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A Literature Review on Silk Maize Health Benefits and It's Pharmacological Effects in Various Diseases

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Abstract -:

Scientifically known as *stigma maydis* or *Zea mays*, Maize silk has significant importance as a traditional medicine for treating a broad range of illnesses. From centuries this plant has been potentially used as an Oral Anti Diabetic and Kidney stone treatment as well as in other like Diuretic, Antioxidant, Nephroprotective, Anti-inflammatory, and Anti-hypertensive.

The composition of maize silk includes proteins, carbohydrates, vitamins, and certain salts of calcium, sodium, potassium, and magnesium ions. The phytoconstituents found in maize silk are Volatile Oils, Tannins, Saponins, Alkaloids, Flavonoids, and some Steroids like Stigmasterol and Sitosterol are all present in Cornsilk. Formic Acid, Oleic Acid, Palmitic Acid, Linoleic Acid, Stearic Acid, Succinic Acid, and Lactic Acid are among the organic acids included in maize silk.

Numerous studies have claimed the Antioxidant potential of maize silk and its medical uses as Diuretic agents, for lowering blood sugar levels, as an Antifatigue agent, and as an Antidepressant. Urinary tract issues are treated with teas and Corn Silk supplements.

This comprehensive Article on health potential of Corn Silk will be provide readers a throughout understanding of maize silk's potential benefits withs its pharmacological effects on health.

Keywords-:

Silk Maize, Herbal, flavonoids, Diuretic, Antioxidant, Nephroprotective, Anti-inflammatory, Anti-hypertensive, Anti Diabetic, Kidney stone.

1. Introduction-:

1.1 History-:

Herbs that have been used for centuries to cure A variety of illnesses which have A significant part on the foundation of Ayurveda, Unani, Homeopathy and Nutraceutical Medications.

Many traditional herbs have therapeutic benefits because they contain natural antioxidants, particularly phenolic constituents [1] because of their strong antioxidant properties, natural products are becoming increasingly important in the medical and food industries. Numerous antioxidant chemicals may be derived from natural sources, including plants, herbs, fruits, and vegetables [2].

These substances have the ability to scavenge reactive oxygen species (ROS), which have been linked to oxidative stress molecules and may be responsible for a number of illnesses, including cancer, hypertension, and cognitive impairment [3]. Many herbs and plants are used to prevent oxidative stress-related disorders in order to protect humans from oxidative stress illness.

Figure 1. Corn Maize Framing

Maize silk (maydis stigma) is a byproduct of maize agriculture, but it is also an affordable plant medicinal diet [4]. Corn Silk was first documented as a traditional chinese classical herb in the medical classic materia medica of south yunnan by the chinese physician lan mao (1397-1470) during china's ming dynasty. According to traditional chinese medicine (TCM) theory, Corn Silk is a valuable medicinal plant with the

function of generating diuresis and excreting dampness, easing the syndrome of farming internal stagnation of fluid dampness [5].

Figure 2. mature Cornsilk

The genus Zea consists of four species of which Zea mays L has majorly economically important. The other Zea species, referred to as teosintes Which are largely wild grasses native to Mexico and central America

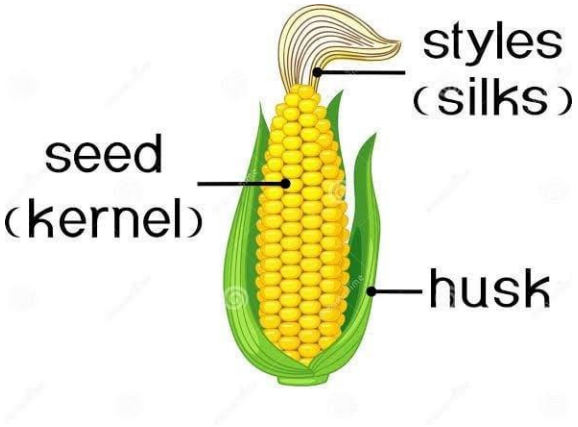

Figure 3 Corn Silk parts

The male and female flowers of Corn are initially found in separate inflorescences on the same stalk, making the blooms hermaphrodite.[6] yellow pollen is produced by the male flowers, or tassels, at the top of the plant. On the meantime, the female flowers, which are found on the leaf axils, generate Corn Silk.

Figure 4 Immature Corn Silk in Baby corn to Produce Corn kernel

The silks are lengthy, staggered structures that resemble a tuft of hair. Light green in hue, Corn Silk eventually becomes red, yellow, or light brown. A single Corn kernel is produced by the pollination of each Corn silk[7].

