

## DEVELOPMENT OF FRUIT NECTAR FROM ANNONACEOUS FRUITS

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### ABSTRACT

Three species of fruits viz., Bullocks heart (*Annona reticulata*), Sweetsop (*Annona squamosa*) and Soursop (*Annona muricata*) were selected for the study. Fruit nectar was developed using the pulp of the selected annonaceous fruits. The fruit pulp was extracted manually under hygienic conditions and varying proportions of fruit pulp viz. 20 (T1), 25 (T2), 30 (T3) and 35 (T4) per cent of fruit pulp were used for the development of nectar. Fruit nectar secured with maximum score in sensory attributes were identified in each species of annona. Fruit nectar with 30 per cent fruit pulp from *Annona reticulata* (T3) and *Annona squamosa* (T3) was found best while *Annona muricata* derived best proportion with 35 per cent of fruit pulp (T4) with maximum mean scores for sensory parameters. The identified proportions were stored at ambient temperature to assess their shelf life. Shelf life and monitored in terms of changes in sensory parameters, acidity and microbial contamination periodically. Organoleptic assessment of the nectars developed from three selected species of fruits during the storage period of three week showed a gradual decrease in rank mean scores in all sensory attributes. Acidity of the stored fruit nectars increased during storage period. Shelf life of the developed product fruit nectar found to be three weeks at ambient temperature.

**Keywords:** Development of Fruit Nectar, Shelf Life of the Nectar

### INTRODUCTION

Bullocks heart (*Annona reticulata*) is grown in many places throughout the world. It is a complex fruit that measures between 3 1/4 inches and 6 1/2 inches (8 cm and 16 cm) across (Sajib *et al.*, 2014). Sweet sop (*Annona squamosa* L.), a native of Tropical America, is widely distributed in the tropical and subtropical regions of the world.

The fruit is round to conical, 5–10 cm (2.0–3.9 in) in diameter and 6–10 cm (2.4–3.9 in) long, and individual fruit weights about 100–240 g, with a thick rind composed of knobby segments (Broughton and Tan, 1997). Soursop (*Annona muricata* L.) is greatly aromatic fruits with white juicy flesh and is distributed in tropical North and South America (Adeoye and Ewete, 2010). Annonaceous fruits have high nutritional quality.

The ripe fruits are highly perishable as they become soft and easily bruised. These fruits are underutilized and unexploited, no systematic plantations have been found in India and no processed products are commercially marketed. In this work fruit nectar was developed from annonaceous fruits, sensory evaluation of products and shelf life were studied.

### MATERIALS AND METHODS

Three species of fruits were selected from annonaceae family for the study. The fruits were collected from local homesteads and local markets from Thiruvananthapuram district.

#### **Extraction of Fruit Pulp**

Fully ripened fruits were selected and the pulp was scooped out from the fruits manually under hygienic conditions. The seeds and pulp were separated using a strainer. Potassium metabisulphite at the rate of 0.4g/ kg pulp was added in extracted fruit pulp and kept under refrigeration till use.

#### **Standardization and Formulation of the Product**

The extracted fruit pulp from three varieties of annonaceous fruits were used for the product development. Water, sugar and citric acid were the other ingredients used for standardization of the nectar. Different proportions of the fruit pulp viz 20, 25, 30 and 35 percent of fruit pulp were used to prepare 100 ml fruit nectar.



