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Indian Jujube: A Lesser Explored, Underutilized and Potential Fruit for Processing With Possible Health Benefits

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Abstract

In several countries around the world, the Jujube, also known as Ziziphus is cultivated. Chinese jujube has been used for years in herbal medicine and has also been researched extensively for its nutraceutical properties and health benefits. However, no systematic study on Indian jujube has been performed yet, and knowledge on the potential Indian varieties is still lacking. Very limited information is available on the phytochemicals of the Indian jujube. Therefore, it is important to characterize the different Indian jujube cultivars in order to better understand the nutraceutical, pharmaceutical, and medicinal value that the fruit provides, and also to have increased consumption of the fruit by the general consumers. The Indian jujube, which is also less explored, less consumed and underutilized, provides a great opportunity for exploitation of the fruit for its contribution toward food security, processing, value addition, and thereby income opportunity for the Indian growers and processors.

Introduction

Jujube has different names in different parts of the world. The jujube grown in China is known as “Chinese dates”, “Tsao”, or red dates once dried; it is known as “Sedra” in Arabic countries and the edible fruit is called “beg” or “Ennab”; and in India and Iran, it is known as “ber” (Rashwan *et al.*, 2020). Indian jujube (*Ziziphus mauritiana* Lamk.) is also referred to as Indian plum or dessert apple. It belongs to the *Rhamnaceae* family. Indian jujube is one of the most ancient fruits indigenous to India. It grows in the tropical, sub-tropical and arid areas of the country. However, only a little information on the genetic diversity of this significant underutilized fruit crop of India is available.

The Indian jujube is a hardy fruit tree (Figure 1) grown throughout India particularly in Maharashtra, Madhya Pradesh, Gujarat, Punjab, Haryana, Rajasthan, Bihar, Tamil Nadu, Karnataka, Andhra Pradesh, Telangana, West Bengal, Assam and Tripura. India ranks second in the world after China among jujube growing countries, occupying approximately 1 lakh hectare land area. It is an arid fruit tree of economic significance, grown in the drier parts of the country as it can withstand long periods of drought. In India, the jujube is only cultivated for a few small markets. However, every part of the plant like stem, bark, roots, leaves, flowers and fruits has shown to have some medicinal values.

Nutritional Significance of Jujube

In comparison to the apple, the ripe fruit is nutritionally richer in protein, phosphorus, calcium, carotene and vitamin C. Due to its high nutritive value, it is considered as a poor man’s apple.

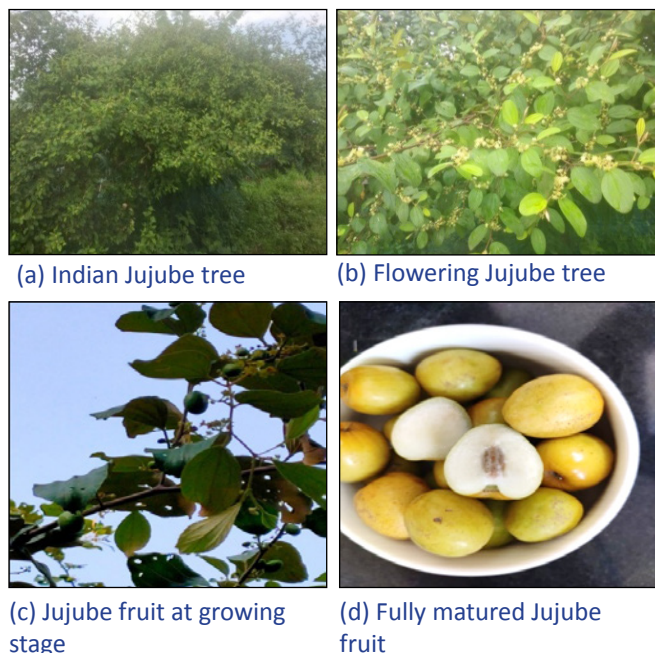


Figure 1: Indian Jujube

Chinese Jujube

The Chinese jujube variety (*Zizyphus jujuba* Mill.) has been cultivated in China since ancient times and is stated to have been cultivated for the last 5000 years. The fruit has a long history of usage as a vital food and in Chinese medicine for over 4,000 years. Almost all the parts of the plant are also used as pharmacological agents (Rashwan *et al.*, 2020). However, various scientific pieces of evidence have shown that the fruit part (peel and pulp) is considered as the main part, which contains most of the bioactive compounds including ascorbic acid, phenolics, triterpenic acids, flavonoids, amino acids, polysaccharides, saponins, cerebrosides, and mineral constituents which can be useful in suppressing several diseases (Pareek, 2013). Several studies have proved their antioxidant, anti-inflammatory, anti-obesity, anti-diabetic, anti-cancer, anti-cardiovascular disease, anti-microbial, hepatoprotective, and gastrointestinal-protective effects, which makes the Chinese jujube a very important crop (Rashwan *et al.*, 2020) with medicinal & nutraceutical values.

