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Utilization of Mango Peel Powder (MPP) in Mango Nectar Formulation

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A B S T R A C T

Mango belong to the genus *Mangifera* member of Anacardiaceae family, is one of the most popular fruit in the word. Mango processing industries discarded large amounts of mango peel and mango kernel as waste. In this research, it was decided to use of ripe mango peel powder (MPP) at different proportion in mango nectar and study the sensory quality of MPP blended mango nectar. The sensory score for overall acceptability of MPP blended mango nectar of treatment T_0, T_1, T_2, T_3 and T_4 were 8.00, 8.07, 8.39, 8.12 and 7.86, respectively. It was observed that the treatment T_2 (1g MPP in 100ml mango nectar) was more acceptable than other treatments. The blended of MPP beyond 1g in 100ml mango nectar decreased the score of overall acceptability by a panel of judges.

Introduction

The mango (*Mangifera indica L.*) is most popular fruit in tropical and sub-tropical regions of the world relished for its characteristic flavour and taste (Salunkhe and Desai, 1984). It is native in India. India is the leading country, sharing more than 50% of the world's production of mango (FAO, 2012). About 20% of total world mango production is utilized to produced value added products include mango pulp, juice, squash, nectar, fruit leathers, jam, canned slices, preserve, pickles, chutney, dried powder etc. which have most popular in the world (Sadhu and Bose, 1976; Rameshwar *et al.*, 1979; Kalra *et al.*, 1981; 1982; Ajila *et al.*, 2007). Mango is highly nutritious fruit being a good source of vitamin A, B and C, minerals, fiber and antioxidants (Wang and Jiao, 2000; Berardini *et al.*, 2005; Tharanathan *et al.*, 2006; Nigam *et al.*, 2007; Rocha Ribeiro *et al.*, 2007). Nutritive value of ripe mango is described in table 1.

In mango processing, large amount of by-products are developed i.e. mango peel, mango kernel etc., contributes about 7-24% and 9-40%, respectively (Wu *et al.*, 1993). They may lead to environmental pollution. But currently they utilized in processed product like beverages, bakery, cereals and macaroni products as functional ingredients. Mango peel contains moisture, protein, ash,

fibre and carbohydrates as 68.50, 2.05, 2.62, 5.40 and 26.5%, respectively and 453.92KJ/100g energy. It has been found to be rich source of phytochemicals such as polyphenol, carotenoids, vitamin E, dietary fibre and vitamin C and it also exhibited good antioxidant properties (Ajila *et al.*, 2007; Bede, 2010; Kim *et al.*, 2010; Ashoush and Gadallah, 2011). The proximate composition of MPP is shown in table 2.

The objective of present study was to utilize ripe MPP in mango nectar as functional ingredients and evaluate sensory characteristics of MPP blended mango nectar. Mango nectar is beverage having 20% pulp, 15% total soluble solids (TSS) and also about 0.3% acid (Mahadeviah *et al.*, 1969 and Shrivastava and Kumar, 2002).

Materials and Methods

Materials

All the raw materials i.e. uniformly ripened mangoes, sugar, citric acid and sodium benzoate were purchased from local market of Sangamner, Dist- Ahmednagar. After mango pulp processing, ripe peels were collected and powder was obtained through the processes of selection, washing, peeling, drying, grinding and packaging.

Mango peel powder (MPP)

Mango peels were washed with tap water to remove any foreign particles. The peels were placed thin in trays and dried at 55°C for 12 h using cross flow drier to moisture content around 10%.

The dried peels were finely grinded by miller and passed through sieve. The obtained powder was packaged in air tight plastic bags and stored at room temperature as per the method described in AOAC (1995).

Product treatment

The utilization of MPP in different proportion to prepared mango nectar are as follows.

T_0: 0.0g MPP in 100ml mango nectar
T_1: 0.5g MPP in 100ml mango nectar
T_2: 1.0g MPP in 100ml mango nectar
T_3: 1.5g MPP in 100ml mango nectar
T_4: 2.0g MPP in 100ml mango nectar

Mango nectar processing

The MPP blended mango nectar was prepared with slight modification as per method described by Shrivastava and Kumar (2002). The diagram of preparation of MPP blended mango nectar as presented in figure 1.

Sensory evaluation

The sensory quality of product was evaluated by a panel of 10 judges selected from the staff of Department of Food Science and Technology, Food Chemistry and Nutrition, Food Engineering and Food Microbiology of Shramshakti College of Food Technology, Maldad, using 9 point Hedonic scale rating (Table 3) as described by Ranganna (1999).

Results and Discussion

The MPP blended mango nectar was subjected to sensory evaluation for colour and appearance, flavour, taste, consistency and overall acceptability by trained judges, through 9 point hedonic scale and is presented in table 4.

The mean colour and appearance score for different treatment of MPP blended mango nectar ranged from 7.35 to 8.34. Treatment T_2 got highest score as compared to treatment T_0, T_1, T_3 and T_4 given in table 4. The studies showed that the addition of MPP beyond 1g in 100ml mango nectar with decrease in the colour and appearance value of mango nectar.