1.2 Taxonomical Description-:

Kingdom	Plantae
Subkingdom	Tracheobionta
Super Division	Spermatophyta
Division	Magnoliophyta
Class	Liliopsida
Subclass	Commelinidae
Order	Cyperales
Family	Poaceae
Subfamily	Panicoideae
Tribe	Andropogoneae
Geneus	Zea
Species	Zea Mays

Table 1-: Taxonomical Classification of maize [8]

Figure 5 Dry Maize silk

1.3 Phytochemical Composition -:

The biological activities of Corn Silk extracts, which are mostly attributed to their flavonoid content, are determined by their compositions.[9] An abundant class of phenolic chemicals found in plants, flavonoids function as well as antioxidants.[10] In addition, it has fibers and sugar that are necessary for a diet, while mucilage, resin, and maizeric acid that function similarly to Diureti corn Silk, or water tablets, and it can change blood sugar levels and reduce inflammation. [11,12]

Other flavonoid derivatives from Corn Silk of various Corn inbreeds were recovered from Corn Silk ethanol extract (80%), and they were recognized as reduced derivatives of Maysin (Figure 6), luteolin (Figure 7) and flavonoid (Figure8) 3'-methoxymaysin(Figure9).[13]

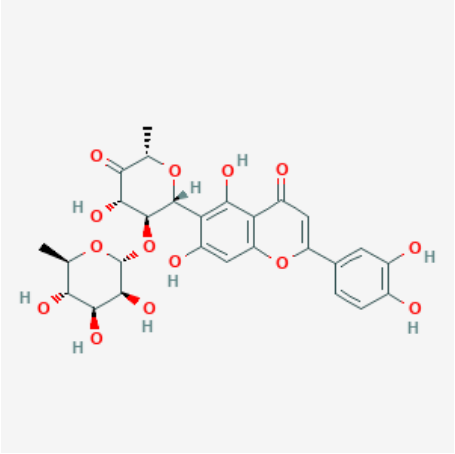

Figure 6. maysin structure

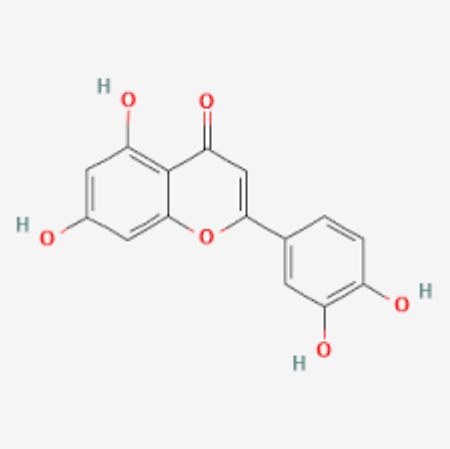

Figure 7.luteolin structure

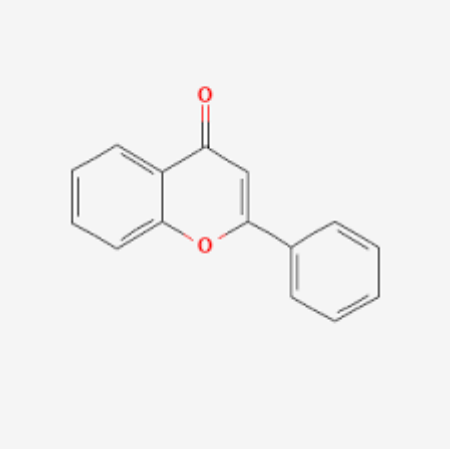

Figure 8. Flavonoid Structure

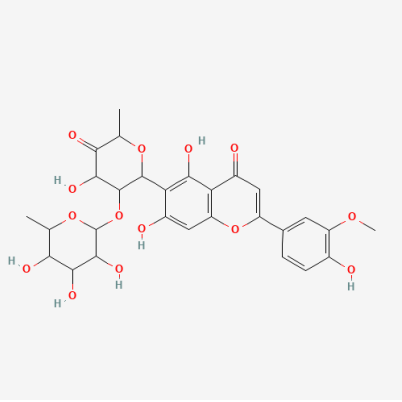

Figure 9. 3'-methoxymaysin

1.4 Nutritional composition of Silk maize -:

Variety	Moisture (%)	Protein content (%)	Dietary/crude fiber (%)	Carbohydrate content (%)	Mineral content
Corn Silk	9.65–10.4%	9.42–17.6%	14.7-15.5%	65.5–74.3%	Rich in Na, K, Ca, Mg, Fe. Zn, Mn and Cu
Mature Corn Silk	84.4%	8.95%	7.34%	29.4%	Rich source of Na, K, Fe and Mn
Corn Silk powder	7.89 g	15.29 g	41.25g	56.16 g	Rich source of Na, Mg, K, Ca, Cu, Fe and Mn
Sweet Corn Silk	72.2%	13%	67.9% hemicelluloses 31.4% cellulose 0.7% lignin	41%	Rich in Mg, P and K, Vitamin A, D, E and K

