



CHEMICAL PROPERTIES OF LOW-FAT FROZEN YOGHURT INFLUENCED WITH ADDITION OF DIFFERENT AMOUNT OF FRUITS PULP

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Abstract: A study were conducted to prepare low-fat frozen yoghurt mix with different amount of locally available fruit pulp of Banana, Lychee and Mango during 2014-15 and 2015-16 at the Warner School of Food and Dairy Technology, Sam Higginbottom Institute of Agriculture, Technology and Sciences (Deemed To-Be University, Formerly AAI-DU), Allahabad-211007 (U.P), India. There were four fat per cent 0.5(F1), 1.0 (F2), 1.5 (F3) and 2.0 (F4), three fruits banana (B), lychee (L) and mango(M) and each fruit having three pulp level 1(5%), 2(10%) and 3(15%). The total treatment combinations were 36 and replicated thrice. The objectives of studies was to analyze the chemical properties of low-fat frozen yoghurts prepared with mixing of three fruits (Banana, Lychee and Mango), its three pulp per cent i.e. (5, 10 and 15) and four fat per cent (0.5, 1.0, 1.5 and 2.0). This was prepared using standard procedure and it was also analyzed with using well developed methodology for its chemical properties i.e. moisture, fat, total solids, acidity, protein, carbohydrate and ash. The results clearly indicated that the addition of mango was better than lychee and banana in frozen yoghurt with 0.5%, 1.0%, 1.5% and 2.0% fat. The high valued frozen yoghurt was made with mango pulp at 10% than 5% and 15% that showed exceptional results as compared to other. The fruit additives are the better options for increasing flavored value of low-fat frozen yoghurt its quality and acceptability.

Keywords: Fat percent, fruits pulp percent, frozen yoghurt.

1.0 Introduction: Yoghurt is most preferred fermented milk which is widely consumed in India and abroad. It is highly safe, tasty and nutritionally potential, preferred food stuff in Asia, Africa, Europe and USA due to its therapeutic and nutritive. The nutritional and potentially therapeutic value of food is a key characteristic in the development of new value-added products manufactured for health conscious consumer ^[1]. The lactic acid bacteria are used as starter culture containing *Streptococcus thermophilus* and *Lactobacillus delbrueckii* ssp. *bulgaricus*. These two genera are used in yoghurt preparation for milk acidification and synthesis of aromatic compounds and also increase lactic acid content in yoghurt ^[2-3]. Their profit compositions in similar to used milk with high biological value with components are added. Yoghurt is an excellent source of protein, carbohydrate, calcium, phosphorus, Vitamins

(B1, B2, and B12), fat and a valuable source of folate, niacin, magnesium and zinc. Yoghurt is one of the most popular easily digestible fermented milk products that improve overall quality of the diet and has gained widespread consumer acceptance as a healthy food ^[4].

The addition of fruits in yoghurt preparation improved composition properties and enhanced taste, make delicious pleasing flavor product that contains refreshing flavor of fruit and beneficial effect of yoghurt. Fresh fruits, fruit juice, canned preserved fruits, frozen fruits and miscellaneous fruit products are used in manufacturing of new generation flavored generic yoghurt regulated by international standard of the country. Now-a-days demands are increasing for a new range of traditional dairy products including yoghurt having low-fat content ^[5]. As per norm of the FAO/WHO the concentrations of fruit for fruit yoghurt are

varying 5 to 15 percent. An effort were made to analyze the chemical properties of low-fat frozen yoghurt prepared with addition of different amount of fruits pulp of Banana, Lychee and Mango in the Warner School of Food and Dairy Technology, Sam Higginbottom Institute of Agriculture, Technology and Sciences (Deemed To-Be University, Formerly AAI-DU), Allahabad-211007 (U.P), India.

2.0 Materials and Methods

2.1 Preparation of Fruit Pulp: Banana, Lychee and Mango were collected from the local market of Allahabad. Fruits were thoroughly washed with clean water and outer layer or rind was separated with the help of knife. Fruit pulp were prepared by crushing of skinned fruits and kept for pasteurization at 95^oC for 15 min. and filled into jars at ambient temperature until added to yoghurt.

