



A REVIEW ON STIGMA MAYDIS AS A POTENTIAL NUTRITIONAL SOURCE FOR HUMAN HEALTH

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ABSTRACT

The portion of maize that has been shown to be advantageous and medicinal is called corn silk scientifically known as stigma maydis or zea mays. It is very valuable in treating a variety of illnesses, including kidney, UTI, hypertension, diabetes, antidepressant and neurological conditions. Additionally corn silk has strong anti-inflammatory and antioxidant properties. Due to its nutritional advantages, it is utilized not only as a medical plant but also as a whitening agent in cosmetics and in the food industry. Secondary metabolites such as proteins, flavonoids, volatile oils, tannins, vitamins K and Ca, and Mg are abundant in it.

KEYWORDS: *Corn Silk; healthcare; pharmacology; phytochemical.*

1. INTRODUCTION

Corn silk, also known as Stigma Maydis, is the delicate, thread-like female inflorescence of corn, spanning 10-20 cm in length. Widely recognized in various traditional medicines globally, corn silk harbors significant medicinal potential. Rich in essential minerals like potassium, calcium, magnesium, iron, and aluminum, it offers diverse applications.

Numerous plants and herbs are valued for their antioxidative properties, aiding in the prevention of oxidative stress-related ailments and overall health maintenance. Corn silk's active compounds, particularly phenolic compounds like flavonoids, function as potent antioxidants. Renowned for its in vivo health benefits, corn silk is utilized in China, Turkey, France, and the United States for its anti-diabetic, anti-depressant, anti-fatigue, diuretic, and hypoglycemic effects.

Additionally, in vitro studies have highlighted corn silk's anti-inflammatory, antibacterial, and antioxidant properties, attributing them to its rich composition of phenolic compounds, sterols, flavonoids, alkaloids, polysaccharides, organic acids, volatile oils, trace elements, and multivitamins. Its consumption in the form of corn silk tea is purported to lower blood pressure, reduce prostate inflammation, alleviate diabetic and urinary tract infections, address edema and obesity, and induce relaxation.

Corn oil, derived from corn germ, starch, and gluten, finds applications in various industries like coatings, biodiesel, soaps, and paints. Predominantly composed of linoleic and oleic acids, with trace amounts of saturated palmitic acid, stearic acid, and myristic acid, corn oil is primarily utilized in the food industry, with limited direct consumption.

1.1 Types of Maize

Maize, classified into different types such as sweet, dent, and flour, is distinguished by its internal kernel structure and the proportions of soft and hard endosperm or starch present, resulting in varied culinary properties:

1. Sweet corn
2. Pod corn
3. Flour corn
4. Dent maize
5. Flint maize
6. Waxy maize

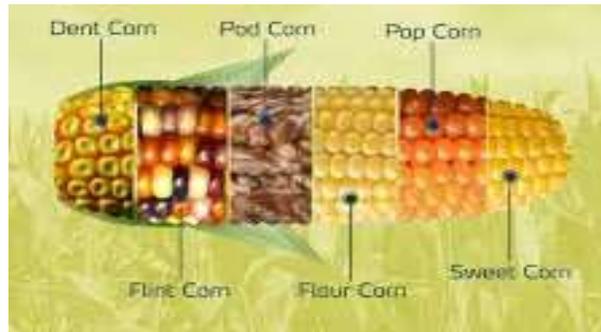


Figure-1 Different types of Maize

1.2 Uses of Corn Silk

Corn silk exhibits various medicinal properties and is utilized for diverse purposes, including:

- Analgesic
- Astringent
- Anti-allergic
- Emollient for skin rashes
- Sore throat remedy
- Anti-angina
- Anti-hypertensive
- Anti-diarrheal
- Treatment of urinary disorders such as dysuria, cystitis, urethritis, and nocturnal enuresis
- Anti-tumor
- Anti-gonorrheal
- Diuretic and Kaliuresis effect
- Management of bedwetting
- Alleviation of fatigue

1.3 Medicinal Uses

Corn silk finds pharmaceutical applications due to its components:

- Diuretic properties attributed to potassium content
- Regulation of blood pressure and cholesterol levels by linoleic acid in corn oil, aiding in
- preventing cardiovascular diseases
- Treatment of dandruff using corn oil
- Abundance of carotenoids, phenolic compounds, and phytosterol compounds, collectively known as phytochemicals, contributing to the reduction of major chronic diseases in humans.

