو واستدامة نبات الذرة البيضاء، اذ ان هذا العنصر يزيد من حجم المجموع الخضري وارتفاع النبات والمسافة الورقية فضلاً عن زيادة حجم المجموع الجذري مما يرفع من كفاءة النبات في امتصـاص العناصـر الغذائية من التربة لاسـيما عنصـري الفسـفور والبوتاسيوم(Banks,2005).

أشـار(عزيز،2009) ان إضـافة النتروجين للذرة البيضـاء قد قلل من التأثيرات السـلبية للشـد الرطوبي، وزاد من كفاءة استخدام الماء. كما ذكر (طالب،2015) ان زيادة كمية النتروجين المضاف إلى محصول الشعير قد أدى إلى زيادة في ارتفاع النبات والمساحة الورقية والوزن الجاف وبناءً على ما تقدم جاءت هذهِ الدراسة الهدف منها معرفة المسافة المثلى بين السطور وكمية السماد النتروجيني للحصول على أعلى حاصل من العلف الأخضر والمادة الجافة لهذا الصنف تحت ظروف المنطقة الوسطى من العراق.

المواد وطرائق العمل

أُجريت هذهِ الدراسة في حقول قسم المحاصيل الحقلية / كلية علوم الهندسة الزراعية / جامعة بغداد للفترة من بداية شهر نيسان إلى منتصف شهر أيلول 2020 كما مبين في الجدول 1.

جدول 1. بعض الصفات الفيزيائية والكيميائية لتربة الدراسة.

القيمة	الصفة
مزيجة طينية	نسجة التربة
8.1	درجة تفاعل التربة PH 1:1
4.2	التوصيل الكهربائي EC $(ds.m^{-1})$ 1:1
0.32	النتروجين الكلي %
12.2	الفسفور الجاهز ملغم كغم$^{-1}$ تربة
156.7	البوتاسيوم الجاهز ملغم كغم$^{-1}$ تربة

نُفذت التجربة بترتيب الالواح المنشقة على وفق تصميم القطاعات الكاملة المعشاة وبثلاث مكررات. اذ تضمنت المعاملات الرئيسية مسافات الزراعة بين الخطوط (30 , 40 , 50) سم بالإضافة إلى معاملة المقارنة (نثراً) وهي الطريقة التقليدية المتبعة من قبل المزارع العراقي اما المعاملات الثانوية فقد شملت مستويات السماد النتروجيني (300,150,0) كغم هـ$^{-1}$ اضيف على شكل يوريا 46% N.

كانت مساحة الوحدة التجريبية 9 م^2 بأبعاد (3x3) م. سمدت الالواح بالسماد الفوسفاتي قبل الزراعة داخل الخطوط وحسب مسافات الزراعة بمقدار 100 كغم P هـ$^{-1}$ على شكل سماد سوبر فوسفات ثلاثي (45% P_2O_5) (اسماعيل،2006). زرعت بذور الصنف بحوث 70 في الثاني من نيسان 2020 بكمية بذور 40 كغم هَ$^{-1}$ سرباً داخل الخط الواحد ثم غطيت البذور بصورة جيدة بالتربة وعلى عمق لا يتجاوز 3 سم ثم رويت التجربة بصورة هادئة لضمان بقاء البذور داخل الخط الواحد. اما مستويات النتروجين فقد اضيفت على شكل 3 دفعات الأولى بعد أسبوعين من البزوغ والثانية بعد الحشه الأولى والثالثة بعد الحشه الثانية وحسب الكميات المقررة.

2

<u>الصفات المدروسة</u>

1- أخذت عينه لخمسة نباتات عشوائياً من كل وحدة تجريبية لقياس كل من

أ–ارتفاع النبات (سم) حيث قيس الارتفاع من سطح التربة حتى نهاية أعلى ورقة النبات ولكل حشة.

ب– المساحة الورقية(سم^2) مثبت حسب المعادلة الاتية :–

A= L x W x 0.75

A= leaf area cm^2

L= length of leaf cm

W= maximum width of leaf cm

0.75   = Constant [15]

جـ– قطر الساق :–

تم قياس محيط الساق من وسط السلامية الأولى فوق سطح التربة بواسطة شريط قياس واعتمدت العلاقة الحسابية بين المحيط والقطر لاستخراج القطر (Quinby,1963).

2– حاصل العلف الأخضر طن هـ$^{-1}$

تم حش جميع النباتات في الخطوط الوسطية وتركت الخطوط الحارسة وذلك عند بلوغ النباتات نهاية النمو الخضري وبداية ظهور ورقة العلم وعلى ارتفاع بحدود 15سم عند سطح التربة وتم وزن حاصل العلف الأخضر مباشرة بعد الحش لضمان عدم فقدان جزء من الرطوبة نتيجة التبخر وحسب الحاصل ثم حول إلى طن هـ$^{-1}$. اخذت عينة لقياس النسبة المئوية للمادة الجافة لغرض استخراج حاصل المادة الجافة والذي يساوي حاصل العلف الأخضر × % للمادة الجافة ولكل حشة.

حللت البيانات احصائيا حسب طريقة تحليل التباين لكل حشة وقورنت المتوسطات الحسابية باستعمال أقل فرق معنوي L.S.D على مستوى معنوية5% (Steel and Torrie,1980).

النتائج والمناقشة

1– ارتفاع النبات (سم) :

يبين جدول 2 وجود فرق معنوي بين مسافات الزراعة في متوسط ارتفاع النبات و للحشات الثلاث واعطت معاملة المقارنة أي الزراعة نثراً وهي الطريقة التقليدية لزراعة هذا المحصول للعلف الأخضر أقل متوسط لارتفاع النبات بلغ (, 199.7 187.4 , 193.7) سم للحشات الأولى والثانية والثالثة بالتتابع واختلفت معنوياً عن جميع مسافات الزراعة في حين أعطت مسافة الزراعة على مسافة 30 سم بين الخطوط أعلى متوسط لارتفاع النبات في الحشتين الأولى والثانية بلغ (201.9 , 207.7) سم بالتتابع واختلفت معنوياً عن المسافة 50,40 سم بين الخطوط. أما في الحشة الثالثة فقد تفوقت معنوياً المسافة 40 سم بين الخطوط في ارتفاع النبات وربما يرجع السبب في تفوق المعاملة عند الزراعة 30 سم في ارتفاع النبات إلى ان هذهِ الطريقة في الزراعة قد حسنت من انتظام توزيع البذور داخل الخط مما اعطى كثافة نباتية لها القدرة على استغلال جميع متطلبات النمو.

جدول 2. تأثير التسميد النتروجين ومسافات الزراعة والتداخل بينهما في صفة ارتفاع النبات (سم) وللحشات الثلاثة.

المتوسط	مستويات النتروجين كغم هـ$^{-1}$			مسافات الزراعة (سم)	رقم الحشة
	300	150	0		
187.4					
201.9	195.3	192.0	175.0	المقارنة (نثراً)	
196.2	222.3	205.7	177.7	30	
197.6	214.7	200.3	173.7	40	الحشة الأولى
	217.7	198.7	176.3	50	
2.04	2.76			L.S.D 5%	
	212.50	199.20	175.70	متوسطات النتروجين	
	1.34			L.S.D 5%	
193.7					
207.7	201.0	198.3	181.7	المقارنة (نثراً)	
200.2	228.0	220.0	175.0	30	
202.6	214.7	206.7	179.3	40	الحشة الثانية
	224.7	204.3	178.7	50	
2.8	4.8			L.S.D 5%	
	217.1	207.3	178.7	متوسطات النتروجين	
	2.6			L.S.D 5%	
199.7	205.0	201.0	166.0	المقارنة (نثراً)	
201.3	230.3	208.3	165.3	30	
203.4	218.0	217.0	175.3	40	الحشة الثالثة
	220.3	210.3	171.3	50	

200				
7.				
2.6		4.4		L.S.D 5%
	218.4	209.2	169.5	متوسطات النتروجين
		2.4		L.S.D 5%

تشير نتائج الجدول2 إلى وجود تأثير معنوي لمستويات النتروجين وفي الحشـات الثلاث حيث ازداد ارتفاع النبات بزيادة مستوى إضافة النتروجين وكانت هذهِ الزيادة معنوية خطية موجبة وكانت الزيادة في ارتفاع النبات عند إضافة 150 و 300 كغم هَـ¹ مقارنة بمعاملة المقارنة هي (13.4% , 20.9%) بالتتابع في الحشة الأولى وفي الحشة الثانية

(16% , 21.5%) وبالتتابع وفي الحشـة الثالثة (23.4% , 28.8%) بالتتابع. وربما ترجع الزيادة في ارتفاع النبات في هذهِ الحشات عند إضافة النتروجين إلى دور هذا العنصر في الانقسام الخلوي ونمو النبات بالإضافة إلى دورة في بناء الحامض الاميني ال tryptophan الذي يشكل المادة الأساسية لبناء هرمون النمو IAA (Wareaing,1983) الذي يؤدي بدورهِ إلى زيادة ارتفاع النبات وتتفق هذهِ النتيجة مع ما توصل اليه) سلامة،2008) و عزيز،2009) و (صالح،2016) اللذين وجدوا زيادة في ارتفاع النبات في الذرة البيضـاء عند إضافة النتروجين. كما بينت النتائج ان تأثير مستوى النتروجين كان أكثر وضوحاً في الحشـة الثانية والثالثة في زيادة ارتفاع النبات مقارنة بمعاملة عدم الإضافة وهذا دليل على ان النبات قد استنزف ما موجود من النتروجين في التربة في الحشة الأولى، ولذا ظهر واضحاً تأثير إضافة النتروجين في الحشات اللاحقة.

2– المساحة الورقية (سم²) :

تشير نتائج الجدول 3 إلى ان النباتات المزروعة على مسافة 30 سم بين الخطوط قد أعطت أعلى متوسط للمساحة الورقية بلغ (2628، 2727، 2671) سم² للحشـات الأولى والثانية والثالثة بالتتابع واختلفت معنوياً فقط على طريقة الزراعة التقليدية نثرا اذا بلغ متوسط المساحة الورقية فيها (2468، 2544، 2482) سم² وللحشـات الأولى والثانية والثالثة بالتتابع. وربما يعود السبب في انخفاض المساحة الورقية عند الزراعة نثراً مقارنة بالزراعة على سطور إلى زيادة التنافس بين النباتات على متطلبات النمو المختلفة مما تؤثر على حجم المسـاحة الورقية الكلية للنبات وتتفق هذهِ النتائج مع ما توصـل اليهِ Gitz واخرون(2015) والجنابي (2016).

يلاحظ من الجدول 3 زيادة المساحة الورقية للنبات وبصورة معنوية مع زيادة مستويات النتروجين وكانت نسبة هذهِ الزيادة مقارنة بعدم الإضافة للمستوى 150 و 300 كغم N هَـ ¹ هي 14.5% و 22.5% في الحشـه الأولى وفي الحشة الثانية 15.2% و 22.1% وفي الحشـه الثالثة 23.9% و 29.0% بالتتابع كما يتضـح من هذهِ النتيجة ان زيادة المسـاحة الورقية تزداد نسبتها وتكون أكثر وضوحاً في الحشـه الثانية والثالثة مما يدل على ان النبات قد استنفذ النتروجين الموجود في التربة فبدأت الفروقات وتأثير إضافة النتروجين أكثر وضوحاً في الحشـه الثانية والثالثة. ان زيادة المساحة الورقية عند زيادة إضافة النتروجين يظهر أهمية هذا العنصر ودوره في انقسام الخلايا المرستمية مما ينعكس ايجابياً على حجم المجموع الخضري وتتفق هذهِ النتيجة مع ما وجده عبود واخرون (2017) في الذرة البيضاء و(فرج،2015)على محصول الشعير.

جدول 3. تأثير التسميد النتروجيني ومسافات الزراعة والتداخل بينهما في صفة المساحة الورقية (سم²) وللحشات الثلاثة.

المتوسط	مستويات النتروجين كغم هـ⁻¹			مسافات الزراعة (سم)	رقم الحشة
	300	150	0		
2468	2599	2528	2276	المقارنة (نثراً)	
2628	2950	2666	2266	30	
2609	2861	2655	2311	40	
2571	2795	2623	2296	50	الحشة الأولى
	98			L.S.D 5%	
60					
	2801	2618	2287	متوسطات النتروجين	
	52			L.S.D 5%	
2544	2656	2616	2359	المقارنة (نثراً)	
2727	3054	2799	2328	30	
2643	2832	2727	2368	40	
2670	2955	2698	2356	50	الحشة الثانية
	113			L.S.D 5%	
74					
	2874	2710	2353	متوسطات النتروجين	
	59			L.S.D 5%	
2482	2663	2609	2173	المقارنة (نثراً)	
2671	3067	2788	2157	30	
2641	2820	2821	2282	40	
2604	2849	2734	2230	50	الحشة الثالثة
	89			L.S.D 5%	
43					
	2850	2738	2210	متوسطات النتروجين	
	51			L.S.D 5%	

يُلاحظ من الجدول 3 وجود تداخل معنوي بين عاملي الدراسة وبجميع الحشات وربما يفسر هذا التداخل على أساس الفرق في الاستجابة النسبية لمستويات العامل الأول باختلاف مستويات العامل الثاني.

3– قطر الساق (سم):

أشـارت النتائج في جدول 4 إلى وجود تأثير معنوي لمسـافات الزراعة وفي الحشـه الأولى فقط اما الحشـه الثانية والثالثة فأن الفروقات بين المسافات ومعاملة المقارنة لم تصل حد المعنوية الا انهُ بصورة عامة يتضح ان الزراعة على مسافة 50 سم. قد أعطت أعلى متوسط لقطر السـاق بلغ 1.68 سـم واختلفت معنوياً عن بقية المعاملات اما في الحشـتين الثانية والثالثة فبالرغم من ازدياد قطر السـاق عند الزراعة على مسافة 50 سم بين الخطوط اذ بلغ قطر السـاق فيها 1.70 سـم الا انها لم تختلف معنوياً عند بقية المعاملات. ان الزيادة الحاصلة في قطر الساق عند تباعد خطوط الزراعة إلى قدرة الضوء على النفاذ بين النباتات مما ينتج عنه زيادة في توسـيع قطر النبات اما قلة نفوذ الضـوء فأنهُ يرجع إلى إنتاج نباتات ذات سـيقان رفيعة و تتفق هذهِ النتائج مع ما توصـل اليهِ الجنابي (2016) والذي أشار إلى زيادة النباتات في وحدة المساحة تؤدي إلى انخفاض معنوي في قطر الساق.

جدول 4. تأثير التسميد النتروجين ومسافات الزراعة والتداخل بينهما في صفة قطر الساق (سم) وللحشات الثلاثة.

المتوسط	مستويات النتروجين كغم هـ⁻¹			مسافات الزراعة (سم)	رقم الحشة
	300	150	0		
1.59	1.66	1.68	1.43	المقارنة (نثراً)	الحشة الأولى
1.61	1.76	1.53	1.53	30	
1.64	1.77	1.66	1.49	40	
1.68	1.79	1.69	1.56	50	
0.07	NS			L.S.D 5%	
	1.76	1.65	1.47	متوسطات النتروجين	
	0.04			L.S.D 5%	
1.68	1.74	1.73	1.56	المقارنة (نثراً)	الحشة الثانية
1.66	180	1.62	1.55	30	
1.69	1.81	1.71	1.53	40	
1.70	1.77	1.74	1.59	50	
NS	NS			L.S.D 5%	
	1.78	1.70	1.56	متوسطات النتروجين	
	0.06			L.S.D 5%	
1.69	1.83	1.65	1.58	المقارنة (نثراً)	الحشة الثالثة
165	176	1.64	1.54	30	
167	1.76	1.73	1.51	40	
1.70	1.78	1.72	1.60	50	
NS	NS			L.S.D 5%	
	1.78	1.68	1.57	متوسطات النتروجين	
	0.04			L.S.D 5%	

يبين الجدول 4 إلى وجود تأثير معنوي لمستويات النتروجين على متوسط قطر الساق ولجميع الحشات حيث ازداد قطر الساق معنويا بزيادة مستوى النتروجين المضاف حيث بلغت نسبة الزيادة في قطر الساق مقارنة بمعاملة عدم الإضافة للمستوين 150 و 300 كغم N هـ $^{-1}$ هي في الحشه الأولى (12.2%، 19.7%) بالتتابع، وفي الحشه الثانية (9%، 14.1%) بالتتابع وفي الحشه الثالثة (7%، 13.4%) بالتتابع وربما يرجع السبب في ذلك إلى زيادة المساحة الورقية بزيادة مستويات النتروجين الذي أدى بدورهِ إلى اعتراض أكبر كمية من الاشعة الضوئية مما أتاح للنبات الفرصة في زيادة انقسام الخلايا وتوسعها وتتفق هذهِ النتيجة مع ما وجدهُ عبود واخرون (2017) في الذرة البيضاء.

4– حاصل العلف الأخضر (طن هـ $^{-1}$)

يبين جدول 5 وجود تأثير معنوي لمسافات الزراعة ومستويات النتروجين والتداخل بينهما في متوسط حاصل العلف الأخضر وللحشات الثلاث و يتضح من هذا الجدول ان الزراعة على مسافة 30 سم بين الخطوط أعطت أعلى متوسط لحاصل العلف الأخضر في الحشة الأولى بلغ 47.62 طن هـ $^{-1}$ واختلف معنوياً عن الزراعة نثرا التي بلغ الحاصل فيها 44.43 طن هـ $^{-1}$ والزراعة على مسافة 50 سم بين الخطوط التي اعطت حاصلاً قدرهُ 46.29 طن هـــ $^{-1}$ ولكنها لم تختلف معنويا عن المعاملة المزروعة على مسافة 40 سم التي بلغ متوسط حاصلها من العلف الأخضر 47.03 طن هـــ $^{-1}$. كذلك في الحشة الثانية فقد تفوقت ايضا معاملة الزراعة على خطوط وبمسافة 30 سم في حاصلها من العلف الأخضر و اختلفت معنويا عن جميع المعاملات الأخرى حيث أعطت حاصلاً قدره 50.61 طن هـــ $^{-1}$ في حين أعطت معاملة الزراعة نثرا أقل متوسط لحاصل العلف الأخضر بلغ 46.66 طن هـــ $^{-1}$ واختلفت معنوياً عن جميع معاملات الزراعة على خطوط اما في الحشة الثالثة فقد تفوقت ايضا معاملة الزراعة على خطوط ولمسافة 30 سم بين الخطوط في حاصلها من العلف الأخضر إذ بلغ 52.28 طن هـــ $^{-1}$ واختلفت معنويا عن جميع المعاملات الأخرى بأستثناء معاملة الزراعة على مسافة 40 سم بين الخطوط التي بلغ حاصلها 51.19 طن هـــ $^{-1}$ وبقيت معاملة الزراعة نثراً أقل حاصل للعلف الأخضر بلغ 48.00 طن هـ $^{-1}$ والتي اختلفت معنوياً عن جميع المعاملات الأخرى وربما يرجع السبب في تفوق معاملة الزراعة على خطوط بمسافة 30 سم إلى تفوق هذه المعاملة في ارتفاع النبات والمساحة الورقية جدول (2،3) والذي انعكس ايجابا على زيادة حاصـــل العلف الأخضـــر وتتفق هذهِ النتيجة مع ما وجده Teurgut واخرون(2005) في علف الذرة السكرية و Mahmood واخرون (2012)في الذرة البيضاء.

أما بالنسبة لتأثير مستويات اضافة النتروجين فيبين الجدول 5 وجود تأثير معنوي لمستويات التسميد النتروجيني وفي جميع الحشـات ويتضـح من هذا الجدول وجود زيادة معنوية خطية موجبة بزيادة مستويات النتروجين حيث بلغت نسبة الزيادة في حاصل العلف الأخضر عند إضافة المستوى 150 كغم و 300 كغمN هـ $^{-1}$ مقارنة بعدم الإضافة. للحشة الأولى (14.4%، 22.5%) وفي الحشـــة الثانية (27.8%، 36.3%) وفي الحشـــة الثالثة (40.2%، 51.1%) بالتتابع يلاحظ من هذهِ النتائج هذهِ زيادة في النسبة المئوية للعلف الأخضر للنتروجين. كلما زاد عدد الحشات يؤكد أهمية إضافة النتروجين بعد كل حشة من الحشات و يلاحظ ان في معاملة عدم الإضافة يقل إنتاج العلف الأخضر بزيادة عدد الحشات مما يؤكد ايضاً أهمية هذا العنصر في زيادة النمو لهذا المحصـول في زيادة ارتفاعهُ وزيادة المسـاحة الورقية مما ينعكس ذلك على حاصـل العلف الأخضـر وتتفق هذهِ النتيجة مع ما توصل اليهِAfzal واخرون (2012) و(Eltelib,2004) .

جدول 5. تأثير التسميد النتروجين ومسافات الزراعة والتداخل بينهما في صفة حاصل العلف الأخضر(طن هـ -1) وللحشات الثلاثة.

المتوسط	مستويات النتروجين كغم هـ -1			مسافات الزراعة (سم)	رقم الحشة
	300	150	0		
44.43	46.78	45.56	46.96	النثر	الحشة الأولى
47.62	53.61	48.26	40.97	30	
47.03	51.51	47.78	41.79	40	
46.29	50.27	47.23	41.38	50	
1.03	1.58			L.S.D 5%	
	50.55	47.21	41.28	المتوسط	
	0.83			L.S.D 5%	
46.66	50.81	44.34	39.84	النثر	الحشة الثانية
50.61	58.89	52.80	40.31	30	
59.56	55.84	52.06	40.77	40	
49.22	54.67	52.19	40.80	50	
0.91	1.46			L.S.D 5%	
	55.05	51.60	4038	المتوسط	
	0.78			L.S.D 5%	
48.00	54.43	52.39	37.17	النثر	الحشة الثالثة
52.28	62.57	55.58	38.69	30	
51.19	59.59	54.80	39.17	40	
50.45	57.35	54.26	39.73	50	
1.49	2.29			L.S.D 5%	
	58.48	54.26	38.69	المتوسط	
	1.19			L.S.D 5%	

كذلك يبين الجدول 5 وجود تداخل معنوي بين العاملين مما يشير ذلك إلى ان اضافة النتروجين بمستويات مختلفة قد سلك سلوكاً متشابهاً في زيادة حاصل العلف الأخضر بزيادة مستوى الإضافة الا ان هذهِ الزيادة كانت أكثر وضوحاً في المسافات الضيقة عنها في المسافات الواسعة بين الخطوط.

أشارت نتائج الجدول6 إلى وجود تأثير معنوي لكل من مسافات الزراعة ومستويات التسميد النتروجيني وللحشات الثلاث وكان التداخل معنوياً فقط بين العاملين في الحشة الأولى والثالثة. وبينت النتائج في هذا الجدول أن في الحشة الأولى أعطت النباتات المزروعة على مسافة 30سم بين الخطوط أعلى متوسط لحاصل المادة الجافة بلغ 11.35 طن هـ[-1] واختلفت معنوياً عن بقية المعاملات باستثناء المعاملة المزروعة على مسافة 40 سم بين الخطوط فيما أعطت معاملة المقارنة المزروعة نثراً أقل متوسط بلغ 10.10 طن هـ[-1] واختلفت معنوياً عن بقية المعاملات. اما قي الحشة الثانية فقد تفوقت ايضا معاملة الزراعة على مسافة 30سم والتي أعطت حاصلاً قدرة 13.18 طن هـ[-1] واختلفت معنوياً فقط عن معاملة النثر التي أعطت أقل حاصل بلغ 11.97 طن هـ[-1].اما في الحشة الثالثة فقد أعطت ايضاً الزراعة على مسافة 30سم أعلى حاصل للمادة الجافة بلغ 14.65 طن هـ[-1] الا أنها لم تختلف معنوياً عن الزراعة على مسافة 40 سم والزراعة على مسافة 50سم التي أعطت كل منها حاصلاً قدرة 13.75 , 14.19 طن هـ[-1] بالتتابع فيما أعطت معاملة الزراعة نثراً أقل متوسط لحاصل المادة الجافة بلغ 13.41 طن هـ[-1] واختلفت معنوياً فقط عن الزراعة على مسافة 30سم , 50سم بين الخطوط وان سبب تفوق المعاملة 30سم بين الخطوط في حاصل العلف الجاف يرجع إلى تفوق هذه المعاملة في حاصل العلف الأخضر الجدول 5.

اما بالنسبة لتأثير التسميد النتروجيني وللحشات الثلاث فقد أعطت معاملة التسميد بالمستوى العالي من النتروجين حاصلاً من المادة الجافة أعلى من المستويات الأخرى بلغ 11.32 , 13.85 , 16.03 طن هـ[-1] للحشات الأولى والثانية والثالثة بالتتابع واختلفت هذه المعاملة عن المعاملات الأخرى معنوياً في حين أعطت معاملة المقارنة (عدم الإضافة) حاصلاً أقل من المادة الجافة بلغ 9.90 , 11.05 , 10.98 طن هـ[-1] وللحشات الثلاثة بالتتابع واختلفت معنوياً عن مستويات الإضافة الأخرى.

ان زيادة حاصل المادة الجافة بزيادة مستويات النتروجين يرجع إلى زيادة حاصل العلف الأخضر بزيادة مستوى التسميد النتروجيني مما انعكس ذلك ايجاباً على حاصل المادة الجافة الجدول 5.

اما التداخل المعنوي بين العاملين في الحشة الأولى والثالثة ربما يرجع السبب في الفرق في الاستجابة النسبية لمستويات النتروجين باختلاف مسافات الزراعة.

جدول 6. تأثير التسميد النتروجين ومسافات الزراعة والتداخل بينهما في صفة حاصل المادة الجافة (طن هـ$^{-1}$) وللحشات الثلاثة.

المتوسط	مستويات النتروجين كغم هـ $^{-1}$			مسافات الزراعة (سم)	رقم الحشة
	300	150	0		
10.10	10.57	10.23	9.49	النثر	
11.35	12.41	11.56	10.07	30	
11.05	11.52	11.45	10.17	40	
10.50	10.78	10.86	9.86	50	الحشة الأولى
0.44	0.55			L.S.D 5%	
	11.32	11.03	9.90	المتوسط	
	0.24			L.S.D 5%	
11.97	12.69	12.60	10.61	النثر	
13.18	14.68	13.71	11.15	30	
12.97	14.16	13.43	11.32	40	
12.89	13.85	13.73	11.11	50	الحشة الثانية
0.47	NS			L.S.D 5%	
	13.85	13.37	11.05	المتوسط	
	0.40			L.S.D 5%	
13.41	14.82	14.62	10.80	النثر	
14.65	17.69	15.37	10.91	30	
13.75	15.89	14.50	10.85	40	
14.19	15.71	15.46	11.38	50	الحشة الثالثة
0.62	0.85			L.S.D 5%	
	16.03	14.99	10.98	المتوسط	
	0.42			L.S.D 5%	

المصادر

1. الجنابي، ياسين عبد احمد.2016.تأثير التوزيع النباتي في نمو وحاصل صنفين من الذرة البيضاء، رسالة ماجستير — كلية الزراعة — جامعة الانبار. ع. ص 66.

2. حمدان، مجاهد اسماعيل.2006.ارشادات في زراعة وإنتاج الذرة البيضاء، الهيئة العامة للارشاد الزراعي. مشروع تطوير بحوث الذرة البيضاء. نشرة ارشادية رقم 19.

3. خريبط،حميد خلف واحمد محمد جاسم.2015. تأثير مواعيد الزراعة ومواعيد القطع في حاصل العلف الأخضر ونوعيته للذرة البيضاء (صنف ابوسبعين 1− صفات النمو وحاصل العلف الأخضر).مجلة العلوم الزراعية العراقية. 46(4) : 475−483.

4. سلامة، محمد عباس عبد.2008.استجابة الذرة البيضاء للتسميد النتروجيني. المجلة العراقية لدراسات الصحراء. المجلد (1) :11−17.

5. صالح، احمد خلف.2016.تأثير نقع البذور بالبيريدوكسين ورش النتروجين في نمو وحاصل الحبوب ومكوناته للذرة البيضاء. اطروحة دكتوراه — كلية الزراعة. جامعة الانبار. ع.ص 104.

6. عبود، نهاد محمد وحميد خلف خريبط واحمد خلف صالح.2017.تأثير التغذية الورقية بالنتروجين في حاصل الحبوب ومكوناته للذرة البيضاء. مجلة العلوم الزراعية العراقية،48(3)740−748.

7. فرج، حمزة طالب.2015.تأثير مستويات النتروجين وتجزئة اضافته في نمو حبة الشعيروحاصل الحبوب. رسالة ماجستير−كلية الزراعة −جامعة بغداد. ع.ص 119.

8. محمد، حسين عزيز.2009.تأثير التسميد النتروجيني والبورون في رفع كفاءة استخدام الماء لنبات الذرة البيضاء. مجلة الانبار للعلوم الزراعية. مجلد 7. العدد (4):30−42.

9. Afzal, M., A. Ahmad , Au.H. Ahmad.2012.Effect of nitrogen on growth and yield of sorghum forage (sorghum bicolor (l.) Moench cv.) Under three cuttings system. Ercetări agronomice în moldova vol. Xlv , no. 4 (152).

10. Banks, S. 2005. Annual forage for grazing or stored feed. Food and rural affairs, OMAFRA, Forage Web Site, Ontario.

11. Ellen, J. and J. H. spiertz. 1987. Effect of rate and timing of nitrogen dressing on grain yield. Fertilizer. Res, (3):177−190.

12. Eltelib H.A.M. 2004. Effect of nitrogen application on growth yield and quality of four forage sorghum cultivars. Msc. Thesis, Univ. of Khartoum, Sudan.

13. Gitz, D.C., Z.Xin, J.T. Baker,R.S.Lascano,and Burke ,J.J.2015. Canopy Light Interception of a Conventional and an Erect Leafed Sorghum. American Journal of Plant Sciences. 6, 2576−2584

14. Kumari, P., Pahuja, SK, Satyawan ; Arya, and Patil ,J.V. 2016. Broadening the genetic base of grain cereals.(pp.163−203) spring Springer, New Delhi.

15. Liang, G. H., C. C. Chu, N. S. Reddi , S. S. Lin and A. D. Dayton.1973. Leaf Blade Areas of Grain Sorghum Varieties and Hybrids.Agron.J.65:456–459.

16. Mahmood.A and and Bernd Honermeier.2012. Effect of row spacing and cultivars on biomass yield and quality of Sorghum bicolor L. Jour for Kulturflanzen. 64(7):250–257.

17. Prakash,R ,K.Ganesamurthy,A.Nimalakumari and P. Nagarajan.2010. Correlation and path analysis in sorghum (Sorghum bicolor L. Moench). Electronic Journal of Plant Breeding, 1(3), 315–318.

18. Quinby.J.R.1963.Manifestation of hybrid vigor in Sorghum. Crop Sci.3:258–291.

19. Steel, R.G.D. and J.H. Torrie. 1980. Principle and Procedures of Statistics. McGraw Hill Book Co., New York, USA., pp: 232–249.

20. Teutsch, C.2002. Warm–Season Annual Grasses for Summer Forage. Southern Piedmont AREC, Publications. No.418–004,Virginia ,USA.

21. Turgut, U. Bilgili, A. Duman & E. Acikgoz.2005. Production of sweet sorghum (Sorghum bicolorL. Moench) increaseswith increased plant densities and nitrogen fertilizer levels. Acta Agriculturae Scandinavica Section B–Soil and Plant. p ; 55: 236–240.

22. Wareaing, P.F.1983.Interaction between nitrogen and growth regulaters in the control of plant development. Group monograph p: 1– 4.

A HISTOLOGICAL STUDY TO DETERMINE THE EFFECT OF OVULATION RATE AND FERTILITY BY SOME ALCOHOLIC EXTRACTS OF PROPOLIS ON OVARIAN TISSUE AND OVIDUCT IN QUAIL

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Abstract:

Objective: This research was carried out in quail in a special place of the laboratory of histopathological diseases in the period 6/9/2018 until 23/11/2018, this study to detect effect of the addition of the alcohol extract of For Propolis Ovulation and fertility rate of the ovary and oviduct tissue in quail

Method: Eight groups and repetitions for each group. Groups were homogenous in weights and placed in 13 cages. Each group consists of 10 rats with 5 prices each. In the first treatment, quails were fed on regular feed without supplementation and quails were fed in the second treatment sessions add to it the alcoholic extract For Propolis in an amount of 200mg/kg. The third group is the same as normal food after adding For Propolis alcohol extract at a concentration of 400 mg/kg.

Results: The results of the histological study showed that feeding the quail on the standard ration added to it the alcoholic extract For Propolis at a concentration of 400 mg/ a physiological reproductive activity and an increase in the percentage of ovulation than the normal limit and an increase in the fertility rate without the appearance of unpleasant side effects or pathological or macroscopic or histological changes, as feeding the birds The alcoholic extract For Propolis led to the growth and increase of the ciliated and ciliated epithelial layer cells in their numbers and shapes in the oviduct, despite the rapid growth and rapid ovulation, unless there was no change in the shape of the egg or a change in its components

Key words: Cholesterol, Ovary Tissue, Alcohol Extract Of Each Of The Propolis.

Introduction:

The cultivation of medicinal and aromatic plants and herbs has spread in most parts of the world and has been used for its medicinal effectiveness and quick cure for diseases which are used as whole herbs, powders, or aqueous or aquatic or oily extracts (Shalmany, S. K. and Shivazad., 2006)

Propolis is a resinous material collected by honey bee workers from the buds and bark of some types of trees, including oak, birch, willow, chestnut, young elm, pine, fir, eucalyptus and other varieties. Due to the contrast of the sources of Propolis, its color tends gradually with all possible colors between yellow and black, and sometimes its color may tend to red or green, in addition to having a strong and aromatic smell (Martos, M et al., 2008).

METHODS

2.1.Preparation of the alcoholic extract For Propolis

Get the For Propolis from the local markets and cut the raw For Propolis into very small pieces. Solve 30 g of raw material in alcohol to get the For Propolis extract in 70 ml of ethyl alcohol at 96% concentration and place in a clean glass jar in a dark place, 4 times daily for at least two weeks. The solution is then filtered with Whatman1 filter paper (Shalmany and Shivazad, 2006). The solution is then placed in the rotary evaporator, at a temperature of 45 m for the purpose of extracting the solution. The solution was then placed in an electric oven at 45 ° C for 20 minutes to dispose of the remaining alcohol. After extracting the extract, it was weighed by a sensitive balance and stored in clean   containers.(Ziaran *et al.*, 2005)**.**

2.2. Histological study of light microscopy

For the purpose of studying the histological structure of the ovary and oviduct of quail, the following chemicals and colors were used.

2.3. Chemicals and dyes used

Formalin solution with 10% formalin fixative concentration Prepare the installer according to the method Vacca (1985).

Subject	Quantity / Ml
Formalin 40%	100%
Distilled water	900

I use this solution in the installation and have attended the accreditation (Bancroft and Stevens, 1982).

2.4. Aqueous Bouin's Solution

I use this solution in the installation and have attended the accreditation (Bancroft and Stevens, 1982).

Subject	Quantity / mL
Saturated aquatic acid	75
Formalin 40%	25
Acetic acid	5

2.5. Alcoholic alcohols

Attended progressive concentrations of ethanol alcohol 30%, 50%, 70%, 80%, 90% and

95% using distilled water Luna (1968).

2.6. Alcohol eosin stain

He attended Bancroft and Stevens (1982).

Subject	the quantity
Eosin Y	1 g
Ethyl alcohol Concentration 95%	99 milliliters

2.7. Harris Hematoxylin Stain

This is a color of basal colors that are generally used for all animal tissues, especially when using the color of the Eocene, attended in Bancroft and Stevens (1982).

Subject	the quantity
Hematoxylin powder	1 g
Potassium Chloride	20 g
Mercury Oxide	0.2 g
Alcohol Absolutely Absolute 100%	100 ml
Distilled water	200 ml
Acetic acid	8 ml

2.8. Dissection of animals

At the fifth week of the quail lifetime, 8 rats were taken from each treatment. The total number of quail was 16 and then the animal was explained after anesthesia based on Evans and Delhunta (1996) and the following:

1-Place the animal in a Dissecting Tray**.**

2- remove the skin, and then remove the sternum Caudal appendage until the area separated with the gravitational bone Coracoid bone Cranial.

3- Make a cut in the skin in the lower abdominal region.

4- Elevation of the liver after cutting the suture that connects it to the transverse septum barrier separating the pericardial cavity and the abdominal cavity.

5- The samples were transferred to the installed solutions Formalin.

2.9. Preparation of histological slides

I attended paraffin slices based on Luna (1968).

2.9.1. Fixation

Place a section of samples in a 10% formalin solution in time 24 hours.

2.9.2. Washing

Samples installed with a formalin solution washed 10% concentration with tap water for half hour.

2.9.3. Dehydration

The samples were passed with an ascending sequence of ethyl alcohol for the purpose of drawing water from the sample, starting from 70%, 80%, 90%, 95% and 100% for half an hour per concentration.

2.9.4. Clearing

Sample samples with Xylene for 15 minutes to make samples more transparent.

2.9.5. Infiltration

Before the leakage, the samples were transferred to a mixture of xylene and paraffin wax, melting 58-56m at 1: 1 for half an hour, then placed in molten paraffin wax and repeated three times for half an hour each.

2.9.6. Embedding and making blocks

The samples were immersed in the same type of wax used for filtration. The molten wax was poured into special molds for this purpose. The samples were then transferred to the air bubbles to remove hot bubbles around the sample and leave the mold to harden.

2.9.7. Trimming and Sectioning

The molds were waxed using a sharp scalpel and mounted on a wooden stand. The mold was placed on the Rotary Microtome. The models were then cut into serial sections with a thickness of seven (Seven, P et al., 2009) micrometers. The sections were then placed on clean glass slides coated with a thin layer of Mayer's aluminum and distilled water. Hot plate temperature 37 m to dry Bancroft and Stevens (1982).

2.9.8. Staining

The textile slides were colored with their own colors and the following :

2.9.9. Harris hematoxylin and eosin

The sections were colored with hematoxylin Harris-eosin

• Histological sections were put in the xylene and in two stages for ten minutes for each stage

• The syllables underwent a downward chain of concentration of ethyl alcohol

• Rinse the sections with Hematoxylin Harris for 15 minutes and then wash with tap water for 2 minutes. After that, wash the sections in distilled water for 2 minutes.

• The sections were painted with the eosin coating for 3-4 minutes, transferred to ethyl alcohol 70% concentration for 2 minutes.

• Dry the sections with a series of progressive concentrations of ethyl alcohol 70-100% and for 2 minutes per concentration.

• Raise sections by using xylene in two phases and for 2 minutes for each stage.

2.9.10. Mounting

The plates were placed using a Dextrin Plasticizer Xylene (D. P. X). Then, covered with glass cover and no bubbles, the glass slides were transferred to a 37 ° C hot plate and left to dry.

3. MICROSCOPY

3.1.MicroscopePhotography

Microscopic slides were examined using a light microscope and various magnification powers to suit the current study requirements. The microscopic slides were selected with a digital microscope equipped with a digital camera and a standard 12-megapixel Canon camera was used to visualize prototypes(Tekeli,A;Kustu,H. and Gelik ,L. 2011).

4. RESULTS AND DISCUSSION

4.1. The Ovary

The results of the current study showed the effect of alcohol extract of ginger in the morphological description and tissue composition of the quail liver and compared it with the treatment of control and the following(Abd El-Hady ., 2002)

4.2. Study of the histological sections of the ovaries and oviducts treated with alcoholic extract of Propolis at a concentration of 400 mg/kg

The results of the histological study showed that feeding the quail on the standard diet supplemented with alcoholic extract of propolis at a concentration of 400 mg/kg led to an increase in the number and size of mature follicles, early ovulation and improved fertility, as well as an increase in the number of uterine cells, a small increase in ovarian diameter and a rise in cells The epithelial lining of the ovary, as well as the oviduct, especially in the uterine region, and a little congestion in the blood vessels(Dogan *et al.*, 2006**)**. The reason for the increase in the number of ovarian follicles, as well as an increase in the height of the epithelial cell and the early maturation of the ovaries and genitals, can be attributed to the fact that propolis contains Triterpenic-acid methyle substances. The esters of these substances act as estrogen that cause these changes and may cause reactions to the positive action directed to activate and improve the gonads, as well as the epithelial cells and others (Kujumgiev, 1999). The egg follicles are more mature than the control, and the tissue forming the ovarian stroma is more than controlled, with little congestion in the

cortex. The pulp of the ovary, and this is due to the fact that propolis contains oils that work as a special mechanism to stimulate the pituitary gland to secrete quantities of hormones, especially the follicle-stimulating hormone (FSH) and the hormone LH to stimulate the growth of follicles and the formation and maturation of eggs, and this result was in agreement with the researcher (Marsh, 1993)), and that the use of the extract In the diet, from the first day of breeding to the day of marketing,(Abd El-Hady *et al.*, 2002) a sufficient time or a long period was sufficient for the secretion of additional quantities of the follicle-stimulating hormone (FSH) and the hormone LH, thus an increase in ovarian growth and in the number of cells lining the ovary and oviduct(Francis et al., 2004).
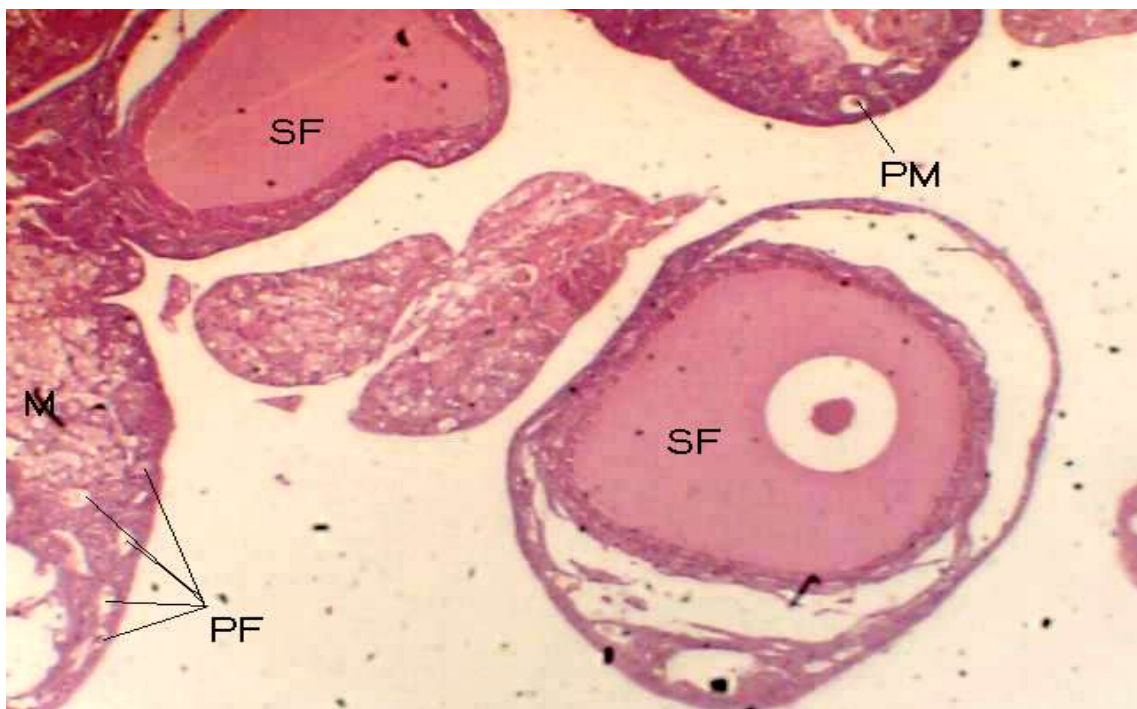
Figure 1: A cross section of an ovary of a female quail treated with alcoholic extract of propolis at a concentration (400 mg/kg), the growth of immature primary ovarian follicles is widely spread in the ovary, growth of mature secondary ovarian follicles, enlargement of the nucleus, and cell differentiation due to treatment with the extract (hematoxylin-eosin stain, 400X).

PF	Primary follicles
SF	Secondary follicles
M	Medulla
C	The cortex
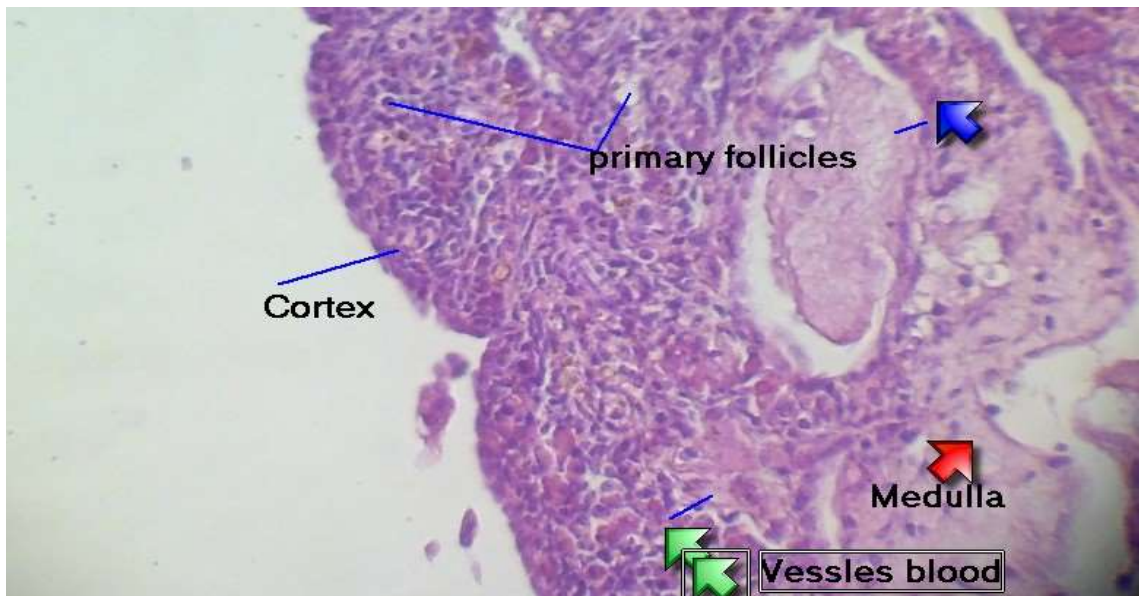
Figure 2: A cross-section of the ovaries of a female quail treated with alcoholic extract of propolis at a concentration (400 mg/kg). He noted the ovary and the areas it consists of, the cortex, which increased in the height of its cells. As for the pulp, it was noted that there was a contraction in its cells and a little congestion in the ovarian blood vessels, and the differentiation of the primary follicles Premature unripe (Hematoxylin-eosin stain, 400X).
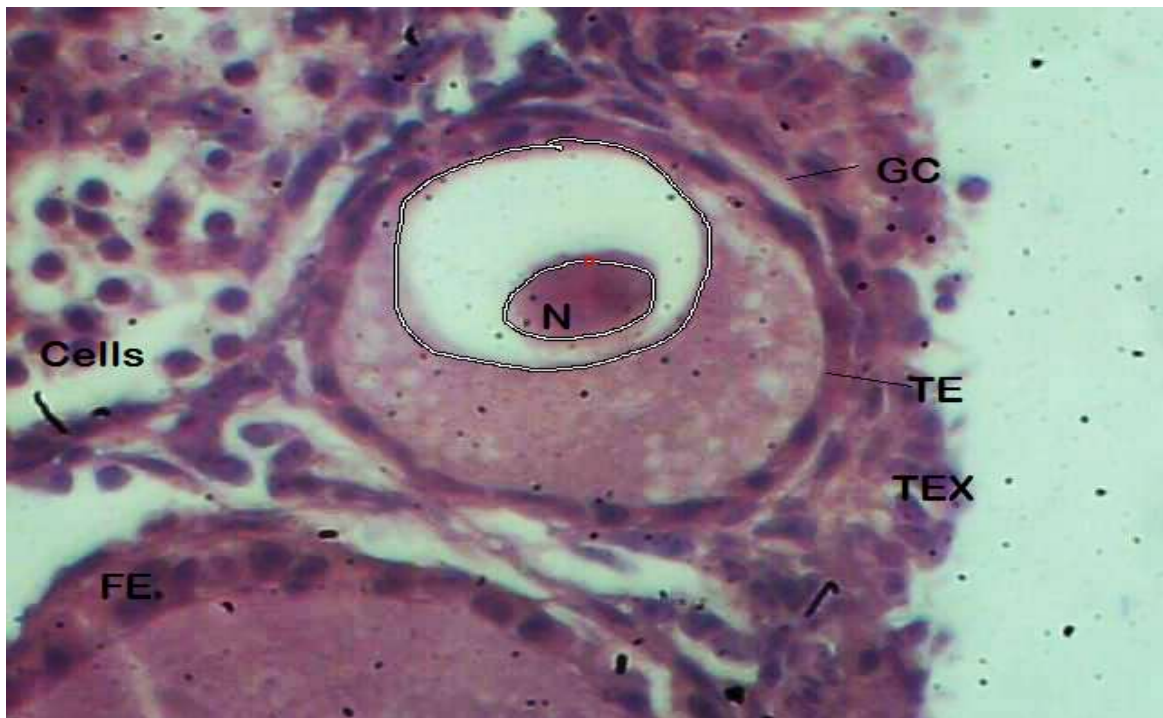
Figure (3): A cross-section of the ovary of a female quail treated with alcoholic extract of propolis at a concentration (400 mg / kg), note the increased growth of the ovarian vesicle and the parts that make up the vesicle are the internal theca, the external theca, the surrounding granulosa cells, the epithelial cells that surround the vesicle from the outside, and the surrounding cells (Hematoxylin-eosin stain, 400X).
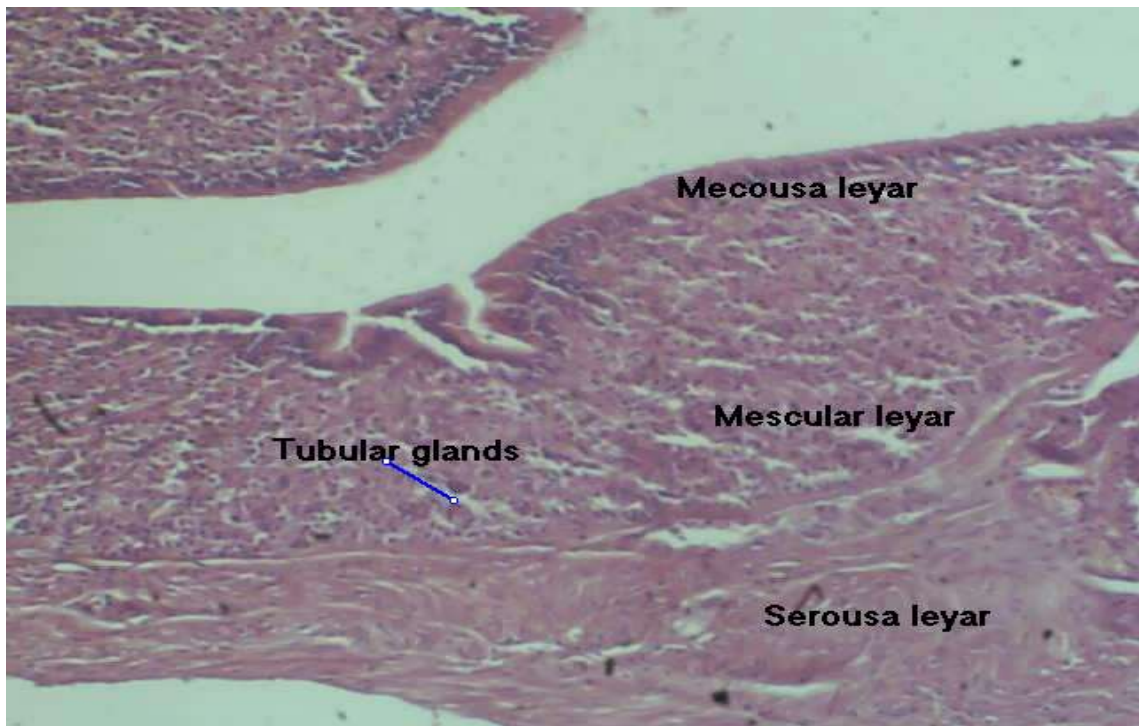
A cross section of the oviduct of a female quail treated with alcoholic extract of propolis at a concentration of (400 mg / kg). Note the layers that make up the oviduct, which are the mucous layer, the muscle layer and the serous layer, where there was an increase in the height of their cells, and note the tubular glands (Hematoxylin-eosin stain, 400X).
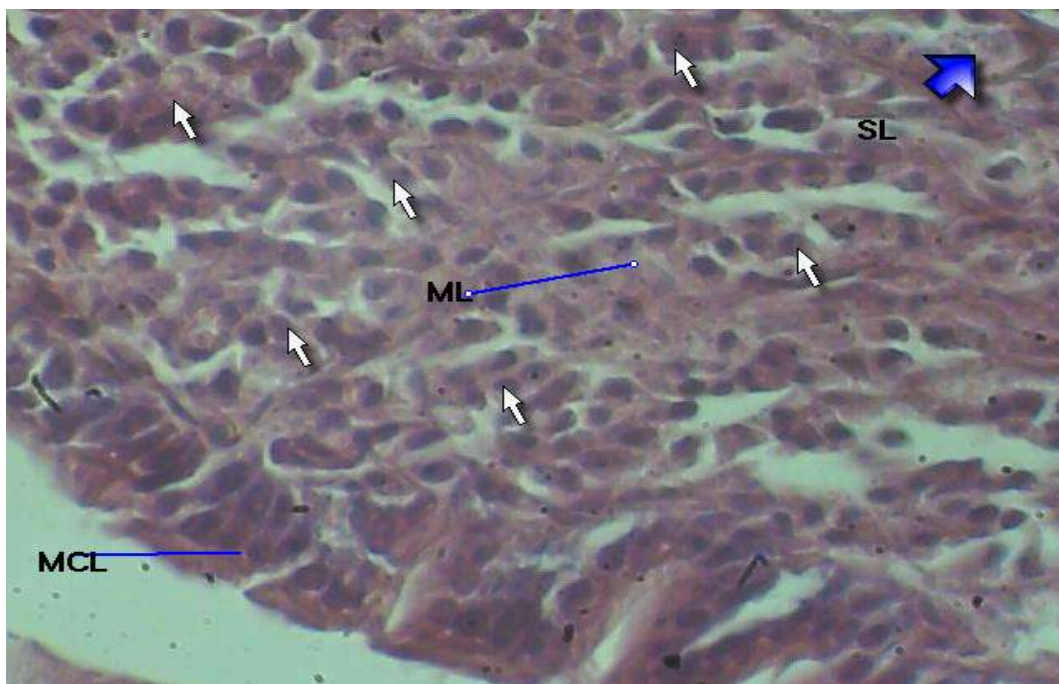
Figure (5):: a cross-section of the oviduct of a female quail treated with alcoholic extract of propolis at a concentration (400 mg / kg), this image shows the areas of the oviduct more carefully, where he noticed an increase in the number of cells lining the ovary canal, as well as an increase in multinucleated cells and an increase in oviduct tissue (hematoxylin stain). Eocene, 400X..

References:

1. **Abd El-Hady, F. K. and Hegazi, A. G. (2002).** Egyptian Propolis: 2.Composition, Antiviral and Antimicrobial Activities of East Nile Propolis. Z. Naturforsch. 57: 386-394.

2. **Bancroft, J. and Stevens, A.(1982).**Theory and practice of histological techniques. 2nd ed., Churchill livingstone, London: 662pp.

3. **Dogan,M.;Silici,S.;Saraymen,R.and Ilhan,I.O.(2006).** Element content of propolis from different regions of Turkey. Turkey .Acta. Alimentaria . J.35(1):127-130.

4. **Evans, H. E. and Delahunta, A. (1996).** Miller's guide to the dissection of the dog. 4th ed. W.B. Saunders Company, U. S. A. 359pp.

5. **Luna, L.G.(1968).** Manual of histological staining methods ,3rd ed , MC Graw – Hill book Co.,Inc.,New york:258pp.

6. **Kujumgiev,A.; Tsvetkova,I.; Sevkedjieva,Y.;Bankova,V.;Chiristov,R.and Popov,S.(1999).**Antibacterial, antifungal,and antiviral activity of propolis of different geographic origin.J.Ethnopharmacology.1(64): 235-240.

7. **Martos, M. V.; Navajas, Y. R.; Lopez, J. F. and Alvarez, J. A. P .(2008) .** Functional properties of honey, propolis, and Royal jelly. Journal of Food Science. 73 (9): 117-124.

8. **Seven, P. T.; Seven, I.; Yilmaz, M. and Simsek, U. G. (2009).** The effects of Turkish propolis on growth and carcass characteristics in broiler under heat stress. Animal Feed Science and Technology, 146: 137-148.

9. **Shalmany, S. K. and Shivazad, M. (2006).** The effect of diet propolis supplementation on ross broiler chicks performance. International Journal of Poul. Sci., 5 (1): 84-88.

10. **Tekeli,A;Kustu,H. and Gelik ,L.(2011)**.Effects of *Z.officinale* and propolis extracts on the performance ,carcass and some blood parameters of broiler chicks.Curr.Res.Poult.Sci.1(1):12-23**.**

11. **Vacca, L.(1985).**Laboratory manual of histochimistry .Raven press, New york. 328pp.

12. **Ziaran, H. R.; Rahmani, H. R. and Pourreza, J. (2005).**Effect of oil extract of propolis on immune response and broiler performance.Pakistan. J.of Biological sciences.8(10):1485-490.

ANATOMICAL STUDY OF THE EPIDERMIS LEAVES FOR SOME GENUS OF ASTERACEAE IN DIWANIYAH

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Abstract:

The current research includes anatomical study of epidermis of some genera that belong to the sunflower family Asteraceae (Compositae), which are Aster L., Calendula L., Dendranthema L., Helianthus L., Lactuca L., Launaea L. and Tagetes L.. And it was found that the anatomical characteristics have the importance of classification in the isolation of genera. The characteristic of undulation of the epidermal anticlincal cell walls of leaves was of great importance in isolation, and the study also showed some importance indumentum such as isolating Dendranthema L. from the rest of the genus because it has non-glandular hairs T-shape.

Key words: Asteraceae, Epidermal Cell, Stomata, Trichomes.

Introduction:

Anatomical characteristics are one of the most important taxonomic evidences. It is also the basis for plant diagnosis and taxonomic studies, and it facilitates the observation of all variations. And the development that took place with modern scientific means, especially the microscope, is one of the things that helped classifiers to rely on these qualities in classifying plants {1}. Many researchers used the anatomical characteristics of the various plant parts in isolating and classifying plants in many plant families, such as the study {2} on species of Poaceae family and the study {3} on Species Rubus Sanctus L. Several studies have been conducted for most of the genera of the Compositae family, the subject of the current study, and it is considered one of the most important families of flowering plants, as it is the largest, most prestigious and most widely spread, as it constitutes about 10% of the total flowering plants. As the family includes (23000-25000) species distributed into (1100-1300) genera {4} Also {5} mentioned that this family is one of the large plant families and includes 950 genera and the number of its types in Iraq reaches 2500 species spread over 1100. It is spread in semi-arid, tropical and subtropical areas and the diversity of its nature of life {6} , It is characterized by dry, achene fruits, usually single-seeded, called Cypsela, bearing a pappus calyx or missing it, and a non-endospermic seed with a large, straight embryo {7}. {8} showed a number of anatomical characteristics of the compositae family, such as the presence of different types of glandular hairs, covering hairs, and the presence of papillae on the abaxial epidermis.{9} explained the filaments as unicellular or multicellular surface structures.

The current study included an anatomical study of some genera belonging to the compositae family spread in Diwaniyah, namely (Aster sp, Helianthus sp, Lactuca sp, Launaea sp, Dendranthema sp, Tagetes sp, Calendula sp).

Materials &Methods

Epidermis

the upper and lower epidermal tissue was prepared from each wet sample of the species studied, it was collected from some areas of Diwaniyah and preserved in 75% ethyl alcohol directly.

A part of leaf was take and fixed place (the middle of the leaf) where includes the middle vein (midrib), then use the method of peeling or stripping to obtain the upper and lower epidermis, using a dissecting blade and forceps. Then the prepared of epidermis was transferred to a clean Petri dish containing water to remove the

remaining substances and tissue residues from the surface of epidermis. After that the removed epidermis was transferred to safranin dye at a concentration (1%) prepared in ethyl alcohol (70%) and placed in a petri dish for (2-5) minutes. then it was transferred to Petri dishes containing ethyl alcohol (70%) for several times to rid of the excess dye. after that, the epidermis was placed on slide containing a drop of glycerin, and the epidermis was brushed and covered with the slide cover, and then it was examined and study , where the stomata measurements was done by examined under the compound Olympus microscope and then it was photographed by the camera placed on the Olympus compound microscope. The stomata number was calculated on the upper and lower surfaces epidermal, also, the stomata spread calculated according to {10} that is following:-

$$\text{stomata index} = \{\frac{number\ of\ stomata\ cells}{number\ of\ epidermal\ cells + number\ of\ stomata\ cells}\} \times 100$$

Results

1-Epidermis

A-Ordinary Epidermal Cell

The current study showed that Epidermal anticlinal cell walls in basal and cauline leaves are identical within the same species on the adaxial surface and abaxial surface Fig, (1 and 2), the genera can be divided according to this characteristic, the symmetry between the two surfaces, into two groups:

The first was the same-shaped represented by the species (*Aster sp., Calendula sp., Lactuca sp., Launaea sp.*) as for the second group were different between the adaxial and abaxial surfaces and they represented the rest species, tables (1,2) and plate (1 and 2).

The species *Launaea* sp. was singled out by the absence of undulate walls if its walls are curved and curved - straight – Curved it shared this characteristic with the walls of the upper surface of the species *Dendranthema* sp., as well as the presence of straight walls.The last sp.ecies was distinguished that the walls of the lower surface were Undulate and undulate - strongly undulate, which is characteristic of the species *Aster* sp., on the upper and lower surfaces.

As for the species *Helianthus* sp., the walls were curved on the upper surface and undulate strongly on the lower surface.

The species *Lactuca sp.* distinguished the presence of straight - curved on the two surfaces, as well as its presence in the upper surface of the species *Tagetes sp.*,

whose lower surface is characterized that its walls are undulating - curved only. Tables (1,2) shows the shapes of the walls of the studied cells.

From observe the table (1,2), it was find that the dimensions of the cells and their shapes also vary between species, as their average lengths on the upper surface ranged between (58.3) μm in the species *Dendranthema sp.* and (94.58) μm in the species *Tagetes sp.*, as for the lower surface, the average ranged between (55) μm in the species *Aster sp.* and (91.6) μm in the species *Calendula sp.*. As for average width, it ranged on the upper surface between (24.3) μm in the species *Lactuca sp.* and (62.91) μm in the species *Tagetes sp.* and in the lower surface, the average width ranged between (25.5) μm in the species *Aster sp.* and (52) μm in the species *Tagetes sp.*

B- Stomata

The current study has shown stomatal complex for the species that were studied existence four types of complexes the first the common one, was of the anomocytic type which is characterized by the absence the subsidiary cell which surrounding the guard cells, second hemiparacytic, in which there is one subsidiary cell parallel to the guard cell, and the third hemidiacytic as there is one subsidiary cell perpendicular to the guard cell, the fourth type is the anisocytic, where the stomata are surrounded by three subsidiary cells of gradual size.

there is find The anomocytic and anisocytic species in all species, as well as the distinction of species *Aster* sp. in the presence of the hemiparacytic and species *Dendranthema* sp. presence of the hemidiacytic , the shapes of the guard cells were kidney shaped and ranged from broad short kidney to narrow elongated kidney, and it was show that there was a difference in the number, arrangement and size of the epidermal cells surrounding the stomata in   anomocytic type and the number of common was (4-5) cells, and it may be three or six cells.

As for the arrangement of cells around the stomata, it is anomocytic in the case of the presence of four cells usually there are two lateral cells so that each parallels a guard cell and the other two cells are vertical or each two cells are parallel to the guard cell so that the common wall between them is perpendicular to the opening of the stomata, may overlap and a fifth cell   between them. may be varies The arrangement of epidermal cells when they are six cells the may be two cells parallel for a guard cell and the rest of the cells are arranged around other guard cell, or they are random, or they are arranged symmetry so that every three cells are parallel to one guard cell so that the common walls of the terminal cells are Parallel to the

stomata opening, or the cells are in another arrangement, as the two cells are perpendicular to one guard cell, and the remaining two cells are anchored Stomata on both surfaces. The study showed that the stomata were of the type amphistomata, as they are located on the upper and lower surfaces ,differences in stomata density were observed on the two surfaces. From the observation of Table (1,2) and Figure (1), it was found that the upper surface was characterized by having the lowest for stomata density, which was characterized by the species *Aster* sp. reaching (7.89), and by the highest value which characterized by the species *Tagetes* sp., which amounted to (32).

As for the stomata dimensions, the length of the stomata on the lower surface ranged between (15.5) μm in the species *Aster* sp. and (29) μm in the species *Helianthus* sp., while the width of the stomata ranged between (2.9) μm in the species *Launaea* sp. and (9.5) μm in Species *Tagetes* sp., table (2).As for the upper surface, the length of the stomata ranged between (16) μm in the species *Aster* sp. and (23.5) μm in the species *Calendula* sp., and the width ranged between (4) μm in the species *Launaea* sp. and (9) μm in the species *Calendula* sp., Table (1).

As for the dimensions of the guard cells, the lengths of these cells on the lower surface ranged between (21) μm for the species *Lactuca* sp. and (43) μm for the species *Helianthus* sp., and the width ranged between (8) in the species *Aster* sp. and (13.5) μm in the species *Calendula* sp., Table (2).

As for the lower surface, the length of the guard cells ranged between (23.5) μm in the species *Aster* sp. and (39.5) μm in the species *Tagetes* sp., and the width ranged between (7.5) μm in the species *Aster* sp. and (16) μm in the species *Calendula* sp. , Table (2).

