

Original Research Articles

EFFECT OF DIFFERENT STORAGE CONDITION ON pH AND VITAMIN C CONTENT IN SOME SELECTED FRUIT JUICES (PINEAPPLE,PAWPAW AND WATERMELON)

ABSTRACT

This research work was carried out to determine the suitable storage condition of fruit juices that will effectively retain their vitamin C content and PH level. Three different samples of fruits were processed into their respective juices, they were then analyzed to determine the vitamin C content and PH level of each samples, and stored at different storage condition. The samples were then analyzed after every week for one month, and the result shows that vitamin C content reduced by 72.9% at room temperature and 47.9% at refrigeration temperature in Pineapple juice, 75.5% at room temperature and 47.2% at refrigeration temperature in Watermelon juice, and 69.4% at room temperature and 55.6% at refrigeration temperature in Papaya juice respectively. The analysis also shows that the PH level of the samples were reduced by 17% and 15.0% in Pineapple juice, 22.4% and 20.7% in Watermelon juice, 25.9% and 20.4% in Papaya juice at both room temperature and refrigeration temperature storage conditions respectively. Statistical analysis shows that there is no significance difference in term of vitamin C content and PH level between room temperature storage and refrigeration temperature at 5% level significance. It is therefore concluded that, storage of fruit juices at refrigeration temperature condition forms the basis of recommendation of this research.

Keywords: Vitamin C; pH; Storage temperature, Pineapple juice; Papaya juice; and Watermelon juice

INTRODUCTION

Fruits are foods rich in vitamins and minerals and supply arrays of colors, flavor, texture and bulkiness to pleasure of eating. Fruits are essential for proper maintenance of human health [12]. Fruits are very popular seasonal fruits of East Africa as they are very delicious, sweat and juicy. In recognition of the importance of fruits as valuable food resources, increasing attention has been paid in recent years to study their physiochemical properties and seasonal variation [3].

The need to recall the vast heaps of fruits in this country going to waste due lack of market, storage or processing facilities, it is therefore logical and reasonable to consider developing local juice processing industries if only to tackle the cases of unquantifiable wastage of valuable fruits produced in this country [5].

Fruit product manufacturers are becoming increasingly aware of the effect storage upon quality. The intensity of the progressive changes that occurs bears a close relation to temperature of storage and other factors that effects the vitamins content and the stability of its organic acids [4].

Juice is a liquid that is naturally contained in fruits and vegetables. It can also refer to liquids that are flavored with these or other biological food sources such as meat and seafood. It is commonly consumed as a beverage or used as an ingredient or flavoring in foods [6]. The sour taste of fruit juices are common sources of weak acids. The fact that fruit juices are acidic can be verified with a pH meter. The pH meter can then be used to monitor the neutralization of the acidic fruit juices with sodium hydroxide solution [6].

Vitamin C (also referred to as L-ascorbic acid) is the lactone-2,3-dieolic acid and it belongs to the water soluble class of vitamins. Ascorbic acid is an odorless, white solid having the chemical formula $C_6H_8O_6$. Vitamin C is mainly found in fruits and vegetables. In nutritional content, vitamin C is the enantiomeric form of ascorbic acid which also encompasses the oxidation product of the dehydroascorbic acid with different oxidizing agent. It participates in numerous biochemical reactions, suggesting that vitamin C is important for everybody's process from birth formation to scar tissue repair [10].

Factors that affect the vitamin C content of citrus fruits include the production factors and climate conditions, maturity state and position on the tree, type of fruits (species and variety), handling and storage, and the type of the container [7].

Storage conditions of low temperature and humidity have been found to retard the microbial growth, chemical and biological processes are also slowed down [42].

Oxygen is the most destructive ingredient in juice causing degradation of vitamin C. However, one of the major sugars found in orange juice, fructose can also cause vitamin C breakdown. The higher the fructose content, the greater the loss of vitamin C conversely, higher acid level of citric acid and malic acid stabilize vitamin C [8].