2. USES OF STIGMA MAYDIS IN VARIOUS DISEASES

Corn silk, rich in diverse plant compounds, offers therapeutic potential in treating various ailments such as heart disease, urinary tract infections (UTIs), prostate issues, and malaria, as documented in traditional Chinese and Native American medicine.

2.1 Treatment of Diabetes Mellitus

Diabetes mellitus, a prevalent metabolic disorder, involves improper insulin function, leading to hyperglycemia. Experimental studies reveal corn silk's efficacy in reducing hyperglycemia induced by alloxan in mice, attributed to its ability to raise insulin levels and heal damaged β -cells. Corn silk extract administration also enhances liver glycogen synthesis and regulates blood glucose levels.



Take 150 gm of dried corn silk with 300 ml water



Boil at 50°C for 5 minutes



Drink daily for 14 days



It lowers the blood glucose level up to 58 g/dl in type 2 diabetes mellitus patient

2.2 Treatment of Chronic Kidney Disease (CKD)

Corn silk, often consumed as tea, aids in increasing urine production, facilitating waste product and toxin elimination, and reducing creatinine levels in CKD. Its diuretic properties alleviate swelling and lower blood pressure, common symptoms of CKD.

2.3 Treatment of Hyperlipidemia

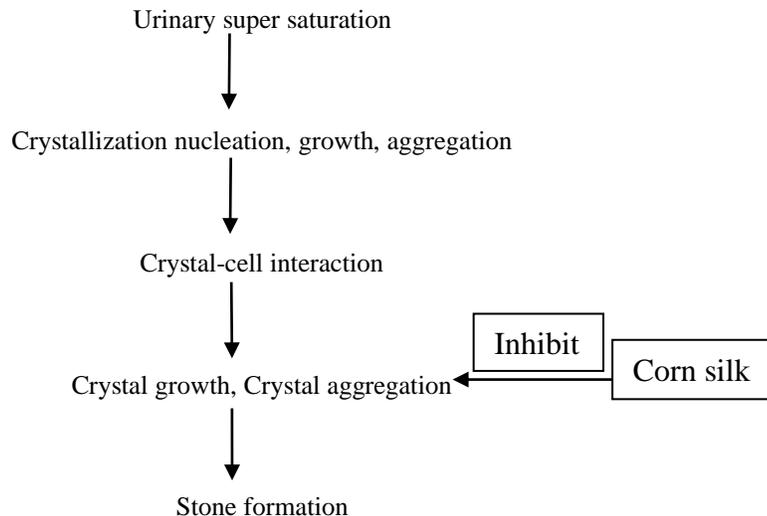
Studies suggest that corn silk extract exhibits anti-hyperlipidemic effects by increasing HDL cholesterol and decreasing total and LDL cholesterol levels. This property makes it valuable in managing hyperlipidemia, reducing the risk of cardiovascular diseases and atherosclerosis.

2.4 Treatment of Urinary Tract Infection (UTI)

Corn silk's soothing and anti-inflammatory properties aid in UTI treatment by coating and calming irritated tissues, stimulating bladder and kidney function, and enhancing urine flow. Consumption of corn silk tea or extract has shown significant symptom reduction without adverse effects.

2.5 Treatment of Kidney Stone

Corn silk's diuretic properties promote urine production, aiding in flushing out toxins and preventing kidney stone accumulation. By improving urine flow and inhibiting excessive uric acid production, corn silk helps prevent kidney stone formation, offering relief from associated pain and discomfort.



2.6 Treatment of Cancer

Corn silk exhibits promising potential in the treatment of cancer, with studies revealing its ability to inhibit tumor growth and extend survival in animal models. Luteolin, a bioactive compound found in corn silk, demonstrates both anticancer and antioxidant properties. Polysaccharides derived from corn silk have been shown to significantly inhibit tumor growth, particularly in prostate cancer. These findings suggest that corn silk, through its various bioactive components, may hold promise as a natural anticancer agent, offering new avenues for research and potential therapeutic interventions against this prevalent and challenging disease.

