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## A review on medicinal activities of mulberry weed

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### Abstract

*Morus Alba* Linn. (Family: Moraceae), commonly known as mulberry, are mainly used as Food for the silkworms and they are sometimes eaten as a vegetable or used as livestock fodder in various parts of the world. *M. alba* Linn. Has potential food source and natural antioxidants. Many researches have been carried out on plants that provide a comprehensive and basic supply to humans used. The authentic product or by-product of plants serves humans in so many ways, one of them what medicine is. The use of plants for health purposes started a long time ago, probably in the beginning moment when a person became ill. About 3,000 years before the present time was mankind well aware of the medicinal properties of some of the plants that grow around him. The use of plants for healing disease and the relief of physical ailments began from the earliest times of human history. That presents article, including the detailed exploration of the phyto-pharmacological properties of *M. Alba* L an attempt to provide a direction for further researches.

**Keywords:** *Morus Alba* linn, Anti-cancer, anti-diabetic, anti-oxidant activities

### 1. Introduction

*Morus Alba* Linn, commonly known as white mulberry, belongs to the Moraceae family and is also known as Tut in India. *Morus Alba* is a medium-sized tree, three to six meters tall. The white mulberry is cultivated all over the world, wherever silkworms are farmed. The leaves of the white mulberry are the main food Source for the silkworms. It is grown for fruit production in European countries and also used as a vegetable in different parts of Europe. In the world, while in Japan mulberry leaves are used as tea and powdered juice <sup>[1, 2, 3]</sup>.

Many traditional medicines contain *M. alba* fruit, leaves, Roots, branches and bark in Ayurvedic medicinal systems for their health benefits and anti oxidative. *alba* is rich in bioactive compounds including phenolic acids, Flavonoid, flavonols, anthocyanins, macronutrients, vitamins, minerals and volatile flavour compounds <sup>[4, 5]</sup>. Its fruits and leaves contain significant amounts of quercetin and rutin apigenin, and acids are also the essential compounds with fruits. These natural bioactive compounds have demonstrated potent biological activities to show excellent pharmacological effects against various diseases. These include antioxidant, diuretic, anti-obesity, hypoglycaemic, antihypertensive, cholesterol-lowering, antidiabetic, And antimicrobial properties <sup>[6, 7]</sup> Added to this is the high content of phenolic compounds also contributes to the functional properties of *M. alba* in food applications. For example the flavonoids and caffeoylquinic acids in *M. alba* can be useful as colorants, flavors, and foods builders, antioxidants, preservatives and antimicrobial agents against bacteria and fungi, all of this is essential in the food industry.

At the same time, their anthocyanins could work as natural antioxidant food colors <sup>[8, 9]</sup>.

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Fig 1: Mulberry Fruit



Fig 2: Mulberry Roots



Fig 3: Mulberry Leave

## 2. Scientific classification

Kingdom: Plantae  
 Subkingdom: Tracheobionta  
 Division: Magnoliophyta  
 Class: Magnoliopsida  
 Subclass: Hamamelididae  
 Family: Moraceae  
 Genus: *Morus L.*  
 Species: *Morus Alba L.*

## 3. Distribution

It is native to Pakistan, India and Nepal to the east mayanmar (Barma), Indochina, China and Japan. It is grown extensively on the plains of India and Pakistan and in the Himalayan hills up to 3,300 m height for its foliage, used as a food source for silkworms, which are also cultivated in Europe and

everywhere most of Asia and is occasionally naturalized <sup>[10]</sup>.

## 4. Cultivation

Mulberry trees can be propagated by seeds, or cuttings finishing. Seeds should be treated with camphor water before sowing to ward off diseases. Thin layer of earth ash is sprinkled over the seed after sowing. Beds are kept wet. Seeds germinate in 9 to 14 days, depending the season. As seedlings they grow to about 7.5 cm are thinned out and weeded. For bush mulberries, seedlings 10 to 15 cm high are used as grafts; for trees, seedlings are allowed to grow 1.3 m and are raised before transplant. Branches are cut into pieces of 22-30 with 3 buds and planted immediately. Mulberry plants from seedlings are more expensive, but give better plants as such from cuttings. Root transplant is usually practiced in India. Rooted cuttings are planted in pits or furrows.