**A**



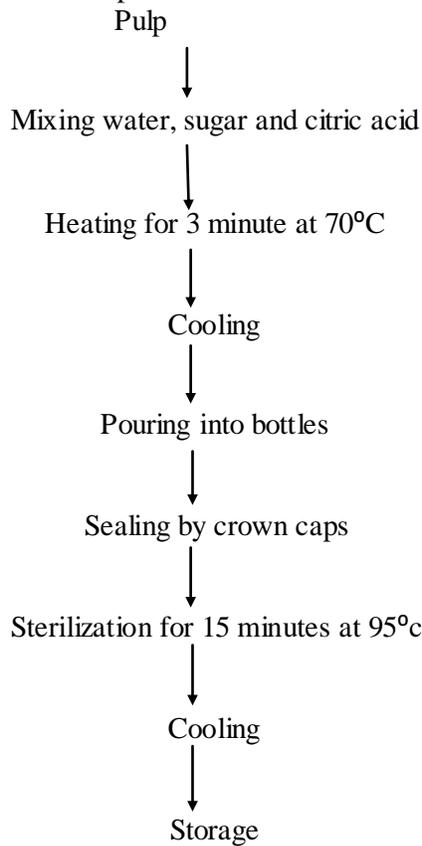
**B**



**C**

**Figure 1: Selected Three Species of Fruits for the Study; A- Bullocks Heart (*Annona Reticulata*), B- Sweetsop (*Annona Squamosa*); C- Soursop (*Annona Muricata*)**

Flow chart details the nectar standardization procedure of annonaceous fruits by trial and error method



**Figure 2: Fruit Nectar Developed from Selected Three Species of Fruits**

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### Quality Evaluation of the Product

Quality of the product was assessed in terms of sensory quality, shelf stability and microbial growth using standard techniques.

### Sensory Acceptability of the Fruit Nectar

Judges were asked to rate evaluation variables according to nine point hedonic scale as described by Jellinick (1985) in terms of the quality attributes; appearance, colour, flavor, taste, consistency along with overall acceptability.

Four proportions viz. 20, 25, 30 and 35 were prepared and initial sensory analysis was done to obtain the best proportion for further storage study. The product was analyzed by a semi trained panel of judges consisting of ten members. The judges recorded the product's sensory characteristics on a sensory evaluation sheet. The scores were decoded and analyzed by statistical procedures to obtain a suitable conclusion.

### Shelf Life of the Product

Selected best proportions of nectar were stored in glass bottles sealed with crown caps, 200 ml capacity kept at room temperature and monitored in terms of changes in sensory parameters, acidity and microbial contamination periodically. The samples were analyzed at weekly interval during the storage period.

### Microbial Evaluation of Stored Fruit Nectar

The standardized and stored fruit nectar was analyzed for bacteria, fungi and actinomycets infection by suitable and standard procedures. The procedures adopted were serial dilution technique.

### Statistical Analysis

In order to obtain suitable interpretation, the generated data was subjected to statistical analysis Kruskal wallis and ANOVA.

## RESULTS AND DISCUSSION

### Sensory Acceptability of the Product

The field of sensory evaluation has grown rapidly. Sensory property is a major parameter in determining the quality of a product.

Nowadays, sensory evaluation becomes a tool irreplaceable in food industry while interacting with the key sectors in food production.

Fruit nectar was prepared using the fruit pulp of the selected annonaceous fruits. Different proportions of viz. 20 (Treatment 1(T<sub>1</sub>), 25 (T<sub>2</sub>), 30 (T<sub>3</sub>), 35 (T<sub>4</sub>) per cent level were tried out and best proportion was identified based on sensory scores. The product was analyzed organoleptically immediately after formulation.

In the case of nectar developed from *Annona reticulata*, among the four proportions the best proportion selected was the one having 30 per cent of fruit pulp (T<sub>3</sub>). T<sub>3</sub> (30 per cent), T<sub>4</sub> (35 per cent) proportions from *Annona squamosa* and *Annona muricata* respectively were selected for further storage study. The mean scores obtained for appearance, colour, flavor, consistency, taste and overall acceptability for the nectar developed from *Annona muricata* (T<sub>3</sub>) were 7.8, 6.3, 8.2, 8.5, 8.4 and 8.2 respectively; while that of nectar from *Annona squamosa* (T<sub>3</sub>) were 8.4, 8.5, 8.5, 8.5, 8.5 and 8.8. Nectar developed from *Annona muricata* (T<sub>4</sub>) observed with mean scores of 8.0, 8.2, 8.5, 8.5, 8.7 and 9.0 in all sensory attributes.