MATERIALS AND METHOD

Method of Processing Fruit Juice

Any of the favorite fruit is carefully sorted, washed, and peeled to a desirable size, and the juice was extracted from the juicer and filtered. One kilogram (1kg) of sugar was mixed with five hundred (500ml) of water to make a syrup, and the mixture was heated up to 90° without boiling and then let it cool down. Now the sugar solution is added with equal volume of filtered juice and water, and then stirred well for proper mixing.

3.5 Production Flow Chart

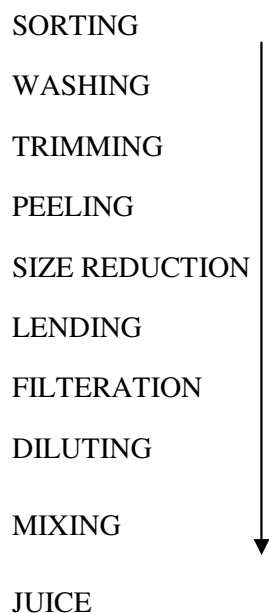


Fig.2.flow chart for production of juice

Fruit Juice Storage

The techniques to be use in this research work for storing fruit juices are as follows:

1. Room temperature storage
 2. Refrigeration temperature storage
- 1 Room Temperature Storage

The samples of different prepared fruit juices were filled and sealed in plastic bottles, the filled juices were then stored in a room that has a temperature which defend on the environmental temperature (29°C to 31°C). The stored juices were analyzed weekly to determine the variation in the vitamin C content and pH level.

2 Refrigeration Temperature Storage

The fruit juice samples prepared, filled and sealed in a plastic bottles were stored in a

refrigerator under refrigeration temperature (4.5°C to 7°C), after which the analysis of the stored samples were carried out every week. The variation of the changes in vitamin C content and pH level were recorded after every analysis of the samples.

DETERMINATION OF VITAMIN C

Principle:

The method exploits one of the most distinctive features of ascorbic acid, that is, its powerful reducing property; it reduces iron(3) to iron(2), the indicator dye 2,4-dinitrophenol indophenols to colorless form and iodine to iodide, which takes place in acidic medium [1].

MATERIAL AND METHOD

Hydrochloric acid, Potassium iodide, Potassium iodate, Starch powder, 250ml beakers, 200ml conical flasks, 50ml burettes, Sample bottles, Glass funnel, Hand globes, Blender, Pipettes, Spatula and Stirrer.

TITRATION PROCEDURE

250ml of fruit juice was pipette into 200ml conical flask. 0.01g of potassium iodate, 2ml of hydrochloric acid solution and 1ml of starch solution were accurately weigh and added to the content of the flask. The mixture was titrated against 0.01M potassium iodate in a burette till a blue-black coloration was observed. The titration was repeated three times to obtain concordant

titer values, and the results of the average were recorded.

DETERMINATION OF pH VALUE

Principle:

The basic principle of potentiometer involves the use of an electrolytic cell composed of two electrodes dipped into a test solution. A voltage (electromotive force) develops which is related to the ionic concentration of the solution [2].

MATERIALS AND REAGENTS

pH meter, Magnetic stirrer, Beakers, Pipettes and Standard buffer solution(4&7)

Procedure

The pH meter was standardized using two buffer solutions (pH 4 & 7).The electrode was removed from the storage solution and it was rinsed thoroughly with distilled water and blot dry.The combine electrode was dipped in buffer 7 solution.The function switch was set to pH position and adjusts “calibrate” control until the meter displays the precise pH of the buffer solution.The function selector switch was set to STAND BY.The electrode was removed from the buffer solution and washed with distilled water.The combined electrode was dipped into the second buffer solution (buffer 4).The function selector switch was set to pH position; the “SLOPE” correction control was adjusted until the meter displays the pH value of the

second buffer solution. Correct readings obtained with both solutions were checked without further adjustment. The function selector switch was returned to STAND BY position. The electrode from the second buffer solution was removed and washed with distilled water. The electrode was immersed into the juice sample under test and the pH selector switch was set to the pH position. The pH values of the test solution were recorded accurately.