Table.1 Nutritive value of ripe mango per 100g

Nutrients	Ripe mango
Protein (g)	0.6
Fat (g)	0.4
Minerals (g)	0.4
Fiber (g)	0.7
Carbohydrates (g)	16.9
Energy (kcal)	74
Vitamin C (mg)	16
Total carotene (mcg)	2,210
Beta carotene (mcg)	1990
Potassium (mg)	205
Sodium (mg)	26
Calcium (mg)	14
Iron (mg)	1.3
Phosphorous (mg)	16

(Source: Nigam *et al.*, 2007)

Table.2 Proximate composition of MPP

Component	Content
Moisture (%)	5.9±0.56
Ash (%)	4.2±0.32
Fat (%)	1.4±0.13
Total Carbohydrate (%)	75.7±0.51
Protein (%)	2.8±0.21
Water-holding capacity (g H_2O/g)	4.3±0.11
Oil-holding capacity (g oil/g)	2.2±0.04
Crude fibre (%)	9.9±0.59
Total phenolics (mg GAE/g)	24.3±0.42

(Source: Bandyopadhyay *et al.*, 2014)

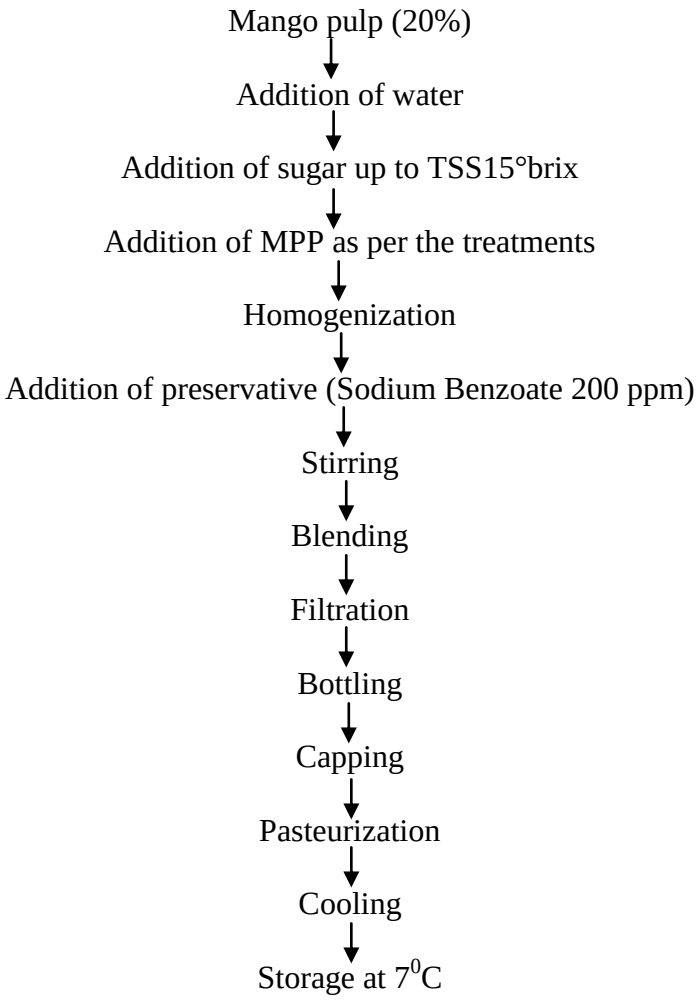
Table.3 Nine point hedonic scale used for sensory evaluation of MPP blended mango nectar

Score	Standard Hedonic scale
9	Like Extremely
8	Like Very Much
7	Like Moderately
6	Like Slightly
5	Neither Like Nor Dislike
4	Dislike Slightly
3	Dislike Moderately
2	Dislike very much
1	Dislike Extremely

Table.4 Sensory score for the MPP blended mango nectar

Treatment	Colour and appearance	Flavour	Taste	Consistency	Overall acceptability
T_0	8.17	7.61	8.12	8.10	8.00
T_1	8.04	8.02	8.10	8.15	8.07
T_2	8.34	8.50	8.30	8.42	8.39
T_3	8.15	8.26	7.99	8.11	8.12
T_4	7.92	8.07	7.62	7.85	7.86

Fig.1 Preparation of mango nectar



Flavour score for MPP blended mango nectar ranged from 7.61 to 8.50. Treatment T_0 obtained lowest score as compared to other. The result also showed that the blending of MPP beyond 1g in 100ml mango nectar there is a decrease in the flavour characteristics of mango nectar.

Regarding to taste, score ranged from 7.62 to 8.30. Treatment T_2 was more acceptable as compared to other treatments. According to the judgement, addition of MPP beyond 1g in 100ml mango nectar with decrease in the taste score of mango nectar.

Consistency of the different treatments was determined by visually from judges, ranged from 7.85 to 8.42. Treatment T_4 was more consistency due to addition of high amount of MPP in mango nectar (2g MPP in 100ml mango nectar).

Treatment T_2 was significantly superior over rest of the treatments. It was observed that the blending of MPP beyond the 1g in 100ml mango nectar there is a decreased consistency score.

The score for the overall acceptability of MPP blended mango nectar ranged from 7.86 to 8.39. The highest score was recorded by treatment T_2, while lowest score recorded by treatment T_4. It was observed that the treatment T_2 (1g MPP in 100ml mango nectar) was more acceptable by judges.

In conclusion based on the above discussion, it can be concluded that the considerable amount of mango waste i.e. mango peel utilized as by-products. In existent study, mango peel powder can very well be utilized in mango nectar preparation. The 1g MPP blended with 100ml mango nectar (T_2) was more acceptable.

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