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## Research Article

### CACTUS PEAR: FUTURE HOLDING FRUIT

Isha Kaushik

Centre of Food Science and Technology, CCSHAU, Hisar-125 004 India

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#### ABSTRACT

Cactus pear, a unique and valuable plant has recently gained worldwide attention, mainly for its medicinal and nutritional potential. It is a member of the Cactaceae family, and widely cultivated in Mexico and in all American hemispheres and also found in many other parts of the world, such as Africa, Australia and the Mediterranean basin. The fruits are rich in carbohydrates, protein, organic acids, amino acids and vitamins, also contain dense contents of carotenoids, vitamin E, dietary minerals and bio-active compounds. Some of the health benefits cited for cactus pear fruit products include: anti-inflammation, antimicrobial action, pain relief, the promotion of tissue regeneration, boosting of the immune system, and protection against cancer and cardiovascular disease. There, potentially, is a wide array of products possible from cactus pear fruit for use as food, fresh fruit, nutraceuticals, pet foods, cosmetics, and skin preparations for improving the health and appearance of the skin. There is no doubt that the future holds a great promise for the cactus pear.

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#### INTRODUCTION

Fruit which is known as prickly pear also famous as Cactus pear. It is a member of the Cactaceae family, and widely cultivated in Mexico and in all American hemispheres and also found in many other parts of the world, such as Africa, Australia and the Mediterranean basin (Jana, 2012). Cactus pear is a xerophyte producing about 200-300 species and is mainly growing in arid (less than 250 mm annual precipitation) and semi-arid (250 - 450 mm annual precipitation) zones and contains about 130 genera and perhaps 1,500 species. There is dearth of literature on cactus pear which makes its recognition difficult (Osuna-Martínez *et al.*, 2014; Feugang *et al.*, 2006). Its berry is an oval, elongated with many hard seeds, with a thick pericarp accounts for 33% to 55% and a juicy pulp is 45% to 67% (Piga, 2004). It is grown as a food source for both humans and animals. Richness of potentially active nutrients and multifunctional properties make increasing utilization of cactus-pear fruit juice, concentrates, and powders as functional ingredients for the soft drink market, including betalainic coloring foodstuffs, is expected (Bohmmar).

##### Biodiversity

Cactus pear belongs to approximately 1,600 species in 130 genera subdivided in the three subfamilies Opuntioideae, Pereskioideae and Cactoideae (Wallace and Gibson, 2002). The most common and widespread Opuntia genus covered in this review regroups a number of more than 300 species,

among which over 100 have been found in wild habitats in Mexico, 60 of them being endemic (Anaya-Pérez, 2006). Cactaceae are one of the most exotic plant families of semi-arid regions of the world, the latter covering about 30% of the world's continental surface (Kigel, 1995). The genus *Opuntia* is most widespread, presumably due to its capacity to regenerate either from root calluses, pads, fruits, seeds, tissue culture and grafting (see table 1) (Lazcano *et al.*, 1999 and Estrada-Luna, 1988). It can be combated from temperate (Italy, Israel), subtropical African and American zones, Asia (China, South Korea) as well as in cold regions with winter snowfalls as in Canada or Argentina (Russel and Felkar, 1987 and Mohamed-Yasseen *et al.*, 1996). This is due to their peculiar adaptations to water scarcity and sun irradiation, such as (Wallace & Gibson, 2002) CAM metabolism (Crassulacean Acid Metabolism), the reduction of (Anaya-Pérez, 2001) leaf tissues and cuticular waxes covering the cladodes and fruit surfaces, which allow them to grow year round and stay evergreen despite harsh environmental conditions (Griffiths, 1915).

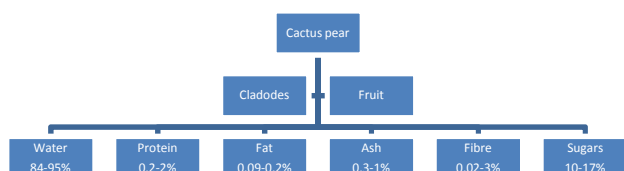
##### Cactus Pear Constituents/Nutritive Value/Bioactive Agents

###### Nutritive value

Cactus pear, a unique and valuable plant has recently gained worldwide attention, mainly for its medicinal and nutritional potential (fig.1).

\*Corresponding author: **Isha Kaushik**

Centre of Food Science and Technology, CCSHAU, Hisar-125 004 India



**Figure 1** Nutritive value of cactus pear

It contains 80-95% water, 3-7% carbohydrate, 1-2% fiber, 0.5-1% protein and 0.1-1% lipid. Its fruit pulp rich in high sugar content rich in glucose and fructose, and low acidity (Sepulveda *et al.*1990, Joubert *et al.*1993) render the fruits a delicious, sweet but sometimes a bland taste (Russet *et al.*1987, Sepulveda *et al.*1990, Sawaya *et al.*1983, Kuti *et al.*1994). And pH of pulp ranges from 5-6 although cactus pear considered as low acidic food. (pH14.5). Therefore, addition of citric acid which is the main organic acid (62 mg/100 g) of prickly pears followed by malic acid (23.3 mg/100 g) is added to decrease liability to microbial spoilage. Along with juice, cactus pear fruit pulp act as a new source of fruit oils representing (0.1-1.0%) i.e., 8.70 g total lipid/kg pulp dry weight compared to 98.8 g total lipids/kg for seeds and the peel fraction contains 36.8 g lipids per kg (Ramadan *et al.*2003). Moreover, it has been shown that the seed oil contains a significant amount of neutral lipid (87.0% of total lipids), albeit higher level of polar lipids are at 52.9% present in pulp oil. Its oil is rich source of essential fatty acids such as linoleic acid as well as sterols (beta-sitosterol and campesterol). It is important source of fat soluble vitamins which makes its oil to less prone to oxidative damage.

