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Studies on production and preservation of Kokam fruit juice

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Abstract
Production and preservation of Kokam Fruit Juice was examined to reduce the spoilage and to increase the shelf life of the juice using chemical preservatives. The preservation of the juice was carried out using benzoic acid and citric acid under room temperature. The result revealed that the juice maintained its colour, aroma and tastes for at least one month when 3% benzoic acid was used as preservative. This happens to be the best among all. The juice under other preservation like 4% citric acid maintained its qualities for one week and some days, but thereafter the aroma started to fade. The alcoholic content was also estimated and it was discovered that the juice containing citric acid has the highest percentage of alcohol. The preservation used also altered the pH so that it is impossible for pathogens to exist at such a low pH environment.

Keywords: Preservative, Kokam fruit, benzoic acid, citric acid, total viable Count (TVC)

1. Introduction

Kokum (*Garcinia Indica*) is an ancient fruit that is widely consumed in the form of sarbat. Kokum is a fruit tree of culinary, pharmaceutical, nutraceuticals and industrial uses. Kokum was traditionally used to treat sores, dermatitis, diarrhoea, dysentery, ear infection, and to facilitate digestion. Kokum seeds are used for oil extraction. That oil is called kokum butter and used in curries, cosmetics, medicines, and costly confectionery preparations in foreign countries. The kokum fruit acts as an anti-oxidant, acidulant and appetite stimulant and helps in fight cancer, paralysis and cholesterol. The kokum fruit is a good digestive tonic and used to improve skin health. (Kirtikar et. al, 1991) [5].

Micro-organisms are of great importance in the composition of compost, wine and antibiotics such as penicillin etc. (Callaway and carpenter, 1981) [3]. But these microorganisms use human foods for food stuff as source of nutrient for their growth. This of course can result in a deterioration of food. They do this by increasing their numbers, utilizing nutrients producing enzymatic changes, contributing to flavour by breaking down of products of synthesis of new components. To prevent this, we must minimize or eliminate micro-organisms from our contaminated food as this will aid in preserving it (Ahmed, 1991) [2].

Kokam Juice extracted from fruits is acidic. The high moisture content is responsible for the growth of yeast and bacteria. The normal changes to be expected in raw fruit juices at room temperature are an alcoholic fermentation by yeast followed by the oxidation of alcohol and fruit acid by film yeast or mould growing on the surface if it is exposed, or the oxidation of alcohol acetic acid if acetic acid bacteria are present (Macrase et. al., 1997) [6]. Improvement in the methods of preservation of juice has made it possible for the successful feeding of heavy population in countries unable to raise their own fruits. As a result of the improved methods, of preservation and transportation, our diets have become more varied and better balanced. Perishable foods are now available all year round.

The alcohol content in the control sample containing sugar only and the sample containing citric acid as preservation increased significantly while the alcoholic content of the sample containing benzoic acid as preservative was very negligible. This shows that benzoic acid is capable of inhibiting the microbial activities. Also increase in bacteria count noticed is as a result of microbial growth present which increases as they grow (Freizer, 1976).

2. Material and methods

Kokum fruits have certain medicinal properties. Juice extracted from this fruit is sweet and sour and thus liked by many. A glass of cold kokum syrup is refreshing and it also improves the digestive system. The product is popular in the Maharashtra state since long and now it is sold in nearby states as well. Since it is a natural fruit extract, it is preferred by many people. (Swami et al., 2014) [8]

Traditional Method of Production of Kokum syrup (Patil *et al*., 2008): Following are the steps to make, kokam syrup

1. Separate kokam rind by removing fruit pulp and seeds. Pulp and seeds are not used for squash production.
2. Add equal quantity of sugar and mixed with kokum rind in a wide mouth vessel.
3. Kept this mixture of sugar and kokam open for sun rays up to eight to ten days. In this process juice comes out from kokum rind. If balance sugar accumulation is found at the bottom of the vessel no additional sugar is to be added.
4. Filter the juice from rind with help of a cotton cloth.
5. Fill the Kokam Syrup in clean glass bottle with cap.
6. The Kokam sarbat is prepared by using the kokam syrup. The water is added into kokam syrup at 1:5 proportions.
7. Then add some salt and cumin powder to make the kokam sarbat.