When watering, cuttings are planted in furrows in April or May, spacing 10 cm, furrow width 22 cm part. With this very tight planting, 110,000 to 200,000 cuttings/ha are required. Grafted plants develop better root system than that of seedlings, cuttings or layering and are used exclusively in Japan. Grafted Trees are planted 1.6 m apart in each direction, approximately 4,000/ha, and are particularly suitable for irrigated areas. Various techniques are employed to prune and train mulberries plant. After each pruning, the field is cultivated and Fertilized <sup>[10]</sup>.

## Growing Information

Growing Needs Light: Full Sun

Water: Drought Tolerant

Height: 8.0m

Width: 8.0m

Fruiting: Oct – Jan

Flowering: Aug – Sep

## 5. Vernacular names:

Sanskrit: Toola, Tula

Hindi: Chinni, Tut, Tutri

Bengali: Tut

Marathi: Tut, Ambat

Gujarati: Shetur

Telegu: Reshme chettu, Pippalipandu chettu

Tamil: Kambli Chedi

Kannada: Bili uppu nerale

Punjabi: Tut, Tutri

Oriya: Tuto, Tuticoli

English: Mulberry, White mulberry.

## 6. Plant description:

The plant is usually a monoecious shrub or medium large tree with a cylindrical trunk and rough, brown, vertically fissured bark. Leaves are variable in size and shape, usually 5 to 7.5 cm long, often deeply lobed, Margins serrate or notched-serrate, tip pointed or short acuminate, base cordate or truncated; 3 basal nerves, Lateral nerves forked near the edges. Flowers inconspicuous and greenish: male spikes (catkins) are broad, cylindrical or ovate, female spikes are ovate and tracked. Fruit (syncarp) consists of many enclosed drupes in a fleshy perianth, ovate or rounded, up to 5 cm long, white to pinkish white, purple or black when ripe white <sup>[11]</sup>.

## 7. Mulberry leaves

Due to the availability and functionality of medicinal plants these are used in various parts of the world primarily for respiratory disorder (10 types), diarrhoea (12 types), urinary

tract infection (UTI) Asthma (9 types), Kidney stone (13 types) and rheumatism (6 types) [12] There are 3000 species of plant those reported by Gilgit Pakistan and those almost 124 have medicinal values. Many studies have been conducted on the use of mulberry leaves to combat the symptoms of medicines cold state. Some of the results of studies showed that Mulberry leaves can be used as a protein source for ruminants. In silkworm breeding industry the mulberry plant is used to determine profitability and productivity.

The leaves of the mulberry are used in the silkworm industry main ingredient as the quality of the sheets produced per unit area has a direct bearing cocoon crop. Maximizing mulberry leaf yield per unit area leads to the realization of two main ones important goals, namely increasing cocoon production per hectare. And reduced production costs [13] The cultivation of berry is an applied science that involves a detailed study of the ecological, morphological and physiological features [14].

## 8. Uses

- Mulberry leaves are expectorant, cheering easing and expectoration of catarrh and prescribed in China to treat cough. The leaves are also used to treat fever, sore and sore eyes, sore throat, headache, dizziness and dizziness.
- The fruit juice has a cleansing and strengthening effect and was often used for gargling and mouthwash.
- The root bark can be used for toothache, and it is considered a laxative. An excerpt of leaves was given as an injection against elephantiasis. Those branches are effective against excessive fluid retention and joint pain.
- The fruit is useful to prevent premature graying of the skin, hair and to treat dizziness, ringing in the ears, blurry eyesight and insomnia.
- The root is reported to possess anthelmintic and astringent properties.
- The bark is beneficial as an anthelmintic and laxative.
- The leaves are antibacterial, diaphoretic and hypoglycemic.
- The stalks are antirheumatic, antispasmodic, diuretic, hypotensive
- And chest.
- The fruit has a strengthening effect on the kidney energy. It is prescribed to treat urinary incontinence.
- Continence, dizziness, insomnia due to anemia, neurasthenia, hypertension and diabetes. The root bark is anti-asthmatic, antitussive and calming [15].



