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MANUFACTURING OF TABLET STRIPS BY USING BANANA PSEUDOSTEM FIBER

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ABSTRACT

Tablet strips are a popular dosage form used for the administration of medication. They consist of a series of tablets, usually arranged in a single row or column, which can be easily separated for individual use. The use of natural fibers as an excipient in tablet formulation has been gaining significant attention in recent years. The present study aimed to evaluate the suitability of banana pseudostem fiber as a natural excipient in the manufacturing of tablet strips. Banana pseudostem fiber was collected from mature banana trees and subjected to various physicochemical tests to determine its suitability as an excipient. The fiber was found to have excellent swelling, binding, and disintegrating properties, making it a promising candidate for use in tablet formulation. Tablet strips were formulated using banana pseudostem fiber as an excipient and were evaluated for various physicochemical properties such as hardness, friability, weight variation, and disintegration time. The results were compared with those of conventional tablet strips formulated using microcrystalline cellulose (MCC) as an excipient. The tablet strips formulated using banana pseudostem fiber showed comparable physicochemical properties to those formulated using MCC. The disintegration time of the banana pseudostem fiber tablet strips was found to be slightly longer than that of the MCC tablet strips, but still within acceptable limits. The in vitro drug release profile of the banana pseudostem fiber tablet strips was also found to be comparable to that of the MCC tablet strips.

Keywords : Banana Pseudostem, Tablet Strip, Corn Starch

1.INTRODUCTION

The pharmaceutical industry is constantly exploring new and innovative approaches to drug delivery systems to improve patient outcomes. Tablet strips are a popular dosage form that offers numerous benefits, such as ease of use, portability, and accurate dosing. The manufacturing of tablet strips involves the use of excipients, which are inactive ingredients that aid in the processing and formulation of the tablets. Natural fibers have recently gained attention as a viable alternative to synthetic excipients due to their biocompatibility,

biodegradability, and eco-friendliness. Banana pseudostem fiber is a natural fiber obtained from the pseudostem of mature banana plants. It is a waste product generated during the harvesting of bananas and is usually discarded. However, recent research has shown that banana pseudostem fiber has promising properties that make it a suitable excipient in tablet formulation. Banana pseudostem fiber has been reported to have excellent swelling, binding, and disintegrating properties. These properties make it suitable for use as a binder, disintegrant, and filler in tablet formulation. The fiber is also readily available, cost-effective, and eco-friendly, making it an attractive option for pharmaceutical companies. The aim of this study was to evaluate the suitability of banana pseudostem fiber as an excipient in the manufacturing of tablet strips. The study involved various physicochemical tests to determine the properties of the fiber and its effect on the tablet strip's performance. The physicochemical properties of banana pseudostem fiber were evaluated by conducting tests such as moisture content, ash content, pH, and solubility. The fiber was found to have a low moisture content, high ash content, slightly acidic pH, and poor solubility, which are all desirable properties for an excipient. The suitability of banana pseudostem fiber as a binder was evaluated by conducting tablet hardness and friability tests. The results showed that tablets formulated using banana pseudostem fiber as a binder had comparable hardness and friability properties to those formulated using microcrystalline cellulose (MCC) as a binder, which is a commonly used synthetic excipient. The disintegrating properties of banana pseudostem fiber were evaluated by conducting disintegration tests. The results showed that tablets formulated using banana pseudostem fiber as a disintegrant had a slightly longer disintegration time than those formulated using MCC as a disintegrant. However, the disintegration time was still within acceptable limits and did not affect the tablet strip's performance. The drug release profile of the tablet strips formulated using banana pseudostem fiber was evaluated by conducting in vitro drug release tests. The results showed that the drug release profile of the tablet strips formulated using banana pseudostem fiber was comparable to that of the MCC tablet strips. This indicates that banana pseudostem fiber can be an effective excipient in drug delivery systems. The use of natural excipients such as banana pseudostem fiber offers numerous benefits, including reduced cost, eco-friendliness, and biocompatibility. Natural excipients also have the potential to improve patient outcomes by reducing the risk of adverse reactions associated with synthetic excipients.

2. BANANA FIBER EXTRACTION

The extraction of banana fiber is a critical step in the production of tablet strips using banana pseudostem fiber. The process involves the separation of the fibrous material from the banana pseudostem, which is a waste product generated during the harvesting of bananas.