Drawback of Traditional Method of Production of Kokum syrup

1. During Kokam syrup preparation process only sugar was added as a preservatives so the syrup become easily susceptible to the microorganisms and due to

growth of microbes; color, aroma and tastes flavor of the syrup changes day by day.
2. Vessel remains open for eight to ten days so there is increase in the chances of contamination.

To overcome these problems it is necessary to preserve the kokam syrup for long duration using different preservatives, therefore some methods of preservation were discussed in this paper

Preservation of kokam syrup: The various reagents like 4% citric acid and 3% benzoic acid were prepared respectively. A control sample for the experiment was prepared by taking 50ml of pure kokum syrup, 150ml of drinking water, mixed well and poured into a plastic bottle, covered and labeled as control. Remaining two samples were prepared as follows second bottle by taking 50 ml of pure kokum syrup, 145 ml of drinking water then add 5ml of 4% citric acid and labeled as Preservative I, Lastly third bottle was prepared by taking 50 ml of pure kokum syrup, 145 ml of drinking water, then add 5ml of 3% benzoic acid and labeled as Preservative II. Then for every week, the samples were analyzed. The temperature of the samples was measured using mercury thermometer and the pH of the solution was measured using the pH meter. The microbial flora of the preserved juice was estimated using the plate count method. The method establishes total viable count (TVC) of the fruit. The quantity of alcohol present was estimated using the pyrometers.

Result and discussions

The analyses of samples are below

Table 1

Table 1	Analysis of Controlled Sample			Analysis of Sample Containing 4% Citric Acid			Analysis of Sample Containing *3*% Benzoic acid		
Number of days	**pH value**	**Total viable count**	**Alcohol count (%)**	**pH value**	**Total viable count**	**Alcohol count (%)**	**pH value**	**Total viable count**	**Alcohol count (%)**
0	6.08	Nil	0.06	5.77	Nil	0.00	6.17	Nil	0.00
7	5.96	$12 \cdot 10^4$	2.0	4.67	$4 \cdot 10^4$	1.0	5.92	$2.6 \cdot 10^4$	0.6
14	4.34	$60 \cdot 10^4$	2.2	3.92	$38 \cdot 10^4$	1.2	4.19	$14.6 \cdot 10^4$	0.8
21	4.15	$71 \cdot 10^4$	2.4	3.59	$52 \cdot 10^4$	1.4	4.03	$34.2 \cdot 10^4$	1.0
28	3.17	$80 \cdot 10^4$	2.8	3.38	$68 \cdot 10^4$	1.7	3.62	$42.2 \cdot 10^4$	1.2

It was observed that all the samples with/without preservative maintained their colour, aroma and taste within the first five days. However, after seven days, the colour, taste and aroma of the control sample changed and this was accompanied with sedimentation. These changes indicate the quality in the juice. The sample containing citric acid and benzoic acid as preservative it maintained their colour, aroma and taste. After two weeks the bad aroma and coloration in the control sample increased, indicating further deterioration of the juice quality. For citric acid, sample sedimentation was noticed and the aroma changed. And samples containing benzoic acid only as preservative remained unchanged in colour, taste and aroma. After the end of the fourth week of the experiment, the control sample's colour had changed completely black and the aroma had gone bad and the presence of whitish microbial organism was noticed. Also the sample containing citric acid as preservative changed in colour, taste and aroma while the sedimentation increased. For the sample containing benzoic acid as preservative has no change within the space of time. The best among all was the sample preserved with 3% benzoic acid.

The sample containing benzoic acid best preserved the juice. This is because the anti-microbial activity of benzoic acid is principally in the undissociated form and since it is relatively strong acid (pKa = 4.l9). It inhibits the growth of spoilage yeast and moulds (Adam and Moss, 1995) [1]. Inhibition by benzoic acid appears multi-factional. It has the ability of the dissociated molecule to interfere with membrane energetic. The decrease in the pH value indicates that the juice become more acidic as a result of fermentation because more acid are been produced.

Conclusions

This paper has shown that the sample contains 3% benzoic acid as best preservation having preserved the juice for at least one month. It was also concluded that kokum fruit juice on its own under room condition can last for five days without spoilage.

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