Fig 4: Mulberry tea, fruits, fruits juice different uses

## 9. Phytoconstituents of mulberry

### 9.1. Vitamins

Mulberry, which is rich in vitamins B and C, can be used systems for a healthy, oxidizing and metabolic turnover of

fats and strengths for normal or accelerated activities. Likewise the mulberry leaf contains rutin for a dynamic hair-like structure, GABA for heart rate reduction and DNJ for glucose reduction. Additionally, sitosterol is used in mulberry leaves to lower blood cholesterol levels. In later age they found success in terms of past experiences mental results with mice mulberry leaves. Mulberry leaf powders now available as a tray or holder in the Korean market. Next the focus in the Korean market is on various techniques for use of mulberry in humans [16].

Mulberry leaves are good for directing fat while boosting digestion. and are full to the brim with vitamin C, vitamins from the A and B groups. It is very safe to drink and a pristine non-lethal herb. It is useful for the elderly to drink daily and can fight infection. Adolescent children, pregnant women and breast-strengthening mothers should not drink hypoglycaemia. Significant amounts unless not recommended by qualified professionals [70].

### 9.2. Bioactive components

Many bioactive components are contained in mulberry leaves and Fruits such as anthocyanins, alkaloids and flavonoids [18] Alkaloids are contained in high concentration in mulberry leaves 1de-oxynojirimycin (DNJ), the most potent glycosidase inhibitor that lowers blood sugar levels [19, 20].

Have mulberry resveratrol (trans-3, 4, 1,5trihydroxystilbene) and oxyresveratrol (trans-2, 3,4,5,1-tetrahydroxystilbene), which are hydroxystilbenes [21].

This bioactive substance has cardio protective and neuroprotective protective effect [22].

Oxyresveratrol has an inhibitory effect on tyrosineinase to reduce the biosynthesis of melanin used as a cosmetic material and medicinal remedy for disorders including hyperpigmentation [23].

Anthocyanins are naturally a group of phenolic compounds responsible for the coloring of flowers, fruits and leaves. You are the best source of health benefits as an anti-inflammatory and antioxidant Compounds [24].

Mulberry anthocyanin extract has an anti-metastatic effect. Ability to inhibit the migration of B16-F1 cells and anthocyanin has high Inhibitory ability to lipid oxidation [25].

Flavonoids are common occurred in the plant kingdom and included at least mulberry four flavonoids including rutin. Flavonoids have been recognized antioxidant, anti-inflammatory, antithrombotic, anti-Allergic, antiviral, hepatoprotective and carcinogenic activities inhuman beings [26].

Plants are also rich in nutrients such as Crude fat, crude protein, total sugars and minerals and are Evaluated to obtain the correlation between the active component sand their antioxidant activities.

### 9.3. Alkaloids

Ethyl cinnamide, omethyl half or dinine, N-4-methyl eoxy styr cinnamide, O-isopentenylehalfordinol, N-2-Methoxy-2-[4-(3, 3 dimethylallyloxy) phenyl] ethylcinnamide, N-2-Methoxy-(4-methoxyphenyl) ethylecinnamide and O-(3, 3 dimethyl allyl) halofordinol [26].

Marmesin, Marmelosin, marmin alloimperatorin, imperatorin, xanthotoxol, scoparone, methyl Ether, scopoletine, umbelliferon, psoralen and marmelides, a-7 Gera-nyleoxy coumarin and Marmenols [27].

### 9.4. Phenolic compounds

Epidemiological studies have confirmed that cancer Means of



protection and contamination Protection part and movement The phenolic and many report varieties have a phenolic peak compound as part of plant species. Remarkable dissimilarities have been observed on the leaves of three mulberry collections Calculations for addition to phenol content. These results noticeable better than published oil palm leaves, and Iranian tonics plant [28, 29].

