



Beni-Suef University

Faculty of Veterinary Medicine

Dept. of Nutrition and Clinical Nutrition

**Presentation on
the project of**

**Feed restriction, unconventional
feeds, and feed additives in broiler
chickens**

**تقييد التأكيل، مواد العلف الغير التقليدية،
وإضافات الأعلاف في دجاج التسمين**

Presented By

Prof. Dr. Elham Saleh

Team leader

Under

The Supervision

Of

Prof. Dr. Hassan Mahmoud Abdel-Hafeez

Prof. Dr. Elham Saleh El-Sayed Saleh

Ass. Prof. Dr. Samar Sayed Tawfeek

Dr. Ibrahim Mohamed Ibrahim

Asmaa Salah Awad Abdel-Daim

Ph.Vet.Sc.Degree

Aim of the study

To investigate:

- ✿ using the feed additives in stress situations correctly, beneficially and economically.
- ✿ the effect of natural **feed additives** as probiotic, prebiotic & synbiotic) with and without **feed restriction** on production performance of broilers.
- ✿ the impacts of using commercial **enzymes** to improve the nutritional value of some **unconventional feedstuffs** as potato peels (PP) and sugar beet pulp (SPP) in poultry diets.

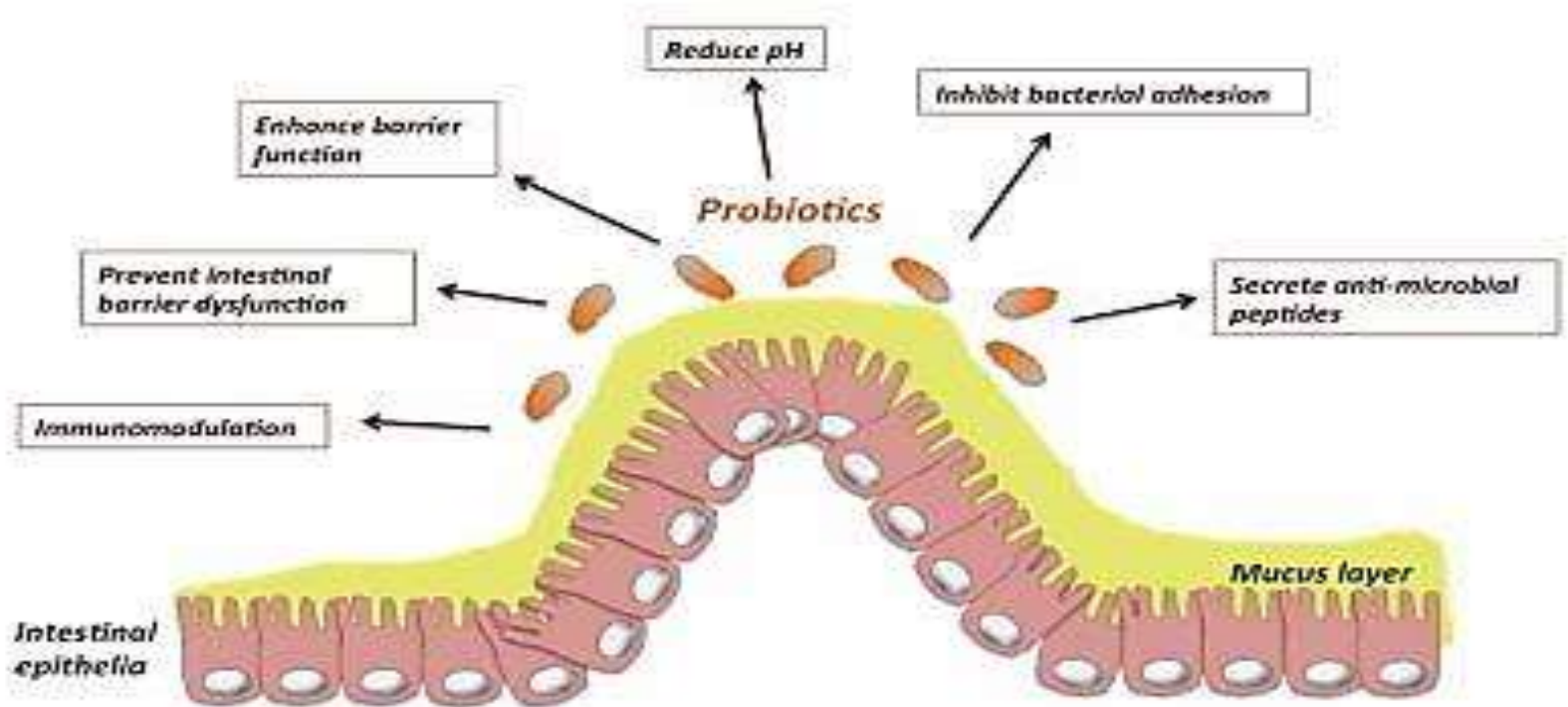
Introduction

- ✿ **Feed plays an important role in broiler production by sharing about 70% of total production cost.**
- ✿ **Great efforts have been made to improve feed conversion, and to minimize feed cost.**
- ✿ **Natural feed additives have become even more important since the European Union banned the use of antibiotic growth promoters in 1999 (drug free production).**

Introduction

🌟 Probiotics:

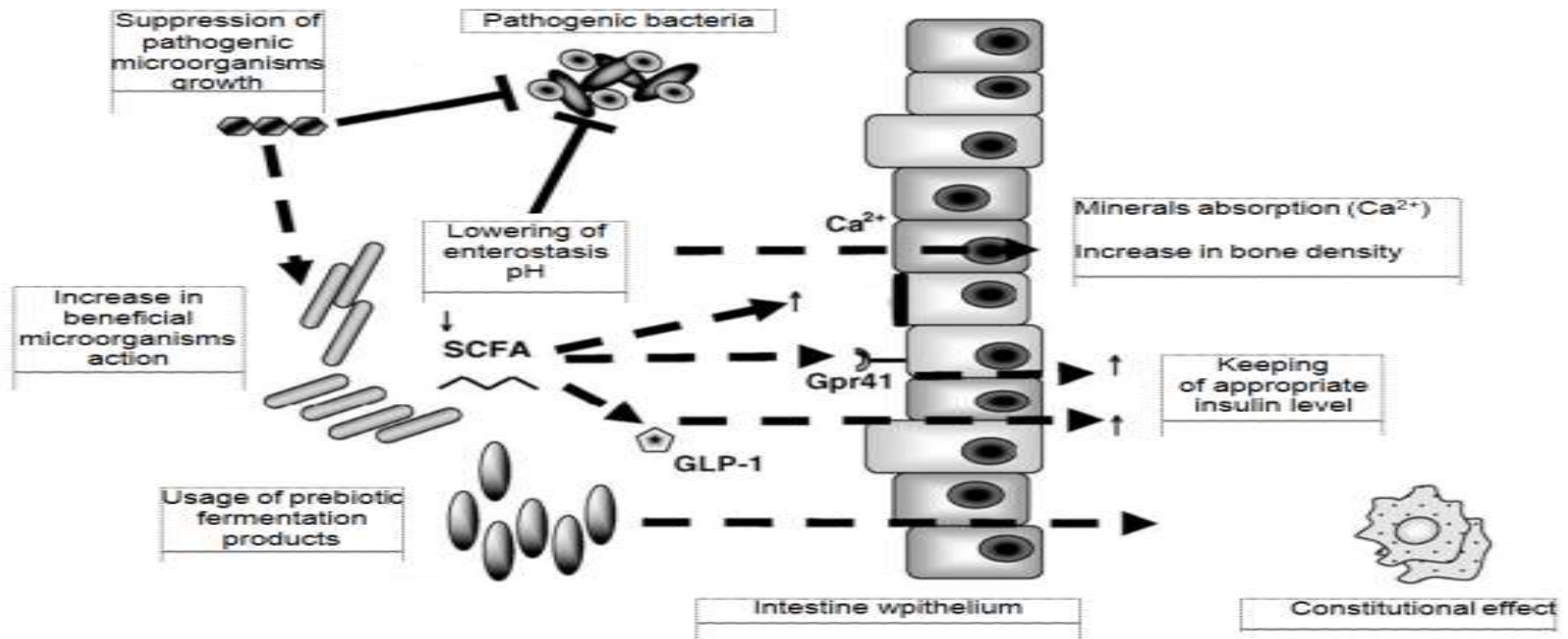
- are alive active **microorganisms**.
- used mainly to reinforce the intestinal mucosal barrier **against deleterious** agents.
- improve digestion, metabolism & nutrient absorption.



