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UTILIZATION OF BANANA PEELS IN SEVERAL INDUSTRY: AN OVERVIEW

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ABSTRACT

The banana, botanically known as *Musa spp*. is one of the most widely grown and consumed fruits, producing a significant amount of trash each year in the form of peels. Due to lack of awareness and knowledge regarding beneficial effects of banana peels, people typically waste banana peel. Numerous bioactive substances, including phytosterol, polyphenols, carotenoids, and biogenic amines are abundant in banana peels. In addition, it has good amounts of dietary fibre and minerals like iron, calcium, sodium, phosphorus, and magnesium. There are several sectors that use banana peels are: Food processing, Medicine industry, Beverage industry, and also agriculture industry. This review article mainly summarized or focused on the nutritional characteristics, bioactive elements and potential health-promoting properties of banana peels and its utilization in several business sector such as Food and beverages industry, Nutraceutical and medicinal industry or so on.

INTRODUCTION

Fruits, with their juicy structures, are among the most delicious parts of plants when ingested raw. Fruits are thought to be the primary source of carbohydrates, vitamins, and bioactive substances that include fibre and phenolic compounds. They also help to reduce the risk of a number of chronic illnesses (Septembre-Malaterre et al., 2018). Bananas, a tropical fruit, are found worldwide in the genus Musaceae. It is the fourth-most important crop produced worldwide and one of the most popular fruits in the world (Aurore et al., 2009).

The peel and pulp are the two components of banana fruit. About 40% of the weight of the fruits is made up of peel, which is the primary by-product of bananas. Banana peel, which contributes a significant amount of organic elements that needed to be controlled, was discarded as waste up until recently since it had no practical uses. Numerous potential uses have surfaced since researchers started concentrating on understanding the makeup of banana peel (Agama-Acevedo et al., 2016). There has been a growing discussion of using banana peels to reduce by-products. Because banana peels are good for health, there is currently interest in applying them in various scientific sectors, including the food industry, beverage industry, medicinal industry, agriculture industry, and so on (de Angelis-Pereira et al., 2016).

According to the different research studies, banana peels have significant levels of ash, crude protein, crude fibre, and available carbohydrate; as a result, they are regarded as a nutrient-dense material with potential health benefits. The variety (genome type) and maturation stage of banana peels were discovered to have a significant role in their chemical contents (Aboul-Enein et al., 2016; Wachirasiri et al., 2009). In addition, it has a high concentration of naturally occurring bioactive chemicals such as flavonoids, phenolic compounds, and carotenoids and possesses strong antioxidant and antimicrobial/antibiotic properties that are linked to improving health and preventing diseases such as anemia, diarrhea, ulcers, and inflammation (Vu et al., 2019).

Bioactive substances found in banana peels include flavonoids, tannins, phlobatannins, alkaloids, glycosides, anthocyanins, and terpenoids. These substances have been shown to have a variety of biological and pharmacological effects, including antibacterial, antihypertensive, antidiabetic, and anti-inflammatory properties (Pereira and Maraschin, 2015). Because they have antioxidant activity, bioactive substances derived from secondary plant metabolism have a great deal of medicinal potential (Singh et al., 2015). Phenolic chemicals have been linked to a number of health advantages, including the prevention of diabetes, obesity, cancer, and cardiovascular disease (Boots et al., 2008; Cheng et al., 2007).

2. APPLICATIONS OF BANANA PEELS IN SEVERAL INDUSTRIES

Usually, banana peels are thrown into the environment untreated. Because banana peel has a high fibre level and minimal tannin content, it can occasionally be used as

organic fertilizer and animal feed (Pereira and Maraschin, 2015). Numerous tons of banana peel trash are produced daily in fruit markets and residential garbage, and because the anaerobic digestion of the biomass releases gases that disrupt the natural equilibrium of the air, these wastes give off an unpleasant stench. While ripe bananas are eaten raw, a large amount of bananas are industrially processed to make chips, flour, and other processed foods, which leads to a huge amount of banana peel waste. Banana peels were previously disposed of by the food production sector in landfills. The transformation of banana peel into a valued commodity would have a positive financial impact on the agriculture sector.

Many ailments, including burns, anemia, diarrhoea, ulcers, inflammation, diabetes, cough, snakebite, and heavy menstruation, have historically been treated with peel (Pereira and Maraschin, 2015). Banana peels contain 18 different types of amino acids in varying amounts, such as leucine, lysine, isoleucine, phenylalanine, norleucine, tryptophan, valine, methionine, cystine, alanine, glutamic acid, glycine, threonine, serine, and aspartic acid. Maturity indices were evaluated based on the color of the banana peel, and harvesting was carried out at the appropriate time and for the appropriate reason based on the distance of the market. Banana peel contains oxalate; when banana peels are ingested by humans, calcium ions and oxalates combine to generate chelating agents, which eventually prevent damage to blood and tissue levels (Vu et al., 2018). Given the speed at which the world's population is growing, it is imperative that food produced from banana peel by-products be creative and efficient, utilizing the right method. Due to the different beneficial qualities of banana peels, they can be used in several industries, such as food processing, beverage industry, medicinal, agriculture, cosmetics industries, and so on. Here are some applications of banana peels are follows below.