Anthocyanin is rich in mulberry extract and a coloring agent that naturally occurring component in plants Anthocyanins showed the antioxidant activity by scavenging the peroxy radicals upon scavenging Reaction. Anthocyanin glycosides after 8 hours of administration were not detected in the gastrointestinal tract. Sodium-dependent glucose transporter has been used to transport anthocyanins through the erythrocytes. The bioactive ingredients isolated from *Morus Alba* like Leachianon showed antibacterial activities [30].

## 10. Pharmacological activities of mulberry weed

### 10.1. Antidiabetic Activity

Leaf extract has a significant postprandial hypoglycemic effect possibly through inhibition of  $\alpha$ -glucosidase and glucose  $\alpha$ Traffic [31].

Leaf extract restores *Morus Alba* decreased number of cells [32] Aqueous ethanol leaf extract reduces blood of *Morus Alba*

Glucose levels of rats with type II diabetes and the effect may be due to it Chlorogenic acid and rutin in the extract [33] Sugar diabetic fat rats treated with mulberry fruit Extract for five weeks showed significantly lower glucose levels as a control group [34].

Ethanol fruit extract significantly reduce blood sugar and serum protein and increases the enzymatic levels of antioxidants in streptozotocin-induced diabetic mice The antidiabetic activity of the fruit extract could . Due to strong  $\alpha$ -glucosidase inhibition [35].

The present review completes the pharmacological importance of *Morus* species and their dietary components. A thorough analysis of the literature revealed that *Morus* species and their medicinally active phytochemicals exhibit a wide range of biomedical activities, including antioxidant, antidiabetic, hypolipidemic, antiobesity, antihypertensive, and antiarthrosclerotic. These plants have also shown remarkable roles in the food, textile and pharmaceutical industries. They have been observed to possess powerful antioxidant activity due to the presence of phenolic compounds, particularly flavonoids and anthocyanins, which have the power to scavenge free radical production. These broad areas of action of the mulberry plants encourage further research and validation of their pharmaceutical and medicinal potential.



**Fig 5:** Herbal Mulberry tea for keeping the diabetes away

In one Study the blood sugar concentration of the healthy person and the Type 2 diabetics after taking 75 g of sucrose in 500 ml of hot Water with 1 g leaf extract or placebo were *Morus Alba* supervised. Significant difference in blood glucose levels between and placebo over the first 120 min was *Morus Alba* observed [36].

In another clinic Examine the hypoglycaemic effects of leaf extract on *Morus Alba* postprandial glucose and insulin levels in patients with type 2Diabetes was treated with sulfonylurea hypoglycaemic drugs guided. Results showed postprandial glucose and insulin Levels in patients with type 2 diabetes treated with sulfonylurea were significantly reduced after taking jelly with 3.3gm leaf extract versus placebo jelly intake by diabetics Patients and healthy subjects [37].

1- Deoxynojirimycin, found in leaves, is a potent *Morus Alba* Glycosidase inhibitor and suppresses abnormally high blood levels glucose levels, thereby preventing diabetes mellitus. Only individually administration of 0.8 and 1.2 g deoxynojirimycin enriched powder significantly prevented the increase in postprandial blood Glucose and insulin secretion. So deoxynojirimycin Fortified powder can be used as a dietary supplement antidiabetic therapy [38].

### 10.2. Anticancer activity

*Morus Alba* (L.) Cancer is a serious public health problem worldwide. Most of the natural compounds target inflammatory pathways and the immune system Modulation for the prevention and treatment of cancer. Mulberry also contains several anti-cancer agents. M. fructus fruit extract

induces cancer cell death *in vitro* and *in vivo*. The *in vitro* effect is due to cell death in a ROS-dependent mitochondrial apoptosis [39].

