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Value addition through blending in Langra mango pulp for β-carotene

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ABSTRACT

A study was undertaken to note the effect of different proportions of mango and carrot pulp to enhance the level of β-carotene and quality of Langra mango pulp. The blend of (50:50) Langra and Dashehari having carrot pulp in the proportions of 50:50:0, 45:45:10, 40:40:20, 35:35:30, and 30:30:40 were tried. The proportion of 40:40:20 was found to be for enrichment of β-carotene and good colour, without change in mango flavour and taste in the blend after storage.

Keywords: Mango and carrot, value addition, β-carotene, sensory score.

INTRODUCTION

The mango (*Mangifera indica* L.) is one of the most important fruits of Asia and currently ranks fifth in total production among the major fruit crops (Hymavathi and Khader, 4). Mango fruit is known for its characteristic aroma and taste. The nutritional importance of mango is mainly due to it's highly β-carotene content as well as appreciate contents of ascorbic acid, total phenols and quercetin. There is great variation in β-carotene content (800 µg/100g in Mulgoa to 1,300 µg/100g in Alphonso) depending on the cultivar, climatic conditions, ripening stages and storage conditions. With the increasing demand for β-carotene as pro-vitamin A and antioxidant in human health, development of a variety of β-carotene rich food from mango is essential (Klaui and Bauernfeind, 9).

Some of the mango cultivars like Langra which is fibrous, soft and inadequate β-carotene is suitable for fresh consumption, but possess high quality of juice, thus it could be utilized for making beverages. However, pulp of Langra mango lacks intense colour as well as having low levels in β-carotene content. This deficiency therefore could be improved by blending with the pulp of other mango cultivars having high β-carotene contents like Dashehari or Bombai Green (Roy *et al.*, 13). The β-carotene content and colour intensity in Langra pulp could be also more enhanced at cheaper price when it can be blended with carrot pulp. Since, carrot is a rich source of β-carotene and carotenoids, it could be a cheap but effective source for blending. Hence, the present study was taken up to find out appropriate blending proportion of mango and carrot pulp for preparing value-added β-carotene rich mango pulp.

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MATERIALS AND METHODS

The fruits of mango cvs. Dashehari and Langra at mature ripe stage were procured from the orchard of the Division of Fruits and Horticultural Technology, IARI, New Delhi, and the carrots (cv. Nantes) were procured from the Demonstration Plot of the Division of Vegetable Science, IARI, New Delhi.

The fully ripe mango fruits and carrot roots were selected and washed in tap water thoroughly to remove adhering dirt and dust and then dried under the fan. The mango fruits were peeled and sliced manually by using a stainless steel knife. The slices were then fed into a pulping machine to make smooth mango pulp. Carrot roots were scraped and sliced longitudinally and core was removed. The carrot slices were heated with the addition of 20-25% water until soft and then blended using a mini blender for obtaining fine carrot pulp. The pulp of mango and carrot was heated at 85 °C for 10 min. to sterilize separately and then filled in pre-sterilized bottles for further use. The Langra pulp was blended with the cv. Dashehari in the proportions of 100:0, 90:10, 80:20, 70:30, 60:40, 50:50 proportions. The blended samples were assessed for β-carotene contents and economically physibility aspects. Among these blended proportions, the proportion 50:50 (L: D) was selected as best and used in experiment. The selected pulp blend 50:50 (L: D) was then blended with carrot pulp in four different proportions, i.e., 50:50:0, 45:45:10, 40:40:20, 35:35:30 and 30:30:40 of (Langra: Dashehari: carrot).

These blends were then subjected to nutritional quality assessment and organoleptic evaluation to find out the optimum blend proportion of mango and carrot pulp. Moisture and ascorbic acid, β-carotene and total carotenoids were determined as per method described by (Ranganna, 12). The TSS (° Brix) was determined by using an Abbe's refractometer. Total phenols was analyzed according to AOAC (2) and total antioxidant

power was tested by using FRAP method (Benzie and Strain, 3).

RESULTS AND DISCUSSION

Chemical compositions of mango and carrot are given in Table 1. The moisture content was higher in carrot as compared to mango and it was 79.37% in Langra, 78.41% in Dashehari and 86.85% in carrot. TSS was higher in Dashehari than Langra and carrot. The high value of TSS might be due to less moisture content and more hydrolysis of polysaccharides into simple sugars. Similar trends have been reported by Sathyavathi *et al.* (14), Roy *et al.* (13), and Kaushik and Kumar (7). Ascorbic acid was higher in Langra then Dashehari or carrot. Low content of ascorbic acid in Dashehari may be due to more oxidation and enzymatic degradation during hydrolysis of polysaccharides into simple sugars. Similar patterns have been reported by Kapur (6), Kapse *et al.*(5), Khurdiya and Roy (8). Total carotenoids as well as β-carotene were higher in carrot than Dashehari and Langra mango. The high content of carotenoids in carrot may be due to its rich content. Total phenols were higher in mango than carrot (Klaui and Bauernfeind, 9). The hydrophilic antioxidant power (HAP) was more in mango than carrot. This might be due to availability of more ascorbic acid and total phenols content in mango.

