

Effect of Different Concentrations of Strawberry Pulp on the Properties of Ice Cream

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ABSTRACT

An experiment was conducted to improve physical, chemical and particularly sensory properties of strawberry pulp in ice cream. Ice cream with 10, 15, 20 and 25% strawberry pulp was prepared. Strawberry flavor ice cream (without strawberry pulp) was kept as control treatment. Ice cream was analyzed for physico-chemical and sensory characteristics at 0, 10, 20, 30 and 40 days of storage. Overrun, standup time, meltdown, moisture, ash, total solids, MSNF, sucrose ascorbic acid, pH and acidity were effected significantly by ice cream treatments as well as storage. While protein, fat and lactose have shown significant difference in case of treatments and non-significant difference for storage. In organoleptic evaluation, the highest score were awarded to the ice cream with 15% strawberry pulp followed by ice cream with 20% strawberry pulp. The ice cream samples without strawberry pulp were liked least. There was a progressive deterioration in all sensory parameters during storage. It was found that ice cream could be prepared with exotic flavor and taste by using strawberry fruit color and aroma.

Key Words: Strawberry; Ice cream; Pulp

INTRODUCTION

Ice cream is a delicious, wholesome, nutritious frozen dairy product. It provides about 4.9% protein, 13% fat and 20.3% carbohydrates. One hundred grams of ice cream give about 214 calories to our body. The annual output of ice cream industry throughout the world is more than 800 million liters (Hyde & Rothwell, 1972).

The earlier use of fruit purees in sorbet has been diversified into ice cream (Friedrich, 1990). The development of new varieties of ice cream is based on either milk, cream and whey concentrates and flavored with fruit and vegetable extract (Olenev, 1989). Frozen and sugar preserved purees have also been used in ice cream manufacture (Anon, 1981).

Strawberry is a small, juicy, very flavorful and sweet in taste fruit. It is an excellent source of Vit. C. It is thought to have tonic, depurative, diuretic, remineralizing and astringent properties (Johnson & Peterson, 1974). As for as their sweet taste were not enough, strawberries are a natural health food. Ounce for ounce strawberries has more vitamin C than citrus fruits. A cup of strawberries have more vitamin C as a medium orange. It is a rich source of iron, potassium and fiber. They have recently been found to be great source of elagic acid, which is a powerful antioxidant and cancer-fighting agent. Strawberry ice cream is a favorite amongst goblins and all other supreme beings. Rumor has it that its consumption confers great powers; it may simply be that only those puissant enough to taste the universe itself dare feast upon such a delicacy. Strawberry ice cream, despite of its wondrous powers, is relatively simple to make. In the view of the facts stated above, it is important to conduct studies to produce good quality ice cream using

fresh strawberries. It was aimed at exploiting the exotic flavor and taste and enriching the product with strawberries to cope with the mineral and vitamins requirements of the body.

MATERIALS AND METHODS

Raw materials including milk, cream, skim milk powder, sugar, strawberry flavor, red color, CMC (Carboxymethyl Cellulose) and fresh strawberries were purchased from local market. Raw milk was tested for fat, SNF, acidity and pH following the methods of Kirk and Sawyer (1991). After washing with water, strawberries were treated in steam jacketed vessel at 80°C for 1 minute and then the pulp was extracted by means of a fine pulper in order to get homogenous textured pulp and then cooled at room temperature. The citric acid, potassium metabisulphite at the rate of 0.08%, was added to the pulp. The pulp was filled to previously sterilized plastic can, which was then stored in deep freezer for later use.

Different treatments used in study

Treatments	Strawberry pulp (%)
T ₀	Ice cream with strawberry flavor
T ₁	Ice cream with strawberry pulp 10%
T ₂	Ice cream with strawberry pulp 15%
T ₃	Ice cream with strawberry pulp 20%
T ₄	Ice cream with strawberry pulp 25%

