

Study on Effect of Carbonation on Storage and Stability of Pineapple Fruit Juice

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“Abstract”

The carbonated pineapple fruit juice was prepared. Different parameters such as shelf life of pineapple juice, its sensory evaluation with respect to the concentration (10%, 12%, and 15% of juice with carbonation at 100 psi) and time were studied. The chemical factors such as acidity, pH, and sugars were studied and the changes were observed with respect to time. The sensory evaluation study was done with Hedonic scale along with the help of different panel members. The best results were obtained for 15 % fruit juice concentration with the initial values of pH, acidity and Total sugars 4.10, 0.58%, 13.8^oBx, was reduced to 2.98, 0.63 and 12^oBx, after 9 weeks respectively. The decrease in the pH value and increase in the acidity with respect to time period was observed which indicates the increase in the shelf life of prepared carbonated pineapple juice.

Keywords- Shelf life, Carbonation, formulation, Hedonic Scale, Brix.

“1.Introduction”

As per as annual production of fruits are considered pineapple is one of the widely grown fruit in tropical areas. The annual production of pineapple was found to be about 17.5 Million Tons in the year 2010 [1]. The post harvest loss of fresh fruits and vegetables are estimated to be 20- 30 %. Currently, most of the perishable fruits are lost during their expedition through the food supply chain, over ripening due to enzyme activity, microbial spoilage, water loss, mechanical damage during packaging and transportation [2].

The delicate nature of ripened fruits poses serious public health problem through infectivity by various

microbes like molds. Tropical fruit beverages have become important in recent years due to overall increase in natural fruit juice consumption as an alternative to the traditional caffeine containing beverages such as coffee, tea or carbonated soft drinks [3]. By the incorporation of tropical fruits into fruit- juice blends, researchers are now able to exploit their exotic flavors without adding synthetic flavors. This is especially true with highly aromatic fruits such as pineapple, mango, strawberry, guava and lemon.

Consumers like pineapple juice because of its convenience, colour, aromatic compounds and refreshing characteristics [4] [5]. Conventional manufacturing process of pineapple juice includes first heating or blanching then juice extraction. Heating is important to deactivation of pectin esterase activity and colour stability. One of the juiciest fruits that is absolutely a delight to eat is the pineapple. It can be taken with whipped cream, custard or just like that. Pineapple juice is equally yummy and refreshing and is one of the favorite drinks of many people during hot weather. The best part about pineapples is that it is loaded with nutrients and beneficial enzymes, which ensures that you not only have a healthy body but also a glowing complexion. Juice from fresh pineapple can be used to relieve bronchitis, diphtheria and chest congestion. Not only does it have enough amounts of Vitamin C, but it also contains an enzyme called Bromelain, which is known to dissolve and loosen up mucus. It is effective in flushing out the toxins from the body, thus making the metabolism healthy. Pineapples are very rich in manganese and even a single cup of pineapple is supposed to contain a good amount of it. This mineral is required for the growth of healthy bones and tissues. [6].

Joseph Priestly (1767) invented carbonation process in which carbonated water was made by passing pressurized carbon dioxide through water. The pressure increases the solubility and allows more carbon dioxide to dissolve than would be possible under standard atmospheric pressure. When the bottle was opened, the pressure is released allowing the gas to come out of the solution, thus forming the characteristic bubbles. A method of preparation of carbonated RTS beverages using pomegranate syrup was described [7]. Preparation and storage of carbonated ready to serve (RTS) pomegranate beverage. Beverage and Food World 36: 30-32.]. The pomegranate syrup consisted of 100% fruit juice, 0.5% citric acid and brix was maintained at 65%. The syrup was diluted to 5 times and then carbonated.

Carbonated RTS beverage from acidic tamarind pulp was developed by exposing the pulp to mixture of food enzymes [8]. Tamarind RTS beverage was prepared using 12.5% tamarind extract, 0.4% acidity and adjusting to 16° brix. It was demonstrated that carbonated coconut beverages packed in glass bottles with crown cork seal can be safely preserved for 6 months period at an ambient temperature range of 28- 32°C [9].

Fruits like pineapple, orange, amla and lemon because of high acidity and sharp taste are not palatable for direct consumption. To make them fit for human consumption and available throughout the year in the form of beverage, a reliable, controllable and reproducible technology has been developed for production of carbonated beverage with preservation of all the nutrients of the fruit. Compared to fruit juices the formulations of carbonated fruit beverage offers more variety of flavors nutrients long shelf life and other physiological benefits with a greater margin of safety in drink with a lower inherent cost.

