

## NUTRITIONAL VALUE OF LOW FAT ICE CREAM

V. Jayalalitha\*, A. Elango, G. Sathiyapriya, B. Balasundaram and C. Naresh Kumar

E-mail: jayav99@gmail.com

Tamilnadu Veterinary and Animal Sciences University  
Chennai, India

**Abstract:** A study was carried out to prepare low fat fibre enriched ice cream by incorporating inulin and fructo-oligosaccharides. Different treatments of fibre enriched ice cream were prepared by incorporating inulin or fructo-oligosaccharides at 3, 5 and 7 per cent levels in two different lots, which were designated as FFIM, LFIM, LFIMI1, LFIMI2, LFIMI3, LFIMF1, LFIMF2 and LFIMF3. Fat and total solids values between different ice cream with a proportional increase to the increase in per cent of inulin and fructo-oligosaccharides. The lowest calorific value was observed in the low fat ice cream with 3% inulin (LFIMI1) and 3% fructo-oligosaccharides (LFIMF1), whereas, the highest calorific value was observed in the full fat ice cream mixes.

**Keywords:** Inulin, Fructo-oligosaccharides, ice cream, low fat.

### Introduction

A typical compositional range for the components used in ice cream mix is milk fat 10-16%, milk solids not fat 9-12%, sucrose 9-12%, stabilizers/emulsifiers 0-0.5%, total solids 36-45% and water 55-64% (Goff, 1997). Fat is the main ingredient in ice cream and the type used is saturated fat. In India, an ice cream has to contain a minimum 10 per cent of butter fat, cream or milk to match food industry specifications (BIS, 1980).

Generally, high dietary fat intake is associated with an increase in the risk of many diseases, such as obesity, some types of cancer, high blood cholesterol and coronary heart disease (Rothstein, 2006). Most of the consumers prefer food products with therapeutic value for their health aspects over its palatability.

Fat replacers have been used to replace fat in food systems due to their properties and the improvement of textural quality of such foods (Akoh, 1998). Fat replacer currently used in low-fat formulation are bulking agents based on carbohydrates, such as cellulose, gum, starch, pectin, maltodextrin and polydextrose (Roland *et al.*, 1998).

Inulin and Fructo-oligosaccharides possess some characteristics of dietary fibre. The physiological actions promoted by fibre addition (Inulin and Fructo-oligosaccharides) in foods include the maintenance of gastrointestinal health, reduction of intestine transit time,

protection against colon cancer, lowering of total and low-density lipoprotein cholesterol in the blood serum, reduction of post prandial blood glucose levels, increase of calcium bioavailability and reinforcement of the immunological system.

Thus, incorporation of dietary fibre would add value to the ice cream not only in terms of variety but also their enhanced healthfulness. Hence, an attempt has been made in the development of low fat fibre enriched ice cream by incorporating dietary fibres like Inulin and Fructo-oligosaccharides with the objectives of preparing low fat fibre enriched Ice cream by incorporating Inulin and Fructo-oligosaccharides and to determine the nutritional value of the product.

## **Materials and methods**

### **Procedure for the preparation of low fat fibre enriched Ice cream**

Low fat Ice cream mixes were prepared by pasteurizing (68<sup>0</sup> C for 30 min) a mix containing skim milk, cream, skim milk powder, sugar, stabilizer and emulsifiers. Fibre enriched ice cream were prepared by incorporating inulin or fructo-oligosaccharides at 3, 5 and 7 per cent levels in two different lots. The mixes were then homogenized at 2000 / 500 psi and ice cream mix were kept for ageing at 4<sup>0</sup> C for 4 hours and for freezing at - 4<sup>0</sup> C. After packing the ice cream were kept for hardening and storage at -23<sup>0</sup> C.

### **Determination of nutritional value of ice cream**

Estimation of fat in ice cream was carried out as per the procedure described in BIS, (1980). Estimation of protein in ice cream was carried out as per the procedure described in AOAC (1995). Lactose content of ice cream was estimated as per the procedure described in BIS, (1980). The total solids of ice cream were determined as per the procedure described in AOAC (1995). Gross energy of different ice cream was estimated using Parr Bomb semi automated calorimeter.

## **Results and Discussions**

### **Chemical composition of different treatment ice cream**

Statistical analysis indicated that there was no significant ( $P > 0.05$ ) difference with reference to protein and lactose in different treatment ice cream. With regard to fat and total solids, there was highly significant ( $P < 0.01$ ) difference was observed. Full fat ice cream showed higher values than low fat ice cream and other different treatment ice cream. No significant ( $P > 0.05$ ) difference was observed among different treatments of ice cream and low fat control ice cream (Table.1). These findings were in accordance with the findings of Akalin and Erisir (2008), who reported that there was no change in fat, protein, lactose and total

solids per cent after addition of inulin or fructo-oligosaccharides in low-fat probiotic ice cream.

