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NUTRITIONAL AND ANTIOXIDANT POTENTIAL OF HONEY POWDER

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Introduction. Honey is a bee's natural product with a rich history of use from ancient medicine, food, and cosmetic industries. Its therapeutic properties have been attributed largely to its biochemical composition, which includes sugars, bioactives, enzymes, amino acids, vitamins, and a plethora of phenolic compounds. This paper reviews of antioxidant activities of honey powders, which are derived from honey through various drying processes. The conversion of honey into powder form not only simplifies its storage and transportation but also concentrates its beneficial compounds. The mechanisms by which honey powders exhibit antioxidant activities are explored, as well as their potential applications in food preservation, nutraceuticals, and functional foods. Honey powder have a large usage is being increasingly used in food, cosmetic and pharmaceutical industry, because it avoids inconveniences of raw honey, such as high viscosity, stickiness and formation of sugar crystals. Honey has been revered for its health benefits for centuries, with a complex blend of bioactive compounds contributing to its medicinal curative properties. Among these properties, antioxidant activity has gained significant attention due to its potential in combating oxidative stress, which is implicated in various diseases including cardiovascular disorders, cancer, and aging.

Honey is characterized by organoleptic and physico-chemical parameters affecting the drying process and the quality of the final product. Consequently, reducing the water content during the drying process significantly contributes to increasing the stability of honey during storage. The resulting powdered dry honey, in compliance with the drying retaining all its useful biological properties and most of active compounds.

The aim of the study. The conversion of honey into powder form has emerged as an innovative preservation technique, enabling increased shelf life and the potential for diverse applications. This paper aims to synthesize the current understanding of the antioxidant activities of honey powders and their implications for health and nutrition. This paper provides a foundational overview of the antioxidant activities of honey powders, highlighting their benefits and potential applications across various fields. Further studies will help illuminate their full capabilities and mechanisms.

Materials and methods. Different types of honey, acacia honey, tilia honey, flower honey etc. Dryers and dehydrators of honey.

Results and their discussion. Honey's composition can vary significantly based on floral sources and environmental factors. Generally, it consists of approximately 80% sugars (primarily fructose and glucose), 18% water, and 2% proteins, vitamins, minerals, bioactives and enzymes. Among its diverse constituents, polyphenols have been identified as key contributors to honey's antioxidant properties. These compounds, which include flavonoids and phenolic acids, can scavenge free radicals and enhance the body's endogenous antioxidant defense mechanisms. Honey powders

are produced through various dehydration methods such as freeze-drying, spraydrying, and vacuum drying. Each method affects the chemical composition and functional properties of the final product. Freeze-drying preserves more of the volatile compounds and antioxidants compared to other methods, while spray-drying is more widely used for its efficiency and scalability. Research has shown that the antioxidant activity of honey powders can vary significantly depending on the drying process used. The Maillard reaction (non-enzymatic reaction of an amino group with a reducing group of sugar in honey leading to the formation of compounds which ultimately polymerize to form brown pigments), which occurs during thermal processing, can also affect the antioxidant capacity by producing new compounds with potential health benefits. Some properties of honey powder are presented as:

Free radical scavenging. The primary mechanism by which honey powders exhibit antioxidant activity is through the scavenging of free radicals. Phenolic compounds present in honey powders can donate electrons to neutralize free radicals, thus preventing cellular damage.

Metal ion chelation. Another mechanism involves the chelation of metal ions, such as iron and copper, which can catalyze the formation of harmful free radicals. Honey powders, due to their high phenolic content, are capable of sequestering these metal ions, contributing to their overall antioxidant capacity.

Enhancement of endogenous antioxidant enzymes. Studies have suggested that honey powders may enhance the activity of endogenous antioxidant enzymes such as superoxide dismutase and catalase, further bolstering the body's defense against oxidative stress. The antioxidant properties of honey powders make them ideal candidates for inclusion in nutraceuticals. Their ability to combat oxidative stress may provide health benefits in preventing chronic diseases. Due to their antioxidant capacity, honey powders have potential applications in the food industry as natural preservatives. Their ability to inhibit lipid oxidation can extend shelf life and maintain the quality of food products.

Conclusion. On the basis of literature review, it can be concluded that bee honey is a biologically bioactive product, the advantage of which is not only high energy value (on average it is about 300–340 kcal per 100 g), but also it obtains a large number of valuable minerals, enzymes, vitamins, organic acids, aromatic and antimicrobial substances causing its healing properties. One of the advantages of this product is the fact of its 100 % absorption by the body, unlike most other sweet foods. Ripe honey contains not more than 21 % water, about 35 % glucose, 40 % fructose, 1.3 % sucrose, 0.45 % protein, 0.1 % organic acids and 0.2 % minerals. Dehydrated and dried honey becomes a concentrate source of bioactive substances with flavonoids and polyphenols, which act as antioxidants. Honey powders represent a powerful natural source of antioxidants, with functional properties that have significant implications for health, nutrition, and food preservation. Further research is needed to fully understand the mechanisms by which honey powders exert their antioxidant effects, as well as to establish standardized methods for their production and assessment. The future holds promise for the incorporation of honey powders into functional foods and health products, harnessing the potential of nature's sweetest gift for improved health outcomes and treatment of diseases.

Key words: antioxidant activities, honey powder, bioactive, oxidative stress.