Albanol A (also known as Mulberrofurane G) is the bioactive compound isolated from the root bark of the mulberry, *Morus Alba* (L.). This Albanol A was found to have an inducing effect Cytotoxicity (IC<sub>50</sub> 1.7mM) in HL60 cells(Human leukaemia cell line).Inhibition of topoisomerase II activity (IC<sub>50</sub> 22.8 mM). In addition, it induced early Apoptosis via the cell death receptor pathway and mitochondrial signalling observed by membrane phospholipid exposure, decreased levels of per-caspase 3, 8 and 9 and increased levels of split-caspase 3, 8 and 9 and increased Bax/BCL2 ratio [40].

The anti-cancer activity of the essential Mulberry-separated oil, *Morus Rotundiloba*Koidz, was studied in laryngeal epidermoid carcinoma (Hep2) and human colon adenocarcinoma (SW620) cell lines with the African green monkey kidney (Vero) cell line as a control. The oil at 0.1-100  $\mu$ g/ml had no effect on Vero cell viability. The mean lethal concentration (LC<sub>50</sub>) of the oil on the cytotoxicity of Hep2, SW620 and Vero was 70, 120 and 280  $\mu$ g/ml [41].

Resveratrol purified from the methanol. Alba extract showed heparinise. Inhibition and anti-metastatic effect urine B16 melanoma cells [42].

This mulberry, *Morus Alba* (L.) is a rich source of prenylated cytotoxic Flavonoid such as Sanggenone J and K, cyclomorusin, morusin, atalantoflavone, kaempferol, etc. Henrietta Misses (1 August 1920 – 4 October 1951)Was an African American woman whose Cancer cells are the source

of the HeLa cell line, the first immortalized cell line and one of the most important cell lines in medical research. An immortalized cell line is Reproduce indefinitely under specific Diseases and the HeLa cell line will continue to be a source of invaluable medical data. The Morusin is the most powerful of them. The morusin is active against HeLa cells with an IC<sub>50</sub> value of 0.64  $\mu\text{M}$  [69].

New 2-arylbenzofuran derivatives (namely moray eels of different structure from mulberry, *Morus Alba* (L.) Witt furans from *Morus wittiorum*) with Strong cytotoxic activity against various Human cancer cell lines have been identified. Recently.

A new galactose-binding lectin was Also purified from *M. alba* leaves with Cytotoxic activity on human breast cancer (IC<sub>50</sub>-8.5  $\mu\text{g}$ ) and colon cancer cells (IC<sub>50</sub>-16Mg) [44].

The anthocyanins are a group of phenols Compounds with Beneficial Effects in reductions risk of cardiovascular disease and cancer Because of its antioxidant, anti-inflammatory And chemo preventive properties [45].

Cyanidin-3-rutinoside and Cyanidin-3-glucosides are the two anthocyanin Present in mulberry, *Morus Alba* (L.). you Have powerful anti-cancer properties. They have Shown to inhibit the invasion and Migration of A549 human lung cancer cells By down regulating the expression of MMP-2 And urokinase plasminogen activator and Improves the expression of TIMP-2 and Plasminogen Activator Inhibitor. Also one Inhibition of activation of NF-kappa B and c-jun was also observed in this case [46].

### 10.3. Anti-inflammatory activity

Morin is a flavonoid with significant anti-inflammatory effects Found in mulberry. It was examined whether the accumulation of CsA In tissues of lymphatic and non-lymphatic tissues as well as in the imaret mune cells are strongly influenced by morin. The more is morin intake, the lower the CsA level in the tissue [67] Flavonoid isolates Of *Morus nigra* plus *Morus Alba* bark are powerful anti-inflammatory Toric agents [68].

### 10.4. Antioxidant activity

The antioxidant activity of leaf extracts was determined by measuring the free radical scavenging activity of 1,1-diphenyl-2-picrylhydrazyl (DPPH•), des 2,2'-azino-bis-(3-ethylbenzthiazoline-6-sulfonic acid-(ABTS•+)- Radicals assessed The cation scavenging capacity and ferric ion reducing power and values were between 1.89-2.12, 6.12-9.89 and 0.56-0.97 mM Trolox equivalent/g dried leaves, respectively.