**Table 1** Different species of Cactus pear

Subgenus	Species	Common synonyms	Locations
Opuntia	Opuntia basilaris	Beavertail cactus	Southwest U.S. and northwest Mexico Native to southwest
Opuntia	Opuntia chlorotica	Pancake prickly pear, clockface prickly pear, flap jack prickly pear	U.S. and the Sonoran and Mojave deserts
Opuntia	Opuntia engelmannii	Engelmann's pear, cow's tongue cactus, Engelmann prickly pear	Mexico
Opuntia	Opuntia ficus-indica	Indian fig, mission cactus, smooth prickly pear	South West Mexico and warm parts of the world
Opuntia	Opuntia fragilis	Little prickly pear, brittle cactus, fragile prickly pear, loose prickly pear	Northern great plains
Opuntia	Opuntia humifusa, Opuntia compressa var. humifusa	Eastern prickly pear, low prickly pear, smooth prickly pear	U.S east of the great plains
Opuntia	Opuntia macrocentra	Black spined prickly pear, purple prickly pear	
Opuntia	Opuntia macrorhiza	Plains prickly pear, starvation prickly pear, delicate prickly pear	Southwest U.S. and Northern Mexico
Opuntia	Opuntia microdasys	Bunny ears prickly pear, angel's wings prickly pear	Mexico
Opuntia	Opuntia santa-rita	Santa Rita prickly pear	Texas, Arizona and Northern Mexico
Opuntia	Opuntia stricta	Coastal prickly pear, yaaxpakan	Coastal regions
Opuntia	Opuntia polyacantha	Hedgehog prickly pear, grizzly bear prickly pear	
Opuntia	Opuntia phaeacantha	New Mexico prickly pear	
Opuntia	Opuntia littoralis	Sprawling prickly pear, coastal prickly pear	
Opuntia	Opuntia erinacea	Grizzly bear opuntia	

Based on various studies on *Opuntia* composition, fruit pulp is considered a good source of minerals, especially calcium, potassium and magnesium (Stintzing *et al.*2001, Piga *et al.* 2004, Lee *et al.*2005, Gurrieri *et al.*2000) and its seeds are also rich in minerals and sulphur amino acids (Sawaya *et al.*1983).

### Phenolic constituents/bioactive components

Cactus pear is a rich source of bioactive components i.e., 8 to 9 mg/100 g fresh weight. Phenolics comprise a wide variety of compounds, divided into several classes such as hydroxybenzoic acids, hydroxycinnamic acids, anthocyanins, proanthocyanidins, flavonols, flavones, flavanols, flavanones, isoflavones, stilbenes and lignans (Pelegri *et al.* 2000, Manach *et al.* 2004, Ross *et al.* 2002, Cieslik *et al.*2006). There is clear evidence that these compounds are more efficient antioxidants than vitamins, since phenolic compounds are able to delay prooxidative effects on proteins, DNA and lipids by the generation of stable radicals (Shahidi *et al.* 1992).

### Cactus Pear Utilization

In Mexico or Chile, cactus pear fruits play significant role in human diet, where peeled fresh fruits are commonly consumed at home, in vegetarian restaurants, or in local health-food stores. Cactus pear offers various opportunities for food processors to utilize in different ways such as in preparation of juices, beverages, concentrates, frozen products, dehydrated products, confectionary products and fermented products (Moßhammer *et al.* 2006). A wide variety of products can be made from cactus pear. These add value to the raw materials and provide employment and income. Product diversification helps to make the investments required of small-scale agro-industries more viable. These new products provide people with choices and help diversify diets. The outcome is higher consumption of fruit, either fresh or processed. Cactus pear fruit has characteristics not commonly found in other fruit species, which require additional care when processing: high pH, low acidity (apart from some species) and high sugar content. Cactus pear products should always be of the highest possible quality and sold/consumed within the stated storage period so that they do not deteriorate and become unsafe. One move that could improve the marketing of cactus pear foods, whether from small-scale agro-industries or more advanced industrial enterprises, is to differentiate them from any similar products already available on the market, including those made from better-known fruits. Consumers tend to enjoy novelty and are keen to sample attractively presented new products. Differentiating products entails highlighting the different components of the various species: physical (appearance, taste, aroma, texture), nutritional and functional (vitamins, fibre, antioxidants and mineral content) (Stintzing and Carle, 2005)

### CONCLUSION

Today the world appears to be increasingly interested in the health benefits of foods and has begun to look beyond the basic nutritional benefits of foodstuffs to disease prevention. It is generally accepted that the beneficial effects of herbal remedies can be obtained from active constituents present in the whole plant, parts of the plant. Cactus pear fruit is rich in nutritive and bio-active compounds that make a sense of utilizing this fruit for various food processing purposes. It has wide array of

applications in food, pharma and cosmetics. It can be a futuristic fruit for solving food and health problems.

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