For ice cream preparation, all the ingredients were weighed using triple beam balance according to the formulation. All the dry ingredients as well as liquid ingredients were manually mixed thoroughly by stirring until a uniform mixture resulted. The ice cream mix was

pasteurized at 72°C for 30 minutes as described by Marshall and Arbuckl (1996) to destroy pathogenic organisms. After pasteurization, the mix was homogenized in electric homogenizer as described by Berger and White (1976). The fat globules were reduced in size by homogenization in order to obtain a uniform dispersion of the fat. After homogenization, strawberry pulp was added according to treatment. The mix was cooled down to 4°C immediately in a deep freezer and stored at 4°C for ageing. Ageing also increased the viscosity of the mix. After ageing, color and flavor were added. After ageing, the mix was frozen at -5°C in the freezing chamber of electrically operated batch type ice cream machine. When the desired consistency had been attained, the product was filled into disposable paper cups of 100 ml. capacity. The cups were immediately transferred to the hardening unit maintained at -25°C to -30°C and the ice cream was kept for 24 hours. These cups were then transferred to deep freezer at -20°C. The storage studies were conducted for a period of 40 days at 10 days intervals. Physico-chemical analysis including over-run, stand up time, melt down, fat, moisture, protein, ash, total solids, MSNF, lactose, sucrose, ascorbic acid, pH and acidity was conducted at 0, 10, 20, 30 and 40 days intervals as described in A.O.A.C. (1990). The temperature of the products during storage was maintained at -20°C. All the ice cream samples were organoleptically rated for appearance, taste, flavor, body/texture and overall acceptability by a panel of 5 judges using the 9-point hedonic scale (Larmond, 1977). The data obtained in the research was subjected to statistical analysis as described by Steel *et al.* (1996).

RESULTS AND DISCUSSION

The results of chemical analysis are shown in Table I. pH, Moisture and ash contents has shown significant difference both in case of treatments as well as storage period. Whereas, Fat and protein has shown significant difference in case of treatments while non-significant differences have been obtained in case of storage intervals. Significant decrease in pH and significant increase in acidity is due to presence of ascorbic acid in strawberries.

The results of this study are supported by the findings of Gwischczynska and Kaluziak (1971). They found that pH decreased in all the samples of vanilla ice cream during storage.

Table II shows the effect of treatments on sensory

Table I. Effect of strawberry pulp on chemical composition of ice cream

Treatments	Fat	Protein	Moisture	Ash	pH
T ₁	9.90	4.00b	64.50a	0.616	6.87a
T ₂	9.85	4.07b	63.44b	0.814	6.21b
T ₃	9.60	4.16ab	62.94c	0.831	6.17b
T ₄	9.30	4.27b	62.50d	0.871	6.09b
T ₅	9.10	4.30ab	62.30d	0.881	5.97b

Table II. Effect of storage on chemical composition of ice cream

Days	Fat	Protein	Moisture	Ash	pH
0	9.55	11.208	63.136a	0.803a	6.260a
10	9.71	11.105	62.286b	0.615b	6.163ab
20	9.79	11.153	62.291b	0.614b	6.201ab
30	9.82	11.164	62.054b	0.619b	6.107b
40	9.89	11.119	61.745c	0.620b	6.090b

Table III. Effect of strawberry pulp on organoleptic characteristics of ice cream

Treatments	Appearance	Taste	Flavor	Texture	Overall acceptability
T ₀	5.60d	3.60e	5.10e	5.20d	3.60c
T ₁	7.00c	5.80d	7.80c	5.80c	6.40b
T ₂	8.20b	7.00b	8.60a	8.00a	8.40b
T ₃	8.60a	7.80a	8.20b	8.40a	8.60a
T ₄	5.40d	6.40c	6.80d	6.40b	6.60b

Table IV. Effect of storage on organoleptic quality of ice cream

Days	Appearance	Taste	Flavor	Texture	Overall acceptability
0	6.80	5.60c	7.60a	6.00d	6.60
10	6.80	5.60c	7.40a	6.40cd	6.60
20	7.20	6.20b	7.40a	6.80abc	7.00
30	7.00	6.40ab	7.40a	7.20ab	6.80
40	7.00	6.80a	6.60b	7.40a	6.60

characteristics of the ice cream. The value of appearance, taste, flavor, body/texture and overall acceptability increased with the increasing level of strawberry pulp in the ice cream. Ice cream having 15% strawberry pulp got highest score and minimum was given to ice cream without strawberry pulp.

During storage a slight degradation in sensory quality was observed (Table IV). According to Palich (1994), with the passage of time, sensory quality of ice cream deteriorated. Organoleptic properties of the ice cream decreased with increase in storage time and temperature (Mahran *et al.*, 1987).

CONCLUSIONS

A new variety of ice creams particularly rich in chewy eating sensation and pleasant flavor can be manufactured by utilizing frozen strawberry fruit. Appearance, taste and mouthfeel characteristics of the ice cream improved upon the addition of the fruit. Further research is recommended to establish the conditions for processing of strawberry fruit in different forms and levels of addition in ice cream without compromising the quality of the product.

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