The examined characteristics clearly show good antioxidant properties [59] In another study, free radical scavenging activity of different parts of mulberry (*Morus Alba* L.) was determined. Methanol extracts and their fractions dose-dependently increased the free radical scavenging activity of mulberry branches, roots and leaves (more than 70%) Study shows that mulberry fruits had the highest radical scavenging activity [60].

### 10.5. Antimicrobial action of mulberry

The methanolic extract from the bark of *M. Mesozygie* and its components (Cycloartocarpesin and various types of Moray eels) are used to treat Infections related to microorganisms [47] Prenylated Flavonoids Isolated from *M. alba* showed antibacterial, Antifungal and antiviral activities [48, 49].

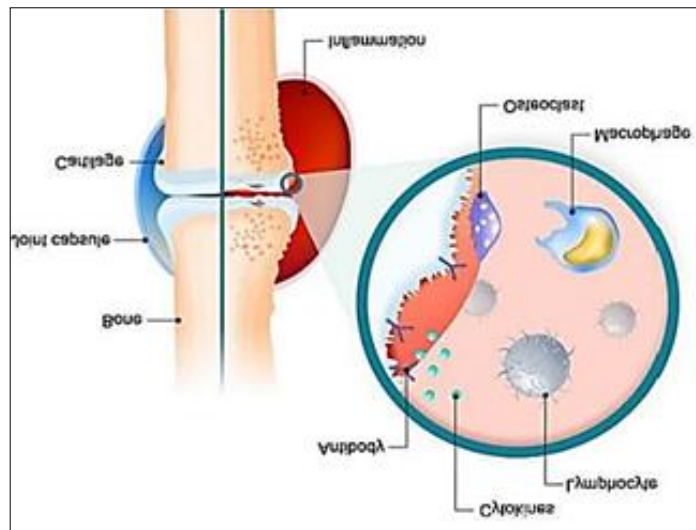


Fig 6: Mechanism of Inflammation

Kuwanon G was Isolated from the ethyl acetate fraction of *m. alba* methanol extract acts as antibacterial agent against oral pathogens [50].

Chalcomoracin, one leaf Phytoalexin of the mulberry tree exhibited Significant antibacterial activity against Methicillin-resistant *Staphylococcus aureus* [51].

for toxicity to *Artemiasalina* (L.), oral Toxicity to mice and antimicrobial activity. Phytochemical analyzes revealed its presence of coumarins, flavonoids, tannins and Triterpenes in the extract that did not show up Toxicity to *A. salinanauplii*. No mortality and mice Behavioral changes were noted in mice Treated with the extract (300 and 2000 mg/kgb.w.) for 14 days. However, animals that received the highest dose showed reduced MCV and MCHC and increased serum Alkaline phosphatase activity. For treatment With the extract at both 300 and 2000 mg/kg, There was a reduction in the number of Leukocytes, with percentage decreases Lymphocytes and increase in the ratio of Segmented cells. Histopathological analysis of Organs from mice treated with the extract 2000 mg/kg showed swollen or distorted Tubules in the kidneys, presence of leukocytes Infiltration around the centrilobular vein of the liver, And high dispersion of splenic white pulp. The extract showed antimicrobial activity Against *Staphylococcus aureus*, *Pseudomonas Aeruginosa*, *Candida albicans*, *Candida Krusei*, *Candida tropicalis* and *Aspergillus Flavus*. Finally, the extract contains Antimicrobials and was not fatal for Mice when ingested; however, requires its use Be careful because there are biochemical, Hematological Changes.

