

Blending of cashew apple juice with fruit juices and spices for improving nutritional quality and palatability

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ABSTRACT

Cashew nut is a tropical fruit rich in vitamins and minerals. Although cashew apple juice is sweet and nutritious but it has astringency, which makes it less palatable. However, its nutritional quality and palatability could be boosted substantially by using juices of other fruits. Hence, a study was conducted by blending cashew apple juice with other fruit juices (lime, pineapple, passion fruit, papaya and gooseberry) and spices for the preparation of RTS beverage and squash. The organoleptic scoring of RTS beverage and squash revealed that sample prepared with cashew apple juice and pineapple juice in equal proportion along with ginger drops, followed by cashew apple juice blended with pineapple juice alone was found to have better acceptability. The blending of cashew apple juice with equal quantity of passion fruit juice along with or without ginger drops also found to be better. Such RTS drink showed maximum flavour, taste (acidity 0.66%), sweetness (sugar 15%) and better appearance and colour. The squash prepared with cashew apple juice, pineapple juice and ginger had the minimum acidity (0.24%) and high sugar content (29.77%) with a vitamin C content of 84.2 mg/ 100 g.

Key words: Cashew apple, RTS, squash, vitamin C, palatability, quality.

INTRODUCTION

Among the horticultural crops in India, cashew is known to provide high economic returns because of the foreign exchange obtainable from the raw or processed cashew nut, which is widely consumed in Europe, America and Asia. With a current annual cashew nut output of 7.28 lakh tonnes, cashew apple production in India is estimated as 60 lakh tonnes per annum; of which very little is consumed either as fresh fruit or in few cases processed into drinks or pulp, the rest gets wasted; because of its perishable nature (Mathew *et al.*, 5)

Considering the fact that cashew apples are harvested over a period of 4 -5 months during a year, its use as a raw material for a variety of fruit-based products can trigger revolution in cashew industry. This, apart from making cashew juice products available year round, will equalize supply from one year to another and will improve earnings from cashew for the rural farmers (Sobhana *et al.*, 9). Cashew apple can be processed as wine, gin, brandy, syrup, vinegar and jam some of which are being produced in commercial scale in Brazil, India and Mozambique. Cashew apple contains 85% juice, 10% of which is sugar (Sobhana *et al.*, 9). It is rich in ascorbic acid, thiamine, niacin and riboflavin and thrice as rich in vitamin C as sweet orange. Cashew apple juice though sweet and nutritious, has astringency due to the presence of phenolic compounds, which makes it less palatable.

In this context, a trial was conducted for improving the palatability and quality of the cashew apple juice by blending with other fruit juices and spices for the preparation of RTS beverage and squash.

MATERIALS AND METHODS

The fully ripe cashew apples without any bruises were collected from the fields of Cashew Research Station, Madakkathara, Thrissur, Kerala during 2011, thoroughly washed and juice was extracted using juice expeller. The fresh juice was clarified by adding sago @ 5 g per litre of juice. Beverages like squash and RTS were prepared after blending the clarified cashew apple juice with juices of other commonly available fruits in different combinations as listed below and preparations were done using standard procedures.

Fourteen different combinations of cashew apple RTS beverage and squash were tried, the details of which are given below. In all the samples the same quantity of juice, sugar and water was used. The treatment combinations were T1 = Cashew apple juice (150 ml) + sugar (120 g) + water (730 ml) + ginger drops, T2 = Cashew apple juice + lime juice (75:25) + sugar + water, T3 = Cashew apple juice + lime juice (75:25) + sugar + water + ginger drops, T4 = Cashew apple juice + pineapple juice (75:25) + sugar + water, T5 = Cashew apple juice + pineapple juice (75:25) + sugar + water + ginger drops, T6 = Cashew apple juice + pineapple juice

(50:50) + sugar + water, T7 = Cashew apple juice + pineapple juice (50:50) + sugar + water + ginger drops, T8 = Cashew apple juice + passion fruit juice (75:25) + sugar + water, T9 = Cashew apple juice + passion fruit juice (75:25) + sugar + water + ginger drops, T10 = Cashew apple juice + passion fruit juice (50:50) + sugar + water, T11 = Cashew apple juice + passion fruit juice (50:50) + sugar + water + ginger drops, T12 = Cashew apple juice + gooseberry juice (75:25) + sugar + water, T13 = Cashew apple juice + gooseberry juice (75:25) + sugar + water + ginger drops, and T14 = Cashew apple juice + passion fruit juice (50:50) + sugar + water. Organoleptic analysis of beverages, viz., squash and RTS was carried out among ten selected judges who scored for various parameters like appearance, colour, flavour, taste, sweetness and overall acceptability.