Table 2 Nutritional composition of Silk maize [14]

1.5 Chemical Constituent of Silk Maize-:

These silk maize chemicals are commonly utilized in soaps, home goods, cosmetic Corn Silk, and fragrance and flavoring applications. Silk from corn. Furthermore, the CORN SILK was rich in minerals, including sodium (0.05%), potassium (15%), iron (0.0082%), zinc (0.016%), and chloride (0.25%), as well as cinnamic compounds, glucose, and rhamnose. 96.5% moisture, 3.91% ash, 0.29% crude fat, 17.6% crude protein, and 40% crude fiber make up the approximate makeup of Corn silk.[14,15]

Numerous investigations revealed that maysin (Figure 5) was connected to the biological activities of Corn Silk components, which were found in the volatile dichloromethane extract by gas chromatography-mass spectrometry (GC-MS) The extract contained over 99% terpenoids[16]

Figure No.	Type of Terpenoid	Percentage Present
10	cis-α-terpinol	24.22%
11	citronellol	16.18%
12	6,11-oxidoacor-4-ene	18.06%
13	pinocamphone	5.86%
14	eugenol	4.37%
15	neo-iso-3-thujanol	2.59%
16	cis-sabinene hydrate	2.28%

Table 3 Corn Silk Components by Gas Chromatography

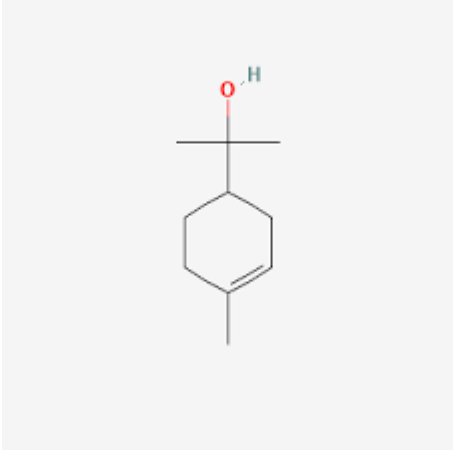

Figure 10. cis-α-terpinol

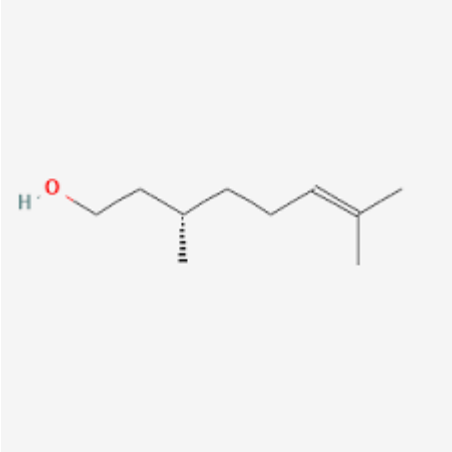

figure 11. citronellol

