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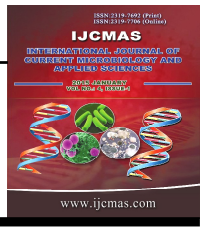

Original Research Article

Utilization of guar gum as stabilizer in ice cream

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A B S T R A C T

Guar gum was isolated and purified by wet processing method. Purified guar gum was utilized as a stabilizer in ice cream. Guar gum was used as a stabilizer in ice cream at level of 0.1, 0.2, 0.3 and 0.4 per cent. The effect of various concentration of guar gum on sensory properties of ice cream was studied. The study shows that guar gum can be successfully added in ice cream at the concentration of 0.2 per cent. As the percentage of guar gum increases in ice cream samples, stiffness in ice cream also goes on increasing. Upon utilization of higher concentration of guar gum in ice cream, body and texture properties of ice cream gets affected and low quality ice cream was produced. The ice cream prepared with the incorporation of guar gum at 0.2% got the highest overall acceptability. Thus good quality ice cream was produced by incorporation of 0.2 per cent of guar gum.

Keywords

Guar gum, Hydrocolloid, Ice cream, Sensory properties, Stabilizer

Introduction

Guar gum is a galactomannan polymer extracted from the seed of *Cyanmopsis tetragonolobus* which has been cultivated for centuries by the farmers in semi-desert regions of northwest India. It has an approximate 1: 2 ratio of D-galactose to D-mannose (Fox, 1997). Guar gum is one of the important gum being used as stabilizer in ice cream manufacturing. Guar gum is a complex carbohydrate obtained from a legume crop, guar. This is widely grown in India and Pakistan and is very much cheap (Ruterberg and Molar, 1981).

Guar gum (galactomannan) is a plant polysaccharide with extensive applications in food, paper, textile and petroleum industries. The main advantages for using guar are its low cost, easy availability and capacity to form viscous solutions and gels at low concentration (Nandhini, 2010). Guar gum is one of the most extensively investigated polysaccharides; its rheological behaviour enables it to contribute to good sensory qualities, including mouth-feel and flavour release in ice cream (Bhandari 2001). Ice cream obtained by fat-protein emulsions contains some additives which are frozen with or without air. It is worth noting the important role of gums as stabilisers in the preparation of those products (Flack, 1981). They retard ice

crystal growth and improve body, texture and melting properties (Bassett, 1983). The demand is increasing for low fat ice cream made with value added ingredients such as fruits and nuts (Shakeel et al., 1994). The quantity of stabilizers and emulsifiers required for different variety of ice cream differs based on the total solids, fat content, desired over run etc (Arbuckle, 1997).

Ice cream is a frozen dessert made from dairy products. It is a complex colloidal system consisting of air cells, ice crystals and fat droplets dispersed into serum phase (Marshell et al., 2003). Standard ice cream contains an equal volume of mix and air, or an over-run of 100%. Premium ice cream, however, has an over-run of only 80% to give it a richer, more-creamy mouth feel (Gunther, 1997). 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).

Materials and Methods

Materials

Guar gum was obtained from guar seeds by simple wet processing method. The other materials used were Milk, Cream, Skim Milk Powder, Sugar, Strawberry flavor, Chemicals and Glasswares.

Methods

Standardization of extraction process for guar gum

The isolation and purification of galactomannan from the guar seeds were achieved by simple wet processing method developed in this laboratory (Rodge *et al.*, 2006a). In typical experiment, seeds (500 g) of guar were suspended in aqueous alkaline solution (1.5 per cent, w/v) containing urea (0.05 per cent, w/v) followed by vigorous boiling at 98^{o}C for 5 min.

The resultant dehusked seeds were thoroughly washed with tap water on a coarse sieve till the seeds were completely free from husk or hull. It was then subjected to sun drying or cabinet drying. The dried dehusked seeds were grinded at low speed to achieve the separation of gum splits and germ meal, based on the principle of the nature of gum splits and germ meal viz. hardness and brittleness of gum splits and germ meal fractions, respectively.

