IOTA-Vol-1,
Issue -3, 2015

"Development of Fruit Juice Blended Carbonated Beverages": An Indian SCM Case Study

Abhinav Tompe[1], Amol Prakash Sonone[2]

Department of Food Processing & Engineering, Karunya University, Coimbatore, Tamil Nadu)

[2]**Corresponding Author:**
E-mail: amolpsonone@gmail.com / amolp@karunya.edu.in

ABSTRACT: The food industry is now facing increasing pressure to ensure that their company's activities are environmentally sensitive, but there is also increased internal pressure to maintain or increase profitability in the face of fierce competition. The food-processing industry has special concerns about the health and safety of the consumer. The carbonation process is cheap and safe and apparently does not have any negative effects on cultured dairy products (Fairbairn and Law, 1986). Different methods can be used to add carbon dioxide to a product, such as the addition of carbonated water, production of a liquid drinkable yogurt by a commercial carbonation process, and the addition of metal carbonates. There are particular problems in the manufacture of non-carbonated RTD beverages that are not aseptically packed. These relate to microbial contamination. Products that have no carbon dioxide in their head space are particularly vulnerable to contamination by moulds and certain types of bacterial infection. A secondary advantage of introducing carbon dioxide under pressure to sweetened yogurt beverages is their expanded shelf-life. Carbonated fruit based beverage is a new concept which provides nutritional elements of the fruit along with natural pigments and flavour in addition to carbonation effects.

Keywords: Carbonation, Yoghurt, Papaya, Fermentation, Beverage, Nutritional value.

INTRODUCTION

Fermented milk products have been well recognized to have therapeutic, anticholeterolemic, anticarcinogenic properties which is superior over non fermented dairy products in term of nutritional & health attributes due to several beneficial micro flora. (Gardiner et.al; 2002).Carbonated soft drinks are known for their thirst quenching and refreshing properties. Yoghurt is a product of the lactic acid fermentation of milk by addition of a starter culture containing Streptococcus thermophilus and Lactobacillus delbrueckii subsp. bulgaricus [Mckinley M. C. (2005)] also its major food constituents are predigested due to fermentation process. Yoghurt gels are formed by the fermentation of milk with thermophilic starter bacteria; milk is normally heated at high temperatures (e.g. 85°C for 30 min), which causes the denaturation of whey proteins. The carbonation process is cheap and safe and apparently does not have any negative effects on cultured dairy products (Fairbairn and Law, 1986). Gas flushing (carbon dioxide or nitrogen) is a viable alternate method to extend the shelf life of fruit-flavored yogurt. This process particularly inhibits the growth of yeast and molds in yogurt. Papaya can be eaten as a fruit, a smoothie or even a milkshake. Papaya contains natural fiber, carotene, vitamin C and essential minerals. Papayas also contain enzymes like arginine and carpain. Arginine is essential for male fertility and carpain is considered to be good for the heart. Papaya is a fruit high in fiber which lowers cholesterol levels. Also it contains antioxidants which prevent the cholesterol from oxidizing. When cholesterol in the body gets oxidized, it can lead to heart-attacks. The anti-oxidants in papaya also help in controlling premature ageing, which helps to give a young look.

Table I: Nutritional Values of 100g of Papaya Fruit

Sr. No.	Constituents	Ripe papaya	Green papaya
1	Protein	0.6g	0.7g
2	Fat	0.1g	0.3g
3	Minerals	0.5g	0.5g
4	Fibre	0.8g	0.9g
5	Carbohydrates	7.2g	5.7g
6	Energy	32kcal	27kcal
7	Total carotene	2740 µm	0
8	Beta carotene	888µm	0

MATERIALS AND METHODOLOGY

Procedure for Studies on Development of fruit flavored carbonated yoghurt.

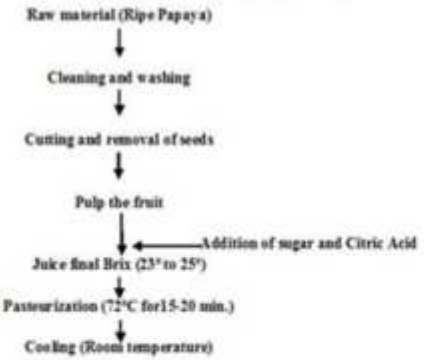
All the raw material required for projects are obtain from the local market during investigation.

1. Preparation of Beverage:

Yoghurt was prepared by method described by Farinde, and Obatolu (African Journal of Biotechnology, Vol.7, 2008).