2.2 Preparation of Low-fat Frozen Yoghurt with Incorporation of Different Fruits: Fruit flavoured frozen yoghurt mix was prepared by using skim milk standardization of fat 0.5%, 1.0%, 1.5% and 2.0%, and 12% milk SNF (solid not fat) with the addition of 12% sugar and 0.2% stabilizer and emulsifier. The mix was homogenized, pasteurized at 85^oC and was cooled 42^oC to 43^oC. Yoghurt starter culture was added at a ratio of 2% and mix was incubated at 42^oC until desired titratable acidity was reached 0.4% to 0.5%. Then mix was cooled to 5^oC. Ageing of mix was done at 5^oC for 3-4 hours. Then different fruit pulps (Banana, Lychee & Mango) in various ratios (5%, 10% & 15%) were mixed in yoghurt and freezed in batch freezer at -4^oC to -5^oC. Packaging and hardening were followed using standard procedure as prevailed in the market.

2.3 Chemical Analysis

Moisture: The moisture percentage in frozen fruit mix yoghurt was determined by over drying method as per the procedure given in Association of Analytical chemist ^[6].

Total Solids: The total solids in frozen mix yoghurt were determined gravimetrically as per the procedure for milk laid down ^[7].

Acidity: Titratable acidity of frozen mix yoghurt samples was determined by titration method as per procedure laid down ^[7].

Protein percent: The Protein content of frozen mix yoghurt was determined by Kjeldahl method as per the procedure given in Association of Analytical chemist ^[6].

Carbohydrate percent: The Carbohydrate was calculated by subtracting sum of the Moisture, Protein, Fat and Ash from 100.

Ash percent: The ash content in frozen mix yoghurt was determined by charing method as per the procedure given in Association of Analytical chemist ^[6].

Fat Percent: The Fat percent in frozen mix yoghurt was determined by Gerber method as per the procedure given ^[8].

pH: The pH of frozen mix yoghurt was determined by digital pH meter.

2.4 Statistical Analysis: The data obtained were statistically analyzed by using factorial design and critical difference (C.D.) technique ^[9].

3. Results and Discussion

The data related with chemical properties i.e. moisture, fat, total solids, acidity, protein, carbohydrate and ash for the different fruit pulp based frozen yoghurt prepared by different concentration of Banana, Lychee and Mango pulp in 5%, 10% and 15% respectively are included in table. There were variations in the results alone and in combination of different treatments. The highest moisture content was recorded in the treatment F1M3 80.71 and the lowest moisture content was F4B3 77.33. It is might be due to the addition of fruit and amount of pulp as it decreases the TS of frozen yoghurt and therefore increases the moisture content. The ascending range of treatments were F4B3<F4B2<F4B1<F4L1<F4M1<F4L2<F3B3<F4M2<F4L3<F3B2 <F4M3 <F3B1 <F3L1 <F3M1<F3L2<F2B3<F3L3<F3M2<F2B2<F3M3<F2B1<F2L1<F2M1<F2L2<F1B3<F2L3<F2M2<F1B2<F2M3<F1B1<F1L1<F1L2<F1M1<F1L3<F1M2<F1M3. The highest total solid content was recorded in the treatment F4B3 22.67 and the lowest total solid content was F1M3 19.29. The addition of fruit pulp increases in the moisture content and there was decrease in the TS of low fat frozen yoghurt. The ascending value of treatment combination were F1B1<F1M3 <F1M2 <F1L3<F1M1< F1L2 <F1L1<F2M3<F1B2<F2M2<F2L3<F1B3<F2L2<F2M1 <F2L1 <F2B1 <F3M3 <F2B2<F3M2<F3L3 <F2B3 <F3L2<F3M1<F3L1 <F3B1 <F4M3<F3B2<F4L3<F4M2<F3B3<F4L2 <F4M1 <F4L1 <F4B1 <F4B2<F4B3. The highest protein content was recorded in the treatment F1B1 3.12 and the lowest protein content was F4M3 2.85. The ascending order of treatment combinations were F1B1<F4L3<F4M3<F4B3 <F1L3<F1M3<F2L3 <F2M3 <F3L3 <F3M3 <F4L2<F4M2<F1B3<F2B3 <F3B3 <F4B2 <

