



Effect of sugar free-low fat levels on chemical composition, melting period and cost of production of softy ice-cream

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ABSTRACT : Low Fat-Sugar Free Softy Ice-cream was prepared in the Dairy Technology laboratory per cent of Department of Animal Husbandry and Dairy Science, Dr. PDKV, Akola. Ice-cream was prepared from different levels of Sugar-Free *i.e.* 1 per cent 3 per cent 5 and 7 per cent which was evaluated for its acceptability by the panel of sensory judges. Acceptable level of 3 per cent Sugar Free Natura was used as base and further fat level treatments were conducted by using 12 per cent 10 per cent 8 per cent 6 per cent and 4 per cent fat for the treatments T₁, T₂, T₃, T₄ and T₅, respectively. Regarding the chemical composition, it was found that maximum titratable acidity (%), fat (%) and added sugar (%) content was recorded in Ice-cream prepared from 12 per cent fat level (T₁) *i.e.* 0.25, 11.99 and 3 per cent, respectively. While maximum total solids and melting period (min) were recorded in ice-cream prepared from 4 per cent fat level (T₅) *i.e.* 37.76 per cent and 34.05 min. 3 per cent Sugar Free Natura (Sucralose) and up to 6 per cent fat level ice-cream was found acceptable which may be beneficial for the people who suffering from diabetic, obesity and vascular cardiac disease. Cost of preparation of Ice-cream was decreased with decrease in fat levels of ice-cream.

KEY WORDS : Low fat, Sugar free natura, Softy Ice-cream, Chemical composition, Melting period, Cost of production

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INTRODUCTION

In the recent past the diseases like obesity, diabetes and cardio vascular have become major health problems in our country. In India, 29.66 per cent people eat out frequently and about 48.14 per cent population consumes high fat diet (Chatterjee, 2007). These habits along with lack of exercise and relaxation have given rise to health problems. Survey conducted by Indian Council of Medical Research (Anonymous, 2001), revealed that 49 per cent of women and 36 per cent of men in urban areas are obese. Obesity is associated with many health implications like hyperlipidimia, hypercholesomia, diabetes, hypertension, cancer and

gallstones (Broomfield *et al.*, 1988; Anonymous, 1985). Obese people need to achieve a negative energy balance to maintain ideal body weights by cutting down their calorie intake. Reduced fat formulations need to be developed for people suffering from cardio vascular diseases which account for around 15 per cent deaths in India and this figure is likely to rise to as high as 40 per cent by 2015 (Anonymous, 2002). Also India harbors the largest population suffering from diabetes (Pradeep *et al.*, 2002; Sahay and Sahay, 2002).

Commercial manufacturing of dieted ice-cream would be of vital importance in India, as it would enable calorie conscious and diabetic people to enjoy it. Considering this view low calorie, sugar free ice-cream were prepared from cow milk and artificial non-calorific sweetener. Which reduces considerable amount of calorie in ice-cream. This sweetener also imparts good taste qualities in ice-cream. Therefore it is the best alternatives to normal ice-cream for the diabetics and VCD's population for enjoying the taste of ice-cream as well as to fulfil the nutritional requirement of health conscious persons.

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MATERIAL AND METHODS

The present investigation on "Chemical composition of low fat-sugar free softy Ice-cream" was carried out in the Department of Animal Husbandry and Dairy Science, Post Graduate Institute, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola.

Ice-cream was prepared as per the procedure described by De and Ray (1982). As per need of treatments, acceptable level of artificial sweetener in softy ice-cream was evaluated in first step (as 1% 3% 5 and 7 % blends) by sensory evaluation. The most acceptable level of 3 per cent artificial sweetener blend was used as base to evaluate the level of fat by sensory evaluation in softy ice cream as, 12 per cent 10 per cent 8 per cent 6 and 4 per cent for the treatments T₁, T₂, T₃, T₄ and T₅, respectively. The standardized cow milk, skim milk powder, milk fat (cream) and stabilizer was used for making of ice-cream mix.