2- Indumentum : Figure (4,3)

Represented the Indumentum in the genera studied with Hairs and Papillae, which differed in their shapes and distribution according to the genera , can be divided The hairs into two types : Aglandular Hairs, which are common and Glandular Hairs, they were all uniseriate, nd the glandular hairs were of two types

Branched Multicellular hairs , the terminal cell is tow-armed, T-shape, and either equal or unequal in length. It is found in the species *Dendranthema* sp. (Plate 4, 5,4). Or the be hairs unbranched multicellular hairs, and they be varied in shapes and numbers of cells among the studied genera. The results showed the existence of bicellulur aglandulur hair, are rounded apical cells in species *calendula* sp. Fig. (4,1) and pointed end in species *Helianthus* sp.. existence it On the two surfaces in the

first species and on the lower surface in the second species (Fig. 4,3), as well as the existence of multicellular hairs single Whip-like, apical cell is characterized by narrow bristles similar to a whip compared to other cells in the species *Tagetes* sp. and on the lower surface of the species *Helianthus* sp., and from these characteristics came the name plate (4,2).

And Found finger-shaped filaments were found, their cells tapering towards the top, and found in species *Tagetes* sp. and in species *Calendula* sp. (Fig. 4,6). unique the species *Helianthus* sp. in the presence of bristles resembling the shape of a rosary. Each cell appears oval-spherical (Fig. 4,7)

As for the glandular hairs, they differed in their shapes and number of cells according to different races, and they can be divided into two groups, the first sessile because there is no carrier. It was found in the species *Calendula* sp., *Tagetes* sp., *Dendranthema* sp., and *Helianthus* sp.. for the second group, it is carried by a carrier that varies in the number of cells (3- or more) and was found in The species *Dendranthema sp.* only. As for the glandular head, it differed in the number of cells. It is either one-celled, two-celled, or four-celled them were found in the species *Tagetes* sp.. Fig. (3)

As for the papillae, they are projections present on the surface of the epidermis and were represented two type of round-shaped papillae, small and large, found on the surface of the epidermis of the species *Calendula* sp. fig. (8,4), and a small and large sharp triangular papilla that resembles a thorn and found on the epidermis of the species *Calendula* sp. fig. (4,9).

Table No. (1) Measurements and variations in the characteristics of the upper epidermis and the stomatal system of cauline and basal leaves measured (in micrometers)

	Species	Upper epidermis					Average cell length * cell display rate	Wall shapes
		Guard cells		stomata				
		width	length	Stomata guide	width	length	Upper epidermis	
1	*Aster sp*	8 (10 – 7.5)	29.5 (37.5 -22.5)	10	6.5 (2.5 - 10)	16 (20-12.5)	36* 73	wavy- very wavy
2	*Calendula sp*	13 (12.5 – 15)	38.5 (32.5 - 45)	16.6	9 (7.5 - 12.5)	23 (17.5-27.5)	72.9 * 55.4	Wavy curved curved wavy curved-straight
3	*Dendranthema sp*	10.5 (10-12.5)	33 (37.5-27.5)	12.5	7,5 (5 - 10)	18.5 (15 - 25)	5803 * 42.8	Curved wavy curved-straight undulating
4	*Helianthus sp*	10.5 (12 - 10.5)	43 (47.5 - 37.5)	30.76	5 (7.5 - 2.5)	16 (12.5 - 25)	75.5 * 43	Curved very wavy
5	*Lactuca sp*	8 (10- 7.5)	21 (17.5 - 25)	7.89	7.4 (6,7 - 7,2)	15.5 (20 – 12.5)	94.58 * 62.91	Straightwavy straight-curved
6	*Launaea* sp	9 (10 - 7.5)	28.1 (35.5 -22.5)	18.75	4 (5 - 2.5)	20 (25 - 15)	85.5 * 51.7	Curved – straight straight
7	*Tagetes* sp	11.5 (10.5 - 12)	39 (47.5 - 32.5)	32	8 (10 – 7.5)	21 (25 - 17,5)	94.58 * 62.91	Crispy wavy-curved straight-curved

The numbers outside the bracket represent averages

Table No. (2) Measurements and variations in the characteristics of the lower epidermis and the stomatal system of cauline and basal leaves measured (in micrometers)

	Species	Lower epidermis					Average cell length * cell display	Wall shapes
		Guard cell		stomata			Lower epidermis	
		width	length	Width	length	Stomata guide		
1	Aster sp	7.5 (12-5.5)	23.5 (23.5 - 30)	8.25 (12,5 – 6,25)	25.5 (47.5 - 17.5)	24.24	42* 55	wavy- very wavy
2	Calendula sp	16 (12.5 – 15)	37 (30-40)	7.5 (5-10)	21 (15 - 30)	21.4	49.16* 91.6	Wavy curved curved wavy curved-straight
3	Dendranthema sp	11.5 (10 - 12.5)	39 (35-42)	6 (2.5 – 7.5)	18.5 (10-22.5)	16.6	29.5 * 58.5	Curved wavy curved-straight undulating
4	Helianthus sp	8.5 (10 - 7.5)	29 (32.5 - 25)	5 (2.5 -7.5)	29 (25-37.5)	17/85	43 * 72.5	Curved very wavy
5	Lactuca sp	11 (7.5-10)	27.5 (22.5 – 32.7)	5.25 (6.2- 5.5)	15.5 (10-20)	11.1	74.5 * 52	Straightwavy straight-curved
6	Launaea sp	9 (7.5-10)	27.5 (30 - 37.5)	2.9 (2.5 -5)	18.75 (25-12.5)	25	30 *72	Curved – straight straight
7	Tagetes sp	13.5 (12.5 - 15)	39.5 (35-42.5)	9.5 (7.5 -12.5)	17.5 (22.5-12.5)	18.75	52 * 47.5	Crispy wavy-curved straight-curved

The numbers outside the bracket represent averages
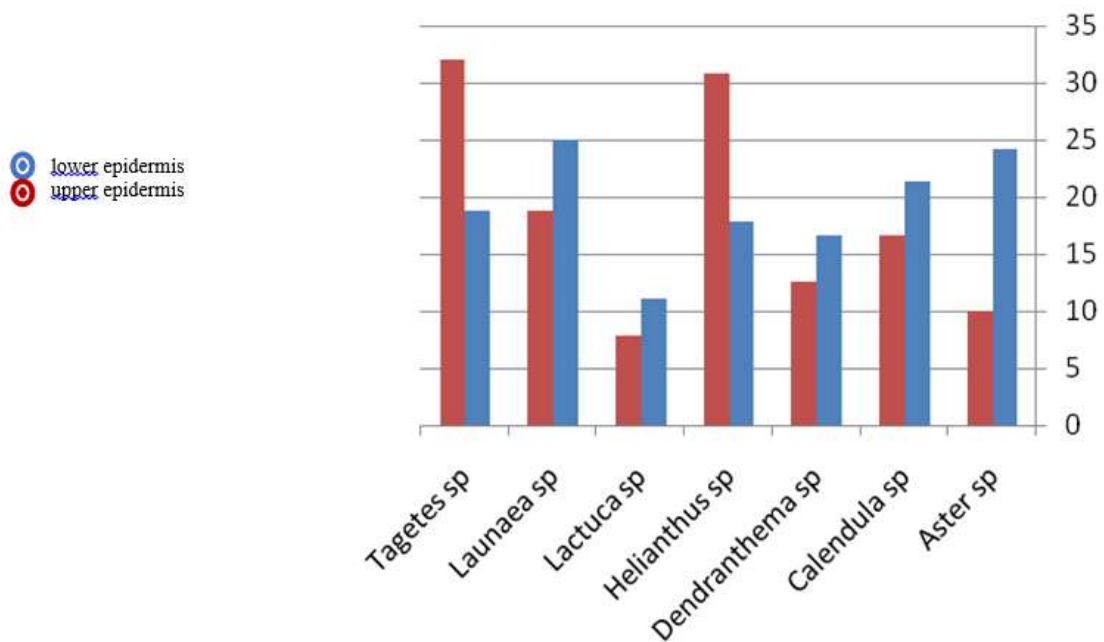
Fig. (1) Changes in the stomata guide for the upper and lower surfaces of leaves according to Table (1)
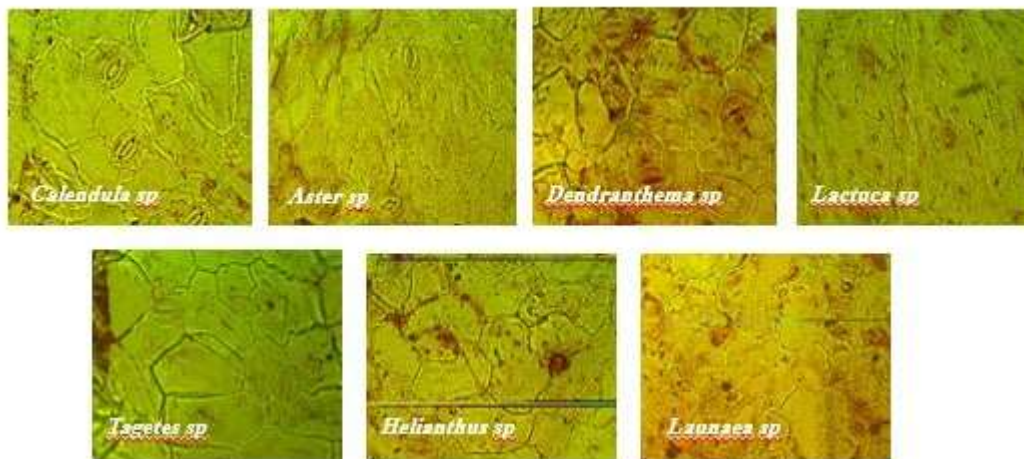
Fig. (1) The upper epidermis of the genera leaves µm 33
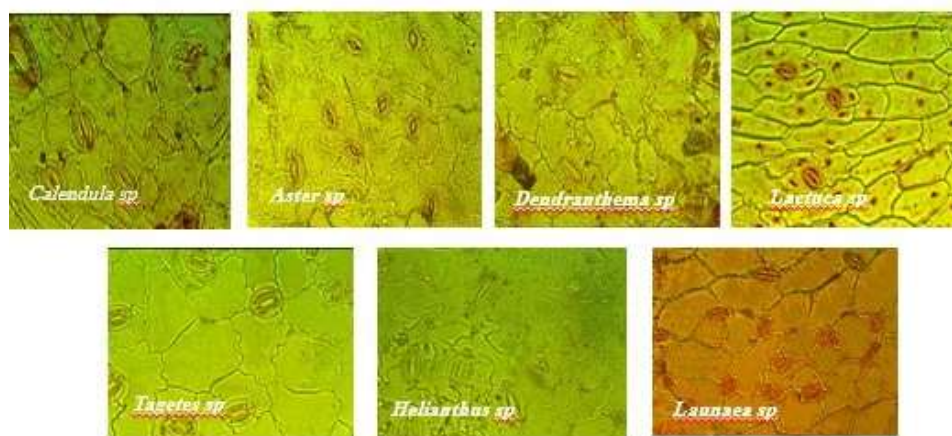
Fig. (2) The Lower epidermis of the genera leaves µm 33
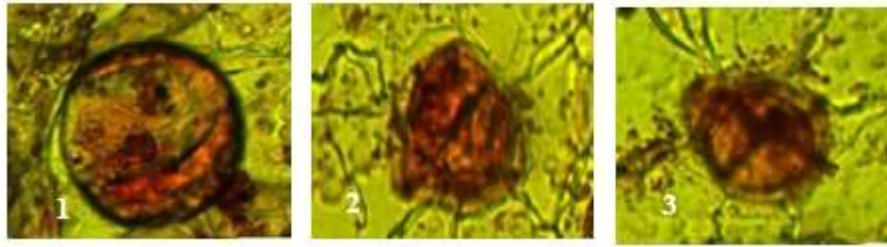
fig. (3) Types of glandular growths on the surface of the epidermis of the studied races100µm

1-Uni-headed gland found on the leaves of the genus *Calendula* sp, *Tagetes* sp. , *Dendranthema* sp. , and *Helianthu*s sp.

2- bi-headed gland found on the leaves of the genus *Calendula* sp. , *Tagetes* sp, and *Helianthus* sp.

3- quadrupedal gland located on the leaves of the genus *Tagetes* sp. and *Dendranthema* sp
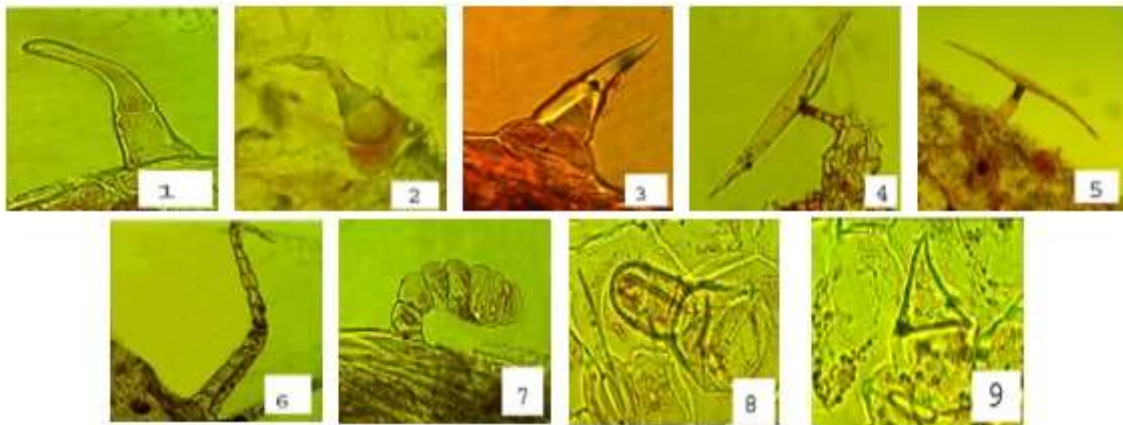
Fig. (4) Types of non-glandular growths on the surface of the epidermis of the sexes studied

1- The two-celled filaments are rounded apical cells in the genus *Calendula* sp

-Single multicellular hairs. The apical cell is characterized by narrow, flagella-like hairs compared to other cells found in the genus *Helianthus* sp and *Tagetes* sp

3- Double-celled filaments with a pointed end in the genus *Helianthus* sp and *Calendula* sp

4- unequal arm T-shape hairs in the genus *Dendranthema* sp

55- Equilateral T-shape hairs in the genus *Dendranthema* sp

6- Finger-shaped, multicellular filaments, whose cells tapering towards the apex, were found in the genus *Tagetes* sp and *Calendula* sp

7- bristles resembling the shape of a rosary, each cell appears oval-spherical in the genus *Helianthus* sp

8- Small and large rounded papillae found on the surface of the epidermis of the genus *Calendula* sp

9- A small and large sharp triangular papilla that resembles a thorn and is found on the skin of the genus Calendula sp

Discussion

Through the presence of glandular hairs , it possible to isolate species into two groups, as indicated by the previously mentioned results and that is through the sessile glandular hairs that are spread in species *Calendula* sp., *Tagetes* sp., *Dendranthema* sp. and *Helianthus* sp. distinguished species *Dendranthema* sp. from the studied species the presence of glandular hairs -mounted on a carrieron , as for the species *Helianthus* sp. it also unique in the presence of bristles resembling the shape of the rosary each cell appears oval - spherical From the foregoing, it was possible to clarify the anatomical significance of some epidermis characteristics for some of the genus that were studied in isolating and diagnosing these genera from each other.

Through the results shown in Table (1,2) it is noted that the dimensions of the epidermal cells as well as their shapes also vary between species as species *Tagetes sp.* had the upper limit of the average length of the upper surface of the epidermis and limit lower in species *Dendranthema* sp. ,while the upper limit was in the species *Calendula sp.* limit of the lower surface epidermal cells, the species *Helianthus sp.* was distinguished from the species *Tagetes* sp. and the species *Lactuca* sp. in the length of the stomata of the lower surface of the epidermal cells.

As for the display rate, it represented species *Tagetes* sp. as the upper limit, and species *Dendranthema sp.* lower limit for lower and upper surface of the species that were studied.

The study showed the presence of four species of stomatal complexes, and this is not consistent with Solerder {11} in the presence of the divergent type only in Asteraceae family , the results agreed with {12} that the anomocytic is the common in Asteraceae family.The study confirmed with the findings of {13}, {14} in the presence of the hemiparacytic and hemidiacytic in Asteraceae family, as the results recorded their presence in both lower and upper surfaces of epidermis, and Table (1,2) shows the guard cell evidence of between the upper and lower surfaces, as it was larger on the lower surface and this may be response to   environmental

conditions, {15},{16} have suggested that increase in stomata size and frequency may be a response to certain environmental conditions such as drought and increased exposure to sunlight.

It also clear through the study that indumentum an important taxonomic diagnosis of species as well as other morphological and anatomical characteristics, it has been observed that there single-row multicellular glandular hairs branching in the shape of a letter T and they are either equal or unequal in length carried on a multi-celled holder, and species *Dendranthema* sp. it unique to and thus it was possible to isolate it from the rest of species that were studied, the species *Helianthus* sp. was also unique in the presence of the non-glandular multicellular flagellated hairs with this characteristic and it possible to isolate it from the rest of the genera, it also possible to isolate the species *Calendula* sp. from species of the genera studied by the non-glandular filaments for two cells.

Also, non glandular hairs found in this family, and this is in agreement with the study {17}, and is in agreement with the research study hairs is found non glandular and glandular in *Tagetes* sp {18}.

Refernces:

1- Metcalf,C.R.andChalk,I.(1950). Anatomy of Dicotyledons. clarendeo Press. vol. 2:782 – 804.

2-Ali, J.K.;Sosa,A.A.; Baji ,S.H.(2022). Anatomical Study of Species in Poaceae Family in Iraq. Indian Journal of Ecology (2022) 49 Special Issue (19): 68-72

3- Sosa, A. A. (2022). Anatomical Study of the Epidermes and Cross-Sections of Stems, Petioles and Leaves, and a Study of Pollen Grains of the Species Rubus Sanctus L. in Diwania. In *IOP Conference Series: Earth and Environmental Science* (Vol. 1060, No. 1, p. 012050). IOP Publishing.

4- Werker,E.(2002). Trichome diversity and development.Adr.Bot.Rev., 31:1-31.

5- Shlash,H.M.(2016). Acomparative Anatomical Study of the Species Aster subulatus and Aster tripolium (Asteraceae) inTikrit- Iraq.Tikrit Journal of Pure Science.(4) 21

6- Zareh,M.M.(2005). Review Synopsis of the family Asteracaea in Egypt. Inter.J.Agri.Bilo.,7(5):832-844.

7- Adedeji,O.and O.A. Jewoola (2008). Importance of Leaf Epidermal Characters in the Asteraceae Famil. Not. Bot. Hort.Agrobot.(luj 36 c2):7-16.

8- Metcalfe, C.R. (1979). Anatomy of Dicotyledons.Vol.2,Oxford,U.K.

9- Werker,E.(2002). Trichome diversity and development.Adr.Bot.Rev., 31:1-31.

10- Stace,C.A. (1965). Cuticular Studies as an aid to plant taxonomy. Bull.Brit. Mus. (Nt. Hist.) Bot.4(1):3-78.

11- Solerder , H. (1908) . Systematic Anatomy of the Dicotyledons , Oxford Clarendon Press , vol. 1: 479 pp.

12- Metcalf,C.R.andChalk,I.(1950). Anatomy of Dicotyledons. clarendeo Press. vol. 2:782 – 804.

13- Abu-Serag, N. A .M.(1998).A Sytematic Study of the Sp.ecies *Lactuca* L. (Compositae) and Related Genera in Ieaq. M.Sc. Thesis , Babylon Univ.

14- Susa,A.A.(2000).A Systematic Study of Sp.ecies *Launaea* Cass. (Compositae) in Iraq.M.Sc.Thesis,AL-Qadisiya Univ.

15- Esau,K.(1953). Plant Anatomy, Second. Toppan Company, Ltd. 767pp.

16- Amran,Z.K.(1988).A Systematic Study of the Sp.ecies *Teucrium* L.(Labiatae) in Iraq. M.Sc.Thesis.Univ. Of Basrah, Unpubl.

17- Mohammed, Z. B. Muhammad (2011). Anatomical and Taxonomic Study of some three-and four-carbon of the vehicle family (Compositae) in Iraq. Master. College of Education. Univ. Tikrit.

18- Anaya-Gutiérrez, E. J., Gutiérrez, J., Serrato-Cruz, M. A., & Vázquez-Sánchez, M. (2022). Anatomía foliar de nueve especies de Tagetes L.(Tageteae: Asteraceae). Botanical Sciences, 100(3), 667-684.

ESTIMATION GENOTYPIC ENVIRONMENTAL INTERACTION BY USING GGE BI-PLOT ANALYSIS OF COTTON GENOTYPES (GOSSYPIUM HERSUTUM L.)

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Abstract:

Seven cotton genotypes were grown in a different environmental conditions (as a combination among plant densities: 15, 20, and 25 cm under salt and non salt stress irrigation) to estimate genetic behavior in different environments of cotton genotypes (Ceebro, W888, Pac-cot189, Lashata, Cocker310, Montana, and Ik259).Analysis of variance for the interaction environments with the genotypes according to Randomized Completely Block Design with three replications were used, furthermore GGE biplot analysis for the seed cotton yield. Results Showed : Environments affected high significant in seed cotton yield for studied genotypes. Genotypic and genotypic environmental interaction contribute of 14.7 and 32.2% of variation respectively. PC1 and PC2 interpreted 53.9 and 26.5 % respectively of differences in GGE variances.IK259 Genotype the most productive and stable than others for high PC1 and low absolute value of PC2.E6 environment correlated significant and positive with other environments that means the effect of salt water stress in a wide distance among plants (25cm). Better performance of IK259 genotype was under un salt stress conditions in narrow distances among plants(15 cm). While Pac-cot genotype was favorable in most salt stress conditions. Consequently IK259 and Pac-cot189 genotypes are productive and desirable in studied   environments.

Key words: Cotton Genotypes, Environments, GGE Bi-Plot Analysis.

Introduction:

The important of cotton fiber crops came out from their superior quality characteristics of lint cotton to the other natural fibers. Quantity lint yield controlled by the genetic ability which may be interpreted by environments factors. Recent years showed deterioration of seed cotton yield though existence many cultivars in Iraq, which can be justification by the shortage information about performance and stability of genotypes across wide range of environments. Potential yield can be consist by the genetic ability which can be drift by environmental factors. Therefore, stability approaches are important idea in understand behavior trait in environment or multi traits in multi environments [1] Each plant breeding program should be involve understanding the stability of yield across wide range of environments that regard the final step for promising genotype before recommend of depend the preferable genotype in a relevant environments. Many statistical and genetical approaches proposed from plant breeder such as Finally and Wilkinson 1963 , Ebrhart and Rusell, 1966 Shukula and GGE biplot methods [2,3]. GGE biplot method is the most graphical modern method technique in distinguish genotype performance in multi environments [4]. High performance of genotype under different environmental conditions is a most important goal in breeding program, therefore the interaction must be consider through testing potential ability under different environmental conditions [5]. GGE biplot analysis use principal component analysis in explanations the differences among genotypes in terms of figures illustrate variability caused differences in traits in terms of stability parameters [6,7]. Seed cotton yield and it's components almost aren't congruent in their performance in different environments [8,9]. Stable genotype doesn't affect by changing environments and in a high delimited and breeding value of breeding program [10].GGE bi-plot explain relationships among genotypes, and environments in addition of interactions, better genotypes for each environments and ideal genotype according to their direction ability and variability in principle component analysis. The study aimed to determine ability and stability for seed cotton yield under different environment of cotton genotypes.

Materials and Methods

A study performed at agriculture field crops farm\ Baghdad governorate\ Al-Mahmoodiyah district(33.05N latitude, 44.32E longitude) to estimate genotypic environmental interaction by using GGE bi-plot analysis for seven cotton genotypes(table 1).

No.	Symbol	Genotype	Origin
1	G1	Ceebro	Greece
2	G2	W888	USA
3	G3	Pac-Cot 189	USA
4	G4	Lashata	Espain
5	G5	Cocker 310	USA
6	G6	Montana	USA
7	G7	IK259	Greece

Environmental treatments obtained from combinations among plant distances:15, 20 and 25 cm and salt stress irrigation: 1 and 6 d.m^{-1}, resulted in six environments(E1:15 cm*1 d.m^{-1}, E2:15cm*6 d.m^{-1}, E3:20cm*1 d.m^{-1}, E4:20cm*6 d.m^{-1}, E5:25cm*1 d.m^{-1}, E6:25cm*6 d.m^{-1}).Seeds grown in 20/ 4/ 2020 after estimation soil chemical properties as shown in table 2.Two types of irrigation water was used : River irrigation water (EC=1 d.m^{-1}) and salt irrigation water (6 d.m^{-1} obtained from adding salt to water till reach determined regime).

Table 2. Soil properties

No.	Characteristics	Rank	Unit
1	Ph	7.7	
2	Organic matter	15.5	gram.kilogram^{-1}
3	N	10	Milligɛram.Kilogram^{-1}
4	P	15.1	Milligram.Kilogram^{-1}
5	K	54.5	Milligram.Kilogram^{-1}
6	Na	93.3	Milligram.Kilogram^{-1}
7	Sand	501	gram.kilogram^{-1}
8	Silt	263	gram.kilogram^{-1}
9	Clay	224	gram.kilogram^{-1}
10	Texture	Sandy Clay Loam	
11	Un Salt stress treatments EC	6.3	
12	Salt Stress treatment Ec	9.7	

GGE bi-plot analysis performed for significant interactions of genotypes with environments only.Statistical analysis focus on two concepts: genotype and genotype environment are used to evaluate genotypes and depend on multi environment yield trails by using PC1 and PC2.According to [1] single value partitioned in two components: $Y_{ij}- \mu-\beta_{j=\lambda1\epsilon i1\ \eta j1+\lambda2\ \epsilon i2\eta j2+Eij...1}$. Y_{ij}:performance i genotype in j environment , μ:average mean , $\Lambda1$ and $\Lambda2$: SDV for the two components PC1 and PC2 respectively , βj: main effect of environment, $\epsilon_{i1, \epsilon i2:}$ eigenvector of the two principle components of I genotype, ηj1, ηj2: eigenvectors for the two principle components of j environment, Eij: standered error for i'th genotype in j;th environment. $G_{i1} = \Lambda1\ ^{fi}\epsilon_{i1}$, $e_{1j=}\Lambda1\ 1^{1-f}\ \eta_{j1....2}$, fi: fraction coefficient for PC1 values . Calculating GGE bi-plot through following equation : $Y_{ij}- \mu-\beta_{j=}$ gi1 e1j +gi2 e2j +Eij ...3 , and the adjusted data the equation will be : $Y_{ij}- \mu-\beta_j/s_{j=}\sum_I{}^k$ gi1 e1j + Eij...4 S_j: standered divation in j environment , i=1...k, gi1 and e1j are PC1 values for I genotype in j environment. Third and forth equation were used in calculating relationships among genotypes and environments and other concepts of GGE bi-plot analysis. [11].

Results and Discussion

Analysis of variance performed in each environment alone to estimate pooled deviation which used in testing significant genotypic environmental interactions. Significant interactions appear in seed cotton yield (table 3) outcome from variability trait behavior and direction response in different environments which evidence genetic variability among genotypes even though from different origin places.

Table 3. Pooled analysis of Seed cotton yield

Environments	S.O.V.	Df	MS
E1	Replicates	2	1542551.70**
	Genotypes	6	3902300.85**
	Experimental error	12	203442.04
E1	Replicates	2	442699.11ns
	Genotypes	6	1009177.17*
	Experimental error	12	274238.91
E3	Replicates	2	739716.52ns
	Genotypes	6	1842491.90**
	Experimental error	12	221226.51
E4	Replicates	2	861888.79**
	Genotypes	6	388481.22*
	Experimental error	12	120682.05
E5	Replicates	2	1359570.37*
	Genotypes	6	1018028.98*
	Experimental error	12	282089.38
E6	Replicates	2	508869.05*
	Genotypes	6	410120.18*
	Experimental error	12	129909.59
Pooled analysis	environments	5	34832966.46**
	Genotypes	6	8081922.50ns
	Interaction	30	3525976**

SS portion,53.02 ,14.76 , 32.2 % for environment, genotype and interaction respectively

Accordingly GGE bi-plot analysis achieved to interpret the relationships among genotypes and environments via PC1 and PC2 estimate in different concepts of out puts (Mare et al , 2020). Most variability were in PC1 (53.9%) followed by 26.5% in PC2 and both principle analysis explained 80.4% of differences in GGE bi-plot analysis. Genotypes that have PC1 higher than zero classified as high yielded and vice-versa for the other genotypes possessed below zero PC1 values. Other than the magnitude absolute value of PC2 refer to unstable while genotypes points closest to PC2 zero axis are stable in their trait. Genotypes divided in three categories: first were high yield and stable (G7) which PC1 higher than 1 and low absolute value of PC2. Second category (G3 and G5) possessed high yield though unstable performance. Third group involve G1,G2,G4 and G6 have low yield though many of them near zero axis (fig.1).

PC1 = 53.9%, PC2 = 26.5%, Sum = 80.4%
Transform = 0, Scaling = 0, Centering = 2, SVP = 2
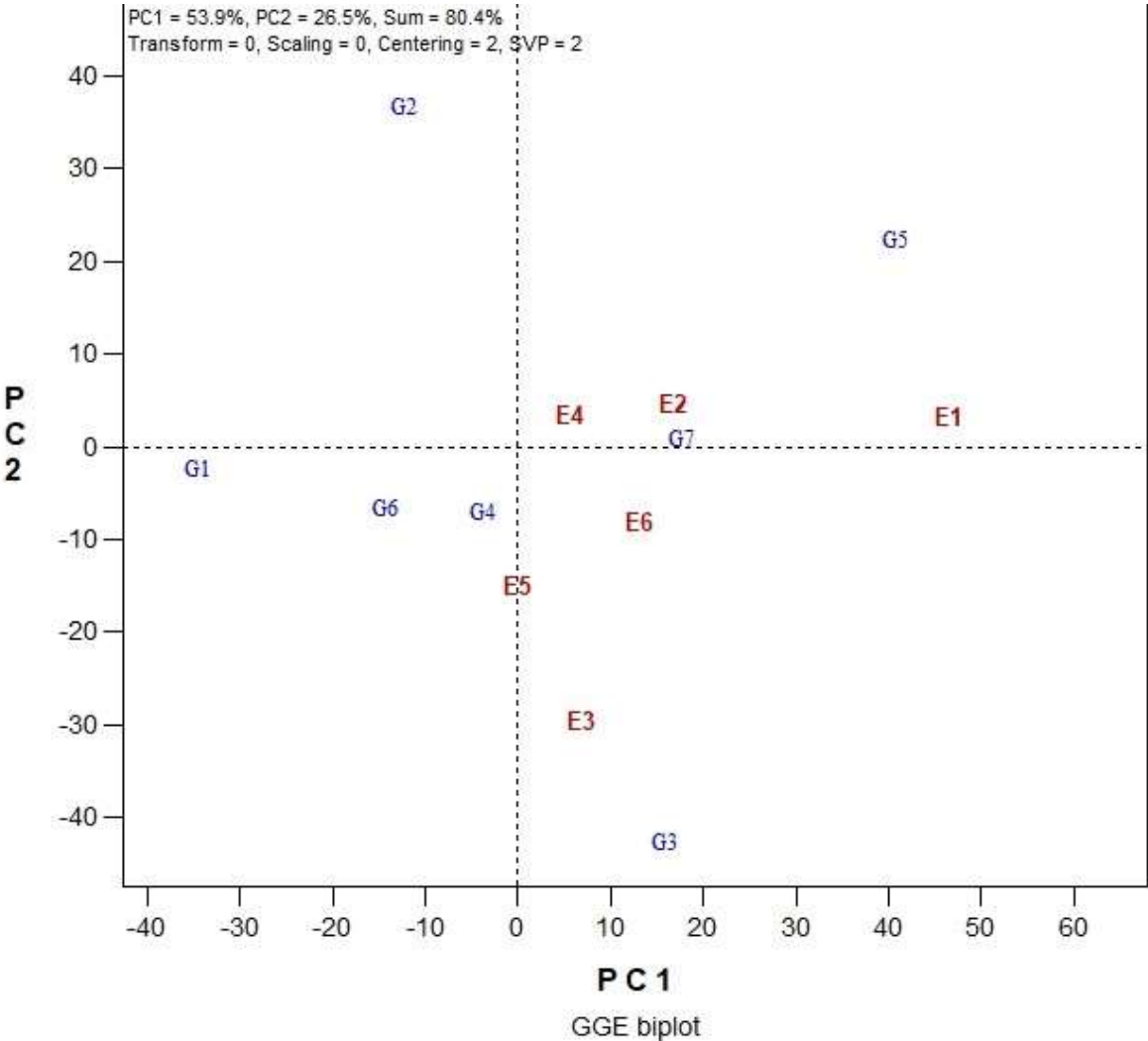
Fig.1:Relation among genotypes and environments

Statistical concepts can be understood as a similarity environments and relationships among environments can be presented in fig.2. Whole environments are positive values in PC1 except E5 which means the similarity of genotypes responses

in most studied environments and selection can be applied by same manner in multiple environments [12]. Straight line from the origin point to the environment value represent standard deviation of environment. While analogous cosine angle between two environmental vectors and any increases in standard deviation lead to incraesing environmental ability in classification genotypes [2]. Most angles are less than 90 degree except E4 and E5 that agree with the correlation results in table (4).

PC1 = 53.9%, PC2 = 26.5%, Sum = 80.4%
Transform = 0, Scaling = 0, Centering = 2, SVP = 2

Relationship among testers
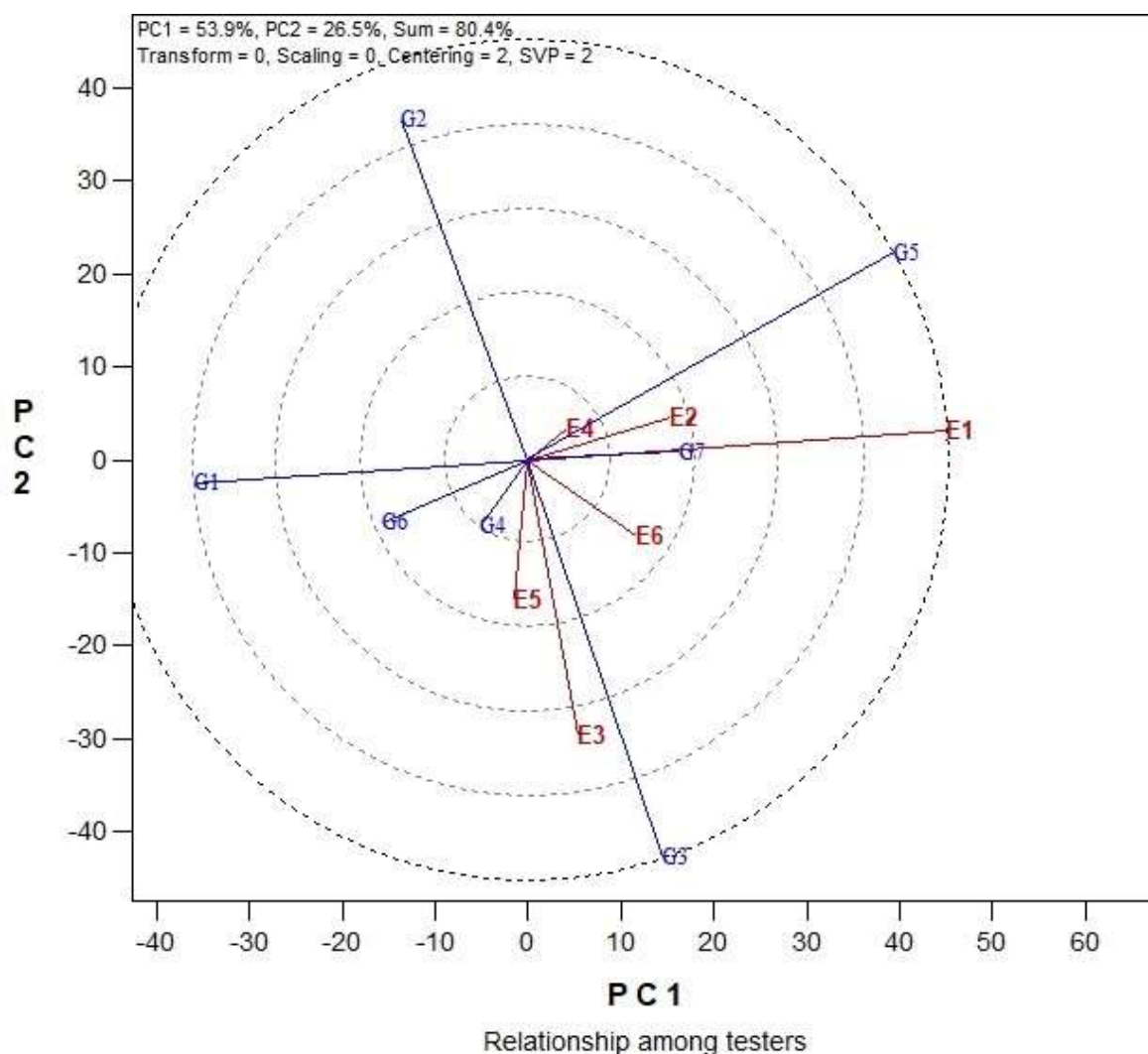
Fig.2: relation among environments

Non significant correlations among E4 and E5 environments and differ from each other in their effects in studied genotypes while significant positive correlations appear among other environments. Absence negative correlation refer to the similar performance of genotypes in different environments and removal of one of pair correlated environments aren't affect on the other environment [13,14]. E1 is the best environment for their high PC1 and low obsolut PC2 value.

Table 4.correlation coefficients among environments

	E1	E2	E3	E4	E5	E6
E6	0.9*	0.91*	0.89*	0.87*	0.86*	1
E5	0.62ns	0.8ns	0.81ns	0.74ns	1	
E4	0.81ns	0.85*	0.75ns	1		
E3	0.69ns	0.73ns	1			
E2	0.87*	1				
E1	1					

Genotypes performance in a favorable environments can be shown in a polygon shape drawn by straight line connection among farest genotypes points from origin point which involve whole other genotypes(fig,4). High yield obtained from G5 and G7 in E1,E2 and E4 environments, other than G4 and G3 have better performance in E3,E5 and E6 environments. Remarkable favorite environment characteristics that their ability in classified genotypes according to high PC1 and Low absolute PC2 values (Yan et al, 2001). Two mega-environments appear in Fig.4 : first (E1,E2 and E4) and second (E3,E5 and E6). The best performance of genotype in favorable environment is the most important goal of plant breeder [10]. Therefore, G4 was high productive in the first mega environments followed by G3 in the second mega environments.

PC1 = 53.9%, PC2 = 26.5%, Sum = 80.4%
Transform = 0, Scaling = 0, Centering = 2, SVP = 2

Which wins where or which is best for what
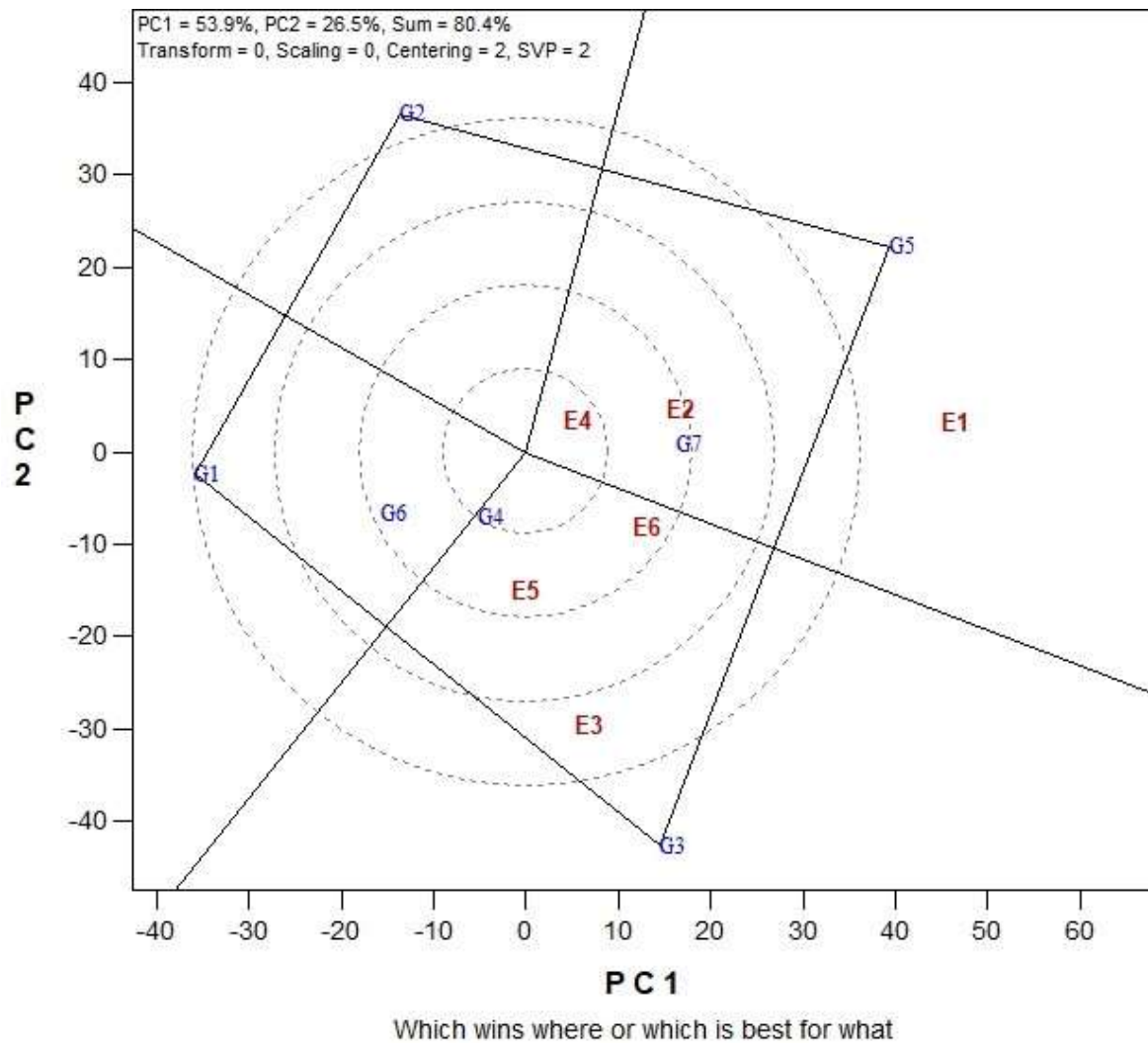
Fig.3: favorable genotypes in environments

Stability genotypes can be predicted by drawing two axis: x-represent AEC (Average Environment Coordination) and determined by average PC1 and PC2 of whole environments. While the second axis drawn vertically on the first axis and both axis passing through original point. AEC axis classified genotypes in two groups: first lay on the right direction which high yield (up to average yield) (G2,G5 and G7) and second include low yield group on the other direction(G1,G3,G4 and G6). Other than Y-axis refer to stability of genotypes according to their distance from average line (Hamadalla et al ,2011   ). Shortest vectors are more stable than others [10,15]. Consequently G7 genotype was more productive and stable in seed cotton yield per hectare (Fig.4).

PC1 = 53.9%, PC2 = 26.5%, Sum = 80.4%
Transform = 0, Scaling = 0, Centering = 2, SVP = 1
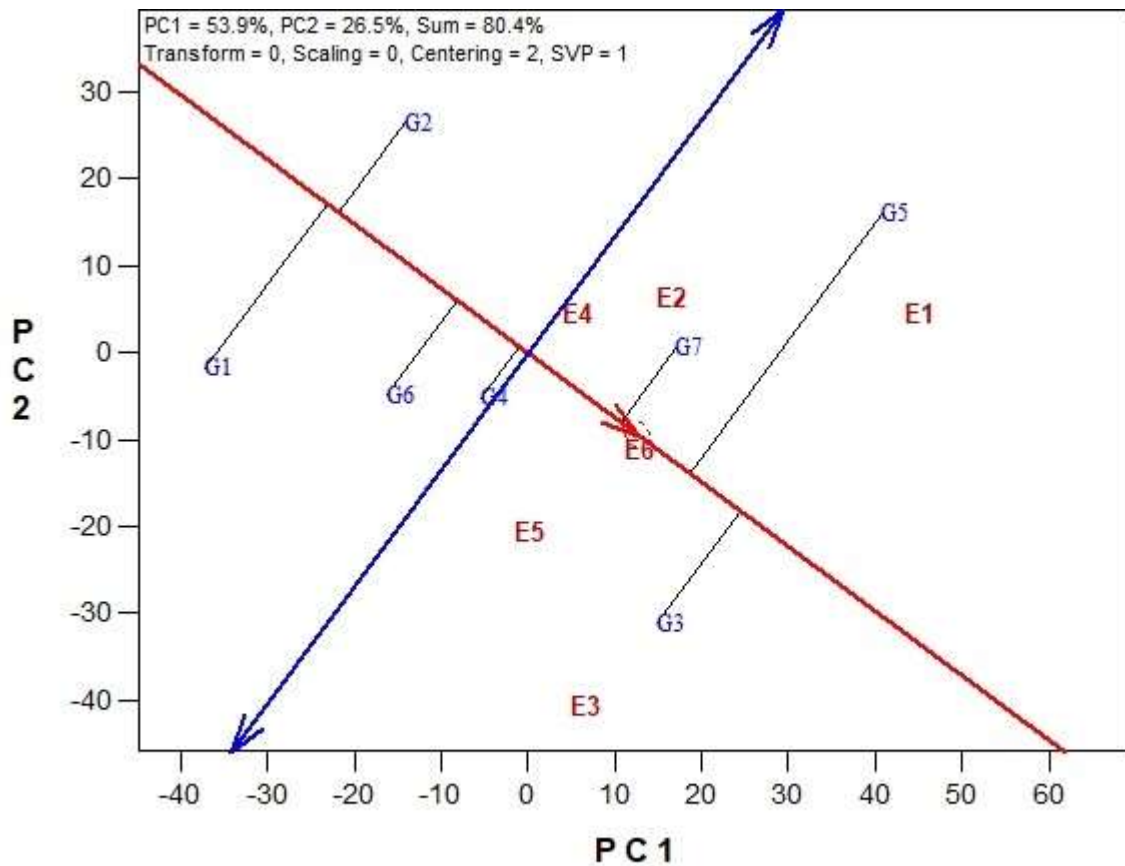
The Average Tester Coordination view

Fig.4: stability genotypes

The other of GGE bi-plot analysis is the similarity and differences of genotypes behavior in the same environment or multi environment in consequences of their performance from general mean. The differences represents as victors from original point to the genotype value (distances from general mean). Vectors of G3 and G5 are the tallest and best performance in yield per unit area to the other genotypes. G1 is the lesser in yield and worse in one or multi environments(Fig.5).Cosine angle between both two genotypes refer to similarity and vice versa[16]. Small angle between G5 and G3 vectors diminished differences in response to the genotypic environmental interaction compare with G1. Genotypes near origin point (G4,G6 and G7) have yield close to the average, though similarity or un similarity among them.

PC1 = 53.9%, PC2 = 26.5%, Sum = 80.4%
Transform = 0, Scaling = 0, Centering = 2, SVP = 1

Relationship among entries
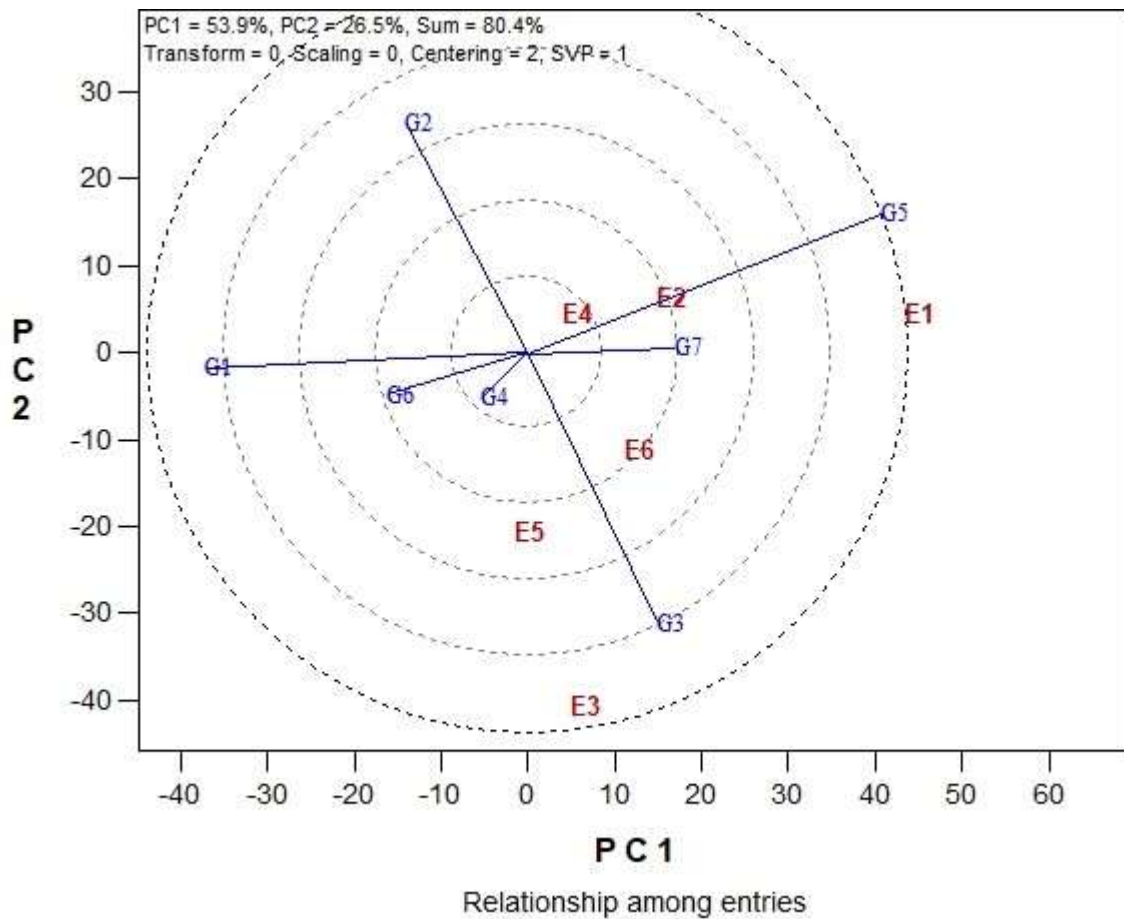
Fig.5: relation among entries

Estimation typical genotype in Fig.6 depend on two essential concepts: High yield and stable performance in different environments . By the same manner typical genotype has low deviation from it's average yield and from over all mean in different environments and keep it's production steady across multi environments besides neglected of genotypic environmental interaction [15]. Typical genotype posses longest vector to the other genotypes and focus on the central circle which determined the best production and stable genotype.(Fig.6) Showed that G7 is the nearest to the central circle followed by G3 that considered promising genotype in production stable seed cotton yield per unit area. While G1 is the farest and worst in seed cotton yield as a result of farest from circle of typical genotype.
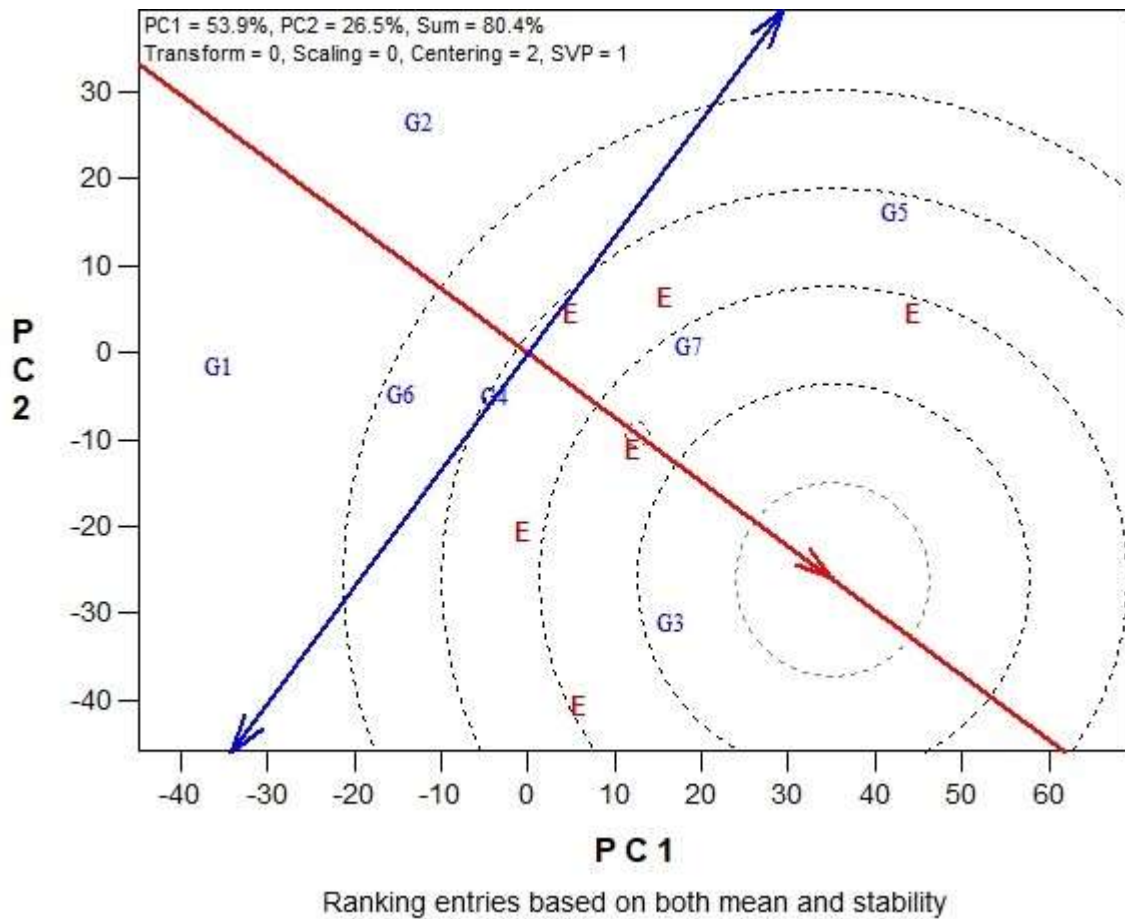
Fig.6: Ideal genotype

Conclussion

G7 can be considered as productive and stable genotype under un stress conditions (E2 and E4) followed by G3 in the second mega environments (stress conditions: E5 and E6).

References

[1] Yan , W. (2002). Singular value partitioning for bi plot analysis of multi-environment trial data. Agron. J. (94): 990-996.

[2] Yan W K, Kang M S .(2003).GGE bi plot analysis : A graphical tool for breeders, geneticists, and agronomists . CRC Press, Boca Raton, Florida, USA : 288..

[3] Abdelmoghny, A.M. , R. H. A. Gilbely , M. S. Max , E. A. Amer and S. S. Hassan (2020).GGE – Bi plot analysis of multi environments yield trials of Egyptian cotton (*Gosspyium baradense* L.). Cotton Breeding Section . Cotton Research Institute . Agricultural Research Center Gize. Egypt. 2(1):1-16.

[4] Elsahookie, H. H. and O. H. Alrawi (2001). Efficiency of some equations to analyza genotype X environment interactions . The Iraqi . J. Agric . Sci. 42(6): 1-18

[5].Aljoboory, A. H. and A.S. Almuhammady (2017)..Genotypic environmental interaction and stability of upland cotton genotypes across different environments.Tikrit j. A. Sc.17:(4):13-26.

[6] Kamali, D., S. B. Jelodar and N. Alishah (2011). The Assessment of Adaptability and Stability of Yield on Cotton Cultivars by Using Uniparametric, Non-Parametric Methods and A MMI Mode. Iranian J. Fiel. Crop Sci. 42(2):397-407.

[7] Peixoto, M. A. ,R. G. Malikouski , E.F. do Nascimento , A. Schuster. F. J. C. Farias , L. P.Carvalho ,P. E. Teodoro and L. L. Bhering (2020). Genotype plus genotype by-environment interaction biplot and genetic diversity analyses on multi-environment trials data of yield and technological traits of cotton cultivars . Ciencia Rural, Santa Maria .52(2):1-7.

[8] Nai- yin , XU , F. Michel , Z. Guo-wei , L. Jian and Z. Zhi- guo(2014). The Application of GGE Biplot Analysis for Evaluat ng Test Locations and Mega-Environment lnvestigation of cotton Regional Trials. Journal of lntergrative Agriculture, 13(9): 1921- 1933.

[9] Sadabadi, M. F. , G. A. Ranjbar , M. R. Zangi , S. K. K. Tabar and H. N. Zarini (2018). Analysis of Stability and adaptation of cotton genotypes using GGE biplot method. Trakia Journal of Sciences, (1): 51-61

[10] Mare, M., B. Chapepa, W. Mubvekeri (2020). Multi- Locational Evaluation of Medium – Staple Cotton Genotypes for Seed-Cotton Yield under the Middleveld Agro-Ecological Zones of Zimbabwe .Research Square:1-16.

[11] Yan, W. and Tinker N.A. (2006). Biplot analysis of multi- environment trial data: Principles and application s. Canadian Journal of plant Science .(86): 623-645

[12]. Gul, S., N. U. Khan, R. Gul, M. Baloch , A. Latif and I.A. Khan (2016). Genotype by environment and phenotypic adaptability studies for yield and fiber variables in upland cotton . J. Amin. Plant Sci., 26(3) : 776-786.

[13] Annicchiarico, P.(2002). Genotype- Environment Interaction : Challenges and Opportunities for Plant Breeding and Cultivar Recommendations . FAO Plant Production andProtection Papers 174.Food Agriculture Organization of the United Nations, Rom, Italy :126..

[14] Hamadalla, M. Sh. , R. J. Mansour and F. A. Kdhem (2011). Analysis of G.E. interaction based on GGE- biplot technique for some genotypes of sunflower. The 8 th Scientrfic Conf. for Agric. Res.: 1-10.

[15] ALI, I., N. U. Khan, F. Mohammad, M. A. Iqbal, A. Abbas, F. Tullah, Z. Bibi, S. Ali , I. A. Khalil , Sh. Ahmad and M. ur Rahman (2017).   Genotype   by Environment and GGE-bi plot analyses for seed cotton yiled in upland cotton. Pak, J. Bot., 49(6): 2273- 2283.

[16] Xu N. , M. Fok , J. Li , X. Yang & W. Yan (2017). Optimization of cotton variety registration criteria aided with a genotype-by-trait bi plot analysis. Scientific Reports: 1-8..

SOLVING NON-LINEAR VOLTERRA INTEGRO-DIFFERENTIAL EQUATIONS USING TOUCHARD METHOD

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Abstract:

In this paper, work effectively built on Touchard polynomials (TPs) was presented to find the solutions of Non-Linear Volterra integro-differential (NLVID) equations of the first, second type and first order. By comparing the exact and approximate solutions for three examples, the accuracy and ability of the offered method were tested. The accuracy of our procedure has been demonstrated by the presented results in tables and graphs. In addition, the solution's accuracy of this technique has been also presented. All computations and graphics were performed using the MATLAB R2018b programme.

Key words: Non-Linear Volterra İntegro- Differential Equation, Touchard Polynomials, Approximate Solutions, Numerical Method, Exact Solution.

Introduction:

The non-linear Volterra integro-differential equation was established by Volterra. The main concern and great interest in finding solutions to these equations were for many scientists and researchers because of their entry into many applications like glass formation, heat transmission, neutron diffusion, and Biological species with increasing and decreasing rates of generation (Abdul-Majid, 2011). The general form (Abdul-Majid, 2011; Rani and Mishra, 2019; Daliri et al., 2018; Khanlari and Paripour, 2018) of the first order and second type of non-linear Volterra integro-differential equation is defined as follows:

$$A'(\beta) = S(\beta) + \int_0^\beta \gamma(\beta, r)G(A(r))dr, \qquad \beta \in [s, d] \ldots (1.1)$$

with the initial condition $A(0) = A_0$, $\qquad\qquad \ldots (1.1a)$

and the general form (Abdul-Majid, 2011; Rani and Mishra, 2019) of the first order and first type of non-linear Volterra integro-differential equation is defined as follows:

$$\int_0^\beta \gamma_1(\beta, r)G(A(r))dr + \int_0^\beta \gamma_2(\beta, r)A'(r)dr = S(\beta), \qquad A(0) = A_0 \quad (1.2)$$

where $A'(\beta)$ is derivative of $A(\beta)$, the kernels $\gamma_1(\beta, r)$, $\gamma_2(\beta, r)$ and $S(\beta)$ are given real-valued functions, and $G(A(\beta))$ is a non-linear function of $A(\beta)$ to be determined. There are a variety of numerical approaches that researchers have used or established to get numerical solutions for the (NLVID) equations, some of which are included below: in (Khanlari and Paripour, 2018) used the Homotopy AnalysisTransform approach and Adomian Polynomials. In (Saleh et al., 2019) applied the 2nd, 4th and 6th order Runge-Kutta approaches. In (Mohsen and El-Gamel, 2010) used the sinc base method. In (Hossein et al., 2018) applied the spectral collocation method and the parametric iteration approach. In (Kim, and Jang, 2015) presented an efficient semi-analytical approach.

In this work, to solve the (NLVID) equations numerically, Touchard method is applied. The following is how the rest of the paper is organized: Touchard polynomilas, approximation function, solution accuracy, there are illustrated

examples as well as the associated tables and graphs. Finally, there are some brief conclusions and references.