In the present study carbonated pineapple beverage was successfully prepared from the pineapple juice with three different concentrations of juice and was compared with Appy fizz an apple juice carbonated beverage from Parle Agro regarding its nutritional attributes. Also the physicochemical properties with sensory evaluation were studied.

“2.Materials and Methods”

Pineapple and Sugar were purchased from the local market of Jalgaon. Domestic potable water used for preparation of beverage. Citric acid and Potassium metabisulphite of food grade was provided by Jinendra Scientific Solutions Jalgaon.

Raw Material Analysis

Moisture

The moisture contents of the fruits were determined according to standard method. (Method 934.06 of AOAC, 1990).

Titrateable acidity

Minced fresh fruit samples (10 g) were mixed with 200 cm³ distilled water, the mixture was then titrated with 0.1M NaOH until pH 8.1 which was measured by pH meter (Electronic Corporation of India Ltd., Hyderabad, type 101). The results were expressed as % citric acid (g-citric acid/100 g-fw (gram-fresh weight)) [10].

Ash

The sample (5 g) was kept in a muffle furnace and ashed at a temperature not exceeding 525 °C for 6 hours. The ash was then cooled in a desiccator and weighed. The ash content was recorded as g per 100 g-fresh weights (g/100 g-fw) (method 940.26 of AOAC, 1990).

Sugars and soluble solids

Total sugars, reducing sugars and total soluble solids content in the pineapple fruits were estimated by following the procedures of 932.12 of AOAC (1990).

Crude fat

The weighed dried fruit sample was put into a thimble, covered with fat free cotton and then put into the soxhlet apparatus. The flask was filled with 150 cm³ petroleum ether and extraction was done for 16 hours or longer on a water bath. The sample was dried at 100°C in the oven for 1 hour, cooled and re-weighed. The difference in the weights gave the fat-soluble material present in the sample. The determination was done in triplicate and the average value was recorded [10].

Crude fibre

Crude fibre was determined by the method of Ranganna [10].

Protein

Protein estimation was done by microkjeldhal Method (A.O.A.C 1984).

Total Soluble Solids (T.S.S)

Total Soluble Solids were determined by using Abbes refractometer (0-32⁰Bx) and expressed in degree brix (⁰Bx).

Organoleptic Evaluation

It has been long recognized that enjoyment of Food product is essential for good health. Enjoyment would mean choice, acceptance, nutrition and whole sameness. The 9 point hedonic scale for sensory evaluation has been used extensively since, its developments with a wide variety of products and with considerable success.

Formulation of Pineapple Carbonated Drink

The sample materials used in this work was fresh Pineapple fruit and various food additives such as citric acid, sucrose and potassium metabisulphate. Undesirable particles of fresh pineapple were properly removed. It was then washed in clean water weighed and crushed in a pulveriser. Desired quantity of water was added for easy crushing. Muslin cloth was used for filtration and the waste raffinate was discarded. The filtered solution was allowed to stand for 2-3 hours to enable the particle settled.

Development and Characterization of a Carbonated Pineapple Beverage

The pure pineapple extract was blended with food additives mentioned above in accordance with standard set by the World Health Organisation (WHO). The resulting solution is a pineapple soft drink. Carbonation was done in carbonation pilot plant. To carbonate the product, it was first absorption of CO₂, which was then added to the pineapple soft drink with the aid of carbonator. The temperature and pressure of the carbonator gauge varied at 100 to 120 psi and three different stages to vary the volume of CO₂ in the pineapple soft drink represented as sample A (Used 10 % pineapple juice), B (Used 12% pineapple juice), C (Used 15% pineapple juice) was carbonated. The product was then bottled and sealed immediately for freshness. The product (carbonated pineapple drink) was then analysed to determine the chemical content, pH, titratable acidity, brix, carbohydrate, protein and etc.

“3.Results and Discussion”

Chemical Characteristic of Pineapple pulp

As per the above mentioned processes the different composition of pineapple pulp was determined and found to be moisture 87.1%, Fat 0.1g, Total Sugars 14.2 gm, Crude fibre 1.4 gm, Protein 0.52 gm, Ash 0.12%, T.S.S 15⁰Bx as shown in table 1.

Nutritional composition of carbonated Pineapple ready to serve beverage

Different concentrations of pineapple juice was taken and carbonated at 100 to 120 psi and checked for nutritional compositions and comparison was done with appy fizz (Parle Agro) an apple juice carbonated beverage as a standard. (Table.2)

Organoleptic evaluation of Pineapple carbonated beverage

The 9 point hedonic scale for sensory evaluation was used in which all the three different concentrations of pineapple juice A, B and C was evaluated for the different characteristics such as Color, Appearance, Taste, Texture, Flavor with the help of selected panel members. The best scores were given for sample C with 15 % pineapple juice with the parameters obtained are shown in table 3.