Introduction

🌟 Prebiotics:

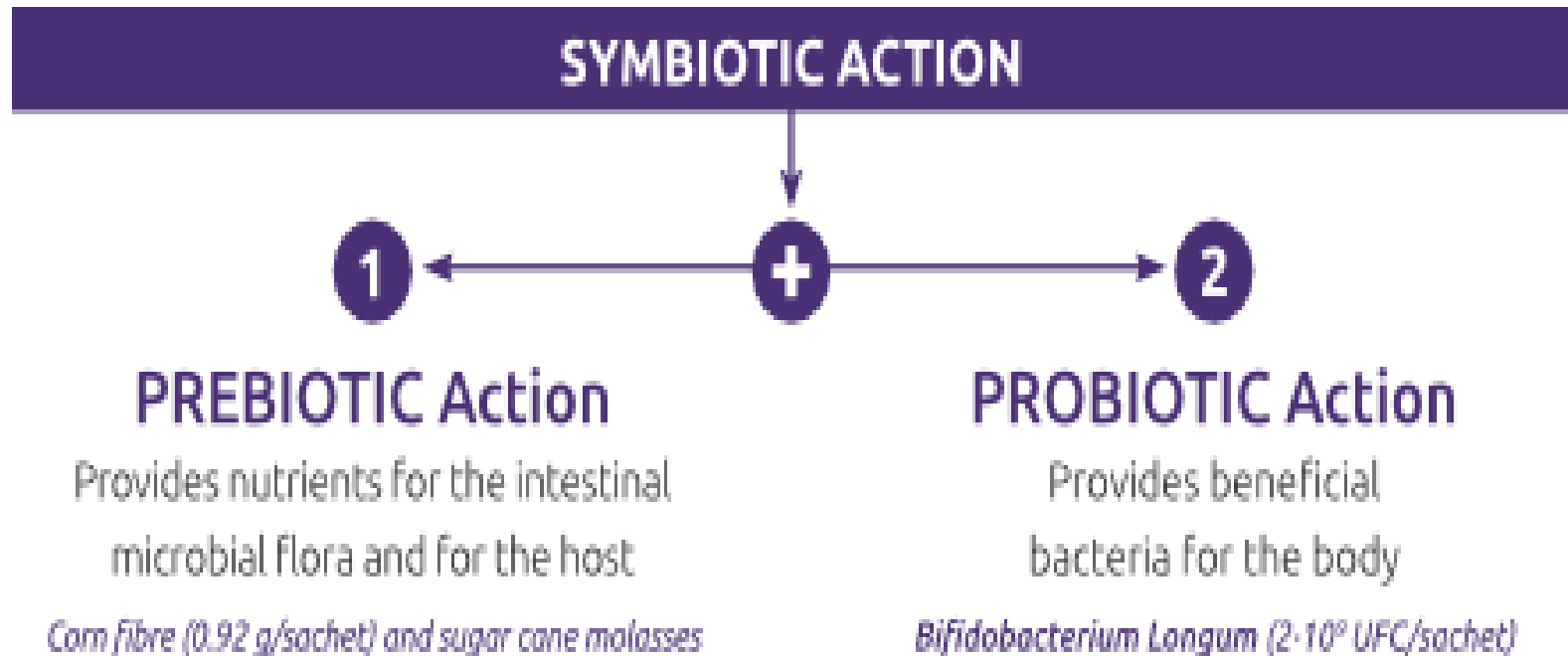
- are a non-digestible cell wall, **special form of fiber** or carbohydrate.
- beneficially affects the host by selectively stimulating the growth and/or activity of one or a limited number of bacteria in the intestine.