The gum splits obtained from the guar seeds were pulverized to 200 meshes and designated as Crude Galactomannan Gum. Further purification of galactomannan was done by suspending it in distilled water followed by vigorous stirring to achieve viscogenic colloidal solution. Preferential fractionation of the galactomannan gum was achieved by adding isopropanol or ethanol at different concentration levels (75 per cent, v/v). The resultant major gum fraction from the guar seeds was recovered quantitatively by centrifugation (5000 x g, 15 min). It was followed by drying in cabinet dryer. The yield of the purified galactomannan was found to be 31.52 per cent, on whole seed basis.

Different treatments prepared with incorporation of Guar gum at varying Concentrations

Ice cream was prepared by incorporation of various four different concentration of guar gum. Carboxy methyl cellulose was used as the stabilizer in control sample of ice cream.

Guar gum was incorporated in ice cream at level of 0.1, 0.2, 0.3 and 0.4 per cent is given in Table 1.

Preparation of Ice cream with incorporation of guar gum

There are various steps involved in the manufacture of ice cream. Knowing a mix specification, mix calculations are performed to determine the amounts of desired ingredients needed to formulate the mix. Mix processing begins with the assembly of the necessary ingredients in the desired amounts.

Generally this assembly requires weighing the ingredients or if liquid ingredients are used they are metered. Meters rely on knowing the density or the specific gravity of the ingredient and these values are highly temperature dependent. In most small scale operations weighing is the method of choice. Preparation of Ice cream with incorporation of guar gum is given in figure 1 **(**Rodge *et al*., 2006b**)**

Results and Discussion

Sensory evaluation of Guar Gum Incorporated Ice Cream

The sensory/organoleptic evaluation of Guar Gum Incorporated Ice Cream was carried out by using 9 point hedonic scale with 8 semi trained judges comprised of postgraduate students and academic staff members of the faculty who had some previous experience in sensory evaluation of different products. The panel members were requested in measuring the terms identifying sensory characteristics and in use of the score. Judgments were made through rating products on a 9 point Hedonic scale with corresponding descriptive terms ranging from 9 'like extremely' to 1 'dislike extremely' (Peryam and Shapiro, 1955).

The prepared product was evaluated for its taste, appearance, flavor, texture and overall acceptance. Sensory evaluation of guar gum incorporated ice cream is given in Table 2.

Guar gum stabilizer can afford functionalities that include increased stiffness; provide a slower and more uniform meltdown; enhance whip ability during aeration; prevent lactose crystallization; prevent shrinkage during storage; stabilize the emulsion; contribute to body, texture and creaminess. The ice cream prepared with the incorporation of guar gum at 0.2% got the highest overall acceptability by the panel members than other treatments. Thus good quality ice cream was produced by incorporation of 0.2 per cent of guar gum.

Table.1 Different treatments prepared with incorporation of Guar gum at varying Concentrations

Sr.No	Sample Code	Guar gum Conc. (in %)	Ice Cream Mix Qty. in Litres
1.	C(Control)	Nil	1 Lit.
2.	T_1	0.1%	1 Lit.
3	T_2	0.2%	1 Lit.
4.	T_3	0.3%	1 Lit.
5.	T_4	0.4%	1 Lit.

Table.2 Sensory evaluation of guar gum incorporated ice cream

Sample	Colour and appearance	Body and texture	Flavor	Taste	Overall Acceptability
C	8.2	8.3	8.4	8.8	8.4
T_1	8.1	8.5	8.6	8.7	8.5
T_2	8.4	8.9	8.8	8.9	8.7
T_3	7.7	7.5	7.4	7.4	7.5
T_4	7.3	7.2	7.0	7.1	7.1
Mean	7.94	8.08	8.04	8.18	8.04
S.E.	0.121	0.088	0.081	0.079	0.099
C.D. at 5%	0.387	0.282	0.257	0.251	0.317

* Each value was an average of three determinations

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