Titrate acidity, TSS and vitamin C content of the prepared samples were determined using standard procedures. Titrate acidity was estimated as per the method suggested by Ranganna (6). TSS was determined using the method given by Lane and Eyon (Ranganna, 6) and vitamin C was estimated by the method suggested by AOAC (3). Data collected from organoleptic studies were subjected to statistical analysis. Kendall's coefficient of concordance was used to assess the degree of agreement among the 10 judges.

RESULTS AND DISCUSSION

The utilization of highly nutritive fruits and vegetables is often limited due to high acidity, astringency, bitterness etc. For improving flavour, palatability, as well as nutritive and medicinal value of various fruit juices, blending of these juices would be effective. Cashew apple, a nutritious fruit is being underutilized due to many reasons, but can be very well exploited for the preparation of healthy refreshing drinks (Sobhana *et al.*, 9). The astringent principle, polyphenols, makes it less palatable. Hence, the palatability can be enhanced by blending with other fruit juices, thus resulting in enhanced consumption. Cashew apple, passion fruit, papaya, pineapple, lime and gooseberry and some spices can also be used for juice blending. All these natural produce are valued very high for their refreshing juice, nutritional value, pleasant flavour and medicinal properties. Therefore, blending of fruit juices along with spice extracts can yield nutritious and healthy RTS drink and squash.

The organoleptic scoring of blended RTS beverage and squash revealed that sample prepared with cashew apple juice and pineapple juice in equal proportions along with ginger drops, followed by cashew apple juice blended with pineapple without ginger drops had better acceptability (Tables 1 & 2).

Table 1. Organoleptic scoring of blended cashew apple RTS drink preparations.

Treatment	Appearance	Colour	Flavour	Taste	Sweetness	Overall acceptability
T1 CJ + G (Control)	6.30	5.65	7.20	7.55	7.50	7.10
T2 CJ + LJ (75:25)	5.50	4.70	6.70	3.55	3.35	3.35
T3 CJ + LJ + G (75:25)	6.60	6.25	4.80	4.65	3.65	3.15
T4 CJ + PA (75:25)	9.20	7.60	6.20	8.35	8.50	8.90
T5 CJ + PA + G (75:25)	8.40	7.55	6.65	7.80	8.90	8.95
T6 CJ + PA (50:50)	9.95	10.85	10.70	10.60	11.80	10.10
T7 CJ + PA + G (50:50)	11.40	11.30	9.90	9.75	10.55	11.50
T8 CJ + PF (75:25)	6.50	6.15	6.75	7.25	7.35	7.05
T9 CJ + PF + G (75:25)	7.10	6.85	6.95	8.10	7.80	7.55
T10 CJ + PF (50:50)	9.10	9.60	10.75	10.50	10.00	9.80
T11 CJ + PF + G (50:50)	9.20	9.25	10.15	9.95	9.80	9.65
T12 CJ + GB (75:25)	4.60	4.65	5.65	5.60	5.50	5.30
T13 CJ + GB + G (75:25)	5.30	5.30	6.50	5.00	4.80	6.60
T14 CJ + PP (50:50)	5.30	9.55	6.10	6.35	7.50	6.50
Kendall's W (a)	0.285	0.322	0.266	0.339	0.395	0.410
Significance	0.00	0.00	0.01	0.00	0.00	0.00

CJ = Cashew apple juice, PA = Pineapple juice, PF = Passion fruit juice, LJ = Lime juice, GB = Gooseberry juice, PP = Papaya juice, G = Ginger drops.

Table 2. Organoleptic scoring of blended cashew apple squash preparations.

Treatment	Appearance	Colour	Flavour	Taste	Sweetness	Overall acceptability
T1 CJ + G (control)	8.20	6.75	10.85	9.70	11.46	7.85
T2 CJ + LJ (75:25)	8.45	7.20	7.70	6.00	7.90	7.90
T3 CJ + LJ + G (75:25)	8.60	4.95	6.35	7.80	7.05	8.25
T4 CJ + PA (75:25)	9.55	7.65	6.20	8.70	10.50	9.95
T5 CJ + PA + G (75:25)	9.40	8.55	8.40	9.25	10.00	8.10
T6 CJ + PA (50:50)	13.50	12.65	9.75	10.95	12.10	10.45
T7 CJ + PA + G (50:50)	13.30	12.50	11.00	10.65	12.65	12.10
T8 CJ + PF (75:25)	7.70	7.25	7.95	8.15	6.95	7.55
T9 CJ + PF + G (75:25)	8.60	7.85	6.30	9.10	7.10	8.45
T10 CJ + PF (50:50)	9.95	11.30	11.90	12.15	10.55	10.85
T11 CJ + PF + G (50:50)	9.75	11.30	9.60	12.15	10.15	10.85
T12 CJ + GB (75:25)	5.50	6.00	7.10	7.80	6.95	5.30
T13 CJ + GB + G (75:25)	7.25	8.20	8.10	4.70	6.60	7.05
T14 CJ + PP (50:50)	7.80	10.55	7.90	6.00	7.00	7.50
Kendall's W (a)	0.204	0.313	0.153	0.271	0.279	0.187
Significance	0.10	0.00	0.85	0.00	0.00	0.21