**Table 1: Proportions Selected for the Storage Study**

S. No.	Name of Fruits	Selected Treatments	Fruit Pulp Proportion (%)
1	<i>Annona Reticulata</i>	(T <sub>3</sub> )	30
2	<i>Annona Squamosa</i>	(T <sub>3</sub> )	30
3	<i>Annona Muricata</i>	(T <sub>4</sub> )	35

On the basis of sensory analysis of the twelve treatments three proportions were selected for further storage study.

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**Shelf Life of the Product**

Assessment of shelf life quality is important since it determines the suitability of a particular product in the market. Shelf life determines the ability of the product to resist the changes in physical, chemical and organoleptic qualities over a period of time.

Stored nectars were monitored in terms of changes in sensory parameters, acidity and microbial contamination periodically.

Onyechi *et al.*, (2015) conducted a comparative study on pulp and drink of *Annona muricata* and found that the pulp and drink contain appreciable quantities of nutrients with health promotion benefits. Pulp of custard apple was stored for 6 months by addition of 1500 ppm of KMS and the pulp were used for various product development.

Developed products were assessed for their keeping quality at both room and cold temperature (Sravanthi *et al.*, 2014).

**Sensory Analysis of the Stored Product**

In sensory evaluation same trend of observation were found in the three proportions of fruit nectar from three species of fruits. All the sensory attributes had a gradual decrease during storage period.

**Appearance**

Acceptability of food by the consumer is determined through organoleptic properties. Appearance being the first factor that decides the acceptance and rejection of food reported by Srilakshmi (2010). The appearance scores of the stored nectars of three different species decreased with increase in the storage period.

Nectar prepared from the fruits get maximum mean rank on initial period. Appearance of the products was acceptable by the judges.

Sravanthi *et al.*, (2014) studied the physico chemical evaluation of the stored custard apple products and it was observed that the product had good nutritional quality.

**Color**

Color also significantly related to the acceptability of a product. Stored nectar of three species of fruits got maximum mean rank on initial sensory analysis. Mean rank of the products had shown a gradual decrease in color attribute.

Changes in stored fruit beverages were reported by Drownowski and Carmen (2000). Diju (1995) found decrease in color scores in the RTS beverage developed from passion fruit when stored for five to six weeks.

**Flavor**

Flavor is a unique experience of sensation produced by the material taken in the mouth. It is a combination of taste and odour. Flavor of the products found to be decreased. Hence, the scores of flavor were decreased from initial to third weeks.

Scores of the nectar developed from *Annona reticulata* had a drastic decrease in flavor. Mean rank of stored nectar of *Annona reticulata* ranged from 29.00 to 8.00.

Desale *et al.*, (2011) reported that mean score obtained for flavor of the beverage on hedonic rating ranged from 8.03- 8.62.

**Table 2: Changes in Sensory Quality of the Fruit Nectar from *Annona Reticulata***

Storage Period (Weeks)	Appearance	Color	Flavor	Taste	Consistency	Overall Acceptability
Initial	22.9	21.5	29.0	33.2	32.2	33.9
First Week	17.1	17.8	22.50	24.20	20.00	21.10
Second Week	15.90	14.30	16.00	14.55	15.30	14.75
Third Week	13.90	14.30	8.00	7.75	11.20	10.65
K Value	1.01	1.24	14.81	18.59	6.78	8.13
CD (0.05)	8.548					

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**Table 3: Changes in Sensory Quality of the Fruit Nectar from *Annona Squamosa***

Storage Periods (Weeks)	Appearance	Color	Flavor	Taste	Consistency	Overall Acceptability
Initial	31.6	33.0	29.5	32.7	33.5	34.4
First Week	18.25	18.50	18.30	24.10	18.25	20.40
Second Week	14.70	15.70	14.10	14.65	16.25	18.35
Third Week	13.55	12.30	14.10	9.86	11.90	7.75
K Value	2.01	3.32	1.76	14.77	3.19	13.52
CD (O.05)	8.548					