Indian Jujube

Most of the information on nutritive value and health benefits of jujube in the literature is strictly confined to the Chinese jujube varieties and the Indian genotypes still remain under-explored and under-researched. In contrast to more expensive but popular fruits such as mango, apple and orange, jujube still remains an underutilized fruit in the average Indian diet despite being a cheap fruit. This is largely because little knowledge about its health-promoting impact is available to the general population. The biodiversity

of *Zizyphus mauritiana* Lamk is enormous in India. Over 300 germplasms, including commercial, exotic, and indigenous cultivars, are accessible. Unfortunately, there is no systematic knowledge available on the nutritional composition, available bioactive compounds or antioxidant activity with regard to jujube cultivated under Indian conditions. Not only genotypes but also factors like geographical location, environmental or climatic conditions, stages of maturity, cultural practices, ripening conditions and post-harvest parameters (Koley *et al.*, 2016) explicitly regulate the nutritional and functional quality. However, the data on this is yet to be analyzed.

The available information on Indian jujube indicates that nutritionally, jujube is widely acclaimed as a rich source of ascorbic acid (70–165 mg per 100 g) and a good source of total phenolics (172 to 328.6 mg GAE per 100 g) and essential minerals such as calcium, phosphorus and iron (Koley *et al.*, 2016). In general, the fruits contain 81.6–83.0 % moisture, 17.0% carbohydrates, 0.8% protein, 0.07% fats, 0.76–1.8 % iron, 0.03% phosphorus, 0.03% calcium, 65.8–76.0 mg ascorbic acid, 0.2–1.1 mg citric acid, 0.021 mg carotenoids, 0.02–0.024 mg thiamine, 0.02–0.038 mg riboflavin, 0.7–0.873 mg niacin, 21.66 g sugar, 2.2–3.4 g pectin, 1.28 g fibre with a calorie value of 104 kcal per 100 g of the fruit (Pareek, 2013).

Scope for Processing of the Indian Jujube to Commercial Food Products

Jujube is an under-consumed fruit in India. The major consumption of the fruit is mostly in its raw or fresh form. But the storage life of Indian jujube fruit is extremely short and the major problem for this is the rapid perishability of the fruit. It cannot be stored under unregulated conditions for more than ten days due to its short post-harvest shelf-life. Therefore, one of the best choices for long time storage and also to save the fruit from enormous wastage is the processing of jujube into any form of food product (Rashwan *et al.*, 2020) which will also make the fruit available throughout the year.

Besides, because of its high nutritional and biological value, it can be a promising food ingredient for the production of functional food products and to be integrated into various food formulations to achieve high consumer acceptability, health benefits and commercial value.

A few studies on processing methods for jujube indicate that cloying with honey, preservation in sweet-sour infusion vinegar, conservation in sweet infusions, dried jujube fruits, nectar, fruit extracts, jam, jelly, chutney, pickle and powdered tea are the most promising processing methods (Rashwan *et al.*, 2020).

Conclusion

There are over 300 varieties of Indian jujube available, but very few are in production. Till today, for most of the Indian jujube cultivars, the complete nutritional

profiling is not established. Proximate composition, bioactive compound profiling, types and composition of sugars, carotenoids, vitamins, minerals, amino acids, etc. should be studied in the cultivars available to recognize the potential of the Indian varieties. Nutritional changes should also be evaluated at different growth, maturation and ripening stage of the fruit (Pareek, 2013). The identification of nutritionally superior Indian jujube cultivars could potentially increase the dietary consumption of the varieties which contain the compounds that promote health and help in the prevention of chronic human diseases. The nutritional properties of a few Indian jujube genotypes have been reported. However, more detailed information about the health-promoting components of different Indian jujube genotypes could lead to better utilization of the important cultivars. Proper identification could also facilitate the food processing industry to preserve,

process or incorporate the potential variety into different fruit products (Koley, 2016).

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