## 11. Bioactivity in Disorder:

### 11.1. Gastrointestinal disorders:

The health benefits of mulberries include their Ability to improve digestion, lower Cholesterol, help with weight loss, increase Circulation, build bone tissue and increase the Immune system. The fruit also helps prevent Certain types of cancer slow down the aging process, Lower blood pressure, protect eyes and Improve the overall metabolism of the body. Mulberries are packed with nutrients that are Important for our body, including iron, Riboflavin, Vitamin C, Vitamin K, Potassium, Phosphorus and calcium. They also contain a significant amount of dietary fiber and a Wide range of organic compounds, including Phytonutrients, Zeaxanthin, Resveratrol, Anthocyanins, lutein and various Polyphenolic compounds. Like the majority Of fruits and vegetables, mulberries include Dietary fiber that makes about 10% of

your daily requirement in one Portion. Dietary fiber can help improve it Digestion by bloating the stool, thereby Accelerates the movement of food through The digestive tract while also reducing Occurrence of constipation, bloating and Cramps.

In addition, dietary fiber helps regulate Cholesterol levels and can improve the heart Health when regularly added to the diet. As Most fruits and vegetables Mulberries contain fiber, which is power About 10% of your day Requirements in a single portion. Fiber may help improve digestion by bulking up The chair, accelerating the movement Of food through the digestive tract while also Reducing constipation, Bloating and cramps. Also fibre Helps regulate cholesterol levels and can Improving heart health with regular dosing The diet. Exploring and evaluating new and as a source of protein for livestock And other farm animals is an important goal For nutritionists to track. Contest Between humans and animals for the same food And the search for food alternatives Livestock increases. The rising costs From conventional feedstuffs such as corn, soybeans Flour and fishmeal for the poultry diet Looking for cheaper alternatives.

A possible feed alternative is tree feed Mulberry leaves (*Morus Alba*). Mulberry Grows well in the tropics and subtropics, It is reported to have excellent nutritional value. Mulberry leaves are very rich in protein (15-35%), minerals [2.42-4.71% calcium (Ca); 0.23-0.97% phosphorus (P)] and Metabolizable energy (1130- 2240 kcal/kg) With absence or negligible anti-nutritional Factors [52, 53, 54, 55, 56].



**Fig 7:** Mulberry, *Morus Alba* L. For skin disorder

### 11.2. Skin disorder

Melanin is a broad term for a group of natural substance Pigments found in most organisms. Melanin is Formed by the oxidation of the amino acid Tyrosine followed by polymerization. That Melanin pigments are produced in a Specialized group of cells known AS Melanocytes. There are three basic types of Melanin: eumelanin, pheomelanin and Neuromelanin. The most common type is Eumelanin, of which there are two types Brown eumelanin and black eumelanin. Pheomelanin is a cysteine derivative that Contains polybenzothiazine moieties that are Largely responsible for the colour of red hair, Including pigmentation. Is neuromelanin Found in the brain, although its function Remains in the dark.

In human skin Melanogenesis is initiated by UV exposure Radiation, causing the skin to darken. Melanin's an effective absorber of light; the pigments able to break down over 99.9% of the absorbed amount radiation. Because of this property Melanin is supposed to protect the skin cells from this Damage from UVB radiation, reducing the risk Cancer

and it is assumed that exposure to UV radiation is associated with an increased risk Of malignant melanoma, a type of cancer Melanocytes (melanin cells). Have studies showed a lower incidence of skin cancer in People with more concentrated melanin, i.e. darker skin tone. However; the Relationship between skin pigmentation and Photo protection is still under investigation.

The melanin present in the skin protects against UV radiation Induced hyperpigmentation, wrinkling, Melasma and cancer. Tyrosinase is a Important enzyme in melanin production and In mammals, skin pigmentation results From the transmission of melanosomes Melanocytes to keratinocytes in the epidermis. *M. alba* L. leaf extract showed strong effect Inhibitory effect on fungal tyrosinase, Mammalian tyrosinase and melanin synthesis melan-a cells. 2, 4, 2',4'-Tetrahydroxy-3-(3-methyl-2-butenyl)-Chalcones (TMBC) recovered from the stem Mulberry bark, *Morus nigra* (L.) modulated Melanogenesis by inhibition of tyrosinase. It Inhibited the L-dopa oxidase activity Fungal tyrosinase which was more potent tyrosinase known as kojicaacidInhibitor [57].