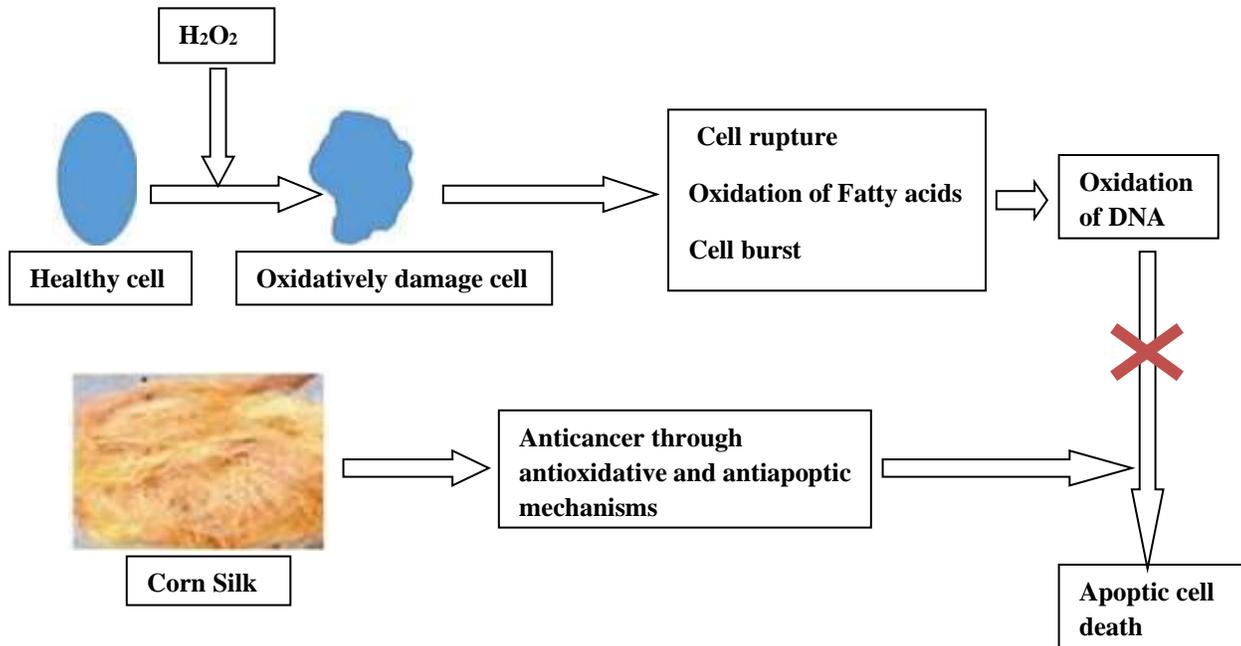
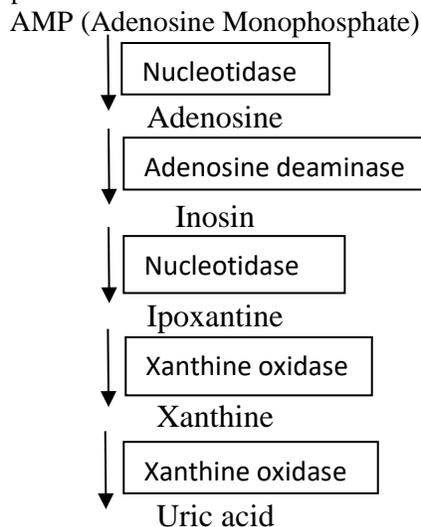


Figure-2 Antioxidative and Anticancer effect of corn silk

2.7 Treatment of Gout

The term "gout" refers to a group of clinical conditions caused by a dysmetabolism resulting in the formation and deposition of monosodium urate (MSU) crystals. Because MSU crystals deposit in the synovial fluid, the condition is linked to recurrent episodes of acute joint pain. Gout is a result of a disorder in purine metabolism



In the current study, the consideration of crude corn silk extracts in evaluating enzyme inhibitory activity is pertinent, as observed differences in inhibitory activity may be influenced by contaminants like soluble carbohydrates and other metabolites. To achieve a more precise assessment of corn silk's intrinsic inhibitory potential, further refinement and isolation of phenolic-enriched fractions are recommended. These fractions hold promise as potent antioxidants found in nature and potential treatments or preventative measures for conditions such as gout.



