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Utilisation of aonla and lime for development of fruit based carbonated soft drinks

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ABSTRACT

Enormous fruit production and its potential are marred by colossal wastage, very low level of processing and non-availability of post-harvest infrastructure. Delay in the use of harvested food products takes away their freshness, palatability, appeal and nutritive value. The commercial viability of fruit juices in the preparation of carbonated drinks is practically limited. Carbonation of juices may also improve aroma, taste and nutritive value of the beverages. Juicy fruits like aonla and lime can be successfully transformed into drinks. Hence in the present investigation an attempt was made to develop and assess the quality of fruit based carbonated soft drinks. For developing fruit based carbonated soft drinks fruit syrup of aonla and lime with TSS 50 per cent was standardized and used in preparation of carbonated soft drinks blends in the ratio of 60:0, 30:30 and 0:60 ml. The developed blends were analyzed for nutrient composition, sensory quality, physico-chemical and microbial load. The pH, TSS (^{0}Brix) and titratable acidity of blends ranged between 3.0 to 2.5, 15.70 to 20.25 and 0.256 to 0.671 respectively. The blends had a good amount of vitamin C and total sugar content. All the blends were found highly acceptable. Pure aonla drink was accepted most with highest vitamin C content (267.93 mg %). The study therefore recommends that there is a need to popularize nutritionally superior aonla based carbonated beverages as better substitute for commercial carbonated beverages.

Keywords: Juices; aonla; lime; soft drink; blends; beverages

INTRODUCTION

People of all groups consume beverages to quench the thirst as social drink due to health consciousness and medicinal values. Enormous fruit production and its potential are marred by colossal wastage, very low level of processing and non-availability of post-harvest infrastructure. Delay in the use of harvested food products takes away their freshness, palatability, appeal and nutritive value. The commercial viability of fruit juices in the preparation of carbonated drinks is practically limited. Carbonation of juices may also improve aroma, taste and nutritive value of the beverages. Consumption of fruit based carbonated soft drinks needs a boost

through appropriate low cost technology. Juicy fruits like aonla and lime can be successfully transformed into drinks. Aonla is highly acidic and is not consumed as fresh fruit in raw state; however the fruit is consumed after processing. Because of its highly acidic and astringent nature the consumers do not relish aonla fruit in fresh form. Therefore blending of aonla with lime juice for the preparation of carbonated fruit based drinks could be a convenient alternative for utilization of these fruits. A study conducted by Balaswamy et al (2011) has also shown that palatable and shelf stable beverages can be prepared from low valued sour grape juice by adjusting the juice quantity and sugar-acid ratio. Beverages blended with purple grape juice and Phalsa juice yielded eye appealing products and received good scores throughout the storage period. Carbonation of blended beverages has an added advantage in improving the palatability during storage period. The study demonstrated that value added beverages from sour grapes could be prepared for commercial exploitation. Literature review revealed various combinations of fruit juice, sugar and citric acid in preparation of ready-to-serve (RTS) beverages such as mango-papaya nectar, guava-lemon and papaya-passion fruit juice blends etc (Param Pal et al 2010). Therefore the present investigation was carried out with the objective to develop fruit based carbonated soft drinks utilizing aonla and lime juice and assess physico-chemical, nutritive, sensory and microbial quality of developed drinks.

MATERIAL and METHODS

Procurement of raw material

Aonla and lime fruits were procured from the local market in a single lot to avoid any varietal differences. The fruits were cleaned to make them free from dust, dirt, washed and dried.

Development of fruit based carbonated soft drink

The juice was extracted and filtered. The juice was used to prepare sugar based fruit syrup. This fruit syrup with TSS (^{0}Brix) of 50 per cent was used to prepare different blends. The blends were further carbonated at 60-100 psi pressure CO_2 gas and sealed. Three blends of aonla and lime juice were prepared.

Preparation of blends of carbonated fruit drinks

Blends	Aonla syrup (ml)	:	Lime syrup (ml)
A	60	:	0
B	30	:	30
C	0	:	60

Aonla and lime syrups were blended in different ratios (60:0, 30:30 and 0:60 ml) and carbonated. The developed blends were analyzed for nutrient composition, sensory quality, physico-chemical and microbial load.

Carbonation and bottling

The desired amount (60 ml) of blends of fruit syrup was poured into the

previously sterilized and clean glass bottles (250 ml), filled with the chilled carbonated water and sealed by crown corking. Carbonation was done with an automatic machine named carbonater-cum-crowner. It was done by incorporating carbon dioxide gas through a cylinder containing carbon dioxide under high pressure (60psi, 3 ½ volume). To increase the solubility of CO_2 in water, the water in the storage tank was cooled before the start of bottling operation. At 60 pounds per sq inch and 40^0F approximately 3½ vol of CO_2 gas was dissolved by one volume of water. The developed blends were subjected to following quality characteristics:

1. Physico-chemical characteristics: The blends were analysed for pH, titratable acidity, TSS and TSS/acid ratio.
2. Nutritional Composition: The blends were analysed for total, reducing and non-reducing sugars using methods as described by Nelson (1957) and vitamin C content as given by Raghuramulu et al (2003).
3. Microbial Examination: The blends were also analysed for total viable count, yeast and mould and coliform count as per the methods described by American Public Health Association (Anon 1982)
4. Sensory Evaluation: The sensory evaluation of blends was done using 9 point hedonic scale (Ranganna 1986) by a panel of 10 judges for assessing the acceptability of the product where score 1 stood for 'dislike extremely' and 9 for 'like extremely'.