Introduction

💡 Synbiotics:

- are defined as a mixture of probiotics and prebiotics.
- beneficially affects the host by activating the metabolism of one or a limited number of health promoting bacteria and/or by selectively stimulating their growth improving the host's welfare.



Introduction

☀ Enzymes:

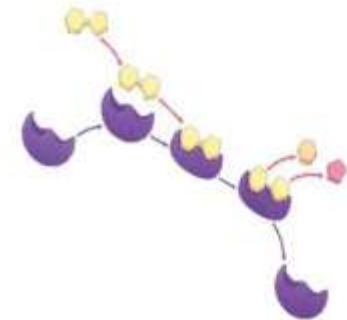
- improve the nutritional value of feed ingredients by increasing the efficiency of digestion-----increase the availability of nutrient.
- help break down **anti-nutritional factors**.
- used for enhancing broiler utilization of **unconventional feedstuffs**.



COCKTAIL ENZYMES FOR POULTRY

Each g provides :

Amylase	3600 IU
Protease	400 IU
Cellulase	1000 IU
Beta-glucanase	400 IU
Xylanase	2000 IU
Pectinase	400 IU
Phytase	400 IU



Benefits:

Replaces 1.5 - 2 kg DCP in one tonne of feed
Ideal combination of all age groups of poultry including broilers/layers
Reduces intestinal viscosity for better utilization and absorption of nutrients.
Improves litter quality, FCR and productivity.
Product is ideal to use even if cheaper fibrous raw material is used in the feed.

Feeding Recommendations:

250g - 300g/tonne of feed.

Introduction

Feed restriction :

- It is one of the feeding strategies.
- It improves feed conversion and reduces feed cost.
- Many feed restriction programs are applied at different phases of age for several duration.

Compensatory growth:

- It occurs as a result of feed restriction
- It is effective tool for bringing about better economic return

Introduction

💡 **Agro-industrial by-products:**

- currently can be used to overcome shortage and rising costs of conventional feed ingredients.
- used as unconventional feedstuffs.
- are cheap and available in large quantities in Egypt, such as potato peels and sugar beet pulp.



Potato peels



Sugar beet pulp

Materials & methods

- **No. of experiments: two separate experiments:**
 - **Experiment I** → **Natural feed additives with and without feed restriction.**
 - **Experiment II** → **Feeding of some agro-industrial by-products (PP & SBP) with and without enzymes.**
- **Birds : unsexed one day old broiler chicks (240 & 150 Arbor Acres chicks for experiment I & II respectively)**
- **Housing: deep litter system**
- **Lightening period: 23 h light and one hour darkness**
- **Temperature : set at 32°C at the age of one day and then gradually reduced as the birds progressed in age**

Experiment I

Table 1 The experimental design

Trial	A (ad- libitum feeding)				B (restricted feeding)			
Group	1	2	3	4	5	6	7	8
	Control	Pro	Pre	Syn	Control	Pro	Pre	Syn
Feed additives	-	Probiotic	Prebiotic	Synbiotic	-	Probiotic	Prebiotic	Synbiotic
	-	<i>Enhancer (B.licheniformis & B. subtilis)</i>	<i>Bio-Mos (MOS)</i>	$\frac{1}{2}$ <i>Enhancer</i> + $\frac{1}{2}$ <i>Bio-Mos</i>	-	<i>Enhancer</i>	<i>Bio-Mos</i>	$\frac{1}{2}$ <i>Enhancer</i> + $\frac{1}{2}$ <i>Bio-Mos</i>
Rate of inclusion (kg/ton) starter grower finisher	-	0.250	- 2.0	- 1.13	-	0.250	- 2.0	- 1.13
		0.250	-1.0	- 0.63.		0.250	-1.0	- 0.63
		0.250	- 0.5	- 0.38		0.250	- 0.5	- 0.38
Feeding regimen <i>1st – 7th day</i> <i>8th – 56th day</i>	Fed ad-libitum				Fed ad-libitum 5 hour feed restriction (from 9 a.m. to 12 a.m. & from 1 p.m .to 3 p.m.)			
Parameters	<ul style="list-style-type: none"> - Performance indices - Blood parameters (Hb, PCV, glucose, total protein, albumin, globulin & total cholesterol) - Carcass characteristics - Economical efficiency 							