Ice-cream was analyzed for titratable acidity, fat, added sugar and total solids contents as well as melting period was also determined as per BIS specifications. Titratable acidity of Ice-cream was determined as per IS-1479 Part-II (1961). Fat content of Ice-cream was determined by Gerbers method as described IS-1224 Part I (1977). Total solids and added sugar content in Ice-cream was determined as per procedures recommended by BIS in "Handbook of Food Analysis" IS-SP-18 Part 11 (Dairy Product 1981). Melting period of Ice-cream

was determined as per procedure given by Webb and Johnson (1965).

Ice-cream was analyzed for sensory evaluation by offering the product to the team of ten judges. 100 points numeric score card of ice-cream as suggested by Pal and Gupta (1985) was used for judging different quality attributes of ice-cream. The cost structure (Rs./kg) of product was worked out by considering the prevailing retail rates of the ingredients. Data obtained from all five treatments with five replications was statistically analyzed with Completely Randomized Design by adopting standard method of analysis of variance as suggested by Gomez and Gomez (1984).

RESULTS AND DISCUSSION

The results of the present study as well as relevant discussions have been presented under following sub heads:

Chemical composition and melting period of Ice-cream :

The data obtained for chemical composition *i.e.* titratable acidity, fat, added sugar and total solids and melting period were tabulated and presented in Table 1.

Titratable acidity (%) :

It is revealed from Table 1 that, average titratable acidity content of Ice-cream ranged from 0.20 to 0.25 per cent. The ice

Table 1 : Effect on chemical composition and melting period of low fat sugar-free softy ice-cream

Treatments	Chemical composition (%)				Melting period (min.)
	Titratable acidity	Fat	Added sugar	Total solids	
T ₁	0.25	11.99	3.00	37.24	29.70
T ₂	0.24	9.96	2.99	37.44	30.28
T ₃	0.22	7.99	2.98	37.57	32.07
T ₄	0.21	5.97	2.97	37.66	33.60
T ₅	0.20	3.99	2.97	37.76	34.05
S.E. ±	0.004	0.10	0.015	0.14	0.58
C.D. (P=0.05)	0.013	0.31	--	--	1.76

Table 2 : Cost production of low fat sugar-free softy ice-cream (Rs./kg.)

Sr. No.	Particulars	Rate (Rs.)	Treatments									
			T ₁		T ₂		T ₃		T ₄		T ₅	
			Qty.	Amount (Rs.)	Qty.	Amount (Rs.)	Qty.	Amount (Rs.)	Qty.	Amount (Rs.)	Qty.	Amount (Rs.)
1.	Cow milk (ml)	34Rs./lit.	600	20.40	600	20.40	600	20.40	600	20.40	600	20.40
2.	Sugar (g)	140 Rs./100g	30	42	30	42	30	42	30	42	30	42
3.	Cream (g)	180/kg	192	34.56	152	27.36	112	20.16	72	12.96	32	5.76
4.	Skim milk powder(g)	130/kg	173	22.49	213	27.69	253	32.89	293	38.09	333	43.29
5.	Stabilizer (g)	150 Rs./100g	5	2	5	2	5	2	5	2	5	2
6.	Miscellaneous cost (Rs.)	-	-	8	-	8	-	8	-	8	-	8
7.	Labour charges (Rs.)	120 Rs./day.	-	12	-	12	-	12	-	12	-	12
8.	Total production cost		1	141.45	1	139.45	1	137.45	1	135.45	1	133.45

cream in treatment T₁ content maximum percentage of titratable acidity (0.25 %) followed by T₂ (0.20 %), T₃ (0.21 %), T₄ (0.22 %), T₅ (0.23 %). It was observed that the decreased level of fat per cent in ice cream affects on titratable acidity content of ice-cream. Fat level decreased, titratable acidity was also decreased. It was found that in all treatments the effects of fat was significantly at 5 per cent level, these may be due to decrease in fat level and replacement of same by skim milk powder. The results obtained in present study were in agreement with the finding of Chawla and Balachandran (1993) and Wandhekar (2003) who reported that as Fat and SNF content of yoghurt and lassi was responsible for titratable acidity.