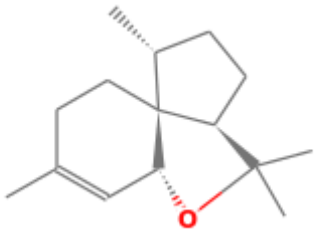

Figure 12. 6,11-oxidoacor-4-ene

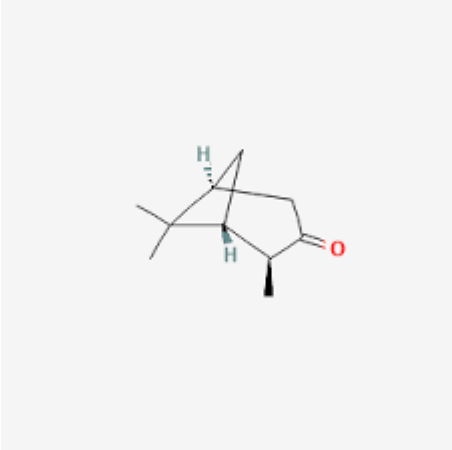

figure 13. trans-pinocamphone

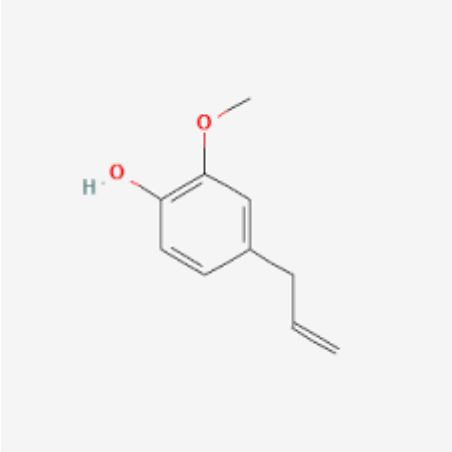

Figure 14. eugenol

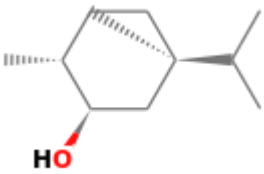

Figure 15. neo-iso-3-thujanol

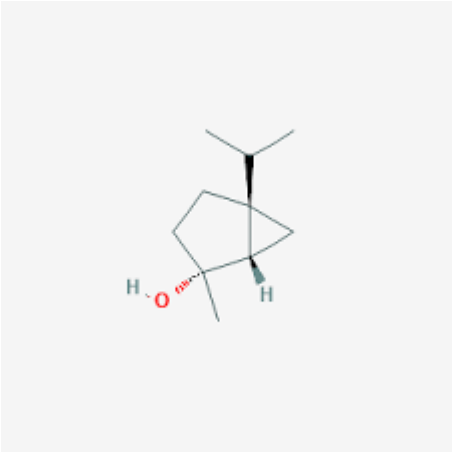

Figure 16. cis-sabinene hydrate

2. Pharmacological Benefits of Cornsilk-:

2.1 Hyperglycemic effect of Corn Silk -:

Diabetes mellitus (DM), sometimes referred to as just diabetes, is a collection of metabolic illnesses characterized by persistently elevated blood sugar levels. The symptoms of increased thirst, increased appetite, and frequent urination are brought on by this elevated blood sugar.[16] Diabetes has several problems if left untreated. Diabetic ketoacidosis and nonketotic hyperosmolar coma are examples of acute complications. Heart disease, stroke, renal failure, foot ulcers, and eye damage are examples of serious long-term consequences. [17]

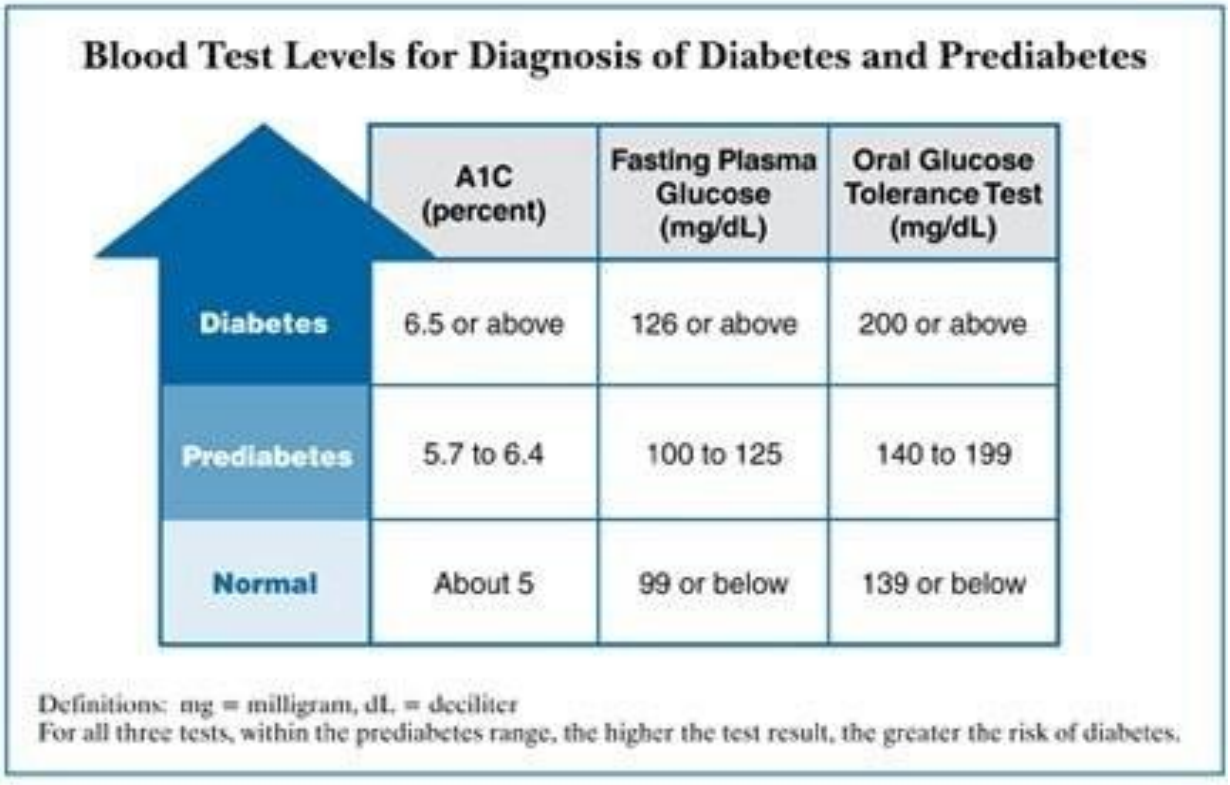

Figure 17 Blood Glucose level for Diagnosis of Diabetes

The complicated metabolic illness known as diabetes mellitus is typified by hyperglycemia, which is brought on by abnormalities in insulin supply and activity[18].