Table 2 Physical composition (%) of the control diets*

Ingredient	Diet		
	Starter	Grower	Finisher
Yellow corn, ground	45.77	52.53	60.72
Soybean oil meal	34.94	35.20	29.10
Corn gluten meal	6.00	0.00	0.00
Vegetable oil	7.23	6.99	5.32
Sugar cane molasses	2.00	2.00	2.00
Common salt	0.48	0.35	0.27
Limestone	1.40	1.35	1.29
Dicalcium phosphate	1.75	1.20	0.96
DL-Methionine	0.13	0.08	0.04
Mineral & vitamin premix	0.30	0.30	0.30

*Formulated on the basis of NRC requirements (1994).

Table 3 Energy value (kcal / kg) and chemical composition (%) of the control diets

Component	Starter	Grower	Finisher
Dry matter*	91.45	91.18	90.83
Metabolizable energy	3203	3203	3200
Crude protein*	23.03	20.06	18.00
Ether extract*	9.52	9.38	7.87
Crude fiber*	3.04	3.13	2.92
Calcium	1.04	0.90	0.81
Available phosphorus	0.47	0.35	0.30
Sodium	0.20	0.15	0.12
Methionine	0.51	0.39	0.32
Methionine +Cystine	0.90	0.72	0.62
Lysine	1.12	1.08	0.93

* Determined – the rest are calculated

Results

Period in weeks	Trial A (ad-libitum feeding)				Trial B (restricted feeding)			
	Group				Group			
	1	2	3	4	5	6	7	8
	Control	Pro	Pre	Syn	Control	Pro	Pre	Syn
0	46.27 $\pm 2.9^{Aa}$	46.40 $\pm 2.9^{Aa}$	47.08 $\pm 2.9^{Aa}$	46.68 $\pm 3.1^{Aa}$	46.55 $\pm 3.4^{Aa}$	45.69 $\pm 4.2^{Aa}$	45.32 $\pm 3.6^{Aa}$	46.38 $\pm 3.6^{Aa}$
3	757.69 $\pm 52.7^{ABb}$	746.28 $\pm 54.4^{ABb}$	746.64 $\pm 39.2^{Ac}$	804.93 $\pm 79.3^{Bd}$	703.11 $\pm 82.8^{Aa}$	704.85 $\pm 54.4^{Aa}$	684.50 $\pm 76.46^{Aa}$	672.0 $\pm 47.4^{Aa}$
6	1590.22 $\pm 76.6^{Ac}$	1898.18 $\pm 58.0^{Ce}$	1671.22 $\pm 62.4^{Bd}$	2014.60 $\pm 91.5^{Df}$	1239.37 $\pm 103.8^{Aa}$	1676.39 $\pm 83.5^{Dd}$	1468.24 $\pm 97.1^{Bb}$	1550.46 $\pm 98.9^{Cc}$
8	2171.31 $\pm 130.0^{Ab}$	2774.47 $\pm 107.8^{Cf}$	2344.00 $\pm 131.53^{Bd}$	2907.22 $\pm 110.8^{Dg}$	1679.94 $\pm 139.32^{Aa}$	2549.50 $\pm 104.8^{De}$	2112.56 $\pm 115.59^{Bb}$	2259.28 $\pm 128.6^{Cc}$

A, B & C Means within the same row (in each trial independently) with different superscripts are significantly different (P<0.05).

a, b, c, d, e, f, g Means within the same row (in both trials together) with different superscripts are significantly different (P<0.05).