CJ = Cashew apple juice, PA = Pineapple juice, PF = Passion fruit juice, LJ = Lime juice, GB = Gooseberry juice, PP = Papaya juice, G = Ginger drops.

The blending of cashew apple juice with equal quantity of passion fruit juice along with and with out ginger drops also was found to be acceptable as evidenced from the organoleptic scoring. Both samples showed maximum flavour, taste and sweetness and better appearance and colour (Tables 1 & 2). Iriyang and Abah (4) prepared blended juices of cashew apple with sweet orange juice in different proportions and the ratio of 60:40 was found to be highly acceptable in terms of flavour, taste and overall acceptability. Vaidya *et al.* (10) prepared blended juices using cashew apple and water melon in the proportions of 75:25, 50:50 and 25:75 where in all the blends were found to be highly acceptable. All these results confirm the possibility of blending fruit juices including cashew apple juice to enhance palatability and in turn their consumption.

The samples were also subjected to quality analysis for vitamin C, TSS and acidity. From the qualitative analysis, it was found that acidity of RTS beverage and squash ranged from 0.26 to 1.51% and 0.24 to 1.24% respectively (Tables 3 & 4). The acidity varied between 0.87 to 3.03% in cashew apple juice after blending with other fruit juices has also been reported by Remyamol (7). Sobhana *et al.* (8) reported an acidity of 1.08% in the cashew apple juice blended with carrot and gooseberry. TSS content of RTS beverage and squash varied from 11.31 to

14.92% and 12.53 to 30.00% respectively. RTS drink prepared with cashew apple and pineapple juice (50:50) along with ginger had sugar content of 11.92% and RTS drink prepared with cashew apple juice and passion fruit juice (50:50) along with ginger had the sugar content of 14.92% both of which had maximum acceptability. The quality analysis of squash samples revealed that the one prepared with cashew apple juice, pineapple juice and ginger had the sugar content of 29.77%. Even though sugar content of the sample prepared with cashew apple juice, passion fruit juice and ginger drops was less than many of the samples (12.53%), and had acceptable organoleptic score. The result indicates that high sugar content leading to more sweetness is not the factor which decides the acceptability; rather the taste and flavour may be associated with the combination effect of acidity and sugar.

The vitamin C content of the RTS beverages varied from 44.42 to 97.77 mg/100 g. RTS beverage prepared with cashew apple juice and pineapple juice in equal proportion along with and with out ginger drops with good acceptability was to found to have the vitamin C content of 55.32 and 55.16 mg/100 g, respectively. Squash prepared with cashew apple juice and pineapple juice in equal proportions along with and with out ginger drops, having the maximum acceptability was found to have vitamin C content of

84.20 and 84.80 mg/100 g, respectively. Akinwale *et al.* (2) reported that cashew apple juice had the highest vitamin C content (203.5 mg/100 g) when compared to other common fruit juices. Vitamin C content of unsteamed cashew apple juice was reported to be 287 mg/100 g (Inyang and Abah, 4) and steaming

of the cashew apple prior to juice extraction resulted in reduction in vitamin C content (230 mg/100 g). Blending of cashew apple juice with other fruit juices results in the variations in vitamin C (Tables 3 & 4). Akinwale (1) reported vitamin C enrichment of some fruit juices by blending with cashew apple juice.

Table 3. Quality analysis of blended cashew apple RTS preparations.