The most common side effects of diabetes include systemic weight loss, impaired eyesight, polyuria, and glycosuria[19]. Conventional Anti-diabetic medications have the ability to alter many glucose metabolism pathways, including insulin secretion and target organ glucose absorption [20].

Corn Silk having antidiabetic and antihyperglycemic properties make it a potential bioactive agent for the management and treatment of diabetes mellitus According to in modern pharmacological study of corn silk extract scientific research performed in alloxa-induced hyperglycemic mice, maize silk improves insulin secretion, which has a positive impact on glycemic metabolism.[21] The improvement of insulin levels and recovery of beta cells are two potential methods by which Corn Silk regulates the hyperglycemia profile.[23]

Genetic Defects, Unhealthy Lifestyle and Physical inactivity

↓

High Blood glucose ,Damage of cells and insulin insensitivity

↓

Silk Maize Extract

↓

Improved insulin level restored damages beta cells

↓

Enhances glucose uptake and regulates its metabolism

2.2 Diuretic and kaliuretic effect of corn silk extract Useful in kidney stone treatment-:

the most notable health benefits of silk maize is its potential as a Diuretic. Diuretic Corn Silk help increase urine production and assist in flushing out toxins and waste products from the body.[25]

This property makes silk maize particularly beneficial in the treatment of kidney stones. By promoting increased urine flow, the silk maize helps to prevent the formation of stones and eases their passage through the urinary tract. In an experiment, using anesthetized Wistar rats Corn silk treated group showed a significantly increased Na+ excretion in a 60 min period (127.5%) and 90 min period (86%) and increase of K+ excretion by 62% and 63% was observed in the same periods of time.[26] Additionally, the Diureticlinical studies need to be carried out claim of an effect of silk maize can also aid in reducing water retention and bloating.

Urine Super Saturation

↓

(Silk maize promotes Diuresis effect)

↓

Promotors such as hyperoxaluria or hypercalciuria

↓

oxidative stress towards nephron cell apoptosis or necrosis

↓

(silk maize shows Nephroprotective effect)

↓

cell injury and cell membrane rupture

↓

Nucleation Modulators

↓

Crystal formation

↓

Crystal growth

↓

Crystal aggregation

↓

Crystal retention

↓

Kidney Stone formation

2.3 Antihypertensive Effects of Corn Silk Extract -:

Diuretic Corn Silk are one of the various types of antihypertensive medications. Diuretic Corn Silk are medications that lower blood pressure by lowering salt level, decreasing blood volume, and stimulating urine flow, among other methods

Corn silk acts as a regulator of the electrolytes present in the body, as it helps the release of potassium and sodium in the urine, so the exit of water and minerals in the urine helps reduce high blood pressure [27].

The body depletes salt as a result of the increased renal output of water, which lowers blood volume. As a result, there is less cardiac workload, plasma volume, and oxygen demand, which lowers blood pressure. Therefore, Diuretic Corn Silk is very effective in treating individuals with hypertension, congestive heart failure, glaucoma, diabetes, and liver diseases.

Anti-hypertensive effects of CSE in rats. SHRs were orally given with 10 mg/mL captopril or various dosages of CSE. Tail SBP was measured at 0 and 1 h. Data are expressed as changes in SBP (mmHg).

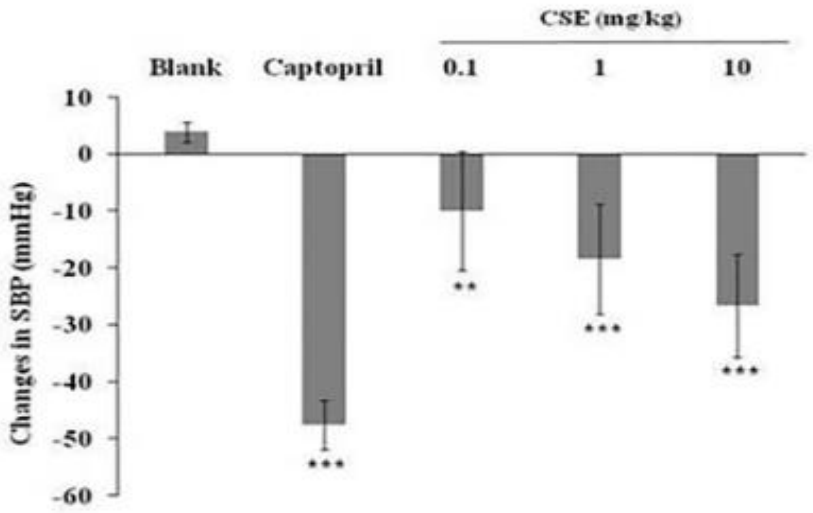

Figure 18. Effect of Corn Silk Extract versus Captopril

As Diuretic effects can cause a loss of water and solutes in the blood, excretion of water and active solutes like Na and K has an influence on blood pressure regulation[28]