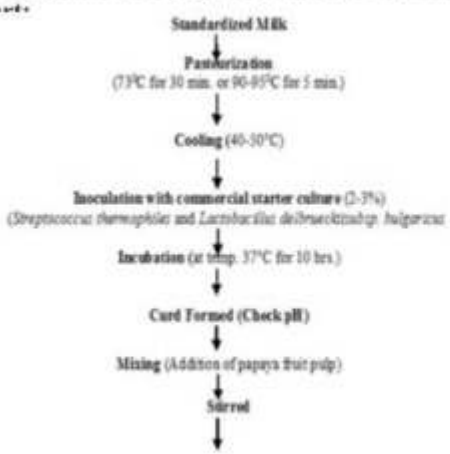
2. Procedure For Papaya Pulp:

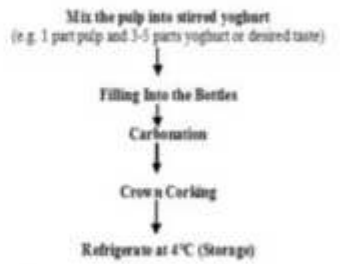
Flow Diagram 1: For Papaya Pulp:



Raw material was obtain from local market, basic operation was done by manually like cleaning and washing of fruits then cut the fruit with help of knife and remove the seeds from fruit. Then cut into pieces and with help of pulper pulp will be collected in stainless steel pot. The pulp was pasteurised in stainless steel steam jacketed kettle and pulp was collect in stainless steel pot for further use and stored at 4oC temperature.

Flow Diagram 2: Papaya Fruit pulp Carbonated Yogh[illegible]





Chemical Analysis:

Methods for Chemical Analysis of yoghurt-

1. Determination of Fat: The fat was determined by Gerber's method described in BIS 10500 (1991). Thebutyrometer were placed in the centrifuge machine & was revolved at a speed of 1100 rpm for 5 min. After centrifugation butyrometer was taken out in upright position with stopper end downward. The fat column which appeared clear, yellowish liquid in the upper portion, fat level adjusted with key & reading was noted.

2. Determination of Protein: The Protein was determined by adopting standard procedure of Ranganna (1991) by using Micro Kjeldhal method. A standard procedure recommended is Micro Kjeldhal method by which protein content of given sample was determined. The percent nitrogen was calculated & protein was quantified in the sample by multiplying with factor 6.25.

3. **Determination of Carbohydrates:** The Carbohydrates were determined by adopting standard procedure of ISI: 1981. The Carbohydrate contents of samples were determined by difference i.e. by subtracting the sum of percent value of moisture, protein, fat, & ash from 100.

4. Determination of Total Solid: The Total Solidwas determined as per procedure given in (PFA1954 & BIS 1991).

$$\% \text{ Total Solid} = C - A / B - A \times 100$$

(A = wt. of metal dish + lid,
B = wt. of metal dish + lid + sample before heating,
C = wt. of metal dish + lid + sample after heating)

5. Determination of Ash: The sample ignited to burn off all organic matter in the sample. The inorganic material, which does not volatilize at that temperature, is ash that is gravimetrically determined (Association of Official Analytical Chemists 1984).

Where,
W1 = Mass of disl $Moisture\ (\%) = \frac{(W2 - W3)}{(W2 - W1)} \times 100$
W2 = Mass of dish + sample
W3 = Mass of dish + after drying to constant mass and cooling

6. **Determination of pH:** The pH of the samplewas measured by using digital pH meter. Firstly the pH meter was standardized at 25°c by using standard buffer solution. The pH of the sample was observed on the dial and recorded.

7. **Acceptability of Yoghurt:** The extent of acceptability of Yoghurt was judged by sensory or organoleptic evaluation using 9-point Hedonic Scale as described by Gupta (1999).The acceptability statement &marking scheme used were as follows.

Table II: The acceptability statement & marking scheme

Score	Reaction
9	Like extremely
8	Like very much
7	Like moderately
6	Like slightly
5	Neither like nor dislike
4	Dislike slightly
3	Dislike moderately
2	Dislike very much
1	Dislike extremely

RESULT AND DISCUSSION

Standardization of Process for Fruit Pulp:

The best combination for the final product which prepared in the work and commercialization and for industrial used as well (may vary with the variety of fruit). The best combination for the final product which prepared in the work and commercialization and for industrial used as well (Table3).

