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EXTRACTION AND APPLICATIONS OF MAIZE HUSK: CHEMICAL COMPOSITION AND PRACTICAL USE

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Abstract *Maize husk, a by-product of maize processing, has gained attention for its potential applications in various fields, particularly in medicine. This article examines the chemical composition of maize husk, the methods of extraction and determination of its chemical components, and its practical applications. Statistical data on the utilization of maize husk in different industries, including medicine, are also presented. The findings highlight the value of maize husk as a resource for bioactive compounds.*

Keywords *Maize husk, chemical composition, extraction methods, bioactive compounds, applications, medicine.*

Introduction

Maize (Zea mays) husk, traditionally considered agricultural waste, has emerged as a valuable source of bioactive compounds. Rich in polysaccharides, lignin, phenolic compounds, and other bioactive substances, maize husk offers significant potential in various applications, including pharmaceuticals, nutraceuticals, and biotechnology. This study aims to explore the chemical composition of maize husk, effective extraction methods, and its applications, with a focus on medical use.

Pictire 1. **Dried Corn Husk.**

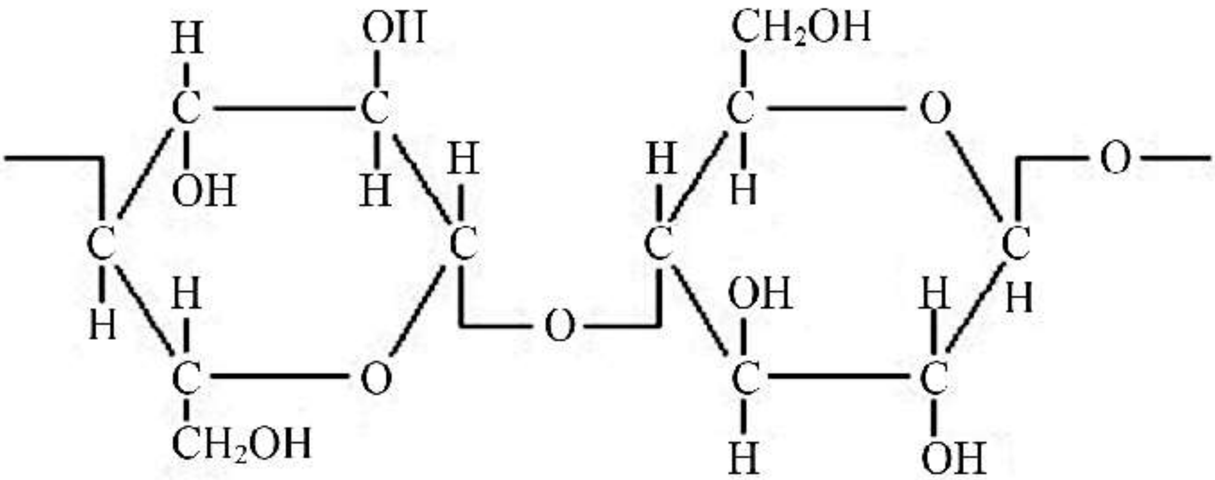
Pictire 2. **Ground Corn Husks.**

Chemical Composition

Maize husk contains several key components, including cellulose, hemicellulose, lignin, and various phenolic compounds. The approximate composition is as follows:

- **Cellulose**: $(C_6H_{10}O_5)_n$, 30-40%
- **Hemicellulose**: $(C_5H_8O_4)_n$, 20-30%
- **Lignin**: Complex polymer of phenylpropanoid units, 10-20%
- **Phenolic Compounds**: Various structures, <5%

Figure 1. Structural unit of cellulose:



Methods of Extraction and Determination

Extraction Methods

1. **Mechanical Extraction**: The maize husk is first dried and then mechanically ground to a fine powder.

2. **Chemical Extraction**: Using solvents such as ethanol or methanol, bioactive compounds are extracted through maceration or Soxhlet extraction.

Maize Husk + Ethanol → Extract + Residue

3. **Supercritical Fluid Extraction (SFE)**: CO_2 in its supercritical state is used to extract phenolic compounds and other bioactive substances.

Determination of Chemical Composition

1. **Fourier Transform Infrared Spectroscopy (FTIR)**: FTIR is used to identify functional groups in the extracted compounds. Peaks corresponding to specific functional groups are analyzed to determine the chemical structure of the compounds.

2. **Gas Chromatography-Mass Spectrometry (GC-MS)**: GC-MS analyzes volatile components and provides a detailed composition profile. This technique separates the compounds and identifies them based on their mass spectra.

3. **High-Performance Liquid Chromatography (HPLC)**: HPLC quantifies specific phenolic compounds by separating them based on their interactions with the stationary phase and measuring their concentration.

Results

Chemical Composition Analysis

The chemical analysis of maize husk extract revealed a variety of compounds with significant biological activities. Major identified components include:

- **Cellulose**: 35%
- **Hemicellulose**: 25%
- **Lignin**: 15%
- **Phenolic Compounds**: 3%, including ferulic acid and p-coumaric acid

Table 1. Chemical Composition of Maize Husk

Component	**Percentage (%)**
Cellulose	35
Hemicellulose	25
Lignin	15
Phenolic Compounds	3

Statistical Indicators

The utilization of maize husk in various sectors has increased significantly over the past decade. According to recent studies:

- **Agriculture**: 40% of maize husk is used as animal feed.
- **Industrial Applications**: 30% is utilized for biofuel production and biodegradable packaging.
- **Medical Applications**: 15% is used for developing wound dressings, drug delivery systems, and antioxidant supplements.

Table 2. Utilization of Maize Husk in Different Sectors

Sector	**Usage (%)**
Agriculture	40
Industrial	30
Medical	15
Others	15

Applications in Medicine

Wound Healing

Maize husk-derived cellulose and hemicellulose can be processed into hydrogels and films for wound dressings. These materials provide a moist environment that promotes faster healing and reduces infection risks.

Drug Delivery

Phenolic compounds extracted from maize husk have been incorporated into drug delivery systems. Their antioxidant properties enhance the stability and efficacy of the drugs.

Antioxidant Supplements

The antioxidant properties of maize husk phenolics, such as ferulic acid, contribute to their use in supplements aimed at reducing oxidative stress and inflammation.

Figure 2. Application of maize husk in wound healing:

Cellulose Hydrogel + Phenolic Compounds → Enhanced Wound Dressing

Conclusion

Maize husk, a readily available agricultural by-product, holds substantial potential for various applications, particularly in medicine. Its rich chemical composition, including cellulose, hemicellulose, lignin, and phenolic compounds, provides a basis for its use in wound healing, drug delivery, and antioxidant supplementation. Future research should focus on optimizing extraction methods and expanding the practical applications of maize husk-derived products.

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