Preservation of Passion Fruit Juice

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Abstract

Production and preservation of Passion 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 sugar, benzoic acid, citric and a combination of citric and benzoic acid under room temperature.

The result revealed that the juice maintained its color, aroma and tastes for at least one month when 30% benzoic acid was used as preservative. This happens to be the best among all. The juice under other preservation like 4% sugar went bad after three days, while that of 4% citric acid maintained its qualities for one week and some days, but thereafter the aroma started to fade. The combination of 3% benzoic acid and 4% citric acid maintained the qualities of the juice fairly between two to three weeks. The alcoholic content was also estimated and it was discovered that the juice containing citric acid and sugar 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, Passion Fruit, Benzoic Acid, Citric Acid, Sugar, Total Viable Count (TVC)

Introduction

The high increase in food deterioration is due to contamination with micro-organism since the entire environment in which we live is colonized by micro-organisms (Nelson, 1981). Micro-organisms are small living organisms such as bacteria, virus, algae, etc, which need microscope to be seen clearly. Though organisms, can cause harm in some cases, they are of great importance and are noted in the composition of compost, wine, garri, ogi, and antibiotics such as griscofulcin, penicillin etc (Callaway and carpenter, 1981).

Although micro-organisms are of great importance, these 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 flavor 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).

Passion fruit is grown as a fresh fruit for making juice and direct consumption. Juice extracted from these fruit is of high nutritional value and of great importance to human health (Macrae et al, 1997). Juice may be extracted directly from passion fruit, may be squeezed from crushed material so as to include considerable amount of pulp (Matta, 2002).

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). 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).

Methodology

The Passion Fruit used in this work was obtained from Kaduna state, Nigeria.

The juice was extracted using a blender and the process of filtration. The filtrate obtained was collected in a beaker and about 650ml of juice was obtained in the end.

The various reagents including benzoic acid, citric acid and sugar were prepared and used by dissolving appropriate mass of the reagent into 100ml of distilled water. 3%, 5% and 4% concentration of benzoic acid, citric acid and sugar were prepared respectively.

A control sample for the experiment was prepared. Some of the pure Passion Fruit Juice without any preservative was measured with the pipette and poured into a plastic bottle and covered. Five of these samples were prepared and labeled.

Each for every week, 145ml of juice was measured and 5ml of benzoic acid was added. Also 50ml of juice was measured and 3%of sugar and 4% of citric acid was added. Sugar was also added alone to 50ml of the pure juice for the third case. In the last case, the experimental sample containing sugar, citric acid and benzoic acid preservative was added and in all cases four samples were prepared and taken for weekly analysis. The temperature of the distillate was measured using mercury thermometer and the pH of the solution was measured using the aid of pH meter.

The microbial flora of the pressured 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.

Analysis of Controlled Sample

Number of days	pH value	Total viable count	Alcohol count (%)
0	4.08	Nil	0.06
7	3.96	$2.1 \cdot 10^4$	1.0
14	3.34	$60 \cdot 10^4$	1.2
21	3.15	$71 \cdot 10^4$	1.6
28	2.17	$80 \cdot 10^4$	1.8

Analysis of Sample Containing Sugar 4%

Number of days	pH value	Total viable count	Alcohol count (%)
0	4.07	Nil	0.00
7	3.92	$2.6 \cdot 10^4$	1.2
14	3.19	$34.6 \cdot 10^4$	1.8
21	3.03	$64.2 \cdot 10^4$	2.2
28	2.62	$72.2 \cdot 10^4$	2.4

Analysis of Sample Containing Sugar and Citric Acid

Number of days	pH value	Total viable count	Alcohol count (%)
0	7.77	Nil	0.00
7	3.67	$4 \cdot 10^4$	2.0
14	2.62	$68.6 \cdot 10^4$	2.2
21	2.59	$82 \cdot 10^4$	2.4
28	2.38	$88 \cdot 10^4$	2.7

Analysis of Sample Containing 4% Sugar and 3% Benzoic Acid

Number of days	pH value	Total viable count	Alcohol count (%)
0	4.05	Nil	0.00
7	3.94	$0.4 \cdot 10^4$	0.001
14	3.84	$25.33 \cdot 10^4$	0.002
21	3.74	$7.6 \cdot 10^4$	0.002
28	3.74	$5 \cdot 10^4$	0.004

Analysis of the Sample Containing 4% Sugar, 4% Citric Acid and 3% Benzoic Acid

Number of days	pH value	Total viable count	Alcohol count (%)
0	3.69	Nil	0.00
7	3.55	$8.6 \cdot 10^4$	0.20
14	2.92	$12.6 \cdot 10^4$	0.40
21	2.54	$25.6 \cdot 10^4$	0.60
28	2.25	$8.1 \cdot 10^4$	0.72

It was observed that all the samples with/without preservative maintained their color, aroma and taste within the first five days. However, after seven days, the color, 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 sugar and citric acid as preservative it maintained their color, aroma and taste. Also those containing benzoic acid as preservative and sample containing citric, sugar and benzoic acid maintained their taste aroma and color.

After two weeks the bad aroma and coloration r in the control sample increased, indicating further deterioration of the juice quality. For citric acid, sample sedimentation was noticed and the aroma changed also both for sample containing citric acid and benzoic acid as

preservative and samples containing benzoic acid only as preservative remained unchanged in color, taste and aroma.

After the end of the fourth week of the experiment, the control sample's color had changed completely brown 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 color, taste and aroma while the sedimentation increased. For the sample containing benzoic acid as preservative along with the sample containing a combination of citric and benzoic acids as preservatives has little or no changes 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). 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 al least one month. It was also concluded that passion fruit on its own under room condition can last for five days without spoilage.

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