II. Touchard Polynomials

Jacques Touchard (1885–1968), a French mathematician (Nazir et al., 2014; Abdullah, 2020), was the first to study Touchard polynomilas, which are polynomial sequences of binomial type that are defined on [0, 1] as follows:

$$P_\alpha(\beta) = \sum_{t=0}^{\alpha} B(\alpha, t)\beta^t = \sum_{t=0}^{\alpha} \binom{\alpha}{t}\beta^t, \quad \binom{\alpha}{t} = \frac{\alpha!}{t!\,(\alpha - t)!}, \qquad \dots (2.1)$$

where α and t are the degree and index respectively for Touchard polynomials. The following first five polynomials are defined as:

$$P_0(\beta) = 1, \quad P_1(\beta) = 1 + \beta, \quad P_2(\beta) = 1 + 2\beta + \beta^2, \quad P_3(\beta) = 1 + 3\beta + 3\beta^2 + \beta^3$$

$$P_4(\beta) = 1 + 4\beta + 6\beta^2 + 4\beta^3 + \beta^4.$$

II.I. Approximation Function:

Assume that the approximate solutions to Eq. (1.1) are defined by the linear combination of Touchard polynomials:

$$A_\alpha(\beta) = \omega_0 P_0(\beta) + \omega_1 P_1(\beta) + \dots + \omega_\alpha P_\alpha(\beta) = \sum_{t=0}^{\alpha} \omega_t P_t(\beta), \quad \dots (2.2)$$

the function $\{P_t(\beta)\}_{t=0}^{\alpha}$ are Touchard basis of αth degree, as defined in Eq. (2.1), also $\omega_t\ (t = 0, 1, \dots, \alpha)$ represents the unknown Touchard parameters will be determined later. Writing Eq. (2.2) as a dot product:

$$A_\alpha(\beta) = [P_0(\beta)\ \ P_1(\beta) \dots P_\alpha(\beta)] \cdot \begin{bmatrix} \omega_0 \\ \omega_1 \\ . \\ . \\ . \\ \omega_\alpha \end{bmatrix}, \quad \dots (2.3)$$

Eq. (2.3) can be written as:

$$A_\alpha(\beta) = \begin{bmatrix} 1 & \beta & \beta^2 & \dots & \beta^\alpha \end{bmatrix} \cdot \begin{bmatrix} \varphi_{00} & \varphi_{01} & \varphi_{02} & \dots & \varphi_{0\alpha} \\ 0 & \varphi_{11} & \varphi_{12} & \dots & \varphi_{1\alpha} \\ 0 & 0 & \varphi_{22} & \dots & \varphi_{2\alpha} \\ \vdots & \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & 0 & \dots & \varphi_{\alpha\alpha} \end{bmatrix} \cdot \begin{bmatrix} \omega_0 \\ \omega_1 \\ . \\ . \\ . \\ \omega_\alpha \end{bmatrix}, \qquad \dots (2.4)$$

where φ_{tt} (t=0, 1, 2,..., α) are the known parameters that are utilized to calculate Touchard parameters. The matrix in this case is square and non-singular. Eq. (2.1) can be derived as follows:

$$P'_\alpha(\beta) = \frac{d}{d\beta} \sum_{t=0}^{\alpha} B(\alpha, t)\beta^t = \sum_{t=1}^{\alpha} \binom{\alpha}{t} t\beta^{t-1} , \quad \binom{\alpha}{t} = \frac{\alpha!}{t!\,(\alpha-t)!} , \qquad (2.5)$$

then, the derivative of Eq. (2.4) is:

$$A'_\alpha(\beta) = \begin{bmatrix} 0 & 1 & 2\beta & \dots & \alpha\beta^{\alpha-1} \end{bmatrix} \cdot \begin{bmatrix} \varphi_{00} & \varphi_{01} & \varphi_{02} & \dots & \varphi_{0\alpha} \\ 0 & \varphi_{11} & \varphi_{12} & \dots & \varphi_{1\alpha} \\ 0 & 0 & \varphi_{22} & \dots & \varphi_{2\alpha} \\ \vdots & \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & 0 & \dots & \varphi_{\alpha\alpha} \end{bmatrix} \cdot \begin{bmatrix} \omega_0 \\ \omega_1 \\ . \\ . \\ . \\ \omega_\alpha \end{bmatrix}, \qquad (2.6)$$

III. Solution the (NLVID) equation of the 1st order and 2nd type

Since the form of Eq. (1.1) is as follows:

$$A'(\beta) = S(\beta) + \int_0^\beta \gamma(\beta, r)G(A(r))dr, \quad A(0) = A_0 , \qquad (3.1)$$

By using Eq. (2.4) and Eq. (2.6), assume that:

$$A(\beta) \cong A_\alpha(\beta) = \begin{bmatrix} 1 & \beta & \beta^2 & \dots & \beta^\alpha \end{bmatrix} \cdot \begin{bmatrix} \varphi_{00} & \varphi_{01} & \varphi_{02} & \dots & \varphi_{0\alpha} \\ 0 & \varphi_{11} & \varphi_{12} & \dots & \varphi_{1\alpha} \\ 0 & 0 & \varphi_{22} & \dots & \varphi_{2\alpha} \\ \vdots & \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & 0 & \dots & \varphi_{\alpha\alpha} \end{bmatrix} \cdot \begin{bmatrix} \omega_0 \\ \omega_1 \\ . \\ . \\ . \\ \omega_\alpha \end{bmatrix}, \dots (3.2)$$

and

$$A'(\beta) \cong A'_\alpha(\beta) = \begin{bmatrix} 0 & 1 & 2\beta & \dots & \alpha\beta^{\alpha-1} \end{bmatrix} \cdot \begin{bmatrix} \varphi_{00} & \varphi_{01} & \varphi_{02} & \dots & \varphi_{0\alpha} \\ 0 & \varphi_{11} & \varphi_{12} & \dots & \varphi_{1\alpha} \\ 0 & 0 & \varphi_{22} & \dots & \varphi_{2\alpha} \\ \vdots & \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & 0 & \dots & \varphi_{\alpha\alpha} \end{bmatrix} \cdot \begin{bmatrix} \omega_0 \\ \omega_1 \\ . \\ . \\ . \\ \omega_\alpha \end{bmatrix}, (3.3)$$

now, by substituting Eq. (3.2) and Eq.(3.3) into Eq. (3.1) yields

$$[0 \ 1 \ 2\beta \ldots \alpha\beta^{\alpha-1}].\begin{bmatrix} \varphi_{00} & \varphi_{01} & \varphi_{02} & \cdots & \varphi_{0\alpha} \\ 0 & \varphi_{11} & \varphi_{12} & \cdots & \varphi_{1\alpha} \\ 0 & 0 & \varphi_{22} & \cdots & \varphi_{2\alpha} \\ \vdots & \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & 0 & \cdots & \varphi_{\alpha\alpha} \end{bmatrix}.\begin{bmatrix} \omega_0 \\ \omega_1 \\ . \\ . \\ . \\ \omega_\alpha \end{bmatrix}$$

$$= S(\beta) + \int_0^\beta \gamma(\beta,r)\, [1 \ r \ r^2 \ldots r^\alpha].\begin{bmatrix} \varphi_{00} & \varphi_{01} & \varphi_{02} & \cdots & \varphi_{0\alpha} \\ 0 & \varphi_{11} & \varphi_{12} & \cdots & \varphi_{1\alpha} \\ 0 & 0 & \varphi_{22} & \cdots & \varphi_{2\alpha} \\ \vdots & \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & 0 & \cdots & \varphi_{\alpha\alpha} \end{bmatrix}.\begin{bmatrix} \omega_0 \\ \omega_1 \\ . \\ . \\ . \\ \omega_\alpha \end{bmatrix} dr \ldots (3.4)$$

Now, the integral (Mustafa and AL-Zubaidy, 2011; Zarnan, 2019) can be determined by putting $\beta = \beta_t$, ($t = 0,1, \ldots, \alpha$) in Eq. (3.4), where $\beta_t = s + tk$, and spacing $k = \frac{d-s}{\alpha}$, as a result, a nonlinear system of the algebraic equations is formed. This system can be solved using "Newton's iterative method". The parameters $(\omega_0, \omega_1, \ldots, \omega_\alpha)$ are obtained, and then substituted into Eq. (2.2) to get the approximate solution of Eq. (1.1).The same technique can be used on the Eq. (1.2)

IV. Solution Accuracy

The solution accuracy (Kurt et al., 2013; Biçer et al., 2018) of the (NLVID) equation second type can be obtained as below: The truncated Touched series in Eq. (2.2) must be approximately satisfied Eq. (1.1). Therefore, for every $\beta = \beta_t \in [s,d], t = 0,1,2, \ldots, \alpha$, the error functions:

$$\text{Efr}\,(\beta_t) = \left| \left(\sum_{t=0}^\alpha \omega_t P_t(\beta_t)\right)' - S(\beta_t) - \int_0^{\beta_t} \gamma(\beta_t, r)\, \sum_{t=0}^\alpha \omega_t P_t(r)\, dr \right| \cong 0, \text{ then,} \qquad \text{the}$$

$\text{Efr}\,(\beta_t) \le \epsilon$, for every β_t in the given interval [s, d] and $\epsilon > 0$, the truncation limit α is then increased until the Efr (β_t) become small enough. The following equation can be used to calculate the error function:

$$\text{Efr}\,(\beta) = \left(\sum_{t=0}^\alpha \omega_t P_t(\beta)\right)' - S(\beta) - \int_0^\beta \gamma(\beta,r)\, \sum_{t=0}^\alpha \omega_t P_t(r)\, dr \ ,$$

$\text{Efr}_\alpha\,(\beta) \to 0$ when α value is very large, the error decreases and then Efr $(\beta) \le \epsilon$.

Also, the same procedure can be used on Eq. (1.2)

V. Numerical Examples

This section testes the proposed method, by checking three examples of the (NLVID) equation. The absolute error was used to measure the accuracy of the solution method. The general formula of the testes was defined as follows:

Absolute error: $|Efr| = |A(\beta_t) - A_\alpha(\beta_t)|$, $\beta_{t \in [0,1]}$ and $t = 0, 1, \ldots, \alpha$ where $A(\beta_t)$ and $A_\alpha(\beta_t)$ are the exact and approximate solutions with Touchard approximation of the (NLVID) equations, respectively.

Example1. Solve the (NLVID) equation of the 2nd type (Abdul-Majid, 2011; Khanlari, and Paripour, 2018; Ahmed and

Elzaki, 2013)

$$A'(\beta) = \frac{9}{4} - \frac{5}{2}\beta - \frac{1}{2}\beta^2 - 3e^{-\beta} - \frac{1}{4}e^{-2\beta} + \int_0^\beta (\beta - r)A^2(r)\, dr,$$

where, the exact solution is $A(\beta) = 1 + e^{-\beta}$, and $A(0) = 2$, as initial condition. By applying the presented method for the degree $\alpha = 3, 4$ and solving the non-linear systems using "Newton's iterative method" and MATLAB R2018b, we have Touchard parameters and the approximate solutions as follows:

$$A_3(\beta) = (3.531)\, P_0(\beta) + (-2.1065)\, P_1(\beta) + (0.6116)P_2(\beta) + (-0.0389)P_3(\beta)$$

$$A_4(\beta) = (3.6)\, P_0(\beta) + (-2.3196)\, P_1(\beta) + (0.85680)P_2(\beta) + (-0.15539)P_3(\beta) + (0.018067)P_4(\beta)$$

Table1 showed the comparison of the approximate solutions and absolute errors, also showing that the accuracy of the results increases as α increase. In Figure1, the exact solution was compared with approximate solutions as $\alpha = 3$ and 4.

Table1. Exact, approximate solutions and absolute errors of example1

β	The exact solution	The approximate solutions		The absolute errors	
		α =3	α =4	α =3	α =4
0	2.0000e+00	1.9972e+00	1.9999e+00	2.8000e−03	1.2300e−04
0.1	1.9048e+00	1.9021e+00	1.9048e+00	2.7273e−03	4.1613e−05
0.2	1.8187e+00	1.8167e+00	1.8192e+00	2.0460e−03	4.9106e−04
0.3	1.7408e+00	1.7407e+00	1.7427e+00	1.2752e−04	1.9031e−03
0.4	1.6703e+00	1.6739e+00	1.6749e+00	3.5744e−03	4.5840e−03
0.5	1.6065e+00	1.6161e+00	1.6154e+00	9.5318e−03	8.8923e−03
0.6	1.5488e+00	1.5670e+00	1.5640e+00	1.8150e−02	1.5163e−02
0.7	1.4966e+00	1.5264e+00	1.5203e+00	2.9773e−02	2.3713e−02
0.8	1.4493e+00	1.4940e+00	1.4842e+00	4.4690e−02	3.4849e−02
0.9	1.4066e+00	1.4697e+00	1.4554e+00	6.3141e−02	4.8869e−02
1.0	1.3679e+00	1.4532e+00	1.4340e+00	8.5321e−02	6.6073e−02
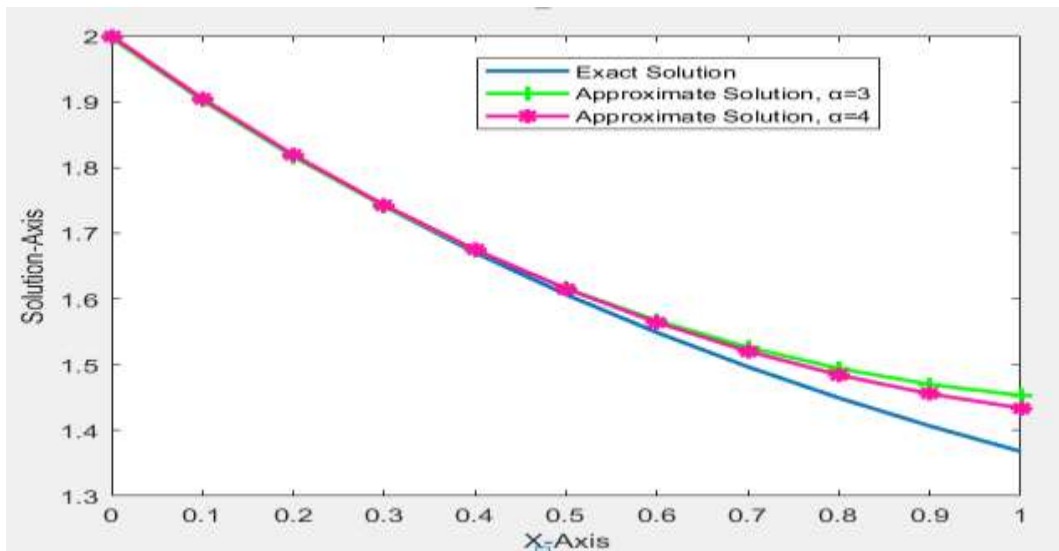
Figure1. Comparing the approximate solutions with the exact solution of example1

Example2. Solve the (NLVID) equation of the 1ˢᵗ type (Abdul-Majid, 2011)

$$\int_0^\beta (\beta - r)A^2(r)\,dr + \int_0^\beta e^{(\beta-r)}A'(r)dr = \beta e^\beta + \frac{1}{4}e^{2\beta} - \frac{1}{4} - \frac{1}{2}\beta,$$

where, the exact solution is $A(\beta) = e^\beta$, and $A(0) = 1$ as initial condition. By applying the presented method for the degree $\alpha = 4, 5$ and solving the non-linear systems using "Newton's iterative method" and MATLAB R2018b, we have Touchard parameters and the approximate solutions as follows:

$$A_4(\beta) = (1.45)\,P_0(\beta) + (-2.5825)\,P_1(\beta) + (3.0093)P_2(\beta) + (-1.0770)P_3(\beta) + (0.19863)P_4(\beta)$$

$$A_5(\beta) = (-0.023)\,P_0(\beta) + (1.1657)\,P_1(\beta) + (-0.072559)P_2(\beta) + (-0.27059)P_3(\beta)$$
$$+ (0.22995)P_4(\beta) + (-0.025701)P_5(\beta).$$

Table2 showed the comparison of the approximate solutions and absolute errors, also showing that the accuracy of the results increases as α increase. In Figure2, exact solution was compared with approximate solutions as $\alpha = 4$ and 5.

Table2. The exact, approximate solutions and absolute errors of example2

β	The exact solution	The approximate solutions		The absolute errors	
		$\alpha=4$	$\alpha=5$	$\alpha=4$	$\alpha=5$
0.0	1.0000e+00	9.9843e−01	1.0038e+00	1.5700e−03	3.8000e−03
0.1	1.1052e+00	1.1078e+00	1.1066e+00	2.6593e−03	1.4255e−03
0.2	1.2214e+00	1.2352e+00	1.2166e+00	1.3812e−02	4.7552e−03
0.3	1.3499e+00	1.3796e+00	1.3366e+00	2.9746e−02	1.3226e−02
0.4	1.4918e+00	1.5405e+00	1.4694e+00	4.8672e−02	2.2410e−02
0.5	1.6487e+00	1.7179e+00	1.6180e+00	6.9143e−02	3.0715e−02
0.6	1.8221e+00	1.9122e+00	1.7855e+00	9.0039e−02	3.6581e−02
0.7	2.0138e+00	2.1243e+00	1.9752e+00	1.1055e−01	3.8519e−02
0.8	2.2255e+00	2.3557e+00	2.1904e+00	1.3017e−01	3.5168e−02
0.9	2.4596e+00	2.6082e+00	2.4343e+00	1.4864e−01	2.5339e−02
1.0	2.7183e+00	2.8843e+00	2.7102e+00	1.6600e−01	8.0698e−03
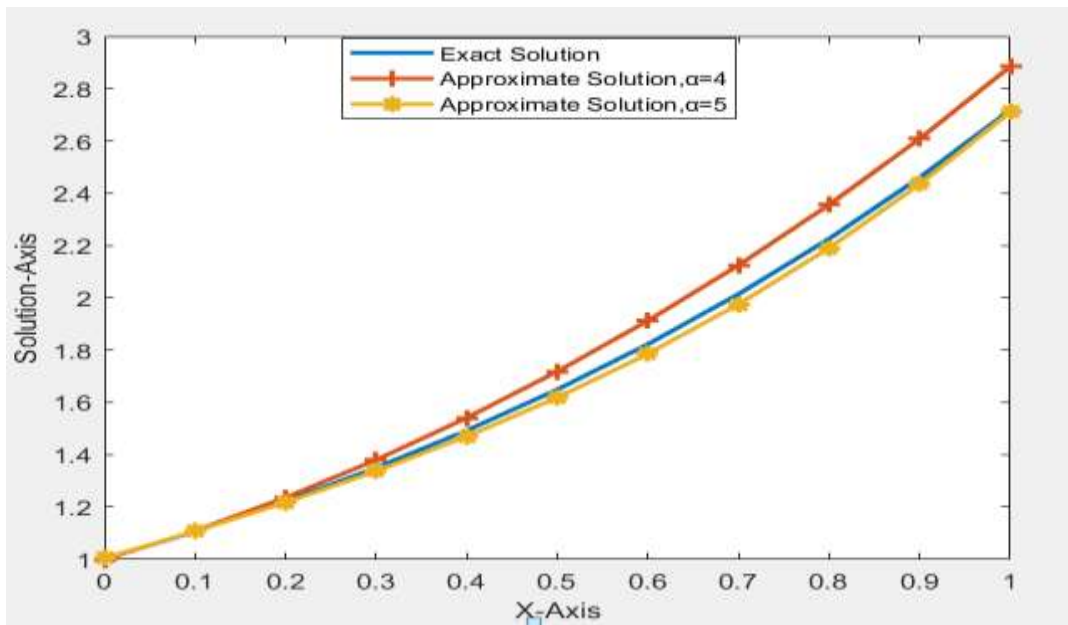
Figure2. Comparing the approximate solutions with the exact solution of example2

Example3. Solve the (NLVID) equation of the 1st type (Wazwaz, (2010)

$$\int_0^\beta (\beta - r)A^2(r)\,dr + \int_0^\beta e^{(\beta - r)}A'(r)dr = -\frac{9}{4} - \frac{5}{2}\beta + \frac{1}{2}\beta^2 + 2e^\beta + \frac{1}{4}e^{2\beta} + \delta e^\beta,$$

where, the exact solution is $A(\beta) = 1 + e^\beta$, and $A(0) = 2$ as the initial condition. By applying the presented method for the degree $\alpha= 4, 5$ and solving the non-linear systems using "Newton's iterative method" and MATLAB R2018b, we have Touchard parameters and the approximate solutions as follows:

$$A_4(\beta) = (2.3)\,P_0(\beta) + (-1.6984)\,P_1(\beta) + (1.4728)P_2(\beta) + (-0.0667)P_3(\beta) + (-0.011746)P_4(\beta)$$

$$A_5(\beta) = (1.11)\,P_0(\beta) + (1.2755)\,P_1(\beta) + (-0.95572)P_2(\beta) + (0.65280)P_3(\beta) + (-0.085037)P_4(\beta)$$
$$+ (0.0035390)P_5(\beta).$$

Table3 showed the comparison of the approximate solutions and absolute errors, also showing that the accuracy of the results increases as α increase. In Figure3, the exact solution was compared with approximate solutions as $\alpha = 4$ and 5.

Table3. The exact, approximate solutions and absolute errors of example3

β	The exact solution	The approximate solutions		The absolute errors	
		α =4	α =5	α =4	α =5
0	2.0000e+00	1.9960e+00	2.0011e+00	4.0460e−03	1.0820e−03
0.1	2.1052e+00	2.1079e+00	2.1067e+00	2.7021e−03	1.5316e−03
0.2	2.2214e+00	2.2431e+00	2.2249e+00	2.1735e−02	3.4723e−03
0.3	2.3499e+00	2.4010e+00	2.3575e+00	5.1166e−02	7.5919e−03
0.4	2.4918e+00	2.5808e+00	2.5061e+00	8.8955e−02	1.4303e−02
0.5	2.6487e+00	2.7816e+00	2.6725e+00	1.3290e−01	2.3733e−02
0.6	2.8221e+00	3.0027e+00	2.8578e+00	1.8063e−01	3.5717e−02
0.7	3.0138e+00	3.2433e+00	3.0635e+00	2.2956e−01	4.9784e−02
0.8	3.2255e+00	3.5025e+00	3.2907e+00	2.7691e−01	6.5143e−02
0.9	3.4596e+00	3.7793e+00	3.5403e+00	3.1967e−01	8.0671e−02
1.0	3.7183e+00	4.0729e+00	3.8132e+00	3.5458e−01	9.4894e−02
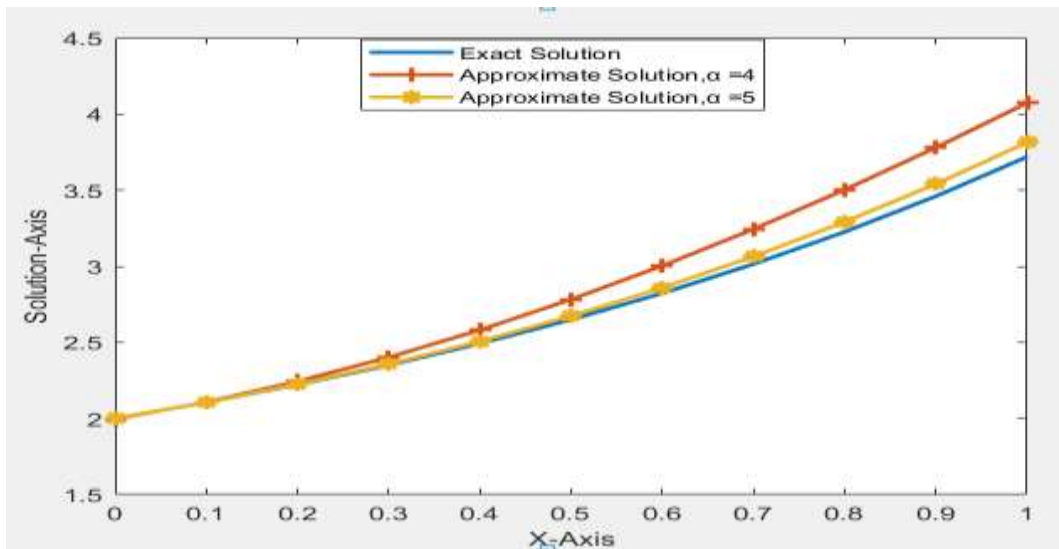
Figure3. Comparing the approximate solutions with the exact solution of example3

VI. Conclusions

Touchard method was used effectively to find approximate numerical solutions to the (NLVID) equations of the first and second type. The results in the Tables and graphs obtained indicate that approximate solutions match exact solutions as the polynomials degree increases. The proposed method can be applied to other non-linear integral and integro-differential equations.

VII. References:

1. Abdul-Majid, W. A. Z. W. A. Z. (2011). Linear and Nonlinear Integral Equations: Methods and Applications. pp.425

2. Rani, D., & Mishra, V. (2019). Solutions of Volterra integral and integro-differential equations using modified

3. Laplace Adomian decomposition method. *Journal of Applied Mathematics, Statistics and Informatics, 15*(1),

4. 5-18.

5. Daliri Birjandi, M. H., Saberi-Nadjafi, J., & Ghorbani, A. (2018). An efficient numerical method for a class of

6. nonlinear Volterra integro-differential equations. *Journal of Applied Mathematics, 2018*(1),1-8.

7. Khanlari, N., & Paripour, M. (2018). Solving Nonlinear Integro-Differential Equations Using the Combined

8. Homotopy Analysis Transform Method with Adomian Polynomials. *Communications in Mathematics and*

9. *Applications, 9*(4), 637-650.

10. Saleh, A. J., Esa, R. E., & Jameel, A. F. (2019, August). Numerical treatment of non-linear Volterra integro-

11. differential equation by using Runge-Kutta methods. In *AIP Conference Proceedings, 2138*(1)

12. Mohsen, A., & El-Gamel, M. (2010). On the numerical solution of linear and nonlinear Volterra integral and integro-differential equations. *Applied Mathematics and Computation, 217*(7), 3330-3337.

13. Hossein Daliri Birjandi, M., Saberi-Nadjafi, J., & Ghorbani, A. (2018, June). A novel method for solving nonlinear volterra integro-differential equation systems. *In Abstract and Applied Analysis*, 2018

14. Kim, K., & Jang, B. (2015). A novel semi-analytical approach for solving nonlinear Volterra integro-differential

15. equations. *Applied Mathematics and Computation, 263*, 25-35.

16. Nazir, M. Usman, S.Tauseef Mohyud-din (2014).Touchard Polynomials Method for Integral Equations. *Int. J.*

17. *Modern Theo. Physics, 3*(1), 74- 89.

18. Abdullah, J. T. (2020). Approximate Numerical Solutions for Linear Volterra Integral Equations Using Touchard

19. Polynomials. *Baghdad Science Journal*, 17(4),1241-1249

20. Mustafa, M. M., & AL-Zubaidy, K. A. (2011). Use of Bernstein Polynomial in Numerical Solution of Nonlinear

21. Fred Holm Integral Equation. *Eng. and Tech. Journal*, *29*(1), 110-115

22. Zarnan, J. A. (2019). Numerical Solutions of Nonlinear Fredholm Integral Equations of the Second Kind. *Journal of Applied Computer Science & Mathematics*, *13*(27), 39-41

23. Kurt, A., Yalçınbaş, S., & Sezer, M. (2013). Fibonacci collocation method for solving high-order linear Fredholm integro-differential-difference equations. *International Journal of Mathematics and Mathematical Sciences*, *18*(3), 448-458

24. Biçer, G. G., Öztürk, Y., & Gülsu, M. (2018). Numerical approach for solving linear Fredholm integro-differential equation with piecewise intervals by Bernoulli polynomials. *International Journal of Computer*

25. *Mathematics*, *95*(10), 2100-2111.

26. Ahmed, S., & Elzaki, T. (2013). The solution of nonlinear Volterra integro-differential equations of second kind by combine Sumudu transforms and Adomian decomposition method. *International Journal of Advanced and*

27. *Innovative Research*, *2*(12), 90-93.

28. Wazwaz, A. M. (2010). The combined Laplace transform–Adomian decomposition method for handling nonlinear Volterra integro-differential equations. *Applied Mathematics and Computation*, *216*(4), 1304-1309.

STUDY THE EFFECT OF DIFFERENT DOSES OF TADALAFIL ON OVULATION INDUCTION IN MATURE FEMALE RATS

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Abstract:

The purpose of the study is to show out the effects of Tadalafil under the brand name (Cialis) through oral administration with various concentrations on some of the reproductive features as ovulation induction in the female rats. In the experimental study, 39 of healthy female rats at the age of (11-13) weeks, weighing (24-26) grams were divided into three groups each one has 13 rats and one group as a control according to various doses of Tadalafil (0.5 mg/kg, 1 mg/kg) throughout the 7-days dosing period. The parameters were evaluated by examining the histological changes in the ovary, such as the number of primary follicles, growing follicles, Graafian follicles, assessed using hematoxylin and eosin stains. The results showed a significant improvement ($P < 0.05$) in reproductive parameters with Tadalafil at both concentrations (0.5 and 1 mg/kg) compared to the control group as; number each of primary follicles, growing follicles and graphic follicles. In addition, high concentrations (1 mg/kg) of Tadalafil showed a significant enhancement in the reproductive parameters as compared to low dose (0.5 mg/kg) and control group.
Key words: Tadalafil, Ovulation, Female Rats, Control Group.

Introduction:

The Ovulation process is the climax of follicular growth. That starts with stimulate of primitive follicles and culminates with the release of a ripe oocyte ability of being fertilized, and with the formation of a corpus luteum [1] The ovulation takes place when a mature egg is released from the ovary, and then pushed out of the fallopian tube, also it is existing to be fertilized. The uterus lining has thickened design to prepare for a fertilized egg. If no visualization occurs, the uterine lining as well as blood will be shed. The shedding of an unfertilized egg and the uterine wall is the time of menses. Ovulation is caused by the pituitary LH surge, which launch a series of ovarian events. The realization of the ovulatory process is essence to illustrate some of the problems relevant to female fertility as periodic abortion, and to improve the technologies utilized [2] Nitric oxide (NO) is a main paracrine mediator of diversified biological processes, containing vascular objectives and infection periodical monophosphate (cGMP). Tadalafil, the phosphodiesterase 5 (PDE5) blockages (inhibitor), promote the vasodilator effects of NO by avoiding the degradation of cGMP [3]. Undeniably, nitric oxide relaxes vascular smooth muscles through a pathway mediated by the Nitric oxide important role is an in genital processes, such ovulation, implantation, and embryo evolution, by the control of the ovarian and uterine blood flow [4], that play important part in promoting fertilization process by conserve the ovum while fertilization versus the harming by oxygen free radical. Because has been not shown to adjusting contractibility of the fallopian tubes [5].

FSH and LH stimulate the ovarian follicular development and ovulation [6] as known. FSH salvage many primary follicles from a pool of these follicles in each cycle, and stimulates maturation of these follicles, while LH stimulates final maturation of these follicles and causes rupture and ovulation [7]. According to previous literatures, it was mentioned that the action of SC is beneficial for increasing of the number of the mature and fertilized oocytes [8]. Expression of (eNOS) accretion during the late secretary stage, whereas (iNOS) express through all menstruation period for non-pregnant and during pregnancy, that is agreed upon with [9]. Accordingly, the current study was arranged to investigate the effects of various doses of Tadalafil on numbers of primary, secondary follicles, and corpus luteum.

MATERIALS AND METHODS

In this study, 39 mature female rats were divided into three groups and one group as control with various doses of Tadalafil, low dose (0.5 mg/kg/day) and high dose (1mg/kg/day) for 7 days of treatment.

The groups were divided according to doses of Tadalafil and like the following:

1. Group G1 (13 mouse as acontrol): Saline was orally administered to this group for 7-days.
2. Group G2 (13 mouse as a Treated): Tadalafil was orally administered (1 mg/kg/day) to this group during the 7-days experiment period.
3. Group G3 (13 mouse as a Treated): This group received oral administration (0.5 mg/kg/day) of Tadalafil during the 7-days experimental period.

Histological investigation:

Freshly sacrificed mice's reproductive organs (ovaries) were fixed with 10% formalin for 12 hours, dehydrated with increasing intensity of ethanol alcohol, cleaned with xylene for 30 m_s, and exchange with other paraffin overnight in the oven. From a paraffin block, serial sections were cut and stained with alum hematoxylin and eosin. Using a light microscope, the slides were examined (4X). All serial portions of the ovaries were enumerated as described in order to account for the various stages of follicle formation. The parameter, as well as the number of primary follicles, developing follicles, Grafian follicle, corpora lutea.

Statistical analysis was performed using SPSS. [10].

Blood samples and hormonal test

Blood samples of mice were collected under anesthesia by heart puncture using a needle(22-19mm). the serum for the hormone test was obtained by centrifugation at 3000   RPM for 10 minutes and kept at (-20) °C, and the testing was used by a mini vidas instrument[11].   .

Results

The results for different doses of Tadalafil versus primary follicle number are shown in table (1). In this table, highly significant differences (P <0.01) in the number of primary follicles were evaluated after 7-days of treatment with low dose compared to control group. An increase in the number of primary follicles appeared at high Tadalafil doses after comparison to the control group. In addition, a significant increase (P <0.05) in the number of primary follicles between high and also low doses was observed during 7 days of treatment.

Table (1): Show different doses of Tadalafil on ovulation of female rats.

	Control	High dose	Low dose
primary follicles	2.666A +0.547	8.662 Bb +0.871	.333 Ba +1.201
growing follicles.	2.767A +0.780	9.143 Bb +0.243	7.767 Ba +0.666
Graafian follicles	4.910 A + 0.013	10.801 Bb + 0.450	8.900 Ba +0.500
corpora lutea	2.485 A +0.792	8.630 Bb +0.975	7.566 Ba +0.425

Values (V)= Mean (M) $+$ Structural *equation modelling* (S.E.M.).

Similar capital letters mean that there are non-significant differences while different capital letters mean that there is a significant difference.

The different small case letters mean that there is a significant difference between high and low doses within the two groups.

After 7 days of low dose administration, a significant increase ($P < 0.001$) in the number of growing follicles was assessed and the same results were seen at high Tadalafil doses in the same dosing period compared to the control group. In addition, a significant increase ($P < 0.05$) was assessed when comparing low and high dose Tadalafil at 7-days of treatment the result as shown in table (1). A significant increase ($P < 0.001$) in the number of Graafian follicles was assessed after 7 dyes treatments in the treated group with low and high doses of Tadalafil when compared to control group. Similarly, there was a significant difference ($P < 0.05$) between low and high dose.

After low dose administration, a significant increase ($P < 0.01$) in the number of corpus lutea was assessed and a significant increase ($P < 0.001$) in the number of corpus lute was assessed at high doses of Tadalafil compared to control group, the result as shown in table (1).

The first advantageous cure is Tadalafil that used commonly as oral medicine to stimulate multiple ovulation and increases number of mature ovum and rate of the fertilization. It is well known that FSH and LH stimulate the ovarian follicular development and ovulation. With more than one explanation, FSH rescues several primary follicles from a pool of these follicles in ovary in each cycle and stimulates

maturation of these follicles, while LH stimulates final maturation of these follicles and causes rupture and ovulation [12], observed that NO by same mechanisms induces releasing of gonadotropin releasing hormone (GnRH) from the hypothalamus, thus stimulate the pituitary gland function to produce and release of follicular stimulating hormone (FSH) and luteinizing hormone (LH). According to previous literatures, it was mentioned that the action of Tadalafil supplementation with hormonally stimulation treatment is beneficial for increasing of the number of the mature and fertilized oocytes. for sufferer with erectile dysfunction with less counteractive effects, later on it's used for remediation of several diseases, such as pulmonary pretension [13]. The intracellular s of periodic monophosphate (cGMP) [14], such as Phosphodiesterase type -5 (PDE5) that belong to an important family of proteins that managed Phosphodiesterase type-5 is the primary enzyme with cGMP- hydrolysing activation [15]. Therefore, the molecular architecture for Tadalafil citrate which is very similar to cGMP [16,17]. Low quantities of NO [18] that play significant strategy in promoting fertilization steps by conserve the ovum, before and after fertilization, versus the harming, by oxygen free radical. As long as NO has been exhibited to regulate contractibility of the fallopian tubes [5].

Table (2): Show the result of the effect of deferent doses of Tadalafil on hormones in female rats.

Hormones	Control	Low dose	High dose
Estragon mIU/ml	28	50	58
Progesterone mIU/ml	2	5	6
FSH mIU/ml	2.6	4.5	5
LH mIU/ml	1	1.5	1.8

Values (V)= Mean (M) $\pm$ Structural *equation modelling* (S.E.M.).

Similar capital letters mean that there are non-significant differences while different capital letters mean that there is a significant difference.

The result in table (2) show the effect deferent doses of Tadalafil on hormones (Estragon, Progesterone, FSH, LH) in rats after 7 days of treatment. FSH and LH stimulate the ovarian follicular development and ovulation [6] as known. FSH salvage many primary follicles from a pool of these follicles in each cycle, and stimulates

maturation of these follicles, while LH stimulates final maturation of these follicles and causes rupture and ovulation [7].

[19] Spotted that NO by same techniques induces releasing of gonadotropin releasing hormone (GnRH) from the hypothalamus, thus stimulate the pituitary gland function to produce and release of follicular stimulating hormone (FSH) and luteinizing hormone (LH). According to previous literatures, it was mentioned that the action of Tadalafil is beneficial for increasing of the number of the mature and fertilized oocytes [20].

Expression of NO increase during the late secretary phase, also during all menstruation cycle for non-pregnant and during pregnancy period, that is agreement with [9].

By the same cGMP/PDE-5 pathway, the Tadalafil action on the ovary is similar to that in uterus, Tadalafil causing inhibition of PDE-5 to avoid cGMP deterioration by improving NO vasodilation action. [21] who stated that Tadalafil improve ovarian blood flow in the Vasodilator blood-vessel leading to an excess blood and nutrients supply, in addition to increase ovarian weight and expansion of the corpus luteum. Results in convent with [22] who recognized that corpus luteum blood flow is exceedingly banded with luteal stage, and its improve blood flow that elevating secretion levels of estragon and progesterone from corpus luteum. The streamed production of progesterone by the corpus luteum stimulate, variation of stromal cells [23].

[2] investigated that role of NO in the control ovulation was regulated locally by ovarian cells, as well as NO produced within the ovarian vasculature. Also, stimulate corpus luteum to increase progesterone secretion by LH, which maintain pregnancy [20]. thereafter, elevation NO levels that induced by Tadalafil treatment resulting, in the rising of production leading to increase numbers of primary, secondary, and follicles and estragon levels by acts of FSH.
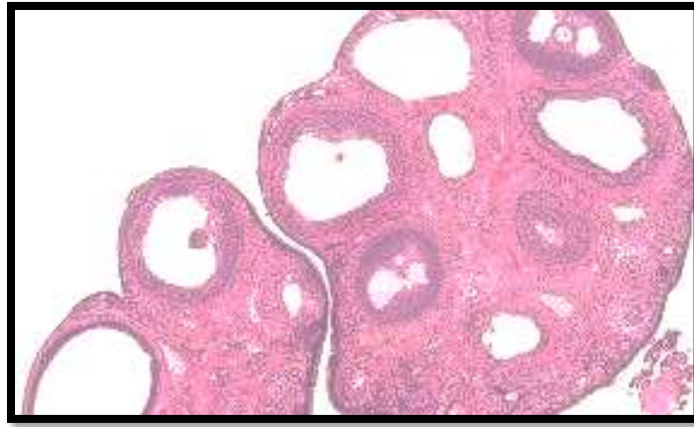
Fig. 1: Ovarian sections of female rate (control group), at 7 days' treatment (4X).

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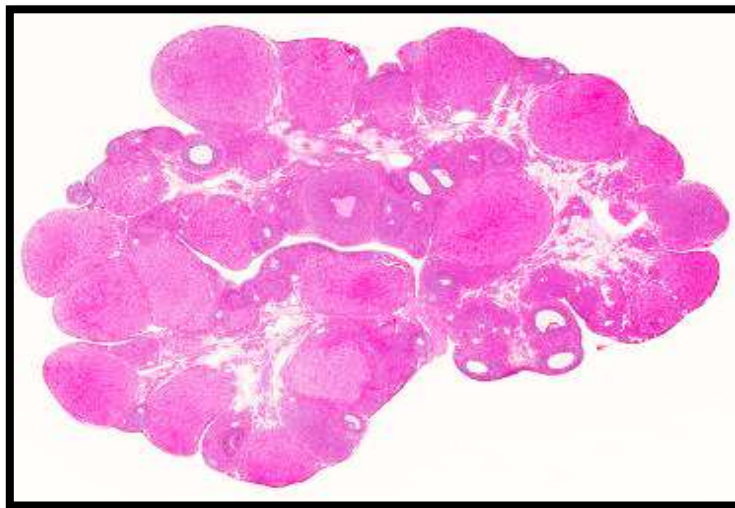
**Fig. 2: Ovarian sections of female rate (High dose) Tadalafil, at 7 days'
treatment, treated with (1 mg/kg) (4X) .**
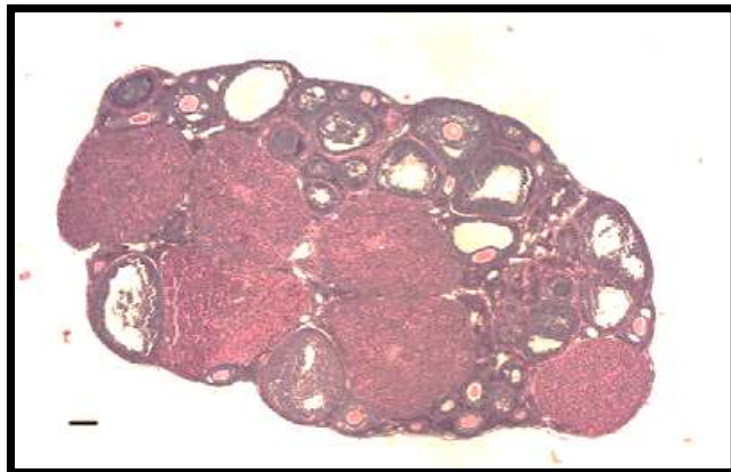
**Fig. 3: Ovarian sections of female rate (Low dose) Tadalafil, at 7 days' treatment,
treated with (0.5mg/kg) (4X).**

Conclusion:

In conclusion, Tadalafil is the best initial treatment especially in relevance with ovulatory problems (dysfunction), and has a super stimulatory effect on ovulation, thereby increasing the number of recruited follicles in female rats rather than affecting the follicular steroidogenic function, and its induce multi follicle ovum forming.

Similarly, it has positive affection on gonadotropene hormones, eventually it leads to a twin pregnancy. Combined c with appropriately timed IUI.

REFERENCES:

1.Carr B. R (2005)"The ovary and the normal menstrual cycle. In Carr B R, Blackwell R E and Azziz R (Eds): Essential Reproductive Medicine" McGraw-Hill Companies. USA, Pp:61-96,

2.Ammar I. M. M. and Salem M. A. A. (2017)" Effect of oral Tadalafil on endometrial thickness in patients receiving Clomiphene citrate for ovulation induction", Middle East Fertility Society Journal. Vol. (23), pp: 121-125.

3.Mostafa T., (2016)" Useful Implications of Low-dose Long-term Use of PDE-5 Inhibitors", Sexual Medicine Reviews, Vol. (4), No. (3) pp:270–284.

4.Lozano D.M., Lenero M.V., Gonzalez R.L., Scheffer J.B., Gonzalez M.T., Barron Y., Frydman R., (2015)" Tadalafil for endometrial growth in clomiphene citrate stimulated cycles in an IUI programme: a pilot study, Facts, Views & Vision ObGyn, vol. (7), No (4), pp: 231-237.

5.Rosselli M, Imthurn B, and Macas E "Endogenous nitric oxide modulate indothlin-1 induced contration in bovine oviduct (1997)"Biochem. Biophys. Vol. (201), No. (2), pp: 143-148.

6.Costanzo L I, (1998) "Reproductive physiology", In: Text book of physiology, W.B. Saunders Company, Philadelphia. Pp: 404.

7.Sadler T W, (2009)"Legman's medical embryology",11th ed. Pincott Williams and Wilkins, USA, pp220.

8.Andrew R. and McCullough M D, (2003) "An Update on the PDE-5 Inhibitors (PDE-5i)", J. Andro, Vol. (24), No (4), pp: 90060.

9.Telfer J F, Irvine G A, Kohnen G, Campbell S, and Cameron I T, (1997)"Expression of endothelial and inducible nitric oxide synthase in no pregnant and decasualized human endometrium", Mol Hum Reprod, VOL. (26), No. (3), pp: 69–75.

10.McCullough A R, (2003)"An Update on the PDE-5 Inhibitors (PDE-5i)" Androl. Vol. (24), No. (6), pp: 25-29.

11.Shinde S. V., Shaikh F. and. Gawande A. N. (2018)" Solubility Enhancement and Physicochemical Characterization of Tadalafil by Inclusion Complexation Method", Vascul Pharmacol, Vol (7), No (8), pp: 687-706.

12.Medeiros V. F. L. P., Azevedo I. M., Carvalho M. D. F., Oliveira C. N., Egito E. S. T., Medeiros A. C., (2017) " The Reno protective effect of oral Tadalafil pre-treatment on ischemia/reperfusion injury in rats ", Acta Cir Bras, Vol. (32), No. (2), pp: 90-97.

13.Rotella D P. (2002) "Phosphodiesterase 5 inhibitors: current status and potential applications", Nat. Rev., Drug Discov, Vol. (24), No. (1), pp: 674-682.

14. Boolell M, Allen M J, Ballard S A, Gepi-Attee S, Muirhead G J, Naylor A M, Osterloh I H, and Gingell C, (1996)"Sildenafil: an orally active type 5 cyclic GMP-specific phosphodiesteras inhibitor for the treatment of penile erectile dysfunction", Int. J. Import, Vol. (34), No. (8), pp: 47-52.

15.AL-Hijji J, Larsson B, and Batra S, (2000) "Nitric oxide syntheses in the rabbit uterus and vagina: Hormonally regulation and functional significance". Departments of obstetrics and Gynecology, University Hospital, pp: 221- 85.

16.Shahpar S, Mino I, Vahid N, and Goudarz S, (2007)"Physiological effects of NO-cGMP pathway on ovarian siroidogenesis in rat", Pakistan J. Biol Sciences, Vol. (10), No. (2), pp: 1175-1179.

17.Guk Na Y., Byeon J., Huh H. W., Min-Ki Kim, Shin Y. G., Lee H. and Cho C., (2019) " Effect of Ticagrelor, a Cytochrome P450 3A4 Inhibitor, on the Pharmacokinetics of Tadalafil in Rats", Pharmaceutics, Vol. (11), No. (4), pp: 1-10.

18.Kazuo S, Naoyuki T, and Michiharo H, (2001) "Requirement of nitric oxide for murine oocyte maturation, embryo development and trophoblast outgrowth in vivo", Mol. Reprod. Dev, Vol. (58), No. (2), pp: 262-268.

19.Tamura H, Takasaki A, Taniguchi K, Matsuoka A, Shimamura K, and Sugino N, (2008)"Changes in blood flow   impedance of human corpus luteum throughout the luteal phase and during early pregnancy" Fertil and Steril, Vol. (90), N. (4), pp: 2334-9,

20. Cullinan E. B., Abbondanzo S. J., Anderson P. S., Pollard, J. W., Lessey B. A., and Stewart C. L., (1996) "Leukemia inhibitory factor (LIF) and LIF receptor expression in human endometrium suggests a potential autocrine/paracrine function in regulating embryo implantation", Proc Natl Acad Sci USA, Vol. (93), No. (3), pp: 3115-3120.

21.Kim N. N., Huang Y., Moreland R B, Kwak S. S., Goldstien I, and Traish A, (2000)"Cross-Regulation of intracellular cGMP and cAMP in in cultured human corpus cavernosum smooth muscle cells", Mol Cell Biol Research Communications, Vol. (4), No. (1), pp: 10-14.

22.Jones E. E., and Decherny A. H., (2005) "The female reproductive system", In: Medical Physiology. Boron., W. F., and Boulpaep, E. L. A cellular and Molecular approach, update-edition. Elsevier Saunders, USA, Pp: 1141-1165.

23.Nisewender G. D., Juengel J. L., and Smith A. G., (2000) "Mechnism controlling the function and life span of the corpus luteum", Physio. Rev, Vol. (43), No. (2), pp:80: 148.

COVID-19 : A RETROSPECTIVE MINI REVIEW ON THE PANDEMIC VIRUS, IMMUNOLOGICAL ASPECTS AND BACTERIAL CO-INFECTIONS

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Abstract:

In 2019 the Corona pandemic spread in Wuhan City, Hubei, China. It is a disease officially known as "coronavirus disease 2019; COVID-19", which is the pathogen of respiratory tract infection and its genome sequence have been fully identified. The genetic sequence of COVID-19 showed a similar but distinct genome content for both SARS-CoV and MERS-CoV.

Clinical evidence and genetics point to the course of this pandemic. Open access data and genomic sequencing combined with the development of a specialized vaccine against infection with this virus, it will give us additional information about what this virus is, the nature of the immune response generated against it and plan for the herd immunity by vaccination. In current study, we review the role of innate and acquired immunity against COVID-19 and how it works in the host's body. Then, talk about herd immunity and how can reach it to protect the population from this virus. Also, focused in this review on associated bacterial infections with viral respiratory infections.

Key words: COVID-19 Pandemic, Immune Response, Herd Immunity, Co-Bacterial İnfections.

Introduction:

Because the infection with COVID-19 is a battle of the virus against the immune system of the infected individuals, therefore we must take a long look at this battle. The infection with coronavirus disease 2019 was discovered and disease broke out in December 2019 , Wuhan city, China. The virus spread through Chinese cities quickly and moved from them and became a global epidemic. As a viral infection of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) that infected 3.6 million people in May 7, 2020, corona virus caused 254,045 deaths globally, and almost 200 countries where the pandemic has spread (Prompetchara *et al.*, 2020). What is remarkable of COVID-19 is the rapid spread of the disease in less than 3 months and has become a pandemic, and keep searching to find out how strong and how long this protection remain, while most people with COVID-19 develop an immune response within the first few weeks after infection. The World Health Organization, (2021) also, research focused on the idea that the length and strength of the immune response, does it vary according to the nature of the infection? whether it was strong, moderate, mild or completely asymptomatic (Prompetchara *et al.*, 2020).

When a population was immunized through previous infection or immunity progress through vaccination, this indirect protection from infectious disease known as population immunity or Herd immunity. The World Health Organization, (2021) encourages obtaining herd immunity by taking the vaccine, and does not support the idea of obtaining it through exposure to a disease or pathogen and does not allow the disease to spread among any segment of society, resulting in unnecessary infections and possibly deaths (Harrison *et al.,* 2020). In order to protect individuals infected with COVID-19, and to achieved herd immunity should be adopted the vaccination, this is a typical way for protection, not by direct exposure to pathogen and causes disease. Vaccines enhances the immune system to create specific immunoglobulins against the virus, exactly as happened when exposure to real pathogen, vaccines working without causing diseases (Liu *et al.*, 2020 ; Gebrecherkos *et al.*, 2022).

Host-pathogen interaction

The transmission mode of COVID-19 occur through close contact of people or from person to person by respiratory droplets (Letko *et al.*, 2020 ; Varghese *et al.*, 2020). Clinical signs of infection were unclear or non-specific and slowly appeared (Bao *et al* ., 2020). One of the important observations accompanying infection with this virus that most of the infected people did not exposed to markets or been in close contact with patients have respiratory symptoms. The highly contagious nature of

COVID-19 is due to its transmission through asymptomatic infected persons (Chan *et al.*, 2020 ; WHO, 2020).

COVID-19 Immunopathology

Although, the initial site of COVID-19 infection is still under investigation, but because it is a respiratory viral agent for most patients, it colonize only the lungs. After transmission of virus through direct contact with infected persons via sneezing or coughing, there is a 14 days of asymptomatic incubation period, during which the virus can be transmitted to another individuals (WHO, 2020). The multi-organ failure that increased in elderly and people have chronic diseases like diabetes, hypertension, cardiovascular disease raising death rates worldwide (WHO, 2020). COVID-19 made contacts and binding interface with specific receptor ACE2 (angiotensin converting enzyme 2) and have affinity for interaction with the host cells (Shang *et al.*, 2020). Spikes present on the surface of the virus it can enter the host's cells by binding to the ACE2 receptor (Walls *et al* ., 2020). Then replication cycle was started, with limited innate immune response from the patient. As the virus continues to multiply and colonize the respiratory system, where it experience a stronger innate immune response. Clinically, disease signs appears at this stage, about 80% of the infected patients have mild disease symptoms, mostly restricted to the upper respiratory pathways (Wu *et al.*, 2020). With appropriate symptomatic treatment, patients can be monitored at home. Some of patients may developed pulmonary infiltrates, others can complicated very severe diseases. Age is an important and influencing factor for patients with severe cases, elderly patients in the severe group have chronic diseases such as coronary heart disease, hypertension, chronic pulmonary disease, malignant tumor, and chronic kidney disease were more frequent than in the mild group, so patients over 60 years old age having comorbidities, like hypertension were at the risk of severe infection with the virus, as well as death (Wang *et al.*, 2020).

Innate immune responses to COVID-19

Cellular immune response represented by T- lymphocytes play a role inside the infected cells, through clearance viral-infected cells by cytotoxic T- cells (Lu *et al.*, 2020).

In Wuhan, through a study that investigated more than 90 case, observed an increase in neutrophils (38%), reduced in lymphocytes (35%), an increase in serum IL-6 (52%) and in c-reactive protein (84%). Increased neutrophils (Lee *et al.*, 2004),

decreased lymphocytes and higher plasma levels of many innate cytokines, all the previous findings may lead to elevated rate of disease and death (Zhou *et al.*, 2020). According to comparison between pro-inflammatory cytokines of mild and severe cases under monitoring, it noticed that IL-1 have an important role in increasing pathogenicity (Blanco-Melo *et al.*, 2020). In mild infections of COVID- 19 pro-inflammatory cytokines were not elevated, that proved a high level of pro-inflammatory response was a clinical finding of severe infection (Blanco-Melo *et al.*, 2020).

The influx of neutrophils and monocytes / macrophages results in hyper-production of pro-inflammatory cytokines (Magro *et al.*, 2020). The immunopathology of lungs may be the result of the "cytokine storms". Specific Th1 / Th17 may be activated and contributed to exacerbate inflammatory responses. B cells / plasma cells produce COVID-19 specific antibodies that may help neutralize viruses (Shokri *et al.*, 2019).

Adaptive immune response against COVID-19

Immune system cannot react properly when the body first encountered germs or viruses and the body get sick, the same thing were happened when first infected with COVID-19 (Kumar *et al.*, 2020). After infection with virus, immune system response mediated by antibodies production, by assistance of T- cells, B- cells were differentiate into plasma cells, which in return produce antibodies specific to a viral antigen. The neutralization process achieved by the antibodies were effective in preventing the virus from invading other host cells (Chen *et al.*, 2022), then restrict the infection. In later stages of infection, antibodies play an protective role, it may provide protection against recurrence of the infection in the future, adaptive immune response which play essential role in clearance of COVID-19 by:

a. cytotoxic T-cells activation that destroy infected cells with virus.
b. B-cells that produce neutralizing antibodies against virus-specific antigens.

One of the distinguishing characteristics of COVID-19 infection is blood lymphopaenia, with decrease in production levels of B-cells, CD4+ T-cells, and CD8+ T-cells (Boix and Merino, 2022). An abnormal innate immune response occurs in blood lymphopenia, characterized by decreased IFN-I production, which play a role in antigen presentation through assembly of viral material, that lead to enhancement of adaptive immunity (Liu *et al.*, 2017). Other mechanisms also present like, infection of T-cells by COVID-19 directly, MAS-related haemophagocytosis, cytokine induced apoptosis and pyroptosis of lymphocytes, lymphocyte sequestration in the lungs or other organs, reduced bone marrow hematopoiesis, and virus induced tissue damage

of lymphatic organs. All previous symptoms associated with COVID-19 lymphopaenia (Kaneko *et al.*, 2020 ; Zhang *et al.*, 2020).

A high percentage of COVID-19 patients, whose infections ranged from mild to moderate, showed potent adaptive immune response consisting of neutralizing antibodies and T-cells that lasts for months after first infection (Bradley *et al.*, 2020 ; Liu *et al.*, 2020). COVID-19 antigens are processed by antigen-presenting cells (APCs), that migrate to the lymphoid system and enhances immune response, leading to antigen recognizing then, proliferation and differentiation of T-lymphocytes leading to produce CD4+ and CD8+ (Tillett *et al.*, 2021).

T-lymphocytes also responsible for infected cells clearance (CD8+ cytotoxic T-lymphocytes), cytokine production, and activation of naïve B-lymphocytes (Wajnberg *et al.*, 2020). Humoral immunity represented by B-lymphocytes that subsequently generate large numbers of neutralizing immunoglobulins. On the other side, induction of cytokines occur in huge numbers, leading to hyper inflammation, as constituents of the 'cytokine storm' in severe disease (Soares-Schanoski *et al.*, 2022). Cytokines that contributed in cytokines storm e.g. IL-6, TNF-α, IL-1β, IP- 10, MCP-1, CSFs, and IL-17A. While those e.g. IL-15, IFN-α, IL-12, IL-21, and IFN-γ are essential in viral clearance in mild to moderate cases (Zuo *et al.*, 2020).

In severe cases of COVID-19, immune cells were distinguished by dysfunction, high levels of neutrophils and monocytes production with decreased levels of effector T-lymphocytes (Rydyznski *et al.,* 2020 ; Zuo *et al.*, 2020).

Basic Concepts of Herd Immunity

At the level of the individual, acquired immunity was build up either by immunization with a vaccine or natural infection with a pathogen (Stephenson *et al* ., 2021). Herd immunity which is also defines as a resistance to the spread of an infectious disease within a population that is based on pre-existing immunity of a high proportion of individuals as a result of previous infection or vaccination, it arises from immunity of the individual, which in turn leads to a broader and more comprehensive immunity, which is the immunity of society (Wu *et al* ., 2020). This effect was often seen at the population level through programs of vaccination, that targets to activate the role of herd immunity, so that children under the age of vaccination and immunocompromised persons, who cannot be vaccinated, remain in a safe position from contracting the disease (Verity *et al* ., 2020), an accordance with this concept, the susceptible persons were gained indirect protection from infection, so the herd immunity has taken on its role in protection. In the simplest model, the

herd immunity threshold is based on a single parameter known as R0, or the basic reproductive number (Boyton and Altmann, 2021). R0 indicates the average number of secondary infections caused by a single infectious individual introduced into a population that was fully susceptible to infection. (Kissler *et al* ., 2020 ; Nasiri *et al* ., 2020). If we consider a hypothetical pathogen with an R0 of 4, this means that, on average, one infected host will infect four others during the infectious period, assuming no immunity exists in the population. Therefore, the more communicable a pathogen, the greater it's associated R0 and the greater the proportion of the population that must be immune to block sustained transmission (Liu *et al.*, 2020). A similar parameter important for understanding population-level immunity is the effective reproduction number (Re or Rt). Re is defined as the average number of secondary cases generated by a single index case over an infectious period in a partially immune population (Aschwanden, 2021). Unlike R0, Re does not assumed a completely susceptible population and, consequently, will vary depending on a population's current immune state, which will change dynamically as an outbreak event or vaccination campaign unfolds (Fantanet and Cauchemes, 2020). The target of vaccination programs is to raise the Re value below 1. This occurs when the proportion of the immune population exceeds the herd immunity threshold. At this stage, the spread of the pathogen cannot be maintained, so there was a decrease in the number of infected individuals in the population (Randolph and Barreiro, 2020).

COVID-19 cases with bacterial co-infections

Bacterial co-infections are demonstrated in viral respiratory tract infections, which represent huge concern leading to disease and death (Wilson *et al* ., 1996 ; Rynda-Apple *et al.*, 2015). The microbial infections associated with COVID- 19, whether viral, bacterial or fungal, were considered medically important because they made it difficult to diagnose, identify and treat the infection and may lead to other diseases that constitute a double burden on the health of the infected person (Huang *et al* ., 2020 ; Page *et al* ., 2021). The most important causes of concomitant infection is the presence of bacteria and its endemicity in the atmosphere of hospitals and its acquisition of antibiotics resistance, which increased its virulence and thus became predisposed to infecting immunocompromised patients (Zu *et al.*, 2020). A viral dynamics, collection of clinical samples, route of transmission, adequate pathways to prevent disease spread, and effective pharmacological therapies, remain unclear (Paget and Trottein, 2019).

Antibiotics were still prescribed for treatment cases infected with COVID-19, while they ineffective for treatment of viral infections (Wu and McGoogan, 2020).

There are many reasons for doing this, it includes the difficulty of excluding bacterial co-infection during the disease as well as the ability of re-infection with bacteria again during the disease period (McCuller, 2014).

Rates of bacterial co-infection were increased in patients admitted to intensive care units, and these diseases could be due to super-infection by antibiotic-resistant bacteria in hospitals (Samaneh *et al.*, 2022). In this situation, the urgent need arises to review frequent and experimental prescribing of broad-spectrum antibiotics for patients with COVID-19 (Paget and Trottein, 2019).

According to many articles have shown that influenza viruses can be associated with secondary bacterial pneumonia that may occur during hospital admission, then developed complications that may lead to death in patients with or without pre-existing respiratory diseases (Chen *et al.*, 2020 ; WHO, 2020). On the other hand, viral infections can give way to bacterial infections, encouraging them, as in respiratory syncytial virus infection to respiratory passages (Arunachalam *et al.*, 2020), the damage of ciliated cells result in deterioration of muco-ciliary clearance by the virus which can increased adhesion of bacteria to mucins, then enhanced colonization of the bacteria in the airway (You *et al.*, 2017). After an acute inflammatory reaction and lungs tissue damage caused by a viral infection, a repair phase of lungs tissue occured, and because of the diverse immune responses in different individuals, this stage may lead to increase susceptibility to bacterial respiratory infections, so new bacterial adhesion receptors can emerged after virus-induced death of airway epithelial cells (Lai *et al.*, 2020). Thus, after viral infection, bacterial super infection can occur which in turn may lead to increased morbidity and mortality rates (Metlay *et al.*, 2019). Secondary infections may significantly reduces the survival of COVID-19 patients, and may be lead to another types of co-infection (Lai *et al.*, 2020), as fungal co-infections as well as viral co-infections that include commonest co-pathogen, *Candida glabrata, Candida albicans*, influenza A rhinovirus respectively (Arabi *et al.*, 2017). In addition, there was another group of viruses that have been identified as co-pathogens, such as influenza B virus, parainfluenza, metapneumovirus, coronavirus, and respiratory syncytial virus (Alfaraj *et al.*, 2017 ; Metlay *et al.*, 2019).

Mechanism of bacterial co-infections

The bacterial co-infection was arised from hospital-associated bacteria that invade hospitals airspace and adapted to develop an infection in individuals with a weakened immune system (Bengoechea and Bamford, 2020). Viral respiratory system

infections were accompanied by opportunistic bacteria or nosocomial infections, leading to secondary bacterial infections (Arunachalam *et al.*, 2020).

After The COVID-19 got entrance to human cells via adhesion to ACE2 protein-specific receptor of the cells that lining the upper and lower respiratory system (ven-Bekel *et al.*, 2020). Virus begin to make pathological changes in lungs tissues nature, include induction of airway damage, goblet cell hyperplasia, losing of cells, reduction in frequency of ciliary beat, altered mucus secretion, decreased in oxygen exchange, finally, breakdown of immune defenses (Seymour *et al.*, 2020). All these changes in the composition of the tissues of the respiratory cells gave an opportunity for pathogenic bacteria and even the normal flora to increase adherence and invasion to infected lungs tissues (Seymour *et al.*, 2020 ; Tay *et al.*, 2020).

The high levels of pro-inflammatory cytokines might lead to shock, respiratory failure or multiple organ failure (Alhazzani *et al.*, 2020). After an acute inflammatory reaction that lead to damage in lungs tissue caused by infection of virus, all of this may increase susceptibility to bacterial respiratory infections (Arunachalam *et al.*, 2020).

Antibiotics ineffective for infection with COVID-19, but it prescribed to individuals who suspected or documented COVID-19 infection because of the possibility of secondary bacterial infection during the course of the disease (Giamarellos-Bourboulis *et al.*, 2020), and to reduce the risk of death for COVID-19 patients with super-infection during influenza epidemics, many guidelines call for the use of empirical antibiotics for patients with severe COVID-19 (Karla *et al.*, 2020 ; Nuovo *et al.*, 2020).

Antimicrobial treatment should be used as soon as possible, with a guarantee of its effectiveness against infection (WHO, 2019 ; Prompetchara *et al.*, 2020). It is important to do culture and antibiotics susceptibility test for patients to identify the concerned bacteria (Weston *et al.*, 2020), and then determine the appropriate treatment or antibiotics, rather than keeping the patient in a state of double treatment for a long time (Sultani *et al.*, 2021). The sudden epidemic caused by COVID- 19 affected people all over the world, and with its emergence and spread, an urgent necessity arose to find a vaccine against the virus, or to discover or develop modern antivirals (Moreno-Garcia *et al.*, 2022).

Conclusions

1. Both innate and adaptive immune responses were stimulated against this virus in patients infected with COVID-19. All types of immune cells participated in the defense against the virus, but the immune response of patients varies depending on the efficiency and strength of their immune system.

2. The elderly and immune-compromised individuals were more affected than others, due to the weakening of their immune system, so death rates are high among them.

3. Bacterial infections occur accompanying patients infected with COVID- 19 and were often acquired from the atmosphere of hospitals and intensive care units, and the weakened immune system of those infected individuals helped to increase the acquisition of these bacterial infections.

4. Bacterial co-infections associated with COVID-19 may lead to high mortality rates among patients.

5. Herd immunity can be reached through community members receiving available and specialized vaccines that work against COVID- 19.

References:

1. Alfaraj, SH.; Al-Tawfiq, J. A.; Altuwaijri, T. A.; Memish, Z. A. (2017). Middle East Respiratory Syndrome Coronavirus and pulmonary tuberculosis coinfection: implications for infection control. Intervirology, 60:53e5.

2. Alhazzani, W.; Møller, M. H.; Arabi, Y. M. et al. (2020). Surviving Sepsis Campaign: guidelines on the management of critically ill adults with coronavirus disease 2019 (COVID-19). Crit Care Med., 48:e440-e469.

3. Arabi, Y. M.; Al-Omari, A.; Mandourah, Y.; Al-Hameed, F.; Sindi, A. A.; Alraddadi, B. et al. (2017). Critically ill patients with the Middle East Respiratory Syndrome: a multicenter retrospective cohort study. Crit Care Med , 45:1683e95.

4. Arunachalam, P.S.; Wimmers, F.; Mok, C.K.P.; Perera, R.A.; Scott, M.; Hagan, T. (2020). Systems biological assessment of immunity to mild versus severe COVID-19 infection in humans. Science, 369:1210–1220.

5. Aschwanden, C. (2021). Why herd immunity for COVID is probably impossible? Nature, 591: 520-522.

6. Ayoubkhani, D. ; Khunti, K. ; Nafilyan, V. ; Maddox, T. ; Humberstone, B. ; Diamond, L. ; Banerjee, A. (2021). Post-covid syndrome in individuals admitted to hospital with covid-19: retrospective cohort study. BMJ, 372(693): 1-9.

7. Bao, L.; Deng, W.; Gao, H.; Xiao, C.; Liu, J.; Xue, J.; Lv, Q.; Liu, J.; Yu, P.; Xu, Y. (2020). Reinfection could not occur in SARS-CoV-2 infected rhesus macaques. BioRxiv.

8. Bengoechea, J. A. and Bamford, C. G. (2020) SARS-CoV-2, bacterial co-infections, and AMR: the deadly trio in COVID-19? EMBO Mol Med., 7;12(7):e12560.

9. Blanco-Melo, D.; Nilsson-Payant, B.E.; Liu, W.C.; Uhl, S.; Hoagland, D.; Møller, R.; Jordan, T.X.; Oishi, K.; Panis, M.; Sachs, D. (2020). Imbalanced host response to SARS-CoV-2 drives development of COVID-19. Cell, S0092- 8674(20)30489-X.

10. Boyton, R. J. and Altmann, D. M. (2021). The immunology of asymptomatic SARS-CoV-2 infection: what are the key questions? Nature Reviews, 21: 762-768.

11. Bradley, B. T.; Maioli, H.; Johnston, R. et al. (2020). Histopathology and ultra-structural findings of fatal COVID-19 infections in Washington state: a case series. Lancet , 396: 320–332.

12. Chan, J. F.; Yuan, S.; K, K. H.; To, K. K.; Chu, H.; Yang, J. et al. (2020). A familial cluster of pneumonia associated with the 2019 novel coronavirus indicating person-to-person transmission: a study of a family cluster. Lancet, 395:514-23.

13. Chowdhury, M. A. ; Hossain, N. ; Abul Kashem**,** M. ; Shahid, A.; Alam, A. (2020). Immune Response in COVID-19: A Review. J. Infect. Public Health, 13(11):1619-1629.

14. Conti, P. and Younes, A. (2020). Coronavirus COV-19/SARS-COV-2 affects women less than men: clinical response to viral infection. J Biol Regul Homeost Agents, 34(2):339-343.

15. Fontanet, A. and Cauchemez, S. (2020). COVID-19 herd immunity: where are we? Nature Reviews, 20: 583-584.

16. Giamarellos-Bourboulis, E. J.; Tsilika, M.; Moorlag, S.; Antonakos, N.; Kotsaki, A.; Dominguez Andres, J.; et al. (2020). Activate: Randomized Clinical Trial of BCG Vaccination against Infection in the Elderly. Cell, 15;183(2):315-323.e9.

17. Huang, C.; Wang, Y.; Li, X.; Ren, L.; Zhao, J.; Hu, Y. et al. (2020). Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. Lancet, 395:497e506.

18. Kaneko, N.; Kuo, H.; Boucau, J. et al. (2020). Loss of Bcl-6-expressing T follicular helper cells and germinal centers in COVID-19. Cell , 183: 143–157.e13.

19. Karla, T.; Sy, N.; Haw, L.; Jhanna, U. (2020) Previous and active tuberculosis increases risk of death and prolongs recovery in patients with COVID-19, Infectious Diseases, 52:12, 902-907.

20. Kissler, S. M.; Tedijanto, C.; Goldstein, E.; Grad, Y. H.; Lipsitch, M. (2020). Projecting the transmission dynamics of SARS-CoV-2 through the post pandemic period. Science, 368(6493):860-868.

