EXPLORING THE BIOACTIVE POTENTIAL OF CORN SILK FOR IMPROVING HUMAN HEALTH: FOSTERING TRADITIONAL MEDICINE THROUGH INNOVATIVE RESEARCH

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Corn silk (CS) (*Stigma maydis*) has been utilized for centuries in traditional medicine (TM) globally to address numerous ailments due to its antioxidant, antidiabetic, diuretic, antibacterial, and anti-inflammatory attributes. The medicinal applications outlined in TM and established publications can be ascribed to the chemical composition of CS, which encompasses polyphenols, polysaccharides, proteins, fiber, alkaloids, minerals, and vitamins. Significant amounts of CS, a principal by-product of maize processing, are frequently wasted, wasting precious bio-resources. Utilizing CS to create functional and health-enhancing value-added products will reroute a portion of agricultural waste towards zero-waste production, thereby saving the environment and bolstering the agro-economy [1-8].

This study aims to evaluate the bioactive profile, specifically phenolic compounds, of corn silk from various hybrids, identifying those with superior antioxidant, antibacterial, diuretic, and anti-diabetic properties and developing capsules as dietary supplements with health-enhancing attributes. The general objective of our study is to develop a comprehensive approach to determining corn silk's bioactive potential for health enhancement and to justify the practical knowledge of traditional medicine with the obtained scientific findings. The first specific objective to assess the bioactive and nutritional profile of corn silk from corn genotypes harvested at different maturity stages. This objective will be accomplished through these steps: (1) To produce, harvest, and prepare the corn silk samples; (2) To assess the nutritional and bioactive profile of the CS samples; (3) To establish a correlation between chemical markers and pharmacological activities; (4) To identify the maturity stage of corn silk with the highest accumulation of bioactive compounds optimal for harvest; (5) To select a corn genotype most suitable for producing corn silk extracts with health-promoting properties. Five corn genotypes will be bred and cultivated at the MRIZP and harvested at 3 different maturity stages, and different drying techniques will be applied for sample preparation. Around 30 different chemical laboratory methods will be used for the assessment of the nutritional and biochemical profile. Corn silk from one corn genotype and one maturity stage will be selected as the one with the best potential bioactive properties for pharmaceutical application.

Considering that research indicates the bioactive composition and antioxidant potential of CS vary with maturity stages, CS samples collected at different stages will be evaluated. The expanding global population has encountered numerous obstacles recently. The recent COVID-19 pandemic, the emergence of novel infectious and non-communicable disorders, and the increase in antibiotic resistance have rekindled interest in the utilization of medicinal plants for health enhancement. Traditional medicine (TM) encompasses the collective knowledge, skills, and