2.8 Treatment of Hypertension

Corn silk exhibits hypotensive effects by reducing levels of angiotensin converting enzyme (ACE) and aldosterone, leading to diuresis and decreased blood volume. ACE inhibitory peptides present in corn silk extract (CSE) contribute to its antihypertensive properties, as demonstrated in *in vivo* studies on hypertensive patients. Molecular docking studies reveal interactions between ACE and antihypertensive peptides in corn silk, highlighting its potential in regulating blood pressure. Furthermore, corn silk's diuretic properties aid in releasing potassium and sodium in urine, thereby reducing high blood pressure, with corn silk tea showing significant positive effects on hypertensive patients.

2.9 Antioxidant Activity

Rich in antioxidants such as saponins, sterols, polyphenols, and vitamins, corn silk demonstrates significant antioxidant activity. These antioxidants help in scavenging free radicals, preventing lipid oxidation, and preserving cellular integrity and function. Corn silk's natural antioxidants contribute to preventing diseases caused by oxidative stress, with studies indicating its effectiveness in enhancing antioxidant defense systems and mitigating oxidative hepatic damage. Ongoing research on corn silk's antioxidant properties explores its potential applications in various fields such as cosmetics, biomaterials, and medicine.

2.10 Antimicrobial Activity

Corn silk extract displays antimicrobial properties attributed to various organic compounds such as tannins, phenols, alkaloids, flavonoids, terpenoids, glycosides, and sterols. Studies have demonstrated its efficacy against common pathogens and food spoilage bacteria, with the strongest antibacterial effect observed in 90% ethanol extract. Isolated flavonoids glycosides, maysin and maysin-3'-methyl ether, exhibit broad-spectrum antimicrobial activity, particularly against gram-positive bacteria, highlighting corn silk's potential as a natural antimicrobial agent.

2.11 Anti-inflammatory Activity

Corn silk extract exhibits anti-inflammatory properties by suppressing major inflammatory compounds and modulating inflammatory markers such as interleukin-17 (IL-17) and tumor necrosis factor alpha. It also shows potential in reducing oxidative stress-related inflammation and allergic reactions by inhibiting IgE antibody formation. Additionally, corn silk's immunomodulatory effects suggest its clinical suitability for treating type 1 allergy diseases.

2.12 Anti-fatigue Activity

Flavonoids extracted from corn silk demonstrate strong anti-fatigue activity in animal studies, indicating its potential in combating fatigue and enhancing physical endurance.

2.13 Anti-malarial Activity

Corn silk extract exhibits anti-malarial activity against chloroquine-resistant strains of *Plasmodium falciparum*, making it a potential therapeutic agent against drug-resistant malaria. *In vivo* studies on mice infected with *Plasmodium berghei* reveal significant reductions in parasitemia with the administration of corn silk extract and its fractions, particularly the methanol fraction.

2.14 Flavouring Agent and Cosmetic Use

Certain varieties of corn silk are utilized as flavoring agents in food processing, while corn silk extract finds application in cosmetics due to its ability to inhibit tyrosinase activity, potentially reducing skin pigmentation. It is also used traditionally as an emollient to soften skin tissues and treat skin rashes, highlighting its multifaceted applications in skincare.

2.15 Hair Growth

Corn silk, rich in compounds like beta-sitosterol and flavonoids, shows promise in promoting hair growth, preventing hair loss, and increasing hair strength. Its constituents inhibit enzymes linked to hair loss and provide essential vitamins like A, C, and E, which nourish and protect the hair follicles, making corn silk a valuable ingredient in hair care products.

3. DIFFERENT MARKETED PRODUCTS OF CORN SILK

3.1 Corn Silk Powder

Corn silk powder, processed using specific temperature and drying techniques, exhibits high antioxidant activity attributed to its levels of total phenols and flavonoids. Incorporating corn silk powder into functional yeast breads enhances their nutritional profile by increasing protein, ash, and total dietary fiber content while reducing moisture. Methanol and ethanol extracts of corn silk showcase antioxidant properties, indicating its potential as a natural source of antioxidants.