Applications of Mulberroside A, Oxyresveratrol and Oxyresveratrol-3-O Glucoside clearly caused depigmentation, reduced melanin indices, inhibited tyrosinase Activity and reduced melanin content in the UU Induced hyperpigmentation in guinea pigskin. Oxyresveratrol and Oxyresveratrol-3-O-Glucoside more inhibited Melanogenesis as Mulberroside A. This Treatment reduced the expression of MITFGene that regulate the transcription of Proteins involved in melanocyte pigmentation [58].

Mulberries also boast a High content of vitamin A and vitamin E, together With a number of carotenoid components such as Lutein, beta carotene, zeaxanthin and alpha Carotene. All of these elements act as Antioxidants that act specifically on the skin, Tissues, hair and other areas of the body where Free radicals strike. Mulberries can help in the skinCare, reduces the appearance of blemishes and age pots and keeps hair shiny and healthy prevents the oxidative effects of free Radical.

### 11.3. Neurological disorders

Neurological disorders part from the beneficial effects of the mulberry in Treatment of diabetes, cardiovascular disease, Cancer etc. but its effects on neurological Disorders are less studied. The neurotoxicity Associated with Alzheimer's disease (AD). The accumulation of amyloid beta peptides which forms as plaque in the brain.

The Mulberry leaf extract contains compounds Such kaempferol-3-O-glucoside, and Kaempferol-3-O-(6-malonyl)glucoside, the Inhibits the formation of amyloid beta peptide Fibrils *in vitro* and protects the hippocampus Neurons induced by amyloid beta peptide Cell death [61].

The amyloidPlaques are formed by the proteolysis of Amyloid precursor protein through the  $\alpha$ ,  $\beta$  or decrease enzyme. Therapeutic effort Target AD has now focused on disruption. This cascade by blocking these enzymes. Many flavones are identified with  $\beta$ -secretase inhibitory activity [62].

Cholinesterase's are key enzymes Which play an important role in cholinergic Transmission. Contains eight flavonoids Kuwanon U, Kuwanon E, Kuwanon C Morusin, Morusinol shows cholinesterase inhibitors(both acetylcholine and butyrylcholineEsterase) activity were isolated from the rootBark of *m. Alba* L. [64].

ThatNeuroprotective effect of oxyresveratrol Studied in *in vitro* model of stretch-induced Trauma in co-cultures of neurons and glia, or By exposing the plants to high



concentrations of Glutamate. Trauma generated significant neural Death and oxyresveratrol significantly Prevented this death. Microscopic examination Of glia indicate toxicity in cultures Treated with 100  $\mu$ M oxyresveratrol, e.g. Detected by elevated S-100B protein Release and a high proportion of cells with Condensed nuclei. Cultures exposed Glutamate for 24 h showed ~37% neuronal loss not verified by Oxyresveratrol [65].

Studies Have demonstrated the beneficial effects of Mulberry on the induction of an antioxidant Improvement of the defense system and memory Worsening in aging animals [66]. The neuroprotective effect of Cyanidin-3-glucoside (C3G) fraction. alba has been studied in oxygen deprivation And glutamate-induced cell death in rats Primary cortical neurons.



Fig 8: The Neurological Disorders

## 12. Conclusion

The present review completes the pharmacological importance of *Morus* species and their dietary components. A thorough analysis of the literature revealed that *Morus* species and their medicinally active phytochemicals exhibit a wide range of biomedical activities, including antioxidant, antidiabetic, hypolipidemic, antiobesity, antihypertensive, and antiarthrosclerotic. These plants have also shown remarkable roles in the food, textile and pharmaceutical industries. They have been observed to possess powerful antioxidant activity due to the presence of phenolic compounds, particularly flavonoids and anthocyanins, which have the power to scavenge free radical production. These broad areas of action of the mulberry plants encourage further research and validation of their pharmaceutical and medicinal potential.

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