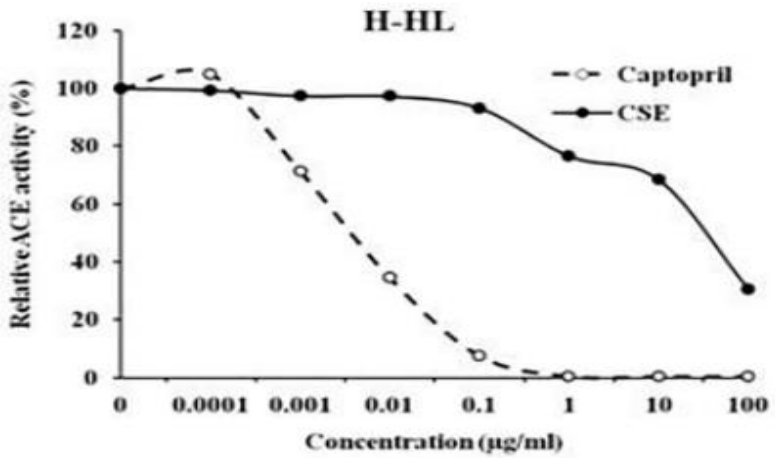

Figure 19 ACE activity assay

Various amounts of captopril or CSE were mixed with serum ACE and substrates

As a result, blood pressure will drop as blood volume decreases. Due to the Diuretic properties of Corn silk, it decreases blood pressure and promotes renal excretion. Various studies show the Corn Silk tea has significant positive effects on hypertension patients by lowering blood pressure in individuals.[29]

2.4 Antihyperlipidemic effect of Corn Silk extracts-:

The term Hyperlipidemia describes an increase in plasma lipids, including phospholipids, triacylglycerols (TG), total cholesterols (TC), and cholesterol esters.[30] This diseased state is known to be a significant risk factor for the start of cardiovascular diseases (CVDs) and plays a critical role in the development of atherosclerosis.[31]

The effects of Corn Silk total flavonoid on cholesterol and lipoprotein cholesterol metabolism also showed a comparable decrease in atherogenic markers (TC, TG, and LDL-c) and an improvement in non-atherogenic lipoprotein. [32,33] obesity induced by a high-fat diet were treated with Maysin.

In a study on anti-hyperlipidemic activity was conducted by feeding the rats with hyperlipidemic feeds containing cholesterol, fat, sodium cholate, and ordinary feed. Total flavonoids of corn silk extracts showed an anti-hyperlipidemic effect on hyperlipidemia rats.[34] The bioactive component from Cornsilk This resulted in a significant reduction in the rats' body weight, kidney weight, and epididymal fat weight, indicating that Maysin had a weight-reducing effect by reducing the body's accumulation of fat.[35]

Bad Dietery Habit Unheathy Lifestyle and Gene Mutation

↓

High TC ,TGA and VLDL

↓

Increases HDLC

↓

Silk maize Ethanolic extract

↓

Lower TC ,TGA and VLDL

↓

Treat/ Inhibits Hyperlipidaemia

2.5 Anti-oxidative Activity-:

Corn Silk contains antioxidants such as Sterols, Saponins, Allantoin, Particularly Beta-sitosterol and Plant Acid, Anthocyanins, Alkaloid, stigmasterol, Vitamin K, Vitamin C, Mucilage, Polyphenols, and Tannins. Corn Silk also contains a wide range of chemical nutritional elements such as alkaloids, tannins, minerals, proteins, vitamins, carbohydrates, flavonoids, steroids, and volatile molecules.[36] Corn Silk glycoproteins reduce the development of IgE antibodies while enhancing the formation of IgG and IgM antibodies.

The capacity of a bioactive component to remove free radicals, stop lipid oxidations, and stop oxidative reactions in order to preserve cell integrity, structure, and function is known as antioxidant activity. Antioxidants with low molecular weight can safely interact with free radicals to halt the chain reaction before important molecules are harmed.[37]

Corn Silk is rich in naturally occurring bioactive compounds with potent antioxidant qualities.[38] Its flavonoids have a potent antioxidant activity that both scavenges the free radicals shown and lowers the formation of free radicals.[39]

During various studies in Greece and Philippines it was found that the methanolic extract of maize silk exhibited the highest overall antioxidant activity and the highest DPPH scavenging activity.[40] One of the most prevalent Corn Silk flavonoids, Maysin stigma, confirms the decrease of intracellular reactive oxygen

species (ROS) and controls the production of intracellular antioxidant enzymes in SK-N-MC cells exposed to H2O2.[41]