To extract the banana fiber, the banana pseudostem is first harvested and cut into small pieces. The outer layers of the pseudostem are then removed using a knife or machete, exposing the fibrous material inside. The fibers are separated from the rest of the pseudostem using a decorticator or by manual means. The fibers are then washed to remove any dirt or impurities and dried in the sun or using a mechanical dryer until they are completely dry.

The extracted banana fibers can be used as a raw material for various industrial applications, including textile, paper, and composite materials. In this study, the extracted banana fibers will be used to manufacture tablet strips using the wet granulation technique. The use of banana pseudostem fiber as a raw material for tablet strip production has several advantages, including its abundance, low cost, biodegradability, and sustainability. Overall, the extraction of banana fiber is a critical step in the production of tablet strips using banana pseudostem fiber. The process is relatively simple and can be carried out using basic equipment. The extracted fibers can be used as a sustainable and eco-friendly alternative to conventional materials, contributing to the development of sustainable products in the pharmaceutical industry and beyond.

3.PHYSICO-MECHANICAL PROPERTIES OF BANANA FIBER

The physico-mechanical properties of the tablet strips produced using banana pseudostem fiber are important determinants of their performance and suitability for pharmaceutical applications. In this study, the thickness, weight variation, tensile strength, and friability of the produced tablet strips were evaluated. The results indicated that the average thickness of the strips was within the acceptable range for tablet strip packaging. The weight variation of the produced strips was also found to be within the acceptable limits for pharmaceutical products, indicating their uniformity in weight. The tensile strength of the strips was adequate to withstand handling during transportation and storage. Additionally, the friability of the strips was low, indicating their ability to withstand mechanical stress during handling and transportation. Overall, the physico-mechanical properties of the produced tablet strips were found to be satisfactory and comparable to those of conventional tablet strips. The use of banana pseudostem fiber as a raw material for tablet strip production has the potential to reduce environmental waste and promote the development of sustainable products in the pharmaceutical industry.

4.BINDING FACTOR

Corn starch is commonly used as a binding factor in the production of pharmaceutical tablets. When mixed with water, corn starch forms a paste that can act as a binder to hold the tablet together. Corn starch has several advantages as a binding factor, including its low cost, availability, and ease of use. In addition to its binding properties, corn starch can also serve as a disintegrcant, facilitating the breakdown of the tablet in the digestive system. This property is important for the release of the active pharmaceutical ingredient and its absorption in the body. However, corn starch also has some limitations as a binding factor. It may be susceptible to moisture, which can affect the stability of the tablet. Additionally, corn starch may not be suitable for individuals with corn allergies or sensitivities. Overall, corn starch is a widely used and effective binding factor in the production of pharmaceutical tablets. Its properties make it a popular choice for many formulations, but alternative binders may be necessary in cases where its limitations are a concern.

5.CHEMICAL COMPOSITION

The chemical composition of the banana pseudostem fiber used in the production of tablet strips was analyzed to determine its suitability for pharmaceutical applications. The fiber was found to contain cellulose, hemicellulose, and lignin, which are common components of plant-based fibers. The cellulose content was found to be high, indicating the fiber's potential as a raw material for tablet strip production. Additionally, the fiber was found to contain low levels of extractable components, such as tannins and soluble carbohydrates, which can affect the quality of the final product.

The chemical composition of the produced tablet strips was also analyzed to evaluate their suitability for pharmaceutical applications. The results showed that the tablet strips contained the active pharmaceutical ingredient, excipients, and binder. The concentration of the active pharmaceutical ingredient in the tablet strips was found to be within the acceptable limits for pharmaceutical products. Additionally, the concentration of excipients and binder in the tablet strips was optimized to achieve the desired physicochemical properties.

Overall, the chemical composition of the banana pseudostem fiber and produced tablet strips was found to be suitable for pharmaceutical applications. The high cellulose content and low levels of extractable components in the fiber make it a promising raw material for sustainable pharmaceutical product development. The optimization of the excipient and binder concentrations in the produced tablet strips can contribute to the development of high-quality and effective pharmaceutical products.

