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Fig (*Ficus carica* L.): A Multipurpose Fruit for Health and Nutrition

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Ficus carica L. is an ancient and nutritionally rich fruit crop valued for its dietary, medicinal, and industrial importance. It provides carbohydrates, dietary fibre, vitamins, minerals, and diverse bioactive compounds with strong antioxidant potential. Regular consumption of figs is associated with improved digestive, cardiovascular, and metabolic health. Besides the fruit, fig leaves, peels, seeds, and latex possess significant therapeutic and nutraceutical properties. Due to its rich phytochemical composition and versatility in fresh, dried, and processed forms, fig is an excellent candidate for functional food development and health-promoting applications.

Introduction

Fig (*Ficus carica* L.) is an edible and highly nutritive fruit, botanically classified as a syconium, belonging to the Moraceae family. Commonly known as "Fig" or "Anjir," The genus *Ficus* is large, comprising more than 600-2000 species. The most prominent *Ficus* species cultivated in India are F. *bengalensis*, F. *carica*, F. *racemosa* and F. *elastica*. with *F. carica* being the most important and the only species widely cultivated for its fruit (Falistocco *et al*., 2020) Archaeological evidence suggests that figs are among the earliest domesticated fruit trees, with records dating back to the thirtieth century BC. Their origin is generally traced to western Asia, particularly the fertile regions of southern Arabia, from where they gradually spread across the Middle East and Mediterranean basin. Today, figs are cultivated across many regions of the world with moderate climates. Turkey remains the leading producer (Singh *et al*., 2022). In India, fig is mainly cultivated in Maharashtra, especially Pune district, with the popular "Poona fig", while other states like Gujarat, Karnataka, Tamil Nadu, Uttar Pradesh, and Rajasthan also contribute. The country produced about 14,940 tonnes from 5,900 ha in 2022, with an average yield of 2.5 t/ha (FAOSTAT, 2022).

Morphologically, *F. carica* is a deciduous tree or shrub, typically ranging from 3-6 m in height. It is characterized by soft wood, smooth gray bark, fibrous shallow roots, and large palmate leaves with three to seven lobes, which serve as a distinguishing trait among cultivars The species is gynodioecious, comprising both male and female flowers and thrives under agroclimatic conditions of low relative humidity (<25%), high solar radiation, hot dry summers (32-37 °C), and mild winters (above -1 °C) (Teruel *et al*., 2021).

Figs exhibit a wide range of skin colors, from green to black violet at maturity, depending on the cultivar, largely due to differences in anthocyanin levels (Abdelsalam *et al*., 2019). They can be consumed fresh, dried, candied, or processed into value-added products. For fresh consumption, fruits are harvested at full ripeness to achieve optimum organoleptic qualities, though their highly perishable nature makes them prone to mechanical damage and postharvest infections. Drying, on the other hand, reduces water activity, weight, and volume, thereby improving storability and lowering transportation and packaging costs (Wang *et al*., 2017)

Nutritionally, figs are rich in dietary fiber, calcium, and an array of bioactive compounds. Phytochemical studies have revealed the presence of phenolic acids (hydroxycinnamic and hydroxybenzoic acids), flavonoids (anthocyanins, flavonols, flavan-3-ols), chlorogenic acid, rutin, luteolin, catechin, and cyanidin, among others. These compounds contribute to a variety of biological activities, including antioxidant, antibacterial, hepatoprotective, antidiabetic, anti-inflammatory, and anticancer effects. Traditionally, figs and their derivatives have been employed in medicine for treating skin ailments, digestive disorders, and metabolic imbalances. Recent research further highlights their potential role in managing cardiovascular diseases, certain cancers and lifestyle-related conditions (Soni *et al*., 2014).

In addition to the fruit, fig peels, leaves, and other by-products are increasingly recognized for their nutritional and pharmaceutical value, presenting opportunities for valorization in functional foods and nutraceuticals.

Taxonomy

The common fig (*Ficus carica* L.) belongs to the kingdom *Plantae* and division *Magnoliophyta*. It is classified under the class *Magnoliopsida*, order *Rosales*, and family *Moraceae*. The genus *Ficus* is highly diverse, comprising more than 800 species across tropical and subtropical regions. It holds significant nutritional, medicinal, and cultural importance worldwide (Dogra *et al*., 2024).