Treatment	Acidity (%)	TSS (%)	Vit. C (mg/100 g)
T1 CJ + G (control)	0.55	11.31	97.77
T2 CJ + LJ (75:25)	1.51	13.62	48.81
T3 CJ + LJ + G (75:25)	1.41	13.14	44.42
T4 CJ + PA (75:25)	0.26	11.25	57.44
T5 CJ + PA + G (75:25)	0.25	11.43	57.45
T6 CJ + PA (50:50)	0.31	11.50	55.16
T7 CJ + PA + G (50:50)	0.31	11.92	55.32
T8 CJ + PF (75:25)	0.35	13.85	80.26
T9 CJ + PF + G (75:25)	0.41	13.93	76.39
T10 CJ + PF (50:50)	0.61	14.50	79.73
T11 CJ + PF + G (50:50)	0.66	14.92	79.29
T12 CJ + GB (75:25)	0.40	13.51	71.12
T13 CJ + GB + G (75:25)	0.44	13.41	75.49
T14 CJ + PP (50:50)	0.52	14.61	75.19

CJ = Cashew apple juice, PA = Pineapple juice, PF = Passion fruit juice, LJ = Lime juice, GB = Gooseberry juice, PP = Papaya juice, G = Ginger drops

Table 4. Quality analysis of cashew apple squash preparations.

Treatment	Acidity (%)	TSS (%)	Vit. C (mg/100 g)
T1 CJ + G (control)	0.54	23.67	108.88
T2 CJ + LJ (75:25)	0.96	20.34	66.53
T3 CJ + LJ + G (75:25)	0.98	21.08	66.60
T4 CJ + PA (75:25)	0.36	29.33	89.14
T5 CJ + PA + G (75:25)	0.36	29.68	89.78
T6 CJ + PA (50:50)	0.24	30.15	84.80
T7 CJ + PA + G (50:50)	0.24	29.77	84.20
T8 CJ + PF (75:25)	0.40	14.27	77.50
T9 CJ + PF + G (75:25)	0.42	14.90	76.64
T10 CJ + PF (50:50)	0.72	12.75	78.50
T11 CJ + PF + G (50:50)	0.72	12.53	75.50
T12 CJ + GB (75:25)	0.60	16.15	92.12
T13 CJ + GB + G (75:25)	0.60	16.50	92.06
T14 CJ + PP (50:50)	0.30	25.50	72.10

CJ = Cashew apple juice, PA = Pineapple juice, PF = Passion fruit juice, LJ = Lime juice, GB = Gooseberry juice, PP = Papaya juice, G = Ginger drops

It can be concluded that cashew apple RTS beverage and squash when prepared by mixing cashew apple juice with different fruit juices like lime, pineapple, passion fruit, papaya and gooseberry improved the palatability and nutritional quality. RTS beverage and squash prepared with cashew apple juice and pineapple juice in equal proportions as well as cashew apple juice with equal quantity of passion fruit juice along with or without ginger drops had better acceptability. These samples showed maximum acceptable flavour, taste and sweetness with better appearance and colour.

REFERENCES

1. Akinwale, P.O. 2000. Cashew apple juice: Its use in fortifying the nutritional quality of some tropical fruits. *European Fd. Res. Tech.* **211**: 205-7.
2. Akinwale, T.O., Olubamiwa, O. and Ajav, E.A. 2001. Cottage processing of cashew apple juice in Nigeria: Physico-chemical and sensory evaluation of product. *J. Fd. Tech. Africa*, **6**: 56-58.
3. AOAC. 1980. *Official Methods of Analysis* (13th Edn.), the Association of Official Analytical Chemists, Washington D.C., 1018 p.
4. Inyang, U.E. and Abah, U.J. 1997. Chemical composition and organoleptic evaluation of juice from steamed cashew apple blended with orange juice. *Plant Fd. Hum. Nutr.* **50**: 295-300.
5. Mathew, J., Sobhana, A. and Mini, C. 2013. Opportunities for income enhancement from cashew plantations through cashew apple processing. Proc. Sec Int. Cashew Conf. 26-29 April, 2010, Kampala, Uganda, pp. 143-49.
6. Rangana, S. 1986. *Manual of Analysis of Fruits and Vegetables Products*. Tata McGraw Hill Publishing Co. Ltd., New Delhi, pp. 1-13.
7. Remyamol, K.K. 2006. Standardisation of blended cashew apple RTS beverages. M.Sc. thesis, Kerala Agricultural University, Thrissur.
8. Sobhana, A., Mathew, J. Ambili, A.A. and Mredhula, R.C. 2011. Blending cashew apple juice with vegetables and spices for improving palatability and quality. *Abstr. 21st Swadeshi Science Congress*, Kollam, 7-9 November, 2011, pp. 91.
9. Sobhana, A. Mathew, J., Mini, C. and Pushpalatha, P.B. 2013. Technologies for cashew apple utilization on commercial scale. *Souv. Nat. Conf. Cashew*, 20-21 November, 2013, pp. 65-71.
10. Vaidya, D., Manoj, V., Surabhi, S. and Ghanshayam, M. 2009. Enzymatic treatment for juice extraction and preparation and preliminary evaluation of kiwi fruit wine. *Natural Prod. Rad.* **8**: 380-85.

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