### **Calorific value of different treatment ice cream**

There was a highly significant ( $P < 0.01$ ) difference in calorific values between different treatment ice creams. Lowest calorific value was observed in the Low fat ice cream with 3% incorporation of inulin(105.66kcal/g) (LFIMI1), followed by Low fat ice cream with 5% incorporation of inulin (107.33 kcal/g)(LFIMI2) and Low fat ice cream with 3% incorporation of FOS (107.83 kcal/g) (LFIMF1). Highest calorific value (181.33kcal/g) was observed in the full fat ice cream (FFIM) (Table.2).

These findings concurred with that of Aykan *et al.* (2007) who reported that the energy value of ice cream was reduced compared to full-fat ice cream (207 kcal/100g) by 75% for non-fat ice cream, 71% for low-fat ice cream and 41% for light ice cream. Based on certain calculations, Roberfroid *et al.*(1993) opined that the caloric value of inulin and oligofructose should be between 1.1 (4.6) and 1.7 (7.3) kcal/g (kJ/g).

### **Conclusions**

Fat and total solids were increasing directly proportional with addition of inulin and fructo-oligosaccharides. It is concluded that, owing to its lower calorific value and low cost of production, ice cream with fructo-oligosaccharides seems to be the ideal choice recommended for production of an acceptable low fat fibre enriched ice cream

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**Table 1: Chemical composition of different treatments of icecream**

Treatment Ice cream mix	Chemical constituents (Mean $\pm$ SE) <sup>@</sup>			
	Fat	Protein	Lactose	Total Solids
FFIM	9.80 <sup>a</sup> $\pm$ 0.025	2.90 <sup>a</sup> $\pm$ 0.036	5.20 <sup>a</sup> $\pm$ 0.036	35.85 <sup>a</sup> $\pm$ 0.042
LFIM	3.10 <sup>b</sup> $\pm$ 0.036	2.95 <sup>a</sup> $\pm$ 0.034	5.26 <sup>a</sup> $\pm$ 0.042	33.83 <sup>b</sup> $\pm$ 0.080
LFIMI1	3.13 <sup>b</sup> $\pm$ 0.055	2.90 <sup>a</sup> $\pm$ 0.044	5.16 <sup>a</sup> $\pm$ 0.033	33.90 <sup>b</sup> $\pm$ 0.036
LFIMI2	3.06 <sup>b</sup> $\pm$ 0.071	2.91 <sup>a</sup> $\pm$ 0.030	5.18 <sup>a</sup> $\pm$ 0.040	33.93 <sup>b</sup> $\pm$ 0.033
LFIMI3	3.05 <sup>b</sup> $\pm$ 0.034	2.93 <sup>a</sup> $\pm$ 0.033	5.18 <sup>a</sup> $\pm$ 0.040	33.88 <sup>b</sup> $\pm$ 0.047
LFIMF1	3.14 <sup>b</sup> $\pm$ 0.030	2.93 <sup>a</sup> $\pm$ 0.033	5.18 <sup>a</sup> $\pm$ 0.030	33.86 <sup>b</sup> $\pm$ 0.042
LFIMF2	3.10 <sup>b</sup> $\pm$ 0.036	2.95 <sup>a</sup> $\pm$ 0.034	5.16 <sup>a</sup> $\pm$ 0.021	33.95 <sup>b</sup> $\pm$ 0.022
LFIMF3	3.13 <sup>b</sup> $\pm$ 0.055	2.93 <sup>a</sup> $\pm$ 0.033	5.18 <sup>a</sup> $\pm$ 0.030	33.90 <sup>b</sup> $\pm$ 0.036
<b>F-value</b>	<b>2680.5**</b>	<b>0.32<sup>NS</sup></b>	<b>0.84<sup>NS</sup></b>	<b>230.67**</b>

**Table 2: Calorific values (kcal / 100 g) of different treatment ice cream**

Treatment Ice cream mix	Mean $\pm$ SE	F – value
FFIM	181.33 <sup>a</sup> $\pm$ 0.494	<b>4006.09**</b>
LFIM	126.50 <sup>b</sup> $\pm$ 0.428	
LFIMI1	105.66 <sup>g</sup> $\pm$ 0.210	
LFIMI2	107.33 <sup>f</sup> $\pm$ 0.333	
LFIMI3	110.33 <sup>e</sup> $\pm$ 0.210	
LFIMF1	107.83 <sup>f</sup> $\pm$ 0.307	
LFIMF2	114.83 <sup>d</sup> $\pm$ 0.477	
LFIMF3	125.33 <sup>c</sup> $\pm$ 0.557	

FFIM - Full fat ice cream mix ; LFIM - Low fat ice cream mix; LFIMI1 - Low fat ice cream mix with incorporation of 3% inulin; LFIMI2 - Low fat ice cream mix with incorporation of 5% inulin; LFIMI3 -Low fat ice cream mix with incorporation of 7% inulin; LFIMF1 -Low fat ice cream mix with incorporation of 3% FOS; LFIMF2 -Low fat ice cream mix with incorporation of 5% FOS; LFIMF3 -Low fat ice cream mix with incorporation of 7% FOS.