F1L2 <F1M2<F2L2<F2M2<F3L2 < F3M2 < F4L1<F4M1<F1B2<F2B2<F3B2<F4B1<F1L1< F1M1<F2L1<F2M1<F3L1<F3M1<F2B1<F3B1. The highest acidity content was recorded in the treatment F4L3 0.66 and the lowest acidity content was F1B1 0.25. The increase in acidity of low fat frozen yoghurt might be due to the acidity of banana, lychee and mango fruits. The ascending order of treatment combinations were F1B1<F2B1<F3B1<F4B1<F2B2<F1B2 <F3B2 <F4B2 <F2B3 <F1B3 <F4B3<F3B3<F1M1< F2M1<F1M2<F3M1<F2M2<F2M3<F4M1<F1 M3 <F3M2 <F4M2 <F3M3< F4M3 <F1L1 <F2L1<F3L1<F1L2<F4L1< F2L2<F3L2<F1L3 <F4L2<F2L3<F3L3<F4L3. The highest content of carbohydrate was recorded in the treatment F1B3 15.68 and the lowest carbohydrate content was F4M1 14.64. The ascending order of treatment combinations were F1B1<F2M1 <F3M1 <F4M1<F2M2<F3M2<F4M2<F2M3 < F3M3<F4M3<F2L1<F3L1<F4L1<F1M1<F1M2 <F1M3<F2L2<F3L2<F4L2<F1L1<F2L3<F3L3 <F4L3<F1L2<F1L3<F2B1<F3B1<F4B1<F2B2 <F3B2<F4B2<F1B2<F2B3 F3B3<F4B3<F1B3. The addition of fruit caused increase in carbohydrate content of frozen yoghurt. There were differences in the protein, ash and pH content of different treatment combinations in experimental low fat fruits mix frozen yoghurts. The highest ash content was recorded in the treatment F1B1 to F3B3 0.72 and the lowest ash content was F4M3 0.66. The ascending order of treatment combinations were F4L3 <F4M3

<F4L2<F4M2<F1L3<F2L3< F3L3<F4L1 < F1M3 < F2M3 <F3M3<F4M1 < F1L2 <F2L2 <F3L2 <F1M2<F2M2<F3M2<F4B1<F4B2 < F1L1<F2L1<F3L1<F1M1<F2M1<F3M1< F4B3 <F1B1 < F1B2 <F1B3 <F2B1 <F2B2 <F2B3 <F3B1<F3B2<F3B3. The highest fat content was recorded in the treatment F4L1 1.73 and the lowest fat content was F1M3 0.42. The ascending order of treatment combinations were F1B3<F1M2<F1M3<F1B1<F1B2<F1M1 <F1L1 <F1L2<F1L3<F2M3<F2B3<F2L3<F2M2<F2B2 <F2L2<F2B1<F2L1<F2M1<F3M3<F3B3<F3L3 <F3M2<F3B2<F3L2<F3M1<F3B1<F3L1<F4B3 <F4M3<F4L3<F4M2<F4B2<F4L2<F4B1<F4M 1<F4L1. The highest pH content was recorded in the treatment F1M1 5.90 and the lowest pH content was F4L3 5.73. The ascending order of treatment combinations were F4B3<F4L3 <F3B3 <F3L3 <F1B3<F2B3<F2L3 <F1L3 <F4B2 <F4L2 <F2B2 <F3B2<F3L2 <F1B2 < F1L2 < F2L2 <F4B1 <F4L1 <F2B1<F3B1<F1B1<F3L1 < F1L1<F2L1<F4M1<F4M2<F3M1 < F3M2 <F3M3 <F4M3<F2M1<F2M2<F2M3 <F1M1 <F1M2 < F1M3. It showed that addition of fruit and amount of pulp increased the acidity of fruit mix frozen yoghurt. It might be due to the acidity content of fruits which were added in flavoured frozen yoghurt. As exhibit in table, the acidity of the lychee was higher than the mango and banana, therefore, when lychee was added to the yoghurt the acidity of yoghurt mix with lychee was increased compared to mango and banana fruit mix pulp yoghurts.