Statistical Analysis

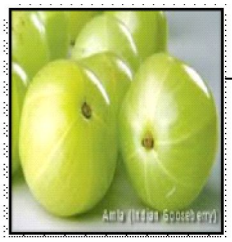
All the determination was made in triplicates. All the data were analysed for mean, critical difference and analysis of variance using completely randomized design (CRD) (Fig 1).

RESULTS and DISCUSSION

Physico-chemical evaluation

Data for physico-chemical properties of fruit based carbonated blends have been presented in Table 1. It can be inferred from the table that the pH of the blends A, B and C was 3.00, 2.80 and 2.50 respectively.

The table also shows that the titratable acidity of blend C exhibited highest 0.671 whereas the lowest titratable acidity was found in blend A ie 0.256. The decrease in titratable acidity may be attributed to the fact that some amount of acids got converted to sugar. It can also be clearly seen that highest TSS (^{0}Brix) was observed in blend C being 20.25 and the lowest in blend A being 15.70. Sowjanya et al (2009) reported a method of preparation of carbonated RTS beverages using pomegranate syrup. The pomegranate syrup consisted of 100 per cent fruit juice, 0.5 per cent citric acid and brix was maintained at 65 per cent. The syrup was diluted 5 times and then carbonated.



Washing & Sorting

Cut Pieces

Crushing Pressing

Juice extraction & Filtration

Sugar Base Fruit Syrup (TSS 50%)

Preparation of Blends of Carbonated Fruit Drinks

Blends	Aonla Syrup (ml)	:	Lime Syrup (ml)
A	60	:	0
B	30	:	30
C	0	:	60

Post mix Carbonation with chilled water

Bottling

Evaluation

Physico-chemical Characteristics | Nutritional Evaluation | Microbial Evaluation | Sensory Evaluation

Fig 1. Flow chart of development of fruit based carbonated soft drinks

Nutritional composition

It is evident from Fig 2 that the vitamin C content of the product was found to be highest in blend A (267.93mg %) followed by B and C (146.3 and 133.16 mg %). Good retention of vitamin C was observed in blend A (39.46%). Fig 3 depicts that high sugar was found in blend C (16.36 g %) followed by blend B and blend A (16.12 and 15.72 g %). Saikia and Saikia (2002) also reported significant effects of total, reducing and non-reducing sugars during the processing and preparation of Ou-tenga (*Dillenia indica*) squash during storage.

Microbial evaluation of blends of carbonated fruit drinks

Microbial load present in all the three blends is depicted in Table 2 which shows non-significant presence of microbes in the blends. Fruit juice beverages are generally bottled with CO_2 content varying from 1 to 8 g/l. Though this concentration is much lower than that required for complete inhibition of microbial activity

Table 1. Physico-chemical characteristics of different blends of fruit based carbonated soft drinks

Blends	pH	Titratable acidity	TSS (^{0}Brix)	TSS/acid ratio
A	3.00	0.256	15.70	61.32
B	2.80	0.511	19.80	38.72
C	2.50	0.671	20.25	30.17
SE(m)	0.002	0.001	0.002	0.102
$CD_{0.05}$	NS	0.163	0.204	0.292

Table 2. Microbial load of different blends of fruit based carbonated soft drinks

Blend	Total viable count (cfu/ml)	Yeats & mould (cfu/ml)	Coliform count (cfu/ml)
A	2.45×10^2	0.30×10^1	0.5×10^1
B	2.42×10^2	0.30×10^1	0.6×10^1
C	2.37×10^2	0.35×10^1	0.7×10^1
SE(m)	0.012	0.289	0.03
$CD_{0.05}$	NS	NS	NS

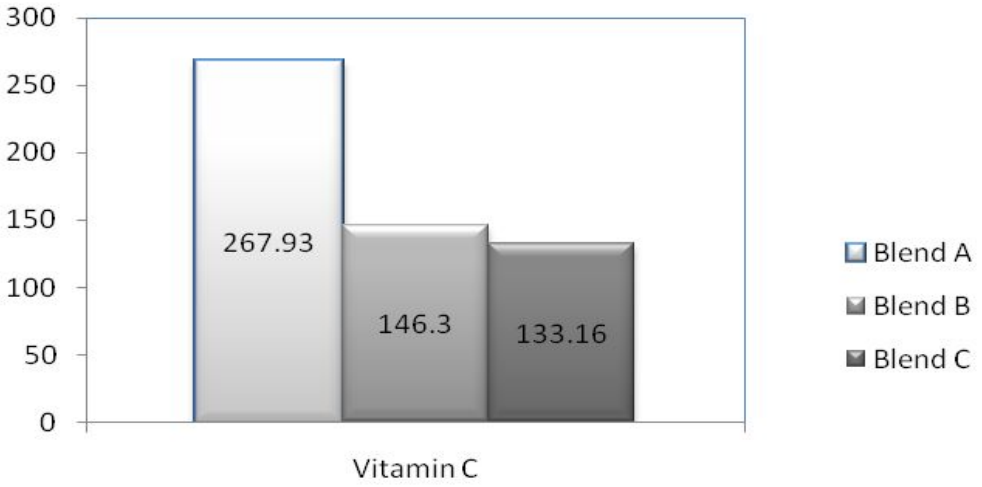


Fig 2. Vitamin C content (mg/100ml) of blends of fruit based carbonated soft drinks