3.2 Corn Silk Water

Corn silk water contains luteolin derivatives, Maysin glycones, methoxymaysin, and isoorietins, known for their neuroprotective, anti-inflammatory, and antioxidative properties. Flavonoids present in corn silk water contribute to preventing ischemic stroke and platelet aggregation, supporting overall brain health and blood circulation. This product offers various health benefits, including reducing inflammation, oxidative stress, hyperglycemia, and supporting the gut microbiome-brain axis.

3.3 Corn Silk Tea

Corn silk tea, enriched with bioactive compounds like flavonoids, possesses antioxidant qualities and offers a range of health benefits. Consumption of corn silk tea has been associated with alleviating edema, reducing prostate inflammation, managing diabetes and hypertension, improving kidney disorders, and exhibiting antidepressant and diuretic effects. With its accessibility, affordability, and pleasant taste, corn silk tea is a convenient option for promoting overall health and well-being. Recommended dosage typically involves adding 30 grams of corn silk powder to boiling water for tea preparation.

4. MARKETED FORMULATION OF CORN SILK

Table-1: Marketed Formulation of Corn Silk

Formulation	Benefits	Nutritional composition
Corn Silk Tea	Beneficial in inflammation of urinary system, bladder infection, kidney stone and bed wetting. Good for heart, blood sugar, high BP, fatigue and high cholesterol level	Corn silk
Corn silk Extract	Urinary tract, Skin, Weight management	---
Corn silk Tincture	Bladder infections, inflammation of the urinary system, inflammation of the prostate	Dried silk, certified organic vegetable glycerin, distilled water
Corn silk Tablet	Reduces The Appearance Of Unsightly Dimple Skin. Helps Eliminate Excess Body Fluid. Also Help In Reducing Cell-U-Lite. Specialized For Reducing Tummy, Hips & Thighs.	Diluents: maltodextrin, NaCl, KCl, calcium carbonate, magnesium oxide Disintegrant: stearic acid Binder: sodium starch glycolate, asparagus
Corn silk Capsule	Urinary tract infection	Carbohydrate, dietary fiber, corn silk, magnesium stearate

5. PRECAUTIONS IN THE USE OF CORN SILK

Individuals with allergies should exercise caution when using corn silk, as some may experience allergy symptoms due to a potassium deficiency. Pregnant individuals should avoid corn silk consumption as it can increase uterine muscle contractions, raising the risk of miscarriage. There is a potential conflict between corn silk and antihypertensive drugs, as simultaneous use may lead to a reduction in blood pressure. Additionally, using corn silk alongside sugar-lowering medications may cause an undesirable sudden drop in blood sugar levels.

6. CONCLUSION

Corn silk exhibits remarkable pharmacological properties, including antioxidant, anti-inflammatory, antimicrobial, diuretic, and anticancer effects, among others. Each bioactive component contributes to its diverse therapeutic actions against various diseases. While research supports its safety and efficacy, clinical evaluations are necessary to validate its potential in healthcare. Further studies are needed to enhance confidence in its positive therapeutic effects and support its utilization as a natural remedy for various health conditions.

7. REFERENCES

1. Pasid Harlisa, Fitri A. Nurani, et al, "The potency of ethanolic extract from corn silk as natural antibiotics for acne-related bacteria: A preliminary study." *Bangladesh Journal of Medical Science* Vol. 21 No. 01 January'2022.
2. Sumarli et al 2019 IOP Conf. Ser., Mater. Sci. Eng. 515 01210.
3. Akanksha Singh and Rita Singh Raghuvanshi, "Influence of Corn Silk Powder Supplementation on Sensory and Chemical Characteristics of Developed Food." *International Journal of Current Microbiology and Applied Sciences* ISSN: 2319-7706 Special Issue-11 pp. 1072-1081.
4. Nur Zuhaili Amrang, Nur Atikah Halid et al, "Corn Silk Tea: An Artificial Chemical-Free." *Multidisciplinary Applied Research and Innovation* Vol. 3 No. 5, 2022, 154-159.