Shelf life study and changes in Nutritional composition of carbonated beverage during its storage

The shelf life study for each pineapple juice carbonated beverages with different concentrations A, B and C were studied for 3,6 and 9 weeks respectively. The results obtained were slightly decreased in pH and Brix while there was increase in acidity of beverages. No more changes in taste, flavour and colour were observed. Because of the sparkling nature of the CO₂ the flavour remains as it is and the freshness of the juice was retained and the shelf life of the beverage was also increased. The juice was preserved upto three months with no changes in taste and after three months the taste slightly changes due to loss of CO₂, the changes in pH, acidity and brix are given in table 4.

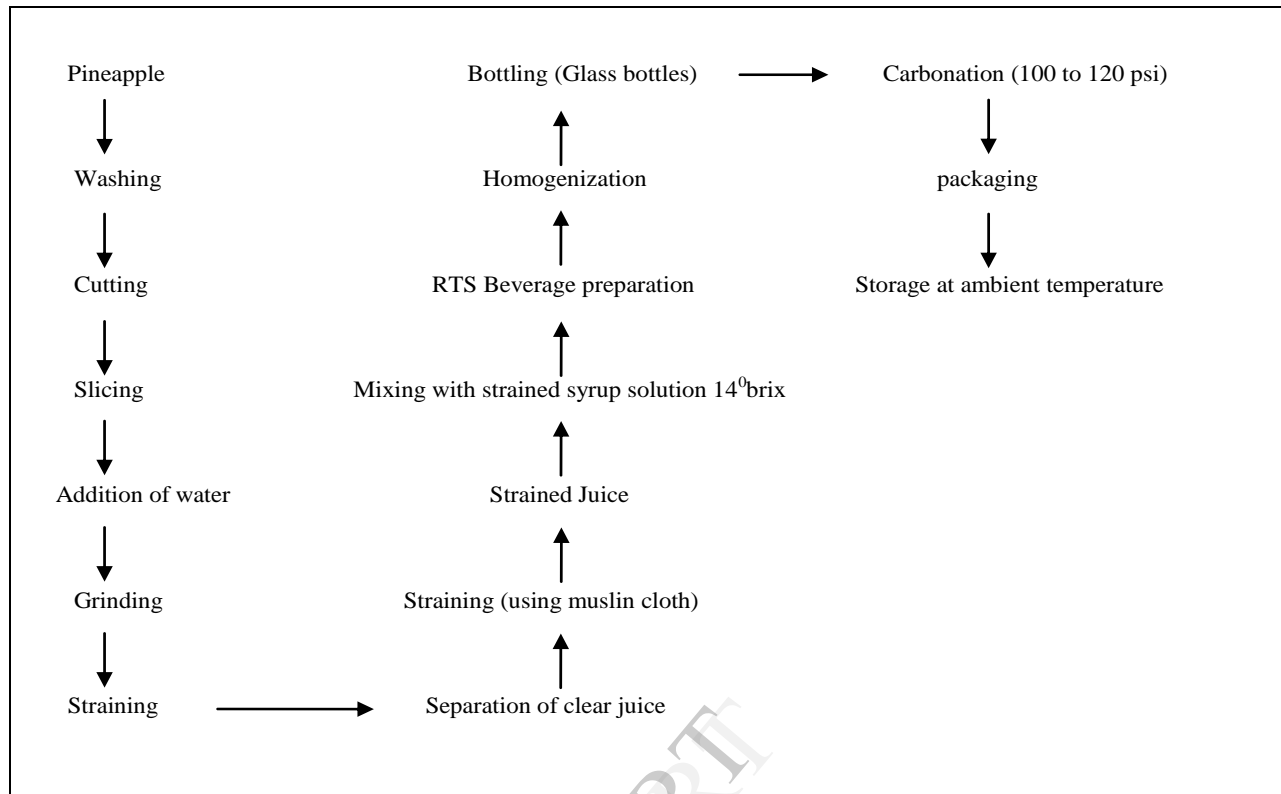
“4.Conclusion”

From all the results and comparison obtained in the above study palatable and shelf stable beverages can be prepared from pineapple juice by adjusting the juice concentration and carbonation. Beverages made

from pineapple juice with carbonation technology, yielded eye appealing products and received good scores throughout the storage period. Carbonation of pineapple juice beverages has an added advantage with an improving the palatability during storage period. The study demonstrated that value added beverages from fruit juices with carbonation technology could be prepared for commercial exploitation. This technology can redress the problems of industrialists by minimizing the spoilage losses, avoid fruit glut in the market, and efficiently utilization of astringent, highly nutritive fruits in the form carbonated beverage with retention of nutrients and nutraceutical properties of fruits for a period of three months.