2.1 APPLICATION OF BANANA PEELS IN FOOD & BEVERAGES INDUSTRY

Compared to pulp, banana peel contains far more ash, protein, fat, crude fibre, and dietary fibre, allowing for the creation of foods with excellent functions (Nasrin et al., 2015; Agama et al., 2016). Banana peel is regarded as a priceless find; its significance is acknowledged, and numerous studies are being conducted on it. Banana peel can be used to make a variety of food and drink products. Banana peels have a high nutritional content, strengthening the immune system and offering antioxidants. Tea brewed from banana peels hinders the reduction of weight (Martins et al.,2019).Vanillin's precursor is ferulic acid. Ferulic acid acts as a cohesive agent between lignin and carbohydrates (cellulose and hemicellulose). In the food business, ferulic acid that is derived from banana peels is typically utilized as a flavoring and aroma-enhancing compound. As a result, it can be utilized to make ice cream, cakes, cookies, noodles, beer, juice, digestive syrup, and bio-vanillin goods (Saeed et al., 2021). In order to create a chicken sausage with an increased dietary content, banana peel powder can be used. When compared to chicken sausage without the inclusion of banana peel powder, chemical analysis revealed a considerable increase in ash and dietary fibre content. Another encouraging result is the reduction of overall fat content from 9.18% in the control sausage to 7.67% in the chicken sausage that has 2% powdered banana peel added (Zaini et al., 2020).

2.2 APPLICATION OF BANANA PEELS IN MEDICINAL INDUSTRY

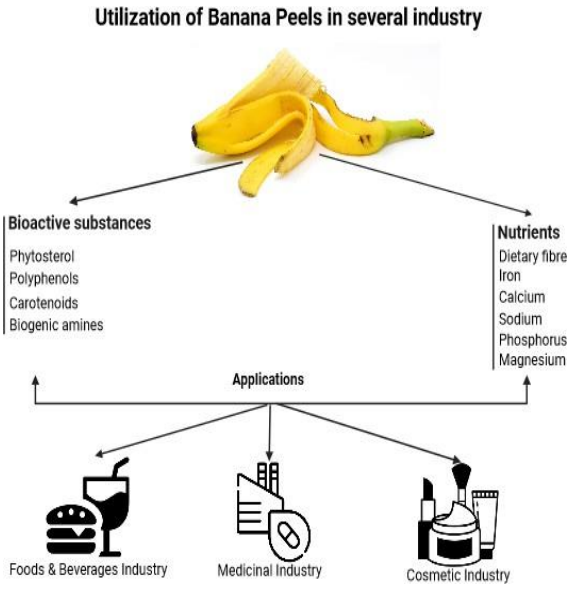
Banana peels are a great source of nutrients for teeth and a powerful whitening agent. By remineralizing the teeth, brushing with banana peels provides them with potassium nourishment (Salman et al., 2022; Benahmed et al., 2021). The peel of a banana was used to cure heel fissures or cracks, which are more common in women due to skin thickness and dehydration. Because fissures allow microbes to enter and infect the foot, increasing the risk of edema, they raise the level of cracking. Thus, a gel is created by combining carboxyl methyl cellulose with an extract from banana peel. Compared to other chemical ointments, this gel is safe for the environment and highly effective (Rathinamoorthy and Keerthana, 2021). Banana peel endocarp should be used right away before using an ointment since insect and mosquito bites cause scratches. This will be very useful in reducing inflammation and itching at the same time (Prashanthi and Chaitanya, 2020).

2.3 APPLICATION OF BANANA PEELS IN COSMETIC INDUSTRY

Banana peel is used to make antibiotic lotion because peels are rich in flavonoids and phenolics. The hydrophilic properties of banana peel create an attracting force on water molecules, forming the lotion's basis. This lotion can manage and treat free radicals, which cause inflammation and damage to cells, raise the risk of UV damage, and play a role in the prevention of skin cancer (Cendana et al., 2020). Enzymes and nutrients like vitamin C and B6 found in banana peels can aid in lightening dark spots on the skin and improving skin tone. They can be an ingredient in exfoliating scrubs or face masks (Parihar and Chaudhary, 2023). The skin can be made more supple by the natural oils found in banana peels. For moisturising qualities, banana peel extracts or oils can be added to moisturisers, lotions, or creams (Zaini et al., 2020). Banana peels have antibacterial qualities that may aid in the fight against microorganisms that cause acne. They can be used to formulas to treat acne or used as a spot treatment for zits. Banana peels' antioxidant content can aid in the prevention of ageing symptoms including wrinkles and fine lines. Banana peel extracts have rejuvenating properties and can be used into anti-aging serums or lotions (Chabuck et al., 2013).

2.4 OTHER APPLICATIONS:

Globally, about 114.08 million metric tons of banana peel waste were produced. These wastes contain cellulose, hemicellulose, and natural fibre, which can be used to make inexpensive wastewater treatment, filters, biofuels, bioplastics, and activated carbons. Sometimes, crops were grown by using banana peels as a biofertilizer (Alzate Acevedo et al., 2021).Banana peels have been shown to be a good source of cellulase. Cellulase is a biocatalyst that works in conjunction with other enzymes to hydrolyze cellulose, which is found in all living things' cell walls. These bio-catalysts find application in the pharmaceutical sector, textiles, bio-polishing, clothing softening, textile color removal, brewing, fermentation, and paper manufacturing (Singh et al., 2021).



3. CONCLUSION

Because of the nutritional and chemical qualities of banana peels, which also enhance their potential health benefits, people may use them in the food processing, beverage, cosmetic, pharmaceutical, and agricultural sectors. Banana peels are used in accordance with the requirements and purposes of the industry. Consequently, this could help with waste management and lower pollution by considerably reducing agricultural waste and byproducts.

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