Body weight development (g)

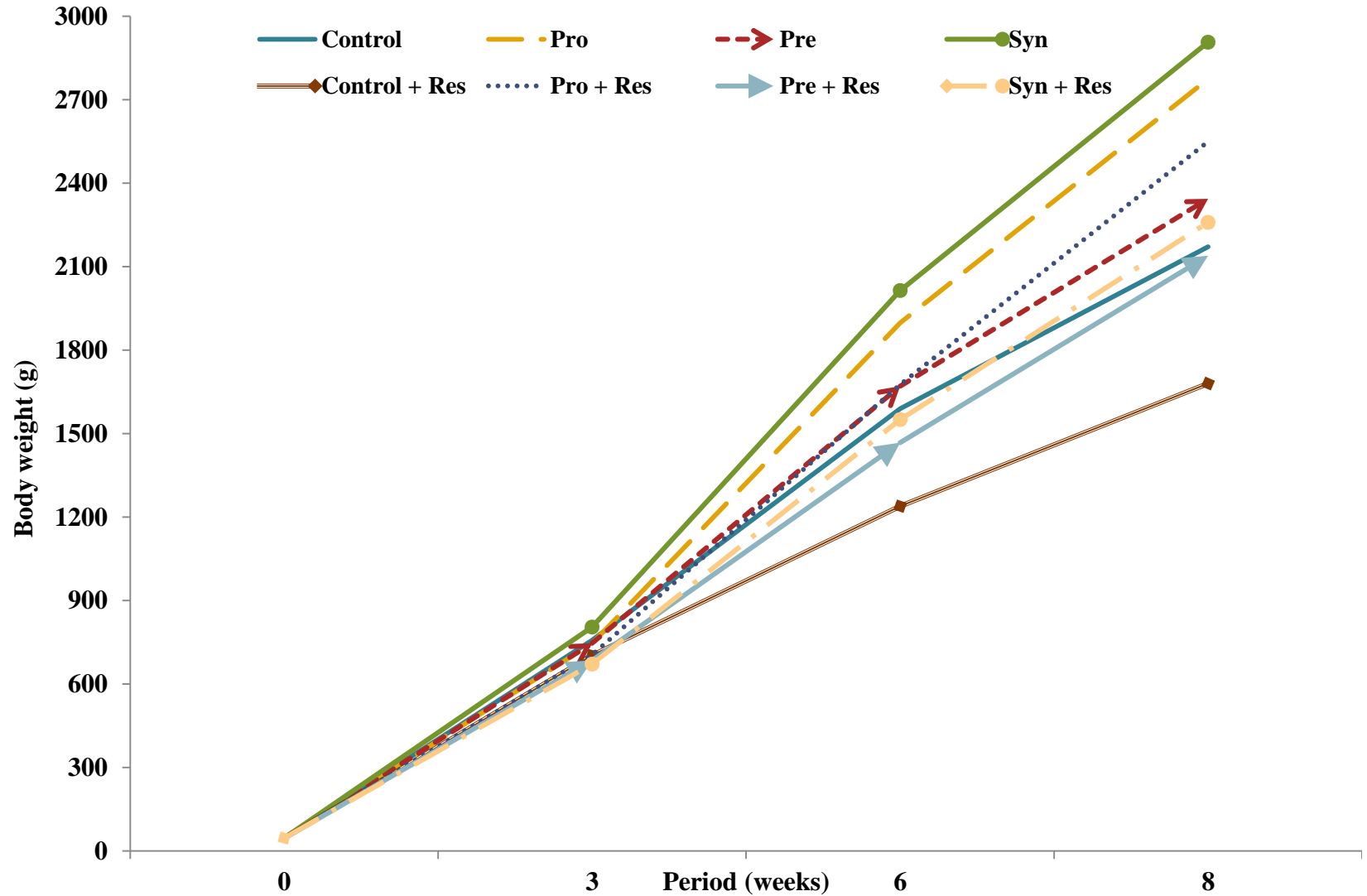


Table 5 Body weight gain (g) of birds throughout the experimental period (Mean ± SD)