“5.References”

- [1] Food and Agricultural Organization, (FAO), 2011.
- [2] AOAC 1999. Official Methods of Analysis 16th Edition, 5th Reversion, International, Gaithersburg, MD, method 942.15.
- [3] Kabasakalis, V.; Siopidou, D. and Moshatou, E. 2000. Ascorbic acid content of commercial fruit juices and its rate of loss upon storage. *Food Chemistry*, 70:325-328.
- [4] Chinprahast N., Tansuphoom N., Ptairahong., Duagrut V. (2002) ;Developed a jelly high fibre drink. *Thai Journal of Agricultural science*, 35,213-222.
- [5] Zadernowski., Markiewicz k., Nesterowicz J. And Pierzynowska- Korniak G.(1997) ;found high viscosity in pineapple juice added with apple puree and physical and chemical properties of pulpy juice. *Fruit Processing* 7,441-444.
- [6] Dr.P.P.Joy, Benefits of Pineapple, Pineapple Research Centre, 2010.
- [7] Sowjanya G, Rokhada AK, Madalageri MB, Swamy GSK, Patil CP (2009) Preparation and storage of carbonated ready to serve (RTS) pomegranate beverage. *Beverage and Food World* 36: 30-32.
- [8] Lakshmi K, Vasanth Kumar AK, Jaganmohan Rao L, Madhava Naidu M (2005) Quality evaluation of flavoured RTS beverage and beverage concentrate from tamarind pulp. *Journal of Food Science and Technology* 42: 411-415.
- [9] Gonzales ON, Alejo JV, Brillante J, Valdecanas M (1985) Process for preparing non carbonated and carbonated coconut water. *Cocomunity APCC/QS/03*: 31-42.
- [10] Ranganna S (1986) Handbook of Analysis and Quality Control for Fruit and Vegetable Products. Tata McGraw-Hill Publishing Co. Ltd., New Delhi, India.

Figures and Tables:**“Figure 1. Flow Chart of Preparation of Carbonated Pineapple Juice Beverage”****“Table 1. Chemical Characteristics of Pineapple Pulp”**

NUTRIENT	VALUES
Moisture	87.1 %
Fat	0.1g
Total Sugars	14.2gm
Crude Fibre	1.4 gm
Protein	0.54 g
Ash	0.12%
T.S.S	15 ⁰ Bx
pH	4.10

“Table 2. Nutritional Composition of Carbonated Pineapple Juice Prepared Samples”

Sample Carbonated beverage	T.S.S	Acidity	Protein	Total Sugars	Fat	Reducing sugar
A	12.14 ⁰ Bx	0.52%	0.8%	12.5%	0.16%	1.0%
B	13 ⁰ Bx	0.56%	0.62%	10.9%	0.14%	0.9%
C	13.8 ⁰ Bx	0.58%	0.62%	10.9%	0.14%	0.9%
S	15 ⁰ Bx	0.60%	0.8%	13.6%	0.2%	1.4%

Where A-10%, B-12% and C-15% of pineapple juice and S –Standard Appy fizz sample

“Table 3. Sensory Evaluation of Carbonated Pineapple Beverage”

Sensory attributes	A (10%)	B (12%)	C (15%)	MEAN
Appearance	7.6	8.0	8.4	8.0
Color	8.2	8.4	8.6	8.4
Taste	8.0	8.2	7.8	8.0
Texture	7.6	7.9	7.8	7.7
Flavour	7.4	7.9	7.6	7.6
After taste	7.9	7.3	7.6	7.6
Overall acceptability	7.8	8.0	8.6	8.1

“Table 4. Shelf Life Study and Changes in Nutritional Composition during Storage of Carbonated Pineapple Juice”

SAMPLE	WEEKS	pH	ACIDITY (%)	BRIX (⁰Bx)
A	3	4.21	0.52	12.14
	6	4.07	0.53	12.00
	9	3.63	0.59	11.93
B	3	3.82	0.56	13.94
	6	3.47	0.59	12.62
	9	3.39	0.61	12.08
C	3	3.97	0.58	13.04
	6	3.81	0.60	12.91
	9	2.98	0.63	12.23

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