Table III: Standardization of Process for Fruit Pulp

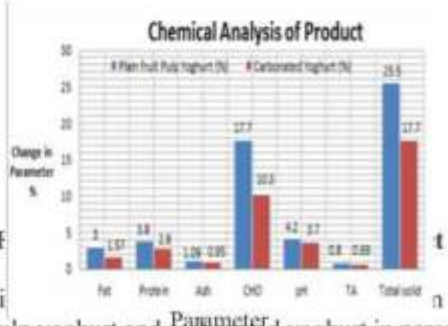
Sr. No.	Parameter	Papaya pulp
1	TSS (o Brix)	11
2	pH	4.5
3	Acidity	2.20
4	Moisture	80%

Chemical Analysis of Product:

Table IV. Chemical analysis of product

Sr. No.	Parameter	Plain fruit Pulp Yoghurt (%)	Carbonated Yoghurt (%)
1	Fat	3.0	1.57
2	Protein	3.8	2.80
3	Ash	1.09	0.95
4	Carbohydrate	17.7	10.30
5	pH	4.2	3.7
6	Treatable Acidity	0.80	0.69
7	Total solid	25.5	17.7

Chemical Composition of Non-Carbonated and Carbonated by using Papaya fruit pulp were studied as T0 & T1 resp. And Presented in Table no.4,Fat content for treatment T0 &T1 were 3.00% & 1.57% resp. , Protein content for treatment T0 &T1 were 3.80% & 2.80% resp., Ash content for treatment T0&T1 were 1.09% & 0.95% resp. Carbohydrate content for treatment T0 & T1 were 17.7% & 10.30% resp. , pH content for treatment T0 &T1 were 4.2 & 3.7 resp., Tritable Acidity content for treatment T0 & T1 were 0.80% & 0.69% resp. ,Total Solid content for treatment T0&T1 were 25.5%& 17.7% respectively.



The Fi n plain fruit pulp yoghurt and carbonated yoghurt in percent. It was observed that the difference in treatment T0 and T1 for every parameter. For fat the difference is 1.43 %, protein content difference is 1%, Ash content for difference is 0.14%. Carbohydrate content for 7.4%, pH content for 0.50, Treatable Acidity content difference is 0.11%, Total Solid content difference is 7.8%. From chart we can conclude there is no big difference between plain fruit pulp yoghurt and carbonated yoghurt in percent. We can consider as safe for consumption.

Table V: Sensory evaluation score for fruit flavoured carbonated yoghurt.

Samples	Colour and appearance	Flavour	Taste	Consistency	Overall Acceptability
T0	7	6	7	7	7
T1	8	7	7.5	6	8

T0 - Preparation of yoghurt incorporated with papaya pulp was Non-Carbonated.
T1 - Preparation of yoghurt incorporated with papaya pulp was carbonated.
The overall acceptability of T1 is 8. Also as the storage time increase the taste and flavor is increasing.

CONCLUSION

Carbonation apparently enhances the organoleptic qualities through its effect on mouthfeel, described as tingling, which imposes a refreshing quality. A secondary advantage of introducing carbon dioxide under pressure to sweetened yogurt beverages is their expanded shelf-life. It was observed that in chemical analysis the pH and Total acidity is decrease at the time of storage. The delicious papaya fruit has nutritional values that make it potent as a raw material in the food processing industry beyond mere raw consumption. The use of papaya extends beyond just as a raw material in the food and pharmaceutical industry; as study shown in table no.4 and Figure-3 make clear that chemical parameter difference is not much between plain fruit pulp yoghurt and carbonated yoghurt in percent. We can consider as safe for consumption. It has further potential applications and uses yet to be fully explored, derived and understood. Carbonated fruit based beverage is a new concept which provides nutritional elements of the fruit along with natural pigments and flavors in addition to carbonation effects.

REFERENCES

A.O. A.C. (1995) Official method of analysis. .Vol. 11, 16th edition. Association of Official Analytical Chemists, Arlington, V.A.

Ajaji F (2006) Technology of main categories of products. File: // E:\Desktop\ the technology of traditional milk product in developing countries.

Akinnubi S (1998) Yoghurt drinks manufacturing, Business Guide. National concord. May 22nd, p.22.

B.I.S. (10500 - 1991) Buero of Indian Standers hand book of food analysis.

