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Studies on the standardization of blended aonla-kinnow mandarin RTS beverage

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ABSTRACT : An investigation involving blending of *aonla* and Kinnow mandarin juice in various proportions for their value addition by preparation of RTS beverage was carried out in the post-graduate laboratory of Department of Post Harvest Technology, College of Horticulture and Forestry, Jhalrapatan, (Rajasthan) during 2011-12. The aonla and Kinnow mandarin juice was blended in various proportions *viz.*, 0:100, 10:90, 20:80, 30:70, 40:60 and 50:50 to prepare ready-to-serve (RTS) beverages having 10 per cent juice, 12 per cent TSS and 0.3 per cent acidity. The treatment involving blending of *aonla* juice with Kinnow mandarin juice in 40:60 proportion was found most suitable since it had maximum sensory qualities in terms of highest overall acceptance score (6.74/9.00) with bright yellow colour, pleasant aroma and taste. It also had second best ascorbic acid (27.92 mg/100 ml) and total phenol content (1.18 %).

KEY WORDS : Blending, Aonla, Kinnow mandarin, RTS

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Aonla (*Emblica officinalis* Gaertn.), popularly known as aonla/ *aml* is one of the oldest minor fruits of India. It belongs to the family Euphorbiaceae; sub family Phyllanthoidae and is native of India, Srilanka, Malaysia and China (Mitra, 1999). The tree bearing capsular fruits with fleshy pericarp is quite hardy in nature and is commercially cultivated in variable agro-climatic conditions all over the India especially in the states of Uttar Pradesh, Gujarat, Rajasthan, Andhra Pradesh, etc. with an area of 95.2 thousand hectares and production of 960.9 thousand tonnes (Anonymous, 2011).

The fruit is well known for its medicinal and nutritional qualities, containing important essential amino acids lysine and methionine (Zemen and Ney, 1998), being the rich source of polyphenols, minerals and regarded as the richest source of vitamin 'C' (200-900 mg/100 g) among fruits, except Barbados cherry (Barthakur and Arnold, 1991). The aonla fruit has good free radical scavenging activity (Shishoo *et al.*, 1998) due to the presence of gallotannic acid, an important antioxidant.

Owing to nutritional and pharmaceutical properties, the possibilities of using aonla fruits for development of beverages are explored on. Attempts have been made in recent

years to commercialize the nutraceutical drinks of pure aonla juice. But due to highly acidic and astringent taste, the beverages developed from *aonla* juice alone are not appealing to the masses. A lot of work has been done on blending of aonla juice with other fruit juice having strong flavour, for preparation of beverages (Jain and Khurdiya, 2004; Deka and Sethi, 2001; Garg *et al.*, 2008).

Kinnow (*Citrus reticulata* Blanco) is a hybrid between 'King' and 'Willow leaf' mandarin. Among the new exotic citrus cultivars grown in India, Kinnow is undoubtedly the most priced one. It is extensively cultivated in the states of Punjab and Rajasthan. The fruit is quite important as it has high juice content having distinctive colour, flavour and refreshing property. The juice is quite nutritious being rich source of vitamin 'C', vitamin 'B', calcium and phosphours (Sogi and Singh, 2001) is popular drink in summers. Attempts have been made to develop beverages by blending of two or more juices so that the final product has better nutritive and sensory attributes.

Therefore, in present investigation, an effort was made to standardize the proportion of aonla and Kinnow mandarin juice for preparation of blended RTS beverages.

RESEARCH METHODS

Procurement of raw material:

Fresh fruits of 'Chaikaiya' variety of aonla and Kinnow mandarin were procured from the local market.

Juice extraction and Preparation of RTS beverages:

The juice from aonla fruits was extracted by first blanching the fruits in boiling water for 5 minutes and then juice was extracted mechanically by crushing and pressing the segments. While, from kinnow mandarin, juice was extracted by peeling the fruits and passing the segments through screw type juice extractor. Aonla juice was mixed with kinnow mandarin juice in the ratio of 0:100, 10:90, 20:80, 30:70, 40:60 and 50:50 to standardize the proportion, having best sensory attributes for preparing ready- to- serve (RTS) beverage with 10 per cent blended juice, 12 per cent TSS and 0.3 per cent acidity, adjusted by table sugar, citric acid and water (Table 1). The prepared RTS beverages was flash pasteurized at 90°C for 1 min. and filled in pre sterilized glass bottles (200 ml capacity).