H2O2

↓

Oxidative cell damage

↓

Cell rupture ,oxidation of fatty acid Cell brust

↓

Oxidation of DNA molecule

↓

Apotitic cell death

↓

Antioxidative and Antitapoptotic mechanism of corn silk

↓

Also shows Anti-Cancer mechanism

The super antioxidant luteolin, a Corn Silk flavonoid, was also identified by a Cu2+ induced liposome oxidation test. It has been determined to be an effective element in the lipid peroxidation test [42,43] Chlorogenic acids (CGAs), in addition to flavonoids, have been identified as important phenolic corn Silk and strong antioxidants. [40,42]

2.6 Anticancer Effect of Corn Silk-:

luteolin, a physiologically active substance found in Maysin, has been demonstrated to possess anticancer and antioxidant qualities. In maize silk extracts, it also functions as an anti-allergic, neuroprotective, antioxidant, and anti-apoptotic molecule.

2.7 Antimicrobial effect of Corn Silk extract -:

A substance that either destroys bacteria (microbicide) or inhibits their development (bacteriostatic agent) is called an antibiotic. Antimicrobial drugs can be categorized based on the bacteria they mostly target.[44]

The electrophoresis technique detected the presence of active chemicals like chitosan and dextran, which showed that these two molecules had antibacterial action.[45]

The hydrophilic flavonoid and the polar head groups of the lipid create a hydrogen bond.[46] Phenolic chemicals cause microbial mortality by denaturing the molecular protein found in microorganisms and stopping the metabolic process carried out by enzymes. This is because possibility exists for Corn Silk extract to prevent Aspergillus from growing [47] The ethanolic extract inactivates both types of bacteria, including E. coli, and the Corn Silk extracts from petroleum ether (PECORNSILK) and methanol (MECORNSILK) have been described for their efficacy against both gram positive and gram-negative bacteria.[48]

Corn silk used as antifungal such as Fusarium gramine arum, in addition to its effect as antibacterial against many organisms as Pseudomonas aeruginosa, Klebsiella pneumonia, Staphylococcus aureus, Streptococcus pneumonia, Escherichia coli and Streptococcus pyogenes [49]

In a study performed by the School of Pharmaceutical Sciences, Universiti Sains, Penang, Malaysia. The microbial growth inhibitory potential of the extracts was determined by using the agar hole-plate diffusion method

the results of antimicrobial activities of different solvent extracts of corn silk, it can be seen that extracts exhibited wider range of antimicrobial activity, petroleum ether and methanol extracts were more active than chloroform extracts.

Therefore, it can be concluded that extracts of corn silk can protect the body from different disease conditions related to pathogenic organisms.

2.8 Anti-inflammatory effects of Corn Silk Extract-:

Inflammatory processes involve a series of events caused by numerous stimuli such as antigen antibody interactions, thermal or physical injury, infectious agents and ischemia.[50] Pain felt from the inflammation is caused by the release of analgesic mediators had a scientific Tumor necrosis factor-α (TNF) or E. coli lipopolysaccharide (LPS) play an important role as mediators of inflammation and promote a variety of physiological responses[51]

the application of CORN SILK as a traditional treatment for inflammatory diseases basis on the various studies the Crude ethanolic extract of CORN SILK exhibited a significant activity in anti-inflammatory herbal drugs for Tumor necrosis factor-α antagonistic activity [52]

the anti-inflammatory efficacy of CORN SILK extract was further investigated by 1in a rat model of carrageenin (Cg)-induced pleurisy, cellular infiltration, exudates formation, Tumor necrosis factor-α shows positive feedback regulation between COX-2 in treating inflammation and increasing vascular permeability.

2.9 Neuroprotective Properties of Corn silk Extract-:

The neuroprotective effects of CORN SILK extracted with ethyl acetate (EtOAc) and ethanol extract (EtOH) from four maize varieties (vars. intendata, indurata, everta, and saccharata) were studied by assessing acetylcholinesterase (AChE) and Butry cholinesterase (BChE) inhibition.[53] The results reveal that there is a high inhibition of acetylcholinesterase (AChE) by CORN SILK extracts in ethyl acetate (EtOAc), indicating that CORN SILK extracts have the potential to be employed in neuroprotective applications.[54]

2.10 Cosmetic Applications of Corn silk Extract-:

Melanin is the most essential hormone in determining the color of the human body's skin. Melanin synthesis by Melan-A cells rises due to tyrosine oxidation by the enzyme tyrosinase. Tyrosinase activity in Melan-A cells was decreased by CORN SILK extract (1). The use of CORN SILK to faces with hyperpigmentation considerably decreased skin pigmentation without causing any adverse responses. CORN SILK has a strong chance of lowering skin pigmentation [[55]. CORN SILK is also used traditionally to soften skin tissues (emollient) and to treat skin rashes.