21. Kumar, S.; Nyodu, R.; Maurya, V.; Saxena, K. (2020). Host immune response and immunobiology of human SARS-CoV-2 infection. In: Coronavirus disease 2019 (COVID-19), p. 43–53.

22. Lai, C. C.; Shih, T. P.; Ko, W. C.; Tang, H. J.; Hsueh, P. R. (2020). Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) and coronavirus disease-2019 (COVID-19): the epidemic and the chal-lenges. Int J Antimicrob Agents, 55:105924.

23. Lee, CH.; Chen, R. ; Liu, J.; Yeh, W.; Chang, J. C.; Liu, P. M. et al. (2004). Altered p38 mitogen-activated protein kinase expression in different leukocytes with increment of immunosuppressive mediators in patients with severe acute respiratory syndrome. J Immunol , 172:7841- 7.

24. Lee, I.T.; Nakayama, T.; Wu, C.; Goltsev, Y.; Jiang, S.; Gall, P. A. (2020). ACE2 localizes to the respiratory cilia and is not increased by ACE inhibitors or ARBs. Nat. Commun., 11:1–14.

25. Letko, M. ; Marzi, A.; Munster, V. (2020). Functional assessment of cell entry and receptor usage for SARS-CoV-2 and other lineage B betacoronaviruses. Nature Microbiol., 5: 562-569.

26. Li, Q.; Guan, X.; Wu, P.; Wang, X.; Zhou, L.; Tong, Y.; Ren, R.; Leung, K.S.M.; Lau, E.H.Y.; Wong, J.Y. et al. (2020). Early transmission dynamics in Wuhan, China, of novel coronavirus-infected pneumonia. N. Engl. J. Med. 382, 1199–1207.

27. Liu, Q.; Shi, Y.; Cai, J. et al. (2020). Pathological changes in the lungs and lymphatic organs of twelve COVID-19 autopsy cases. Natl Sci Rev , 7: 1868–1878.

28. Liu, W.; Zhang, Q.; Chen, J.; Xiang, R.; Song, H.; Shu, S. et al. (2020). Detection of Covid-19 in Children in Early January 2020 in Wuhan, China. New Engl J Med, 380(14):1370-1371.

29. Liu, W. J.; Zhao, M.; Liu, K.; Xu, K.; Wong, G.;Tan, W. et al. (2017). T-cell immunity of SARS-CoV: Implications for vaccine development against MERS-CoV. Antiviral Res., 137:82-92.

30. Lu, R.; Zhao, X.; Li, J.; Niu, P.; Yang, B.; Wu, H. et al. (2020). Genomic characterisation and epidemiology of 2019 novel coronavirus: implications for virus origins and receptor binding. Lancet, 395(10224):565–74.

31. Magro, C.; Mulvey, J. J.; Berlin, D. et al. (2020). Complement associated microvascular injury and thrombosis in the pathogenesis of severe COVID-19 infection: a report of five cases. Trans Res., 220: 1–13.

32. McCullers, J. A. (2014). The co-pathogenesis of influenza viruses with bacteria in the lung. Nature Reviews, 12: 252-262.

33. Metlay, J. P.; Waterer, G. W.; Long, A. C.; Anzueto, A.; Brozek, J.; Crothers, K. (2019). Diagnosis and treatment of adults with community-acquired pneumonia. An official clinical practice guideline of the American Thoracic Society and Infectious Diseases Society of America. Am J Respir Crit Care Med , 200:e45e67.

34. Moreno-Garcia, E. ; Puetra-Alcalde, P. ; Letona, L.; Soriano, A.; Garcia-Vidal, C. (2022). Bacterial co-infection at hospital admission in patients with COVID-19. Int J Infect Dis., 118:197-202.

35. Nasiri, M. J.; Haddadi, S.; Tahvildari, A.; Farsi, Y.; Arbabi, M.; Hasanzadeh, S.; Jamshidi, P.; Murthi, M.; Mirsaeidi, M. (2020). COVID-19 clinical characteristics, and sex-specific risk of mortality: Systematic Review and Meta-analysis. Frontiers In Medicine, 7(457):1-10.

36. Nuovo, G.; Tili, E.; Suster, D.; Matys, E.; Hupp, L.; Magro, C. (2020). Strong homology between SARS CoV-2 envelope protein and a *Mycobacterium* sp. antigen allows rapid diagnosis of Mycobacterial infections and may provide specific anti-SARS-CoV-2 immunity via the BCG vaccine. Ann Diagn Pathol., 48:151600.

37. Page, J.; Hinshaw, D.; McKay, B. (2021). "In Hunt for Covid-19 Origin, Patient Zero Points to Second Wuhan Market – The man with the first confirmed infection of

the new coronavirus told the WHO team that his parents had shopped there". The Wall Street J.

38. Paget, Ch. and Trottein, F. (2019). Mechanism of bacterial superinfection post-influenza: A role for unconventional T cell. Frontiers in immunology, 10(336): 1- 13.

39. Pourajam, S.; Kalantari, E.; Talebzadeh, H.; Mellali, H.; Sami, R.; Sultaninejad, F.; Amra, B.; Sajadi, M.; Alenaseri, M.; Kalantari, F.; Solgi, H. (2022). Frontiers in cellular and infection microbiology, 12(784130): 1-9.

40. Prompetchara, E.; Ketloy, Ch.; Palaga, T. (2020). Immune responses in COVID-19 and potential vaccines: lessons learned from SARS and MERS epidemic. Asian Pac J Allergy Immunol., 38:1-9.

41. Randolph, H. E. and Barreiro, L. B. (2020). Herd immunity: Understanding COVID-19. Immunity Primer, (52): 737-741.

42. Rydyznski, C.; Ramirez, S. I.; Dan, J. M. et al. (2020). Antigen specific adaptive immunity to SARS-CoV-2 in acute COVID-19 and associations with age and disease severity. Cell, 183: 996–1012.e19.

43. Rynda-Apple, A.; Robinson, K. M.; Alcorn, J. F. (2015). Influenza and bacterial superinfection: illuminating the immunologic mechanisms of disease. Infect Immun., 83(10):3764-70.

44. Seymour, C.W.; Gesten, F.; Prescott, H. C. et al. (2017). Time to treatment and mortality during mandated emergency care for sepsis. N Engl J Med., 376:2235-2244.

45. Shang, J.; Ye, G.; Shi, K. et al. (2020). Structural basis of receptor recognition by SARS-CoV-2. Nature, 581:221.

46. Shokri, S.; Mahmoudvand, S.; Taherkhani, R.; Farshadpour, F. (2019). Modulation of the immune response by Middle East respiratory syndrome coronavirus. J Cell Physiol. , 234:2143-51.

47. Shorls, H.; Zeng, G.; Ren, X.; Li, H.; Ke, C.; Tan, Y.; Cai, C.; Lai, K.; Chen, R.; ChanYeung, M.; Zhong, N. (2006). Longitudinal profile of antibodies against SARS-coronavirus in SARS patients and their clinical significance. Respirology, 11:49–53.

48. Soares-Schanoski, A.; Sauerwald, N.; Goforth, C.; Periasamy, S. ; Weir, D.; Lizewski, S.; Lezewski, S. et al. (2022). Asymptomatic SARS-CoV-2 infection associated with higher level of serum IL-17C, matrix metalloproteinase 10 and fibroblast growth factors than mild symptomatic COVID-19. Frontiers in Immunology, 13(821730): 1-18.

49. Stephenson, E., et al. (2021). Single cell multiomics analysis of the immune response in COVID19. Nature Medicine, 27:904-916.

50. Sultani, S.; S. Faramarzi, ; M. Zandi, ; R. Shahbahrami, ; A. Jafarpour, ; R. Pakzad. (2021). Bacterial coinfection among coronavirus disease 2019 patient

groups: an updated systemic review and meta-analysis. New microb. New infect., 43:100910.

51. Tay, M. Z.; Poh, C. M.; Rénia, L.; MacAry, P. A.; Ng, L. F. (2020). The trinity of COVID-19: Immunity, inflammation and intervention. Nat Rev Immunol., 20:363–374.

52. Tillett, R. L.; Sevinsky, J. R.; Hartley, P. D.; et al. (2021). Genomic evidence for reinfection with SARS-CoV- 2: a case study. Lancet Infect Dis, 21: 52–58.

53. van Berkel, M.; Kox, M.; Frenzel, T. et al; (2020). RCI-COVID-19 study group. Biomarkers for antimicrobial stewardship: a reappraisal in COVID-19 times? Crit Care. , 24:600.

54. Varghese, P. M.; Tsolaki, A. G.; Yasmin, H.; Shastri, A.; Ferluga, J.; Vatish, M.; Madan, T.; Kishore, U. (2020). Host-pathogen interaction in COVID-19: Pathogenesis, potential therapeutics and vaccination strategies. Immunobiology. 225, Review.

55. Verity, R.; Okell, L.C.; Dorigatti, I.; Winskill, P.; Whittaker, C.; Imai, N.; CuomoDannenburg, G.; Thompson, H.; Walker, P.G.T.; Fu, H. et al. (2020). Estimates of the severity of coronavirus disease 2019: a model-based analysis. Lancet Infect. Dis., 20(6):669-677.

56. Wajnberg, A.; Amanat, F.; Firpo, A. et al. (2020). Robust neutralizing antibodies to SARS-CoV-2 infection persist for months. Science, 370: 1227–1230.

57. Walls, A. C.; Park, Y. J.; Tortorici, M. A.; Wall, A.; McGuire, A.T.; Veesler, D. (2020). Structure, function, and antigenicity of the SARS-CoV-2 spike glycoprotein. Cell, 180:281-292.

58. Wang, D.; Hu, B.; Hu, C.; Chang Zhu, F.; Liu, X. et al. (2020). Clinical characteristics of 138 hospitalized patients with 2019 novel coronavirus-infected pneumonia in Wuhan, China. JAMA, 323(11):1061-1069.

59. Wilson, R.; Dowling, R.; Jackson, A. (1996). The biology of bacterial colonization and invasion of the respiratory mucosa. Eur Respir J., 9(7):1523-30.

60. World Health Organization. (c 2020). Summary of probable SARS cases with onset of illness from 1 November 2002 to 31 July 2003. Geneva, Switzerland.

61. World Health Organization. (2021). Introduction to COVID-19: methods for detection, prevention, response and control. Geneva, Switzerland.

62. World Health Organization. (2019). Global tuberculosis report 2019.Geneva, Switzerland.

63. World Health Organization. (2020). Clinical management of COVID-19 interim guidance. Geneva, Switzerland.

64. World Health Organization. (2020). Coronavirus disease (COVID-19): Herd immunity, lockdowns and COVID-19. Geneva, Switzerland.

65. Wu, F.; Zhao, S.; Yu, B.; Chen, Y. M.; Wang, W.; Song, Z. G. et al. (2020). A new coronavirus associated with human respiratory disease in China. Nature, 579:256-269.

66. Wu, Z. and McGoogan, J. M. (2020). Characteristics of and Important Lessons From the Coronavirus Disease 2019 (COVID-19) Outbreak in China: Summary of a Report of 72 314 Cases From the Chinese Center for Disease Control and Prevention. JAMA, 323(13):1239-1242.

67. Zangrillo, A.; Beretta, L.; Scandroglio, A. M.; Monti, G.; Fominskiy, E.; Colombo, S. et al. (2020). For the COVID-Bio Study Group. Characteristics, treatment, outcomes and cause of death of invasively ventilated patients with COVID-19 ARDS in Milan, Italy. Crit Care Resusc., 22(3):200-211.

68. Zhang, X.; Tan, Y.; Ling, Y. et al. (2020). Viral and host factors related to the clinical outcome of COVID-19. Nature, 583: 437–440.

69. Zhou, P.; Yang, X. L.; Wang, X. G.; Hu, B.; Zhang, L.; Zhang, W. et al. (2020). A pneumonia outbreak associated with a new coronavirus of probable bat origin. Nature., 579:270-

70. Zuo, J.; Dowell, A.; Pearce, H. et al. (2020). Robust SARS-CoV-2-specific Tcell immunity is maintained at 6 months following primary infection. bioRxiv. Nat. Immunol., 22(5):620-626.

SOLVING SOME LINEAR EQUATIONS BY USING ENHANCED THEOREM

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Abstract:

In this project, a new fast, efficient, and accurate method is presented to determine the general solution of the second order linear differential equation when the coefficients are variables that are related to each other by another ordinary differential equation. One of the solution methods consists in transforming the second-order differential equation once into a Riccati ordinary differential equation, the latter ODE can be solved without the need to know a particular solution a priori. These solution methods provide tools that allow explaining this type of ODE in a straightforward way in the classroom.

Key words: Linear Equations, Enhanced Theorem.

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Introduction

A second order linear ordinary differential equation (ODE) constitutes a special class of differential equations and plays an important role in many fields of applied science, this type of ODE appears in classical problems of mechanics, electromagnetism, and gas dynamics [1],[2]. In general, a linear ODE of the form

$$\alpha_2(x)y''(x) + \alpha_1(x)y'(x) + \alpha_0(x)y(x) = f(x) \qquad (1)$$

where the variable coefficients $a0$, $a1$, $a2$, and $f(x)$ are arbitrary functions of x with $\alpha_2(x) \neq 0$, $\alpha_1(x) \neq 0$, it is called second-order linear ODE and to solve it, it is necessary that the coefficients $ak(x)$ satisfy certain conditions. The best-known way is to divide the ODE (1) by $\alpha_2(x)$ and write it in the form:

$$y''(x) + P(x)y'(x) + Q(x)y(x) = g(x) \qquad (2)$$

The procedure to determine the solution of this linear ODE of second order has two steps: first the associated homogeneous linear ODE is solved and then using the method of variation of parameters a particular solution is determined, the general solution of the complete non- homogeneous ODE is achieved by adding these two solutions [3],[4].

The main idea here is to offer a new approach to obtain the general solution of some linear homogeneous second-order ODEs, as well as to show and promote the use of this solution method among practicing engineers and engineering students. In order to use the proposed solution method, one of the two conditions given in this work must be satisfied, and when either of them verified, the second-order linear ODE can reduce to a first-order equation, which allows it to be easily solved without using power series.

This work organized as follows: the existing solution methods presented; the proposed solution methods are presented; some applications of these methods are presented, for this, some differential equations whose solutions are obtained using power series are selected and are solved using the proposed methodology. Finally, the conclusions are presented.

The second-order linear ODE solution methods, which are presented in the classic ODE texts and used by mathematics teachers, are described below. For simplicity a second-order homogeneous linear ODE solution methods are considered.

Cauchy–Euler Equation

This linear ODE is in which the degree of the coefficients coincides with the order s of the differentiation of the ODE (1), that is, the coefficients are of the form:

$$\alpha_s(x) = \alpha_s x^s, \quad s = 0,1,2$$

Where $\alpha_s \in R$. For this type of ODE, the solutions are of the form $y(x) = x^n$, and the value of n is determined as the solution of the quadratic equation:

$$\alpha_2 n(n-1) + \alpha_1 n + \alpha_0 = 0$$

This type of ODE has one of the following solutions:

If $n_1 \neq n_2, y$ is real, then $y(x) = c_1 x^{n_1} + c_2 x^{n_2}$.

If $n_1 = n_2$, then $y(x) = c_1 x^{n_1} + c_2 x^{n_2} \ln x$

If $n_1 = \alpha + i\beta, n_2 = \alpha - i\beta,$

then $y(x) = x^\alpha (c_1 \cos(\beta \ln x) + c_2 \sin(\beta \ln x))$

Exact Equation

It is the one in which the coefficients of the ODE (1) satisfy the following accuracy test

$$\alpha_2^{''}(x) - \alpha_1^{'}(x) + \alpha_0(x) = 0$$

This type of ODE has a solution of the form

$$y_1(x) = \alpha_2(x) e^{-\int \frac{\alpha_1(x)}{\alpha_2(x)} dx}$$

and the other solution is determined using the order reduction method.

Change the Variable

The change of function $y(x)$ by $g(x)$ given by $y(x) = e^{-\int g(x)dx}$ transforms the ODE (1) into

$$g'(x) = (g(x))^2 - \frac{\alpha_1(x)}{\alpha_2(x)} g(x) + \frac{\alpha_0(x)}{\alpha_2(x)} \tag{3}$$

This is a Riccati equation. In some cases, little is gained by this transformation, since the new ODE (3) may be just as difficult to solve as the old one. In [5], several transformations are presented that allow the Riccati ODE to be linearized and for some cases to determine the general solution of said ODE. In [6], some solutions of the Riccati ODE are presented when the coefficients satisfy certain conditions, which allows finding the general solution without knowing a particular solution.

Solution by Power Series

Among the types of linear ODEs that are solved by this method are: the Airy equation, the Bessel equations, the Legendre equations, and the hypergeometric equation, among others.

Proposed Methods

The methods proposed to establish a solution of the homogeneous linear ODE associated with the ODE given in (1) with variable coefficients, are summarized in the theorems presented below:

Theorem 1:

If the coefficients of the linear ODE given in (1) are related by the following condition:

$$\frac{\alpha_0(x)}{\alpha_2(x)} = \frac{a}{dx} \left[\frac{\alpha_1(x)}{\alpha_2(x)} \right] \tag{4}$$

then a solution of the associated homogeneous equation is given by

$$y_1(x) = e^{-\int \frac{\alpha_1(x)}{\alpha_2(x)} dx}$$

and by the order reduction method:

$$y_2(x) = y_1(x)g(x)$$

Were,

$$g(x) = \int e^{\int \frac{\alpha_1(x)}{\alpha_2(x)}dx}dx$$

Test: If the coefficients satisfy expression (4), then the homogeneous linear ODE associated with the second-order linear ODE (1) can be rewritten as

$$\alpha_2(x)\left[y''(x) + \frac{\alpha_1(x)}{\alpha_2(x)}y'(x) + \frac{d}{dx}\left(\frac{\alpha_1(x)}{\alpha_2(x)}\right)y(x)\right] = 0$$

$$\alpha_2(x)\frac{d}{dx}\left[y'(x) + \left(\frac{\alpha_1(x)}{\alpha_2(x)}\right)y(x)\right] = 0$$

this expression behaves like the derivative of a constant, so

$$s = y'(x) + \frac{\alpha_1(x)}{\alpha_2(x)}y(x)$$

with $s \in R$, this ODE is first order linear and using the integrating factor

$$P(x) = e^{\int \frac{\alpha_1(x)}{\alpha_2(x)}dx}$$

thus we arrive at the following solution

$$y(x) = e^{-\int \frac{\alpha_1(x)}{\alpha_2(x)}dx}\left[\int s e^{\int \frac{\alpha_1(x)}{\alpha_2(x)}dx}\,dx + F\right]$$

where $F \in R$ and we have what we wanted to prove.

Theorem 2:

If the coefficients of the linear ODE given in (1) satisfy the following condition:

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$$\frac{d}{dx}\left[\frac{\alpha_1(x)}{\alpha_0(x)}\right] = -1 \tag{5}$$

then a solution of the associated homogeneous equation is

$$y_1(x) = \frac{\alpha_1(x)}{\alpha_0(x)}$$

and by the order reduction method:

$$y_2(x) = \frac{\alpha_1(x)}{\alpha_0(x)} g(x)$$

Were,

$$g(x) = \int e^{\left\{\int\left[2\frac{\alpha_0(x)}{\alpha_1(x)} - \frac{\alpha_1(x)}{\alpha_2(x)}\right]dx\right\}} dx$$

Test: If the coefficients satisfy expression (5), then it is easy to verify that a solution of the homogeneous linear ODE associated with the second order linear ODE (1) is given by

$$y_1(x) = \frac{\alpha_1(x)}{\alpha_0(x)} \tag{6}$$

Using the order reduction method, we have

$$y_2(x) = y_1(x)g(x), \qquad y_2'(x) = y_1(x)g'(x) - g(x)$$

$$y_2''(x) = y_1(x)g''(x) - 2g'(x)$$

a linear ODE given in (1) becomes,

$$\alpha_2(x)[y_1(x)g''(x) - 2g'(x)] + \alpha_1(x)y_1(x)g'(x) = 0$$

Then we arrive at the following solution

$$g(x) = \int e^{\int \left[\frac{2}{y_1(x)} - \frac{a_1(x)}{a_2(x)}\right]dx} dx = \int \frac{e^{-\int \left[\frac{a_1(x)}{a_2(x)}\right]dx}}{\left(y_1(x)\right)^2} dx$$

substituting (6) we have what we wanted to prove.

In other words, Theorem 2 tells us that in case the quotient between $\alpha_1(x)$ and $\alpha_2(x)$ is alinear function with slope of value -1, a solution of the homogeneous linear ODE (1), is said linear function.

Illustration

In this section, the methods presented to find the general solution of some second-order linear ODEs given in [2],[7], are applied.

Example 1:

Find the general solution of the homogeneous linear ODE

$$2x^2y'' + x(2x + 1)y' - y = 0, \qquad x > 0$$

Solution:

This exercise is one of the examples that appears in [7], to illustrate the Frobenius method. Note that the coefficients of this ODE satisfy the condition given in (4), so the linear ODE can be rewritten as

$$2x^2 \frac{d}{dx}[y' + \frac{2x + 1}{2x}y] = 0 \qquad\qquad (7)$$

Then,

$$y' + \frac{2x + 1}{2x} y = s$$

Using the integrating factor, the general solution is:

$$y(x) = \frac{1}{\sqrt{x}}e^{-x}[c_1 + s\int \sqrt{x}\,e^x dx]$$

$$= c_1y_1(x) + c_2y_2(x)$$

where $y(x)$ corresponds to the solution of the first-order linear ODE that appears in expression (7). Note that this linear ODE is not exact. Furthermore, the proposed procedure involves few steps unlike the series solution method.

Example 2:

Find the general solution of the homogeneous linear ODE

$$y'' + xy' + y = 0$$

Solution:

This exercise is proposed in [6], to apply the exact method. Note that the coefficients of this ODE satisfy the condition given in (4), so the linear ODE can be rewritten as

$$\frac{d}{dx}(y' + xy) = 0$$

this new ODE can be written as

$$\frac{dy}{dx} + xy = s$$

which corresponds to a first-order linear ODE and its solution is given by

$$y = e^{-\frac{1}{2}x^2}\left[\int k e^{\frac{1}{2}x^2}\, dx + c\right]$$

Therefore, the general solution is:

$$y(x) = \mathcal{C}\, e^{-\frac{1}{2}x^2} + \mathcal{C}\, e^{-\frac{1}{2}x^2}\int e^{\frac{1}{2}x^2}\, dx$$

    note that this linear ODE is exact. It can be seen that the procedure is much more direct and simpler than the exact ODE solution method.

Example 3:

Find the solution of the linear Legendre ODE

$$(1 - x^2)y'' - 2xy' + 2y = 0$$

Find the solution of the linear Legendre ODE

$$(1 - x^2)y'' - 2xy' + 2y = 0$$

Solution:

This exercise is solved using Legendre polynomials. Note that the coefficients of this ODE satisfy the condition given in (5), so a second-order solution of this ODE

$$y_1(x) = x$$

and the other solution is given by

$$y_2(x) = x \int e^{\int [-\frac{2}{x} + \frac{2x}{1-x^2}] dx} dx$$

$$= x \int e^{\int [-\frac{2}{x} + \frac{1}{1-x} - \frac{1}{x+1}] dx} dx$$

$$= \int \frac{dx}{\underline{x(1-x^2)}}$$

again using partial fractions, after some operations and simplifying we arrive at

$$y_2(x) = x \tanh^{-1}(x) - 1$$

where $\tanh-1(x) = arc \tanh x$. Therefore, the general solution is:

Note that this linear ODE is not exact. Furthermore, the proposed procedure involves few steps unlike the series solution method. Below are two practical examples, where the methods proposed in this project can be applied.

Example 4. Variable electrical resistance

Consider a resistor-inductor-capacitor RLC circuit shown in the figure. Suppose the voltage at the source is $E(t) = 0$ volts, the inductance is L henrys, the capacitance is C farads. Furthermore, it is assumed that the resistor heats up, such that the electrical resistance increases

in the form $R(t) = R_0 + \frac{1}{C}t$ ohms, where R_0 is a constant denoting the reference resistance of

the resistor [9],[10]. Determine the charge on the capacitor in the circuit

Solution:

The charge t(x) of the capacitor is the solution of the second order equation

$$L\frac{d^2}{dt^2}q(t) + (R_0 + \frac{1}{C}t)\frac{d}{dt}q(t) + \frac{1}{C}q(t) = 0 \qquad (8)$$

Note that condition (4) is satisfied by the equation, so the second-order linear ODE can be written as

$$L\frac{d}{dt}\{\frac{d}{dt}q(t) + \frac{1}{L}(R_0 + \frac{1}{C}t)\,q(t)\} = 0$$

To find a solution to the homogeneous problem (8) the exact linear equation is solved

$$\frac{d}{dt}q(t) + \frac{1}{L}(R_0 + \frac{1}{C}t)\,q(t) = s_1, \qquad s_1 \text{ is constant}$$

whose general solution is

$$q(t) = exp\left\{-\frac{R_0}{L}t - \frac{1}{2LC}t^2\right\}\left[k_2 + k_1\int e^{\left\{\frac{R_0}{L}t + \frac{1}{2LC}t^2\right\}}\,dt\right]$$

Example 5. Dynamics in a marine ecosystem

Denoting by x and y the amounts of biomass of zooplankton and phytoplankton in a certain marine ecosystem, respectively. Assuming the great abundance of phytoplankton in the ecosystem and since it constitutes food for zooplankton [11], then it is considered that the rate of change of zooplankton biomass is proportional to the amount of phytoplankton biomass. Furthermore, it is assumed that phytoplankton grow with a time-varying intrinsic

rate of the form $1 + e-t$ and the phytoplankton biomass decreases due to consuming organisms (zooplankton) with a time-varying rate of the form $e-t$. Then the interaction between the two populations of organisms is modeled by the following system of differential equations

$$\frac{dx}{dt} = y, \quad \frac{dy}{dt} = (1 + e^{-t})y - e^{-t}x \tag{9}$$

Determine the amount of biomass of both populations.

Solution:

First, the system of first-order differential equations (9) is transformed into a second- order differential equation. Differentiating the first equation of (9) once and substituting $\frac{dy}{dt}$,

we get

$$\frac{d^2x}{dt^2}(1 + e^{-t})\frac{dx}{dt} + e^{-t}x = 0 \tag{10}$$

Note that condition (4) is satisfied by equation (10), so it can be written as

$$\frac{d}{dt}[\frac{dx}{dt} - (1 - e^{-t})x] = 0$$

A solution to the homogeneous problem (10) is now determined by solving the exact linear equation

$$\frac{dx}{dt} - (1 - e^{-t})x = s_1 \qquad (11)$$

$$X(t) = exp\{t - e^{-t}\}[s_2 + s_1 \int e^{\{e^{-t}-t\}} dt]$$

where $s2$ is constant. Finally from the equation (11) it is obtained that the phytoplankton biomassis

$$y(t) = (1 + e^{-t})x(t) + s_1$$

Conclusion

A new solution method for some second-order linear ODEs with variable coefficients is presented. When the coefficients of the ODE satisfy any of the established conditions, the method allows to determine the general solution of the ODE in an exact and very simple way without the need to use power series. The proposed conditions on the ODE coefficients can be seen as a criterion to reduce the equation to first order. In future works it is desired to identify criteria of this style for higher order ODEs.

References

1. Murphy G 1960. Ordinary differential equations and their solutions. Van Nostrand Reinhold Company, New York, 462p.

2. Boyce W y R DiPrima 1997. Elementary Differential Equations and Boundary Value Problems. Sexta edición, John Wiley & Sons, New York, 749p.

3. Boyce W y R DiPrima 1997. Elementary Differential Equations and Boundary Value Problems. Sexta edición, John Wiley & Sons, New York, 749p.

4. Esraa Habeeb Khaleel Al-Juhaishi, 2022. Symbolic Solutions by Using the Functional Separation of Variables. Iraqi Journal of Humanitarian, Social and Scientific Research, 1060-1070 p.

5. Sugai, I. (1961). A class of solved Riccati's equations. Electrical Communication, 37(1), 56-60.

6. William E. Boyce, Richard C. DiPrima, Elementary Differential Equations and Boundary Value Problems, Seventh Addition, John Wiley and Sons, Inc. (2001).

7. Simmons G 1991. Differential Equations with Applications and Historical Notes. Segunda edición, McGraw-Hill, New York, 629p.

8. Pastor J 2008. Mathematical Ecology of Populations and Ecosystems. Wiley-Blackwell, Oxford, 344p.

9. Moscoso, J. A. J., & Vera, J. M. R. THE SOLUTION OF SOME SECOND-ORDER LINEAR DIFFERENTIAL EQUATIONS.

10. Al-Juhaishi, Esraa Habeeb Khaleel. Novel Approaches for Constructing Persistent Delaunay Triangulations by Applying Different Equations and Different Methods. Missouri University of Science and Technology ProQuest Dissertations Publishing, 2020. 28000687.

11. Pastor, J. (2011). Mathematical ecology of populations and ecosystems. John Wiley & Sons.

ESTIMATION OF POTENTIAL EVAPOTRANSPIRATION OF THE AL-WAND RIVER BASIN IN KHANAQIN DISTRICT – DIYALA GOVERNORATE

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Abstract:

Khanaqin District is located within Diyala Governorate in northeastern Iraq. More particularly, it is located within latitudes 34° 18' 00" and 34° 22' 00" N , and longitudes 45° 21' 00" and45° 25' 00" E. Its total area is 3789 km2 which equals 21.4% of the country's area. This manuscript aims to find the monthly average values of potential evaporation-transpiration (PE) for Khanaqin station based on meteorological data for this station for the period (1988-2017), which shows that the total rainfall (269.22)mm, average temperature (23.88 c°), Relative humidity (47.79%), average wind speed (1.43 m/s), solar brightness rate (7.89h/d), total evaporation from the free surface (3297.12mm). Whereas the value Potential Evapotranspiration it was according to the methods used in this paper is the Blaney Criddle, Kharufa, and Penman- Monteith using Cropwat 8.0 program method, 2120.83, 2293.34, 1612.41 mm respectively. The results indicated that the total Potential Evapotranspiration of the study area exceeds the annual rainfall in the basin, which indicates that the area is suffers from a water deficit due to climate change and the resulting decrease in the amount of rain, the delay in the rainy season and the increase in temperatures.

Key words: Rainfall, Evaporation, Potential Evapotranspiration.

تخمين التبخر– نتح الكامن لحوض نهر الوند في قضاء خانقين – محافظه ديإلى

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ملخص:

يقع قضاء خانقين ضمن محافظة ديإلى شمالي شرق العراق تقع ضمن دائرتي عرض N "00 '18 34° و "00 '22 34° وخطي طول E "00 '21 45° و"00 '25 45° وتبلغ مساحتها الاجمالية 3789كم2 أي 21.4% من مساحة المحافظة. الهدف من البحث هو أيجاد المعدلات الشهرية لقيم التبخر –نتح الكامن (PE) لمحطة خانقين بالاعتماد على بيانات الأرصاد الجوية لهذه المحطة للفترة (1988 – 2017) تبين أن مجموع الساقط المطري بلغ (269.22) ملم، معدل درجة الحرارة (23.88 درجة مئوية)، معدل الرطوبة النسبية (47.79%)، معدل سرعة الرياح (1.43م/ثا)، معدل السطوع الشمسي (7.89ساعة/اليوم) ومجموع التبخر من سطوح حرة بلغت (3297.12 ملم). حيث أن قيم التبخر – نتح الكامن كانت حسب الطرق المستخدمة في هذا البحث بطريقة بلاني كريدل،خروفة وطريقة بنمن–مونتيث باستخدام برنامج Cropwat 8.0   2120.83 ملم، 2293.34 ملم، 1612.41 ملم على التتابع. وقد أشارت النتائج أن مجموع التبخر–نتح الكامن لمنطقة الدراسة يفوق مجموع الأمطار السنوية الساقطة على الحوض مما يشير أن المنطقة تعاني من عجز مائي واضح في ظل التغير المناخي وما نتج عنه من تناقص كمية الأمطار وتأخر الموسم المطري وزيادة درجات الحرارة.

الكلمات المفتاحية: الأمطار، التبخر، تبخر –نتح الكامن.

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المقدمة:

يعتبر عنصر التبخر– نتح من أهم عناصر الدورة الهيدرولوجية (بالمناطق الجافة وشبه الجافة لندرة وجود المياه) وهو يمثل جميع الفواقد المائية من سطح التربة والمسطحات المائية والغطاء النباتي. ويعد من التطبيقات الهيدرولوجية المهمة مثل (جدولة الري، تصميم مشاريع الري) أعلى تقدير الموازنة المائية المناخية لأي منطقة يتم دراستها). وهو ناتج من تفاعل عدد كبير من عناصر المناخ أهمها: الأمطار، درجة الحرارة، الاشعاع الشمسي، التبخر، سرعة الرياح، الرطوبة الجوية اضافة إلى كثافة الغطاء النباتي وطور النمو للنباتات.

أظهرت الأمطار في الأعلنة الأخيرة اتجاهاً عاماً للتناقص مع ارتفاع بمعدل درجات الحرارة العظمى. كما توقعت الكثير من الدراسات انخفاضاً لكميات الأمطار شرقي البحر المتوسط بنسبة تتراوح بين (15–25)% بسبب التغير المناخي (13)، وعنصر التبخر هو العنصر المتحكم في قيم الفائض والعجز المائي، فوجود عجز مائي يعني نقص الامكانات المائية، أما ارتفاع قيم التبخر والنتح الكامن فهو يعني العجز المائي والمزيد من الضغط على الموارد المائية (16).

يكافي التبخر – نتح الكامن الاستهلاك المائي للنبات أعلى الاحتياجات المائية للمحاصيل التي يحتاج إلى تخمينها في تصميم مشاريع الري(7).

تم في هذا البحث تخمين (حساب) التبخر – نتح الكامن لحوض نهر الوند ضمن قضاء خانقين بمحافظة ديالى التي تقع ضمن دائرتي عرض N "00 '18 °34 و "00 '22 °34 وخطي طول E "00 '21 °45 و"00 '25 °45 وتبلغ مساحتها الاجمالية 3789كم^2 أي 21.4% من مساحة المحافظة. بمساعدة المعادلات التجريبية واعتماداً على المعطيات المناخية، والذي يعد من الأحواض المائية المهمة في العراق لسعة مساحته التي تصلح لأغراض الزراعة، يدخل الأراضي العراقية على بعد 8 كم جنوب شرق خانقين ويعتبر أحد روافد الرئيسية لنهر ديالى حيث ينبع من الأراضي الأيرانية ويجري عبر الأراضي العراقية لمسافة 50 كم من خلال سهول الخصبة وتبلغ مساحة حوض التغذية الكلي حوالي (3340)كم^2، مساحة الحوض داخل الأراضي الأيرانية يبلغ (2780)كم^2 والأراضي العراقية (560) كم^2، يروي ويغذي مدينة خانقين قبل أن يصب في نهر سيروان (ديالى) شمال جلولاء. هنالك العديد من الدراسات السابقة التي خصت الموازنة المائية المناخية بشكل عام واستخدام معادلات تخمين التبخر – نتح بشكل خاص لأن المناخ يعد عاملاً مهماً ومؤثراً. وجد (9) عند دراسته لتحليل اثار التغيرات المناخية لشمال العراق في السنوات العشر الاخيرة نقصا حاد في المياه في حين كان الفائض المائي محدوداً وبالاعتماد على السنوات الجافة والرطبة. بينما توصل (2) إلى أن محطات منطقة الدراسة أظهرت اختلافاً لأحوال المناخ من منطقة لاخرى مما انعكس على حساب الموازنة المائية بين محطة واخرى، وسجلت محطات المناخية من خلال تطبيق معادلتي (أيفانوف ونجيب خروفة) عجزاً مائياً خلال فصلي الصيف والشتاء. أما (8) فقد ظهرت نتائج بحثه من خلال تطبيق معادلات الموازنة المائية المناخية على محطتي (الموصل والحي) والتي تتماشى مع موقع العراق واحواله المناخية فقد بلغ مجموع العجز المائي والفائض بتطبيق معادلة أيفانوف نحو (161.45–،162.4+)على التتابع، وعند تطبيقه لمعادلة نجيب خروفة على نفس المحطتين (الحي والموصل) تبين عجزاً مائياً بلغ (197.6– و 992.7–) ملم على التوالي. استخدم (12) طريقة Penman-Monteith لتقدير وحساب تخمين التبخر–النتح باستخدام البيانات الاساسية المتمثلة بـ (درجة الحرارة، الرطوبة، ضوء الشمس، الأمطار، سرعة الرياح و التبخر)، واستخدام برنامج Cropwat 8.0 لتقييم

الاحتياجات المائية ومدى تاثر التغيرات المناخية عليها، ومن العوامل المؤثرة على زيادة التبخر– نتح (ET$_O$) هي درجة الحرارة وكمية الأمطار الساقطة وبالتالي تأثيرها على احتياجات الري.

المواد وطرائق العمل:

– تم الاعتماد على البيانات المناخية الشهرية (الأمطار، درجة الحرارة، الإشعاع الشمسي، التبخر، سرعة الرياح، الرطوبة الجوية) المسجلة في محطة خانقين للفترة من 1988 – 2017 والماخوذة من سجلات الهيئة العامة للأجواء الجوية والرصد الزلزالي العراقية (4) لتخمين التبخر– نتح الكامن للحوض جدول(1)، شكل(1).

جدول (1): المعدلات الشهرية للمعاملات المناخية المختلفة في منطقة الدراسة للمدة (1988–2017) لمحطة خانقين المناخية

Months	Rainfal (mm)	Relahie Humidity%	Temperatures c°	Wind speed (m/sec)	Sunshine (h/day)	Evaporation (mm)
Oct.	16.81	40.21	26.25	1.34	7.56	267.54
Nov.	47.76	60.79	17.67	1.17	6.69	125.38
Dec.	41.58	72.82	12.31	1.03	5.39	68.94
Jan.	52.01	76.61	10.51	1.24	5.52	56.28
Feb.	37.95	69.04	12.31	1.47	6.15	99.45
Mar.	41.29	59.67	16.51	1.70	6.14	168.82
Apr.	26.11	49.69	22.69	1.71	7.49	241.45
May.	5.60	36.29	29.57	1.73	8.79	337.23
June.	0.03	26.64	34.02	1.57	10.68	467.77
July.	0.03	25.32	36.57	1.52	10.62	540.4
Aug.	0	26.14	36.28	1.38	10.28	525.73
Sep.	0.05	30.29	31.92	1.30	9.35	398.14
Average		47.79	23.88	1.43	7.89	
Total	269.22					3297.13

شكل(1) العلاقة بين المتغيرات المناخية للمدة (1988–2017) لمحطة خانقين المناخية.

- اما المعادلات التجريبية الشائعة التي استخدمت وكما مبينة قيمها بالجدول (2) هي معادلة بلاني كريدل ومعادلة خروفة ومعادلة بنمن– مونتيث باستخدام برنامج Cropwat 8.0 والتي يمكن الاستفادة منها في حساب الموازنة المائية المناخية لمنطقة الدراسة ومعرفة الفائض المائي والنقص الحاصل بالمنطقة.

Months	Rainfall (mm)	Evaporation (mm)	PE by Blaney Criddle	PE by Kharufa	PE by Penman–Monteith
Oct.	16.81	267.54	169.2	187.92	**127.72**
Nov.	47.76	125.38	90.16	99.82	**69.6**
Dec.	41.58	68.94	59.18	61.51	**41.85**
Jan.	52.01	56.28	52.47	51.38	**38.75**
Feb.	37.95	99.45	59.09	61.42	**54.88**
Mar.	41.29	168.82	98.59	108.83	**95.48**
Apr.	26.11	241.45	155.22	173.2	**135.3**
May.	5.60	337.23	245.03	269.93	**194.37**
June.	0.03	467.77	299.86	323.23	**224.4**
July.	0.03	540.4	340.21	361.66	**236.22**
Aug.	0	525.73	317.24	338.01	**221.34**
Sep.	0.05	398.14	234.58	256.43	**172.5**
Total	269.22	3297.13	2120.83	2293.34	**1612.41**

النتائج والمناقشة:

تم حساب قيم المعدل الشهري للمتغيرات المناخية في منطقة الدراسة للفترة من (1988–2017). تبين أن مجموع الساقط المطري الكلي هو (269.22) ملم، ومعدل درجة الحرارة (23.88 درجة مئوية)، ومعدل الرطوبة النسبية (47.79%)، ومعدل سرعة الرياح (1.43م/ثا)، ومعدل السطوع الشمسي (7.89ساعة/اليوم) ومجموع التبخر من سطوح حرة بلغت (3297.12 ملم) والنتائج مبينة في جدول (1). هناك علاقات مختلفة بين المتغيرات المناخية حيث ترتبط الرطوبة النسبية بعلاقة عكسية مع درجات الحرارة، التبخر وسرعة الرياح وطردياً مع الأمطار كما موضح بالشكل (1).

التبخر–نتح الكامن:

يعد التبخر–نتح الكامن مؤشراً مهماً في القياسات الهيدرولوجية، وهو عبارة عن مجموع التبخر والنتح ويعرف على أنه مجموع الفقدان الكلي للمياه عن طريق التبخر والنتح (6). هنالك عدة طرق لحساب التبخر–نتح الكامن نظرياً.

تم استخدام طرق Blaney Criddle، Kharufa، Penman –Monteith لكونها ملائمة لمناخ الحوض. تعد هذه الطريقة Penman –Monteith باستخدام البرنامج Cropwat 8.0 واحدة من افضل الطرق المتوفرة حالياً في حساب التبخر– نتح والتي تتميز بدقتها وصلاحيتها لكل الأقاليم المناخية والظروف الجافة والرطبة. إذ تعتمد هذه الطريقة على الأسس الفيزيائية التي استعملها بنمن في معادلته. نظرا للتطور الكبير لاجهزة الحاسوب وظهور برامج محاكاة في مجالات إدارة مياه

الري، ساعد مهندسي وباحثي الري في تقدير الاحتياجات المائية في مشاريع الري. ويعتبر برنامج Cropwat 8.0 واحد من أهم البرامج العالمية التي استخدمت على نطاق واسع في إدارة مياه الري (Smith 1992). يقوم البرنامج بتسهيل حساب وتقدير قيمة التبخر والنتح بالاعتماد على الدول الاساسية المناخية في البرنامج (5).

1- طريقة بلاني كريدل (1972) Blaney Criddle:

تعتمد هذه الطريقة على درجات الحرارة الشهرية وعدد ساعات السطوع الشمسي، وهي من المعادلات شائعة الاستخدام في المناطق الجافة وشبه الجافة (14) والمعادلة العامة تكون كما يلي:

$$PE = KS \ (0.46t + 8.13) \ \dots(1)$$

حيث أن: PE : مقدار التبخر – نتح الكامن الشهري (ملم).

K : عامل التصحيح (K=0.0311t + 0.24).

t : المعدل الشهري لدرجات الحرارة (م°).

S : النسبة المئوية لعدد ساعات السطوع الشمسي الشهري إلى عدد ساعات السطوع السنوي.

ان المجموع السنوي للتبخر– نتح يسأعلمي (2120.83) ملم أكثر من مجموع الأمطار الساقطة على الحوض والتي بلغت 269.22 ملم، بين جدول (2) قيمة PE للفترة (1988–2017)، وشكل (2) يوضح العلاقة بين كمية الأمطار الساقطة على الحوض والتبخر ومقدار التبخر — نتح الكامن PE.

من الصعب استخدام معادلة بلاني كريدل المطورة (Modified) وذلك بسبب اعتمادها على عامل نوعية المحصول (KP) ومن الصعب الحصول على هذه القيمة للتنوع الكبير في نوعية المحاصيل الزراعية في منطقة الدراسة (1)، المعادلة كما يلي:

$$PE = 4.55 \ KP(T + 17.8) \ \dots\dots\dots \ (2)$$

حيث ان: PE : مقدار التبخر – نتح الكامن الشهري (ملم).

KP: عامل نوعية المحصول.

t : المعدل الشهري لدرجات الحرارة (م°).

2- طريقة خروفة (1984) Kharufa Method:

تعتمد هذه الطريقة على درجات الحرارة والسطوع الشمسي، وهذه الطريقة ملائمة جداً لمناخ شمال العراق لكونها اعتمدت على ظروف مناخ العراق(3). والمعادلة تكون كالآتي:

$$\frac{PE}{\rho} = at^m \ \dots\dots\dots \ (3)$$

PE: التبخر– نتح الكامن الشهري (ملم)

P : النسبة المؤية لعدد ساعات السطوع الشمسي الشهري إلى عدد ساعات السطوع الشمسي السنوي.

a : ثابت (0.33)

m : ثابت (1.31)

t : المعدل الشهري لدرجات الحرارة

وتم تبسيط المعادلة إلى:

$$PE = \frac{\rho}{3t^{1.31}} \quad \dots\dots \quad (4)$$

إن المجموع السنوي لقيمة PE المحسوبة بهذه الطريقة يسأعلـي (2293.34) ملم أي أكثر من القيمة المحسوبة بطريقة بلاني كريدل بالرغم من اعتمادهم لنفس المتغيرين لكلا الطريقتين (جدول 2) كما ويبين شكل (3) العلاقة بين كمية الأمطار والتبخر ومقدار التبخر — نتح الكامن للحوض.

3– طريقه بنمن – مونتيث باستخدام برنامج Cropwat 8.0:

إذ بلغ المجموع السنوي بهذه الطريقة (1612.41) ملم وهي أقل من القيم السابقة المحسوبة بالطرق المذكورة أنفاً لأنها اعتمدت على الأسس الفيزيائية التي استخدمها بنمن — مونثيت ولأغلب عناصر المناخ عكس بقية الطرق التي تعتمد على عوامل محددة في حساب تخمين التبخر — نتح لكنها تفوق مجموع الأمطار السنوية الساقطة على الحوض. كما يبين جدول (2) والشكل (4) يوضح العلاقة بين الأمطار الساقطة على الحوض والتبخر ومقدار التبخر — نتح الكامن للحوض.
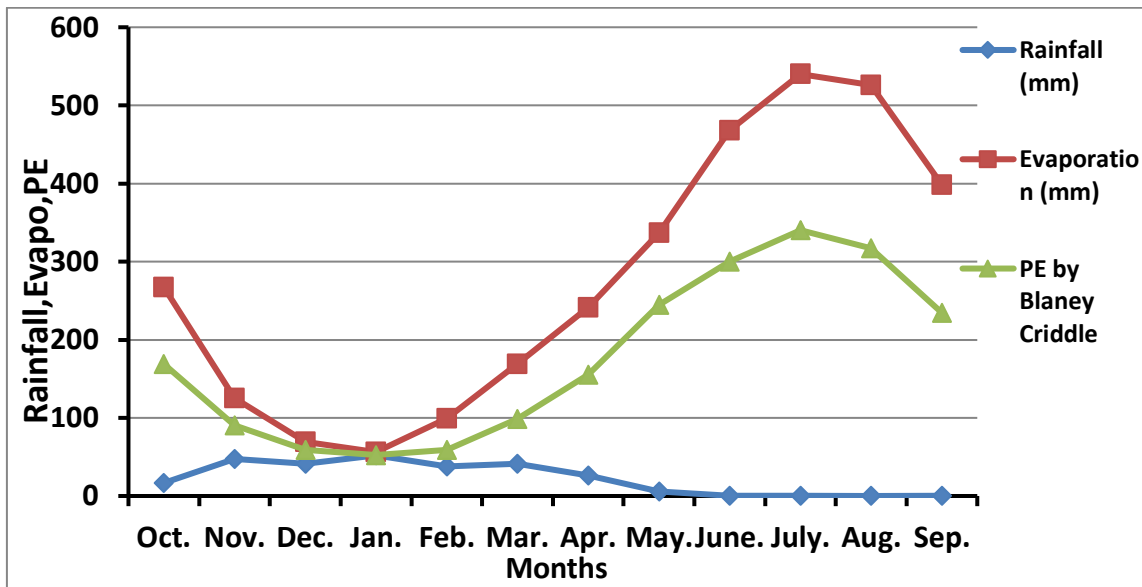
شكل (2) العلاقة بين كمية الأمطار، التبخر والتبخر– نتح الكامن بطريقة بلاني–كريدل.
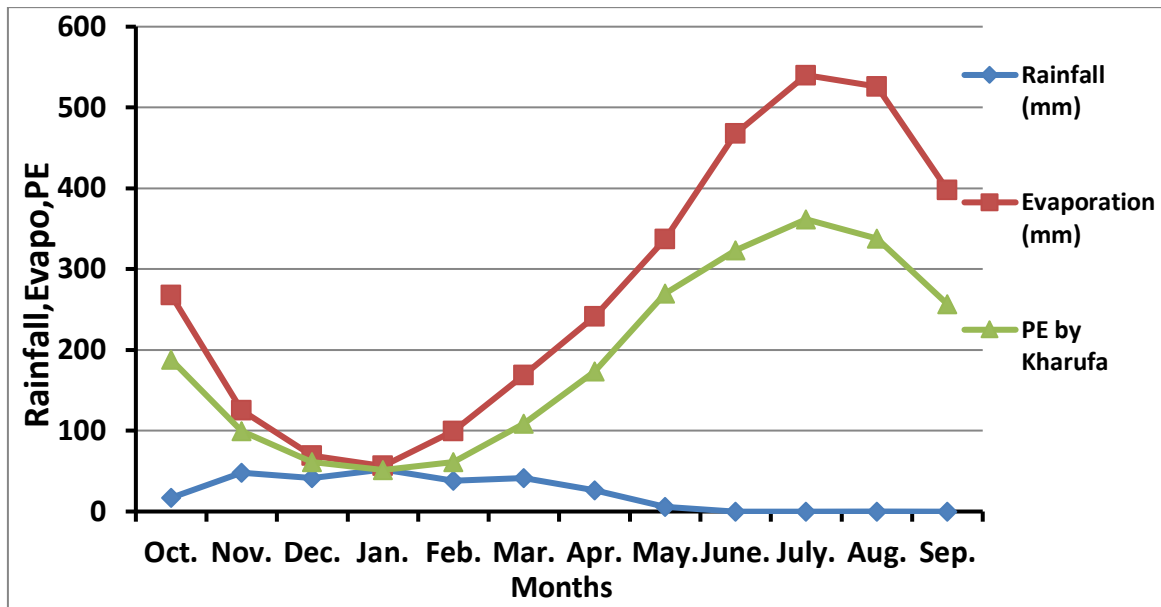
شكل (3) العلاقة بين كمية الأمطار، التبخر والتبخر– نتح الكامن بطريقة خروفة.
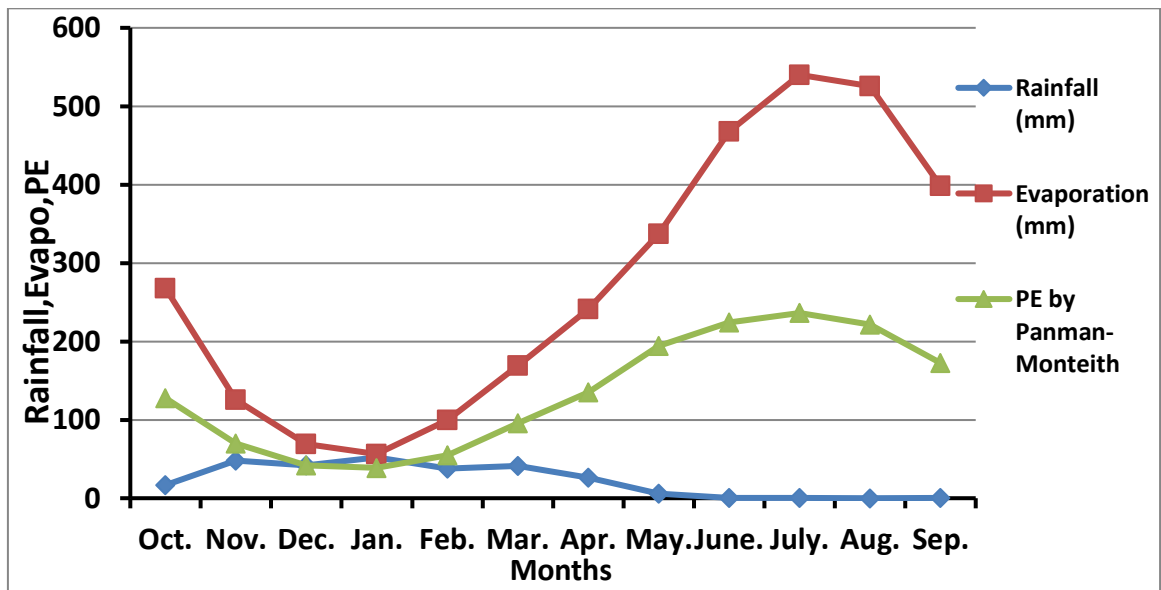
شكل (4) العلاقة بين كمية الأمطار، التبخر والتبخر– نتح الكامن بطريقة بنمن –مونتيث.

يمكن مما تقدم في الاشكال 2، 3، 4 السابقة تحديد الوضع الهيدرولوجي لأي حوض من خلال تحديد كمية الفائض أعلى العجز المائي أعلى فعالية الأمطار الساقطة على الحوض. يكون هنالك فائض مائي (Water Surplus) عندما يكون معدل سقوط الأمطار اعلى من معدلات التبخر–نتح الكامن كما في المعادلة التالية (11):

$$WS = P - PE \dots \dots P > PE \dots \dots (5)$$

حيث أن: WS: الفائض المائي (ملم).

P: الأمطار (ملم).

PE: التبخر–نتح الكامن.

وعند استخدام هذه المعادلة على نتائج الطرق المذكورة سابقاً جدول (2) نجد فترة فائض مائي فقط في شهر كانون الثاني

وبطريقتي خروفة وبنمن– مونتيث. أما الحالة الأخرى (فترة العجز المائي Water Deficit) تكون قيم التبخر –نتح الكامن أعلى

من معدل الأمطار ويحسب من المعادلة التالية:

$$WD = PE - P \ldots\ldots PE > P \ldots\ldots \quad (6)$$

حيث ان : WD: العجز المائي (ملم).

وعند تطبيق هذه المعادلة على جدول (2) نجد ان العجز المائي يسود طوال العام، يوضح جدول (3).

جدول (3) المعدل الشهري للامطار،التبخر –نتح الكامن والفائض والعجز المائي

Months	Rainfall p (mm)	Blaney Criddle			Kharufa			Penman– Monteith		
		PE	WS	WD	PE	WS	WD	PE	WS	WD
Oct.	16.81	169.2	0.0	152.39	187.92	0.0	171.11	127.72	0.0	110.91
Nov.	47.76	90.16	0.0	42.40	99.82	0.0	52.06	69.6	0.0	21.84
Dec.	41.58	59.18	0.0	17.60	61.51	0.0	19.93	41.85	0.0	0.27
Jan.	52.01	52.47	0.0	0.46	51.38	0.63	0.00	38.75	13.26	0.00
Feb.	37.95	59.09	0.0	21.14	61.42	0.0	23.47	54.88	0.0	16.93
Mar.	41.29	98.59	0.0	57.30	108.83	0.0	67.54	95.48	0.0	54.19
Apr.	26.11	155.22	0.0	129.11	173.2	0.0	147.09	135.3	0.0	109.19
May.	5.60	245.03	0.0	239.43	269.93	0.0	264.33	194.37	0.0	188.77
June.	0.03	299.86	0.0	299.83	323.23	0.0	323.2	224.4	0.0	224.37
July.	0.03	340.21	0.0	340.18	361.66	0.0	361.63	236.22	0.0	236.19
Aug.	0	317.24	0.0	317.24	338.01	0.0	338.01	221.34	0.0	221.34
Sep.	0.05	234.58	0.0	234.53	256.43	0.0	256.38	172.5	0.0	172.45
Total	269.22	2120.83	0.0	1851.63	2293.34	0.63	2024.72	1612.41	13.26	1356.45

الاستنتاجات والتوصيات:

بينت نتائج الدراسة الحالية بسيادة فترة العجز المائي طوال العام وذلك من خلال مجموع قيم التبخر– نتح الكامن والمحسوبة

بالطرق التالية بلاني كريدل 2120.83 ملم، خروفة 2293.34 ملم، ومونثيت – بنمن باستخدام برنامج Crop wat

1612.41 ملم اعلى من قيم المجموع السنوي للأمطار الساقطة على الحوض التي بلغت 269.22ملم، لهذا يعاني الحوض من

عجز مائي نتيجة نقص في كمية المطر الفعال و زيادة الجفاف كون الحوض يقع ضمن المناخ الجاف وشبه الجاف وتاثره بالتغير المناخي.

لذا توصي الدراسة بما يلي:

– بأن أفضل طريقة لتخمين التبخر – نتح الكامن هي طريقة بنمن– مونتيث بأستخدام برنامج Cropwat 8.0 لأنها تعتمد وتأخذ كل العناصر المؤثرة على التبخر–نتح وصعوبة تطبيقها يدوياً لهذا استخدم برنامجها الحاسوبي الحديث Cropwat 8.0 لتسهيل تطبيقها، وممكن استخدامها لجميع انواع البيانات سوى كانت يومية أعلى شهرية أعلى فصلية أعلى سنوية ولأغلب عناصر المناخ المؤثرة، كما أعلنصت واعتمدت بها من قبل مجموعة من الخبراء الاستشاريين والباحثين في منظمة الفأعلى FAO وبالتعاون مع اللجنة العالمية للري والصرف ومنظمة المعلومات المناخية في أيار 1990م باستخدام هذه المعادلة كطريقة قياسية للحساب من البيانات المناخية الخاصة بالمنطقة (10).

– ضرورة الاهتمام بالإدارة العلمية للموارد المائية من خلال معرفة الوارد من المياه إلى الحوض والخارج منه بعناصر الفقد المختلفة.

– زراعة المحاصيل المناسبة لمنطقة الدراسة والتي تتأقلم مع الظروف المناخية (التبخر/نتح) الشديد لتغلبها على فترات الجفاف التي قد تسود في معظم اشهر السنة.

– لصفات التربة الفيزيائية (نسجة التربة) دور فعال في الاحتفاظ بالمحتوى الرطوبي والتي من الممكن ان تسبب العجز المائي ولتقليل الفقد يمكن خلط التربة ذات نسجة ناعمة بالتربة الاصلية ذات النسجة الخشنة.

– التقليل من حجم التبخر استخدام وسائل الري الحديثة للمحافظة على الموارد المائية.

المصادر:

1- **الشماع، أيسر محمد. أروى شاذل طاقة، مريوان أكرم حمه سعيد، (2007)**. الموازنة المائية لحوض اربيل الشمالي (شمال العراق) المجلة العراقية للعلوم، المجلد48، العدد 1، الصفحة 124-134.

2- **الطائي، عدنان عودة، (2020)**. الموازنة المائية المناخية لمحطات بحيرة الثرثار للفترة 1980-2014، مجلة القادسية للعلوم الانسانية، المجلد 23، العدد 3.

3- **النقشبندي، ازاد محمد امين والسويدي، مصطفى عبدالله، (1999)**، الجفاف سمة اساسية من سمات مناخ العراق، مجلة زانكو للعلوم الانسانية، العدد14: 5-14.

4- **الهيئة العامة للانواء الجوية والرصد الزلزالي، 2018**. قسم المناخ والموارد المائية، بيانات غير منشورة لسجلات الأمطار ودرجات الحرارة والتبخر والرياح لمحطة خانقين للفترة (1988-2017).

5- **حجازي، أيمن، رابعة الحأيك، محمد حقون، (2016)**. مدى ملائمة برنامج CropWat 8.0 لجدولة الري وتحديد الاستهلاك المائي لبعض المحاصيل والاشجار المثمرة المزروعة في غوطة دمشق. المجلة السورية للبحوث الزراعية. المجلد 3. العدد 2.

6- **حسين، طارق عبد، غيداء ياسين الكندي، رنا جواد كاظم، (2017)**. الموازنة المائية لمدينة النجف الاشرف/جنوب العراق، مجلة ديالى للعلوم الصرفة، المجلد 13، العدد 4، تشرين الأعلمل 2017، P-ISSN: 2222-8373.

7- **حسين، محمدحسن، (2017)**. الهيدرولوجيا اساسياتها وتطبيقاتها، الطبعة الأعللى،دار النشر دجلة،عمان- الاردن.

8- **فليح، عدنان عودة، (2021)**. الموازنة المائية المناخية لمحطة الموصل ومحطة الحي للفترة 2010-2020، مجلة البحوث الجغرافية، العدد 24.

9- **كشمولة، محمد سعيد، (2017)**. دراسة تحليلية لاثار التغيرات المناخية في تبأين الأمطار الساقطة والموازنة المائية لشمال العراق، مجلة زراعة الرافدين، المجلد 45، العدد(2)، on line 2224-9796 ISSN.

10- **Allen**, R.G.; **L.S**. **Pereira; D Raes; and M**. **Smith**, (**1998**). Crop evapotranspiration , guidelines for computing crop water requirements , FAO I rrigation and Drainge Paper No. 56. Roma, Italy.

11- **Brickle**, p., **Rodriguez**, **V.T& Patrida**, **E.G**., (**1998**), The water balance for the basin of the vally of Moxico and future water consumption. Hydrogeology, Vol. 6: 500-517.

12- **Hussien**, **Karim Badr**, (**2021**). Astudy of climate changes impact on the quantities of water used for irrigation, Vol. 16, No. 60, July, 538-552.

13- **Pederson**, **D**. 2008. Will climate change reduce or Increase Middle East Rainfall. Green Report. H.44.

14- **Saxton**, **K.E**. **and McGuinness**,**J**.**L**.**1982**. Evapotranspiration.In: Hydrologic Modeling of Small Watersheds (eds. C. T. Haan, H.P. Johnson and D.L. Brakensiek). Am. Soc. Agric. Engrs, St Joseph, MI, USA. Pp 229-273.

15- **Smith**, **M**. **1992**. CROPWAT–A computer program for irrigation planning and management. FAO Irrigation and Drainge paper 46. Land and Water Development Division, Food and A griculture Organization of the United Nations, Rome, Italy.

16- **Zeitoun**, **Mohammad**. **2016**. The Analysis of the Water Balance of the Soil in the North of Jordan during (1970–2009).An–Najah Univ. J. Res.(N.Sc.)Vol.30(1),

CLASSIFICATION OF THE RELATIONAL DATABASE FOR STUDENTS OF THE ARABIC LANGUAGE DEPARTMENT AT THE TEACHERS PREPARATION INSTITUTE/NINEVEH USING FUZZY C-MEANS WITH A SELF-TEACHING BAG

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Abstract:

The Arabic language is one of the Semitic and human languages, which has its importance, benefits and role in education, and to determine the scientific level of (for today's students - future teachers) a questionnaire was designed and distributed to - the research sample - (200) female students, they were chosen randomly, and they were filled out from Before them, after its terms were explained to them, this form included the axes (the student's assessment of the conditions of her study, the student's assessment of the available study aids, the student's scientific level, which in turn results from three criteria:

• The student's degree in spelling

• Student's degree in Arabic literature

• The student's degree in Arabic grammar and syntax,

The programming language (Visual Basic.net) was used to create an integrated electronic system, databases were programmed using SQL (Structured Query Language), and Microsoft Access was used to create the database, and Because of the specificity of the nature of the data obtained in this research being logical data, it was necessary to use the fuzzy C-Means to classify the students' in Arabic language The most important results that have been reached are: (40%) of the female students have a weak level, (35%) of the female students have Moderate level, and (25%) of the female students have a good level. The academic level of weak female students in the Arabic language was improved, as the problem-solving strategy programmed in the system's self-education unit achieved individual education to a high degree.

Key words: Database, DBMS, Data Mining, Cluster Analysis, Fuzzy Cluster Algorithm, Multivariate Fuzzy Logic.

تصنيف قاعدة البيانات العلائقية لطالبات قسم اللغة العربية في معهد إعداد المعلمات/نينوى باستخدام C-Means المضبب مع حقيبة تعليم ذاتي

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ريم علي الجراح[4]

ملخص:

اللغة العربية هي من اللغات السامية والإنسانية والتي لها أهميتها وفوائدها ودورها في التعليم، وللوقوف على المستوى العلمي لـ(الطالبات اليوم– معلمات المستقبل) تم تصميم استمارة استبيان وزعت على – عينة البحث – (200) طالبة، تم اختيارهن بشكل عشوائي، وتم ملئها من قبلهن بعد أن شُرِحت بنودها عليهن، تلك الاستمارة تضمنت المحاور (تقييم الطالبة لظروف دراستها، تقييم الطالبة للوسائل الدراسية المتاحة)، المستوى العلمي للطالبة الذي بدوره ناتج من ثلاث معايير:

- درجة الطالبة في الإملاء

- درجة الطالبة في الأدب العربي

- درجة الطالبة في القواعد والنحو العربي

تم استخدام لغة البرمجة(Visual Basic.net) في إنشاء نظام الكتروني متكامل، وتم برمجة قواعد البيانات باستخدام لغة الاستعلام المهيكلة SQL (Structured Query Language)، وتم استخدام Microsoft Access في تكوين قاعدة البيانات، وبسبب خصوصية طبيعة البيانات المستحصل عليها في هذا البحث كونها بيانات منطقية كان لابد من استخدام C-Means المضبب في تصنيف مستوى أداء طالبات قسم اللغة العربية بمادة اللغة العربية، فضلاً عن استمارة التقييم التي تملأ من قبل رئيس القسم لتقييم المستوى العام للتدريسي.

وأهم النتائج التي تم التوصل إليها هي: أن (40) % من الطالبات مستواهم ضعيف، (35) % من الطالبات مستواهم متوسط، (25) % من الطالبات مستواهم جيد. وتم تحسين المستوى العلمي للطالبات الضعيفات في مادة اللغة العربية حيث أن استراتيجية حل المشكلة المبرمجة في وحدة التعليم الذاتي التابعة للنظام حققت تعليماً فردياً إلى درجة عالية.

الكلمات المفتاحية: قاعدة البيانات، نظم إدارة قواعد البيانات، تنقيب البيانات، التحليل العنقودي، خوارزمية العنقدة الضبابية، المنطق المضبب متعدد المتغيرات.

