The Bioscan 11(2): 1247-1249, 2015 (Supplement on Agronomy)
AN INTERNATIONAL QUARTERLY JOURNAL OF LIFE SCIENCES
www.thebioscan.com

STUDIES ON STANDARDIZATION OF RECIPES, STORAGE LIFE AND BIO CHEMICAL CHANGES OF CARAMBOLA NECTAR (*AVERRHOA CARAMBOLA* L.)

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KEYWORDS
Carambola nectar
Organoleptic
Recipes

Received on :
15.12.2015

Accepted on :
13.05.2016

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ABSTRACT
The present study was carried on three aspects of carambola i.e. to study the physical properties and chemical composition, to standardise the ideal recipes for preparation of nectar and to study the storage stability of ideal nectar. And it reveals that the juice content (%), TSS (%), total Titrable acidity(%), Ascorbic acid mg/100gm, reducing sugar(%), Total carbohydrates (gm%) is 99.72,5.68,0.84, 9.98, 3.64 and 7.08 respectively. There were 5 different treatments of recipes, and after organoleptic evalution, the nectar prepared from the recipe composed of 20% pulp, 18 % TSS and 0.25% acidity (T_4) gave highest organoleptic quality score. Biochemical changes during six month of storage Studies reveal that TSS increased slightly (18.00-19.84), Total acidity of nectar increase slightly (0.25-0.31), Ascorbic acid content of the nectar beverage decreased continuously (2.21-1.42). In the present study browning of nectar increased continuously (0.06-0.18). Reducing sugars increased continuously (7.35-7.78), Total carbohydrate decreased continuously (27.20-27.00). The organoleptic scores of ideal Carambola nectar decreased gradually during storage at room temperature (8.20-6.62). The acceptability of nectar was maintained up to sixth month of storage. Hence it was concluded that the recipe composed of 20% pulp, 18 % TSS and 0.25% acidity (T_4) gave significantly result.

INTRODUCTION

Carambola (*Averrhoa Carambola* L.) belongs to the family Oxalidaceae and is often called as 'Star fruit' or 'five finger' fruit. The fruit is believed to have originated in Southeast Asia, Indonesia or Malaysia, but it is now cultivated throughout the tropics and subtropics of the world. The major Carambola producing countries are China, Taiwan, Malaysia, Thailand, Pakistan, Indonesia, Australia, West Indies and USA (Bose *et al.,* 2002). In India, it is distributed in Uttar Pradesh, Karnataka, Assam, West Bengal, Madhya Pradesh, Bihar and Tamil Nadu (Srivastava and Rajput, 2003). The fruit is non-climacteric and rich in reducing sugars, ascorbic acid and minerals such as K, Ca, Mg and P (Bose *et al.,* 2002). Oxalic acid and tannins are believed to strongly influence the taste. Ripe fruits of sweet form of Carambola contain both oxalic acid (0.16%) and malic acid (0.06%), whereas, fruits of the sour form contain only oxalic acid ranging from 1.0 per cent in unripe fruits to 0.51 per cent in ripe. Two cultivars sour and sweet depending on their taste are grown in our country. Sugars present in both types vary largely in glu-cose with moderate quantities of fructose and traces of sucrose. The fruit also contains amino acids such as serine, glutamic acid and alanine. Carambola is mainly used in food preparation and has good medicinal properties. Carambola serves as an excellent garnish and unripe fruits can be used as vegetables. The tree is medium sized, attractive and evergreen growing to about 10m (Bose and Mitra, 1990). Carambola fruit with its attractive appearance, oval shape and translucent skin is soft and juicy and is highly perishable. It has strong fruity aroma and sour sweet taste. It is not a popular table fruit in India because of its sour taste. Hence it has great potentiality for processing industries. It is required that fruits have to be preserved fresh and make available throughout the year to fulfill the human dietary requirements. Processed Carambola products are not available in our market and very little work has been done on the processing of Carambola in our country. It has great potentiality for processing industry in coming years. Traditional carambola products (juice, dried sliced, jellies) have been studied by different authors (Matthews; 1989, Campbell; 1983, Morton, (1987). The present study was thus undertaken to investigate the physical properties and chemical composition, recipes for preparation of quality beverages organoleptic quality of carambola.

MATERIALS AND METHODS

Carambola fruits free from bruises, deformities, infested were harvested randomly from different plants of central farm of O.U.A.T., Bhubaneswar. Five fruits each from Carambola replicated four times were taken for assessing the physical characters .The flesh of five fruits replicated three times was subjected to chemical analysis.

Fig-I, (Flow diagram for preparation of Carambola nectar)

The fully ripe, healthy and fresh fruit → washing → removal of seeds → blend the segments by adding water in the ratio of

1:1→ collection of juice → Straining → Mixing with syrup according to recipe → Straining & cooling it → → Bottling→Crown Corking → Pasteurization for 20 minutes → Cooling→ Labeling → Storage at ambient temperature.

After that it was subjected to organoleptic evaluation the results obtained was given in the Table 4. Nectar prepared from ideal treatments was analyzed for chemical parameters initially and at an interval of one month upto Sixth month of storage period and the results obtained was given in the Table 4.

The total soluble solids of juice and product were determined by hand refractomer of different ranges. The reading was corrected to 20ºC and the mean value was expressed as the percent total soluble solids in samples. For determination of Total titrable acidity (%) Five ml of freshly extracted juice or beverage was diluted with distilled water and titrated against N/10 NaoH using phenolphthalein as an indicator. The titrable acidity was expressed as percent citric acid present in 100 g solid samples or in 100 ml liquid sample (Ruck, 1969).

