Meet the Fruit That Looks Like a Hand — and Smells Like Heaven: Buddha's Hand

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Citrus fruits are among the oldest known fruits and are widely recognized for their nutritional and health benefits. They are rich in bioactive compounds, secondary metabolites, nutrient and non-nutrient molecules. Citrus fruits are rich in macronutrients such as dietary fibre and sugars along with micronutrients like potassium, niacin, calcium, vitamins, phosphorus, copper, riboflavin and many more. Whether consumed fresh or processed into jams and beverages, fruits of the Rutaceae family have been useful to people since they were cultivated. There are many more fruits in the citrus family that are rare and lesser known, and have phytotherapeutic and phytochemical features.

The fruit Foshou (*Citrus medica* L. var. *sarcodactylis* Swingle), also called as Buddha's hand, is a medicinal plant belonging to the Rutaceae family. It is one of the most unique citrus fruits in the world. The fruit is indigenous to northeast India and China and is known by different names, such as Buddha's Hand citron, Longevity orange (Mahdi *et al*., 2018), Five-Finger orange, Buddha's fingers, Fingered citron, and Flesh-Finger citron, among others. The unique name is due to its peculiar shape which resembles human fingers in prayer. In many Asian cultures, Buddha's Hand symbolizes good fortune, happiness, and longevity, and is commonly used in religious offerings and traditional ceremonies, particularly within Buddhism.

Buddhas hand is generally distributed in South and Southeast Asia like Thailand, Sri Lanka, Vietnam, Japan, China, and Taiwan. It is a small shrub or a tree with purplish leaves, branches and flowers during young stage. It has thorny branches with axillary inflorescence with about 12 flowers, each consisting of 5 petals. Generally, the top flower of the multi-flowered inflorescence becomes fruit (Liao, 2017). The plant needs consistent moisture and is sensitive to frost. The fruit is unique, having a white or pale-yellow color resembling fingers when it ripens. The fruit has soft pericarp with a seedless centre surrounding the sarcocarp which contains 10-15 milky yellow detached segments encircled by the

pericarp. The sarcocarp is fragrant and has an acidic to sweet taste. The fruit has a lemony, pleasant scent (Anushree and Veena, 2022) and it also has therapeutic properties. It is aromatic and has been used in perfume or to scent rooms and clothes. Foshou flowers from October to November and fruits are seen from April to May. It grows well in well-drained, sandy soils with regular moisture (Denero *et al*, 2020) and prefers full sun, which is necessary for the production of essential oil in its peel. The fruit almost have no pulp but the peel is completely edible. the peel can be used as fresh or can be processed to make candy, jam or pickles. Although the fruit has no pulp or juice, it can be used in salads, for fragrance and aesthetic appeal. Changes occur in the synthesis of essential oils by the fruit when it ripens. The fruit has been preserved as a dessert in China, Japan and Taiwan. The fruit setting mechanism of Buddha's Hand has been studied, and the results showed that it produces parthenocarpic fruits. Studies with a variant of *Citrus medica* L. showed that the pollen of the Foshou germinates and elongates in vitro and the ovules gets aborted during flower development indicating that the fruit exhibits obligate parthenocarpy (Liao, 2017).

Fruits of the citrus family have been used in traditional medicine and to treat digestive problems, skin inflammations, cough, ringworm infection and muscle pain (Denaro *et al.,* 2020). Similarly, Foshou also exhibits anti-inflammatory, anti-oxidant, anti-coagulant and anti-cancer properties. Foshou or buddha's hand can be considered as a functional food because it has the potential to provide a range of bioactive compounds to human diet, reducing the hazard of chronic diseases and improving health. Additionally, the nutrients and bioactive complexes can be utilized in the food and pharmaceutical industries. The essential oil from its peel which is rich in secondary metabolites and they are made use in aromatherapy. Dried Foshou fruits are used in herbal medicines and to treat a variety of chronic diseases like asthma, hypertension and respiratory tract infections. One of the most significant active constituents presents in Foshou is 'Foshou polysaccharides (FPs).' These polysaccharides are effective antioxidants that is linked to minimise the risks of many chronic diseases especially obesity. Various studies have confirmed the role of chemical compounds in Foshou having anti-dyspepsia and hypoglycaemic effects. Dyspepsia is a general term used to describe abdominal pain combined with gastrointestinal problems. Xiayou decoction is used for the treatment, and foshou is one of the components of the decoction (Jiang *et al*., 2001). Foshou, eaten as dessert, is considered ideal for sore throat and dyspepsia. Moreover, studies prove the presence of limonin in foshou, which is an anti-carcinogenic agent (Zhang, 2015).

One of the vital functions of Foshou includes anti-helminthic activity (Kabra *et al*.,2011). Helminths damage the host by living in the gastrointestinal tract causing blood loss, lymphatic and intestinal obstruction, damage organs by secreting toxins. Studies proved that foshou petroleum ether extracts of leaves can resist helminths. By exposure of earthworms to different concentrations of Foshou extract, they were able to identify that Foshou can paralyze worm and cause its death. Certain anti-inflammatory compounds have been separated from the stem and root barks of Foshou such as xanthyletin, citumedin-B- B, nordentatin (Chan *et al*.,2010) which is used for the treatment of inflammatory and allergic responses in traditional Chinese medicine. Fruit peel of Foshou fruit has been confirmed to have natural preservatives for the treatment of foodborne diseases and exhibits antimicrobial properties (Hart *et al*., 2014) against *Escherichia coli, Streptococcus* spp., *Pseudomonas,* Klebsiella (Al-Kalifawi, 2015), etc. Also, the fruit is a rich source of antioxidants which decrease with maturity. Various studies have confirmed the insulin secretion property of foshou fruit which makes it use in the treatment of diabetes-induced hyperglycaemia (Kazeem and Davies, 2016). The fruit also helps in weight loss and further studies are being carried out to study the fruit's anti-diabetic properties.

More and more functional benefits and bioactive compounds are still being investigated in foshou. The fruit remains underutilized, as its immense potential is not widely recognized. Future studies on this unexplored fruit as a functional food can aid in many health benefits to humans.

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