[3] جامعة الموصل، العراق،

[4] جامعة الموصل، العراق،

1-المقدمة:

اللغة العربية، قديمة الميلاد، عتيقة النشأة، لا يستطيع أحد أن يقطع برأي في عصر ولادتها، سارت هذه اللغة حتى قطعت مرحلة طفولتها ودخلت طور الشباب الفتي، ولم يكن ذلك إلا بعد آماد طويلة سارت فيها نحو النضج ولم تنتهي جاهليتها حتى أدركت اللغة العربية من القوة والفتوة واستقراء الضوابط والأوضاع نصيباً وافياً(عبد العباس، 2022، 1268).

ولما جاء الإسلام دين نور وهداية للبشرية جميعاً ونزل القرآن بهذه اللغة التي كرمها الله جل شأنه بقوله تعالى (إنا جَعَلْنَاهُ قُرْآنًا عَرَبِيًّا لَعَلَّكُمْ تَعْقِلُونَ) الزخرف أية3 ة، (كِتَابٌ فُصِّلَتْ آيَاتُهُ قُرْآنًا عَرَبِيًّا لِقَوْمٍ يَعْلَمُونَ) فصلت أية3 ة.

هذا الاعجاز الرباني العظيم دفع الطلائع الأولى إلى إطالة الوقوف والمراقبة والموازنة بجمع أصول اللغة واستنباط أحكامها العامة والفرعية وإحاطتها بسياج متين من اليقظة الواعية بعد أن نشر الإسلام جناحيه على البلاد العربية وتجاوزها إلى غيرها من البلدان الأجنبية.

فزع المسلمون حرصاً على لغتهم ولغة كتابتهم إلى درء الخطر، وكان أول ما اتخذوه لذلك وضع (قواعد النحو) بمشورة الإمام علي (رضي الله عنه) وانتدب المهمة(أبا الأسود الدؤلي) وكان للرائدين العظيمين فضل السباقين الذين يكشفون المجهول ويمهدون الطريق لمن بعدهم أمثال أبو عمرو بن العلاء، الفراهيدي،،سيبويه، والكسائي، والفراء، وغير هؤلاء من الرواد والأئمة (مهدي، 2022، 187) الذين أخلصوا للغتهم وجاهدوا في ميادينها فاستوجب الثناء عليهم والدعاء لهم من كل طالب علم على مر العصور حتى يومنا هذا.

هذا ما سعى إليه العقل البشري ليخدم اللغة فماذا بمقدور العقل الآلي ليضيف إليها خاصة وأنه لم يتبقى ما يضاف وكل جهود اليوم هي دراسات لما قُدِم بالأمس من قواعد ونحوٍ وأدب.

واستناداً إلى ما سبق تركز مشكلة البحث على طرح التساؤلات التالية:

- طلاب اللغة اليوم أين هم من تلك الجهود الجبارة التي دأبت لنشر وتقويم اللغة بين طلابها؟
- وهل يا ترى يستحقون أن يكونوا الخلف الصالح؟
- من يتولى تعليم أبنائنا وبناتنا اللغة العربية في مراحلهم الابتدائية؟
- هل يمكن تصميم نظام الكتروني يسهل عملية تقييم أداء الطلاب والتعلم والتدريب الخاص بمادة اللغة العربية؟
- هل أنهم مؤهلين ليحملوا هذه المسؤولية ؟...

هذه التساؤلات وغيرها حاولت الباحثتان الإجابة عليها من خلال تصميم نظام الكتروني متكامل باستخدام مجموعة أدوات برمجية من منتجات شركة مايكروسوفت والتي تتضمن Microsoft Visual Basic.net و (Microsoft Access)، فضلاً عن(SQL).

2. الدراسات السابقة

❖ دراسة (ثابت حسان ثابت، إسماعيل عبدالوهاب إسماعيل،2017)

● **عنوان الدراسة**: استخدام المنطق المضبب لتقييم أداء تدريسي اللغة العربية في الأقسام الجامعية غير المتخصصة.

● **تهدف الدراسة إلى**: تقييم ووصف أداء التدريسيين ووضع مقترحات وحلول لتحسين أداء التدريسيين بشكل يتلائم مع رغبة الطلاب واعداد مناهج دراسية متناسبة مع الاحتياجات العملية للطلبة، كالتركيز على مفردات نحوية ولغوية.

أهم النتائج التي تم التوصل إليها هي عدم رضا الطلاب بأداء وطرائق تدريسي اللغة العربية، وعدم ملائمة مفردات مناهج تدريس مادة اللغة العربية التي لا تحسن من أداء الطلاب اللغوي، ولا تخدم تخصصاتهم

❖ دراسة (خالد بن عبدالعزيز الدامغ وهند بنت محمد الهاجري، 2018)

● **عنوان الدراسة** : تصميم الاختبارات الالكترونية لمتعلمي اللغة العربية لغة ثانية.

● **تهدف الدراسة إلى**:تحديد الأطر الرئيسة في تصميم اختبارات اللغة العربية الالكترونية، وبيان أوجه الاختلاف والشبه بينها وبين الأطر المقابلة في تصميم الاختبارات العالمية الالكترونية.

وأهم النتائج التي توصلت إليها الدراسة هي اعداد الأطر الرئيسة التي تضمنت عشرة محاور، ودراسة اختبارين الكترونيّين للغة العربية.

❖ دراسة (Ihya Al–Arabiyah,2019)

● **عنوان الدراسة** : تصميم اختبار اللغة العربية كاللغة الأجنبية.

● **تهدف الدراسة إلى** :تحديد العيوب والمزايا من برنامج تعليم اللغة العربية، وتمكين الطلاب من معرفة مستوى قدراتهم واستيعابهم لمواد تعليم اللغة العربية.

وأهم النتائج التي تم التوصل إليها هي أن هنالك اتجاهات ومواقف إيجابية معتدلة نحو الامتحان الالكتروني.

❖ دراسة (محمد موسى الشمري،2020)

● **عنوان الدراسة**: توظيف أسلوبي التحليل العنقودي والتحليل التمييزي في تصنيف البيانات وبناء الدوال التمييزية.

● **تهدف الدراسة إلى**: استخدام الدالة التمييزية والتحليل العنقودي في تصنيف بيانات الطلبة في أدائهم الأكاديمي المنخفض والمرتفع ودقة تصنيف العناقيد.

أهم النتائج التي توصلت اليها الدراسة هي أن تصنيف الحالات عند اجراء مقارنة التصنيف للحالات التي تمت باستخدام التحليل العنقودي وجد ان التصنيف كان صحيحاً بنسبة عالية (98.4%) وهذه تؤكد دقة التصنيف.

3.الادوات المستخدمة والمنهجية المتبعة

1.3. التحليل العنقودي Cluster Analysis

يعتبر أسلوب التحليل الاحصائي أحد أشكال التحليل الاحصائي المتعدد المتغيرات((الحلولي،2018)، وهو ''عبارة عن إجراءات تهدف الى تصنيف مجموعة حالات أو متغيرات بطرق معينة وترتيبها داخل عناقيد، تكون الحالات المصنفة داخل عنقود معين متجانسة فيما يتعلق بخصائص محددة وتختلف عن حالات أخرى موجودة في عنقود آخر''. (حسين، 2021، 217)

تُصَنف العنقدة بناءاً على مقياس التشابه بين المشاهدات والمفاهيم النظرية والاساسية التي يعتمد عليها أسلوب تحليل العنقدة (العلي، ابراهيم، محمد،2020)، وظهرت انواع من العنقدة مثل :

●**العنقدة الهشة Crisp clustering**: تفترض عدم التداخل بين المجاميع،ولهذا تصنف البيانات فيها الى مجاميع هشه.

●**عنقدة شبكة كوهين Kohonen net clustering** : تعتمد العنقدة على مفاهيم الشبكة العصبية.

●**العنقدة الضبابية Fuzzy clustering** : تستخدم تقنيات غامضة لتجميع البيانات، إذ يمكن أن يصنف العنصر فيها إلى أكثر من مجموعة بدرجة انتماء متفاوتة.(**الفخري،نعمه عبد الله،واخرون،2016**).

وأهم استخدامات التحليل العنقودي هي: (Dimitrios S.Stamoulis & Panos A.Giannopoulos,, 2022):

●الكشف عن البيانات :يمكن استخدامها للكشف عن البيانات.

●التصنيف: يمكن أن تختصر المعلومات الخاصة في مجال معين إلى معلومات ذات عناقيد محددة.

●التشخيص: يتم تقسيم المشاهدات الى عدد من العناقيد لتحديد هوية كل مشاهدة.

●توليد الفرضيات : التحليل العنقودي يمكن أن يزود بالافتراضات التي تتعلق ببنية المجتمع التي تم اخذ البيانات منها.

●التنبؤ : العناقيد التي يتم الحصول عليها بواسطة التحليل العنقودي يمكن استخدامها فيما بعد في التصنيف.

3 . 1 . 1. خوارزمية متوسط العناقيد المضببة Fuzzy C−Means Algorithm

استخدام العنقدة بأسلوب متوسط العناقيد المضببة (−FCM− Fuzzy C−means) يعتمد على بيانات تنتمي إلى مجموعة مضببة (**Fuzzy Set**) بخواصها المعروفة، والتي غالباً ما تكون بيانات نوعية، تتراوح الإجابة عنها ما بين (النعم=1) وال (كلا=0)، بمعنى آخر أن (**FCM**) يستعمل التقسيم المضبب بحيث أن البيانات قيد الدراسة بإمكانها الانتماء إلى عدة مجاميع بدرجة انتماء مقيدة ومحددة بمراتب الانتماء ذات القيم الممتدة بين$(0 − 1)$. (**2021**, Shrook..AL−Sabbah, etal.

إن درجة انتماء البيانات تقاس بدالة تعرف بدالة العضوية Membership Function وهي'' المنحنى الذي بحدد كيفية تعيين كل نقطة في فضاء الإدخال إلى درجة عضويتها بين الرقمين الطبيعيين 0,1''.

يمكن تمثيل ماذكر اعلاه رياضياً كالآتي: (S.Hamed Javadi,Angela & Abdul M.Mouazen, 2022,645)

$$\mu_{ik} \in [0,1], 1 \le i \le c, 1 \le k \le p$$

$$\sum_{i=1}^{c} \mu_{ik} = 1$$

$$0 < \sum_{k=1}^{p} \mu_{ik} < p$$

$$\dots \dots (1)$$

حيث

μ_{ik} : تمثل درجة الانتماء او عضوية العنصر k في العنقود i.

C: عدد العناقيد، p: عدد العناصر

وتعرف الصيغة الجبرية المستخدمه في العنقدة كالآتي: (Niroom , et al., 2021)

$$Z = \sum_{k=1}^{c} \frac{\sum_{i=1}^{p} \sum_{j=1}^{p} \mu_{ik}^2 \mu_{jk}^2 . d_{ij}}{2 \sum_{j=1}^{p} \mu_{jk}^2} \qquad \dots \dots (2)$$

$$\mu_{ik} \ge 0 , \sum_{i=1}^{c} \mu_{ik} = 1$$

subject to

$$d_{ij} = \sqrt{\sum_{k=1}^{p} (x_{ik} - x_{jk})^2}$$

$$\dots \dots (3)$$

حيث: x_{ij} , x_{ik} يمثلان قيمة العنصرين i, j في المتغير X على التوالي، d_{ij} : المسافة بين العناصر.

2.3. قواعد البيانات العلائقية

أصبحت لقواعد البيانات تطبيقات واستخدامات كثيرة بسبب التطور الهائل الذي طرأ على تقنيات قواعد البيانات، والكثير منها مبني على نموذج قواعد البيانات العلائقية، بما فيها من التطبيقات المتقدمة في التجارة الالكترونية والذكاء الاصطناعي(Sen WangLei Li,Gottfried,2021).

وتعرف (قنبر حامد،512،2021) قواعد البيانات بأنها "مجموعة من البيانات والمعلومات الرقمية المبرمجة بعلاقة منطقية التي تتيح معالجتها واسترجاعها"

وأحد أنواع قواعد البيانات هي قواعدالبيانات العلائقية والتي تعتمد على التركيب العلائقي بين عناصر البيانات والذي يعتبر من أنجح التراكيب المطبقة في قواعد البيانات المعلوماتية، والتركيب العلائقي هو "الاعتماد على علاقة محددة بين عناصر البيانات" ويمكن تعريف قواعد البيانات العلائقية على أنها "تنفيذ برمجي للمفاهيم التي تعبر عنها النظرية التي قدمها النموذج العلائقي".(Chuangtao Ma,&Balint Molnar,2021)

ويتعامل نظام إدارة قواعد البيانات (DBMS) مع البيانات نفسها وتنسيقها بشكل عام، ومع أسماء الحقول وهيكل الملف وهيكل السجل (ثامانج و أمير و محمد،2018)، كما تحدد القواعد المطلوبة للتحقق من صحة البيانات ومعالجتها ويمكن تعريفه هو "برنامج مصمم لتخزين واسترجاع وإدارة البيانات(Shaimaa , etal,2020)".

3.3 تحليل وتصميم قاعدة البيانات

تم تصميم قاعدة البيانات وواجهات اخراج وإدخال البيانات في هذه المرحلة، فضلاً عن التقارير والاستفسارات وتم تقسيم مرحلة التصميم إلى ماياتي:

● التصميم المنطقي: يتم وضع المخطط المنطقي بدءاً من قاعدة بيانات النظام وتحديد الجداول والعلاقات فيما بينها، وتم تبسيط البيانات باستخدام Normalization ومن ثم يتم الانطلاق إلى التصميم المنطقي الخاص بالشاشات والبرامج الخاصة بالنظام كبرامج (البحث، التعديل، الإلغاء، الاستعلامات، التقارير...الخ)

● التصميم المادي: يتم تصميم الملفات الخاصة بقاعدة بيانات النظام وتحديد العلاقات فيما بين الجداول وتتضمن هيكلية قاعدة بيانات النظام الجداول التالية:

جدول1: جداول قاعدة بيانات النظام

اسم الحقل	نوع الحقل	مفتاح	اسم الحقل	نوع الحقل	مفتاح
جدول الدخول			جدول الاساتذة		
Username	Character		TID	Number	رئيسي
Pass	Character		TName	Character	
جدول المعلومات			TAge	Number	
ID	Number	رئيسي	TGCer	Character	
Username	Number		TAddress	Character	
DateBirth	Date		TGeneral	Character	
PlaBirth	Character		Tspecial	Character	
Religion	Character		TGYear	Number	
MobileNO	Number		MobileNO	Number	
Email	Character		Email	Character	
CRAddress	Character		جدول المواد		
PRAddress	Character		SubID	Number	رئيسي
			SubName	Character	
			SubT	Character	
جدول الاسئلة			جدول ظروف الدراسة		

جدول1: جداول قاعدة بيانات النظام

اسم الحقل	نوع الحقل	مفتاح	اسم الحقل	نوع الحقل	مفتاح
SubID	Character	ثانوي	ID	Number	ثانوي
QNO	Number	رئيسي	Q1	Number	
QCON	Character		Q2	Number	
جدول الأجوبة النموذجية			Q3	Number	
QNO	Number	ثانوي	Q4	Number	
QACont	Character		Q5	Number	
جدول إجابات الطلاب			Q6	Number	
ID	Number	ثانوي	Q7	Number	
SubID	Character	ثانوي	Q8	Number	
QNO	Number	ثانوي	Q9	Number	
QSAns	Character		Q10	Number	
جدول الدرجات			جدول الوسائل الدراسية		
ID	Number	ثانوي	ID	Number	ثانوي
TID	Number	ثانوي	Q1	Number	
SubID	Number	ثانوي	Q2	Number	
Degree	Number		Q3	Number	

جدول1: جداول قاعدة بيانات النظام

مفتاح اح	نوع الحقل	اسم الحقل	مفتاح اح	نوع الحقل	اسم الحقل
	Number	Q4			
	Number	Q5			
جدول حداثة الكتاب			جدول الكتب		
ثانوي	Number	TID	رئيسي	Number	BookId
ثانوي	Number	BookId		Character	BookT
جدول درجة التقييم				Character	BPub
ثانوي	Number	TID		Number	BPNo
	Number	TDegree		Number	BYear

3.4 المنهجية المتبعة

تم اعتماد المنهجية الموضحة في المخطط الهيكلي بالملحق 1، الفقرات التالية توضح المنهج المتبع في هذا البحث.

3.4.1 عينة البحث

شملت عينة البحث (200) طالبة من طالبات قسم اللغة العربية، اُختريَن بشكل عشوائي و وُزعت عليهن استمارة استبيان من اعداد الباحثتان. تلك الاستمارة تضمنت المحاور الآتية:

1. تقييم الطالبة لظروف دراستها.

2. تقييم الطالبة للوسائل الدراسية المتاحة.

والتي بدورها تحتوي على عدة فقرات، تم شرح كل فقرة وأهميتها للطالبات قبل الإجابة عنها من قبلهم لضمان دقة الإجابة على الأسئلة وتقليل نسبة الخطأ الناتج عن جمع البيانات.

3. المستوى العلمي للطالبة، وهذا ناتج عن ثلاث معايير :–

درجة الطالبة في الإملاء العربي، درجة الطالبة في الأدب العربي، درجة الطالبة في القواعد والنحو العربي.

2.4.3 نموذج المنطق المضبب

النموذج موضح في الملحق(1)، وباتباع خطوات الخوارزمية المذكورة انفا في الفقرة **1.1.3**، تم صياغة دالة العضوية لكل محور من محاور استمارة الاستبيان وكما يوضحها الجدول (2).

جدول 2: المستويات المقترحة لتقييم متغيرات البحث قيد الدراسة

المستويات المقترحة للمتغير			الدالة العضوية	المتغيــرات
جيدة Good	مقبولة (معتدلة) Moderate	ضعيفة(سيئة) Bad	S.SC	ظروف الطالبة الدراسية Student Study Circumstances
جيدة Good	مقبولة (معتدلة) Moderate	ضعيفة(سيئة) Bad	T.GL	المستوى العام للتدريسي General level for the teacher
جيدة Good	مقبولة (معتدلة) Moderate	ضعيفة(سيئة) Bad	S.ASL	وصول المادة العلمية للطالبة Access scientific level for the students
جيدة Good	مقبولة (معتدلة) Moderate	ضعيفة(سيئة) Bad	S.SM	الوسائل الدراسية المتاحة للطالبة Study Means
جيدة Good	مقبولة (معتدلة) Moderate	ضعيفة(سيئة) Bad	S.SL	المستوى العلمي للطالبة Scientific level for the students
حديثة Modern		قديمة Old	S.BP	طبعة الكتاب The Book Print

كما يصنف النظام إجابات الطالبات على كل فقرة من فقرات مادة اللغة العربية إلى ثلاث مستويات موضحة في الجدول (3).

المتغيـــرات	الدالة العضوية	المستويات المقترحة لتحديد مستوى إنجاز الطالبات في الاختبار		
اختبار القواعد Rules Test	Ru. Test	سيئ Bad	متوسط Medium	جيد Good
اختبار الأدب Literature Test	Lit. Test	سيئ Bad	متوسط Medium	جيد Good
اختبار الإملاء Dictation Test	Dic. Test	سيئ Bad	متوسط Medium	جيد Good

القواعد المنطقية المضببة لكل من:تقييم وصول المادة العلمية للطالبة، تقييم المستوى العلمي للطالبة كما يوضحها الجدول (4) و (5) على التوالي.

جدول4: القواعد المنطقية المضببة لتقيم وصول المادة العلمية للطالبة

R # ule	القواعـد المنطقيـة المضببة (Rules)
1	If T.GL is Bad andS.BP is Old Then S.ASL is Bad
2	If T.GL is Bad andS.BP is Modern Then S.ASL is Medium
3	If T.GL is Moderate andS.BP is Old Then S.ASL is Bad
4	If T.GL is Moderate andS.BP is Modern Then S.ASL is Medium
5	If T.GL is Good andS.BP is Old Then S.ASL is Good
6	If T.GL is Good andS.BP is Modern Then S.ASL is Good

R # ule	القواعد المنطقيـة المضببة (*Rules*)
1	If Ru.Test is Good andLit.Test is Good and Dic.Test is Good Then S.SL is Good
2	If Ru.Test is Good andLit.Test is Medium and Dic.Test is Good Then S.SL is Good
3	If Ru.Test is Medium andLit.Test is Medium and Dic.Test is Good Then S.SL is Medium
4	If Ru.Test is Medium andLit.Test is Medium and Dic.Test is Medium Then S.SL is Medium
5	If Ru.Test is Bad andLit.Test is Bad and Dic.Test is Bad Then S.SL is Bad
6	If Ru.Test is Bad andLit.Test is Bad and Dic.Test is Medium Then S.SL is Bad

4.قاعدة البيانات وشاشات النظام

4.1.قاعدة بيانات النظام

تم تصميم قاعد البيانات باستخدامMicrosoft Access والتي تتضمن جميع المعلومات المطلوبة والخاصة بالنظام والمرتبطة

مع بعضها بالعديد من المفاتيح والعلاقات وكما موضح في الشكل التالي:
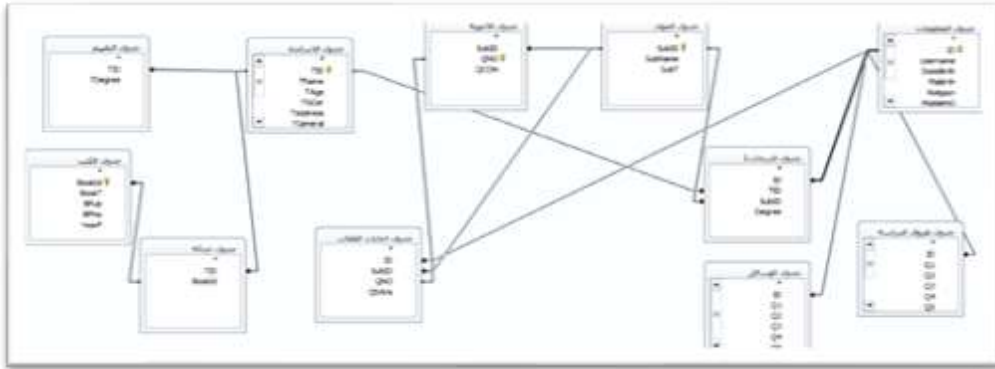
الشكل 1: قاعدة البيانات العلائقية الخاصة بالنظام

وتم استخدام لغة Visual basic.net في برمجة النظام وهي لغة عالية المستوى.

2.4. شاشات النظام

يبدأ العمل بهذا النظام بظهور الواجهة الرئيسية بوحداته الرئيسية كما يوضحها الشكل (2)، وهي وحدة التعامل مع البيانات، وحدة التضبيب، وحدة التصنيف، وحدة التقارير، وحدة التعليم الذاتي

الشكل 2: الواجهة الرئيسية للنظام

✔ **وحدة التعامل مع البيانات** : يتحتم على المستفيد من البرمجيات المصممة إدخال معلومات تتعلق بالمواد المنهجية المقرر دراستها، المعلومات الشخصية عن الطالبة والتدريسي ...الخ، مع إمكانية التحول بين مواقع البيانات في الشاشة الواحدة، أو التحول بين الشاشات المختلفة بسهولة بهدف تحديث البيانات أو إدخال معلومات جديدة، و الشكل (3) يوضح إحدى هذه الواجهات.

الشكل3: واجهة ادخال معلومات الطالبة

✔ **وحدة التضبيب**: تتضمن هذه الوحدة أربعة أوامر ثانوية هي : تقييم ظروف الطالبة الدراسية، تقييم مدى إيصال المادة العلمية للطالب، تقييم الوسائل الدراسية المتاحة، تقييم المستوى العلمي للطالبة.

● **تقييم ظروف الطالبة الدراسية** : تم توزيع استمارة استبيان والتي تتضمن ثلاث فقرات، الأولى تحتوي على (10) أسئلة تتعلق بظروف دراسة الطالبة،الواجهة الموضحة في الشكل (4،أ)، حيث يتم تحديد أوزان مضببة للأسئلة تسهيلا لعملية تقييم ظروف دراسة الطالبة، ومن ثم معالجة القوانين وحساب المجموعة المضببة لهذا التقييم.

● **تقييم مدى إيصال المادة العلمية للطالبة**: تشمل كل من تقييم حداثة الكتاب اعتماداً على تاريخ طباعته، وتقييم المستوى العام للتدريسي من قبل مسؤوله الأعلى – رئيس القسم– وذلك من خلال استمارة مُعِدة مسبقاً، وبعدها يتم معالجة

القوانين وحساب المجموعة المضببة، وصولاً إلى تقييم مدى ايصال المادة العلمية للطالبة بالاعتماد على القواعد المنطقية المضببة آنفة الذكر في الجدول(4).

● **تقييم الوسائل الدراسية المتاحة:**الفقرة الثالثة من استمارة الاستبيان تتضمن خمس أسئلة تتعلق بالوسائل الدراسية المتاحة للطالبة، كما يوضحها الشكل (4، ب)، حيث يتم تحديد أوزان مضببة للأسئلة لتسهيل عملية تقييم الوسائل الدراسية المتاحة للطالبة، ومن ثم معالجة القوانين أيضاً وحساب المجموعة المضببة لهذا التقييم.

● **تقييم المستوى العلمي للطالبة** يكون على شكل اختبار لثلاث محاور – القواعد العربية، الأدب العربي، والإملاء– كل منها يتضمن أسئلة عديدة خاصة به، يتوجب على الطالبة حلها (خطوة ─ خطوة)، وعند كل خطوة من الإنجاز تُحَدَّث مجموعة أوزان مضببة تبنى على فرضيات تعتمد على مستوى إنجاز الطالبة عند تلك النقطة، حيث أن الإجابة الصحيحة لكل سؤال مخزنة في قاعدة البيانات. واحدة من الشاشات موضحة في الشكل(4).

الشكل (4–أ): تقييم ظروف الطالبة الدراسية

الشكل(4– ب) : تقييم مدى إيصال المادة العلمية للطالبة

وبعدها يتم معالجة القوانين وحساب المجموعة المضببة، ومن ثم تحديد المستوى العلمي لكل طالبة بمادة اللغة العربية بالاعتماد على القواعد المنطقية المضببة الموضحة في الجدول (5).

✔ **وحدة التصنيف** : يتم في هذه الوحدة برمجة خوارزمية (FCM) الموضحة في الفقرة(**1.1.3**)، حيث يتم الاستفادة من نتائج وحدة التضبيب لتطبيق الخوارزمية على المتغيرات(ظروف الطالبة الدراسية، وصول المادة العلمية للطالبة، الوسائل الدراسية المتاحة للطالبة، المستوى العلمي للطالبة).

الشكل5: احدى شاشات اسئلة القواعد

✔ **وحدة التقارير** : هناك العديد من التقارير التي تصدرها هذه الوحدة واحدة، منها تقرير عن الظروف الدراسية لكل طالبة مرتبة حسب الحروف الأبجدية لأسماء الطالبات.

الشكل 6: واجهة وحدة التقرير لظروف الطلبة

✔ **وحدة التعليم الذاتي**: يتم في هذه الوحدة التفاعل بين المتعلم والنظام من خلال المقرر الدراسي، حيث تحتوي هذه الوحدة على جميع مواضيع المقرر الدراسي، بهيأة محاضرات مقدمة، بالإضافة إلى مجموعة كبيرة من الأسئلة الموجهة إلى الطالبة مباشرة بعد إنهاء كل درس لمتابعة تقدم الطالبة في هذه المادة.

5. مناقشة النتائج

تم تطبيق الخوارزمية (FCM) وبعد اختيار ثلاث عناقيد لتشمل مستوى أداء الطالبات (ضعيف، متوسط، جيد)، وعدد التكرار المساوي لـ(100)، ومعيار التوقف (ε=0.001) وجد أن :‐

(40) % من الطالبات شملوا بالمستوى الضعيف.

(35) % من الطالبات شملوا بالمستوى المتوسط.

(25) % من الطالبات شملوا بالمستوى الجيد.

الواجهة في الشكل(6) تُظهِر قيم دالة انتماء كل طالبة إلى العناقيد الثلاث التي تم التوصل إليها بعد ثبوت قيمها عند التكرار (87). ونجد فيها أن بعض الطالبات أظهرن انتمائهن إلى عنقودين وبقيم دوال انتماء مختلفة، فيتم اختيار القيمة الأعلى بالانتماء، وكخطوة لاحقة يتم شمول الطالبات ضمن العنقود الثالث (الطالبات ذات المستوى الضعيف) بدورة على الحقيبة العلمية الخبيرة والتي تم برمجتها لتساهم في رفع المستوى العلمي للطالبات.

الشكل 6: واجهة وحدة التصنيف

يتسم النظام بالمرونة في اختيار وعرض التمارين بناءاً على مستوى إنجاز الطالبة، حيث تخزن التمارين في قاعدة بيانات خاصة و خُصِصَ لكل تمرين إيعاز به لغرض تسهيل عملية الاستدعاء. في حالة الإجابة الخاطئة يعرض النظام التوجيهات ويحدد موقع الخطأ ونوعه وكيفية تصحيحه، وكذلك تعرض هذه الوحدة تمرين مشابه يعتمد على نوع الخطأ الحاصل لغرض تحسين معرفة المتلقية وإنجازها، مع توفر خاصية المساعدة أثناء حل التمرين في حالة : طلبها من قبل المتعلم أو من خلال تدخل هذه الوحدة عند حصول خطأ معين في الحل، أو للاطلاع على الأجوبة النموذجية لكل سؤال.

6. الاستنتاجات والتوصيات

6 .1 الاستنتاجات:

1. ملائمة المنطق المضبب في تحليل البيانات ذات الطابع المضبب ومرونة استخدامه في التحليل العنقودي.

2. استخدام المنطق المضبب في التحليل العنقودي للتصنيف بين مستوى الطالبات أعطى نتائج طيبة وقريبة جداً من الواقع الملموس.

3. إمكانية الوصول السريع للمعلومات المخزونة في قاعدة البيانات، حيث أن عملية استرجاع أي معلومة أو ملف لا تتطلب الا عدة ثواني.

4. تقليل الازدواجية في البيانات من خلال إعطاء رقم لكل طالب وتدريسي مما يزيد من كفاءة العمل.

5. ثبات فعالية الحقيبة التعليمية المصممة في التركيز على المعلومات التي تستوجب الوقوف عندها، إذ بعد إخضاع الطالبات ذات المستوى الضعيف لدورة تقوية باستخدام الحقيبة التعليمية الخبيرة المبرمجة وإجراء اختبار لهن، أُثبتن تحسن في أدائهن الإمتحاني.

6. تحسين المستوى العلمي للطالبة الضعيفة في مادة اللغة العربية حيث أن استراتيجية حل المشكلة المبرمجة في وحدة التعليم الذاتي التابعة للنظام حققت تعليماً فردياً إلى درجة عالية.

6. 2 التوصيات

1. استخدام أسلوب التحليل العنقودي المضبب عندما تكون جميع متغيرات الدراسة ذات طابع مضبب.

2. فيما يتعلق بمستوى الطالبات فللحفاظ على مستوى علمي مقبول لمعلمات الأجيال القادمة توصي الباحثتان بـ :–

– الانتساب إلى قسم اللغة العربية بحسب معدل الطالبة في مادة اللغة العربية ثم الرغبة.

– إجراء اختبار لكفاءة الطالبة في مادة اللغة العربية قبل انتسابها إلى القسم شرط أن يكون هذا الاختبار اختباراً ذو دقة وموضوعية.

– إجراء امتحان شامل ومركزي في المرحلة الأخيرة، بحيث يعطي له وزناً وقيمة، وعلى ضوء نتيجة الطالبة يحدد موقع تعيينها بحيث يكون الأفضلية والأولوية للمتميزات من الطالبات ليكون حافزاً للبقية.

3. نشر وترسيخ أسلوب التعليم الحاسوبي بين الفئات الطلابية لتوسيع إدراكهم الفكري واستثمار قابلية الحاسوب بالوجه السليم والمثالي، خاصة إذا ما تم الاعتماد على أساس علمي قوي رصين وغني بالمعلومات المفيدة ضمن الاختصاص المعني معززاً بالأمثلة ووسائل الإيضاح.

المصادر

1- مانج أنور عبدالله و أمير سردار كويخا رشيد و محمد إسماعيل أحمد،2018، نظام تغذية رجعية الطالب لتقييم أداء التدريس في عملية التعميم باستخدام نظم إدارة قواعد البيانات دراسة تجريبية مقدمة لوحدة ضمان الجودة في جامعة السليمانية، مجلة جامعة كركوك للعلوم الإدارية والاقتصادية،المجلد :8، العدد :1.

2- مل صالح مهدي، 2022، دلالات علامات الإعراب عند سيبويه (ت 180هـ)والفراء(ت207هـ)، *مجلة الجامعة العراقية، ,2022المجلد 54, العدد 1* ,الصفحات 186-198.

3- ثابت حسان ثابت، إسماعيل عبدالوهاب إسماعيل،2017، : استخدام المنطق المضبب لتقييم أداء تدريسي اللغة العربية في الأقسام الجامعية غير المتخصصة، مجلة جامعة العلوم الإنسانية /كلية اللغات.

4- حسين، آسيا حمود،2021، تصنيف المحافظات العراقية من خلال العوامل المؤثرة على وفيات الأمهات عند الولادة باستخدام بعض الطرق الهرمية للتحليل العنقودي، مجلة الإدارة والاقتصاد، العدد 130، ص ص 213-226

5- لحلولي، ماجى احمد خليل،2018، استخدام أسلوب التحليل العنقودي في تصنيف محافظات جمهورية مصر العربية المجلة العلمية للاقتصاد والتجارة،المجلد 48، العدد 1.

6- خالد بن عبدالعزيز الدامغ وهند بنت محمد الهاجري، 2018، تصميم الاختبارات الالكترونية لمتعلمي اللغة العربية لغة ثانية، المجلد الثاني من العدد الخامس والثلاثين لحولية كلية الدراسات الإسلامية والعربية للبنات بالإسكندرية.

7- لشمري،محمد موسى،2020، توظيف اسلوبي التحليل العنقودي والتحليل التمييزي في تصنيف البيانات وبناء الدوال التمييزية، مجلة كلية التربية، جامعة الأزهر، العدد: (681،الجزء الأول).

8- عبد العباس، فاطمة موسى، 2022، لِدِلالةُ النَحَوية للشَاهِدِ القُرْآنِيّ في المفعولِ المطلَق والمنَادى في كِتَابِ البَسِيطِ لِرُكنِ الدِّينِ الأسْتَرَآباذِي(ت:715هـ)، مجلة كلية التربية للعلوم التربوية والإنسانية، العدد 55، المجلد 14.

9- لعلي، ابراهيم محمد، 2020، أسس التحليل الإحصائي متعدد المتغيرات، جامعة تشرين، اللاذقية، سوريا.

10 لفخري،نعمه عبد الله،واخرون،2016، " اعتماد تقنيات العنقدة المضببة في تحديد الصفات الوراثية لثمرة الزيتون "، مجلة بوليتكنك للعلوم الانسانية و الاجتماعية، المجلد 6، العدد 3 .

11- نبر، هدى عباس و حامد، ميسون عدنان، 2021، قواعد البيانات للرسائل والاطاريح في المكتبات المركزية بالجامعات العراقية–دراسة وصفية، مجلة جامعة تكريت للعلوم الإنسانية، المجلد 28، العدد 8، الصفحات 511-533.

1. Chuangtao Ma, and Balint Molnar, (**2021**), "Ontology Learning from Relational Database: Opportunities for Semantic Information Integration", Vietnam J. Comp. Sci., Vol. 8, No.4.

2. Dimitrios S.Stamoulis & Panos A.Giannopoulos,,2022,"My personal forecast : the digital transformation of the weather forecast communication using a fuzzy logic recommendation system", Adv.Sci.Res.,21st EMS Annual Meeting-virtual: European Conference for Applied Meteorology and Climatology.

3. Ihya Al-Arabiyah,2019, Designing the Arabic language test as a foreign language ,Jurnal Pendidikan Bahasa dan Sastra Arab, Volume 5 No. 1.

4. Miao Qiao,Gottfried VossenSen WangLei Li, (**2021**), "Databases Theory and Applications", 2nd Australasian Database Conference, Dunedin, New Zealand, Springer

5. Niroomand, et al., (**2021**), "Vehicle Dimensions Based Passenger Car Classification using Fuzzy and Non-Fuzzy Clustering Methods", Transportation Research Record.

6. S.Hamed Javadi,Angela Guerrero & Abdul M.Mouazen, 2022,"Clustering and Smoothing Pipeline for Management zone Delineation Using Proximal and Remote Sensing, Sensor",Vol.22,P.645

7. Shaimaa K. Ahmed , Zobeda H. Naji, Yousif N. Hatif, Meaad Hussam,2020. Design and Implementation of a Computerized Drug Inventory Management Information System Using ASP.NET MVC, Diyala Journal of Engineering Sciences Vol (13) No 4, P P 80-90

8. Shrook.A.S.AL-Sabbah, etal , **2021**, "Using the Hierarchical Cluster Analysis and Fuzzy Cluster Analysis Methods for Classification of Some Hospitals in Basra" , Baghdad Science Journal, 18(4): PP.1212-1217.

الملحق 1

الشكل 1. مخطط سير عملية التضبيب

قاعدة بيانات

اختبار القواعد

اختبار الأدب

جدول وصول

جدول الطلاب

جدول الظروف

اختبار الإملاء

جدول التدربسبون

جدول تقييم

جدول الكتب

مجالات التقويم

جدول الوسائل المتاحة

جدول حداثة

S.BP   T.EL

Ru.Tes   Lit.Test   Dic.Tes

S.SM   S.SC

Fuzzification

Fuzzification

Fuzzification

Rule1   Rule2   Rule3   Rule4   Rule5   Rule6

Fuzzification

Rule   Rule2   Rule3   Rule4   Rule5   Rule6

Fuzzification

المستوى العلمي للطلاب S.SL

تطبيق خوارزمية FCM

THE CONCEPTUAL OF SMART CITIES IS A SOLUTION TO THE PROBLEM OF ENVIRONMENTAL AND URBAN DETERIORATION

Hussam Jabbar ABBAS[1]

Abstract:

Research in the cognitive dimension based on the sources with the aim of clarifying the nature of smart cities by summarizing them with a knowledge content consisting of three words (the goal - problem questions - solutions) focusing on the fact that the phenomenon of smart cities does not constitute an intellectual luxury, but that smart cities have a function in light of urban randomness in the built environment In the atmosphere of technological and cognitive progress, which is a focus that represents solutions to urban design problems, then the contemporary experience of structuring smart cities globally was discussed, to be a database for what was discussed in the knowledge framework. To reach the results, we compared the trends of the contemporary urban design system (according to Carmona), to the trends of smart cities, to reach the pros and cons in the knowledge and technical orientation axes of the context and dimensions of the urban structure for the future directions of cities. The research sources took three official global axes: the periodicals (ITU) of the International Telecommunication Union (one of the main marketers of smart city trends), European Parliament policies and plans for building smart cities (from the implementation institutions for smart cities), the research also dealt with World Bank publications, and sources Others support the idea in the margins.

Key words: Smart Cities, Urbanization, Environmental Deterioration, Digital Progress.

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ظاهرة المدن الذكية حلاً للعشوائية البيئية والحضرية

حسام جبار عباس [2]

ملخص:

أحاط البحث بالبعد المعرفي استناداً إلى المصادر بهدف توضيح ماهية المدن الذكية من خلال ايجازها بمحتوى معرفي مؤلف من ثلاث مفردات (الهدف – اسئلة المشكلة – الحلول) مركزاً على أن ظاهرة المدن الذكية لا تشكل ترفاً فكرياً، إنما للمدن الذكية وظيفة في ظل العشوائية الحضرية في البيئة المبنية، في أجواء التقدم التكنولوجي والمعرفي التي تعد محوراً يمثل الحلول لمشاكل التصميم الحضري، ثم تم مناقشة التجربة المعاصرة لهيكلة المدن الذكية عالمياً، ليكون قاعدة بيانات لما تم مناقشته في الإطار المعرفي. وللوصول إلى النتائج قارنا توجهات منظومة التصميم الحضري المعاصرة (وفقا لكارمونا)، على توجهات المدن الذكية، للوصول إلى الإيجابيات والسلبيات في محاور التوجه المعرفي والتقني لسياق وأبعاد البنية الحضرية للتوجهات المستقبلية للمدن. مصادر البحث أخذت ثلاثة محاور رسمية عالمية هي: دوريات (ITU) الاتحاد الدولي للاتصالات (أحد المسوقين الأساسيين لتوجهات المدن الذكية)، سياسات وخطط الاتحاد الأوربي European Parliament لبناء المدن الذكية (من مؤسسات التنفيذ للمدن الذكية)، كما تناول البحث منشورات البنك الدولي، ومصادر أخرى تدعم الفكرة في الهوامش.

الكلمات المفتاحية: الذكاء في المدن، الامتداد الحضري، العشوائية البيئية، التطور الرقمي.

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1-1/المشكلة البحثية:

خدمات المدن في المدينة الذكية وفي بنيتها الأساسية على تكنولوجيا المعلومات والاتصالات، وإن مفهوم الذكاء المكاني للمدن يعبر عن عمليات المعلومة والإدراك، كتجميع ومراجعة المعلومة، والتعليم، والتوقع والذكاء الجمعي والتنبيه الآني، والتعاون في حل المشكلات، ما تتميز به المدن ''الذكية. نحن أمام عدة تساؤلات: ما الرابط بين ظاهرة المدن الذكية وشاغليها ؟ هل أن تركيب المدن الذكية هي مفهوم واسع تشيد في ضوئه المدن أم هو توجه تابع لعملية التصميم في المدن؟ هل بالإمكان قياس حاجات المدن على وفق المدن الذكية ؟

1-2/ فرضية البحث:

1-2-1/ الفرضية الرئيسة : (مجتمعات المعرفة في المدن الذكية) هي كل ما يساعد على أن المدن تصمم على وفق معادلة مفاهيم المدن الذكية المبنية على مواد معرفية يتساوى في اقتنائها كل فرد في المجتمع.

1-2-2/ الفرضية الثانوية : وجود عدد من محاور العمل تحسب مقياساً لتصميم المدن الذكية هي (الأهداف – المشكلة – الحل)، ومن خلالها يتبين أن المدن الذكية ليس أمراً ترويقياً كمالياً بقدر ما هو حلاً لمشكلة العشوائية البيئية والتوسع الحضري المتزايد، و الحاجة الواقعية لتلك المدن في ظل تقدم البشرية في المجال المعرفي.

1-3/ أهداف البحث:

1-3-1/ يمكن احتواء ومعرفة التغير في الإدراك المعرفي لاستيعاب المدن الذكية بمعرفة الأساسيات التي بنيت عليها لتعامل على أساس أنها حاجة وحقيقة معاشه.

1-3-2/ إيجاد طريقة للقياس علمية من خلالها يتم الوصول إلى العلاقة الجديدة و الاستراتيجية القادرة على توفير معادلة للقياس تبين الأهداف الاستراتيجية لتصميم (المدن الذكية) .

2-/ مفاهيم لزيادة الوعي في مصطلح مدن الذكية :

2-1/المدن الذكية نشوء المصطلح:

أول ظهور لمصطلح ((المدينة الذكية)) في المؤتمر الأوروبي للمدينة الرقمية عام 1994. وفي 1996 باشر الأوروبيّون بفتح ((مشروع المدينة الرقمية الأوروبيّة)) في عدد من المدن، ثم تبنّت الحكومات الأوروبية في مدينة أمستردام مدينة رقمية وبعدها هلسنكي.

تركيب المدن الذكية الأوروبية انتشر في 70 مدينة أوربية ذات الحجم المتوسط سنة 2007 تم ترتيبها على وفق مفردات المدن الذكية. استهدف المشروع في وقتها قيام تحديد عناصر القوة والضعف في تلك المدن المتوسطة الحجم لتصبح ذات تنافسية عالية بتحقيق التنمية الداخلية للجميع. (كما جاء في واحد من منشورات البنك الدولي).

تعتمد خدمة المدينة الذكية في بنيتها التحتية على تكنولوجيا المعلومات والاتصالات، كنظام المرور الذكي المدار آلياً، وخدمة إدارة الأمن وأنظمة السيطرة على المباني وتشغيلها آلياً في المنازل والمكاتب وقارىء المقاييس وباقي التقارير. اصطلاح الذكاء المكاني في المدن فيه إشارة إلى كل العمليات الإدراكية و المعلوماتية، من جمع للمعلومات وقراءتها وإرسال المنبهات الفورية والتوقع، وإعادة القراءة والتعلم منها، هو ما يميز المدن ''الذكية'' كما يشير المفهوم إلى التوسع في انتشار واستعمال تكنولوجيا المعلومات والبيئة المؤسسية من (ICTs) والاتصالات للتوصل إلى العلوم والابتكارات والبنيات التحتية المادية للمدن للتوسع بقدرة حل المشكلات المجتمعية.

2-2 / ما هي المدينة الذكية؟ كما يشير له الاتحاد الدولي للاتصالات ITU

المدينة الذكية تعبر عن مدينة المعرفة، ويمكن تسميتها مدينة رقمية، أو مدينة فضائية "إيكولوجية"، و يتوقف ذلك على ما يتم تحديده من قبل المسؤولون من هدف معالجة المدينة تخطيطياً. والتي يحددها البرلمان الأوربي بأنماط سبعة هي :

Wired City', Sustainable City', 'Intelligent City', , Talented City', Digital City' Knowledge City',Eco–City'.(https://itunews.itu.int/ar/Note.aspx?Note=4251)

اجتماعياً واقتصادياً يمكن للمدن الذكية أن تتنبأ بالمستقبل. وتسمح بمتابعة البنية التحتية كالمطارات والأنفاق والأبنية الرئيسية والطرق والجسور وغيرها، للوصول إلى المثالية من الموارد والأمن. وتعظيم الخدمة، وإيجاد استدامة بيئية تعالج الأحساس بالصحة والسعادة. ويتمحور كل هذا حول البنى التحتية لتكنولوجيا المعلومات والاتصالات،.(Mapping Smart Cities 2014)

من الناحية الهيكلية تعد المدينة الذكية، منظومة مؤلفة من أنظمة تعمل سويةً. لذا يجب توفير ما يلزم من الانفتاح والتقييس–

هناك علاقة بين المواطنين والمدن الذكية و تعد العلامة الفارقة المميزة لها عن المدن التقليدية. فما توفره المدن التقليدية من خدمات على مستوى تكنولوجيا المعلومات لا يمكنها الإستجابة للظروف الثقافية الاجتماعية الاقتصادية المتغيرة بنفس استجابة خدمات المدن الذكية. لذلك فإن الانسان هو محور تركيز المدن الذكية، بالاعتماد على التطور العمراني والبنى التحتية المستمر وتكنولوجيا المعلومات والاتصالات، إضافة إلى مراعاة الاستدامة والبيئية الاقتصادية.(2013 Smart Cities Seoul: a case study)

شكل (1) علاقة المدينة الذكية وارتباطاتها

2-2-1/ نشوء العلاقة بين الذكاء والاستدامة:

أشار هشام جلال أبو سعده، (ابو سعيد،2010) في مؤتمر الإسكان العربي الأول، إلى أن مستقبل تطور الاستدامة العالمي الذي يجمع بين ثلاثيته الشهيرة، (البيئة والاجتماع والاقتصاد) ذاهب إلى ما يسمى بالاستدامة الذكية، وذلك بحسب الدراسة التي قاموا بها في تاريخ نشوء المصطلح وعلاقته الرابطة بمصطلح العمارة المحلية وذلك بتأثير التقدم التقني للبشرية، وهذا ما يشير اليه الواقع التكنولوجي المعاصر، بحكم المناخ الفكري السائد في يومنا هذا، والشكل (2) يبين ذلك.
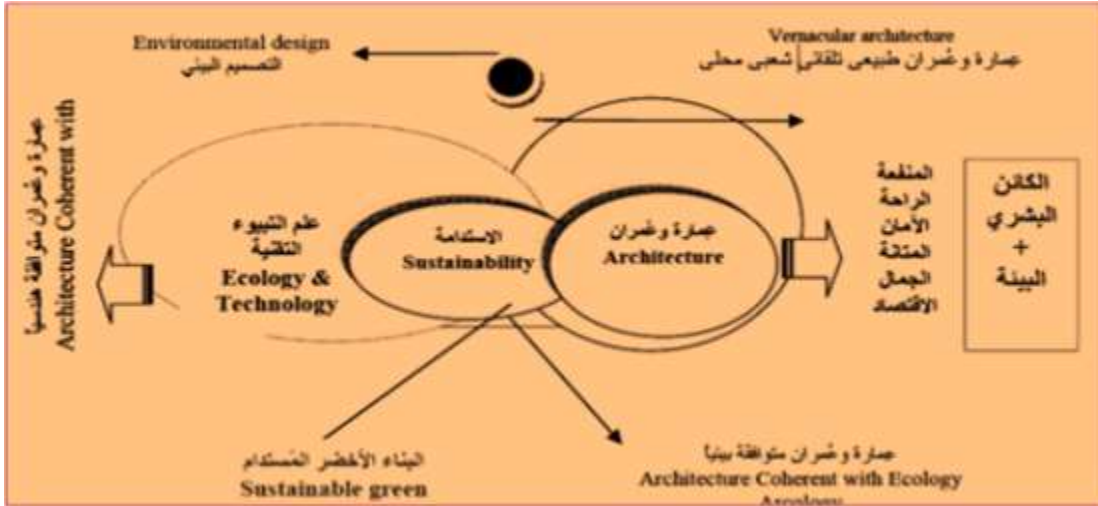
شكل (2) نشوء العلاقة

بين التقدم والاستدامة

عمارة وعمران طبيعي تلقائي محلي vernacular) (design	التصميم البيئي Environmental design الخمسينيات (علم مدرسي)	عمارة وعمران متوافقا بيئيا Architecture coherent with (technology الاربعينيات (حسن فتحي)	عمارة وعمران متوافقا بيئيا Architecture coherent with Ecology (Arcology الستينيات (باول سولاري)	عمارة وعمران بيئية Ecological) Architecture السبعينيات (علم درسي)	البناء الاخضر المستدام Sustainable green building الستينات السبعينيات اتجاه المؤلف	البناء الذكي المستدام Inelegant) (building التسعينيات (مختصون)
-بيئة طبيعية مخلوقات غير مجلوبة -تابعة لافراد مكان بعينه -جماعية منخبة -مهارات ذاتية انسانية تلقائية -الطريقة الخالدة للبناء -الثقافة والحرفة اصل التشكيل	-بيئة اصطناعية -انظمة بيئة اصطناعية متكاملة	– بيئة طبيعية اصطناعية – اصطناعية تابعة لافراد مكان بعينة -توفق بين الطبيعة وعلوم التقنية	– بيئة طبيعية -اصطناعية تابعة لافراد مكان بعينه – توفق بين الطبيعة وعلوم البيئة – توفق بين الطبيعة وعلوم التقنية	بيئة طبيعية -اصطناعية من مصادر الطاقة الطبيعية – اساليب اصطناعية، – مواد بناء اصطناعية وطبيعية، -مهارات معمار مختص	– بيئة شبه طبيعية -مواد بناء محلية طبيعية او مصنعة او معاد تدويرها – تابعة لفكر عالمي -مهارات معمار مختص	– بيئة اصطناعية -تنبؤات الحاسب الرقمي في ادارة انظمة المباني

2-2-2/ مظاهر المدن الذكية في العالم:

في ضوء معدل الابتكار يمكن تحقيق نماذج المدن الذكية على نطاق واسع، لتشكل بدورها نماذج المدن الذكية الاستراتيجيات العامة لتطور المدن.

على العموم جميع المدن الذكية لها مظاهر رئيسة يمكن إيجازها بثلاث نقاط هي: (https://itunews.itu.int/ar/Note.aspx?Note=4251)

1– البنى التحتية لتكنولوجيا المعلومات والاتصالات.

2– تكامل الإطار الإداري للمدينة.

3– ذكاء المستخدمين في المدينة الذكية.

2-3/ قياس وتقييس المدن الذكية:

منظمات مختلفة تتكفل بمهمة وضع معايير للمدن الذكية. كمنظمة توحيد المقاييس الدولية (ISO) من خلال مجموعات متخصصة في ((تقييس البنية التحتية في المجتمعات الذكية)). كما تم بناء منظمة تقييس الاتصالات في اتحاد الاتصالات الدولي (ITU–T) فريقاً متخصصاً بقضايا المدن المستدامة الذكية لتقييم متطلبات التقييس.

لتعد المدن الذكية هي الخطوة التالية لعملية التمدين في العالم مما يتطلب وضع معايير وحلول مبتكرة في قطاع تكنولوجيا المعلومات والاتصالات وبنى تحتية حتى تكون هذه الرؤية واقعاً ملموساً. https://itunews.itu.int/ar/Note.aspx?Note=4251.

3/ الإدارة الاستراتيجية في التصميم الحضري للمدن الذكية (جامعة الملك عبد العزيز، 2009):

هناك عدة مدارس أو اتجاهات لتكوين استراتيجية التخطيط العمراني، وإدارة المناطق الحضرية والمدن، يمكن حصرها في عشر مدارس: لكن أهمها المدرسة العاشرة ذات المنهج الشمولي وهي المدرسة التي تسمى مدرسة الهيكلة ؛ القائمة على تركيب الاستراتيجية عن طريق عملية تحول، والتي ظهرت في العقد التاسع من القرن العشرين وهي تكاد تجمع بين المدارس التسع السالفة، حيث يسعى المخططون إلى أن يكونوا متكاملين في جهودهم فيجمعون الأطراف المختلفة في عملية وضع الاستراتيجية بما في ذلك محتوى الاستراتيجيات والهياكل النظامية ومضمونها في مراحل متباينة. على سبيل المثال يمكن تقسيم النمو الابتكاري أو النضوج المستتب للمؤسسة إلى سلسلة متتالية عبر الزمن لوضع وصف دقيق لمراحل حياة المنظمة. وإذا جنحت منظمة إلى أوضاع مستتبة فعملية تكوين الاستراتيجية توضح القفزة من حالة استباب إلى أخرى. وبهذا فإن عملية وضع الاستراتيجية تجري ضمن عملية تحول تتصف بالتغيير الاستراتيجي.

وعموماً فإن كل استراتيجية شأنها كشأن أي نظرية، إنما هي تبسيط يشوه الواقع بالضرورة، فالاستراتيجيات ليست حقائق مطلقة ولكنها سبل مقتضبة لتمثيل الواقع بصورة يمكن إدراكها. فالاستراتيجية ليست واقعاً ملموساً، وهذا يعني أنه من الممكن أن يرافق كل استراتيجية عامل مشوه للواقع أو عدم مصداقية في تمثيل الواقع حتى يمكن تقريبه للأذهان. وهذا هو الثمن الذي يدفعه الباحث عن استراتيجية. وعموماً فإن العمل الجماعي وأخذ رأي المستخدمين الحقيقيين للتصميم، ومراعاة متطلبات المستخدم الحقيقية والواقعية يعد المفصل المهم والمعول عليه في نجاح الخطة الاستراتيجية إضافة إلى مواكبة العصر وما تفرزه التكنولوجيا والواقع من متطلبات وامتيازات، مع قدر واسع من الاستشارة للمختصين في مجالات مختلفة، وضمن نطاق إداري يجمع ويراعي جميع هذه الأطراف (. https://itunews.itu.int/ar/Note.aspx?Note=4251).

أجريت محاولات لتوضيح قدرة التخطيط العمراني الاستراتيجي على المعالجة المبتكرة للربط بين الاتصالات ونمط الحياة في المدن المعمورة والمواصلات. ففي المقام الأول يتم التدخل المحلي من خلال التخطيط لتقنية المعلومات والاتصالات عن طريق الكشف عن العلاقات بين التعمير وانتشار تقنيات المعلومات والتغير في تكوين وتعمير المدن ومواقعها ونظم الانتقال الحسية. ويتم ذلك عن طريق مراجعة الأربع مجالات الرئيسة في علاقات الاتصالات بالمدينة؛ أي:

- علاقات وسائل النقل بالاتصالات.
- الروابط الواسعة بين الاقتصاديات العمرانية واقتصاديات المعلومات.
- العلاقة بين المدينة وثقافة الحاسوب.
- السبل التي تربط بين مجتمعات المدن والمجتمعات الافتراضية القائمة على تقنية المعلومات.

وفي واقع الأمر أن هناك مبادرات عالمية واسعة النطاق في التخطيط العمراني تحاول تشكيل روابط بين أسلوب المعيشة في المدن والتعاملات الإلكترونية ففي شمال أمريكا وأوروبا وآسيا هناك عدة سياسات تتضمن مخططات لدمج استراتيجية المواصلات بالاتصالات، وسياسات إعلامية على مستوى المدينة، لتكوين ما يسمى بالضواحي المعلوماتية وقرى الاتصالات العمرانية.

إن تقنيات المعلومات تتجاوب بطبيعتها مع تعمير المدن ومرتبطة بإنشاء الأماكن المختلفة وليست مجرد تكرار لعملية التعمير أو إضافة لها، أي أن التعمير العمراني الاستراتيجي يقتضي إنشاء الأماكن العمرانية والمناطق الالكترونية في نفس الوقت. هذا لأن سهولة القدرة على مزاولة الأعمال الاقتصادية والتواصل الاجتماعي أصبحت تعتمد إلى حد كبير على الأماكن التي تتخللها البنيات التحتية الإعلامية المعقدة والتي تربطها بسائر الأماكن والمناطق. فمؤسسات اليوم ليست مدعومة بالمباني فحسب بل بالاتصالات وبرامج الحاسوب. وبهذا فإن الربط بين الإعلام ونظم الاتصالات الشاملة والمنشآت أصبح أمراً طبيعياً؛ وهذه هي سمة العمران الحديث. فمن المتوقع أن تصبح الخدمات الإلكترونية للمنشآت أمراً ضرورياً حيث تترجم المعلومات الرقمية إلى تمثيل مرئي ومسموع وملموس أو بأية صورة تدركها الحواس وبالعكس. وبهذا تصبح شاشات العرض وأجهزة الاستشعار للحصول على المعلومات وعرضها جزءاً لا يتجزأ من المنشآت له ضرورة كضرورة الباب للغرفة. وباتساع المدن إلى مناطق ممتدة متعددة المراكز، فإن المناطق العمرانية في المدينة ستنشأ بصورة فسيحة وأكثر تعقيداً كمساحات الأراضي العامرة والمترابطة بشبكات متكاملة بالغة التعقيد.

ولا شك أن هناك طفرة كبيرة في التخطيط العمراني الاستراتيجي قائمة حول فكرة كيفية تجسيم البنايات بحيث تتداخل فيها الوسائط الإلكترونية. وهناك مجموعة من المبادرات المبتكرة يتضح منها أن مبادرات التخطيط تعمل على تشكيل الجمع بين تطوير واستخدام تقنيات الوسائط المستحدثة والاتصالات وتعمير المدن. تلك المبادرات مدعومة بجهود مكثفة من المخططين ووكالات التعمير المدني وهيئات المواصلات وشركات الإعلام مما يظهر بوضوح مدى التعقيد في عملية التفاعل بين الاتصالات الإلكترونية واستغلال الأراضي وواقع العمران والمواصلات وعمليات الاتصال وجهاً لوجه. بالإضافة إلى ذلك فإن كل مدينة غربية مهما كانت ضئيلة تستخدم شعارات الحاسوب والسليكون والإنترنت كوسيلة لتسويق نفسها.

وأدى النمو الجاري في الاتصالات العمرانية والمبادرات الرامية إلى اعتبار الاتصالات ووسائل المعلومات جزءاً لا يتجزأ من التخطيط العمراني الاستراتيجي أمر يلاقي ترحيباً كبيراً لعدة أسباب منها، أن في ذلك اعتراف بأن الاتصالات في المدن هي من متطلبات الحياة المدنية، وأن تلك السياسات قائمة على فهم أنضج للعلاقات المعقدة بين وسائل الإعلام الجديدة والحياة في المدن أكثر من الحديث الدائر عن أفكار مثل تلاشي المسافات ونهاية عصر المدن التي تنتشر في مجتمعات المعلومات. ثم إن انتشار تلك السياسات الساعية لدمج المناطق العمرانية بتقنيات الإعلام الحديث مفتوحة لتدخل ابتكاري من المخططين، حيث أن المخطط بمقدوره أن يفيد المدن أكثر مما قد تقدمه قوى السوق أو السلطات المركزية التي تشرف على التخطيط.

في هذه المرحلة المبتدئة من التخطيط العمراني الاستراتيجي الذي يستوعب الاتصالات وشبكات المعلومات يلزم الحرص على إنجاح مبادرات الاتصالات في المدن في إيجاد نوع من التناغم الإيجابي بين التفاعلات القائمة على المكان وتعميره وتفاعلات الوساطة الإلكترونية وتطويرها؛ وعدم الاكتفاء بكونها مجرد قيمة رمزية مضافة للممتلكات أو إضفاء وضع متميز عليها.

ورغم التوسع في نطاق المبادرات فمن اللازم توخي الحذر في فائدة تلك المبادرات من حيث مداها واتجاهها. فمن حيث المدى يجب عدم المبالغة في الدور المتوقع لتقنية الاتصالات والمعلومات في استراتيجيات التعمير. فبينما غالبية طرق التخطيط العمراني الاستراتيجي ما فتئت تجاهد في محاولة سبل جديدة لتخطيط شبكات النقل والمناطق العمرانية في الوقت نفسه، فإن عملية الوصلات والشبكات الإلكترونية ما زالت تعد أمراً ميسوراً. أما بالنسبة لاتجاهات المبادرات فمن الواضح أن عمليات التخطيط لاستغلال الأرض والنقل والاتصالات لو أجريت في الوقت نفسه فإن التقدم الحقيقي في هذا المضمار يتطلب معالجة قضايا أخرى. (https://itunews.itu.int/ar/Note.aspx?Note=4251).))

4/ أهمية المعرفة والإدارة في المدن الذكية:

إن التنافس العمراني بين المدن المختلفة حول العالم مظهر من مظاهر القدرة العالمية عندما تصبح المعرفة العماد لمجتمع المعلومات. فالنمو الاقتصادي أصبح مرتبطا بالمعرفة، وأن هناك رابطة بين انتعاش المعرفة في مكان ما والتجمع الصناعي فيها. وبهذا نما الاهتمام ببناء جوهر حضري للقدرة التنافسية والحفاظ عليه. وأن بناء جوهر حضري للقدرة التنافسية على أساس المعرفة يؤدي إلى صيانة المنزلة التنافسية للمنطقة الحضرية.

ومن خلال تحليل تفصيلي لنظريات الجوهر الحضري للقدرة التنافسية وبناء على دراسة للمعرفة ونماذج سريان المعرفة تم التوصل إلى استنتاج أن الجوهر الحضري للقدرة التنافسية قدرة فريدة لأي منظمة مبنية على المعرفة. و أن الجوهر الحضري للقدرة التنافسية المبني على المعرفة يتأثر بمقاصد المعرفة وأساليب سريانها من وجهة القيم، والابتكار التقني والتنظيمات المؤسساتية والابتكارات المؤسساتية والتوازن في البيئة والتنوع الحيوي. ومن بدايات القرن الحادي والعشرين، ومن خلفيات تكوين مجتمع المعلومات بدأ التاريخ البشري يندفع تجاه مرحلة نمو وتطوير لم يكن لها مثيل من قبل. ومن بين مظاهر هذه الحقبة الزيادة في مستوى الامتداد الحضري حول العالم كله حيث ارتفعت نسبة المناطق الحضرية من ١٣ ٪ إلى ٥٠ ٪ بنهاية القرن العشرين. وفي القرن الجديد تقدمت عملية توحيد التقنية والمعلومات والاقتصاد بطفرة سريعة؛ وتحت هذه الظروف أصبح التنافس بين الدول المختلفة تنافساً بين المدن التي تمثل الخلايا الحية للدولة. وبهذا فإن العديد من المدن تبحث عن أنسب الطرق لتعزيز منزلتها التنافسية في العالم. ثم أن الاتجاه الحديث في الإدارة الاستراتيجية العالمية للمناطق الحضرية والمدن يتحول بالتدريج من التوسع في مساحات الحضر إلى إدارة استراتيجية تعمل على التقوية الشاملة والمكثفة لقدرات المناطق الحضرية، لاسيما من جانب الجوهر الحضري للقدرة التنافسية، وذلك هو أساس القوة المستدامة للمدن.

5/ مجتمع المعرفة في المدن الذكية (دراسة في المصطلح):

معظم الباحثين والمفكرين متفقين على أن المقصود بمفهوم " مجتمع المعرفة " هو توافر مستويات متقدمة من البحث العلمي والتنمية التقنية بهدف توفير المادة المعرفية لكل أفراد هذا المجتمع دون تمييز، لبحث هؤلاء الأفراد في تعلم الكيفية التي يتم بها تحقيق الاستفادة الشاملة والمتكاملة من المواد المعرفية و استثمارها وتوظيفها وإدارتها بالشكل المناسب، لتكون المعرفة هي ما تميز المجتمع و تحدد مقدرته على الاستمرار والتقدم والتفوق والمنافسة. فالانتقال من مجتمع الصناعة إلى مجتمع المعرفة هو الواقع الحالي للعالم المعاصر، ويمكن عقد مقارنة بين المجتمعين فيما يلي :(عليان،أ.د. ربحي مصطفى، 2012)

القضية الأولى هي أن واضعي السياسات العمرانية لاسيما في الثقافة الغربية يفترضون أنه يمكن إدخال التقنيات الحديثة على مشاريع التعمير المعقدة في المدن كمجرد نوع من الإصلاح السريع. ولما كان أغلب صناع السياسة والمخططين على غير معرفة أو خبرة بقطاع الاتصالات فهناك خطر من أن تؤدي الاستراتيجيات العمرانية إلى تأثير سيء على المدينة من التقنية الحديثة. وفي الواقع أن مبادرات الاتصالات الجديدة ما زالت مرتبطة بأفكار المدينة المثالية في ضوء اليقين من أن التقنية ستعود بمنافع كبرى على تطور المدن الاجتماعي والبيئي وتوزيع المناطق القابلة للتعمير. غير أن تنفيذ أفكار معقدة بالنسبة لدور الاتصالات في الاستراتيجية العمرانية يقتضي من واضعي السياسات العمرانية القيام بدراسة تحليلية لدور التقنية في الاستراتيجية العمرانية. وقبل كل شيء، يجب على المخططين أن يكونوا حساسين تجاه القوة الرمزية الهامة لتقنيات المعلومات والإعلام كمظاهر من مظاهر مدنية التقنية الرفيعة. ويجب عليهم أن يكونوا متجاوبين مع أولئك الذين تفيدهم هذه القوة الرمزية ومدركين لكيفية الاستفادة منها. تلك القوة الرمزية؛ التي هي ظاهرة بطبيعتها للعيان، قد تكون في الواقع بأهمية، أو أكثر أهمية في بعض الأحوال، من التطبيقات الجديدة أو البنى التحتية الجديدة؛ التي عادة ما تبقى خفية أو غير معروفة.

