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ORIGINAL PAPER

Medicinal uses and value added products of ber

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The Jujube or the Ber (*Zizyphus mauritiana* Lamk.) is a very old fruit of India and China. Ber belongs to the genus Zizyphus of the family Rhamnaceae. Ber fruit is generally available in the market from November– March, when other main fruits are less available. Ber is widely cultivated in different states of India, i.e. Madhya Pradesh, Rajasthan, Gujarat, Punjab, Haryana, Uttar Pradesh, Maharashtra and to limited extent in several other states (Samant *et al*., 2008). It is cultivated in semi arid regions. The main constriction for fruit production in arid and semi-arid regions is water. The ber tree is, however, drought hardy and can grow under the most hazardous conditions of soil, water and climate. The cultivation requires perhaps the least inputs and care. It gives good production even without irrigation (Kumar *et al.*, 2008, Dayal *et al.*, 2010). Ber fruit is a blend of sweet and sour taste which is commonly used for direct consumption. In comparison to apple and oranges, ber fruit is considered as an ideal source of calcium, phosphorus, iron, vitamin B-complex (thiamin and riboflavin), vitamin C, and carotene (Doymaz, 2007). As a result, seasonal glut has started in the local market and growers are not realizing remunerative price for their produce. Moreover, the shelf life of ber fruit is very short as after harvesting, if not handled properly, it becomes over mature within two days at ambient temperature. Therefore developing and standardization of processing techniques such as the preparation of squashes, jam, murabba, candy etc. will help to stabilize the price level and utilize the surplus produce (Gupta *et al*. 2013).

MEDICINAL USES

Ber contains numerous ethnopharmaceutical compounds. These include ascorbic acid, thiamine, riboflavin, bioflavonoids, alkaloids, pectin A, glycosides (spinosins, saponins, triterpenoic acids, betulinic acid and oleanolic acid) and lipids Ber also have neurological properties (hypnotic-sedative and anxiolytic effect and cognitive activities), hypotensive and antinephritic effect, cardiovascular activity, immunostimulant effects, antifungal, antidiabetic, antiallergic, antiulcer, anti-inflammatory, antispastic, antioxidants and antibacterial activities (Azam-Ali *et al*., 2001). Rathore *et al*. (2012) reported that different secondary metabolites present in ber fruit like flavonoids, glycosides, saponins, lignins, sterols and phenols, extracted through methonol, 95% ethanol and distilled water extraction method. These secondary metabolites show very effective function against pathogens. Therefore, ber fruit can be used in the treatment of liver diseases according to their function and also used in cancer treatment. In addition to fruit, different parts of plant like root, bark, leaves, flowers, seeds are used in Ayurvedic and Yunani medicines for treatment of diarrhoea, ulcer, billousness, indigestion, cough, headache, bleeding gums, asthma. It is also used as blood purifier and appetizer (Baloda *et al.,* 2012).

PREPARATION OF VALUE-ADDED PRODUCTS

Ripe, firm fruits without marks or bruising were selected and dried as per standard method of Lal *et al*. 1986 with some modifications. Pricking of fruit skin with stainless steel fork followed by blanching (plunging them in boiling water for 2 min), which was done to improve the uptake of sugar. Fruits were then sulphited by dipping in a solution of potassium metabisulphite (KMS) @ 0.3 % for 30 min. After this, the fruits were again washed thoroughly, drained, and submerged overnight in 60 °B sugar syrup containing 0.5 % citric acid. Next day, the fruits were removed from the syrup and drained on wire mesh trays. The fruits were then dried in mechanical dehydrator at a temperature of 55-60 ^{0}C till constant weight.

Jakhar and Pathak (2012) prepared RTS by blending ber and jamun pulp. The different blending ratios of ber and jamun pulp were 75:25, 50:50, and 25:75, respectively. RTS using 100 per cent ber pulp and 100 per cent jamun pulp were also developed. They found that RTS prepared using 25% ber pulp and 75% jamun pulp scored highest mean scores followed by RTS prepared using ber and jamun pulp in the ratio of 50:50 and RTS prepared using 100 per cent jamun pulp. All the prepared RTS blends were organoleptically acceptable. There was a gradual decrease in organoleptic score of the blended RTS beverage during the storage period at room temperature. The RTS was found acceptable up to five months of storage.

Kumar (2006) prepared ber powder by dehydrating ripe ber fruits using sun drying and oven drying techniques with different pre-treatments and reported that the powder contained total sugars 57.38%, reducing sugars 36.98%, non-reducing sugars 20.40% and ascorbic acid 35.17%.

Nutritional composition of Ber candy in terms of moisture content, TSS, ascorbic acid, acidity, total sugars and reducing sugar was found to be as 10.08 %, 48 °B, 95.97 mg/100gm, 0.225 %, 21.65 % and 9.67 % respectively (http://vikaspedia.in/agriculture/post-harvest-technologies/technologies-for-agri-horti-crops /preparation-of-ber-candy).

Gupta and Kaul (2013) developed candy like product (Chuhara) from ber by osmo-air drying process. The pretreatments like dipping in boiling 5% NaOH solution for 5 min followed by rinsing in water and 5% citric acid and dipping in 4000 ppm KMS solution for 12 hours. Pretreated fruits were then dipped in different sugar concentration of 40, 50, 60 and 70^{0}brix at 24, 48 and 72h.The treated fruits were then air dried at 52 ^{0}C. On the basis of quantitative parameters and sensory traits it was found that ber *chuhara* prepared with 60^{0}Brix steeping for 72 h rated the best, followed by those prepared with 70 or 50 ^{0}Brix sugar syrups.

Pickle was prepared as per standard method of Lal *et al.* 1986 using following pre-standardized recipe: Ber fruit pieces= 1 kg, salt= 60 g, turmeric powder= 15 g, red chilli powder= 15 g, jeera (whole)= 10 g, aniseeds= 10 g, clove (powder)= 5 g, cardamom= 5 g, ginger and garlic (grated)= 10 g each, acetic acid= 20 mL, and mustard oil= 100 mL. The washed fruits were cut into small pieces with a stainless steel knife. The pieces were then blanched in boiling water (2 min) and air dried (10 min). The whole ingredients were mixed well and heated for 5-10 min, after which acetic acid was added and the mixture was then filled in the sterilized glass jars (500 g). Mustard oil brought to boiling and cooled to about 60 ^{o}C was added to each jar followed by storage in cool dry place.

Khurdiya and Singh (1975) standardized the process of ber murraba. Fully mature ber fruits were blanched in boiling water for 6 minutes followed by rinsing in cold water. The fruits were then peeled and pricked. Destoning with cork borer could also be done, if desired. The prepared fruit was kept overnight in 20 to 30 per cent sugar syrup containing 0.5 per cent citric acid. Next day more sugar was added to the syrup at the rate of 250 g per 'kg of prepared fruit and boiled for few minutes, the process being repeated on fourth and sixth day. After one week, the syrup was concentrated to 70 per cent. Prepared murraba could be stored easily for a year.

CONCLUSION

Ber is suitable for preparing different value added products like preserve, osmotically dehydrated ber, candy, and pickle with good nutritional and sensory qualities. Value addition of ber fruits can improve the economy by reducing the post-harvest losses, establishment of the agro-process industries and promoting the importance of functional products from ber fruit.

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