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EFFECT OF FAT REPLACEMENT BY FIG ADDITION ON ICE CREAM QUALITY

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ABSTRACT

Fig ice cream samples having 10, 8, 6 and 4% milk fat were prepared using 20% figs paste. Plain ice cream having 10% milk fat was kept as reference standard. Ice cream was analyzed for physico-chemical and sensory characteristics at 0, 10, 20, 30 and 40 days of storage. Addition of the figs decreased the overrun, meltdown, moisture, pH, MSNF, lactose and sucrose while increased the standup time, total solids, protein, acidity and ash contents of the ice cream significantly. However, it had no effect on fat contents. Fat replacement resulted in decreasing standup time, meltdown and pH of the ice cream while ash, MSNF and lactose contents increased significantly. Storage had significant effects on overrun, standup time, meltdown, moisture, total solids, pH, acidity and lactose contents. On sensory evaluation, the highest scores were awarded to the fig ice cream having 10% milk fat followed by fig ice cream samples having 8 and 6% fat contents, respectively. There was a progressive deterioration in all sensory parameters but non significant effect of storage on overall acceptability was observed. It was found that half of the milk fat can be replaced by the addition of figs in ice cream preparation without altering its physico-chemical and sensory characteristics.

KEYWORDS: *Ice cream; Figs; Fat replacement; Physico-chemical; Sensory quality.*

INTRODUCTION

Being rich in fat, ice cream is an excellent source of food energy, while high intake of dietary fat is associated with increased risk of health hazards. That is why consumers demand is increasing for low fat ice cream made with value added ingredients such as fruits and nuts. To meet the demands, the dairy industry has developed a variety of fat-free ice cream products without altering the sensory characteristics (Shakeel et al., 1994). Fat plays an important role in the stabilization of the ice cream structure, as partially coalesced fat is mainly responsible for stabilizing the air bubbles and the foam structure (Koxholt et al., 2001). As milk fat is substituted with fat replacers, both the texture and flavour profile of ice cream may change (Prindiville et al., 2000). In attempts to provide desirable flavour and texture characteristics of full fat ice

cream, manufacturers substitute carbohydrates and protein based fat replacers for milk fat (Welty et al., 2001). Among the various fat replacers, dried fruit-based fat replacers produced from raisins, figs and plums provide moisture, rich texture and sweetness in food products (Giese, 1996). Dried figs are fat free, sodium free and like other plant foods, cholesterol free. Figs puree provides richness and mouth feel in ice cream that is why; it can be used as both sweetness and fat substitute (CFAB, 2002). Dried figs contain 49% sugar, 12% dietary fiber, 0.5% fat, 3% protein and large amount of vitamins and minerals (CFAB, 2002). This excellent nutritional profile and multifunctional properties of figs can be utilized in the preparation of ice cream, rich in nutrients and having unique distinct flavour and colour.

Keeping in front the consumers demand for fat substitution with natural ingredients and nutritional importance of figs, this research project was designed primarily to examine the effects of fat replacement by the addition of figs paste on the ice cream quality.

MATERIALS AND METHODS

UHT milk and cream, dried figs and other ingredients were purchased from local market. The dried figs were socked in warm water and blended with milk to obtain homogeneous paste. After various preliminary trials with different levels of figs and their sensory evaluation by a panel of judges, the 20% (of total ice cream mix) was finalized. Keeping the amount of figs constant and varying the fat contents, the following treatments of ice cream were prepared:

T0 Ice cream without fruit having 10% fat (control sample)
T1 Fig ice cream with 10% fat T2 Fig ice cream with 8% fat
T3 Fig ice cream with 6% fat
T4 Fig ice cream with 4% fat

Preparation and storage of ice cream.

Weighed dry ice cream ingredients were mixed with the liquid material by constant mechanical stirring. The prepared ice cream mix was pasteurized at 720 C for 30 min and then homogenized by using high speed homogenizer. After homogenization the figs paste was added to the mix. The material was kept for 5 to 6 h for ageing at 40 C. The ice cream was frozen at a temperature of –1 to –90 C along with the whipping of air into the mix by agitation in hand operated ice cream freezer (machine). The ready ice cream was filled in 100 mL disposable cups and kept in the hardening unit at –300 C for 24 h. The prepared ice cream was stored at –250 C in a freezer for 40 days.

Physico-chemical and sensory evaluation.

Ice cream samples were analyzed at 0, 10, 20, 30, and 40 days of storage for Physico-chemical and sensory quality. Overrun was estimated according to the method described by Varnam and Sutherland (1994), while standup time and meltdown according to Bhandari (2001). Methods given by Kirk and Sawyer (1991) were applied to determine moisture, MSNF and acidity. Protein, ash and total solids were calculated according to AOAC (1990). Digital pH meter was used to note the pH of ice cream (AOAC, 1990). Gerber method (Davide, 1977) was applied for fat determination whereas lactose and sucrose contents were estimated as described by Lees (1971). Sensory evaluation was carried out using 9-point hedonic scale (Larmond, 1977). The results obtained were statistically analyzed as described by Steel et al. (1996).

RESULTS AND DISCUSSION

Physico-chemical analysis of ice cream overrun. The highest overrun was observed in control sample (without fig). The addition of figs lowered the overrun values significantly. However, fat replacement had non significant effect (Table I). During storage, overrun values of all the samples decreased significantly (Table II).

Standup time. Addition of figs increased the standup time of the ice cream. However, as the milk fat was replaced, the standup time decreased gradually (Table I). The highest value was noted for fig ice cream having 10% milk fat while the ice cream without fruit showed the lowest standup time. During storage, significant increase in standup time was observed (Table II).

Meltdown. Addition of figs as well as replacement of fat decreased the meltdown time of the ice cream

gradually, with the highest value for plain ice cream sample (reference standard) (Table I). The reason is that the melt down of ice cream is influenced by its composition and additives and by fat globule size (Koxholt et al., 2001). Storage also significantly decreased the meltdown time of the ice cream (Table II). Maximum decrease was noted in control sample

Moisture. Treatments and storage had highly significant effects on moisture contents of ice cream. The highest moisture contents were found in ice cream sample without fruit (control sample). The fig addition resulted in decreasing the moisture level; however, fat replacement had no effect (Table I). Moisture contents showed a decreasing trend throughout the storage (Table II).

Total solids. Total solids play an important role in the overall quality and appearance of ice cream. Due to addition of figs paste, total solids of ice cream increased significantly, whereas different levels of milk fat had almost non significant effect (Table I). Storage gradually increased the solid contents due to decrease in moisture level in all the samples (Table II).

Fat. Ice cream without fruit (control) and Fig ice cream with full fat had the highest fat contents while other samples showed gradually lower levels according to the fat replacement (Table I). Storage had non significant effect on fat contents of all the samples (Table II). No change in fat upon storage was also reported by Gwiszczynska and Kaluziak (1971).

Protein. Being rich in protein, figs addition increased the protein contents significantly as compared to plain ice cream. However, fig ice cream samples with varying fat levels had non significant differences in their means (Table I). During storage non significant changes occurred in protein contents of ice cream (Table II).

pH. The highest pH was noted for plain ice cream (control sample) while fig ice cream had comparatively lower pH. The pH decreased gradually with decreasing fat contents (Table I). The results showed that there was a gradual decrease in pH throughout the storage period (Table II).

Acidity. Addition of figs resulted in significant increase of acidity; however, fat replacement had almost non significant effect. The lowest acidity was found in ice cream sample without fruit (reference standard) (Table I). During storage acidity increased significantly in all samples (Table II).

Table I. Comparison of means for physico-chemical analysis as influenced by treatments