القضية الثانية المتعلقة بمبادرات دمج تقنيات الاتصالات والمعلومات في عملية التخطيط العمراني الاستراتيجي هي في مدلولات تلك المبادرات بالنسبة للمدينة وأفكار تنمية المدن المتكاملة، وبالأخص الدور المحتمل لتلك المبادرات إما في تعزيز وإعادة تشكيل أنواع جديدة من التمييز وتردي البيئة، أو في نجاح محاولات مفيدة للسعي لإيجاد عمران مستقبلي يتميز بالاستدامة واحتواء الجميع.

<div align="center">جدول (2) مقارنة بين مجتمع الصناعة إلى مجتمع المعرفة</div>

مجتمع المعرفة	مجتمع الصناعة
– المساواة	– الهرمية
– الفردية والابتكار	– التماثل
– التنوع	– القياسية
– اللامركزية	– المركزية
– الفاعلية	– الكفاءة
– الاقتصاد بالموارد والتكامل مع الطبيعة	– استنفاذ الموارد الطبيعية والتلوث
– تقييم التكنولوجيا	– الاستهلاك والقوة المنتجة المادية
– العمومية، متعدد المجالات، الشمولية	– التخصص
– التداؤب(Synergy)	– الفردية
– جودة الحياة والمحافظة على الموارد	– تعظيم الثروة المادية
– التأكيد على المحتوى النوعي	– التأكيد على المحتوى
– التعبير الذاتي وتحقيق الذات	– الأمان والضمان

5–1/ كيف نصل إلى مجتمع المعرفة (مراحل التكوين):

ويتم ذلك في ثلاثة مراحل متدرجة، الأولى تعمل عمل القاعدة التأسيسية الطليعية لمجتمع المعرفة، والثانية، عملية الإصلاح وتطبيق المعايير، والثالثة، تعد مرحلة تحقيق الهدف وبناء مجتمع المعرفة. وكما يلي : (عليان،أ.د. ربحي مصطفى، 2012)

5–1–1/ تبدأ المرحلة الأولى من وجود رأس مال بشري يشكل مقدمة لمجتمع المعرفة ويمكنه أن يحقق بنية أساسية لقيام النهضة التنموية، ويوضح ذلك الشكل التالي:

المرحلة الأولى (وجود طليعة مجتمع المعرفة ومستخدمي التقانة الحديثة)

شكل (3) وجود طليعة مجتمع المعرفة ومستخدمي التقانة الحديثة / المصدر الباحثون

5–1–2/ المرحلة الثانية: تتطلب الإصلاح باستخدام العلم والتكنولوجيا، ليشكل الأرضية الصالحة لنمو مجتمع المعرفة، الذي يعني بإعداد إنسان قادر على استخدام المعلومة والتكنولوجيا في الحياة على ثلاثة مستويات:

- مستوى تربوي: يتم فيه تعلم برمجة المعلومات في إطار المعرفة، ليزداد وعيه المعرفي اتساعاً.

- مستوى بحثي: يمكنه من التعمق بالأشياء, واستخدام المفاهيم واكتشاف القوانين.

- مستوى العمل التجريبي: لغرض تحويل المعلومة إلى معرفة، والمعرفة لابتكار.

المرحلة ثانية (نمو مجتمع المعرفة وازدياد مستخدمي التقانة الحديثة في المجتمع)

التنمية البشرية

الاصلاح الساسي

ستخدام التقانة

الاصلاح الاداري

الاصلاح الاقتصادي

الاصلاح الاجتماعي
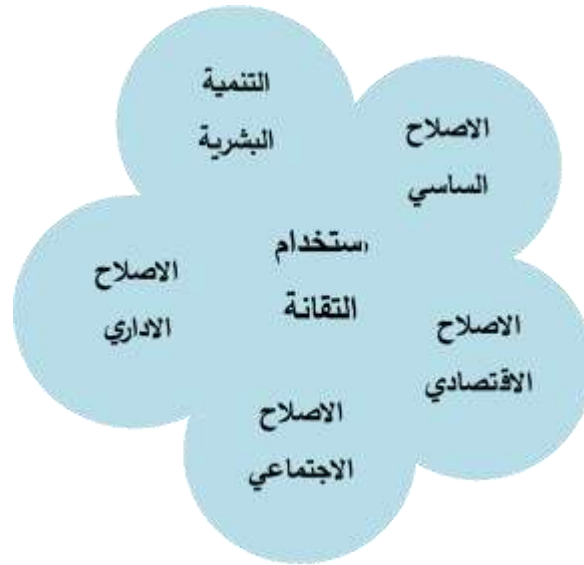
شكل (4) نمو مجتمع المعرفة وازدياد مستخدمي التقانة الحديثة في المجتمع / المصدر الباحثون

المرحلة الثالثة: تكامل مجتمع المعرفة لتحقيق نهضة تنموية شاملة مستدامة، من خلال زيادة أعداد المبتكرين والمبدعين والمفكرين.

المرحلة الثائلة (تكامل مجتمع المعرفة ومستخدمي الثقافة الحديثة وتزايد المبتكرين والمبدعين)

التنمية البشرية

الاصلاح الساسي

مجتمع تكامل المعرفة

الاصلاح الادري

الاصلاح الاقتصادي

الاصلاح الاجتماعي

شكل (5) تكامل مجتمع المعرفة ومستخدمي الثقافة الحديثة وتزايد المبتكرين والمبدعين / المصدر الباحثون

وهذه المرحلة الأخيرة من مراحل تكوين / خلق مجتمع المعرفة لابد لها من متطلبات واستحقاقات تتحدد في ما يلي:

▪ تطوير منظومة التعليم: عن طريق إعادة هندسة العملية التعليمية بما يواكب التغيرات والتحديات المعاصرة وربط التخطيط التربوي بخطط التنمية وتحقيق معايير الجودة.

▪ دعم البحث العلمي والتطوير: عن طريق زيادة الانفاق عليهما وتشجيع وتحفيز العاملين فيها.

▪ استخدام التكنولوجيا بإقامة بنى تحتية أساسية للاتصالات والبرمجيات ووسائل التكنولوجيا.

5/ استنتاج: وبناء الإطار المعرفي للمدن الذكية (الهدف – المشكلة – الحل)

تشير منشورات الاتحاد الدولي للاتصالات إلى أن التوسع الحضري الذي تعيشه المدن المعاصرة قد يقود إلى التدهور البيئي إذا لم تتطور البنى التحتية لهذه المدن بوتيرة تتماشى مع معدلات التوسع الحضري (www.itu.int/newsroom). ويمكن أن نضيف إلى ذلك

هو تطور المناخ الفكري والتكنولوجي للبشرية بعد الثورة الرقمية في نهايات القرن العشرين وبدايات القرن الحادي والعشرين (حميد، احمد طالب، 2014).

ولأجل عمل هذه الموازنة بين التوسع الحضري والوضع البيئي للمدن، لجئت المدن المعاصرة إلى مجموعة حلول تركزت بجانبين هما تكنولوجيا المعلومات، وتكنولوجيا الاتصالات، وذلك لأجل الحصول على طاقة متجددة، وتنمية مستدامة، وتخفيض أوكسيد الكربون وإدارة الطاقة. فالتنمية المستدامة تهدف لتحقيق :

● تقليل الأثر البيئي للقطاعات الصناعية.

● توزيع واستهلاك الطاقة.

● تطوير أنظمة النقل.

● إدارة المياه والتخلص من المخلفات.

فلذلك لجأت المدن الذكية المستدامة إلى دمج التكنولوجيات الذكية في البنى التحتية للمدن وعملياتها لزيادة الكفاءة البيئية والرفاه الاجتماعي والاقتصادي. ويتم ذلك في مجموعة إجراءات يمكن إجمالها : (الاتحاد الدولي للاتصالات،2014)

● تطوير منهجية موحدة دولياً لتقييم الأثر البيئي لتكنولوجيا المعلومات والاتصالات في المدن.

● وضع مجموعة مؤشرات للأداء الرئيسة (kpi) للمدن بغية قياس تقدمها في دمج تكنولوجيا المعلومات والاتصالات كجزء من استراتيجيات المدن الذكية بالتعاون مع صناعة الطاقة.

إن المفاصل المهمة الأخرى في تكوين المدن الذكية هي أهمية أن يكون مجتمع تلك المدن هو مجتمع المعرفة، وأن تكون الإدارة الاستراتيجية الشاملة والتي تراعي قرارات وجهات نظر المستخدمين لتلك المدن وتكون نتيجة لاستشارات مكثفة للاختصاصين هي التي ستقود عملية التصميم والتخطيط الحضري لتلك المدن.

ويمكن استنتاج ثلاثة إطارات عمل يمكن أن نعدها مدخلاً نظرياً لدراستنا وكما ممثلة بالأشكال التالية التي تمثل (الأهداف
– المشكلة – الحل)، وهي توضح بجلاء أن المدن الذكية ليست هي من الأمور الكمالية والتزويقية بقدر ما تكون حلاً لمشكلات
التدهور البيئي والتوسع الحضري المطرد، بالإضافة إلى الحاجة الواقعية لهذه المدن في ظل التقدم المعرفي الهائل للبشرية.

شكل (6) أسباب نشوء المدن الذكية الحل

المصدر/ الباحثون

شكل (7) أسباب نشوء المدن الذكية المشكلة

المصدر/ الباحثون
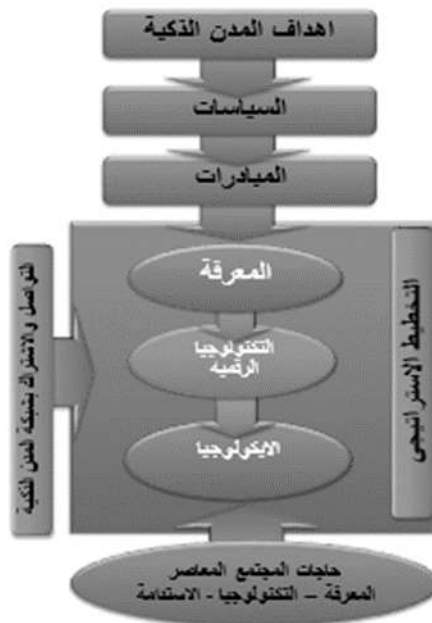
شكل (8) أهداف المدن الذكية

المصدر/ الباحثون

6/ أمثلة للمدن الذكية:

1-6/ باريس

تعتمد باريس على ميزة مهمة سهلت دخولها عالم المدن الذكية وهو امتلاكها لشبكة بنى تحتية متكاملة منذ القرن التاسع عشر، تم تطويرها لتلائم التطورات والتحديثات التكنولوجية وتحديات التنمية الحضرية، وأهم مميزات شبكة البنى التحتية هي وجود هيكل كامل لها تحت جميع الشوارع الرئيسة والفرعية للمدينة، مما سهل تزويد المدينة بمختلف التقنيات الحديثة مثل إمدادات خطوط الألياف الضوئية التي تنقل البيانات وتنشرها في أحياء المدينة لتصبح جميع المدينة مترابطة لاسلكياً عن طريق الإنترنت.

شكل رقم (9)

شكل (6) برج ايفل ، وقوس النصر ، معالم باريس ، و مايحيطها ، المدينة العلوية

والتقنيات الحديثة دخلت أيضاً في مجال الصيانة وأعمال التطوير كاستخدام العمال الآليين بدل العمال الحقيقين في الأماكن الصغيرة والخطرة، بالإضافة إلى وضع برنامج النمر الذي يتم به السيطرة على أرجاء المدينة السفلية (البنى التحتية للمدينة) بكل سهولة، وهو برنامج يكتشف ويراقب ويسيطر على كافة أجزاء شبكة البنى التحتية عن طريق الكمبيوتر والمتحسسات المزروعة على طول شبكة البنى التحتية، علماً أن أسماء فروعها وتفرعاتها مشابه لأسماء الشوارع الأصلية بالأعلى.

كما أن للمدينة قدرة على السيطرة على مياه الأمطار من خلال الكمبيوتر الذي يحاول نقل المياه الزائدة المتجمعة في أنفاق المجاري إلى خزانات احتياطية لتجنب الفيضانات، فإذا امتلئت، ينقلها أوتوماتيكياً إلى مصب نهر السين للتخلص منها. وهي شبكة مصممة بدقة للقضاء على أي مشكلة.

وفي خطوة من بلدية المدينة لعدم تلويث نهر السين الذي يقسم المدينة إلى قسمين أنشأت محطة تنقية لمياه المجاري هي الأكبر بالعالم تعمل بصورة عمودية لتقوم بتنقية أكبر قدر من المياه، مقارنة بتلك التقليدية التي تعمل أفقياً، بالإضافة إلى القدرات التكنولوجيا للآلات والأفران الحرارية الضخمة التي تحرق ما يتبقى من نتاج عملية التنقية وتحوله إلى دخان خفيف صديق للبيئة. وبذلك تعد باريس علامة مميزة في العالم من ناحية كفاءة البنى التحتية، وكفاءة شبكة الاتصال

شكل رقم (10) ينة السفلية لباريس ، انفاق متكاملة تمثل انعكاسا للمدينة العلوية بشوارعها وأزقتها ، وهي المنفذ للتطوير المدينة ، وقبولها السلس للتكنلوجيا مع المحافظة على عراقتها ، منظومة بنى تحتية متكاملة

والحفاظ على البيئة مناخياً وتراثياً، وبمواصفات هي الأرقى عالمياً، كما يشير لها خبراء محطة الجغرافيا العالمية. وباريس صنفت بالمرتبة الخامسة بالنسبة إلى المدن الذكية بالعالم بعد كل من كوبنهاكن، وامستردام، وفيينا، وبرشلونة. كما عرضته المجلة الأمريكية الملقبة بـ Fast Company (http://www.belg24.com/news-2546.html)

يقول(2014)Boyd Cohen البروفيسور في استراتيجيات التصميم الحضري، وأحد المشاركين في تصنيف المدن الذكية الأوربية : إن من مميزات باريس هو احتوائها على واحدة من أكفأ شبكات تأجير الدراجات الهوائية الذكية، التي من مميزاتها بحسب ما يقول Peter MIDGLEY 2009.

- القدرة على التنقل اليومي بوسائط محمولة daily mobility.
- تعد شبكة النقل بالدراجات الهوائية الذكية smart bike-sharing من طرق النقل المستدام.
- تعد شبكة النقل بالدراجات الهوائية الذكية، جزء من نظام النقل العام في المدن.
- تسهل هذه الشبكة من سرعة وسهولة إنجاز الأعمال باستعمال الكارتات الذكية أو الهواتف الذكية.
- تعد هذه الشبكة من مميزات المدن الذكية في أوربا، وإحدى مميزات مدينة باريس.

بالإضافة إلى ذلك، فباريس متقدمة في مشروع السيارة الكهربائية، الذي يعد المشروع الأعلى تكلفة بالعالم. بالإضافة إلى ريادة باريس بمشروع Genome لقياس النظم الايكولوجية للمدن عبر العالم، وحاز نظامها الايكولوجي على المرتبة الحادية عشرة عالميا (http://www.fastcoexist.com/3024721/the-10-smartest-cities-in-europe).

6-2/ ضاحية الحصن الذكية في باريس

وهي مدينة ISSY MEDIA ايسينومولونوف، أو ضاحية الحصن التي تحولت إلى حي رقمي بامتياز لتعكس بذلك صورة الحي الذكي في المستقبل، وذلك لتوافر الخصائص التالية: (برنامج تكنوفيليا مفهوم المدن الذكية على القناة الفرنسية العربية).

- ارتباط جميع أجزاء المدينة بالألياف البصرية (لغرض سهولة وسرعة نقل المعلومات والاتصالات)، والذي به تمت عملية أتمتة للمنازل يمكن بها دفع جميع انواع الفواتير عن طريق الهاتف المحمول.

- توفير الطاقة بواسطة الحرارة الجوفية (وهو لم يكلف كثيراً لوجود بنى تحتية لذلك).

- إبعاد سيارات النفايات عن التجول في أحياء المدينة وذلك بتجميع النفايات بالهواء المضغوط.

- بناء مدرسة مصنوعة كلياً من الخشب والقش.

- دعم كامل لأسلوب البناء المستدام في معظم الابنية، وهذا يظهر بجلاء في واجهاتها وطبيعة الشكل المعماري والحضري.

- شبكة كاملة من المتحسسات في كل أنحاء المدينة لغرض تحسس الوضع المناخي، والوضع الوظيفي في الأماكن العامة.

- دعم تطبيقات الهاتف المحمول الذكية لتبادل المعلومات حول الفعاليات الاجتماعية العامة، وتسهيل عملية التواصل الاجتماعي.

6-3-1/ أجهزة ذكية للمجتمع

بدأت سول في 2012، توزيع الأجهزة الذكية المستعملة على الأسر منخفضة الدخل وغيرها من المحتاجين. وتتحرك سوق تكنولوجيا المعلومات والاتصالات بسرعة، فعادة ما يقوم مستعملو الأجهزة الذكية بشراء منتجات جديدة حتى قبل انتهاء العمر التشغيلي الافتراضي للأجهزة التي يقومون باستبدالها. وتتخذ إجراءات لتشجيع المواطنين – وخصوصاً عن طريق تخفيضات ضريبية تتراوح بين 50 دولار أمريكي إلى مائة دولار أمريكي لكل جهاز – مقابل التبرع بالأجهزة القديمة لدى شراء الأجهزة الجديدة. وبعد قيام جهات التصنيع بفحص الأجهزة التي تم التبرع بها وإصلاحها، يجري توزيعها بدون مقابل على السكان المحتاجين.

وتنفذ حكومة سول حالياً مشروعاً تجريبياً يركز على العمل الذكي، ويسمح لموظفي الحكومة بالعمل من عشرة مكاتب – مراكز عمل ذكية – تقع بالقرب من محل إقامتهم. ويستطيع الموظفون العاملون بمراكز العمل الذكية استعمال البرمجيات الجماعية المتقدمة وأنظمة عقد المؤتمرات عن بُعْد، بما يضمن أن غيابهم عن مجلس المدينة لا يعطل بأي حال أدائهم لأعمالهم. وتعتزم سول عرض أعمال ذكية على 30 في المائة من موظفي الحكومة بحلول سنة 2015.

6-3-2/ المقياس الذكي

تعكف سول على تنفيذ مشروع للقياس الذكي يستهدف الحد من مجموع استخدامات الطاقة بنسبة 10 في المائة. وقد بدأ هذا المشروع في 2012، باختبار استطلاعي يقوم على تركيب ألف عداد ذكي تزود أصحاب المنازل والمكاتب والمصانع بتقارير في الوقت الفعلي عن استهلاكهم للكهرباء والمياه والغاز. وتُعرض هذه المعلومات في شكل وحدات مالية، مصحوبة بتفاصيل عن أنماط استهلاك الطاقة وسبل تعديل هذه الأنماط للحد من تكاليف الطاقة.

وقد أظهر مشروع وطني استطلاعي عن العدادات الذكية، انتهى العمل فيه في 2008، أن نسبة 84 في المائة من المشاركين اعتادوا الاطلاع على معلومات استهلاكهم للطاقة مرة واحدة يومياً أو أكثر، وأن نسبة 60 في المائة أبلغوا بأن المشروع كان مفيداً في الحد من استهلاكهم الطاقة، وأن نسبة 71 في المائة أعربوا عن رغبتهم في المشاركة في مشاريع مماثلة في المستقبل. https://itunews.itu.int/Ar/Note.aspx?Note=4252

6-3-3/ أجهزة الأمان

كجزء من مشروع سول الشاملة، تم تشغيل جهاز أمان منذ أبريل 2008. ويستخدم هذا الجهاز أحدث تكنولوجيات نظم التلفزيون ذات الدوائر المغلقة (CCTV) المرتبطة بالمكان في إبلاغ السلطات وأفراد الأسر بحالات الطوارئ التي تحيط بالأطفال وذوي الإعاقة، وكبار السن، ومن يعانون من مرض الزهايمر. وقد تم تطوير جهاز ذكي لهذا الغرض. فعندما يغادر حامل الجهاز منطقة الأمان المحددة أو عندما يضغط على زر الطوارئ، يتلقى الحراس أو مكتب الشرطة أو إدارة الحريق أو مراكز المراقبة القائمة على الدوائر التلفزيونية المغلقة إشعاراً بذلك.

وللاستفادة من سول الشاملة، يتعين على المواطنين التسجيل مع إحدى شركات تشغيل الاتصالات المتنقلة المعينة خصيصاً لهذا الغرض. ولدعم الأسر منخفضة الدخل وخصوصاً الفئات الأكثر ضعفاً، كثيراً ما توفر سول أجهزة إنذار بالطوارئ دون مقابل أو بتخفيضات كبيرة، بغرض الوصول إلى 50000 مستعمل مسجل بحلول 2014.

6-3-4/ التطبيقات المبتكرة

pyeong هو اسم أحد أحياء سول، كما أنه اسم مشروع للمدينة الشاملة في هذا الحي بدأ تنفيذه في 2006 وانتهى العمل فيه في مارس 2011، وأصبح الآن يشمل 45000 نسمة. واتصالات المدينة الذكية تمكّن المقيمين في الحي من تلقي معلومات عملية عن طريق الأجهزة الذكية المثبتة على جدران غرف معيشتهم. وللدواعي المتصلة بسلامة السكان، تقوم الكاميرات العاملة بتكنولوجيا CCTV المثبتة في كل ركن من أركان الشوارع بكشف الذين يتعدون على الممتلكات الخاصة بطريقة أوتوماتية. فإذا قام شخص من ذوي الإعاقة أو من كبار السن يحمل جهازاً لكشف المواقع بترك حي Eun-pyeong أو بالضغط على زر الطوارئ، يتم إرسال بيانات الموقع أوتوماتياً إلى من يقومون على رعايتهم عن طريق رسالة نصية. وتؤدي مصابيح الإنارة في شوارع المدينة وهي مصابيح عالية التكنولوجيا، إلى تخفيض استهلاك الطاقة وتبث رسائل صوتية وتسمح للسكان بالنفاذ اللاسلكي إلى الإنترنت. وهناك رسالة إخبارية رقمية تزود السكان والزوار بالأخبار ومنها مواعيد الحافلات وغير ذلك من المعلومات العملية.

وأخيراً، تقوم خدمة المدينة الشاملة المراعية للبيئة برصد عوامل مثل نوعية المياه والهواء من خلال شبكة من أجهزة الاستشعار، مع نقل هذه المعلومات مباشرة إلى لوحة الإعلان والأجهزة الموجودة في غرف معيشة المواطنين.

7/ الاستنتاجات

بينت هذه الجولة السريعة في مفهوم المدينة الذكية مجموعة من الاستنتاجات :

أهم الأسس التي انبنت عليها هذه المدينة التي أصبحت حاجة وواقعاً معاشاً في القرن الحادي والعشرين الحالي.

- عصر التكنولوجيا الرقمية، وعصر الانفجار السكاني،الذي يقابله تدهور بيئي كبير، مما تطلب الأمر إعادة النظر في عملية إحياء المدن القائمة.

- إعادة النظر في التفكير بمدن المستقبل، وأهمية تكنولوجيا المعلومات والاتصالات في ربط أنحاء البنى الفيزيائية والاجتماعية والبصرية والإدراكية للمدن الذكية المعاصرة والمستقبلية خصوصاً وفق رؤية موروفولوجية جديدة تراعي السياقات المختلفة المحيطة بالمكان وتتجه نحو بناء العلاقات التصميمية بين المباني والأحياء ومحيطها الحضري أكثر من تركيزها على الشكل البصري الفيزيائي المعماري أو الحضري.

- أصبحت مدن العالم تتنافس في كسب قصب السبق في الوصول إلى حدود تلبية متطلبات المدن الذكية.

- يتزامن ذلك مع تطوير الاجتماع الإنساني وتحوله من الاعتماد المباشر على الثروة المادية إلى الاعتماد على المعرفة والرأسمال المعرفي في تكوين مجتمع المعرفة في ظل ثورة المعلومات، والتبادل السهل والسريع للمعلومة دون حدود وفواصل.

- وجود إدارة استراتيجية قادرة على إعطاء الأهداف الاستراتيجية وفق متغيرات واقعية تاخذ في قمة اعتباراتها أخذ رأي الزبون الذي يمثله هنا (في المدن الذكية) مجتمع المعرفة، وهي رغم هذا وذاك تبذل قصارى جهدها لتوفير بيئة نظيفة لا تستهلك الطاقة إلا في حدود الحاجة، ضمن ضوابط الاستدامة، وتوفير الراحة الشمولية للانسان (نفسياً – جسدياً – حرارياً).

- يلزم الحرص على إنجاح مبادرات الاتصالات في المدن في إيجاد نوع من التناغم الإيجابي بين التفاعلات القائمة على المكان وتعميره وتفاعلات الوساطة الالكترونية وتطويرها، وعدم الاكتفاء بكونها مجرد قيمة رمزية مضافة للممتلكات أو إضفاء وضع متميز عليها.

- يجب عدم المبالغة في الدور المتوقع لتقنية الاتصالات والمعلومات في استراتيجيات التعمير.

8/ التوصيات

اهتمام أقسام العمارة بالتطور التكنولوجي لتخطيط وتصميم المدن الذكية وعلاقاتها بالإنسان على وفق قواعد معرفية لها القدرة على إيجاد مقياس ضابط لعملية التصميم في المدن الذكية.

المصادر:

1–   أحد منشورات البنك الدوليhttp://blogs.worldbank.org/arabvoices/ar/smart-cities-in-north-africa

2 – MANVILLE , G. &Oters,2014, Mapping Smart Cities in the EU. the European Parliament's

3-Committee on Industry,Research and Energy.2020 خطة البرلمان الأوربي للمدن الذكية حتى

4-Smart Cities Seoul: a case study ,ITU-T Technology Watch Report , February 2013

5-https://itunews.itu.int/ar/Note.aspx?Note=4251

6– أبوسعده ، هشام جلال ، والشاطر ، عبير محمد رضا ، 2010 ، إشكالية البناء الأخضر المستدام المعاصر في بيئات المدائن العربية الحضرية الصحرواية ، مؤتمر الإسكان العربي الأول.

7-https://itunews.itu.int/ar/Note.aspx?Note=4251

8-https://itunews.itu.int/ar/Note.aspx?Note=4251

9– جامعة الملك عبد العزيز ، 2009 ، التخطيط الاستراتيجي العمراني والإدارة الاستراتيجية للمدن ، سلسلة نحو مجتمع المعرفة ، السعودية.

10– عليان ،أ.د. ربحي مصطفى ، 2012 ، مجتمع المعرفة : مفاهيم اساسية ، المؤتمر الـ23 للاتحاد العربي للمكتبات والمعلومات،قطر.

11– عليان ،أ.د. ربحي مصطفى ، 2012 ، مجتمع المعرفة : مفاهيم أساسية ، المؤتمر الـ23 للاتحاد العربي للمكتبات والمعلومات،قطر

12-www.itu.int/newsroom

13– حميد ، أحمد طالب ، 2014 ، مناهج التصميم المعماري في ضوء التقدم الفكري والتكنولوجي للإنسان. المجلة العراقية لهندسة العمارة ، مجلد 28 ، عدد 1-2، صفحة 100-126

14– الاتحاد الدولي للاتصالات ،2014، المدن الذكية المستدامة: أولوية من أولويات التنمية العالمية: معايير رئيسية لتحقيق مكاسب الكفاءة وتقديرها كميا.

15-http://www.belg24.com/news-2546.html

16-http://www.fastcoexist.com/3024721/the-10-smartest-cities-in-europe

17-MIDGLEY,P. 2009 , The Role of Smart Bike-sharing Systems in Urban Mobility,in, www.lta.gov.sg/.../doc/IS02-p23%20Bike-sharing.pdf

18-http://www.fastcoexist.com/3024721/the-10-smartest-cities-in-europe

19- برنامج تكنوفيليا مفهوم المدن الذكية على القناة الفرنسية العربية.

20-https://itunews.itu.int/Ar/Note.aspx?Note=4252

21-MANVILLE, G. &Oters,2014, Mapping Smart Cities in the EU. the European Parliament's

22- Committee on Industry,Research and Energy.خطة البرلمان الأوربي للمدن الذكية حتى 2020

23- Kolarevic, Branko ,2009 , ARCHITECTURE IN THE DIGITAL AGE, Spon Press,NEW YORK

24- كوثر ، خولة كريم ،2014، الصورة البصرية لمدن المستقبل ، رسالة ماجستير ، قسم هندسة العمارة ، الجامعة التكنولوجية.

25- سلام ، شورش ، 2009 ، البنية الشكلية الحضرية في العصر الرقمي ، رسالة ماجستير ، قسم هندسة العمارة ، الجامعة التكنولوجية.

BEST COMPARISON ABOUT CONVERGENCE OF NEW ALGORITHMS VIA DIFFERENT MAPPINGS

Zena Hussein MAIBED[1]

Abstract:

In this article, we will introduce a new mapping concept called nonexpansive resojungck mapping,also we create two three-step iterations called resojungck z and resojungck P-iteration.On the other hand,we prove that resojungck z-iterations converge faster than resojungck P-iteration.

Key words: Resolvent Mappings, Jungck Schemes, Fixed Point,Rate of Convergence.

1 - Introduction

There are many iterative methods for solving equations by studying their convergence and despite the diversity of these methods, basic concepts such as fastest, convergent and stability are relevant to all of them to include all of these methods. In the past few decades, iterative procedures based on fixed point theory whose convergence is established on strict contractual type assignments have gained much attention for their rigorous applications in diverse fields And the importance of iterative methods, so researchers have made great efforts to study different types of iterations such as etc. in terms of their acceleration and convergence for example, Jungck-Noor, Jungck-Ishikawa, and Jungck-Mann iteration on different spaces e.g. [1-15]. Let Ω be a nonempty closed convex subset of complete metric space $\mathfrak{D}$.

2 – Main Results

During this part, we propose new iterative methods using resolvent and jungck mapings.Also,we establish the convergence and speediness using nonexpansive resojungck mapping.

Definition 2.1(The Reso-CR iterative method):Let $\mathcal{G}:\Omega \to \Omega$ be a jungck mapping,the sequences $\langle i_\vartheta \rangle, \langle j_\vartheta \rangle$ and $\langle k_\vartheta \rangle$ lies in [0,1].

$$\mathrm{k}_{\vartheta+1} = \mathcal{R}_\Omega \left((i_{\vartheta,0})\mathcal{G}\mathrm{m}_\mathrm{n} + \sum_{k=1}^{l} i_{\vartheta,k} \ \mathcal{R}_\Omega \mathcal{G}\mathcal{G}\mathrm{m}_\mathrm{n} \right),$$

$$\mathrm{m}_\vartheta = (k_{\vartheta,0})\mathcal{R}_\Omega \mathcal{G}\mathrm{n}_\vartheta + \sum_{k=1}^{l} k_{\vartheta,k} \ \mathcal{G}\mathcal{G}\mathrm{n}_\vartheta$$

$$\mathrm{n}_\vartheta = (j_\mathrm{n})\vartheta \mathcal{R}_\Omega \mathcal{G}j_{\vartheta,k} + \sum_{k=1}^{l} j_{\vartheta,k} \ \mathcal{R}_\Omega \ \mathcal{G}\mathrm{k}_\vartheta \ , \text{ where, } \mathcal{R}_\Omega \text{be a resolvent mapping}$$

Definition 2.2(The Reso-SP– iterative method): Let $\mathcal{G}:\Omega \to \Omega$ be a jungck mapping,the sequences $\langle i_\vartheta \rangle, \langle j_\vartheta \rangle$ and $\langle k_\vartheta \rangle$ lies in [0,1].

$$e_{\vartheta+1} = (i_{\vartheta,0})\mathcal{R}_\Omega \mathcal{G}d_\vartheta + \sum_{k=1}^{l} i_{\vartheta,k} \ \mathcal{G}d_\vartheta$$

$$d_\vartheta = \mathcal{R}_\Omega \left((k_{\vartheta,0})\hbar_\vartheta + \sum_{k=1}^{l} k_{\vartheta,k} \ \mathcal{G}\hbar_\vartheta \right)$$

$$\hbar_\vartheta = (j_{\vartheta,k})e_\vartheta + \sum_{k=1}^{l} j_{\vartheta,k} \mathcal{R}_\Omega \ \mathcal{G}e_\vartheta \ . \sum_{k=1}^{l} i_{\vartheta,k} + i_{\vartheta,0} = 1$$

Now, we denoted $\mathrm{N}(x,y) = \|x - y\|$and give the following

Definition 2.3: A self-mapping, $T:\Omega \to \Omega$ is called a reso-contraction mapping if

$$N(Tx,Ty) \le a_1 N(\mathcal{R}_\Omega x, \mathcal{R}_\Omega y) + a_2 N(x,y), \forall x,y \in \Omega, 0 < a_1, a_2 \le \frac{1}{2}$$

Now, we give new results:

Lemma 2.4: Let $\mathcal{G}$ be a reso-contraction mapping and $\langle e_\vartheta \rangle$ the reso-SP iterative method. If $t \in \mathrm{fix}(\mathcal{S}) \wedge \mathrm{fix}(\mathcal{G}) \wedge \mathrm{fix}(\mathcal{R}_\Omega)$, then $\lim\limits_{n \to \infty} \mathbf{N}(e_n, t)$ exists, for all $n \in \mathbb{N}$.

Proof:

$$N(e_{\vartheta+1}, t) = N\left((i_{\vartheta,0}) \mathcal{R}_\Omega \mathcal{G} d_\vartheta + \sum_{k=1}^{l} i_{\vartheta,k} \, \mathcal{G} d_\vartheta, t\right)$$

$$\leq (i_{\vartheta,0}) N(\mathcal{R}_\Omega \mathcal{G} d_\vartheta, t) + \sum_{k=1}^{l} i_{\vartheta,k} \, N(\mathcal{G} d_\vartheta, t)$$

$$\leq (i_{\vartheta,0}) N(\mathcal{G} d_\vartheta, t) + \sum_{k=1}^{l} i_{\vartheta,k} N(\mathcal{G} d_\vartheta, t)$$

$$\leq (i_{\vartheta,0})\left(a_1 N(\mathcal{R}_\Omega d_\vartheta, \mathcal{R}_\Omega t) + a_2 N(d_\vartheta, t)\right) + \sum_{k=1}^{l} i_{\vartheta,k}$$

$$(a_1 N(\mathcal{R}_\Omega d_\vartheta, \mathcal{R}_\Omega t) + a_2 N(d_\vartheta, t))$$

$$\leq (i_{\vartheta,0})(a_1 + a_2) N(d_\vartheta, t) + \sum_{k=1}^{l} i_{\vartheta,k} (a_1 + a_2)(N(d_\vartheta, t))$$

$$\leq (i_{\vartheta,0}) h N(d_\vartheta, t) + \sum_{k=1}^{l} i_{\vartheta,k} h N(d_\vartheta, t)$$

$$\leq \left((i_{\vartheta,0}) + \sum_{k=1}^{l} i_{\vartheta,k} h\right) N(d_\vartheta, t)$$

$$\leq h N(d_\vartheta, t)$$

Now, to find $N(d_\vartheta, t)$

$$N(d_\vartheta, t) = N\left(\mathcal{R}_\Omega\left((k_{\vartheta,0}) h_\vartheta + \sum_{k=1}^{l} k_{\vartheta,k} \, \mathcal{G} h_\vartheta\right), t\right)$$

$$\leq N\left(k_{\vartheta,0} h_\vartheta + \sum_{k=1}^{l} k_{\vartheta,k} \, \mathcal{G} h_\vartheta, t\right)$$

$$\leq (k_{\vartheta,0}) N(h_\vartheta - t) + \sum_{k=1}^{l} k_{\vartheta,k} N(\mathcal{G} h_\vartheta, t)$$

$$\leq (k_{\vartheta,0}) N(h_\vartheta - t) + \sum_{k=1}^{l} k_{\vartheta,k} \left(a_1 \|\mathcal{R}_\Omega h_\vartheta - \mathcal{R}_\Omega t\| + a_2 N(h_\vartheta - t)\right) +$$

$$\leq (k_{\vartheta,0}) N(h_\vartheta - t) \sum_{k=1}^{l} k_{\vartheta,k} \left(a_1 N(h_\vartheta - t) + a_2 N(h_\vartheta - t)\right)$$

$$\leq (k_{\vartheta,0}) N(h_\vartheta - t) + \sum_{k=1}^{l} k_{\vartheta,k} h(N(h_\vartheta - t))$$

$$\leq ((k_{\vartheta,0}) + \sum_{k=1}^{l} k_{\vartheta,k} h) N(h_\vartheta - t)$$

Now, to find $N(h_\vartheta - t)$

$$N(h_\vartheta - t) = N\left((\jmath_{\vartheta,k}) e_\vartheta + \sum_{k=1}^{l} \jmath_{\vartheta,k} \mathcal{R}_\Omega \mathcal{G} e_\vartheta, t\right)$$

$$\leq (\jmath_{\vartheta,k}) N(e_\vartheta, t) + \sum_{k=1}^{l} \jmath_{\vartheta,k} N(\mathcal{G} e_\vartheta, t)$$

$$\leq (\jmath_{\vartheta,k}) N(e_\vartheta, t) + \sum_{k=1}^{l} \jmath_{\vartheta,k} \left(a_1 N(\mathcal{R}_\Omega e_\vartheta, \mathcal{R}_\Omega t) + a_2 N(e_\vartheta, t)\right) +$$

$$\leq \left(j_{\vartheta,k} \right) N(e_\vartheta, t) + \sum_{k=1}^{l} j_{\vartheta,k} \left(a_1 N(e_\vartheta, t) + a_2 N(e_\vartheta, t) \right)$$

$$\leq \left(j_{\vartheta,k} \right) N(e_\vartheta, t) + \sum_{k=1}^{l} j_{\vartheta,k} \, h(N(e_\vartheta, t))$$

$$\leq \left((j_{\vartheta,k}) + \sum_{k=1}^{l} j_{\vartheta,k} \, h \right) N(e_\vartheta, t)$$

$$N(d_\vartheta, t) \leq \left((k_{\vartheta,0}) + \sum_{k=1}^{l} k_{\vartheta,k} \, h \right) \left((j_{\vartheta,k}) + \sum_{k=1}^{l} j_{\vartheta,k} \, h \right) N(e_\vartheta, t)$$

$$N(e_{\vartheta+1}, t) \leq h. \left(\left(k_{\vartheta,0} \right) + \sum_{k=1}^{l} k_{\vartheta,k} \, h \right) . \left((j_{\vartheta,k}) + \sum_{k=1}^{l} j_{\vartheta,k} \, h \right) N(e_\vartheta, t) \leq N(e_\vartheta, t)$$

So, $\langle N(e_\vartheta, t) \rangle$ is non-increasing and bounded. So, $\lim_{n \to \infty} N(e_\vartheta, t)$ exists.

Theorem 2.5: Let $\mathcal{G}$ be a reso-contraction mapping and $\langle \mathcal{S}e_\vartheta \rangle$ the reso-SP iterative method If $t \in \text{fix}(\mathcal{S}) \wedge \text{fix}(\mathcal{G}) \wedge \text{fix}(\mathcal{R}_\Omega)$. Then the reso-SP method converges strongly .

Proof: By the above lemma, we have

$$N(e_{\vartheta+1}, t) \leq (1 - \sum_{k=1}^{l} j_{\vartheta,k} \, (1 - h) \, N(e_\vartheta, t)$$

$$N(e_{\vartheta+1}, t) \leq \prod_{n=0}^{n} (1 - \sum_{k=1}^{l} j_{\vartheta,k} \, (1 - h) \, N(e_0, t)$$

$$\|e_\vartheta - t\| \leq e^{-(1-h) \sum_{n=0}^{\infty} \sum_{k=1}^{l} j_{n,k}}$$

Since $\sum_{k=1}^{l} j_{\vartheta,k} \in [0, 1]$ and $h \in [0, 1]$ and $\sum_{\vartheta=0}^{\infty} \sum_{k=1}^{l} j_{\vartheta,k} = \infty$

Then $e^{-(1-h) \sum_{\vartheta=0}^{\infty} \sum_{k=1}^{l} j_{\vartheta,k}} \to 0$ as $\vartheta \to \infty$

So, $\lim_{\vartheta \to \infty} N(e_\vartheta, t) = 0$. Therefore, $\langle e_\vartheta \rangle$ converges strongly.

Lemma 2.6: Let $\mathcal{G}$ be a reso-contraction -mapping, and $\langle k_\vartheta \rangle$ the reso-CR iterative method. If $t \in \text{fix}(\mathcal{S}) \wedge \text{fix}(\mathcal{G}) \wedge \text{fix}(\mathcal{R}_\Omega)$, then $\lim_{n \to \infty} N(k_n, t)$ exists, for all $n \in N$.

Theorem 2.7: Let $\mathcal{G}$ be a reso-contraction mapping $\langle \mathcal{S}k_\vartheta \rangle$ the– iteration method. Then the resolvent reso CR converges strongly.

Theorem 2. 8: Let $\mathcal{G}$ be a reso-contraction mapping , if $t \in \text{fix}(\mathcal{S}) \wedge \text{fix}(\mathcal{G}) \wedge \text{fix}(\mathcal{R}_\Omega)$, then the reso-CR iterative method is faster than reso-SP iterative method.

Proof:

With reso-CR iterative method, we have

$$N(k_{\vartheta+1}, t) = N\left(\mathcal{R}_\Omega \left((i_{\vartheta,0}) \mathcal{G}m_n + \sum_{k=1}^{l} i_{\vartheta,k} \, \mathcal{R}_\Omega \mathcal{G}\mathcal{G}m_\vartheta \right), t \right)$$

$$\leq N\left((i_{\vartheta,0}) \mathcal{G}m_\vartheta + \sum_{k=1}^{l} i_{\vartheta,k} \, \mathcal{G} \, \mathcal{G}m_\vartheta, t \right)$$

$$\leq (i_{\vartheta,0}) N(\mathcal{G}m_\vartheta, t) + \sum_{k=1}^{l} i_{n,k} \, N(\mathcal{G}\mathcal{G}m_\vartheta, t)$$

$$\leq (i_{\vartheta,0}) \left(a_1 N(\mathcal{R}_\Omega m_\vartheta, \mathcal{R}_\Omega t) + a_2 N(m_\vartheta, t) \right) + \sum_{k=1}^{l} i_{\vartheta,k}$$
$$\left(a_1 (\mathcal{R}_\Omega \mathcal{G}m_{\vartheta n}, \mathcal{R}_\Omega \mathcal{G}t) + a_2 N(\mathcal{G}m_\vartheta, t) \right)$$

$$\leq \left(i_{\vartheta,0}\right)hN(m_\vartheta, t\,) + \sum_{k=1}^{l} i_{\vartheta,k}\, h^2 N(m_\vartheta, t\,)$$

$$\leq \left(i_{\vartheta,0}\,\right)hN(m_\vartheta, t\,) + \sum_{k=1}^{l} i_{\vartheta,k}\, h^2 N(m_\vartheta, t\,)$$

$$\leq h\left(1 - \textstyle\sum_{k=1}^{l} i_{\vartheta,k}\,(1-h\,\right)N(m_\vartheta, t\,)$$

Now, to find $N(m_\vartheta, t\,)$

$$\|m_\vartheta - t\|N(m_\vartheta, t\,) = N\left(\left(\Bbbk_{\vartheta,0}\right)\mathcal{R}_\Omega \mathcal{G}n_\vartheta + \sum_{k=1}^{l} \Bbbk_{\vartheta,k}\; \mathcal{G}\mathcal{G}n_\vartheta, t\,\right)$$

$$\leq \left(\Bbbk_{\vartheta,0}\,\right)N(\mathcal{R}_\Omega \mathcal{G}n_\vartheta, t\,) + \textstyle\sum_{k=1}^{l} \Bbbk_{\vartheta,k}\, N(\,\mathcal{G}\mathcal{G}n_\vartheta, t)$$

$$\leq \left(\Bbbk_{\vartheta,0}\,\right)N(\mathcal{G}n_\vartheta, t) + \textstyle\sum_{k=1}^{l} \Bbbk_{\vartheta,k}\, N(\,\mathcal{G}\mathcal{G}n_\vartheta, t)$$

$$\leq \left(\Bbbk_{\vartheta,0}\,\right)(a_1 N(\mathcal{R}_\Omega n_\vartheta, \mathcal{R}_\Omega t\,) + a_2 N(\,n_\vartheta, t))$$

$$+ \sum_{k=1}^{l} \Bbbk_{\vartheta,k}\,(a_1 N(\mathcal{R}_\Omega \mathcal{G}n_\vartheta, \mathcal{R}_\Omega \mathcal{G}t) + a_2 N(\mathcal{G}n_\vartheta, \mathcal{G}t\,))$$

$$\leq \left(\Bbbk_{\vartheta,0}\,\right)hN(n_\vartheta, t\,) + \sum_{k=1}^{l} \Bbbk_{\vartheta,k}\, h(N(\mathcal{G}n_\vartheta, \mathcal{G}t\,))$$

$$\leq \left(\Bbbk_{\vartheta,0}\,\right)hN(\mathcal{G}n_\vartheta, \mathcal{G}t\,) + \sum_{k=1}^{l} \Bbbk_{\vartheta,k}\, hh(a_1 N(\mathcal{R}_\Omega n_\vartheta, \mathcal{R}_\Omega t) + a_2 N(n_\vartheta, t))$$

$$\leq \left(\Bbbk_{\vartheta,0}\,\right)hN(n_\vartheta, t) + \sum_{k=1}^{l} \Bbbk_{\vartheta,k}\, h^2 N(n_\vartheta, t)$$

$$\leq h\left(1 - \textstyle\sum_{k=1}^{l} \Bbbk_{\vartheta,k}\,(1-\mathfrak{b})\right)N(n_\vartheta, t)$$

As the same way we get, $N(n_n, t) \leq N(k_n, t)$

$$N(m_\vartheta, t) \leq h^2\left(1 - \textstyle\sum_{k=1}^{l} \Bbbk_{\vartheta,k}\,(1-\mathfrak{b})\right)N(k_\vartheta, t)$$

$$N(k_{\vartheta+1}, t) \leq h^2\left((1 - x(1-\mathfrak{b}\,)\right)^2 N(k_\vartheta, t), x \leq 1$$

$$N(k_{\vartheta+1}, t) \leq h^{2\vartheta}\left(1 - x\,(1-h)\right)^{2\vartheta} N(k_0, t)$$

The reso-SP iterative method , we have

$$N(e_{\vartheta+1}, t) \leq h^\vartheta (1 - x(1-\mathfrak{b}))^{2\vartheta}\; N(e_\vartheta, t)$$

$$\frac{N(k_{\vartheta+1}, t)}{N(e_{\vartheta+1}, t)} \to 0 \;\; as \;\; \vartheta \to \infty$$

Conclosion

In this article, new iteration methods namely (resojungck z and resojungck P)iterations for nonexpansive resojungck mappings are introduced.Also, the convergence and rate of convergence for these iterations to the fixed point are proved.

References

[1] Duan, Qibin, Wang, Eril, WU, Dingping and Xie Xuping, Ishikawa iterative algorithm of non-expensive mappings and averaged mappings, American Journal of Engineering and Technolgy Research , Vol. 11, No. 9, 3983-3988, 2011.

[2] K. P. R. Sastry and G. V. R. Babu, Convergence of Ishikawa iterates for a multivalued mapping with a xed point , Czechoslovak Mathematical Journal, Vol. 55 No. 130 , 817-826 , 2005.

[3] R. Agarwal, D. Regan and D. Sahu, "Fixed Point Theory for Lipschitzian-type Mappings with Applications," Springer Dordrecht Heidelberg London New York, vol. 6, 2009.

[4] A Q Thajil and Z H Maibed, On The Convergence Speediness of K * and D-Iterations,J. Phys : Conf. Ser. 1897 012056 ,(2021).

[5] Z.Maibed and S.Hussein, Some Theorems of Fixed Point Approximations by Iteration Processes,J.Phys.Conf. Ser.1818 01215, (2021).

[6] S.Hussein and Z.Maibed,Iterative Methods for Approximation Fixed Points Via Like ContractionMapping,J. Phys.: Conf. Ser. 1818 012152 , (2021).

[7] A Q Thajil and Z H Maibed, the Convergence of Iterative Methods for Quasi δ-Contraction Mappings,J. Phys.: Conf. Ser. 1804 012017, (2021).

[8] Z.Maibed, Genralized Tupled Common Fixed Point Theorems for Weakly Comptible Mapping in Fuzzy Metric Space,(IJCIET)10, 255–273, (2019).

[9] Z H Maibed,A New Iterative Methods For a Family of Asymptotically Severe Mappings, J. Phys.: Conf. Ser. 1591 012087,(2020).

[10] Sh. Ishikawa, , Fixed points by a new iteration method, Proceedings of the American Math-ematical Society Vol. 44, No. 1,

[11] M. O. Olatinwo, and C. O. Imoru, Some Convergence Result for the Jungck-Mann and Jungck-Ishikawa Iteration Process in the class of Generalized Zamrescu Operators. Acta Math. Univ. Comenianae, Vol. 77 No. 2, 299-304, 2008.

[12] R. Chugh and V. Kumar, "Strong Convergence and Stability results for Jungck-SP iterative scheme," International Journal of Computer Applications, vol. 36, no. 12, 2011

[13] S. T. Moftat. "The Resolvent Average An Expansive Analysis Of Firmly Non-expansive Mapping and Maximally Monotone Operators", (2014).

[14] Imoru .C. O., Olantiwo M. O. "On the Stability of the Picard and Mann Algorithm Processes."   Carpathian J. Math., 19 , 155–160, (2003).

[15] R. Chugh, V. Kumar, and S. Kumar, "Strong Convergence of a New Three Step Iterative Scheme in Banach Spaces," Am. J. Comput. Math., vol. 02, no. 04, pp. 345–357, 2012.

THE EFFECT OF IRRIGATION INTERVAL AND SPRAYING WITH NANO-FERTILIZER ON THE FLOWERING LIFE OF TOMATO PLANTS

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Abstract:

This experiment was carried out in one of the fields (A) affiliated to the College of Agricultural Engineering Sciences / University of Baghdad, for the spring season 2021, On hybrid tomato plants (Mayai Mayai) to test flower viability, using two factors, the first was three levels of irrigation interval (2, 4, 6) days, and the second factor three concentrations of compound Nano fertilizer with concentrations (0, 1.5, 2.5) gm liter-1, so that the number of treatments is 9 treatments and three replications, the number of experimental units is 27 experimental units distributed randomly according to the random drawing method to ensure reducing experimental error and obtaining the most accurate results. A factorial experiment 3 x 3 x 3 was carried out according to the Nested Design with Factorial design (RCBD), and the results were analyzed using the statistical program Genstat version 12, the means were compared according to the LSD test at the level of significance of 0.05.

The results showed a significant superiority of treatment S1 with irrigation interval of 2 days with treatment of N2 with a concentration of 1.5 gm l-1of Nano fertilizer in most of the flowering characteristics of tomato plant in both the number of leaves before the first flowering cluster, the number of days from planting the seedlings until the first flower opens. Plant-1, number of flowers in the flower cluster. Plant-1, number of flowering inflorescences. Plant-1, the number of days from planting seedlings until holding the first flower. Plant-1, the percentage of the contract %, the results were (4.67, 22.33, 6.33, 24.0, 27.33, 81.54) respectively compared to the 6-day irrigation interval treatment, which gave the lowest values (10.00, 31.00, 3.67, 10.67, 38.00, 55.37), respectively.

Key words: Tomato, Irrigation Interval, Nano Fertilization, Flowering.

Introduction:

    The tomato is *Solanum Lycopersicum.* Mill is a vegetable crop belonging to the Solanaceae family. It is considered an annual and herbaceous plant with deep roots of the topical type. The leaf is classified as feathery and compound. Its leaves consist of 7-9 lobed leaves, with a distinctive and pungent smell, especially when the leaves are rubbed by hand. The tomato varieties are divided according to The nature of growth to unlimited growth Indeterminate, which are the varieties that are grown in conditions of protected agriculture and limited growth, and which are grown open without cover, according to the nature of the formation of flower clusters on the plant and the nature of growth (Hassan, 1998), the crop has a high nutritional value because the fruits contain carbohydrates and proteins Vitamins A, C, E, pigments, and other elements. (Perveen *et al.*, 2015), as the crop is included in the areas of cooking and fresh direct consumption or manufacturing fields such as ketchup and tomato paste and others, and the importance of the crop from a medical point of view is that the fruits contain antioxidants such as lycopene and beta-carotene (Meléndez – Martínez *et al.*, 2013) , The crop has juicy fruits and needs a regulated irrigation system, and Iraq is located in an area threatened by drought due to several factors, including wrong policies in water harvesting, lack of rain and razing orchards, in addition to a decrease in the rates of trees that act as windbreaks, so tomato plants were exposed to 3 levels of irrigation interval to test the resistance of the plant to drought and its relationship to plant nutrition. Therefore, taking care of the crop from the nutritional point of view is very important in producing a strong and drought-resistant plant for the purpose of reaching the optimum yield level (Turk, 2021), using the latest methods and modern technologies with the least cost and most efficient methods, and from These methods use nanotechnology, as the chemical and physical properties of the material are almost radically different in the Nano state than in the same material, which is in their natural sizes, bulky, due to the difference in the mechanical forces of atomic interactions and the surface area in both cases (Saleh, 2015), where the effective nutrient is from small enough that it penetrates the intercellular spaces and cell membranes as quickly and efficiently and is released slowly, Pushing agricultural specialists to use nanotechnology to increase the effectiveness of these elements in a legal and safe manner (morals-diaz *et al.*, 2017).

    Therefore, the research aimed to: Study the effect of Nano-fertilizers on the flowering life of tomatoes. And the effect of Nano fertilization by interfering with irrigation interval on flower parameters of plants.

Materials and methods

The experiment was carried out in one of the fields (A) of the College of Agricultural

Engineering Sciences / University of Baghdad, in spring season 2021, by planting hybrid tomato seeds Mayai Mayai, produced by the Dutch company Monsanto and distributed by the American company Seminis, the seedlings were transferred to the open field at the station on 15/ 3/2021.

3 samples were taken from different depths of the soil before planting (10, 20 and 30) cm and mixed well to ensure homogeneity. Then a sample was selected and analyzed in the laboratories of the Bin Sina Factory / Ministry of Industry and Minerals. The results of the analysis of the soil were as shown in Table (1).

Table (1) Chemical analysis of field soil

Analysis type	CO3	SO4	Ca	Mg	K	P	N	EC	pH
Analysis results	328	197	324.50	109.32	168.86	13.95	42.26	2.48	7.54
Measruing unit	$mg.L^{-1}$		$mg.L^{-1}$		$mg.kg^{-1}$			$ds.m^{-1}$	
texture	Clay								
Moisture content at field capacity	0.337				$cm.cm^{3}$				
Moisture content at wilting point	0.174				$cm.cm^{3}$				

The field was prepared through orthogonal plowing, then the soil was softened, the drip irrigation system was installed, with calculations of field capacity and wilting point with the calculation of the drip capacity. The emitter calibration of the irrigation system was carried out, as a vessel of known size was placed under a section of the drippers, the system was opened and the irrigation was carried out for half an hour, then the water was collected and the discharge of the dripper was calculated in one hour, bearing in mind that the actual discharge of the dripper was 6.5 liters per hour, and the period was The time interval for the amount of water

given to the experimental units is (one hour, one and a half hours and two hours) for each of the treatments (S1, S2, and S3), respectively.

The irrigation time was calculated according to the following equation: **Qt = ad**

So: Q = drainage (m³/ h) a = irrigated area (m²) t = watering time (hours) d = depth of water added (m)

The experiment was carried out using two factors, the first three was levels of irrigation interval and the second factor three concentrations of Nano fertilizer, so that the number of treatments was 9 treatments and with three replications, the number of experimental units is 27 experimental units distributed randomly to ensure that the experimental error is reduced and to obtain the most accurate The results were designed as a factorial 3 x 3 x 3 experiment according to the Nested Design with Factorial design (Kazim and Nazim, 2017), and the results were analyzed using the statistical program Genstat version 12. The averages were compared according to the LSD test at the level of significance of 0.05. (Al-Mohammadi *et al.*, 2012).

- **The first factor:**

The plants were exposed to three levels of water stress after three weeks of sowing, depending on the irrigation interval (2, 4, 6) days (Pet Roy, 2015) (Salman, 2019), as all experimental units were irrigated in the first three weeks after sowing. With the same amount of water to ensure that the plants reach the size in which they can withstand stress treatments and before flowering (21 days after transplanting) (Al-Mohareb, 2014) The symbols for the parameters (S3, S2, S1).

- **The second factor:**

The foliar spray with the compound Nano-fertilizer Cereals Specific Fertilizer (CSF), which is a fully soluble granular fertilizer consisting of 12 elements of major and minor Nano elements, and the details of its components are shown in the table (2) below and shown in Appendix, and at concentrations of (2.5, 1.5, 0) g . Liter $^{-1}$and for three sprays, the first spray after the appearance of the first 4 true leaves of plants, and the second when the (beginning of flowering) and the third in (the knot of floweres) The symbols for the parameters (N3, N2, N1).

chemical symbol	Mn	S	Mg	Ca	Mo	B	Zn	Fe	K	Cu	P	N
ratio	2 %	% 6	3 %	1 %	0.1 %	0.5 %	4 %	4 %	17 %	0.5 %	3 %	6 %

Table (2) Components of CSF Nano crystalline Fertilizer

Experimental measurements:

1- Number of leaves before the first flower cluster.

2- The number of days from planting seedlings until the first flower opens. plant^{-1}.

3- The number of flowers in the flower cluster. plant^{-1}. As mentioned by it

4- The number of inflorescences. plant^{-1}. (Al-Shammari, 2005)

5 - The number of days from planting seedlings until the first flower is set. plant^{-1}.

6 - Percentage of the contract

The total number of flowers and the number of knotted flowers from the beginning of their appearance until the end of the growing season was calculated on the total branches of 50% of the plants of the experimental unit, and the percentage of knots was calculated on the basis of the following equation: -

$$\text{Percentage of knots in flowers \%} = \frac{\text{The number of flowers held t}}{\text{number of flowers t}} \times 100 \text{ Total}$$

 as mentioned by Al-Obaidi (2006) **Results:**

Table (3) shows a clear significant effect of the single study factors on the number of leaves before the first flowering cluster, as the two-day irrigation interval treatment S1 excelled and recorded the highest number of leaves amounting to 5.67 leaf^{-1}compared to the 6-day irrigation interval treatment S3, which gave 9.22 leaf^{-1} The treatment N2 (Nano fertilization 1.5 g L^{-1}) was significantly superior to 6.89 leaf-1 compared to the measured treatment N1, which gave 8.22 leaf^{-1}, and the dual interaction S1 N2 treatment was significantly superior to the other treatments, and the number of leaves was 4.67^{-1}compared with the treatment of S3 N1 were give 10.00 leaf plant $^{-1}$.

Table (3) The effect of irrigation interval and spraying with Nano-fertilizer for tomato plants on the number of leaves before the first flowering cluster.

irrigation interval Day	Treatment of Nano tube			Average
	N1	**N2**	**N3**	
S1	6.67	4.67	5.67	5.67
S2	8.00	7.33	7.00	7.44
S3	10.00	8.67	9.00	9.22
Average of Treatment	8.22	6.89	7.22	
0.726	0.726			1.257
L.S.D				

Table (4) shows a clear and significant effect of the single study factors on the number of days from planting seedlings until the first flower opens. The two-day irrigation interval treatment S1 excelled and recorded the lowest number of days to open the first flower amounted to 24.78 days compared to treatment S3 with the 6-day irrigation interval which It gave 29.22 days, and the treatment N2 (Nano fertilization 1.5 g L^{-1}) was significantly superior and gave 26.22 days compared to the measurement treatment N1, which gave 29.33 days, and the dual interaction treatment S1 N2 was significantly superior to the other treatments and recorded the least number of days for the first flower to open, which amounted to 22.33 days compared to With the S3 N1 treatment that gave the first flower after 31.00 days.

(4) The effect of irrigation interval and spraying with Nano-fertilizer for tomato plants on the number of days from planting seedlings until the first flower opens. plant^{-1}

irrigation interval Day	Treatment of Nano tube			Average
	N1	N2	N3	
S1	27.33	22.33	24.67	24.78
S2	29.67	27.67	28.33	28.56
S3	31.00	28.67	28.00	29.22
Average of Treatment	29.33	26.22	27.00	
1.051	1.821			1.051
L.S.D				

Table (5) shows a clear significant effect of the study factors on the characteristics of the number of flowers in the flower cluster. Plant^{-1}, as the irrigation interval of two days outperformed S1 and recorded the highest number of flowers in the flower cluster, which was 5. 56 flowers compared to treatment S3, with an irrigation interval of 6 days, which gave 3.89 flowers, and treatment N3 (Nano fertilization 2.5 gm l^{-1}) was significantly superior to treatment, which gave 5.00 flowers, compared to treatment N1, which gave 4.11 flowers, and the dual interaction treatment S1 N2 was significantly superior to the other treatments and recorded The highest number of flowers on one cluster was 6.33 compared with S3 N1 treatment, which gave the lowest number of 3.67 flowers.

Table (5) The effect of irrigation interval and spraying with Nano-fertilizer for tomato plants on the number of flowers in the flower cluster. Plant^{-1}.

irrigation interval Day	Treatment of Nano tube			Average
	N1	N2	N3	
S1	4.33	6.33	6.00	5.56
S2	4.33	3.33	4.67	4.11
S3	3.67	3.67	4.33	3.89
Average of Treatment	4.11	4.44	5.00	
0.879	1.522			0.879
L.S.D				

Table (6) shows a clear significant effect of the single study factors on the characteristic of the number of flowering inflorescences. Plant^{-1}, where the 2-day irrigation interval S1 was superior, and recorded the highest number of flowering inflorescences, which amounted to 21.22 flowers, compared to the 6-day irrigation interval treatment S3, which gave 13.22 inflorescences. Treatment N3 (Nano fertilization 2.5 g l^{-1}) was significantly superior and gave 18.89 inflorescences compared to treatment N1 which gave 14.11 pink inflorescences, and the treatment of the binary interaction S1 N2 significantly outperformed the other treatments and recorded the highest number of pink inflorescences amounted to 24.00 inflorescences compared with the treatment of S3 N1 which gave the lowest number of 10.67 inflorescences.

Table (6) Effect of irrigation interval and spraying with Nano fertilizer for tomato plants on the number of flowering inflorescences. plant⁻¹.

irrigation interval Day	Treatment of Nano tube			Average
	N1	N2	N3	
S1	17.00	24.00	22.67	21.22
S2	14.67	16.33	18.33	16.44
S3	10.67	13.33	15.67	13.22
Average of Treatment	14.11	17.89	18.89	
1.677	2.904			1.677
L.S.D				

Table (7) shows a clear significant effect of the individual study factors on the number of days from planting seedlings until the first flower set. Plant⁻¹, where the two-day irrigation interval S1 was superior and recorded the lowest number of days until the decade was 29.67 days compared to treatment S3, the 6- day irrigation interval, which gave 35.00 days. The treatments N2 and N3 did not differ significantly giving 31.33 days, compared to the measurement treatment N1, which gave 35.22 days. Significantly, the treatment of binary interaction S1 N2 outperformed the other treatments and recorded the lowest number of days until the contract amounted to 27.33 days compared with the treatment of S3 N1 which gave the lowest number of 38.00 days.

Table (7) The effect of irrigation interval and spraying with Nano fertilizer for tomato plants for the number of days from planting seedlings until the first flower set. plant^{-1}.

irrigation interval Day	Treatment of Nano tube			Average
	N1	N2	N3	
S1	32.67	27.33	29.00	29.67
S2	35.00	32.33	32.33	33.22
S3	38.00	34.33	32.67	35.00
Average of Treatment	35.22	31.33	31.33	
1.164	2.016			1.164
L.S.D				

Table (8) shows a significant and clear effect of the single study factors on the percentage of knot in flowers, as the two-day irrigation interval treatment S1 excelled, and the highest percentage of flower knot was 74.63% compared to treatment S3, the 6-day irrigation interval, which gave 63.55%, and the N3 treatment (fertilization) was superior. Nanoscale 2.5 g L^{-1}) significantly gave 70.22% compared with the measurement treatment N1, which gave 61.98%, and the binary interaction S1 N2 treatment significantly outperformed the other treatments and recorded the highest percentage of flower knot amounted to 81.54% compared with the treatment of S3 N1 which gave the lowest value which reached 55.37%.

Table (8) Effect of irrigation interval and spraying with Nano fertilizer for tomato plants on the percentage of flower set %.

irrigation interval Day	Treatment of Nano tube			Average
	N1	N2	N3	
S1	70.71	81.54	71.65	74.63
S2	59.84	62.37	69.12	63.78
S3	55.37	65.40	69.88	63.55
Average of Treatment	61.98	69.77	70.22	
6.374	11.040			6.374
L.S.D				

Discussion:

Tables (3 and 4) show the superiority of the two-day irrigation treatment in most of the individual traits with the superiority of spraying with Nano-fertilizer concentration of 1.5 g.l^{-1}, as the early emergence of the flowering inflorescence with the least number of leaves for plants and the least number of days for the opening of the flowering inflorescence since seedling had the effect on early contracting The result of the treatment of bilateral interference and this is important from the economic side, which reflects the effect of the elements in the Nano fertilizer with the availability of the appropriate moisture content, which was reflected in an increase in the formation of protein compounds, as it is known that the porphyrin ring in the plastid is centered on a magnesium atom and 4 pyrrole molecules in it nitrogen, and this may come From the presence of these elements in the compost components (Turk *et al,*2020) which stimulated vegetative growth, which reflected on the flower life, and then the knot and fruiting, and this was agreed with Al Obaidi (2006).