Period in weeks	Trial A(ad-libitum feeding)				Trial B (restricted feeding)			
	Group				Group			
	1 Control	2 Pro	3 Pre	4 Syn	5 Control	6 Pro	7 Pre	8 Syn
Starter (0-3)	711.42 ± 52.7	699.88 ± 53.9	699.56 ± 39.2	758.25 ± 78.7	656.56 ± 83.7	659.16 ± 54.88	639.16 ± 76.88	625.53 ± 47.8
Grower (3-6)	832.53 ± 81.1	1151.90 ± 65.7	924.58 ± 72.6	1209.67 ± 132.2	536.26 ± 105.6	971.54 ± 95.14	783.74 ± 114.01	878.46 ± 118.4
Finisher (6-8)	581.09 ± 139.7	876.29 ± 156.5	672.78 ± 118.01	892.62 ± 124.2	440.57 ± 105.62	873.11 ± 123.41	644.32 ± 72.02	708.82 ± 161.4
Total (0-8)	2125.04 ± 129.9	2728.07 ± 108.2	2296.92 ± 130.1	2860.32 ± 111.2	1633.39± 140.18	2503.81 ± 103.29	2067.24 ± 115.56	2212.81 ± 128.5

Table 6 Feed intake (g) of birds throughout the experimental period

Period in weeks	Trial A (ad-libitum feeding)				Trial B (restricted feeding)			
	Group				Group			
	Control	Pro	Pre	Syn	Control	Pro	Pre	Syn
Starter (0-3)	999.88	768.87	917.33	833.55	865.1	715.75	757.41	724.63
Grower (3-6)	1521.46	1936.08	1665.89	1951.65	939.76	1598.28	1332.67	1410.75
Finisher (6-8)	1604.05	1874.68	1612	1872.40	970.19	1778.35	1425.24	1401.27
Total (0-8)	4125.39	4579.63	4195.22	4657.60	2775.05	4092.38	3521.32	3536.65

Total feed intake (g) of birds throughout the experimental period (0-8 weeks)