The effect of Langra and Dashehari proportions on chemical characteristics of mango blends is given in Table 2. The moisture content in the blend of Langra and Dahsehari pulp decreased with increasing the proportion of Dashehari pulp in the blend. This may be due to lower content of Dashehari pulp in the blends as compared to Langra pulp. In contrast, TSS in blend of Langra and Dashehari pulp increased with increasing the proportion of Dashehari pulp. This might is due to higher TSS of Dashehari pulp as compared to Langra. Ascorbic acid content was higher in Langra pulp than Dashehari, therefore, ascorbic acid content decreased with increase in the proportion of Dashehari pulp to Langra. Dashehari mango pulp had high carotenoids/β-carotene contents. Hence, β-carotene content increased with increasing the proportion of Dashehari pulp in the blend. Total phenols and HAP decreased with increasing the proportion of Dashehari pulp to Langra in the blend. This might be due to less content of total phenols in Dashehari pulp.

The effect of proportion on chemical characteristics and sensory evaluation of mango and carrot blends are presented in Table 3. The moisture content increased with increasing the proportion of carrot pulp and the increase was significantly higher in all the five proportions studied. This was due to higher moisture content in carrot pulp compared to mango pulp. The TSS was higher in the mango pulp prepared after mixing of Langra: Dashehari: carrot (50:50:0) without carrot pulp and it decreased with increasing the proportion of carrot pulp in the blends of different proportion. The decrease in TSS was due to increasing carrot pulp which is has low TSS than mango pulp. A significant decrease in ascorbic acid was observed with increase in carrot pulp to mango pulp in all the different proportions. This was due to decrease the proportion of mango pulp in the blends which are higher in ascorbic acid content than carrot pulps. The value for total carotenoids and βcarotene increased with increase the carrot pulp in the mango blends. This is due to their richness in carotenoids and βcarotene added from carrot pulp. Total phenols content was higher in the blends having only mango pulp. However, phenol content decreased with increase carrot pulp in the blends. This may be due to lower content of total phenol in carrot pulp. Similarly, HAP in the blend of mango and carrot pulp decreased with increase the proportion of carrot pulp. This might have been due to lower of ascorbic acid and total phenols contents in carrot pulp, which might be mainly responsible for hydrophilic antioxidant power (Miller *et al.*, 11; Agrahari *et al.*, 1; Mahattanatawee *et al.*, 10).

The physical and sensory characters were better in the blend of 40:40:20 (L:D:C) in respect of colour, flavour and taste. Comparatively proportions of 50:50:0 blend could not improve the colour, β-carotene level while proportion 40:40:20 had improved physico-

Table 1. Chemical compositions of mango and carrot.

Parameter	Mango		Carrot
	Langra	Dashehari	Nantes
Moisture (%)	79.37	78.41	86.85
TSS (°B)	18.03	18.47	9.05
Ascorbic acid (mg/100g)	144.90	18.64	4.97
Carotenoids (mg/100g)	17.12	37.02	42.37
β-carotene (mg/100g)	5.63	24.74	31.25
Total phenols (mg/100g)	9.85	9.40	2.27
HAP (µmol Fe^{2+}/100g)	534.02	420.98	67.85

Table 2. The effect of Langra and Dashehari pulp proportion on chemical characteristics of mango blends.

Proportion (L : D)	Moisture (%)	TSS (^{0}Brix)	Ascorbic acid (mg/100 g)	Total carotenoids (mg/100 g)	β-carotene (mg/100 g)	Total phenols (mg/100 g)	HAP (µmol/100 g)
100 : 0 (L)	79.37	18.03	58.56	17.12	5.63	9.85	534.02
0 : 100 (D)	78.41	18.47	6.60	37.02	24.72	9.40	420.98
90 : 10	79.28	18.08	53.36	19.11	7.54	9.80	522.71
80 : 20	79.18	18.12	48.16	21.10	9.45	9.76	511.41
70 : 30	79.08	18.16	42.97	23.09	11.37	9.71	500.10
60 : 40	78.99	18.21	37.77	25.08	13.28	9.67	488.80
50 : 50	78.89	18.25	32.58	27.07	15.19	9.62	477.50
40 : 60	78.79	18.29	27.38	29.06	17.10	9.58	466.19
30 : 70	78.70	18.34	22.18	31.05	19.01	9.53	454.89
20 : 80	78.60	18.38	16.99	33.04	20.92	9.49	443.58
10 : 90	78.50	18.42	11.79	35.03	22.83	9.44	432.28
$CD_{0.05}$	0.301	0.090	1.897	0.907	0.367	0.112	36.866

L = Langra; D = Dashehari; L : D = Langra : Dashehari

Table 3. Effect of mango and carrot proportion on sensory and chemical characteristics of blends.

Parameter	L : D : C					CD (0.05)
	50 :50: 0	45: 45: 10	40: 40: 20	35: 35: 30	30: 30: 40	
Quality						0.215
Moisture (%)	78.89	80.29	81.68	83.08	84.48	0.062
TSS (^{o}Brix)	18.25	16.93	15.61	14.29	12.96	1.377
Ascorbic acid (mg/100g)	31.28	28.29	25.29	22.30	19.30	0.561
Carotenoids (mg/100g)	27.07	28.60	30.13	31.66	33.19	0.047
Total phenol (mg/100g)	9.624	8.889	8.154	7.419	6.684	32.081
HAP (µmol Fe^{2+}/100g)	393.71	361.12	328.54	295.95	263.37	
Sensory						
Colour	Yellow	Yellow	Yellow	Y-O	Y-O	
Flavour	Mango	Mango	Mango	Mango	Mango	
Taste	Mango	Mango	Mango	M-Carrot	M-Carrot	

Y-O = Yellow-Orange; M = Mango

chemical and nutritional properties, without change in mango taste or flavour, hence could be readiliy used for preparing different value added products from the mango pulp.

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