Fat (%) :

The ice cream in treatment T₁ has maximum fat per cent *i.e.* 11.99 followed by T₂ (9.96), T₃ (7.99), T₄ (5.97), T₅ (3.99) per cent. Fat content was also found significant at 5 per cent level, these is due to the change in the level of fat as per treatments. Hamilton (1998) reported that milk fat in ice-cream normally ranges from 2.5 to 14 per cent, thus fat content of present study was in the range. Pawar (2011) and Dere (2012) also recorded in fat level up to 8 per cent has non-significant effect on sensory evaluation.

Added sugar (%) :

The average total sugar content of ice-cream ranged from 2.97 to 3.00 per cent. The values obtained for total sugar content of Ice-cream were 3.00, 2.99, 2.98, 2.97 and 2.97 in treatments T₁, T₂, T₃, T₄ and T₅, respectively.

However, above treatments had statistically non-significant influence on the added sugar content. Added sugar content (%) was decreased numerically with decreased in rate of decrease in fat level and increased in the level of skim milk powder to maintain TS. Sugar Free Natura accepted very well in Softy Ice-cream up to 3 per cent level. This results are supported by the results of Yadav (2012), who recorded that Sugar Free Natura can be used for preparation of Shrikhand.

Total solids :

Total solids content was ranges from 37.76 to 37.24 per cent. The values obtained for total solids content of Ice-cream were 37.24, 37.44, 37.57, 37.66 and 37.76 in treatments T₁, T₂, T₃, T₄ and T₅, respectively.

Total solids content in all treatments was found non significant at 5 per cent level of significance. From treatments T₁ to T₅ numerical increase in total solids content was recorded. These may be due to adjustment of fat and skim milk powder levels done for maintenance of average total solid percentage. Tayade (2010), Pawar (2011) and Dere (2012) also noted that use of ingredients added in ice-cream affects the total solids content of ice-cream.

Melting period (min) :

The average melting period of ice-cream was recorded as 29.70, 30.28, 32.07, 33.60 and 34.05 min. for treatments T₁, T₂, T₃, T₄ and T₅, respectively. The treatment T₅ required maximum time for the melting of ice cream (34.05 min) followed by T₄ (33.60 min), T₃ (32.07 min), T₂ (30.28 min), T₁ (29.70 min).

It was observed that the decreased level of fat per cent in ice cream, results in increase in the melting period of ice-cream. This may be due to increase in the level of skim milk powder used for replacement of fat to maintain TS of ice-cream mix. Pawar (2011) and Dere (2012) noted that change in total solids affects melting period of ice-cream.

Economics of ice-cream preparation :

The prevailing cost of each ingredient and services were taken into consideration to calculate the cost of production of ice-cream. Data in respect to cost of production was presented in Table 2.

It is observed from Table 2 that, the cost of production of low fat sugar-free softy ice-cream ranges from 141.45 to 133.45 Rs./kg. The cost of production was found Rs. 141.45, 139.45, 137.45, 135.45 and 133.45 for treatments T₁, T₂, T₃, T₄ and T₅, respectively. It is noticed that the cost of production of ice-cream was decreased due to decrease in the fat levels.

Umesh *et al.* (1989) observed that the cost of ice-cream was reduced due to reduction of milk fat in ice-cream replaced by Vanaspati. Tayade (2010) also noted that average cost of production of ice-cream is directly related to the fat levels. These results supports the trend of present investigation.

Conclusion :

Fat plays important role in the chemical composition, melting period and cost of production of ice-cream. From the present study it is concluded that as fat levels of ice-cream decreased, the content of fat, titratable acidity and added sugar content was also decreased, while the effect on total solids content was recorded non-significantly only numerical increase was found. Melting period of ice-cream was increased due to decrease in fat content of ice-cream. As the fat level was decreased, the cost of production was also decreased. But good acceptable quality ice-cream can be prepared by using 3 per cent artificial sweetener (Natura) and 6 per cent fat and become a best alternative source of ice-cream for calorie conscious and diabetic peoples to enjoy it.