Nutritional composition

Figs (*Ficus carica* L.) have been cultivated and valued since antiquity, not only for their distinct sweetness and culinary versatility but also for their remarkable nutritional composition. Contemporary studies affirm that figs are a rich source of carbohydrates, dietary fiber, essential minerals, vitamins, amino acids, fatty acids and bioactive compounds. While the exact nutrient profile is influenced by cultivar, ripening stage, environmental conditions and processing methods, both fresh and dried figs remain outstanding contributors to human nutrition (Sandhu *et al*., 2023) Fresh figs contain a high proportion of water (70-80%), which explains their comparatively low caloric content of 37-80 kcal per 100 g. Their carbohydrate concentration typically ranges from 7.6 to 20 g per 100 g, primarily in the form of readily digestible sugars such as glucose, fructose and sucrose, making them an immediate energy provider. They also supply around 2-3 g of dietary fiber per 100 g, derived largely from pectin and cellulose in the peel, while protein levels are modest (<1 g/100 g) and fat is negligible (<0.5 g/100 g). Conversely, dried figs exhibit a far denser nutritional profile due to water removal, with carbohydrates increasing to 65-74 g/100 g, fiber to 14-18 g/100 g and protein to 6-9 g/100 g, resulting in an energy yield of 249-365 kcal/100 g, placing them well above several common fruits such as apples or grapes in terms of nutrient density, particularly when consumed in dried form (Mawa *et al*., 2013)

A defining nutritional attribute of figs is their high fiber content, which not only enhances gastrointestinal health but also aids in moderating cholesterol levels and postprandial glycemia. Selective cultivars such as ‘Banane’ and ‘Brown Turkey’ have been reported to contain fiber concentrations as high as 4-7 per cent in fresh fruits (Pereira *et al*., 2017). Figs are also exceptionally rich in minerals, with potassium, calcium, magnesium, and iron being present in significant quantities. it also contains Vitamin C which varies across cultivars, with some peels, such as that of the ‘Onk Elhamam’ variety, containing up to 10.7 mg per 100 g of vitamin C. Dried figs exhibit higher concentrations of vitamin K (approximately 15 µg/100 g) compared to fresh fruits, and also provide small amounts of vitamin A, thiamine, riboflavin, niacin, vitamin B6, and folates. The distribution of these vitamins is uneven within the fruit, with the peel generally richer in vitamin C, calcium, potassium, and phenolics compared to the pulp, reinforcing the importance of consuming whole fruits to maximize nutritional intake (Yang *et al*., 2023)

Beyond their macro- and micronutrients, figs are notable for their phytochemical richness, which contributes significantly to their health-promoting potential. They contain diverse phenolic acids, flavonoids, and anthocyanins, compounds responsible not only for their antioxidant capacity but also for their distinct sensory qualities. Key identified compounds include chlorogenic, protocatechuic and vanillic acids, alongside flavonoids such as luteolin and quercetin derivatives, with anthocyanins particularly cyanidin in the peel accounting for the deep pigmentation of certain varieties. These phytochemicals not only enhance the visual and flavour characteristics of figs but also elevate their functional value as potent antioxidants, further establishing them as a nutritionally superior fruit (Palmeira *et al.*, 2019).

Health Benefits of *Ficus* Species

Ficus carica fruits are a valuable dietary source of antioxidants, dietary fiber, vitamins, and essential minerals. Their high calcium and potassium content contributes significantly to bone health and prevention of osteoporosis, while the abundance of polyphenols and flavonoids aids in mitigating oxidative stress, supporting cardiovascular health and lowering the risk of chronic diseases. The latex of fresh figs has been traditionally employed in the treatment of warts, toothache, hemorrhoids, cough and even tumors, reflecting its versatile medicinal properties. Species, such as *Ficus sycomorus*, hold considerable ethnomedicinal importance. The fruits are widely used in the treatment of fungal infections, jaundice, dysentery, liver disorders, infertility and tuberculosis, in addition to their nutritional value. Likewise, *Ficus benghalensis* exhibits a high nutritional and mineral profile, with extracts showing potential for development into pharmaceutical formulations. The seeds of this species are also regarded as a quick and effective dietary source of essential minerals, reinforcing their functional food potential. *Ficus pumila* has been utilized both as a traditional herbal remedy and as an ingredient in various beverages. Similarly, phytochemical investigations of *Ficus racemosa* have identified bioactive constituents such as saponins, phenols, flavonoids, tannins, and terpenoids. Its methanolic extract demonstrates notable cytotoxic activity, suggesting promising applications in cancer and tumor therapy (Walia *et al*., 2022)

Conclusion

Figs (*Ficus carica* L.) are one of the earliest domesticated fruits, widely cherished for their unique flavour, cultural significance and health-promoting properties. They are a rich source of dietary fiber, essential minerals, vitamins and bioactive compounds that contribute to digestive health, cardiovascular wellness, glycemic control, and overall disease prevention. Both fresh and dried figs serve as valuable dietary components, while their phytochemicals extend applications in functional foods, nutraceuticals, and traditional medicine. Additionally, fig leaves, peels and other by-products hold considerable nutritional and pharmaceutical importance. Collectively, figs emerge as a versatile fruit with nutritional, medicinal and industrial relevance, offering strong potential in addressing modern health and dietary challenges.

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