practices rooted in the theories, beliefs, and experiences of various cultures, alongside scientific and professional expertise, utilized for diagnosing, preventing, and treating illnesses, as well as promoting health and well-being. Nearly fifty percent of the population in industrialized nations consistently engages with various forms of traditional medicine, resulting in an increasing desire for more empathetic and individualized care. The World Health Organization (WHO) is poised to execute a revised Traditional Medicine Strategy for the 2025–2034 timeframe, concentrating on the establishment of norms, standards, and technical documentation grounded in credible information and data to ensure the provision of safe and effective traditional medicine services and their suitable incorporation into health systems. Although many believe that natural therapies are safer and healthier than traditional medications, it is crucial to recognize that certain advantages may be attributable to placebo effects. As with every pharmaceutical, extensive scientific investigation is essential. The therapeutic properties of numerous traditional medicinal plants are ascribed to the presence of phytochemicals, particularly phenolic compounds. Clarifying TM's health claims and delivering conclusive answers necessitates contemporary interdisciplinary scientific investigation. There is considerable interest in examining agricultural by-products to uncover substances with potentially advantageous functional qualities, biological activities, or nutritional profiles due to their low cost, abundance, and accessibility. Despite its myriad potential medical applications, corn silk (*Stigma maydis*), the style and stigma of the maize pistil, continues to be regarded as a byproduct of corn processing. The principal nations that initially employed maize silk as a traditional remedy were China, the United States, Thailand, and Malaysia, after which its use proliferated globally. The preference for alternatives to medication therapy arises from the antihypertensive qualities exhibited by plant derivatives and their negligible side effects. Corn silk (CS) exhibits numerous therapeutic qualities, including the treatment of hypertension through its diuretic effects, enuresis, nephrolithiasis, oedema, cystitis, prostate disorders, urinary tract infections (UTIs), skin pigmentation difficulties, and obesity. The Panel on Dietetic Products, Nutrition, and Allergies (NDA) of the European Food Safety Authority (EFSA) stated that health claims regarding enhanced renal water elimination, or diuresis, do not provide adequate evidence to establish a causal relationship between the intake of specific foods, such as maize silk, and their advantageous physiological effects. Furthermore, EFSA's proposed health claim ID 2739 posits that CS improves urinary and intestinal health. Certain research have indicated the prospective therapeutic applications of CS as an antioxidant, anti-diabetic, diuretic, antibacterial, and anti-inflammatory agent. The ingestion of maize silk has garnered global interest as a nutritional and therapeutic supplement. Currently, the regulation of food and pharmaceuticals results in the nutrition labels on commercially available maize silk extract products, such as tea and powdered dietary supplements, lacking critical information regarding bioactive constituents and chemical composition. The absence of such information may expose certain consumers to the risk of experiencing harmful medication responses. This study seeks

to elucidate the bioactive potential of CS for healthcare applications by examining its phytochemical and pharmacological properties. This study aims to create a correlation between bioactive chemical markers and pharmacological actions to obtain scientifically validated information for both the scientific community and the general public, including users of health-promoting products. In the near future, conventional medicine may employ this data as an authoritative scientific guideline. Moreover, the practical utilization of agricultural waste could enhance ecological sustainability and augment the agro-economy.

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References

1. Kaur P., Singh J., Kaur M., Rasane P., Kaur S., Kaur J., et al. Corn silk as an agricultural waste: A comprehensive review on its nutritional composition and bioactive potential. *Waste Biomass Valoriz.* 2023. 14(5):1413–32. doi: 10.3390/agronomy12040777.
2. Al-Janabi A.S., Khadim O.M. Mouth gargles and antimicrobial activities of extracts of corn silk. *Int. J. Drug Deliv Technol.* 2022.12(3):1025–7.
3. da Hora N.R., Santana L.F., da Silva V.D., Costa S.L., Zambotti-Villela L., Colepicolo P., et al. Identification of bioactive metabolites from corn silk extracts by a combination of metabolite profiling, univariate statistical analysis and chemometrics. *Food Chem.* 2021. 365:130479. doi: 10.1016/j.foodchem.2021.130479.
4. Mulat M., Khan F., Muluneh G., Pandita A. Phytochemical profile and antimicrobial effects of different medicinal plant: current knowledge and future perspectives. *Curr. Tradit. Med.* 2020. Mar;6(1):24–42. doi: 10.2174/2215083805666190730151118.
5. Wang B., Xiao T., Ruan J., Liu W. Beneficial effects of corn silk on metabolic syndrome. *Curr. Pharm. Des.* 2017. 23(34): 5097–103. doi: 10.2174/1381612823666170926152425.
6. Morshed S., Islam S.M. Antimicrobial activity and phytochemical properties of corn (Zea mays L.) silk. *SKUAST J. Res.* 2015;17(1):8–14.
7. Sarepoua E., Tangwongchai R., Suriharn B., Lertrat K. Influence of variety and harvest maturity on phytochemical content in corn silk. *Food Chem.* 2015 Feb;169:424–9. doi: 10.1016/j.foodchem.2014.07.136.
8. Žilić S., Janković M., Basić Z., Vančetović J., Maksimović V. Antioxidant activity, phenolic profile, chlorophyll and mineral matter content of corn silk (Zea mays L): Comparison with medicinal herbs. *J. Cereal Sci.* 2016. 69:363–70. doi: 10.1016/j.jcs.2016.05.003.

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