2.11 Corn Silk Extract on effect of Hair Growth-:

A steroid (sitosterol)found in silk maize that prevents the synthesis of DHT, a hormone linked to hair loss. In tiny research, it was shown that beta-sitosterol combined with saw palmetto significantly improved hair growth in 60% of males with male pattern baldness symptoms.

Another silk maize [56] steroid(stigmasterol) that inhibits DHT and restores antioxidants to the hair shaft to promote hair follicles. According to a study, stigmasterol functions as a potent hair growth supplement by inhibiting the activity of the enzyme that converts testosterone into dihydrotestosterone (DHT).[57,58] It has been demonstrated that Corn Silk flavonoids benefit hair in ways such as strengthening it, preventing hair loss, and encouraging growth. Corn Silk furthermore contains lutein, a potent antioxidant that provides extra defense against UV ray damage. [56,58]

2.12 Corn silk tea-:

a product made from corn silk that contains bioactive compounds such a flavonoids and antioxidants. It has been shown to help with Edema, decrease prostate inflammation, hypertension, diabetes, kidney disorders, anti-depressant and diuretic effects, and neurological problems.[59] Corn silk offers several advantages, including its ease of availability, low cost, and pleasant flavour when drank as tea. The powdered can be kept and utilized later.[60]

2.13 Corn silk water -:

The contains luteolin derivatives that can be converted into luteolin aglycones, as well as Maysin, aglycones, methoxy Maysin, and isoorietins, which have been shown to reduce oxidative stress, inflammation, hyperglycaemia protect neuronal cell death, increase blood flow, -cell mass, and promote the gut microbiome-brain axis.[61}

1. **Conclusion-:**

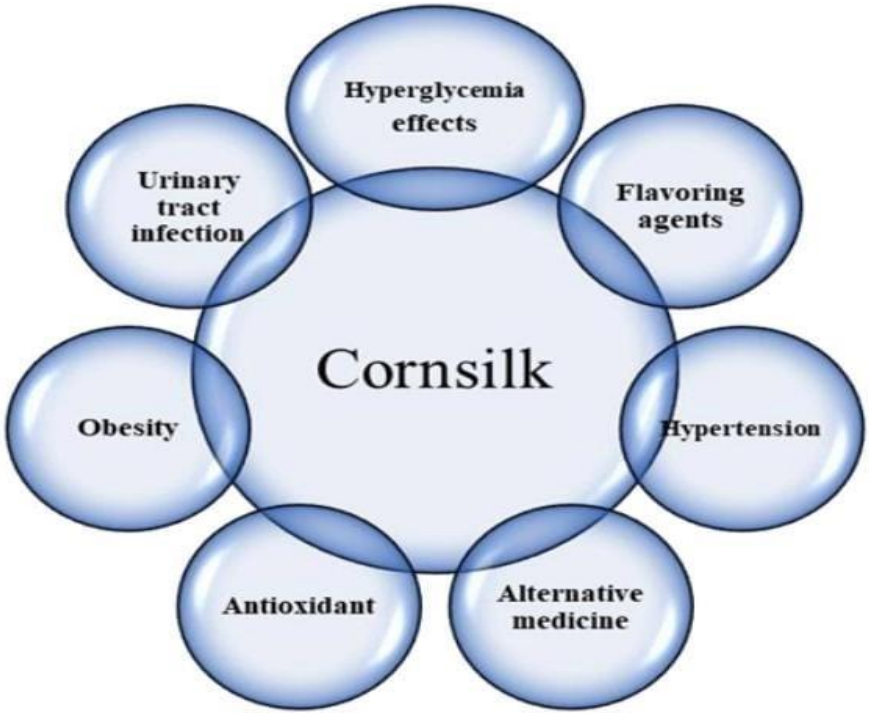

Figure 19. Pharmacological Benefits of Silk maize

Silk maize multiple pharmacological properties, has emerged as a promising natural resource for promoting health and well-being. As research continues to develop into its therapeutic potential, its Diuretic and antihypertensive effects, along with its potential in managing hyperglycaemia and protecting against nephrotoxicity, hold immense promise for the of modern medicine, emerging as the wonders of silk maize may mark a breakthrough in the pursuit of holistic healthcare, merging the wisdom of traditional remedies with the advancements of scientific exploration.

The review's main objective is to increase the value of agricultural waste that has excess nutrients and medicinal qualities. Regarding maize silk's chemical makeup, pharmacological characteristic Corn Silk, and application in the creation of value-added goods, several studies have been carried out. Only a limited amount of research examined the relationship between the pharmacological characteristic Corn Silk and the mechanism of action of the bioactive constituents. This review fills up the gaps and examines the bioactive chemicals' mechanisms of action.

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