**Table 4: Changes in Sensory Quality of the fruit nectar from *Annona muricata***

Storage Periods (Week)	Appearance	Color	Flavor	Taste	Consistency	Overall Acceptability
Initial	27.4	26.6	29.7	30.70	31.4	35.50
First Week	21.10	15.50	16.75	18.30	17.90	22.10
Second Week	12.85	15.50	15.95	18.00	17.90	15.90
Third Week	12.55	15.50	13.80	10.20	10.70	8.50
K Value	7.86	0.00	0.73	6.06	5.22	13.41
CD (O.05)	8.548					

*Taste*

Food is valued for its taste. Taste sensations are categorized as sweet, salty, sour or bitter (Sharma, 2006). The present study revealed that the stored products got with low scores of taste by the panel of judges during the storage period. In the case of RTS and fruit nectars the scores of taste reduced during storage period reported by Beena (1998), Irene (1997).

*Consistency*

Stored proportions were shown same trend in sensory attribute of consistency. Scores of consistency had a gradual decrease in all stored nectars.

*Overall Acceptability*

Overall decrease in acceptability scores was observed in all the proportions of fruit nectar from three selected species of fruits during storage. As mentioned in all the above attributes it can be concluded that acceptability of the stored products were decreased over the storage period indicating the deteriorative changes taking place in all the stored products.

*Acidity*

Acidity is an important chemical constituent which indicate the deteriorative changes in the product. Acidity indicates the flavor as well as wholesomeness of the product (Balaji and Prasad, 2014).

**Table 5: Change in Acidity of the Selected Proportions of Fruit Nectar from *Annona Spp.* during Storage**

Storage Period (Weeks)	Acidity (%)		
	<i>Annona Reticulata</i> (T <sub>3</sub> )	<i>Annona Squamosa</i> (T <sub>3</sub> )	<i>Annona Muricata</i> (T <sub>4</sub> )
Initial	0.35	0.32	1.05
First Week	0.39	0.35	1.07
Second Week	0.47	0.41	1.12
Third Week	0.48	0.46	1.20
CD (O.05)	0.020	0.033	0.017

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Acidity of the stored fruit nectar showed an increase from 0.35 – 0.48 per cent (*Annona reticulata*), 0.32 – 0.46 per cent (*Annona squamosa*), and 1.05 – 1.20 per cent. Highest acidity was noted in nectar developed from *Annona muricata* (T4), due to the presence of high acid content in fresh fruit. The content of acidity was increased from the specified limits of FPO (0.3 per cent). Abbo *et al.*, (2006) conducted a study on ‘storage stability of soursop (*Annona muricata* L.) juice’ and found gradual increase in the acidity of the pasteurised juice within the first to third week. Increase in acidity of stored beverages was reported by Kumar and Manimegalai (2001). The results were similar with the result of Sogi and Singh, (2001).

### Microbial Profile of the Stored Products

Microbial quality is one of the most critical quality parameter in a dynamic system such as food. Spoilage causing micro organisms are responsible for the development of off flavor and off taste (Zagory, 2003). Keeping quality of the products very much depends upon the microbial contamination. Initially no microbial count was recorded in all the treatments. However at the final stage of storage the bacterial count was in the nectar of *Annona reticulata* (T3) found to be  $20 \times 10^6$ ,  $21.5 \times 10^7$  cfu/ml. Stored nectar of *Annona reticulata* (T3) observed with bacterial count of  $2 \times 10^6$  and  $2.5 \times 10^7$  cfu/ml. While nectar of *Annona muricata* recorded with bacterial growth in the range of  $4 \times 10^6$  and  $6.25 \times 10^7$  cfu/ml, whereas no fungi and actinomycetes growth was observed.

It could be concluded that annona fruits are superior in nutritional quality and highly beneficial for promoting and maintaining health. Fresh fruits keep well for one week. Fruit nectars with acceptable aroma and taste could be developed from these fruits withstand its qualities upto three weeks.

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