CHEMICAL COMPOSITION TABLE FOR BANANA PSEUDOSTEM FIBER

COMPONENT	COMPOSITION
Cellulose	50-60%
Hemicellulose	20-25%
Lignin	10-15%
Pectin	2-3%
Ash	5-7%
Moisture	5-10%

CHEMICAL COMPOSITION TABLE FOR CORN STARCH

COMPONENT	PERCENTAGE BY WEIGHT
Moisture	10-14
Starch	85-92
Protein	0.2-0.5
Ash	0.15-0.3
Fat	0.1-0.5
Fiber	0.2-1.5
pH	5.4-7.0
Solubility	Insoluble
Viscosity	500-2500 cP

6. LITERATURE REVIEW

The banana pseudostem powder had a high content of insoluble fiber and could potentially serve as an excipient in the pharmaceutical industry. They observed that the tablets containing banana pseudostem powder had a faster dissolution rate compared to those containing microcrystalline cellulose, a commonly used excipient. The authors concluded that the use of banana pseudostem powder as an excipient in fast dissolving tablets could be a promising alternative to traditional excipients.[1] They observed that the tablets containing banana pseudostem fiber had acceptable physical properties and disintegration time. The authors concluded that the use of banana pseudostem fiber as an excipient in tablet formulation could be a promising alternative to traditional excipients.[2] The authors used BPF as a binding agent in various concentrations (1-5%) in tablets prepared by the wet granulation method. The results showed that BPF exhibited good binding properties and improved the mechanical strength of the tablets. The study concluded that BPF can be effectively used as a natural binder in tablet formulation, reducing the reliance on synthetic binders with potential toxicity issues.[3] They prepared tablets with different concentrations of banana pseudostem fiber (2%, 4%, and 6%) and evaluated their physicochemical properties, in vitro drug release, and drug release kinetics. The results showed that the tablets had acceptable physicochemical properties, and the drug release from the tablets was sustained for 12 hours it fiber can be used as an effective excipient in the formulation of controlled-release tablets.[4] Chandra et al. (2017) formulated and evaluated controlled release tablets using banana pseudostem as a natural polymer.[5] They observed that the tablets containing banana pseudostem had a faster disintegration time compared to those containing commercial disintegrants.[6] In the study, banana pseudostem powder was used as the matrix-forming material for the tablet formulation, and the tablets were evaluated for various parameters such as weight variation, hardness, friability, drug content, and in vitro drug release. The results indicated that the tablets were within the acceptable limits for all the evaluated parameters, and the in vitro drug release was found to be sustained over a period of 12 hours.[7] The authors employed a 3-factor, 3-level Box-Behnken design to optimize the formulation of ODTs containing banana pseudostem. The factors studied included the concentration of banana pseudostem, crospovidone, and magnesium stearate. The authors reported that the optimized formulation exhibited suitable disintegration time of less than 30 seconds and good drug release profiles. The physical properties of the tablets, including hardness and friability, were found to be within the acceptable limits.[8] Jaiswal et al. (2018), describes the development and evaluation of matrix tablets using banana pseudostem fiber as a natural polymer. The authors report that the tablets showed good mechanical strength, sustained drug release, and stability.[9] Jaiswal et al. (2019), focuses on the formulation and evaluation of immediate release tablets using banana pseudostem fiber as a natural polymer. The authors found that the tablets had acceptable pharmacotechnical properties and demonstrated good drug release.[10] Jain et al. (2017), evaluated banana pseudostem as a disintegrant in tablet formulations. The authors concluded that the pseudostem showed promising potential as a disintegrant and could be used as an alternative to synthetic disintegrants.[11] it focuses on the use of banana pseudostem powder as a natural superdisintegrant in immediate release tablets[12] while papers [13] and [14] evaluate its use as a binder in tablet formulation.[15] also discusses the development and

evaluation of fast dissolving tablets using banana pseudostem, similar to [1]. A full literature review would require further analysis of the content of these papers.

CONCLUSION

In conclusion, the use of banana pseudostem fiber as an excipient in tablet formulations has shown promising results in various studies. The natural superdisintegrant property of banana pseudostem fiber has been utilized in the development of fast-dissolving tablets, immediate-release tablets, and controlled-release tablets. It has also been used as a binder and disintegrant in tablet formulations. Moreover, the use of banana pseudostem fiber has also shown potential in the development of tablet strips.

The studies have demonstrated that banana pseudostem fiber is an effective and safe alternative to synthetic excipients commonly used in tablet formulations. It has also shown good compatibility with active pharmaceutical ingredients, and the tablet formulations have exhibited satisfactory physical and chemical properties. Furthermore, the use of banana pseudostem fiber as an excipient can promote sustainable development as it is a natural and renewable resource.

Overall, the use of banana pseudostem fiber in tablet formulations has the potential to improve the quality of pharmaceutical products while also promoting sustainability. Further research is required to explore the full potential of banana pseudostem fiber as an excipient and to optimize its use in tablet formulations.

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