Ascorbic acid was determined by the usual titration method using 2, 6 dichlorophenol indophenol solution as described by Ranganna (1986). The end point was marked by appearance of pink colour. It was expressed as mg of ascorbic acid present in 100 mL of liquid sample.

Reducing sugar was estimated by Fehlings solution method as given by lane and Eynon (1923). Results were expressed as percentage of reducing sugar on the basis of flesh.

Total carbohydrate was determined by colorimetrically. The optical density (O.D) value of the sample was measured through 630 nm wavelength in a colorimeter for against blank. A standard curve was prepared by plotting the known concentrations of glucose solution against respective O.D value of each.From the standard curve, the amount of carbohydrate actually present in the sample was determined. The non-enzymatic browning in product was assessed by the method as described by Ranganna (1986). 20 ml of filtered sample was mixed with 30 ml alcohol. This was filtered through whatman filter paper no 1. Absorbance of the filter was measured at 440 mm using 60% aqueoous alcohol as blank in a spetrophotometer. Non-enzymatic browning was expressed as absorbance of a sample extract at 440 nm using 60% aqueous alcohol as blank.

The organoleptic evaluation for assessing sensory attributes of the samples was conducted by a panle of six judges. The samples were rated on the basis of Hedonic rating scale as given below (Amerine *et al.,* 1965)

Table 1: Treatment details

Treatments	Pulp (%)	TSS (%)	Acidity (%)
T_1	20	15	0.30
T_2	20	13	030
T_3	20	16	0.25
T_{4-}	20	18	0.25
T_5	20	14	0.30

Table 2: physical characters and chemical composition of the carambola fruits

Sl. No.	Characters	Average Value
1.	Average weight (g)	70.92
2.	Volume (ml)	135.92
3.	Specific gravity (g/cc)	0.521
4.	Overall length (cm)	7.15
5.	Maximum width (cm)	5.70
6.	Juice content (%)	99.72
7.	Sphericity (%)	98.20
8.	Bulk density (kg/m^3)	477
9.	True density (kg/m^3)	950
10.	Moisture content (%)	89.29
11.	Total Soluble Solids (%)	5.68
12.	Total Titrable acidity (%)	0.84
13.	Ascorbic acid (mg/100g)	9.98
14.	Reducing Sugar (%)	3.64
15.	Total carbohydrates (g %)	7.08

RESULTS AND DISCUSSION

Data on the organoleptic evaluation of nectar recipes are given in the Table 3 results indicated that recipe containing 20 percent Juice, 18 percent TSS and 0.25 percent acidity (T_4) was found to be the best. There were no significant variations in the organoleptic scores of recipe number 1, 2 and 5. However recipe number 3 (T_3) is significantly variant from all other recipes.

Studies on changes during storage of Carambola Nectar indicated that TSS increased slightly after three month of storage (Table 4). It is due to the conversion of polysaccharides in to sugars. Similar observation was recorded by Khurdiya (1979) in phalsa beverages. Total acidity of Nectar did not change up to three months of storage, then gradually increases the acidity of fruit products (Conn and Stumf, 1976). The present findings are also in agreement with the observation of several workers (Ashraf, 1987: Singh, 2000). Results indicated that ascorbic acid content of the Nectar beverage decreased continuously during the entire period of storage. The reduction may be due to oxidation of ascorbic acid in to

Table 3: Organoleptic quality of different recipes of Carambola Nectar

Treatment /Recipes	Juice (%)	TSS (%)	Acidity (%)	Organoleptic quality Score	Rating
T_1	20	15	0.30	7.25	Liked moderately
T_2	20	13	0.30	7.21	Liked moderately
T_3	20	16	0.25	6.28	Liked slightly
T_4	20	18	0.25	8.20	Liked very much
T_5	20	14	0.30	7.29	Liked moderately
C.D at 5% level				0.49	
S.E.M ±				0.16	

Table 4: (Changes in quality parameters during storage of ideal recipes of Carambola nectar)

Sl.no	Characters	Storage period in months							
		0	1	2	3	4	5	6	7
1.	TSS %	18.00	18.00	18.00	18.25	18.45	19.00	19.52	19.84
2.	Acidity %	0.25	0.25	0.25	0.27	0.27	0.28	0.29	0.31
3.	Ascorbic Acid (mg/100g)	2.21	2.21	2.17	2.08	1.92	1.87	1.64	1.42
4.	Browning (O.D)	0.06	0.06	0.06	0.08	0.10	0.13	0.15	0.18
5.	Reducing Sugar %	7.35	7.39	7.44	7.49	7.56	7.64	7.69	7.78
6.	Total carbohydrate (g %)	27.20	27.17	27.14	27.11	27.09	27.06	27.04	27.00
7.	Organoleptic quality	8.20	8.11	8.06	7.82	7.74	7.34	7.12	6.62

dehydroascorbic acid by oxygen. Several authors (Roy and Singh, 1979; Singh, 2000) have also reported losses of ascorbic acid in fruit beverages during ambient storage (Table 4). In the present study browning of Nectar increased continuously throughout the entire period of storage. It may be due to non-enzymatic reactions, which occurs between nitrogenous compounds with sugar or organic acids with sugars. Increase in browning was observed by several workers (Siddappa *et.al.*, 1959). Reducing sugars increased continuously and total carbohydrate decreased continuously. The organoleptic score of Nectar decreased gradually during storage it room temperature. The acceptability of Nectar was maintained up to sixth months.

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