LITERATURE CITED

- Anonymous (1985). NIH consensus development panel: Health implications of obesity. National Institute of Health consensus development conference statement. *Annals. Internat. Med.*, 103-1073.
- Anonymous (2001). India Council of Medical Research annual report.
- Anonymous (2002). India Council of Medical Research annual report.

- Broomfield, P.H., Chopra, R., Sheinbuam, R.C., Bonoris Silverman, G.G., Schenfield, L.J. and Marks, J.W. (1988). Effects of ursode acid and aspirin on the formation of lithogenic bile gallstones during loss of weight. *New Eng. J. Med.*, **319** : 1567.
- Chaterjee, S. (2007). Young India is unfit. In life, Times of India. March 18, pp. 1-4.
- Chawala, A.K. and Balachandran, R. (1993). Studies on yoghurt from buffalo milk: Effect on different levels of fat on chemical, rheological and sensory characteristics. *Indian J. Dairy Sci.*, **46**(5) : 220-223.
- De, S. and Ray, H. (1982). Cited from requirements of dairy processing methods. 5th Short Course, NDRI, Karnal, pp. 23-24.
- Dere, V.D. (2012). Effect of different levels of Turmeric on the quality of Ice-cream. M.Sc. (Ag.) Thesis, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola, M.S. (INDIA).
- Gomez, K.A. and Gomez, A.A. (1984). Statistical procedure for agricultural research. John Wiley and Sons, New York, pp. 241-266.
- Hamilton, P.M. (1990). Ice cream manufacture. *J. Soc. Dairy Technol.*, **43**(1) : 17.
- I.S. - 1479, Part II (1961). Methods of test for dairy industry. Indian Standard Institute, ManakBhavan, NEW DELHI (INDIA).
- IS - 1224, Part I (1977). Determination of fat by Gerbers method. Indian Standard Institute, ManakBhavan, NEW DELHI (INDIA).
- IS - 1981. Hand book of food Analysis, SP- 18 part XI (Dairy Product) Bureau of Indian Standard ManakBhavan 9, Bahadur Shah ZafarMarg, NEW DELHI (INDIA).
- Pal, Dharma and Gupta, S.K. (1985). Sensory evaluation of Indian milk products. *Indian Dairy.*, **37**(10) : 465.
- Pawar, S.S. (2011). Preparation of softy ice cream blended with ginger (*Gingiber officinale*) juice. M.Sc. (Ag.) Thesis, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola, M.S. (INDIA).
- Pradeep, R., Deepa, R. and Mohan, V. (2002). Epidemiology of diabetes in India: current prospective and future projections. *J. Indian Med. Assoc.*, **100**(3) : 144-148.
- Sahay, B.K. and Sahay, R.K. (2002). Lifestyle modification in management of diabetes mellitus. *J. Indian Med. Assoc.*, **100**(3): 178-180.
- Tayade S.S. (2010). Preparation of ice cream blended with custard apple pulp; M.Sc. (Ag.) Thesis, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola, M.S. (INDIA).
- Umesh A.R., Almaram, K. and Jayprakasha, H.M. (1989). Utilization of vanaspati in the preparation of filled soft serve ice cream. *Cheiron.*, **18**(3): 118-123.
- Wandhekar, S.L. (2003). Effect of fat and solids-not-fat on quality of Lassi. M.Sc. (Ag.) Thesis, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola, M.S. (INDIA).
- Webb, Byron H. and Arnold, H. Johnson (1965). Fundamentals of dairy chemistry. The Avi Publishing Company, Inc. Westport : 787-813.
- Yadav, G.K. (2012). Preparation of low calorie, sugar free Shrikhand. M.Sc. (Ag.) Thesis, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola, M.S. (INDIA).

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