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Honey Powder: Drying Methods, Physicochemical Properties, and Its Applications in Food Formulations

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ABSTRACT

Honey is an organic natural substance that is produced from the nectar of flowers by *Apis mellifera* and is a sweet flavorful liquid. It is one of the most popular natural sweet substances. It works as an antioxidant, anti-inflammatory, antibacterial, and antimicrobial agent and is used as medicine for burns, ulcers, diabetes, and wound healing. Because of its high density and viscosity, usage of liquid honey in the food and pharmaceutical industries is limited, making honey powder an enticing substitute. However, there are still challenges facing the industry and researchers in the production of powdered honey. The bacteria that cause honey to deteriorate are eliminated by thermal processing. The physicochemical characteristics of dried honey powder, its storage stability, its applications in the food industry, and the marketed goods have all been covered in this review, along with the several processing techniques that have been proposed for its production. Research has been carried out on spray drying, freeze drying, vacuum drying, and microwave drying as substitutes for conventional heat processing.

1 | Introduction

Honey is a thick sweet liquid made from blossom nectar (Aati et al. 2022). Depending on location and seasonal factors, this liquid's pleasant smell, fragrance, and taste range from light yellow to dark amber (Popović et al. 2020). It has been used as a sweetener worldwide since the beginning of time. India produces 60,000 tonnes of honey annually. It has long been used as a sweetening agent in food. Honey's origin, sensory perception, and composition all have an impact on its quality (Seraglio et al. 2021). A natural biological product, honey is predominantly made up of sugars (70%–80% glucose and fructose), with phenolic components, mineral salts, proteins, phenolic compounds, free amino acids, water, and organic acids making up the remainder (10%–20%) (Castro-Muñoz et al. 2022). Due to its distinct flavor, customers enjoy honey because of its great nutritional content, sweetness, and texture (Ramya and Anitha 2020). On a small and large scale, honey is commonly used in beverages, baked goods, confectionery, sweets, marmalades, jams, and spreads (Raziuddin et al. 2021). Honey is a naturally occurring sweet, popular, and important religious component. Hindus regard honey as one of the five elixirs of immortality. The bee may gather honey from plants or flowers and keep it in colonies for three to 6 weeks (Disayathanoowat et al. 2020).

India has around 159.7 million hectares of productive land, making it the second-largest agricultural nation in the world. Based on the land used for agriculture and the crops used as bee feed, India has the capacity to create approximately 200 million bee colonies. The number today is approximately 34 lakh colonies. India has a wide range of ecosystems, social groups, and places where beekeeping is practiced (Abrol 2023). The production of honey increased by 57.58% from 76,150 MTs in 2013–2014 to 120,000 MTs in 2019–2020. The number of MTs has significantly increased from 28,378.42 in 2013–2014 to 59,536.74 in 2019–2020. In 2017–2018, India produced 1.05 lakh metric