Cinbas and Yazici (2007) Effect of the Addition of Blueberries on Selected Physicochemical and Sensory Properties of Yoghurts. Food Engineering Department, Engineering College, OndokuzMayis University, TR-55139 Samsun, Turkey A. CINBAS and F. YAZICI: Blueberry Addition to Yoghurts, Food Technol. Biotechnol. 46 (4) 434–441 (2008).

Carey Dunlop Miller and Ruth Coburn Robbins. (1936). The Nutritive value of Papaya. Journal of Biochemistry, volume XXXI (1):pp 275-300.

De, S. (1982) Outline of dairy technology. Oxford University press, Bombay, pp. 98 – 99.

A.O. Wright, L.V. Ogden, and D.I. Eggett (2007).Determination of Carbonation

Threshold in Yogurt, Sensory threshold for carbonated yogurt,(2007).

DeMan JC, Rogosa M, Sharpe E (1960). A medium for the cultivation of Lactobacilli. J. Appl. Bacteriol. 60:130 – 135.

Early, R., (1992) the technology of dairy product VCH publishers.

Fadela et.al. (2009) worked on Physico-chemical and rheological properties of yoghurt manufactured with ewe's milk and skim milk African Journal of

Biotechnology Vol. 8 (9), pp. 1938-1942, 4 May, 2009 ISSN 1684–5315.

Farinde et.al. (2008) use of alternative raw materials for yoghurt production. Soymilk and maize steep water were used as alternative raw materials. Institute of Agricultural Research and Training, P.M.B 5029, Ibadan, Nigeria. African Journal of Biotechnology Vol. 7 (18), pp. 3339-3345, 17 September, 2008 ISSN 1684-5315.

FPO (1954) Food product Order procedure for chemical analysis of yoghurt.

Gardiner et.al. (2002) Microbiology of therapeutic milk Dairy cryobiology hana book John Wiley & son Inc. publication. Pp 431 – 478.

Gupta, S.A. (1999) Sensory evaluation of food industry. Indian Dairyman 28:293 -295.

Imele and Atemnkeng (2001) worked on Preliminary study of the utilization of coconut in yoghurt production. The Journal of Food Technology in Africa, Vol. 6, Jan-Mar, 2001, 11-12.

J.M.Ryan et.al. (1984) Consumer acceptance of fruit-flavoured yoghurt drinks. Dariry Science Deparment Louisiana State University, 1984 J Dairy Sci. 67:1369 – 1375, 1984.

Krishna . K.L., Paridhavi.M and Jagruti A Patel. (2008). Review on nutritional, medicinal and pharmacological properties of papaya (Carica papaya Linn.).

Lee W. J. and Lucey J. A. (2004). "Structure and Physical properties of Yogurt Gels: Effect of Inoculation Rate and Incubation Temperature". Journal of Dairy Science, 87: 3153-3164.

Mckinley M. C. (2005). "The Nutrition and Health Benefits of Yoghurt". International Journal of Dairy Technology, 58: 1-12.

Manfred Kroger (1975) Quality of yoghurt. Authorized for publication on May 16, 1975 as paper No. 4868 in the Journal of the Pennsylvania Agricultural Experiment station.

Kucukoner &Tarakct (2003) Influence of Different Fruit Additives on Some Properties of Stirred Yoghurt during Storage Yuzuncu Yil Universitesi, ZiraatFakultesi, TarımBilimleriDergisi (J. Agric. Sci.),
2003, 13(2): 97-101.

NafisehVahedi et.al. (2008) Optimizing of Fruit Yoghurt Formulation and Evaluating Its Quality during Storage Department of Food Science and Technology, College of Agriculture, Ferdowsi University of Mashhad, Iran American-Eurasian J. Agric. & Environ. Sci., 3 (6): 922-927, 2008 ISSN 1818-6769 © IDOSI Publications, 2008.

N.J.N YAU M. R. MAcDANIEL (1989) Sensory Evaluation of Sweetened Flavored Carbonated Milk Beverages, Journal of Dairy Science Vol. 72, No.2, 1989.

Patel & Schaven (1997) Therapeutic role of yoghurt.

27.S.M.R. Rahman et.al. (2001) Utilization of jack fruit in the manufacture of yoghurt, Online Journal of biological sciences 1 (9): 880 – 882, 2001.

Rangannna S. (1987) Hand book of analysis & quality control for fruit & vegetable products: Tata McGraw – Hill Publication, New Delhi.

Tomer, O.S. (1999) Chairman's address. National Seminar on "Challenges Dairying in next millennium" Indian Dairyman, 51(9):9.