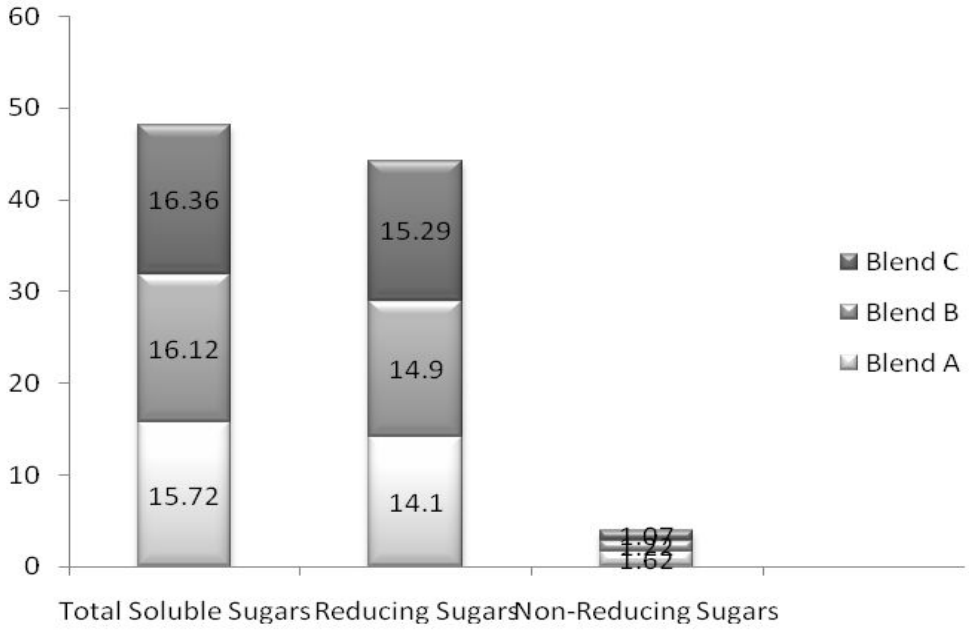


Fig 3. Sugar content of different blends of fruit based carbonated soft drinks

(14.6 g/l) it is sufficient for supplementing the effect of acidity on pathogenic bacteria. Another advantage of carbonation is the removal of air thus creating an anaerobic condition. Mould and yeast require O_2 for their growth and become inactive in the presence of CO_2 (Srivastava and Kumar 1998).

Sensory evaluation

The data on sensory evaluation of blends in Table 3 reveal that the color of blend A (60:0) was highest and 'liked very much' with a score of 7.80 as compared to blend B and C which were 'liked very much' with scores 7.60 and 7.40 respectively. The overall acceptability scores show that although all the blends were liked very much but blend A was liked extremely by the panel of judges. Balaswamy et al (2011) while working on the sensory evaluation of beverages prepared from Thompson Seedless grapes (*Vitis vinifera*) indicated that carbonated beverages were highly acceptable than plain beverages throughout the storage period. Highest scores of 7.4 and 7.5 were recorded for blended grape beverages with purple grape and Phalsa juice respectively even after a storage period of 6 months. Similar observations were noticed in the study carried out on apple and apricot blended juices (Imtiaz et al 2011).

CONCLUSION

The present study reveals that palatable beverages can be prepared from valued aonla and lime juice by adjusting the juice quantity and sugar-acid ratio. Beverages blended with aonla and lime juice yielded eye appealing products and received good scores. Carbonation of blended beverages has an added advantage in improving the palatability. The study demonstrated that value added beverages from aonla and lime could be prepared for commercial exploitation. It can also be stated that the blends had a good amount of vitamin C and total sugar content. All the

Table 3. Sensory evaluation of different blends of fruit based carbonated soft drinks

Blend	Color	Flavor	Taste	Appearance	Overall acceptability	Total mean score
A	7.80	7.60	7.80	7.90	8.00	7.82
B	7.60	6.30	5.90	7.40	6.40	6.72
C	7.40	6.00	5.40	7.20	5.60	6.32
SE(m)	0.091	0.530	0.147	0.099	0.130	0.328
$CD_{0.05}$	NS	0.128	0.406	NS	0.535	0.164

blends were found highly acceptable. Pure aonla drink was accepted most with highest vitamin C content (267.93 mg %). The study therefore recommends that there is a need to popularize nutritionally superior aonla based carbonated beverages as a better substitute for commercial carbonated beverages.

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