It is noted from tables (5 and 6) that the highest number of flowers and inflorescences appeared in the individual treatments and the binary interaction S1 N2 treatment, which may indicate the effectiveness of spraying with Nano-fertilizer because it contains micro elements such as boron and molybdenum (Abo-Hinna *et al* , 2019) as boron contributes effectively to the opening of flower buds With the

availability of adequate moisture around the rhizosphere, and this was reflected in the floral characteristics of the plant, and then the crop (Ahmad, 2021) Tables (7 and 8) show the effect of the experimental factors in reducing. the period of days from seeding until the flower set, and thus the increase in the percentage of tomato blossoms, and this in turn contributes to an increase in the yield through the indicators that the flower life gives to the plant, that the micro-elements in the Nano fertilizer such as iron, copper, manganese and calcium As these elements, as enzymatic chaperones and cofactors, contribute to cell division and elongation, opening and closing stomata, as indicated by that (Al-Moaini, 1999) It is believed that the genetic composition of the cultivated variety or hybrid, as well as the influence of the environmental conditions surrounding the plant, have an effect on the characteristics of the number of flowers and inflorescences and the percentage of nodes that can be produced by the plant when the appropriate conditions are available for that (Abdul Rasoul, 2003).

References:

1. Abdul Rasoul, **Ayman Jabber**. (2003). Estimation of genetic parameters by cross multiplication in tomato. PhD thesis. College of Agriculture - University of Baghdad. Iraq.

2. Abo-Hinna, M. A, Aqeel. K. H., Hayder. A. M. Turk and Nasser. M.A. (2019). Effect of Adding Bio fertilizer Azotobacter and Foliar Spray with Nitrogen on growth Parameters of Potato Plant Solanum Tubersoum L. CV– Bellini. Int. J. Agricult. Stat. Sci. Vol. 15, No. 2.

3. Ahmad. Radhiyah Ali Hasan. (2021). The effect of usage tow methods of garlic extraction (foliar and ground application) on the growth of tomatoes (*Solanum lycopersicum*) plant. Institute of Physics Publishing. journal of Physics.1879. 022021. doi**:10.1088/1742-6596/1879/2/022021**

4. Al-Mohammadi, **Fadel Mosleh**. (2012). Agricultural Experiments Design and Analysis, Dar Al-Yazuri Scientific, 1st Edition. Ammaan Jordan.

5. Al-Obaidi, **Reda Mustafa Abdel**-**Hussein**. (2006). Effect of whey spray and nutrients on growth and yield of tomato *Lycopersicon esculentum* Mill. , PhD thesis, College of Agriculture, University of Baghdad, Ministry of Higher Education and Scientific Research, Iraq.

6. Al-Moaini, **Montaser Mansour Hamza**. (1999). Response of tomato plants to spraying with cyclocyl and nutrient solution. Master Thesis. College of Agriculture, University of Baghdad - Iraq.

7. Al-Muhareeb , **Muhammad Zaidan Khalaf** . (2014). The effect of irrigation levels and organic matter on growth, yield and quality of cayenne pepper under the organic farming system, PhD thesis, College of Agricultural Engineering Sciences, University of Baghdad, Ministry of Higher Education and Scientific Research, Iraq.

8. Al-Shammari, **Aziz Mahdi**. (2005). Cross-crossing and estimation of genetic parameters in tomatoes grown under plastic tunnels. PhD thesis. College of Agriculture, University of Baghdad, Iraq.

9. Hassan, **Ahmed Abdel Moneim**. A. (1998). Production technology, physiology, agricultural practices, harvesting and storage, Arab House for Publishing and Distribution. Cairo University.

10. Kazem, **Fawzi Abdel Hassan**, **Nazem Younes Abdel**. (2017). Applications in Statistics and Analysis of Agricultural Experiments (Practical Part), College

of Agriculture, University of Baghdad, Ministry of Higher Education and Scientific Research, Iraq.

11. Melendez Martinez, **A.; A. Nascimiento; Y. Wang; C. Liu; Y. Mao and X. Wang**. (2013). Effect of tomato extract supplementation against high-fat diet-induced hepatic lesions. *Hepatobiliary Surgery and Nutrition. 2 (4).* doi: 10.3978/j.issn.2304- 3881.2013.07.04.

12. Morales-Díaz, A, B, O. O. Hortensia, J. M. Antonio, C. P Gregorio, G. M Susana and B. M. Adalberto .(2017). Application of nano elements in plant nutrition and its impact in ecosystems. *Adv. Nat. Sci.: Nanosci. Nanotechnology.* y Adv. Nat. Sci.: Nanosci. Nanotechnol. 8 (2017) 013001 (13pp) *https://doi.org/10.1088/2043-*

6254/8/1/013001.

13. Perveen, **R.; H.A.R. Suleria; F.M. Anjum; M.S. Butt; I. Pasha and S. Ahmad**. (2015). Tomato (*Solanum lycopersicum*) carotenoids and lycopenes chemistry; metabolism, absorption, nutrition, and allied health claims—a comprehensive review. *Critical Reviews in Food Science and Nutrition. 55:919–929.*, DOI: 10.1080/10408398.2012.657809.

14. Pet Roey. L. P Jingjing P. C .(2015). Effect of Different Fertilizer Schemes and Irrigation Intervals on Tomatoes' Response to Water Shortage, *DOI: 10.7603/s 40934-015-0006-0.*

15. Saleh, **Mahmoud Muhammad Salim**. (2015). Nanotechnology and a new scientific era, Almalic Abdulaziz City for Science and Technology (KACST), Riyadh, Kingdom of Saudi Arabia.Singh, DB. 2014. Stress Physiology, translated by Majeed Kazem Abbas, College of Agriculture, University of Al-Qadisiyah, Iraq.

16. Salman, **Asmaa Khudair**. (2019). Evaluation of some criteria for carrying drought tolerance of tomato genotypes and determination of WRKY1 gene expression. College of Agricultural Engineering Sciences. University of Baghdad, Iraq.

17. Turk, H.A, Mansour. A.A, Mahmood. T.M, .(2020). The Effect of Adding Animal Manure and Bio-Stimulant Amalgerol on the Growth Parameters of two Verities (Local, Spanish) of the Broad Bean Plant (Vicia Faba L.). Int. J. Agricult. Stat. Sci. Vol. 16.

18. Turk, **Hayder Abdul Munem**. (2021). Response of Tomato Growth and yield to Spraying with Nano – elements and Selenium under Water Stress Conditions. PHD Dissertation, College of Agricultural Engineering Sciences, University of Baghdad, Ministry of Higher Education and Scientific Research, Iraq.

HANDWRITTEN DIGITS CLASSIFICATION BASED ON DISCRETE WAVELET TRANSFORM AND SPIKE NEURAL NETWORK

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Abstract:

In this paper, a handwritten digit classification system is proposed based on the Discrete Wavelet Transform and Spike Neural Network. The system consists of three stages. The first stage is for preprocessing the data and the second stage is for feature extraction, which is based on Discrete Wavelet Transform (DWT). The third stage is for classification and is based on a Spiking Neural Network (SNN). To evaluate the system, two standard databases are used: the MADBase database and the MNIST database. The proposed system achieved a high classification accuracy rate with 99.1% for the MADBase database and 99.9% for the MNIST database.

Key words: Machine Learning; Artificial Intelligence; Classification; Discrete Wavelet Transform; Spike Neural Network.

Introduction:

Handwritten Digits Classification or Recognition (HDR) is one of the most prominent applications in computer vision. As with other universal symbols, digits are utilized extensively in technology, banking, optical character recognition, postal service, license plate recognition, etc. (Banjare & Massey, 2016). Without human assistance, automatic handwriting digit classification is difficult. Due to variations in handwriting styles, the same numeral may be written differently depending on the font size, orientation, and writing substance. The solution to these problems lies in the development of an accurate handwritten numeral recognition technique (Abdulhussain et al., 2021).

This topic has already been the subject of numerous recent investigations, research papers, and publications. (Meier et al., 2011) used a committee of twenty-five neural nets with one hidden layer based on the digits from MNIST. (McDonnell et al., 2015) proposed a classification system for handwritten digits that uses an algorithm called "extreme learning machine" to build a shallow neural network classifier. (Singh & Lal, 2014) combined the use of a neural network classifier with a single layer and principal component analysis (PCA) to produce a system capable of recognizing the MNIST dataset of handwritten digits. The method in (Tavanaei & S., 2015) consisted of employing a three-layer spiking neural network in order to classify handwritten digits. To extract handwritten digit features, a spiking neural network model influenced by synaptic pruning was created and tested in (Faghihi et al., 2022), which consists of three spiking neural layers and a single output neuron whose firing rate is employed for classification. (Loey et al., 2017) introduced a new unsupervised learning strategy with stacked autoencoder (SAE) for the classification of Arabic handwritten digits (MADBase database). The paper (El-Sawy et al., 2017) talked about a deep learning method that works efficiently for recognizing handwritten Arabic digits, that method uses a CNN that has been trained and tested using the MADBase. The author (Lawgali, 2015) describes a technique based on DWT and DCT for obtaining the discriminative features of the handwritten digits database (ADBase database) and ANN during the classification stage.

Digit classification is a straightforward process for humans, but much more difficult for computers and systems, especially when there are digits like 1, and 9 that have a lot of similarities in their patterns. While several deep learning-based classification methods have been studied for the classification of handwritten digits, the classification accuracy remains a key concern. To achieve this aim, this paper proposes combining the Discrete Wavelet Transform for feature extraction with a

spiking neural network classifier to effectively and accurately classify handwritten digits.

The second section of the study outlines the preliminary materials employed. The section begins with a brief introduction to the DWT and then moves on to a brief description of SNN. Section three describes the method for classifying handwritten digit. The fourth section presents and examines experimental outcomes and comparisons with other approaches described in the scientific literature. In Section five, the conclusion is reached.

2- Preliminaries:

2.1 Discrete Wavelet Transform (DWT)

DWT is a transform that decomposes a given signal into a number of different sub-bands. Figure 1 depicts the DWT at one level. Clearly, DWT is composed of four levels. Any level or row can have the Low Pass Filter (LPF) and High Pass Filter (HPF) levels applied to it. Alternately, divide the image's column into three high-frequency sub-bands and one low-frequency sub-band (LL) (LH, HL, and HH). DWT is used for feature extraction where the sub-bands are intended for usage as features. Low frequency (LL) coefficients have been used in a number of studies to detect features since they are close to the original (Lawgali, 2015) (Kadhm et al., 2017).

A DCT is applied to the DWT image's low-frequency sub-band (LL) to derive DCT coefficients. DCT is useful because it can reduce the total energy of an image to just a few coefficients.
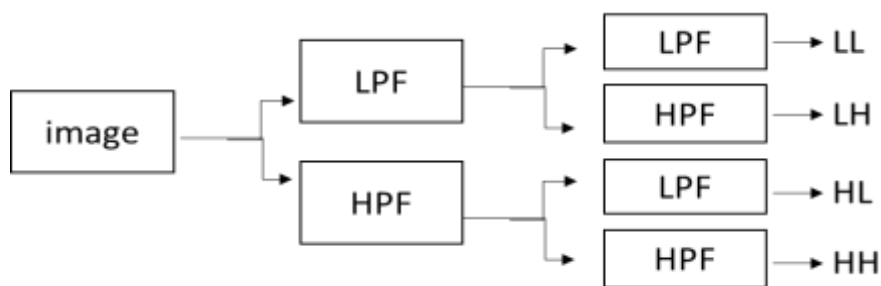

Figure 1. one level DWT.

2.2 Spiking Neural Networks (SSNs)

Third-generation neural network technology, known as SNNs, employs neuron models driven by the biological mechanics of neuronal signaling (Ghosh-Dastidar & Adeli, 2009). SNNs have a structure resembling that of regular neural networks. Each spike neuron has three stages of computation; the first stage involves adding up all of the neuron's inputs. After that, the membrane potential is checked to see if it has exceeded the threshold, and finally, the neuron emits the spike and the membrane potential is reset to zero (Al-jamali & Shihab, 2017).

The spike neural network has various advantages. With a few pulses, spiking neuron networks may transmit and receive massive amounts of data, and implementations can be completed quickly and efficiently. Furthermore, pulsed networks make use of temporal information and may quickly integrate into dynamic environments. In addition, with fewer neurons, pulsed networks can perform any second-generation function. Finally, because spike networks are becoming more similar to biological neural networks, they can benefit from neurophysiology's expanding knowledge base (Kunkle & Merrigan, 2002).

3. The Classification Methodology for Handwritten Digit (D-SNN)

The proposed classification system is explained in this section. Preprocessing, feature extraction, and classification are just a few of the phases that make up this system. Figure 2 displays a detailed diagram of the suggested system.

Figure 2. The proposed D-SNN diagram.

An image of a handwritten digit is used as the system's input, and after that, it goes through a preprocessing stage. The algorithm then takes each handwritten digit and extracts features, classifying them based on the labels assigned to each class.

Preprocessing is the first stage, utilized to get the input image ready for the subsequent stages. In this layer, the images were normalized.

The second stage is known as feature extraction, and DWT is applied at one level at this stage in this particular study. Each image is decomposed into four levels, which are referred to as (LL, LH, HL, and HH) using the Haar wavelet, and the low

frequency coefficients (LL) are used to extract the image's features. Then, by applying DCT to the LL of the DWT image, 50 DCT coefficients are created.

SNN is used for the classification stage, which is the last step of the procedure. The SNN consists of three layers: the input, the hidden, and the output layer. The preceding stage's extracted features are now being sent into the input layer, which consists of 50 neurons. This layer was created after the previous one. There are 75 neurons in the hidden layer, while there are 10 neurons in the output layer.

When making an SNN, it's important to make sure that the number of hidden units strikes the right balance between being big enough to accurately model the problem and not being so big that they overfit the data. 75 was chosen as the value for this parameter because it strikes this balance.

The classification procedure of the proposed technique is depicted in simplified form in Figure 3, which includes every level in depth.
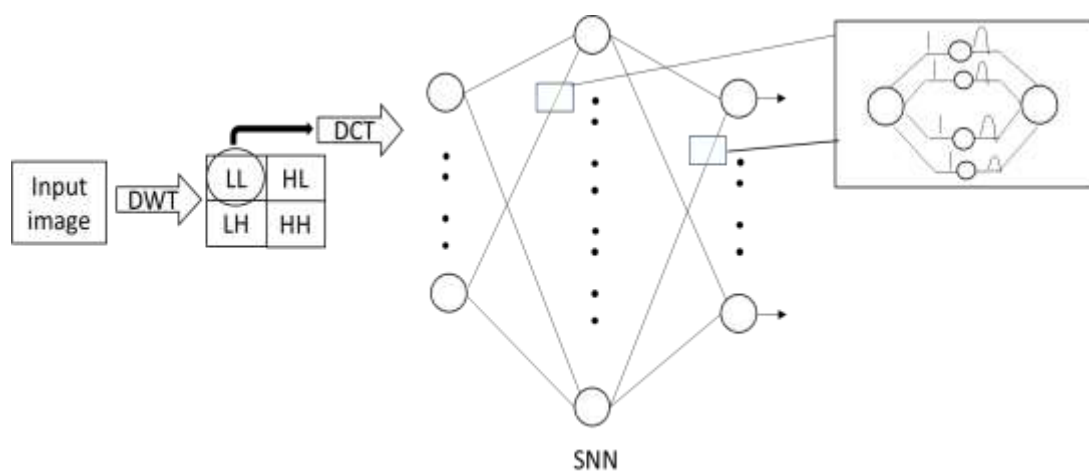
Figure 3. The proposed D-SNN structure.

4. Experimental Results and Discussion

In this paper, the TensorFlow 2.8.2 framework and Python language 3.7.13 are used, running on the Google Colaboratory notebook. In this section, we show a few simulation results that test how well the proposed handwritten digit classification system works in different datasets.

The subsequent subsections provide a description of the datasets that were utilized for the purpose of this paper. After that, an analysis of the performance of the suggested method for classifying digit based on accuracy and confusion matrix is presented.

4.1 Database Description

In this paper, two standard handwritten digits databases are used in the experiments. The first database is the Modified Arabic Digits dataBase (or the MADBase) provided by (Abdelazeem & El-Sherif), which consists of 70000 digits written by 700 individuals from different institutions to guarantee that a variety of writing styles are included. The second database is the Modified National Institute of Standards and Technology database (or the MNIST) provided in (LeCun et al., 1998). Both databases are composed of 70000 images of digits, divided between 60000 samples for training and 10000 examples for testing. In addition, they have 10 classes.

Figure 4 illustrates different samples for each dataset, which includes MADBase and MNIST. Based on the datasets we've already talked about; the next section evaluates how well the proposed method for classifying digits works.

(a)   (b)
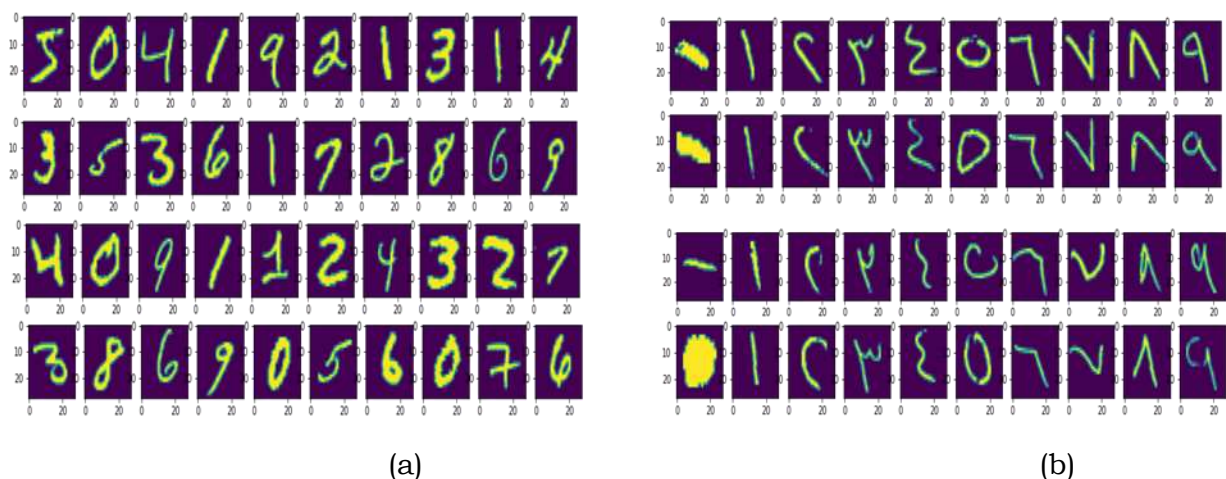
Figure 4. dataset sample images (a) MNIST, (b) MADBase.

4.2 Evaluating the Effectiveness of the Proposed D-SNN

Testing the suggested D-SNN's efficiency includes measuring the accuracy of the method. In comparison, the same dataset is used to train and evaluate the same system using a neural network (NN) with the same architecture as the SNN during the classification step, which will be noted as (D-NN). These results are depicted in Table 1.

The primary aim of this paper is to develop an accurate method for classifying handwritten digit, and Table 1 demonstrates that D-SNN has accomplished this for both datasets.

Table 1. D-SNN and D-NN accuracy for MNIST and MADBase.

Dataset	Method	Accuracy
MADBase	D-SNN	0.991
	D-NN	0.9789
MNIST	D-SNN	0.999
	D-NN	0.9801

The confusion matrices for D-SNN and D-NN are examined using both datasets to provide a more comprehensive explanation. Figure 7 illustrates this, with a and b displaying the confusion matrix of digit classification using D-SNN and D-NN based on MNIST, respectively. while c and d show the digit classification confusion matrix using D-SNN and D-NN based on MADBase, respectively. Figure 5 shows clearly that, according to the digit classification confusion matrix, the D-SNN is better than the D-NN in both of the datasets that were looked at.
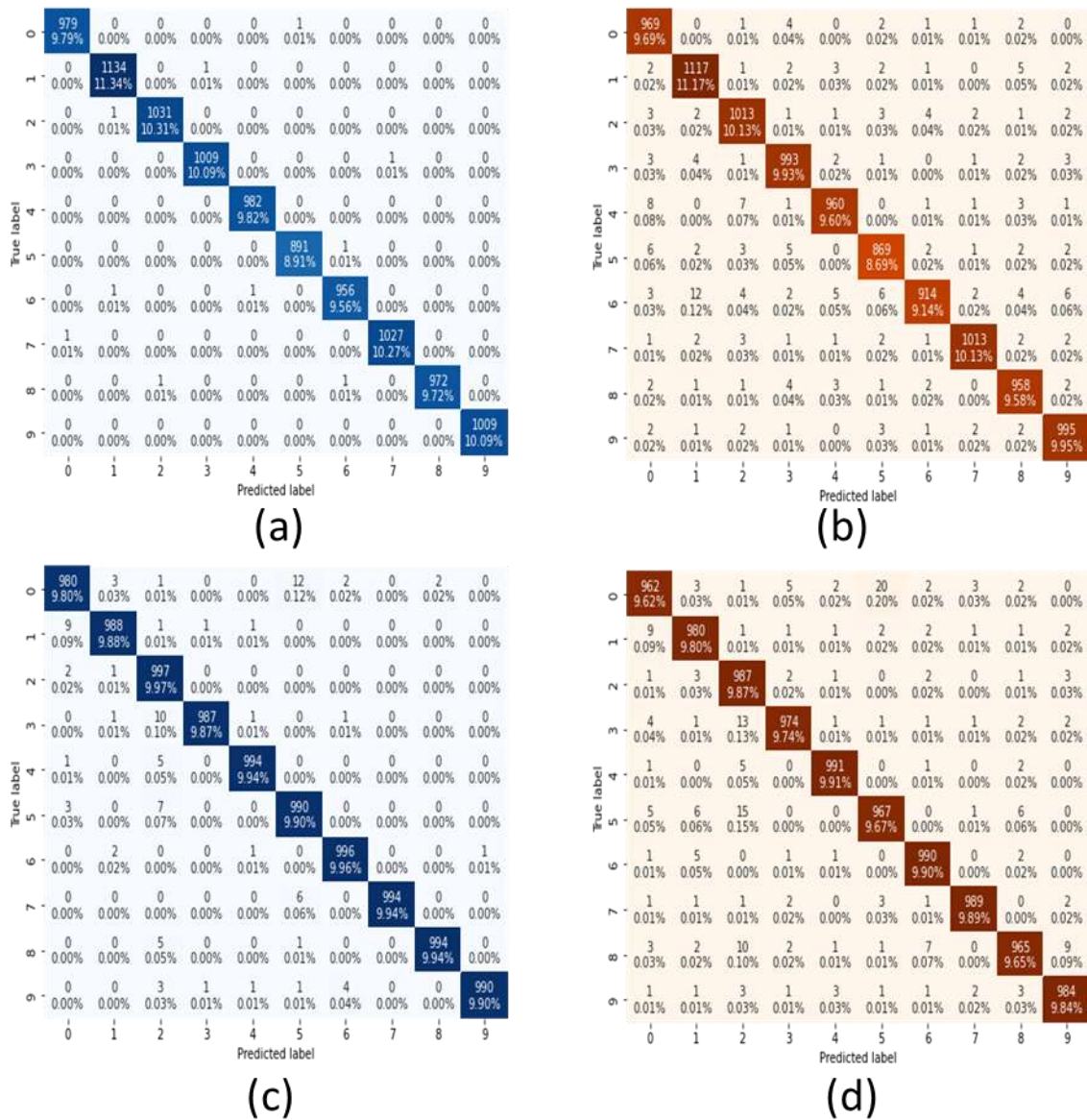
Figure 5. The confusion matrix of a digit classification system applying (a) D-SNN for the MNIST dataset, (b) D-NN for the MNIST dataset, (c) D-SNN for the MADBase dataset, and (d) D-NN for the MADBase dataset.

In this part, a number of comparisons with previously established methodologies are carried out. Table 2 displays comparisons that compare a number of different classification strategies that make use of a number of different types of classifiers with the strategy that we have presented. SNN is used as a classifier in our suggested technique, combined with DWT and DCT for feature extraction.

In (Mishra & Singh, 2017) For feature extraction, the histogram of the directed gradient approach and wavelet transform technique are utilized. As classifiers, radial basis function neural networks and back-propagation neural networks have been utilized. In addition, the system utilized the standard MNIST database for testing.

A CNN architecture is proposed in (Ahlawat et al., 2020) for the purpose of classifying handwritten digit, and it is evaluated using the MNIST dataset.

In (Kadhm et al., 2017) The features of the image are extracted using the DWT and the FCT. Based on the cityblock distance function, a KNearest Neighbor (KNN) classifier used to classify the extracted features. Furthermore, the system was tested against the standard ADBase database.

The study by (El-Sawy et al., 2017) revealed a deep learning system that is capable of detecting Arabic handwritten digits and can be applied in this context. LeNet-5, a Convolutional Neural Network (CNN), was implemented to train and analyze the MADBase database.

In (Lawgali, 2015), the author proposes a method for capturing the properties of handwritten digit that is based on DWT and DCT. ANN is used during the classification step. The ADBase database was used to evaluate this study.

Table 2. Comparison of the Proposed Method's Accuracy with Other Methods.

Approach	Technique / Classifier	dataset	accuracy
(Mishra & Singh, 2017)	back-propagation neural network	MNIST	83.66%
(Mishra & Singh, 2017)	Radial Basis Function NN	MNIST	98.26%
(Ahlawat et al., 2020)	CNN	MNIST	99.87%
(Kadhm et al., 2017)	Knearest Neighbor (KNN)	ADBase	98.2%
(El-Sawy et al., 2017)	CNN	MADBase	88%
(Lawgali, 2015)	ANN	ADBase	98.32 %
The proposed method (D-SNN)	SNN	MNIST	99.9%
The proposed method (D-SNN)	SNN	MADBase	99.1%

5- Conclusion:

A discrete wavelet transform combined with a spike neural network system for handwritten digit classification was proposed in this paper. The suggested system contains three phases: preprocessing, feature extraction and classification. To extract features in the second phase, the Haar transform is used, followed by DCT. The retrieved features are then utilized to train an SNN as a classifier. The suggested approach has been tested on two different handwritten digit standards: MNIST and MADBase. The results demonstrated that the proposed approach gets high classification accuracy, with a classification accuracy of 99.9 percent for the MNIST dataset and 99.1 percent for the MADBase dataset, respectively.

References:

Abdelazeem, S. & El-Sherif, E. (n.d.). *AHDBase.* https://datacenter.aucegypt.edu/shazeem/

Abdulhussain, S. H., Mahmmod, B. M., Naser, M. A., Alsabah, M. Q., Ali, R. & Al-Haddad, S. A. R. (2021). A robust handwritten numeral recognition using hybrid orthogonal polynomials and moments. *Sensors, 21*(6). https://doi.org/10.3390/s21061999

Ahlawat, S., Choudhary, A., Nayyar, A., Singh, S. & Yoon, B. (2020). *Improved Handwritten Digit Recognition Using Convolutional Neural Networks (CNN).* https://doi.org/10.3390/s20123344

Al-jamali, N. A. S. & Shihab, Z. (2017). Indoor Mobile robot navigation based on Time-driven FeedForward Spike Neural Network. *1st International Conference on Recent Trends of Engineering Sciences and Sustainability 17-18 May / 2017, September.*

Banjare, K. & Massey, S. (2016). *Handwritten Numeric Digit Classification and Recognition : Recent Advancements. 4*(6), 228–231.

El-Sawy, A., EL-Bakry, H. & Loey, M. (2017). CNN for Handwritten Arabic Digits Recognition Based on LeNet-5. In A. E. Hassanien, K. Shaalan, T. Gaber, A. T. Azar & M. F. Tolba (Eds.), *Proceedings of the International Conference on Advanced Intelligent Systems and Informatics 2016* (pp. 566–575). Springer International Publishing.

Faghihi, F., Alashwal, H. & Moustafa, A. A. (2022). A Synaptic Pruning-Based Spiking Neural Network for Hand-Written Digits Classification. *Frontiers in Artificial Intelligence, 5*(February), 1–17. https://doi.org/10.3389/frai.2022.680165

Ghosh-Dastidar, S. & Adeli, H. (2009). Third Generation Neural Networks: Spiking Neural Networks. In W. Yu & E. N. Sanchez (Eds.), *Advances in Computational Intelligence* (pp. 167–178). Springer Berlin Heidelberg.

Kadhm, M. S., Mhawi, D. E. & Zaki, R. M. H. (2017). An Accurate Handwritten Digits Recognition system Based on DWT and FCT. *Iraqi Journal of Science, 58*(4B), 2200–2210. https://doi.org/10.24996/ijs.2017.58.4b.23

Kunkle, D. R. & Merrigan, C. (2002). Pulsed neural networks and their application. *Computer Science Dept., College of Computing and Information Sciences, Rochester Institute of Technology.*

Lawgali, A. (2015). Handwritten Digit Recognition based on DWT and DCT. *International Journal of Database Theory and Application, 8*(5), 215–222. https://doi.org/10.14257/ijdta.2015.8.5.18

LeCun, Y., Cortes, C. & Burges, C. J. C. (1998). *THE MNIST DATABASE of handwritten digits*. http://yann.lecun.com/exdb/mnist/

Loey, M., El-Sawy, A. & EL-Bakry, H. (2017). *Deep Learning Autoencoder Approach for Handwritten Arabic Digits Recognition*. http://arxiv.org/abs/1706.06720

McDonnell, M. D., Tissera, M. D., Vladusich, T., Van Schaik, A., Tapson, J. & Schwenker, F. (2015). Fast, simple and accurate handwritten digit classification by training shallow neural network classifiers with the "Extreme learning machine" algorithm. *PLoS ONE, 10*(8), 1–17. https://doi.org/10.1371/journal.pone.0134254

Meier, U., Cireşan, D. C., Gambardella, L. M. & Schmidhuber, J. (2011). Better digit recognition with a committee of simple neural nets. *Proceedings of the International Conference on Document Analysis and Recognition, ICDAR, 2,* 1250–1254. https://doi.org/10.1109/ICDAR.2011.252

Mishra, A. & Singh, D. (2017). Handwritten digit recognition using combined feature extraction technique and neural network. *International Journal of Current Engineering and Scientific Research (IJCESR), 21*(2), 80–88.

Singh, V. & Lal, S. P. (2014). Digit recognition using single layer neural network with principal component analysis. *Asia-Pacific World Congress on Computer Science and Engineering*, 1–7. https://doi.org/10.1109/APWCCSE.2014.7053842

Tavanaei, A. & S., A. (2015). A Minimal Spiking Neural Network to Rapidly Train and Classify Handwritten Digits in Binary and 10-Digit Tasks. *International Journal of Advanced Research in Artificial Intelligence, 4*(7), 1–8. https://doi.org/10.14569/ijarai.2015.040701

THE ANTIBIOFILM ACTIVITY OF LIME JUICE AND Lio2NPs AGAINST K. PNEUMONIAE

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Abstract:

Thirty specimens of fresh white cheeses, presented for sale in different markets at different cities of Iraq were analyzed microbiologically in this study. Isolates of Klebsiella, included in the specimens collected from November 2017 to January 2018. Two methods, the Congo red agar method and the tissue culture plate method (TCP) used to demonstrate the ability to produce biofilms (CRA). The antibiofilm activity of lime extract and LiO2NPs was then examined individually, and the TCP method used to determine the synergistic impact. The findings demonstrated that, although to varying degrees, all Klebsiella isolates form biofilm. The results also shown that LiO2NPs and lime extract, both alone and in combination had an antibiofilm impact against Klebsiella. In conclusion, shown that the fresh white cheese samples used in this investigation had microbiological contamination at a level that was hazardous to human health, but this contamination could be removed using lime extract and LiO2NPs**.**

Key words: Biofilm, LiO2NPs, Lim juice, Congo red, Klebsiella, and Cheese.

Introduction:

Cheese a dairy product prepared from milk that comes in a variety of tastes, textures, and natures thanks to the casein milk protein's ability to coagulate. It is made up of milk-derived proteins and lipids, frequently from the milk of cows, buffalo, goats, or sheep. Milk is typically acidified during manufacturing, and adding the rennet enzyme causes coagulation. separating and pressing the solids in their final shape **[1]** Since cheese contains a lot of protein and calcium, germs that cause infection from many sources develop quickly in it **[2].** Biofilm production in milk tanks and milk development position resulting from the capacity of bacteria to stick and acumulative on stainless steel surfaces. Occasionly for microbial pollution of the processed dairy food caused by biofilms maturation in milk treating places **[3].** The consumption of tainted food or beverages that are contaminated with pathogens and toxins (chemicals) such bacteria, viruses, and parasites results in food-borne disease. In impoverished nations, foodborne infections are the primary cause of illness and death. **[4][5].** *Salmonella, E. coli, Proteus, and Klebsiella spp. are the four pathogens that are most frequently identified in cases of food poisoning* **[6].** *Klebsiella is a Gram-negative, rod-shaped, encapsulated, lactose-fermenting, facultatively anaerobic bacterium. It emerges as a mucoid lactose fermenter on MacConkey agar.* **[7].** The alarming incidence of antibiotic resistance in bacteria of medical importance makes there was a constant need for novel and efficient healing agents so we require to apply other antimicrobial agents such as plant extract for example is *Citrus aurantium, L. Citrus aurantium* has long been inspired in food industry as a part of liqueurs and marmalades, and its extracts have also been using in traditional Chinese medicine to encourage essential energy and exchange, eliminate phlegm, and divide stagnation**[8] [9].** Plants have been valuable and necessary sources of natural goods for human health for a very long time, and they have a significant potential for creating novel medications **[10].** Drugs used as therapeutic treatments can be genetically transmitted and acquired resistance by bacteria **[11].** Many scientists were interested in discovering novel, naturally active substances in plants or agricultural products made from plants. As a result, citrus's antibacterial properties have drawn a lot of attention as a possible and promising source of medicinal drugs **[12] [13].** A key member of the Rutaceae family of therapeutic plants is the lemon. Citrus flavonoids exhibit a wide range of biological actions, such as antibacterial, antifungal, anti-diabetic, anticancer, and antiviral effects **[14] [13].**

In terms of their features, nanoparticles frequently differ from their bulk equivalents and can be anywhere from 1 and 100 nanometers in size (nm). Materials' characteristics alter as their dimensions are shrunk to the atomic scale.

Nanoparticles' distinctive physical, chemical, optical, and biological characteristics can be changed to suit the needs of varied applications [15]. The nanoparticles' small size and high surface to volume ratio, or big surface area, improve their interaction with bacteria to perform a variety of potentially antimicrobial activities. It is well known that the surface area of the nanoparticles that come into touch with the microbes determines their antimicrobial effectiveness [16]. For a range of applications, including water treatment, synthetic textiles, biomedical and surgical equipment, food processing, and packaging, metal nanoparticles having antimicrobial activity can be implanted or coated on surfaces. The composites made from metal nanoparticles and polymers also exhibit improved antimicrobial activity, enabling greater usage [17]. Based on the previously mentioned facts, this study's objectives to identify isolates that produce biofilms using various techniques, test local cheese for bacterial contamination by *Klebsiella*, and investigate the antibiofilm effects of lime extract and LiO2NPs on Klebsiella isolates.

Materials and Methods

Isolation and Identification

Local fresh-white cheese randomly gathered from markets in various Iraqi cities between November 2017 and January 2018. Thirty samples delivered by refrigerator containers directly to the lab, where they inspected right away without any additional holding. At 37° C for 24 hours, 5 grams of cheese incubated in 10 ml of buffered peptone water. From this broth, a loop-full was streaked onto MacConkey agar (Himedia/India) and Xylose Lysine Desoxycholate Agar (XLD) (Himedia/India), where they were cultured for 24 hours at 37°C. The suspected colonies were then immediately transferred to Triple Sugar iron agar (TSI) and Urea agar base (Himedia/India) tubes by puncturing the bottom and streaking the slope, and cultured for 24 hours at 37 c. Epi 20 tests then conducted to confirm the identification.

Biofilm assay: Tissue culture plate method (TCP)

All bacterial isolates were grown using the tissue culture plate method (TCP) in 96-well polystyrene tissue culture plates using the brain heart infusion broth (BHI), which includes 1% glucose. The bacteria were then exposed to an aerobic environment for 24 hours at 37°C, allowing them to develop into biofilms. Following three rounds of distilled water rinsing for the bacteria, 200 l of 100% methanol was used to fix the adhering cells in each well for 20 minutes. Overnight, the plates were

cleaned and dried. For 15 minutes, 200 1 of 0.1 percent crystal violet was used to stain the adhering cells. Extra stain was then washed away with water. The plates were air dried for the duration of the evening after a second D.W wash. The crystallized dye was connected to the adherent cells using 200 L of 96 percent ethanol in each well before the plates were analyzed at 490 nm with a spectrophotometer. The experiment was carried out in triplicate by measuring the absorbance of wells containing sterile BHI broth, and the results were compared to the control. as in Table (1). **OD= optical density, c= control, t = test**

Table (1): Classification of bacterial adherence by tissue culture plate method (20)

OD values	Biofilm formation
< OD c	Not producer
OD < OD ≤ 2*ODc	Weak
2*ODc < ODt≤ 2*ODc	Moderate
4ODc<OD t	strong

Congo red methods

This process followed the guidelines provided by **Freeman *et al.* [18]**, who created an alternate way of screening Staphylococcus isolates for biofilm formation. They recommend using a solid medium that has been carefully manufactured and is made up of a mixture of BHI broth (37 gms/L), sucrose (50 gms/L), agar no. 1 (10 gms/L), and Congo red dye (0.8 gm). Earlier, an aqueous solution of congo red stain was prepared separately and autoclaved at 121°C for 15 minutes. When the medium had cooled to 45°C, it was then added. Bacterial isolates were grown on culture media plates and remained there for 24 to 48 hours at 37°C. Dry black colonies, modest production of gray hue, and poor production of pink slime were indicators of a successful outcome **[19].**

Preparation of LiO2 NPs suspension

Following **[20]**, 100 milligrams of LiO2NPs added to 10 ml of sterile D.W. and vigorously agitated to prepare the nanoparticles. After being treated with ultrasound (40 kHz) for 30 minutes, the suspending solution autoclaved at 121° C for 20 minutes, and then cooled to room temperature.

Preparation of Lime juice:

The preparation of lime Juice extract done according to the methods reported by **Owhe-Ureghe *et al.*, [21].** Lemon fruits were bought from the market, cut into half with a sterile knife, and then each one had its liquid squeezed out and placed in a sterile container. The lemon juice was squeezed with care to prevent contamination; it was stated on the label that this extract was a 100% concentrated juice extract. The 100% extract diluted with the necessary volume of sterilized distilled water to produce a concentration of 50%.

Antibiofilm study of lime juice

Lime juice's antibiofilm activity investigated using the same techniques as those used to identify isolates that produce biofilms, with the exception that different lime juice concentrations added in volume 100 with the same volume for bacterial suspension in the wells as triplicates for each concentration. All wells then rinsed three times with D.W., stained with 0.1 percent crystal violet, and read by an ELIZA reader at 18 °C after 24 hours at 37 °C.

Detection the antibiofilm activity of LiO2 against bacterial isolates

The identical procedure was followed, but three independent wells filled with bacterial suspensions at various LiO2 NP concentrations. The wells were then washed, stained, and the O.D. at 490 nm read after being incubated for 24 hours at 37 °C

Detection the synergetic antibiofilm activity of LiO2 and Lime juice against bacterial isolates:

LiO2 NPs combined with lime juice were studied for their anti-biofilm action using the TCP experiment. Each individual well received 100 ml of the bacterial solution and 50 ml of the LiO2 NPs and lime extract mixture. After the plate had been incubated for 24 hours at 37°C, the wells were three times D.W. washed and stained with crystal violet for 15 minutes. The stain's optical density was measured at 490 nm after it had been removed and resolved with ethanol. The control, which was derived from the first biofilm formation result, was believed to reflect 100% of the biofilm formation isolates **[21].**

Results and Discussion:

Isolation and identification:

According to the results of the current investigation, 84 isolates from various bacterial species were found in cheese samples, with 18 of those isolates being identified as *K. pneumoniae*. According to **Schiemann's [22]** *K. pneumoniae* is found in dairy products rather frequently, according to an examination of 165 dairy products. Given the high frequency of coliform bacteria, including *K. pneumoniae*, in these goods, it is imperative to employ retail settings for food preparation rather than dairy facilities for hygienic operations. This highlights the importance of human handling in the introduction of these organisms. **[22]**. Another investigation involved gathering mozzarella cheese from a nearby dairy, and the findings revealed contamination by the growth of gas holes and swelling of plastic pouches in the mozzarella cheese. Of the 41 isolates found, 37 were *Klebsiella pneumoniae* **[23]**. **Podder *et al.*, [24]**. When discovered in 61 milk samples collected routinely from cows exhibiting CM symptoms on 11 farms in Newfoundland over the course of a year. Based on common biochemical and phenotypic testing, *K. pneumoniae* was determined to be present in these initial 61 isolates.

Mladenović *et al.*, [25], examined the presence of enterobacteria in locally produced, traditionally prepared Sokobanja cheese from Southeast Serbia. The samples, which came from various households, were collected throughout the summer and the fall. We looked at the samples' chemical and physical properties, including their water, fat, acidity, pH, and sodium chloride concentration. Four different genera of the family Enterobacteriaceae (Klebsiella [65 percent], Escherichia [20 percent], Serratia [10 percent], and Enterobacter [5 percent]) were found in the cheese samples that were examined.   A number of illnesses in both domestic and wild animals, as well as outbreaks of mastitis in cattle, are brought on by the bacteria *Klebsiella pneumoniae*. Klebsiella organisms found in dairy herd bedding in large numbers can invade the surfaces of cow teats. Materials used for bedding can serve as a significant reservoir for this coliform mastitis pathogen **[26]**.

Biofilm assay

The gold-standard method for this study was TCP method, in compare with data from TM and CRA methods **[27].** Current result reported that all bacterial isolates has the ability for producing biofilm but in different degrees. *Klebsiella* isolates formed biofilm in the following percentage, 7 isolates gave strong biofilm, and

11 isolates produced moderate biofilm, while no isolates showed weak biofilm, Figure (1).
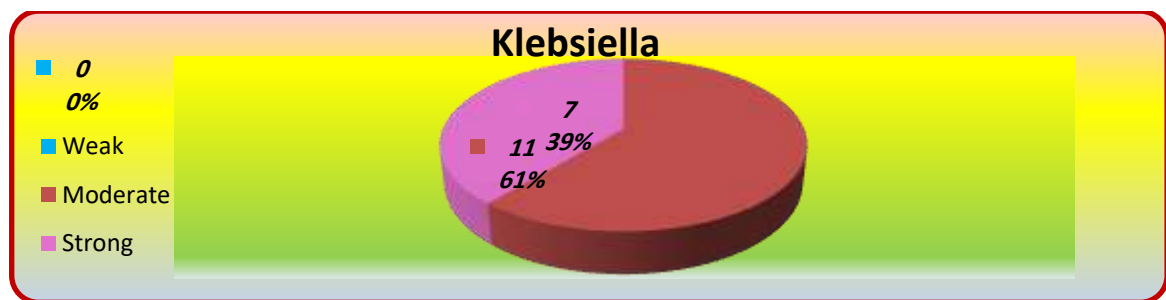

Figure (1): Biofilm producing by *Klebsiella pneumoniae*

A study in Iraq used phenotypic biofilm tests, such as scanning electron microscopy, to isolate *K. pneumonia* from a variety of clinical samples in Iraqi hospitals. The results **[28]** showed that 22/24 (91.67%) of the isolates could generate biofilm (OD0.68). The ability of several Klebsiella isolates from clinical sources to form biofilm was hypothesized by **Maldonado *et al.* [29].** They discovered that *Klebsiella pneumoniae* isolated from UTIs has a biofilm-forming ability (OD > 0.5) at 550 nm. In different parts of Baghdad, 8 *K. pneumonia* isolated from drinking water has been shown by **Oleiwi and Abid [30]** to generate biofilm with a mean of (OD>0.7).

The biofilm traits of *K. pneumonia* isolates that cause pneumoniae, according to **Pour *et al.* [31],** were those that attracted the most interest because they enhanced this bacterium's ability to transmit resistance markers to other clinical strains in mixed infection. The majority of *K. pneumonia* biofilm-forming strains were shown by **Bellifa *et al.* [32]** and **Jamal *et al.* [33]** to stick firmly to glass slides and to be at least 10 times more antibiotic resistant than their planktonic counterparts. They made the connection between the strong adhesion and the presence of type 3 fimbriae.

Congo red method

Although less precise than the microtiter plate approach, this is the other method for detecting biofilm. According to recent findings, different Klebsiella species produce different amounts of lipopolysaccharides. Only 10 isolates (52%) produced positive results that were black crystalline in color, 4 isolates (21%) produced moderate results that were gray in color, and 5 isolates (26%) produced negative results that were orange in color, figure (2).
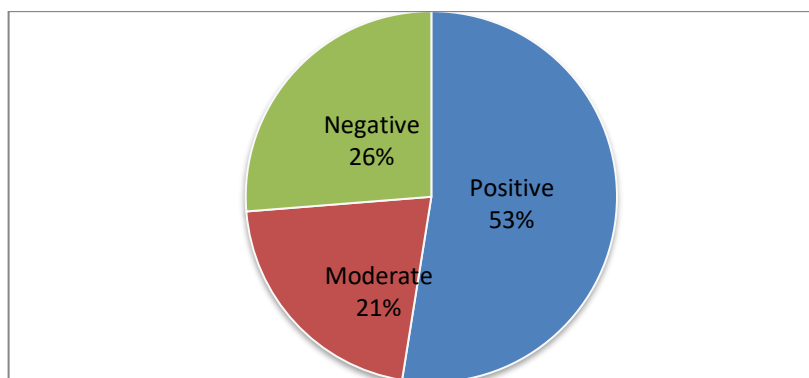
Figure (2): Congo red results for *Klebsiella pneumoniae*

The performance characteristics of CRA were compared to those of TCPM, the industry standard for biofilm identification. TCPM demonstrated a sensitivity of 93.1 percent and a specificity of 81.4 percent, while CRA attained a sensitivity of 88.1 percent and a specificity of 75.5 percent. **[34].**

145 isolates of *Escherichia coli* and *Klebsiella pneumoniae* from urine samples were evaluated by **Sultan and Nabiel [34]** for the development of biofilms using the TCPM and CRA. According to the findings, the TCPM only found biofilm generation in 43 samples (29.7%), but the CRA found it in 63 isolates (43.4 percent). In an analogous pattern of detection, **Ruchi et al. [35]** discovered the development of biofilms in 40.8 percent of uropathogen isolates by CRA and in 27.8 percent by TCPM. The CRA is a simple qualitative screening method for identifying biofilms that has the benefit of still-viable colonies that may be helpful for further investigation **[36].**

Antibioflm study of lime juice

There aren't many researches on lime juice's ability to inhibit bacterial biofilms, and those that do mostly focus on the antibacterial power of bacteria as planktonic cells. The findings of this investigation demonstrated that all lime juice concentrations had an impact on Klebsiella biofilm, but concentration 6.25 percent had the strongest antibiofilm effect, **figure (3).**
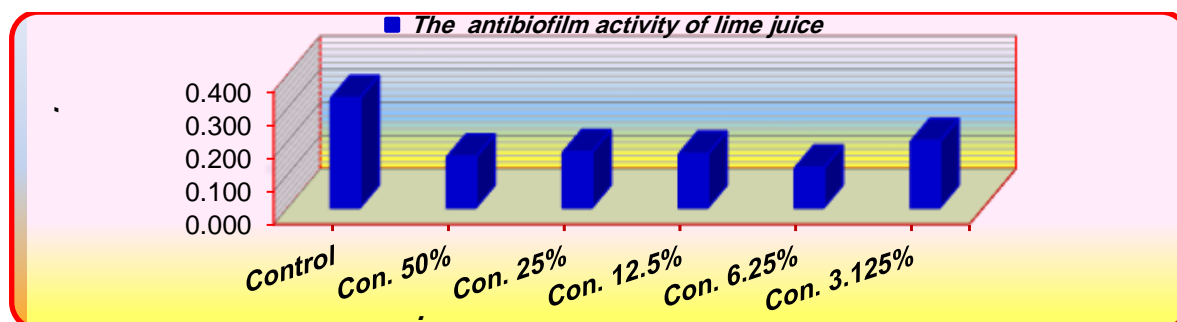

Figure (3): Antibiofilm study of lime juice against *Klebsiella pneumoniae*

Evaluation of the antibacterial and antibiofilm capabilities of citrus peel aqueous extracts by **Caputo *et al.* [37]** against a variety of nosocomial pathogens and commensal bacteria on human skin. **Adukwu *et al.* [38]** examined the effectiveness of lemongrass essential oil highlights against antibiotic-resistant *Staphylococcus aureus* in the hospital setting. An important agricultural product, citrus is mostly used in the culinary business to make fresh juice. The residual peel and pomaces from citrus processing are by-products that have been used to make pectin, molasses, fragrances, and compounds that fight germs and free radicals, like phenolic acids and flavonoids **[39].**

Detection the antibiofilm activity of LiO2 NPs against bacterial isolates

The antibiofilm activity of Lithium superoxide (LiO2) carried by microtiter plate also; LiO2 NPs were prepared in different concentrations and used as antimicrobial materials on biofilm of *Klebsiella*. Current study revealed that all prepared concentration of LiO2NPs had the antibiofilm activity against *Klebsiella,* and higher activity was achieved by 3.9 μg / ml concentration, figure (4).
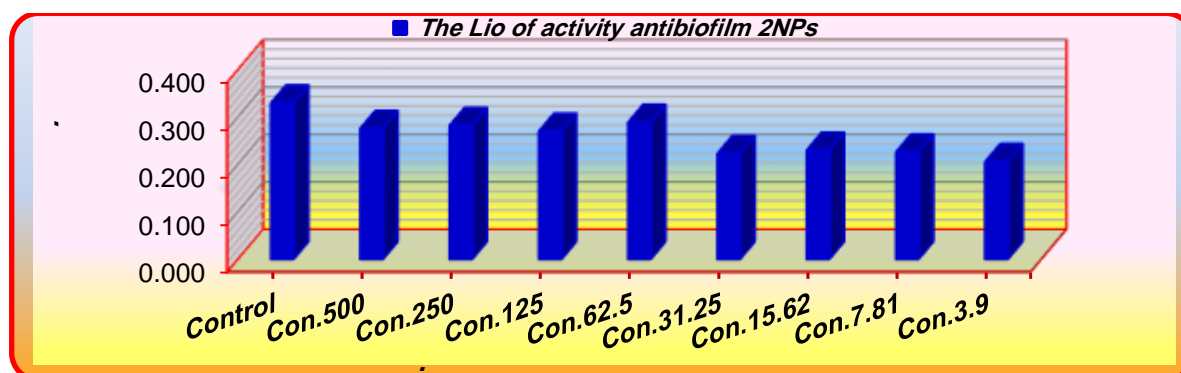
Figure (4): Antibiofilm activity of LiO2 against *Klebsiella*

Some studies have indicated that nanoparticles significantly restrict the growth of some bacterial strains, despite the paucity of research on the impact of LiO2 on biofilms. For instance, a study by **Gatta *et al.* [40]** discovered that *Streptococcus pyogenes* and *Bacillus subtilis* were less affected by silver and copper nanoparticles than *Pseudomonas aeruginosa* and *E. coli*. Silver nanoparticles alone had a better impact on *Candida albicans* growth compared to other treatments. A study conducted at Lahore College for Women University proved the antibacterial impact of zinc oxide nanoparticles (ZnO NPs), which are well recognized antimicrobial agents and are regarded as nontoxic and bio-safe (*E. coli*) **[41].** Additionally, this study showed that nanoparticles are among the most potent therapeutic agents. According to **Al-**

Salmany [42], adherent cells and the mature biofilm that *C. albicans* generated were affected by nanoparticles (Ag and Li O2).

Detection the synergitic antibiofilm activity of LiO2 NPs and Lime juice against bacterial isolates

LiO2 NPs and lime juice have a synergistic effect that has been studied as well. It was discovered that when these two substances were combined, the antibiofilm activity was increased and had a greater effect against Klebsiella at a concentration of 6.25 g/ml from lime juice and 3.9 g/ml from LiO2 NPs. Previous studies indicated that combining antimicrobial agents was more effective than using any one agent alone. For instance, **Sharma *et al.*, [43**] showed that multidrug resistant microbes can be treated with a combination therapy of antibiotics and nanoparticles. Using the traditional microdilution approach, they also looked at the antibacterial effects of doped ZnO nanoparticles (ZnO NPs) on fungus, gram-positive and gram-negative bacteria.. **Gatta *et al.*, [40]**, revealed that geranium extract works well as an antibacterial when combined with nanoparticles (silver nanoparticles and copper nanoparticles). A different study revealed that *Candida albicans* and *C. glabrata* biofilms were resistant to the antifungal effects of silver nanoparticles when combined with chlorhexidine digluconate and nystatin **[44]**.
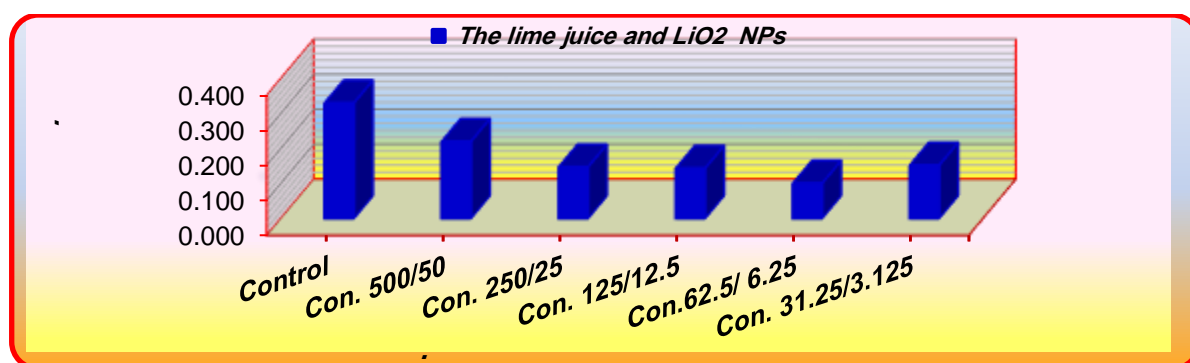

Figure (5): Antibiofilm activity of lime juice and LiO2 against *Klebsiella*

Conclusions:

The results of current study revealed that lime extract and LiO2NPs had the antibiofilm effect against *Klebsiella* isolates when each one of them was used alone or when the combination between them was accur.

References:

1. **Fankhauser**, D. B. (2007). Fankhauser's Cheese Page. *Taken To*, *9*(23), 2007.

2. **Evrendilek**, G.A., Koca, N., Harper, J.W. and Balasubramaniam, V.M. 2008. High-pressure processing of Turkish white cheese for microbial inactivation. Ournal of Food Protection 71(1):102-108.

3. **Sophie** Marchand, Jan De Block, Valerie De Jonghe.(2012). An Coorevits, Marc Heyndrickx, and Lieve Herman. Comprehensive Reviews in Food Science and Food Safety. 11:133-147.

4. **World Health Organization.** (2008). *Foodborne disease outbreaks: guidelines for investigation and control.* World Health Organization.

5. **Mohammed** FA. The incidence of enterobacteriaceae causing food poisoning in some meat products. Adv J Food Sci Technol. 2011;3(2):116–121.

6. **Duong** L, Green L, EHS-Net. The relationship between restaurant ill worker policies and working while ill. Atlanta: Centres for Disease Control and Prevention; 2012.

7. **Ryan**, K. J., & Ray, C. G. (2004). Medical microbiology. *McGraw Hill*, *4*, 370.

8. **Aibinu**, I, Adenipekun, E and Odugbemi, T. (2004). Emergence of Quinolone Resistance amongst Escherichia coli strains isolated from clinical infections in some Lagos State Hospitals in Nigeria. Nig. J. Hlth. Biomed. Sci. 3(2):73-78.

9. **M. Ou**. (1989). ―Chinese–English manual of common-used in traditional Chinese medicine‖, Hong Kong: Joint Publishing Co., pp.348-349,

10. **Nascimento** GG, Locatelli J, Freitas PC and Silva GL. Antibacterial activity of plant extracts and phytochemicals on antibiotic resistant bacteria. Braz J Microbiol 2000; 31: 247–256.

11. **Abeysinghe** PD. Antibacterial Activity of some Medicinal Mangroves against Antibiotic Resistant Pathogenic Bacteria. Indian J Pharm Sci 2010; 72(2): 167-172.

12. **Jo** C, Park BJ, Chung SH, Kim CB, Cha BS, Byun MW. Antibacterial and anti-fungal activity of citrus (Citrus unshiu) essential oil extracted from peel by-products. Food Sci Biotechnol 2004; 13: 384-386.

13. **Ortuño** A, Báidez A, Gómez P, Arcas MC, Porras I, García- Lidón A and Del Río JA. Citrus paradisiand Citrus sinensis Flavonoids: Their influence in the defense mechanism against Penicillium digitatum. Food Chem 2006; 98: 351-358.

14. **Burt** SA. Essential oils: Their antibacterial properties and potential applications in foods: A review. Inter. J. Food Microbiol 2004; 94: 223-253.

15. **Feynman** R. There's plenty of room at the bottom. Science. 1991;254:1300-1301

16. **Ravishankar** Rai, V., & Jamuna Bai, A. (2011). Nanoparticles and their potential application as antimicrobials. *A Méndez-Vilas A, editor. Mysore: Formatex.*

17. **Gutierrez** FM, Olive PL, Banuelos A, Orrantia E, Nino N, Sanchez EM, Ruiz F, Bach H, Gay YA. Synthesis, characterization, and evaluation of antimicrobial and cytotoxic effect of silver and titanium nanoparticles. Nanomedicine. 2010;6:681-688.

18. **Freeman**, D.J., Falkiner FR, Keane CT. (1989). New method for detecting slime production by coagulase negative staphylococci. J Clin Pathol;42:872–4.

19. **Kouidhi**,B. T. Zmantar, H. Hentati, and A. Bakhrouf, .(2010). ―Cell surface hydrophobicity, biofilmformation, adhesives properties and molecular detection of adhesins genes in Staphylococcus aureus associated to dental caries,‖ Microbial Pathogenesis, vol. 49, no. 1-2, pp. 14–22.

20. **Ansari**, M.A. M.K. Haris, A.K. Aijaz, S. Asfia,and A. Ameer. (2009). Synthesis and characterization of the antibacterial potential of ZnO nanoparticles against extended-spectrum b-lactamases-producing E.coli and K. pneumoniaeisolated from a tertiary care hospital of North India. Appl.Microbiol. Biotech.10, 3733– 3736

21. **Owhe-Ureghe**, U., Ehwarieme, D. and Eboh, D. (2010). Antibacterial activity of garlic and lime on isolates of extracted carious teeth. African Journal of Biotechnology 9(21): 3163-3166.

22. **Schiemann,** D. A. (1976). Occurrence of Klebsiella pneumoniae in dairy products. *Journal of Milk and Food Technology*, *39*(7), 467-469.

23. **Massa,** S., Gardini, F., Sinigaglia, M., & Guerzoni, M. E. (1992). Klebsiella pneumoniae as a spoilage organism in mozzarella cheese. *Journal of Dairy Science*, *75*(6), 1411-1414.

24. **Podder,** M. P., Rogers, L., Daley, P. K., Keefe, G. P., Whitney, H. G., & Tahlan, K. (2014). Klebsiella species associated with bovine mastitis in Newfoundland. *PloS one*, *9*(9), e106518.

25. **Mladenović,** K. G., Muruzović, M. Ž., Žugić Petrović, T., Stefanović, O. D., & Čomić, L. R. (2018). Isolation and identification of Enterobacteriaceae from traditional Serbian cheese and their physiological characteristics. *Journal of Food Safety*, *38*(1), e12387.

26. **Rendos,** 1. 1., R. 1. Eberhart, and E. M. Kesler. 1975. Microbial populations of teats end of dairy cows and bedding materials. 1. Dairy Sci. 58:1492

27. **Hassan**, *et al.,* (2011). Evaluation of different detection methods of biofilm formation in the clinical isolates1.Braz J Infect Dis 2011; 15(4):305-311.

28. **Aziz**, R. A. R., & Al-Jubori, S. S. (2017). Characterization of biofilm production in antibiotic resistant klebsiella pneumonia isolated from different clinical samples in iraqi hospitals. *Journal of Global Pharma Technology*, *2*, 26-34.

29. **Maldonado**, N. C., Silva de Ruiz, C., Cecilia, M., & Nader-Macias, M. E. (2007). A simple technique to detect Klebsiella biofilm-forming-strains. Inhibitory potential of

Lactobacillus fermentum CRL 1058 whole cells and products. *Communicating current research and educational topics and Trends in Applied Microbiology*, 52-59.

30. **Oleiwi**, S. R., & Abid, H. K. (2014). Role of Extracted Genomic DNA on Biofilm Formation byPseudomonas aeruginosa and Klebsiellapneumoniae in vitr. *Ibn Al-Haitham Journal For Pure And Applied Science*, *27*(3), 34-44.

31. **Pour**, N. K., Dusane, D. H., Dhakephalkar, P. K., Zamin, F. R., Zinjarde, S. S., & Chopade, B. A. (2011). Biofilm formation by Acinetobacter baumannii strains isolated from urinary tract infection and urinary catheters. *FEMS Immunology & Medical Microbiology*, *62*(3), 328-338.

32. **Bellifa**, S., Hassaine, H., Balestrino, D., Charbonnel, N., Mrsquo, I., Terki, I. K., ... & Forestier, C. (2013). Evaluation of biofilm formation of Klebsiella pneumoniae isolated from medical devices at the University Hospital of Tlemcen, Algeria. *African Journal of Microbiology Research*, *7*(49), 5558-5564.

33. **Jamala**, M., Hussaina, T., Dasb, C., & Andleeba, S. (2015). Inhibition of clinical multi-drug resistant Klebsiella pneumoniae biofilm by Siphoviridae bacteriophage Z. *Sci Lett*, *3*(2), 122-6.

34. **Sultan,** A. M., & Nabiel, Y. (2019). Tube method and Congo red agar versus tissue culture plate method for detection of biofilm production by uropathogens isolated from midstream urine: Which one could be better?. *African Journal of Clinical and Experimental Microbiology*, *20*(1), 60-66.

35. **Ruchi,** T., Sujata, B., & Anuradha, D. (2015). Comparison of phenotypic methods for the detection of biofilm production in uro-pathogens in a tertiary care hospital in India. *Int J Curr Microbiol App Sci*, *4*(9), 840-49.

36. **Hassan**, A., Usman, J., Kaleem, F., Omair, M., Khalid, A., & Iqbal, M. (2011). Evaluation of different detection methods of biofilm formation in the clinical isolates. *Brazilian Journal of Infectious Diseases*, *15*(4), 305-311.

37. **Caputo**, L., Quintieri, L., Cavalluzzi, M., Lentini, G., & Habtemariam, S. (2018). Antimicrobial and antibiofilm activities of citrus water-extracts obtained by microwave-assisted and conventional methods. *Biomedicines*, *6*(2), 70.

38. **Adukwu**, E. C., Allen, S. C., & Phillips, C. A. (2012). The anti-biofilm activity of lemongrass (C ymbopogon flexuosus) and grapefruit (C itrus paradisi) essential oils against five strains of S taphylococcus aureus. *Journal of Applied Microbiology*, *113*(5), 1217-1227.

39. **Shan** Y. Comprehensive Utilization of Citrus by-Products. Academic Press; London, UK: 2016. pp. 335–365.

40. **Gatta**, A., Jawad, M., Bahjat, A., Al-ani, N., & Ali, A. (2015). Antimicrobial activities of geranium extract and silver, copper nanoparticles. *IJBPR, 6*, 84-86.

41. **Farzana,** R., Iqra, P., Shafaq, F., Sumaira, S., Zakia, K., Hunaiza, T., & Husna, M. (2017). Antimicrobial behavior of Zinc oxide nanoparticles and β-lactam antibiotics against pathogenic Bacteria. *Arch. Clin. Microbiol*, *8*, 57.

42. **Al-Salmany**, S.T. J. (2016).The Effect of Nanoparticles on the Virulence and Pathogenicity of Candida spp. Ph.D. thesis, PP: 210.

43. **Sharma**, N., Jandaik, S., & Kumar, S. (2016). Synergistic activity of doped zinc oxide nanoparticles with antibiotics: ciprofloxacin, ampicillin, fluconazole and amphotericin B against pathogenic microorganisms. *Anais da Academia Brasileira de Ciências*, *88*(3), 1689-1698.

44. **Monteiro**, D.R.; Silva, S.;Negri, M.;Gorup, L.F.; de Camargo, E.R.,Oliveira, R.;Barbosa, D.B. and Henriques, M.(2013).Antifungal activity of silver nanoparticles in combination with nystatin and chlorhexidine digluconate against Candida albicans and Candida glabrata biofilms. Appl. Microbiol.25:1-9.

ISOLATION AND IDENTIFICATION OF AIR BORNE FUNGI IN HOUSE 'S ROOMS OF MOSUL CITY AND RELATION OF SENSITIVITY DISEASES

Abeer Ahmed MAHMOOD[1]

Abstract:

This study was conducted to isolate fungi from air of (bedroom, kitchen and sitting room) of two (2) houses in fifteen (15) areas of east and west side of Mosul city which largest in the north of Iraq. A total of 165 fungal colonies (88in west,77 in east) were isolated ,the genera Aspergillus, Penicillium, Fusarium, Alternaria, Cladosporium, Heliminthosporium, Stemphylium, Botrytis.   Penicillium was most prevalent fungal genera 38% in Wadihajar and the 10% in Masarif ,also Aspergillus 14% in east side and 6% in old city of west side of Mosul then Alternaria with rate of 5% in Masarif , 4% in old city and Cladosporium in Wadihajar, Khadraa with rate 3%, in each other .Using Czapek yeast extract(CYA), Malt extract agar(MEA) and 25% Glycerol nitrate agar (G25N)showed Penicillium italicum was most fungal species recorded in Wadihajar(22colonies in bedroom)Also, Penicillium digitatum was recorded in Wadihajar and Yarmouk, Aspergillus niger dominant in Masarif (4 in bedroom and sitting room in same house). . Generally, Wadihajar and Amil district were most contaminated in east and Masarif, Hadba in west reflexes of that 50- 40% of People in Masarif ,50- 16.6% in Muhandisin in east side of Mosul and 28.5% in Yarmouk district in west side suffered from respiratory allergic disease.