Sensory and physico-chemical analysis:

The sensory evaluation of the product was done on colour, aroma, taste and overall acceptance on a 9 point hedonic scale (Amerine *et al.*, 1965). TSS was measured using a digital pocket refractometer (PAL-1) of ATAGO, Tokyo, and expressed as °Brix. Acidity was determined by titrating a known volume of sample against 0.1 N NaOH

solution to a pH of 8.1 with a glass electrode pH meter. Vitamin 'C' content was estimated by diluting a known volume of sample with 3 per cent metaphosphoric acid and titrating with 2, 6- dichloro- phenol indophenols dye solution. Total sugar content was determined by using anthrone reagents method (Dabois *et al.*, 1951). Reducing sugar content was measured as suggested by Nelson-somogyi, while phenols content of the aonla based blended RTS beverage was determined by folin-ciocalteau phenol reagent (Sadasivam and Manickam, 1991).

RESEARCH FINDINGS AND DISCUSSION

The results obtained from the present investigation as well as relevant discussion have been summarised under following heads:

Sensory attributes (Score out of 9):

The data pertaining to the effect of proportion of aonla and kinnow mandarin juice on the sensory qualities and physico- chemical attributes are presented in Table 3 and 4.

It is clearly indicated from the data on sensory quality (Table 3) that increasing the proportion of aonla juice up to 40 per cent increased the sensory quality of RTS beverages in terms of colour, aroma, taste and overall acceptance, thereafter it decreased. The RTS beverage prepared from Kinnow mandarin juice alone had a dull yellow colour but blending of aonla juice caused positive change in the colour and developed brightness in the RTS (Bhardwaj and

Table 1 : Recipes for standardization of ratio of Indian gooseberry and kinnow blended RTS

Recipe* No.	Proportion of juices (ml)*		Sugars ** (g)	Citric acid ** (g)	Water (ml)
	Indian gooseberry	Kinnow			
1.	0	100	109.0	2.5	788.5
2.	10	90	109.5	2.41	788.1
3.	20	80	110.0	2.31	787.7
4.	30	70	110.5	2.22	787.3
5.	40	60	111.0	2.12	786.9
6.	50	50	111.5	2.03	786.5

* The contents were calculated for preparing 1000 ml RTS having 10 % juice, 12 % TSS and 0.3 % acidity

** The inherent TSS in aonla and Kinnow mandarin juice was 6 and 11% while acidity was 1.4 and 0.5 per cent, respectively.

Table 2 : Effect of proportion of Indian gooseberry and Kinnow juice on sensory quality (score out 9) of blended RTS beverages

Sr. No.	Treatments	Sensory score (out of 9.00)			
		Colour	Aroma	Taste	Overall
1	Indian gooseberry: Kinnow (0:100)	5.51	5.75	5.30	5.71
2	Indian gooseberry: Kinnow (10:90)	5.92	5.93	5.77	5.89
3	Indian gooseberry: Kinnow (20:80)	6.37	6.15	6.16	6.26
4	Indian gooseberry: Kinnow (30:70)	7.09	6.51	6.50	6.53
5	Indian gooseberry: Kinnow (40:60)	7.97	6.97	6.77	6.74
6	Indian gooseberry: Kinnow (50:50)	7.34	6.42	6.19	6.44
S.E. _±		0.133	0.141	0.133	0.047
C.D. (P=0.05)		0.397	0.423	0.398	0.140

Table 3: Effect of proportion of Indian gooseberry and Kinnow juice on physico-chemical characteristics of blended RTS beverages