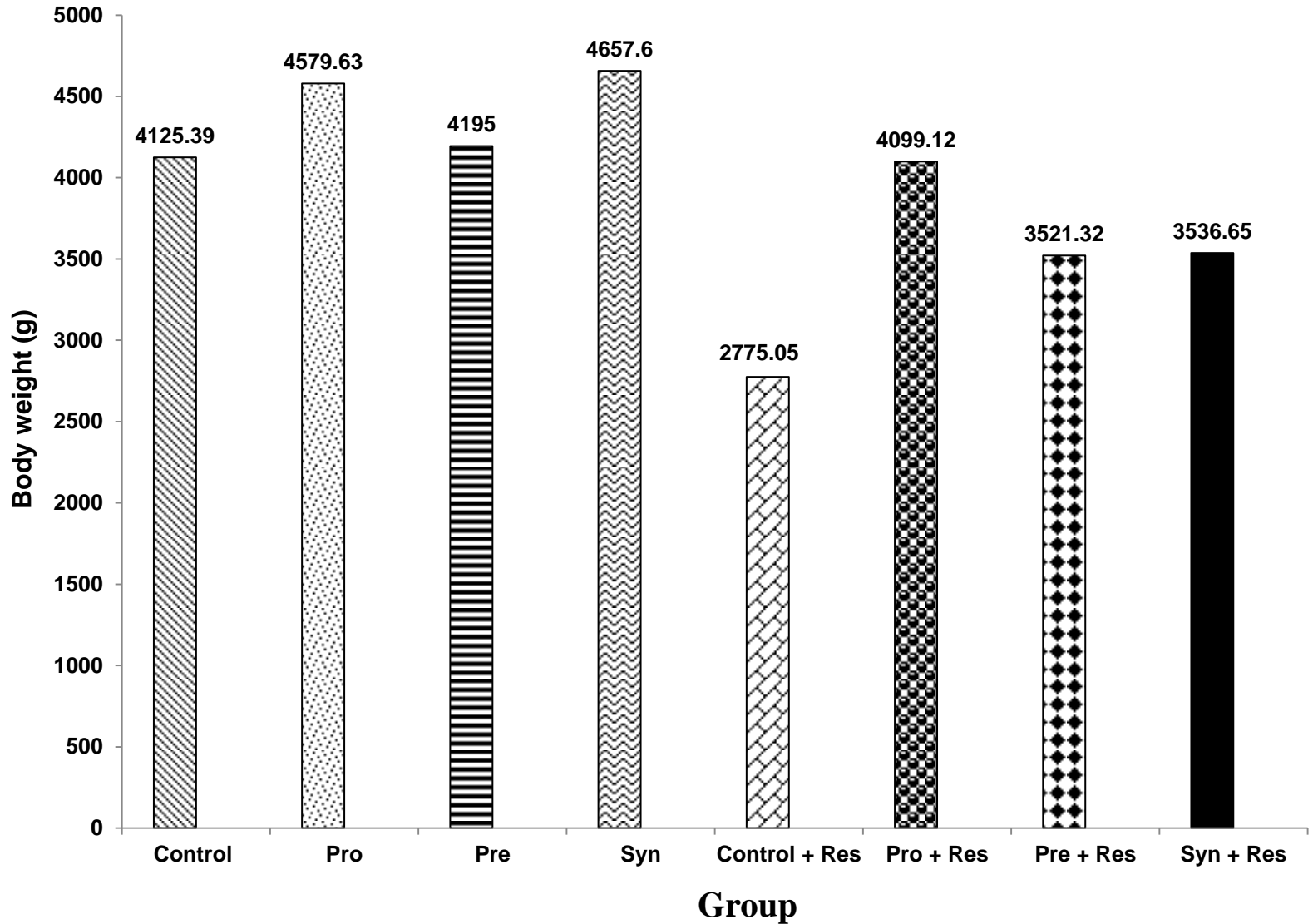


Table 7 Feed conversion ratio (g/g) of birds throughout the experimental period

Period in weeks	Trial A(ad-libitum feeding)				Trial B(restricted feeding)			
	Group				Group			
	Control	Pro	Pre	Syn	Control	Pro	Pre	Syn
Starter (0-3)	1.40	1.10	1.31	1.10	1.32	1.08	1.18	1.16
Grower (3-6)	1.83	1.68	1.80	1.61	1.75	1.64	1.70	1.61
Finisher (6-8)	2.76	2.14	2.40	2.10	2.20	2.04	2.21	1.98
Total (0-8)	1.94	1.68	1.83	1.63	1.70	1.63	1.70	1.60

Economical efficiency in the different experimental groups

Total period costs (L.E./kg)	Trial I (ad-libitum feeding)				Trial II (restricted feeding)			
	1	2	3	4	5	6	7	8
	Control	Probiotic	Prebiotic	Synbiotic	Control	Probiotic	Prebiotic	Synbiotic
Cost of starter gain	4.01	3.12	3.83	3.43	3.49	2.88	3.15	2.99
Cost of grower gain	5.44	6.95	6.06	6.45	3.35	5.72	4.85	4.68
Cost of finisher gain	5.24	6.17	5.34	6.19	3.17	5.86	4.72	4.63
Total cost /gain	14.69	16.24	15.23	16.07	10.01	14.46	12.72	12.30
Total gain ,kg	2.125	2.728	2.297	2.861	1.633	2.504	2.067	2.213
Feed cost of production	6.92	5.95	6.63	<u>5.62</u>	6.13	5.78	6.15	<u>5.56</u>

Conclusion

- **Diets supplemented with synbiotic, probiotic & prebiotic (with and without feed restriction) improved broiler performance in comparison with the control.**
- **Feed restriction improved feed conversion ratio in comparison with non restricted groups.**
- **Natural feed additives can be used as anti-stress factor for feed restriction .**

Experiment II

Under study

Table 8 The experimental design

Trial	A			B	
Group	Control	Potato peels	Sugar beet pulp	Potato peels + enzymes	Sugar beet pulp + enzymes
Diet	Control	Experimental			
Inclusion rate %	-	15	7.5	15	7.5
Enzymes	-	-	-	+	+
Parameters	<ul style="list-style-type: none">- Performance indices- Blood biochemistry (total cholesterol & triglycerides)- Carcass characteristics- Economical efficiency- Digestibility measurements				



Prebiotics and synbiotics



Without Probiotics



With Probiotics



Chicken face is red color meaning the chicken is in good condition

THANKS