Key words: Eastern Districts, Respiratory Allergy, Aspergillus, Penicillium, Westerns Districts.

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Introduction:

Currently, human beings spent almost of their life in houses, so the poor houses and bad ventilated houses and offices were perfect habitat for fungi and yeasts(Carrer,2018).The dust in a house is a fibrous substance made mostly of a textile matrix, fibers, hairs, and shed detritus. Ascomycota and Zygomycota anamorphic fungus, commonly referred to as "moulds," are currently responsible for indoor contamination in North America. *Alternaria alternata, Aureobasidium pullulans, Aspergillus versicolor, Penicillium chrysogenum, Cladosporium cladosporioides, P. spinulosum, Aspergillus niger, and Trichoderma viride* were the most prevalent genera. (Scott,2000).Primary irritability, infections, allergies, and toxic consequences are a few forms of human health conditions that have been linked to exposure to fungi. (Bush, Portnoy ,2001.Kurup, Shen ,2000. Guneser ,et al,1994). The fungus species *Aspergillus niger, Penicillium citrinum, and Penicillium brevicompacyum* are all known to generate mycotoxin, and the Penicillium genus is frequently linked to allergies. (Kurup,et al,2000).Hypersensitivity diseases caused by fungi like *Aspergillus* and *Curvularia* . Patients with asthma may develop allergic bronchopulmonary aspergillosis (ABPA), which is characterized by a long-term colonization of the airways with the fungus Aspergillus fumigatus. (Sehgal,et al,2019) higher rate of fungi frequency in a three areas to Hilla in Iraq was 6 – 36% caused by *Aspergillus niger* (Abassi, Samaei ,2018) many of researchers study fungal and bacterial contaminates inside buildings, like hospitals, schools ,shopping centers and University campus (AL-Rejaboo, Jalalulden ,2019. Rostami,et al,2017. Rose,et al,2004). Also *Aspergillus niger, Aspergillus fumigatus* and *Aspergillus flavus* were isolated from carpets and floor dust samples from Usman Danfoido University with 100%(percentage frequency of occurrence) to *Aspergillus niger* while least percentage frequency is 8% to *Aspergillus ustus* a black *Aspergillus,* notably *Aspergillus niger, Aspergillus cuebonarius, and Aspergillus wehwitschiar* in interior environments of six different nations revealed that Thailand had the largest species diversity in indoor samples, while Algeria had the lowest. (Varga,et al,2014) . *Cladosporium, Aspergillus, and Penicillium* made up the majority of the fungal indoor environments that were recorded in 15 residences in Kitchener, Canada ,besides *Leptosphaeria* ,Unidentified basidiospores , *Ganoderma , Alternaria* and *Epicoccum.* Most fungal species recorded indoors showed seasonal periodicities similar to outdoor but with lower counts in summer than outdoors, with the exception of *Penicillium ,Aspergillus* which show no seasonal patterns(De-Weiet al,1995)

With an incidence of 1: 3500, cystic fibrosis (CF) is the most prevalent uncommon genetic disease in Europe and the United States. (Farell,2008) As a result,

around 40% of CF patients have *Aspergillus spp.* isolation(Armstead ,et al,2014) and the most prevalent fungal taxa *(Aspergillus fumigatus, Candida spp., Scedosporium apiospermum, Lomentospora* species, and *Exophiala dermatitidis*) found in CF. (Renner,et al,2020) . Lower lung function and higher co-morbidities have been observed in people with CF and ABPA (Allergic Bronchopulmonary Aspergillosis), suggesting a potential acceleration of the CF disease course. (Janahi,et al,2017. Poore et al,2021).

MATERIAL AND METHODS

1-Sample collection

Samples were collected from 15 districts in Mosul city(9 in east,6 in West). .From each district samples collected in bedrooms, kitchens and sitting rooms in two houses by opening petri dishes have PDA medium which sterilized by autoclave (121c°) for15 min . Streptomycin antibiotic was applied, and it was then opened for 30 to 60 minutes (1.5 meter height) closed and incubated at (28c°) for seven days (AL-Rejaboo,Jalaldin, ,2019. Salah, et al 2013. Rafai ,et al,2015) .

2-Diagnosing fungi

Petri dishes which contain fungi screened by counting number of colonies, color, texture, microscopic examination was carried out by taking portion of the colony and affixing it to clean glass and adding one drop of cotton blue lacto phenol (Crystal phenol dissolved in 20 ml Glycerin and 10 ml lactic acid) diagnosing was based on colonial and cellular morphology of the fungi depending on the classification key(Rafai et al,,2015 – Pitt, Hocking ,1985. - Domsch,et al,1980, Davood,et al,2021) .

3-Diagnosing *Aspergillus* and *Penicillium*

Purified colonies of a *Aspergillus* and *Penicillium* were done before Employing three different mediums, identification Malt extract agar (MEA), Czapek yeast extract (CYA), and 25% glycerol nitrate agar (G25N)So the culture media inoculated equally by spore suspension which taken from solid agar consisting of 0.2 - 0.4 Spore suspension in 5 ml ,Slant with concentration 0.2 agar with 0.05 tween 80 sterilized by autoclaving at 121c0 for 15 min, the semisolid agar inoculated with spore suspension and parts of hypha by sterile Loop before sterilized loop again inoculations the medium in 5c° for growth of spores after incubation in three different temperatures(5, 25,37c°) for seven days to count colonies diameter and another characteristic depending of the classification Keys mentioned above.

4- Allergy diseases test

Diagnosis of allergy diseases was on the basis of a history of sensitive disease since in seasonal or perennial done by skin prick test where considered positive if the mean wheal diameter was 3mm or above and it was applied in Mosul hospital Laboratories.

RESULTS AND DISCUSSION

Utilizing settle plates, the distribution and diversity of indoor airborne fungus were assessed in the current investigation (Ghabfarokhi et al,2014. Davood,et al,2021. Topbas, et al,2005) .Tables1and 2 refers to predominant fungi like *Aspergillus Cladosporium, Stemphillium, Rhizoctonia* as in figure1.

Table1: Studies on airborne fungi from different sites in two houses of western districts

Districts	Houses	predominant fungi		
		Bed rooms	Sitting rooms	Kitchens
	A	*Stemphylium sp(1)*	*Aspergillus fumigates(2)* *Cladosporium sp(1)*	*Aspergillus sp (1)*
Amil	B		*Aspergillus sp(1)*	*Penicillium sp(1)* *Alternaria sp(1)*
Reffai	A			*Alternaria alternata(1)*
	B			*Penicillium sp(2)*
Yarmouk	A		*Penicillium.digitatum(1)*	*Rhizoctonia solani(1)*
	B	*Cladosporium sp(1)* *Aspergillus sp (1)* *Alternaria sp(1)* *Penicillium sp(1)*		*Penicillium sp(1)*
Wadihajar	A	*Penicillium italicum(20)*	*Penicillium sp(6)* . *Cladospoium cladosporioides(1)*	*Rhizopus stolinifera(1)*
	B	*Cladospoium cladosporioides(1)* *Penicillium italicum(2)*	*Aspergillus fumigates(1)*	*Botrytis.sp(1)* *Penicillium sp(1)* *Fusarium sp(1)*
Old city	A	*Aspergillus sp(1)*	*Aspergillus niger(1)*	*Alternaria citri(1)*
	B	*Penicillium italicum(1)* *Aspergillus fumigatus(2)* *Alternaria sp(1)*	*Aspergillus ustus(1)*	*Cladosporium sp(1)* *Alternaria citri(1)* *Penicillium italicum(1)*
17 Tammuz	A	*Alternaria alternata(1)* *Stemphyliumsp(2)*	*Penicillium.digitatum(1)* *Fusarium sp(1*	*Aspergillus niger(1)* *Fusarium sp(1)*
	B	*Penicillium sp(2)*	*Aspergillus niger(1)* *Penicillium sp(1)*	*Rhizoctonia solani(1)* *Aspergillus flavus(1)*

Note: the number of brackets refer to number of colony for each fungi

Table2: Studies on airborne fungi from different sites in two houses of Eastern districts

		predominant fungi		
Districts	**Houses**	**Bed rooms**	**Sitting rooms**	**[j]Kitchens**
Masarif	A	*Alternaria alternata(2)* *Aspergillus sp(2)*	*Aspergillus candidus(1)*	*Penicillium italicum*(2)
	B	*Penicillium sp(6)* *Aspergillus niger(4)*	*Alternaria sp(2)* *Cladosporium sp(1)* *Aspergillus niger(4)*	*Penicillium italicum(1)* *Aspergillus sp(1)*
Zuhour	A	*Aspergillus sp(1)*	*Cladosporium sp(1(* *Rhizopus stolinifera(1)*	*Penicillium sp(1)*
	B	*Alternaria alternata(1)*		*Aspergillus niger(1)* *Aspergilus sp(1)*
Arabi	A	*Alternaria alternata(1)* *Fusarium sp(1)*	*Aspergillus sp(1)*	*Alternaria alternata(1)* *Botrytis sp(1)* *,Rhizoctonia solani(4)*
	B		*Aspergillus sp(1)* *Alternaria alternata(1)*	
Hadba	A	*Cladosporium sp(1)*	*Aspergillus flavus(3)*	*Alternaria alternata(1)* *Penicillium solitun(2)*
	B	*Aspergillus sp(1)* *Penicillium sp(2)*		
Muhandisin	A	*Aspergillus fumigates(1)*	*Aspergillus niger(1)*	*Cladosporium sphaerosperime(1)*
	B			*Rhizoctoniz solani*(1) *Penicillium sp(1)*
Khadraa	A			*Cladosporium sp(2)* *Rhizoctonia solani(3)*
	B	*Heliminthosporium sp(1)*	*Fusarium sp(2)* *Aspergillus fumigates(1)*	*Cladosporium variable(1)*
Kafaat	A		*Aspergillus niger(1)* *Penicillium italicum*(1)	
	B	*Penicillium griseofulvum(1)*	*Penicillium italicum*(1)	
Samah	A	*Alternaria alternata(1)*	*Fusarium sp(1)*	*Rhizoctonia solani(1)* *Stemphylium sp(1)*
	B		*Heliminthosporium sp(1)*	
Wahida	A		*Aspergillus niger(1)* *Penicillium sp(1)*	
	B	*Penicillium sp(1)*	*Penicillium chrysogenum(1)* *Stemphylium vesicarium(1)*	

Note: the number of brackets refer to number of colony for each fung
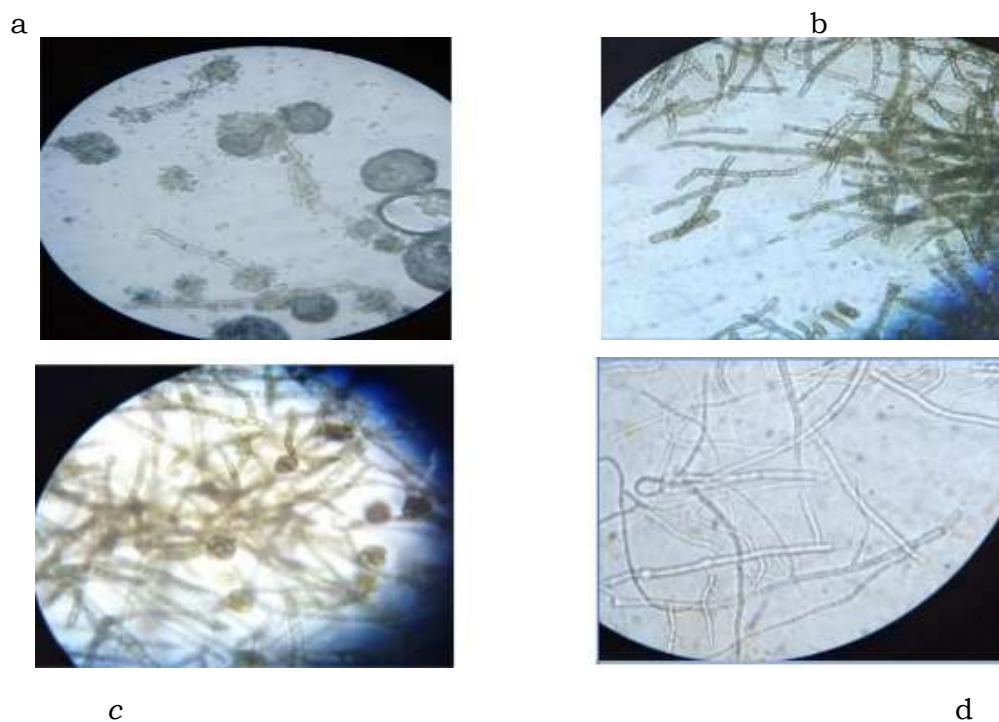
Figure1: a- *Aspergillus flavus* b- *Cladosporium sp* c-*Stemphyllium sp*

d- *Rhizoctonia solani*(40x)

It is found from figure 2 that Wadihajar was most contaminated district with *Penicillium italicum* , this result promotes(Dharmaga et al,2002).Yarmouk and 17 Tammuz also contaminated of *Penicillium digitatum* in sitting room of A house ,*Aspergillus* isolated in all western district except Reffai , *Aspergillus* was the most fungi dominant in western districts, especially *Aspergillus niger* (AL-Herthi,2005. Helene,2020) .Masarif district contaminated of *Aspergillus* and *Penicillium* 14 – 10% consequently ,*Aspergillus niger* was most dominant in this district especially in sitting room of B house figure3 .Also *Alternaria alternata* was prevalent than the other species of *Alternaria* (Nascimento et al,2019) *Heliminthosporium* was less spread from other fungi and this result agree with a former study Aliya,Gambo,2014)
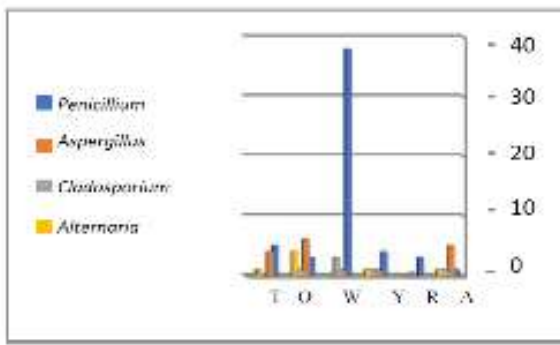
Western districts

T:17 Tammuz,O:Old
city,W:Wadihajir
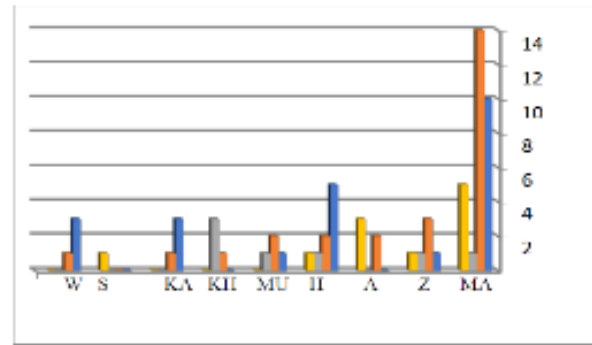
Eastern districts

W:Wahida,S:Samah,KA:Kafaat,
Kh:Khadraa, MU:Muhadisin,H:Hadba ,

**Figure 2: Frequency occurrence of predominant fungi in houses
of Mosul city**

(a)

(b)

**Figure3: *Aspergillus niger(a)*conidial head and conidiophore 40*x* (b) colonies on
CYA,G25N,MEA , 5c⁰,25c⁰,37c⁰.**

Table 3 Explain that highest percentage rate of susceptibility to person who live in testing house found in Masarif district in both A and B houses 40% ,50% in east side ,While Yarmouk also suffered from respiratory allergy 28.5% in A house as in table 4,this results revealed relationship between air contamination and respiratory disease .Ascomycetes and Basidomycetes are most predominantly allergies indoor air of school (Reddy et al,2017)*Aspergillus,Penicillium,Rhizopus,Alternaria,Cladosporium,Curvularia,* all these genera responsible of hyper respiratory allergy disease (Hasanain et al,1998) A total of 10% people have sensitive against mold and fungi (Burge ,2001) the basic source of indoor count contamination coming from outdoor air(

Abassi,.Samaei,2019). Germany most contaminated of *Aspergillus ,Penicillium, Alternaria, Cladosporium* while Canada leas(1000fu/m³-150fu/m³)respectively(Nascimento et al,2019).

Table3: Percentage of patients of respiratory allergic in houses of eastern districts

Distrcts	Houses	H	P	Types of allergic diseases				Percentage rate
				R	S	F	M	
Masarif	A	6	4	++++	+	-	-	40%
	B	1	2	+ +	+ +	+	+	50%
Zuhour	A	3	1	-	-	+	+	0%
	B	8	1	+	-	-	-	13%
Arabi	A	3	1	+	-	+	-	25%
	B	6	3	+ + +	-	-	-	33.3%
Hadba	A	4	1	-	+ +	-	-	0%
	B	2	1	+	+	-	-	33.3%
Muhandisin	A	5	1	+	+	-	-	16.6%
	B	3	3	+ ++	+	-	+	50%
Khadraa	A	6	1	+ +	+	-	++	28.5%
	B	5	0	-	-	-	-	0%
Kafaat	A	6	1	+	-	-	-	14.2%
	B	2	0	-	-	-	-	0%
Samah	A	5	0	-	-	-	-	0%
	B	4	0	-	-	-	-	0%
Wahida	A	2	1	+	-	-	-	33.3%
	B	5	0	-	-	-	-	0%

H: healthy, P: patients, R: respiratory, S: skin, F: food, M: medicine

Table4: Percentage of patients of respiratory allergic in houses of western districts

Districts	Houses	H	P	R	S	F	M	Percentage rate
Amil	A	9	1	-	+	-	-	0%
	B	7	0	-	-	-	-	0%
Reffai	A	8	2	+	+	-	-	10%
	B	4	0	-	-	-	-	0%
Yarmouk	A	6	1	+ +	+	-	-	28.5%
	B	5	0	-	-	-	-	0%
Wadihajar	A	12	1	++	+	-	-	15.3%
	B	7	0	-	-	-	-	0%
Old city	A	7	1	+	-	+	+	12.5%
	B	8	0	-	-	-	-	0%
17 Tammuz	A	7	1	-	-	+	+	0%
	B	7	1	-	-	-	-	0%

H: healthy, P: patients, R: respiratory, S: skin, F: food, M: medicine

Conclusion

The detection of indoor air fungi revealed that the Mosul city as in any of the tested houses in 15 districts harbors various species of fungi, especially Aspergillus and Penicillium which were most predominant of all species and Masarif in east

side was the most contaminated restrict in Mosul City, from results There is relationship between predominant fungi and Allergy disease, especially respiratory allergy disease. It can be said that a good percentage of fungi isolated may have Counteraction health effect on concern of such indoor environment.

References

1- Abassi F.Samaei MR.The effect of temperature on airborne filaments fungi in the indoor and outdoor space of a hospital .Env .Sci.Poll.Res. 2018.26(2):1-9.doi:10.1007/s11356-017-0939-5.Epub2018 jan 3.

2- AL-Herthi AA. Isolation and Identification of some indoor dust fungi and their effect on the respiratory system. . 2005. Master Thesis.University of Mosul .Iraq.

3- Aliya.SH.S;Gambo A.Isolation and identification of air borne fungal spores and fragments in building within Usman Danfiodiya University ,Sokoto,Nigeria.Aceh.Int.J. Sic .Technol. 2014.3(67-72).

4-AL-Rejaboo M.. Jalalulden AM.Studying the airborne fungi of some rooms in the internal sections of Mosul University Campus and the possibility of using Sage plants to control it. Journal of Advanced Pharmacy Education &Research. . 2019 .9(3):17-22.

5-Armstead J.Morris j.Denning DW.Multi-Country Estimate of Different anifestations of Aspergillosis in cystic fibrosis.polSONE2014,9,e98502doi: 10.1371/journal.pone.0098502.

6- Burge HA.Fungi :Toxic killers or unavoidable nuisances. Annals of Allergy, Asthma and Immunology.J.2001.87(6):52-5

7-Bush RK . Portnoy JM. The role and abatement of fungal allergens in allergic diseases .J .Allergy Clin. Immunal. . 2001.107:430-440.

8-Carrer P .Wolkoff Assessment of Indoor Air Quality Problems in Office-like Environments Role of Occupational Health Services.2018.International journal of Envionmental Reaserch and public Health,15,741,doi:10.3390/ijerph1504741.

9-Davood J . Mohamad HD. Abdolmajid F. Mahmood A. Assessment of Airborne Bacterial and Fungal Communities in Shahrekord Hospitals.2021.Journal of Environmental and Public Health Volume 2021, Article ID 8864051, 7 pages https://doi.org/10.1155/2021/8864051.

10-De-Wei L. Bryce K.Ayear-round comparison of fungal spores in indoor and ouydoor air.Mycologia. 1995.,87(2):190-195.

11-Dharmaga S.Bailey M.Raven J.Mitakakis T.Cheng,A.Guest,D.Rolland J.Forbes A.Thien F. Abramson M. Walters H.Current indoor allergen levels of fungi and cats, but not house dust mites ,influence allergy and asthma in adults with high dust mite exposure. Am .J. Respir. Crit. Care MAD. 2001.164(1):65-71.

12- Domsch KH. Gams W. AndersonTH. "Compendium of Soil Fungi". Academic Press, London. 1980 p. 859 ..

13-Farell PM. The prevalence of cystic fibrosis in the European Union . Journal of Cystic Fibrosis.2008, 7(5):450-3 DOI: 10.1016/j.jcf.2008.03.007

14-Ghabfarokhi MSH. Gharegbolagh SA . Abyaneh MRI. Investigation on distribution of airborne fungi in outdoor envirpment in Tehran,Iran.Journal of Enviromental Health Science and Engineering. 2014.12:54.http://www.ijehse.com/content/12/1/54

15- Guneser S. Atici A. Koksal F. Yaman A. Mold allergy in Adna Turkey. allergy Imm.Path.Madril . 1994.22(2):52.

16- Hasanain SM. Al-frayh A.Gad MO.Alsedairy S.Airborne Alternaria spores;potential allergic sensitizers in Saudi Arabia.Ann.Saudi.Med. 1998 .18(6):497-501DOI:10.5144/0256-4947.1998.497 .

17-Helene NH. Shen Y. Corinne H .Vincent P. Dusan L. Joelle G P Fungal Contaminants in Energy Efficient Dwellings: Impact of. Ventilation Type and Level of Urbanization.2020 Int. J. Environ. Res. Public Health2020, 17, 4936; doi:10.3390/ijerph17144936

18-Janahi IA .Rehman A . AL-Naimi.AR. Allergic bronchopulmonary aspergillosis in patients with cystic fibrosis.Ann.Thorac.Med.2017,l2:74-82. .[CrossRef] [PubMed]

19-KurupVP..Shen HD. Banejee B .Respiratory fungal allergy .Microbes and fection.2000,2(9),1101-1110,doi;10.1016/S1286-4579(00)01264-8 .

20- Nascimento.JPM. Lopez AMQ. Araujo MA. Arauja LA. Filho EAS.Air borne fungi in indoor hospital environments.Int.J.Curr.Microbial App.Sci. 2019.8(1):2749-2772.http://doi.org/10.20546/ijcmas.2019.801.291.

21- Pitt JI. Hocking AD. Fungi and Food Spoilage. Sydney. Academic Press., 1985 p.405.

22-Poore TS .Hong G . Zemanick T .Fungal Infection and Inflammation in Cystic Fibrosis.2021.Pathogens

2021,10,618.https://doi.org/10.3390/Pathogens10050618

23- Rafai M.Elyazid H. Tawakkol WThe Genus Penicillium".Depatment of Microbiology ,Faculty of Veterinary Medicine,Cairo University Egypt. 2015.",pp120-148.

24- Reddy MK..Srinivas T.Molds allergy in indoor play school environment.Energy Procedia 2017.109(2007):27-33.(http://creativecommons.org/licenses/by-nc-nd/4.0/)

25-Renner S.Nachbaur E.Jaksch P and Dehlink.E. Update on Respiratory Fungal Infections in Cystic Fibrosis Lung Disease and after Lung Transplantation. 2020.J.Fngi.6,381;doi:10.3390/jof6040381.

26-Rose CR.M.Terezinha ES.Ulisses A .Galdino A.Studies on fungal and bacterial population of air conditioned environment. . 2004.Brazilian Archives of Biology and Technology.47(5):827-835. DOI: 10.1590/S1516-89132004000500020.

27- Rostami N. Alidadi H. Zarrinfa ,H.Aleh P.Assessment of indoor and outdoor airborne fungi in an educational, research and treatment center.Ita.J.Med. . 2017 11:52-56.https://doi.org/10.4081/itjm.2016.663.

28-Salah MA. Asaad AA. Majeed MA.The relation between fungi isolated from higher respiratory tract of allergic and asthmatic patients and air fungi in their residenc.Rafidian journal of science. 2013. 24(2):1-12.doi 10.33899/rjs.2013.71017

29-Sehgal IS, Choudhary H, Dhooria S, Aggarwal AN, Bansal S, Garg M, Behera D, Chakrabarti A, Agarwal R. Prevalence of sensitization to Aspergillus flavus in patients with allergic bronchopulmonary aspergillosis. Med Mycol. 2019 Apr 01;57(3):270-276. DOI: 10.1093/mmy/myy012.

30- Scott JA. Studies on indoor fungi. Ph.D. Thesis. 2000. Department of Botany MN in University of Toronto. Canada.

31-Topbas M. Tosun L.Can G. Kaklikkaya N. Aydin F .Identification and seasonal distribution of air fungi in Urban outdoor air in an Eastern black sea Turkish town ,Turky.J.Med.Sci. . 2005.36:31-36.

3-Varga J.Kocsube S.Szigeti G. Barayi N. Vagrology C. Despot.DG. Magyar D. Meijer M. Samson RA . Karic MS.Occurrence of black Aspergilli indoor. . 2014,223.DOI:10.2478/10004-1254-65-2014-2450.

EFFECT OF FATTY EXTRACT OF AZOLLA PLANT WITH DIFFERENT SOLVENTS ON HEMATOLOGICAL AND BIOCHEMICAL PARAMETERS OF COMMON CARP CYPRINUS CARPIO L

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Ahmed Khalaf ABD [2]

Abstract:

The study was conducted in the fish laboratory of the Department of Animal Production in the College of Agriculture and Forestry / the University of Mosul. The experiment included feeding common carp fish using ten experimental diets containing Azolla plant extract at percentages (0.5%, 1%, 1.5%) of each solvent, ether, acetone, and ethanol, and the control was free of additives. Glass tanks were used in the growth experiment of carp fish for a period of 49 days. The results of the statistical analysis showed that the average hemoglobin concentration and the percentage of the volume of compacted blood cells were significantly (P≤ 0.05) higher in the two treatments of fish with fatty extract (petroleum ether 0.5% and acetone 0.5%) than the control treatment and the treatment of fish with fatty extract Acetone for the two concentrations (1 and 1.5) %, noting the arithmetic differences between the other treatments. Best results were found for adding the fatty extract with different solvents to fish diets on total protein, albumin, and globulin in the acetone treatment (05%) and also significantly (P≤ 0.05) the total protein in the ethanol treatment (1.5%) and the albumin increased in the ether treatment. Petroleum (0.5%), acetone 1%, and ethanol (0.5% and 1.5%). A significant decrease was observed in the average concentration of glucose, cholesterol, and triglycerides in the blood serum of fish treated with fatty extract and according to solvents (ethanol 0.5% and 1%) for the average concentration of glucose, and acetone (0.5% and 1.5%) for the average of cholesterol and triglycerides, respectively. A significant decrease was observed in the average concentration of the aspartate transporter enzyme and the amino acid Lanin transferase enzyme in the serum of fish treated with the fatty extract (petroleum ether 0.5% and acetone 1%), respectively.

Key words: Azolla Extract, Carp, Various Solvents

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Introduction:

fish farming industry has experienced rapid development due to the increasing demand for the consumption of fish meat because of its great advantages compared to the rest of the animals, due to the high proportion of protein in its meat (Hassan and Hashem, 2016). Common carp, Cyprinus carpio L., is one of the most important cultured fish, as it is characterized by high production rates, rapid growth, resistance to adverse environmental conditions, ease of cultivation, and provision of its requirements. These are typical characteristics of fish to be farmed on a commercial scale (Gupta et al., 2005).

Development in fish farming at the global level has led to an increase in fish production inputs, in particular the feeding process, which constitutes more than 50% of the cost of fish farming. Therefore, it is necessary to search for different alternatives to replace the costly feed ingredients such as fish meal and bean meal. Soy (Sajid et al., 2016) Feed additives from plant extracts have played an important role in aquaculture due to their easy availability and cheapness, as well as containing useful bioactive compounds that stimulate the immune system. A stimulant, stimulates appetite, increases growth, enhances the functioning of the digestive system, increases antioxidants, and is anti-microbial (Gabriel et al., 2015 and Yilmaz, 2019).

Azolla plant is used as a feed for farm animals because of its high nutritional value (Balaji, 2009), as it contains biologically active compounds (flavonoids, saponins, tannins, phenols, anthraquinones). A protein source that is added to animal diets, as the protein percentage reaches 19-30% of the dry weight, contains most of the essential amino acids and is rich in vitamin A, B12, and beta-carotene, as well as minerals such as iron, calcium, magnesium, potassium, phosphorous and manganese (Pillai et al. , 2005).

The Azolla plant is characterized by its ease of cultivation, high yield, good nutritional value, and ability to double its live mass within 2-5 days (Taghi-Ganji et al., 2005), and has an effective effect in preventing the oxidation of meat fat (Prabina. and Kumar, 2010). Because of its high production density, it was used in the feeding of common carp fish, as it transforms the crude protein in the Azolla plant into a better edible protein and reduces the feeding costs of fish in fish production projects (Datta, 2011).

Azolla plant extract is one of the most important alternatives and feeds additives in animal diets, including fish, and due to the lack of studies on the effect of the extract and according to the solvents used on fish, this study aimed to.

A - the rate of total protein, albumin, and globulin

B- Hematological parameters (volume of compacted blood cells and hemoglobin concentration)

C- Biochemical parameters (glucose, cholesterol, and triglycerides with liver enzymes that transport amino acids).

Research materials and methods:

study was conducted in the fisheries laboratory of the Department of Animal Production at the College of Agriculture and Forestry / the University of Mosul for a period of seven weeks, from 3/12/2020 to 21/1/2020 using 20 glass tanks with dimensions (40 x 60 x 40). Cm was placed on steel bearings from three floors and each tank was equipped with an air pump type (RS-510) of Chinese origin, with feeding all tanks with air supply tubes from an AUTO SAN type air compressor of Chinese origin.

In the growth experiment, fingerlings of common carp were used. Cyprinus Carpio L was placed in ponds containing saline solution at a concentration of 3 g/L for 5 minutes until signs of stress appeared on the fish to get rid of bacteria and external parasites, if any (Muhaisen, 1983). 140 fingerlings of carp fish with an average weight of 18.59 ± 2 g/fish were distributed to 20 glass tanks, with seven fish/ponds, and two replicates/treatments.

These basins were equipped with liquefaction water by means of a large tank inside the laboratory in which the water was stored for 24 hours to ensure that it is free of chlorine and to obtain water at a moderate temperature. The temperature of the laboratory was controlled between (25-30) C using air conditioners.

Waste and food residues not eaten by the fish in the ponds were disposed of on a daily basis by partially replacing the pond water by siphoning 20-25% of the aquarium water and adding pure water from the water tank in the laboratory, and the fish were fed twice daily during a period of time. Localization until the start of the search experiment.

The water temperature of the glass tanks was measured during the experiment with a mercury thermometer, and it was at a rate of 24 °C, to ensure a suitable

temperature for the growth of common carp fish, which is 25 °C because it is a warm water fish (Crockford and Johnston, 1990). As for the pH, it was between 7.7 - 8.1 and it was measured by a pH meter type Labtech (Digital Ph Meter). It is within the recommended limits (FAO, 1981).

primary feed materials were brought to the fish laboratory and crushed by a laboratory mill of German origin, and ten experimental rations were made by adding the fat extract of the Azolla plant to the experimental rations in different proportions (zero%), the comparison and (0.5%, 1%, 1.5%) mediated by the fat extract Non-polar solvent ether and (0.5%, 1%, 1.5%) fat extract mediated by partial polar solvent acetone and (0.5%, 1%, 1.5%) fat extract mediated by polar ethanol solvent for treatments (1, 2, 3, 4, 5, 6, 7, 8, 9, 10) respectively, as shown in Table (1).

The proportions of the feed materials were mixed well for the purpose of homogeneity of the mixture for each ration separately. A cup of warm water was added to the mixture, then the mixture was placed in a National type meat mincer (of Japanese origin, with holes 4 mm), where small and cohesive gratings were formed and dried In the laboratory for three days, it was cut into small pieces to fit the size of the mouth of the experimental fish and placed in dark bags to prevent exposure to light and kept inside plastic containers. The relationships are classified as follows:

1- Control diet (1): Free from Azolla plant extract.

2- Diet (2): Adding a fatty extract of the Azolla plant by means of a nonpolar petroleum ether solvent at a rate of 0.5% to the total ratio.

3- Diet (3): Adding a fatty extract of the Azolla plant by means of a nonpolar petroleum ether solvent at a rate of 1% to the total ratio.

4- Diet (4): Adding a fatty extract of the Azolla plant by means of a non-polar petroleum ether solvent at a rate of 1.5% to the total ratio.

5- Diet (5): Adding a fatty extract of the Azolla plant with partial polar solvent acetone at a rate of 0.5% to the total ratio.

6- Diet (6): Adding a fatty extract of the Azolla plant with partial polar solvent acetone at 1% to the total ratio.

7- Diet (7): Adding a fatty extract of the Azolla plant with partial polar solvent acetone at a rate of 1.5% to the total diet.

8- Diet (8): Adding a fatty extract of the Azolla plant with a polar solvent of ethanol at a rate of 0.5% to the total diet.

9- Diet (9): Adding a fatty extract of the Azolla plant with 1% ethanol polar solvent to the total diet.

10- Diet (10): Addition of a fatty extract of the Azolla plant with a polar solvent of ethanol at a rate of 1.5% of the total diet.

experimental fish were fed the experimental diets mentioned in Table (1) at a rate of 3-5% of their body weight, and the system of providing three meals a day from the ration was adopted. Every two weeks using a sensitive electronic scale (0.01) gm, a type of Chinese origin, for a period of seven weeks, the feed provided to the fish was cut off one day per week to increase the appetite of the fish to eat the feed for the next day during the experiment period.

Table (1): Composition of the components of the experimental diets (%) resulting from adding different percentages of the fatty extract of the azalea plant with different solvents.

Transactions	Control	Ether 0.5%	Ether 1%	Ether 1.5%	Acetone %0.5	Acetone %1	Acetone %1.5	Ethanol %0.5	Ethanol %1	Ethanol %1.5
feed ingredients										
Fish meal	12	12	12	12	12	12	12	12	12	12
soybean meal	30	30	30	30	30	30	30	30	30	30
wheat bran	19	19	19	19	19	19	19	19	19	19
yellow corn	16.5	16.5	16.5	16.5	16.5	16.5	16.5	16.5	16.5	16.5
Local black barley	20	20	20	20	20	20	20	20	20	20
(binding substance) linguistc*	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
A mixture of vitamins ,minerals, and salts	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Salt	1	1	1	1	1	1	1	1	1	1
Limestone	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Petroleum Ether	-	0.5	0.5	1.5	-	-	-	-	-	-
Acetone	-	-	-	-	0.5	1	1.5	-	-	-
Ethanol	-	-	-	-	-	-	-	0.5	1	1.5

Table (2): Table (2): Chemical composition (%) of experimental diets based on the dry weight.

Transactions chemical composition	First	second	third	Fourth	Fifth	Sixth	Seven	eight	ninth	Tenth
raw protein	25.60	25.60	25.60	25.60	25.60	25.60	25.60	25.60	25.60	25.60
raw fiber	4.70	4.70	4.70	4.70	4.70	4.70	4.70	4.70	4.70	4.70
ether extract	4.10	8.95	10	8.91	7	9.45	10.5	10.5	10.55	10.55
Ash	6.97	6.97	6.97	6.97	6.97	6.97	6.97	6.97	6.97	6.97
Humidity	7.20	7.20	7.20	7.20	7.20	7.20	7.20	7.20	7.20	7.20
(. Nitrogen-free extract (NFE	51.43	46.58	45.53	46.62	48.53	46.08	45.03	45.03	44.98	44.98
Metabolic energy* (Mica Joule/kilogram)	13.28	14.24	14.45	41.09	13.85	14.34	14.54	14.54	14.55	14.55

* Metabolic energy was calculated based on Smith's equation (1971), which is: $13.8 \times NFE + 33.5 \times Fat + 18.8 \times Protein = (Kg/MJ)ME$

Data were analyzed statistically using the Complete Randomized Design (CRD) by the Statistical Package for Social Science (SPSS 2001), in analyzing the effect of the experimental treatments and testing the significant differences between the averages of the studied traits by Duncan's multiple range test (Duncan, 1955).

Hematological and biochemical parameters:

Hematological and biochemical characteristics are vital indicators for diagnosing the health and physiological status of fish, and they are of great importance in forming clear visions and indicative of some positive and negative cases of the impact of environmental and nutritional factors to which fish are exposed.

1-The volume of agglutinated blood cells and hemoglobin:

The results of the statistical analysis of the volume of packed blood cells and hemoglobin indicated that there were significant differences ($P \leq 0.05$) between the treatments, where the second treatment outperformed petroleum ether 0.5% (36%) and (10.60) g/100ml and the fifth treatment was acetone 1 % (36.25%) and (10.68) g/100ml of the volume of packed blood cells and hemoglobin, respectively, on the control treatment and the acetone treatment at concentrations (1 and 1.5) %, and this is shown in Table (3).

Table (3): Effect of adding Azolla plant fatty extract using three solvents in different proportions on the volume of compacted blood cells and hemoglobin (g/100ml) blood of common carp (mean ± standard error).

Studied Traits Transactions	Volume Of Stacked Cells %	Hemoglobin (g/100ml)
Control (1)	1.88±32.25 b	0.57±9.47 B
Petroleum Ether 0.5% (2)	1.58±36 a	0.48±10.60 A
Petroleum Ether 1% (3)	0.94±34.75 ab	0.28±10.22 Ab
Petroleum Ether 1.5% (4)	0.50±33.50 ab	0.15±9.84 Ab
Acetone 0.5% (5)	0.85±36.25 a	0.25±10.68 A
Acetone 1% (6)	1.31±32.25 b	0.39±9.47 B
Acetone 1.5% (7)	0.47±31.75 b	0.14±9.31 B
Ethanol 0.5% (8)	0.50±34,50 ab	0.15±10.15 Ab
Ethanol 1% (9)	0.94±33.75 ab	0.28±9.92 Ab
Ethanol 1.5% (10)	1.18±34.75 ab	0.35±10.22 Ab

*different letters vertically indicate the presence of significant differences (P≤ 0.05).

Studies indicated that extracts of vegetable fats have the ability to enhance some blood parameters in fish, and this is due to the ability of plant extracts to stimulate the formation of red blood cells and lead to increased oxygen transport and increase the strength of defense mechanisms against physiological stress within the body and this is due to its rich nutritional properties It contains sugars, essential vitamins (such as riboflavin, thiamine, and folic acid) and nonessential amino acids, which are essential for the synthesis of hemoglobin (Hamman, 2008 and Latona, 2012).

When adding Azolla plant fat extract, it appears effective in reducing the activity of pathogenic bacteria due to the presence of active substances (Veerabahu et al., 2015), and when added to diets, it is enough to eliminate harmful microorganisms in the intestine and improve the utilization of food and thus This is reflected in an increase in the number of red blood cells (Citarasu, 2010). The plant extracts contain active phenolic compounds that stimulate the immune system and increase the amount of hemoglobin in the blood (Hussein et al., 2016 and Wang et al., 2018).

2-The concentration of albumin, globulin, and total protein in the blood serum:

The results of the statistical analysis showed the effect of adding different percentages of Azolla plant fat extract to different solvents with a significant difference (P≤ 0.05) in the total protein concentration in the blood of common carp fish between treatments where the total protein concentration increased for the fifth treatment (acetone). 0.5%) and the tenth (ethanol 1.5%) on the rest of the treatments, and their value in both treatments was (3.56) (g/100ml) for the control treatment and ether 1%.

The results of the statistical analysis of albumin concentration in fish serum showed that there were significant differences (P≤ 0.05) between treatments, where the albumin concentration increased significantly in the treatment of ether (0.5%, 1.5%) and acetone (0.5%, 1%). And ethanol (0.5%, 1.5%) compared to the control treatment, and it amounted to (0.92) (gm/100ml), with the arithmetic difference between the treatments as shown in Table (4).

It was noted from the results of globulin that there were significant differences (P≤ 0.05) between the treatments, where the concentration of globulin in the fifth treatment, acetone 0.5%, was significantly increased and reached 2.53 g/100 ml than the rest of the treatments except for the 1.5% acetone and ethanol treatment with both concentrations (0.5 and 1.5)%, with the arithmetic difference between these transactions shown in Table (4).

Measuring the concentration of total blood protein, albumin, and globulin in fish serum or blood plasma is an important indicator for enhancing the immune system and revealing the health status of fish (Dossou et al., 2018). The increase in blood proteins as a result of the fatty extract of the Azolla plant indicates a high The immune status of fish because the Azolla plant contains many active compounds that have an effective biological effect on the body of the fish, such as Phycocyanin, an antibiotic, as well as polyunsaturated fatty acids, especially Docohesaexanoic acid, It

stimulates the immune system in fish and thus shows an increase in immune proteins in the fish body (Promya and Chitmanat, 2011).

Table (4): Effect of adding the fatty extract of Azolla plant using three solvents in different proportions on the concentration of albumin, globulin and total protein (g/100ml) in the blood serum of common carp (mean ± standard error).

Studied Traits Transactions	Total Protein (g/100ml)	Albums (g/100ml)	Globulin (g/100ml)
Control (1)	0.00±2.60 c	0.00±0.92 b	0.03±1.66 d
Petroleum Ether 0.5% (2)	0.10.±3.20 ab	0.03±1.13 a	0.06±2.13 Bc
Petroleum Ether 1% (3)	0.08±3.03 b	0.03±1.06 ab	0.05±2 cd
Petroleum Ether 1.5% (4)	0.26±3.26 ab	0.08±1.16 a	0.18±2.13 bc
Acetone 0.5% (5)	0.12±3.56 a	0.05±1.10 a	0.16±2.53 a
Acetone 1% (6)	0.06±3.16 ab	0.03±1.13 a	0.08±2.13 bc
Acetone 1.5% (7)	0.18±3.33 ab	0.06±1.06 ab	0.11±2.2 abc
Ethanol 0.5% (8)	0.17±3.36 ab	0.05±1.10 a	0.14±2.26 abc
Ethanol 1% (9)	0.05±3.10 ab	0.03±1.03 ab	0.06±2.06 c
Ethanol 1.5% (10)	0.16±3.56 a	0.03±1.13 a	0.12±2.46 ab

*different letters vertically indicate the presence of significant differences (P≤ 0.05).

Ashour et al., (2020) mentioned that the use of marine algae extract with 2% water solvent led to an increase in the level of albumin, globulin, and total protein of tilapia fish.

Akbary et al., (2018) reported that when feeding mullet flounder on Ulva rigida extract with 1% methanol solvent, it raised fish immunity by increasing the level of immune proteins.

3-Glucose, cholesterol, and triglycerides:

The results of the statistical analysis of the level of glucose in the serum of fish indicate that adding the fatty extract of the Azolla plant to the ethanol treatment (0.5%, 1%) led to a significant decrease (P≤ 0.05) in the level of glucose in the serum, which reached 19.20 and 19. 40 mg / 100 ml, respectively, compared to the rest of the treatments as shown in Table (5).

Average cholesterol concentration in fish serum was significantly (P≤ 0.05) higher in the control treatment than in the rest of the treatments. As for the average concentration of triglycerides in fish serum, it was significantly (P≤ 0.05) higher in the 1% acetone treatment than in the rest of the treatments, as it reached (340.05) mg/100 ml, and it was added the fatty extract with petroleum ether solvents 0.5% and acetone at both concentrations (0.5 and 1.5)% were significantly lower than the control treatment, petroleum ether with concentrations (0.5 and 1.5)% and ethanol at its three concentrations, with no significant differences between these treatments as shown in Table (5).

Table (5): Effect of adding the fatty extract of the Azolla plant using three solvents at different ratios on glucose, cholesterol, and triglycerides (mg/100ml) in the blood serum of common carp (mean ± standard error).

Studied Traits Transactions	Sugar (mg/100ml)	Cholesterol (mg/100ml)	Triglyceride (mg/100ml)
Control (1)	2.80±40.15 a	3.60±156.63 a	1.52±320.55 b
Petroleum Ether 0.5% (2)	0.05±36.40 a	5.28±129.83 bc	6.49±275.06 c
Petroleum Ether 1% (3)	9.33±32.76 a	8.02±123.46 bc	5.74±318.55 b
Petroleum Ether 1.5% (4)	2.71±28.93 ab	2.74±128.06 bc	5.54±320.20 b
Acetone 0.5% (5)	3.03±34.55 a	3.24±116.63 c	7.14±287.63 c
Acetone 1% (6)	1.73±35.60 a	10.87±138.65 b	8.97±340.05 a
Acetone 1.5% (7)	0.00±36.50 a	3.35±119.16 bc	7.25±217 d
Ethanol 0.5% (8)	0.05±19.20 b	4.47±132.75 bc	2.10±312.95 b
Ethanol 1% (9)	0.63±19.40 b	7.41±132.46 bc	5.77±318.20 b
Ethanol 1.5% (10)	2.45±34.95 a	3.59±122.63 bc	6.09±307.25 b

*different letters vertically indicate the presence of significant differences (P≤ 0.05).

There are many studies indicating the importance of the active compounds extracted from plants such as flavonoids, polyphenols, and saponins, and their biological effect on blood sugar levels (Mendes et al., 2015). Researchers (Gruenwald et al., 2010) pointed to the role of extracted phenols From the Azolla plant to promote and improve the metabolism of glucose and fatty acids.

It was observed through this study that the ethanol extract at concentrations of 0.5% and 1% led to a significant decrease in the level of glucose in the blood of fish, and this may be due to the extraction of saponins from the Azolla plant in high concentrations and have an effect on the level of glucose from the serum of fish by increasing The level of insulin in the body through activating pancreatic cells and inhibiting the activity of disaccharide, and also it is important by activating the synthesis of glycogen and inhibiting the process of synthesis of glucose gluconeogenesis. -Glucosidaseɑ, saponins have in their chemical structure the hydroxyl group OH, which works to stimulate antioxidants and thus preserve cells from the effect of free radicals (Elekofehinti, 2015), in addition to the effect of one of the compounds extracted from Azolla is Flavonoids (Farook et al., 2019) These compounds have a role in reducing the level of glucose in the body as they are insulin-like or anti-hyperglycemic substances. In the body antihyperglycemic (Pereira et al., 2011).

Cholesterol is an insoluble fat molecule that plays an important role in the function and structure of the cell membrane and the rest of the metabolic activities of the body. If its concentration increases in the body of the living organism, it leads to many diseases (Tabas, 2002), and therefore medicinal plants are used as food supplements for humans and additives. Animal feed due to the effectiveness of nano-derived materials such as flavonoids, saponins, polyphenols, tannins, and anthraquinones. As phenols are of vital importance in reducing the level of cholesterol in the blood serum by inhibiting the liver enzyme HMG COA reductase and thus reducing the formation of the mevalonate compound, which has an important role in the process of fat metabolism and synthesis (Morton et al., 2000 and Reddy et al., 2014). In addition to inhibiting the 5-lipoxygenase enzyme, or some of the active compounds extracted from plants may have a vital role in the activity and secretions of the bile duct, which is important in lipid and cholesterol metabolism (Reddy Palvai and Urooj, 2014).

Increasing the activity of the liver and the process of protein synthesis due to the effect of the active compounds extracted with different solvents and concentrations, according to Table (5), has an important role in decreasing the level of triglycerides, as fats are metabolized and absorbed from the intestines and also by the effect of bile, which turns into fatty compounds that are associated with proteins manufactured in the liver Thus, it forms a lipoprotein complex, which has a role in the structure and functions of body tissues. Also, the researcher Marrelli et al., (2016)

indicated that saponins have an important role in inhibiting adipogenesis through their effect on the AMP enzyme. -activated protein kinase and this enzyme have a role in the process of regulating metabolism, fatty acid synthesis, insulin secretion, and glucose uptake from body tissues (Kim et al., 2014).

Akbary et al., (2018) reported that adding methanol extract of algae Ulva rigida at 1.5% improved glucose and triglyceride levels and no significant difference in cholesterol in flounder fish. It was found, by Ashour et al., (2020) that using seaweed extract with 2% water solvent reduced the level of triglycerides.

4- Alanine aminotransferase enzymes (ALT) and aspartate (AST):

When using the fatty extract of Azolla plant in the diets of the common carp fish feeding experiment for 49 days, it led to a significant decrease ($P \leq 0.05$) in the AST enzyme activity rate, for all treatments except for the control treatment, and it amounted to (155.96) IU/L. The oil ether treatment was 0.5% lower than the 1% petroleum ether treatment and amounted to (62.53 and 103) international units/liter respectively, and it was noted that there were no significant differences between the 1.5% petroleum ether treatment and the acetone (0.5%, 1%, 1.5% treatment)) and the ethanol treatment (0.5%, 1%, 1.5%) shown in Table (6)

A significant decrease ($P \leq 0.05$) was observed in the rate of ALT enzyme activity of fish fed on Azolla plant extract in (1%, 1.5%) acetone treatments, and it reached (7.76 and 9.30) IU/liter, respectively than The control treatment amounted to (20.05) international units/liter. It was noted that the activity rate of ALT was significantly high ($P \leq 0.05$) in the control treatment and 1.5% ethanol, and these two treatments did not differ from the treatments of petroleum ether with its concentrations (0.5 and 1.5) and acetone (0.5%) and ethanol with both concentrations (0.5 and 1% as shown in Table (6).

Measurement of aspartate aminotransferase (AST) and alanine aminotransferase (ALT) depends mainly on determining the protective activity of the liver (Cui et al., 2014).

Table (6): Effect of adding the fatty extract of Azolla plant using three solvents at different ratios on the activity of the aminotransferase enzymes AST and ALT (international units / liter) of common kar fish.

Studied Traits Transactions	AST (IU/L)	ALT (IU/L)
Control (1)	7.16±155.96 a	1.87±20.05 a
Petroleum Ether 0.5% (2)	1.68 ± 62.53 c	2.61±13.96 abc
Petroleum Ether 1% (3)	21.76±103 b	1.15±16.30 ab
Petroleum Ether 1.5% (4)	17.70±70.03 bc	1.88±13.53 abc
Acetone 0.5% (5)	8.26±79.33 bc	3.93±13.86 abc
Acetone 1% (6)	7.12±68.43 bc	0.76±7.76 c
Acetone 1.5% (7)	12.45±81.76 bc	1,52±9.30 bc
Ethanol 0.5% (8)	5.90±73.16 bc	1.27±15.36 abc
Ethanol 1% (9)	13.37±101.16 bc	3.26±12.26 abc
Ethanol 1.5% (10)	7.19±64.56 bc	4.04±19.50 a

*different letters vertically indicate the presence of significant differences (P≤ 0.05).

Antioxidant compounds stimulate the activity and protection of the liver by feeding fish on plant extracts that are bound to phytochemicals such as phenols, polyphenols (gallic acid, tannins, ellagic acid), enzymes (SOD, CAT, GSH-Px), and vitamins (C. and E) and carotenoids and flavonoids (flavones, isoflavones, flavones, anthocyanins, and catechins) (Gupta and Sharma, 2006), which are found in plant

extracts that support the oxidation process and increase its activity or by increasing the activity of enzymes of natural antioxidants such as CAT, SOD, and glucose-6-phosphate dehydrogenase or by increasing the bioavailability of both vitamin E and C (important antioxidants) (Vinson et al., 2005 and Rajasekaran et al., 2005).

Fatty extract of the Azolla plant possesses important properties in enhancing growth, immunity, antioxidants, and anti-bacterial properties through its active compounds such as phenols and flavonoids (Nayak et al., 2015). The low activity of AST and ALT enzymes in treatments was out of control due to the increased potency of antioxidants and reduced hemolysis (Mirghaed et al., 2017).

The metabolic activity in animals produces many reactive oxygen species, and this leads to oxidative stress. Therefore, adding the fatty extract of the Azolla plant may have a role in protecting and protecting the liver from harm, because it contains some compounds. Which has the ability to stimulate antioxidants and also maintain cell membrane exudation (Abdel-Daim et al., 2019 and Hoseinifar et al., 2020).

Choi et al., (2015) found that adding Pyropia yezoensis extract at 2% in water solvent improved the level of liver enzymes ALT and AST for flat olive fish Paralichthys olivaceus. Ashour et al., (2020) when using seaweed extract with water solvent, did not notice an improvement in liver enzymes of tilapia fish.

Conclusions and Recommendations:

• The best decrease in the concentration of glucose was found in the blood of fish fed on experimental diets to which the fatty extract was added by the polar solvent ethanol 0.5% and 1%.

• The fatty extract of the Azolla plant contributed to improving the general health of fish as a result of increasing the concentration of albumin, and the best concentration of ether was 0.5% and 1.5%, acetone 0.5% and 1%, and ethanol 0.5% and 1.5%, and the best fat extract was found from the Azolla plant-mediated by a solvent. Acetone 0.5% increased globulin concentration, and the best solvent for improving the total protein value was acetone 0.5% and ethanol 1.5% found in fish serum.

• It is recommended to use the fatty extract in higher percentages in carp fish diets.

• Diagnosing the active substances within the fatty extract of the Azolla plant and knowing their effect on common carp fish when added to the diets to improve the production and general health of the fish.

• Studying the effect of the fatty extract of Azolla on other types of fish.

• Conducting a comparative study between the effect of the Azolla plant as a raw material with the fatty extract on the physiological and growth parameters of common carp.

Reference:

Hassan, Hussein Fadel, and Hashem, Dalia Sadad. (2016). Mesopotamian fish parasites. Fuzuli Press -

Kirkuk, first edition, 251 p.

Muhaisen, Farhan Damad (1983). Fish diseases and parasites. Ministry of Higher Education and Scientific Research,

General Directorate of Arabization. p. 227.

Abdel-Daim, M.M., Eissa, I.A.M., Abdeen, A., Abdel-Latif, H.M.R., Ismail, M.,

Dawood, M.A.O., Hassan, A.M., (2019). Lycopene and resveratrol ameliorate zinc oxide nanoparticles-induced oxidative stress in Nile tilapia, Oreochromis niloticus. Environ. Toxicol. Pharmacol. 69: 44–50.

Akbary, P.; E. Molazaei, and Z. Aminikhoei, (2018). Effect of dietary supplementation of Ulva rigida C. Agardh extract on several of physiological parameters of grey mullet, Mugil cephalus (Linnaeus). Iranian Journal of Aquatic Animal Health, 4(1), 59-68.

Ashour, M.; M. M. Mabrouk, H. F. Ayoub, M. M. El-Feky, S. Z. Zaki, S. H. Hoseinifar, and A. M. S. Goda, (2020). Effect of dietary seaweed extract supplementation on growth, feed utilization, hematological indices, and non-specific immunity of Nile Tilapia, Oreochromis niloticus challenged with Aeromonas hydrophila. Journal of Applied Phycology, 32(5), 3467-3479.

Balaji, K.; A. Jalaludeen, R. R. Churchil, P. A. Peethambaran, And S. Senthilkumar, (2009). Effect Of Dietary Inclusion Of Azolla (*Azolla Pinnata*) On Production Performance Of Broiler Chicken. Indian Journal Of Poultry Science, 44(2), 195-198.

Choi, Y. H.; B. J. Lee, and T. J. Nam, (2015). Effect of dietary inclusion of Pyropia yezoensis extract on biochemical and immune responses of olive flounder Paralichthys olivaceus. Aquaculture, 435, 347-353.

Citarasu, T. (2010). Herbal Biomedicines, A New Opportunity For Aquaculture Industry. Aquaculture International, 18(3), 403-414.

Crockford, T. and Johnston, I. A. (1990). Temperature acclimation and the expression of contractile protein isoforms in the skeletal muscles of the common carp (Cyprinus carpio L.). Journal of comparative physiology B, 160(1): 23-30.

Cui, Y.; Q. Ye, H. Wang, Y. Li, W. Yao, And H. Qian, (2014). Hepatoprotective Potential Of Aloe Vera Polysaccharides Against Chronic Alcohol Induced Hepatotoxicity In Mice. Journal Of The Science Of Food And Agriculture, 94(9), 1764-1771.

Datta, S. N. (2011). Culture of Azolla and its efficacy in diet of Labeo rohita. Aquaculture, 310(3-4), 376-379.

Dossou, S.; S. Koshio, M. Ishikawa, S. Yokoyama, M. A. Dawood, M. F. El Basuini, And A. Olivier, (2018). Effect Of Partial Replacement Of Fish Meal By Fermented Rapeseed Meal On Growth, Immune Response And Oxidative Condition Of Red Sea Bream Juvenile, Pagrus Major. Aquaculture, 490, 228-235.

Duncan, D. B. (1955). Multiple range and multiple F tests. Biometrics, 11(1), 1-42.

Elekofehinti, O. O. (2015). Saponins: Anti-diabetic principles from medicinal plants– A review. Pathophysiology, 22(2), 95-103.

Farook, M. A.; H. M. Mohamed, G. S. Kumar, S. Subash, M. Paranjothi, V. M. Naveez, And I. A. Ahmed, (2019). Phytochemical Screening, Antibacterial And Antioxidant Activity Of Azolla Pinnata. International Journal Of Research And Analytical Reviews, 6(2): 240-247.

Food and Agriculture Organization (FAO),(1981). Report of the symposium on new developments in the utilization of the heated effluents in the circulation system for intensive aquaculture stavanger, 29-30 ,Rome. Italy.

Gabriel, N. N.;J. Qiang, X. Y. Ma, J. He, P. Xu, And K. Liu, (2015). Dietary Aloe Vera Improves Plasma Lipid Profile, Antioxidant, And Hepatoprotective Enzyme Activities In Gift-Tilapia (*Oreochromis Niloticus*) After Streptococcus Iniae Challenge. Fish Physiology And Biochemistry, 41(5), 1321-1332.

Gruenwald, J.; J. Freder, And N. Armbruester, (2010). Cinnamon And Health. Critical Reviews In Food Science And Nutrition, 50(9), 822-834.

Gupta M.V.; Dey, M.M. and Penman, D. (2005). Importance of Carp genetic resources. In: Penman, D.J.; Gupta, M.V. and Dey, M.M. (Eds.). Carp genetic resources for aquaculture in Asia. World Fish Center Technical Report 65, Penang, Malaysia: World fish center, 1-5 p.

Gupta, V. K.; And S. K. Sharma, (2006). Plants As Natural Antioxidants.Natural Product Radiance.Vol 5(4), Pp. 326-334.

Hamman, J. H.; (2008). Composition and applications of Aloe vera leaf gel. Molecules, 13(8), 1599-1616.

Hoseinifar, S. H.; Y. Z. Sun, Z. Zhou, H. Van Doan, S. J. Davies, And R. Harikrishnan, (2020). Boosting Immune Function And Disease Bio-Control Through Environment-

Friendly And Sustainable Approaches In Finfish Aquaculture: Herbal Therapy Scenarios. Reviews In Fisheries Science & Aquaculture, 28(3), 303-321.

Hussein, M. S.; A. M. El-Zaiat, S. M. El-Saiad, (2016). Effects Of Garlic And Onion Oil Extracts As A Natural Growth Promoters On Growth Performance, Nutrient Utilization, Whole Body Composition And Hematological Parameters Of Nile Tilapia (*Oreochromis Niloticus*) Fingerlings. J. Egypt. Acad. Soc. Environ. Develop., 17 (1): 141-155.

Kim, H. J.; J. T. Hwang, M. J. Kim, H. J. Yang, M. J. Sung, S. H. Kim, and D. Y. Kwon, (2014). The inhibitory effect of saponin derived from Cheonggukjang on adipocyte differentiation In vitro. Food Science and Biotechnology, 23(4), 1273-1278.

Latona, D. F.; G. O. Oyeleke, And O. A. Olayiwola, (2012). Chemical Analysis Of Ginger Root. Journal Of Applied Chemistry, 1(1), 47-49.

Marrelli, M.; F. Conforti, F. Araniti, and G. A. Statti, (2016). Effects of saponins on lipid metabolism: A review of potential health benefits in the treatment of obesity. Molecules, 21(10), 1404.

Mendes, M. F.; I. David, and L. Bogle, (2015). Evaluation of the effects and mechanisms of bioactive components present in hypoglycemic plants. International Journal of Chemical and Biomolecular Science, 1(3), 167-78.

Mirghaed, A. T.; M. Ghelichpour, S. M. Hoseini, And K. Amini, (2017). Hemolysis Interference In Measuring Fish Plasma Biochemical Indicators. Fish Physiology And Biochemistry, 43(4), 1143-1151.

Morton, L. W.; R. A. A. Caccetta, I. B. Puddey, and K. D. Croft, (2000). Chemistry and biological effects of dietary phenolic compounds: relevance to cardiovascular disease. Clinical and experimental pharmacology and physiology, 27(3), 152-159.

Nayak, N.; R. N. Padhy, And P. K. Singh, (2015). Evaluation Of Antibacterial And Antioxidant Efficacy Of The Fern Azolla Caroliniana Symbiotic With The Cyanobacterium Anabaena Azollae. Proceedings Of The National Academy Of Sciences, India Section B: Biological Sciences, 85(2), 555-569. Pillai, P. K.; S. Premalatha, And S. Rajamony, (2005). Azolla: A Sustainable Feed For Livestock. Leisa-Leusden, 21(3), 26.

Pereira, D. F.; L. H. Cazarolli, C. Lavado, V. Mengatto, M. S. R. B. Figueiredo, AGuedes, and F. R. M. B. Silva, (2011). Effects of flavonoids on α-glucosidase activity: potential targets for glucose homeostasis. Nutrition, 27(11-12), 1161-1167.

Prabina, B. J.; and K. Kumar, (2010). Dried Azolla as a nutritionally rich cost effective and immuno-modulatory feed supplement for broilers. Asian Journal of Animal Science, 5(1), 20-22.

Promya, J.; And C. Chitmanat, (2011). The Effects Of *Spirulina Platensis* And *Cladophora Algae* On The Growth Performance, Meat Quality And Immunity Stimulating Capacity Of The African Sharptooth Catfish (*Clarias Gariepinus*). International Journal Of Agriculture And Biology, 13(1).

Rajasekaran, S.; K. Sivagnanam, and S. Subramanian, (2005). Modulatory effects of Aloe vera leaf gel extract on oxidative stress in rats treated with streptozotocin. Journal of pharmacy and pharmacology, 57(2), 241-246.

Reddy Palvai, V.; and A. Urooj, (2014). Inhibition of 3-hydroxy-3-methylglutaryl coenzyme A reductase (ex vivo) by Morus indica (Mulberry). Chinese Journal of Biology.1-5.

Reddy, P. V.; L. Sarkar, and A. Urooj, (2014). Inhibition of 3-hydroxy-3-methylglutaryl coenzyme A (HMG-CoA) reductase (ex vivo) by medicinal plants from Western Ghats. Annals of Phytomedicine, 3(1), 56-61.

Sajid, M.; Noor, K.; Khalid, J.I.; Muhammad, A. and Anjum K. (2016). Evaluation of water hyacinth (*Eichhornia crassipes*) supplemented diets on the growth, digestibility and histology of grass carp (*Ctenopharyngodon idella*) fingerlings. J. Appl. Anim. Res., 46(1): 24-28.

Smith, R. R. (1971). A method for measuring digestibility and metabolizable energy of fish feeds. The Progressive Fish-Culturist, 33(3), 132-134.

Tabas, I. (2002). Consequences of cellular cholesterol accumulation: basic concepts and physiological implications. The Journal of clinical investigation, 110(7), 905-911.

Taghi-Ganji, M.; M. Khosravi, and R. Rakhshaee, R. (2005). Biosorption of Pb (^{2}I), Cd (^{2}I), Cu (^{2}I) and Zn (II) from the wastewater by treated A. filiculoides with H2O2/MgCl2. International Journal of Environmental Science and Technology, 1, 265-271.

Veerabahu, C.; D. Radhika, A. Mohaideen, S. Indrani, And R. Priya, (2015). Phytochemical And Biochemical Profiles Of Azolla microphylla Cultured With Organic Manure. Int. J. Curr. Agric. Res, 4(8), 131-133.

Vinson, J. A.; H. Al Kharrat, And L. Andreoli, (2005). Effect Of Aloe Vera Preparations On The Human Bioavailability Of Vitamins C And E. Phytomedicine, 12(10), 760-765.

Wang, C.; L. Chen, S. Zhao, Y. Hu, Y. Zhou, Y. Gao, And Y. Tian, (2018). Impacts Of Prenatal Triclosan Exposure On Fetal Reproductive Hormones And Its Potential Mechanism. Environment International, 111, 279-286.

Yilmaz, S. (2019). Effects Of Dietary Blackberry Syrup Supplement On Growth Performance, Antioxidant, And Immunological Responses, And Resistance Of *Nile Tilapia, Oreochromis Niloticus* To Plesiomonas Shigelloides. Fish & Shellfish Immunology, 84, 1125-1133.