5. Hady Anshory Tamhid, Tika Luthfi Sadrina et al, "Hepatoprotective Effect of Corn Silk Infusion in Male Wistar Rats." *EKSAKTA Journal of Science and Data Analysis Volume 1, Issue 1*, 51-55 February **2020**.
6. Nwankpa Promise and Uche Mercylyn Ezinne, "Anti-Anaemic and Hyperlipidemic Potentials of Corn Silk (*Stigma Maydis*) Extract On Paracetamol-Overdose in Wistar Rats." *World Journal of Pharmaceutical and Medical Research Vol 8, Issue 8*, **2022**.
7. Saeed AhmedKhan, Susan George et al, "In-Vitro evaluation of xanthine oxidase inhibition and antioxidant capacity of water extracts of corn silk (*Zea mays L.*)". *Pharm Sci Asia*; 48(5), 471-480, **2021**.
8. Huma B, Hussain M, Ning C, Yuesuo Y, "Human Benefits from Maize". *Sch J Appl Sci Res Vol: 2, Issu: 2 (04-07)*, **2019**.
9. Guo, J.; Liu, T.; Han, L. and Liu, Y., "The effects of corn silk on glycaemic metabolism." *Nutrition & Metabolism*. **2009**, 6: 47.
10. Guo, Q., Chen, and H., "Structural characterization of corn silk polysaccharides and its effect in H₂O₂ induced oxidative damage in L6 skeletal muscle cells." *Carbohydrate Polymer* 208, 161-167 (**2019**).
11. Ibrahim M.A., Abdulkadir A. et al., "Modulation of sialic acid levels among some organs during insulin resistance or hyperglycemic states." *Mol. Cell Biochem*. 411(1), 235-239 (**2016**).
12. ILA Maratush Shalihah, Vega Yoesepa Pamela et al, "Corn Silk Tea Extract as Antidiabetic: A Review." *Food ScienTech Journal Vol. 2 (2) 2020* ISSN: 2685-4279 DOI:10.33512/fsj.v2i2.9647.
13. Elin Yulinah Sukandar, Joseph Iskendarso Sigil et al, "Study of kidney repair mechanisms of cornsilk (*Zea MaysL.Hair*), Binahong (*Anredera cordifolia (Ten) Steenis*) Leaves combination in rat model of kidney failure." *International Journal of Pharmacology*, ISSN 1811-7775, **2013**.
14. Charles R V Tomson, "Kidney stone disease: pathophysiology, investigation and medical treatment." *Clinical Medicine* **2012**, Vol 12, No 5: 467-71.
15. Elbossaty WF, "Medical Healthy Care of *Stigma maydis*: Pharmacological Review." *Sci J Food Sc Nutr*. **2020**; 6(1): 001-003.
16. Frank J. Bruggeman, Hans V. Westerhoff et al, "Cancer: A Systems Biology disease." *Bio Systems* 83 (**2006**) 81-90.
17. Mattheus K Reinders & Tim L Th a Jansen, "New advances in the treatment of gout: review of pegloticase." *Therapeutics and Clinical Risk Management*, 543-550, DOI: 10.2147/TCRM.S6043, **2010**.
18. K. Ammor, et al, "Study of Antioxidant, Anti-inflammatory, Antinociceptive Activities and Toxicity of Stigmata of *Zea mays* Extracts." *Lavoisier SAS* **2019**.
19. Yan-Nan Li, et al, "Purification and anti-fatigue activity of flavonoids from corn silk." *International Journal of Physical Sciences*, 5(4), pp. 321-326, April **2010**.
20. Jude E. Okokon, et al, "Antimalarial and antiplasmodial activity of husk extract and fractions of *Zea mays*." *Pharmaceutical Biology*, 55(1), 1394-1400, **2017**.
21. RyukJ.A.;et al, "Protection against Neurological Symptoms by Consuming corn silk water in Artery-Occluded Gerbils with reducing Oxidative stress, Inflammation and Post -Stroke Hyperglycemia through the Gut-Brain Axis." *Antioxidants*, **2022**, 11: 168.
22. J.A., Bankehde, et al, "Antimalarial and Antipyretic Activities of Cornsilk Extract and Fractions of *Zea Mays*." *Discovery Phytomedicine* **2019**, Volume 6, Number 4: 143-150.