Table: Chemical property of frozen mix yoghurt prepared with different combination of fruits and fat in per cent except pH.

Treatments	Moisture	Total Solids	Protein	Acidity	Carbohydrate	ASH	FAT	pH
F1B1	80.11	19.89	3.12	0.25	15.08	0.72	0.44	5.84
F1B2	79.9	20.1	3.03	0.32	15.39	0.72	0.44	5.8
F1B3	79.7	20.3	2.95	0.38	15.68	0.72	0.43	5.76
F2B1	79.26	20.74	3.12	0.26	14.99	0.72	0.87	5.83
F2B2	79.08	20.92	3.03	0.29	15.31	0.72	0.85	5.79
F2B3	78.91	21.09	2.95	0.35	15.61	0.72	0.83	5.76
F3B1	78.41	21.59	3.12	0.27	14.99	0.72	1.3	5.83
F3B2	78.26	21.74	3.03	0.34	15.31	0.72	1.26	5.79
F3B3	78.12	21.88	2.95	0.39	15.61	0.72	1.22	5.75
F4B1	77.55	22.45	3.03	0.28	14.99	0.7	1.72	5.82
F4B2	77.44	22.56	2.95	0.34	15.31	0.7	1.67	5.78
F4B3	77.33	22.67	2.87	0.38	15.61	0.71	1.61	5.74
F1L1	80.41	19.59	3.11	0.55	14.81	0.7	0.45	5.84
F1L2	80.47	19.53	3.02	0.57	14.88	0.69	0.45	5.8
F1L3	80.52	19.48	2.93	0.61	14.95	0.68	0.45	5.77
F2L1	79.56	20.44	3.11	0.56	14.73	0.7	0.87	5.84
F2L2	79.65	20.35	3.02	0.58	14.8	0.69	0.86	5.8
F2L3	79.74	20.26	2.93	0.63	14.87	0.68	0.84	5.76
F3L1	78.7	21.3	3.11	0.56	14.73	0.7	1.3	5.83
F3L2	78.83	21.17	3.02	0.6	14.8	0.69	1.27	5.79
F3L3	78.95	21.05	2.93	0.64	14.87	0.68	1.23	5.75
F4L1	77.85	22.15	3.02	0.57	14.73	0.68	1.73	5.82
F4L2	78.01	21.99	2.93	0.62	14.8	0.67	1.68	5.78
F4L3	78.16	21.84	2.85	0.66	14.87	0.66	1.63	5.74
F1M1	80.48	19.52	3.11	0.43	14.74	0.7	0.44	5.89

F1M2	80.6	19.4	3.02	0.44	14.75	0.69	0.43	5.89
F1M3	80.71	19.29	2.93	0.46	14.76	0.68	0.43	5.89
F2M1	79.63	20.37	3.11	0.43	14.66	0.7	0.87	5.88
F2M2	79.78	20.22	3.02	0.45	14.67	0.69	0.84	5.88
F2M3	79.92	20.08	2.93	0.45	14.68	0.68	0.82	5.88
F3M1	78.77	21.23	3.11	0.44	14.66	0.7	1.29	5.87
F3M2	78.96	21.04	3.02	0.47	14.67	0.69	1.25	5.87
F3M3	79.14	20.86	2.93	0.49	14.68	0.68	1.21	5.87
F4M1	77.92	22.08	3.02	0.45	14.66	0.68	1.72	5.86
F4M2	78.14	21.86	2.93	0.48	14.67	0.67	1.66	5.86
F4M3	78.35	21.65	2.85	0.51	14.68	0.66	1.61	5.87

4. Conclusion: The results showed a better understanding of chemical properties imparted by the addition of fruits and amount of fruits pulp to the frozen yoghurt. Chemical properties of experimental frozen yoghurt were analyzed for moisture, total solids, protein, acidity, carbohydrate, ash, fat and pH. The results of the present study revealed that the incorporation of mango was better followed by lychee and banana in frozen yoghurt with 0.5%, 1.0%, 1.5% and 2.0% fat. The high valued experimental frozen yoghurt was with the mango pulp at 10% showed exceptional results as compared to other. The results of this study concluded that fruit additives are the better options for increasing frozen yoghurt quality and its acceptability.

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