RESULT AND DISCUSSION

pH Content

The pH content of the fresh pineapple juice was recorded to be 4.0 and that of the fresh watermelon juice was 4.6 with papaya having 5.4. The pH of the three samples were founded to be reducing under various storage conditions form the production day to four weeks time. At room temperature, the pH content of Pineapple juice ranges from 4.0 to 3.3, 5.6 to 4.5 in Watermelon juice and that of Papaya ranges from 5.4 to 4.0 respectively. At refrigeration temperature, the pH content of Pineapple ranges from 4.0 to 3.4, Watermelon 5.6 to 4.5 and that of Papaya ranges from 5.4 to 4.3 respectively.

Vitamin C Content

The Vitamin C content of fresh juices were 4.8 mg/100ml in Pineapple juice, 5.3 mg/100ml in Watermelon juice and 7.2 mg/100ml in Papaya juice. During the period of four weeks, the vitamin C content was founded to be reduced

significantly at both room temperature condition and at refrigeration temperature conditions. At room temperature, the vitamin C content ranges from 1.3 to 4.8 mg/100ml, 1.4 to 5.3 mg/100ml in Watermelon juice and 2.2 to 7.2 mg/100ml in

Papaya juice. At refrigeration condition, the vitamin C content in Pineapple juice ranges from 2.5 to 4.8 mg/100ml, 2.8 to 5.3 mg/100ml in Watermelon juice and 3.2 to 7.2 mg/100ml in Papaya juice respectively

Table 1: Ascorbic acid content (mg/100ml) of different fruit juice samples

S/N	Sample code	Zero week	First week	Second week	Third week	Fourth week	Percent reduced
1	PA-RM	4.8	2.5	1.8	1.4	1.3	72.9
2	PA-RF	-	4.0	3.9	3.5	2.5	47.9
3	WM-RM	5.3	3.5	2.5	1.9	1.4	75.5
4	WM-RF	-	3.9	3.5	3.2	2.8	47.2
5	PP-RM	7.2	6.4	4.8	4.2	2.2	69.4
6	PP-RF	-	6.8	5.2	3.9	3.2	55.6

Key:

KEY: PA-RM = PINE APPLE AT ROOM TEMP.

PA-RF= PINE APPLE AT REFRIG. TEMP.

WM-RM= WATER MELON AT ROOM TEMP.

WM-RF= WATER MELON AT REFRIG. TEMP.

PP-RM= PAPAYA AT ROOM TEMP.

PP-RF= PAPAYA AT REFFRIG. TEMP.

Table 2:pH level (mg/100ml)of different fruit juice samples

S/N	Sample code	Zero week	First week	Second week	Third week	Fourth week	Percent reduced
1	PA-RM	4.0	3.8	3.6	3.4	3.3	17.5
2	PA-RF	-	3.9	3.8	3.6	3.4	15.0

3	WM-RM	5.8	5.4	5.1	4.8	4.5	20.7
4	WM-RF	-	5.6	5.3	5.0	4.6	22.4
5	PP-RM	5.4	5.0	4.7	4.5	4.0	20.4
6	PP-RF	-	5.1	4.9	4.7	4.3	25.9

KEY: PA-RM = PINEAPPLE AT ROOM TEMP.

PA-RF= PINEAPPLE AT REFRIG. TEMP.

WM-RM= WATER MELON AT ROOM TEMP.

WM-RF= WATER MELON AT REFRIG. TEMP.

PP-RM= PAPAYA AT ROOM TEMP.

PP-RF= PAPAYA AT REFFRIG. TEMP.

CONCLUSION

The results obtained after an accurate analysis and precise measurement shows that refrigeration storage is more preferable because it retained 52.1% vitamin C and 85% pH Pineapple juice, 52.8% vitamin C and 79.3% pH level in Watermelon juice, and 44.4% vitamin C and 79.6% pH level in Papaya juice respectively.

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