Sr. No.	Treatments	TSS (%)	Acidity (%)	Ascorbic acid (mg/100 ml)	Total sugar (%)	Reducing sugar (%)	Total phenols (%)
1.	Indian gooseberry: Kinnow (0:100)	12	0.3	6.38	9.66	7.27	0.80
2.	Indian gooseberry: Kinnow (10:90)	12	0.3	11.77	9.58	7.22	0.90
3.	Indian gooseberry: Kinnow (20:80)	12	0.3	17.13	9.16	7.15	0.99
4.	Indian gooseberry: Kinnow (30:70)	12	0.3	22.49	8.77	7.01	1.10
5.	Indian gooseberry: Kinnow (40:60)	12	0.3	27.92	8.57	6.91	1.18
6.	Indian gooseberry: Kinnow (50:50)	12	0.3	33.26	7.50	6.36	1.22
S.E.±		0.00	0.00	0.031	0.016	0.012	0.004
C.D. (P=0.05)		NS	NS	0.094	0.048	0.035	0.011

NS=Non-significant

Mukherjee, 2011).

Similarly, blending of juices in 40: 60 ratio had maximum aroma and taste, which could be attributed to blending effect of two juices (Deka and Sethi, 2001; Jain and Khurdiya, 2004). It was also observed that overall acceptability of the aonla: kinnow blended RTS beverage increased by increasing the proportion of aonla juice up to 40 per cent, thereafter it decreased. This might be due to dilution of colour and higher astringency by increasing the proportion of aonla juice beyond a certain limit. These findings are in conformity to that reported by Deka and Sethi (2001) and Jain and Khurdiya (2004).

Physico-chemical attributes:

Total soluble solids and acidity (%):

The data on physico-chemical characteristics (Table 3) of RTS indicates that there was non-significant difference in the RTS beverages with respect to TSS and acidity since, at the time of preparation of RTS beverages from different blends, the recipe was so adjusted by sugar and citric acid that the final TSS and acidity remains constant, *i.e.* 12 per cent and 0.3 per cent, respectively.

Ascorbic acid (mg/100 ml):

It was noticed that increasing the proportion of aonla juice significantly increased the ascorbic acid content of the RTS. The maximum ascorbic acid content (33.26 mg/100 ml) was observed in RTS prepared from aonla: Kinnow juice blended in 50:50 ratio, followed by 27.92mg/100 ml in RTS prepared by blending the same juices in 40:60 proportion. This increase in ascorbic acid content is due to higher concentration of ascorbic acid in aonla juice (Jain and Khurdiya, 2004; Mall and Tandon, 2005; Garg *et al.*, 2008).

Total and reducing sugars (%):

A decreasing trend in total and reducing sugars content was observed with increasing the proportion of aonla juice for blending with Kinnow mandarin juice for preparation of RTS beverages. The maximum total sugar (9.66%) and reducing sugar (7.27%) content was observed in RTS

prepared by blending aonla and Kinnow mandarin juice in 0:100 ratio while minimum total sugars (7.50%) and reducing sugar (6.36%) was observed in RTS prepared by blending aonla and Kinnow mandarin juice in 50:50. This could be attributed to the higher sugar and reducing sugar content in Kinnow mandarin juice as compared to aonla juice. These results are in concurrence to the findings of Bhardwaj and Mukherjee (2011).

Total phenol (%):

The treatments had significant effect on the total phenol content of freshly prepared RTS beverages. An increasing trend in the total phenol content of the RTS beverages was observed by increasing the proportion of aonla juice. The maximum total phenol content (1.22%) was observed in RTS prepared by blending aonla and Kinnow mandarin juice in 50:50 ratio whereas minimum (0.80%) was found in RTS prepared by blending aonla and Kinnow mandarin juice in 0:100 ratio. This could be attributed to the higher total phenol content in the aonla juice (Barthakur and Arnold, 1991; Kalra, 1988).

Hence, from the point of view of maximum sensory attributes and second best ascorbic acid content, total phenol content and fair sugars content, the treatment involving blending of aonla and Kinnow mandarin juice in 40:60 ratio was found best.

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