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Preparation of ice cream blended with Cocoa and Sago powder

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Abstract
Ice cream coca powder is one of the most popular dessert options all over the globe liked by people of all age groups. Cocoa originates from beans of the cocoa tree (*Theobroma cacao* L.) and it is an important commodity in the world and the main ingredient in chocolate manufacture. Its value and quality are related to unique and complex flavors. Bulk cocoas (Forastero type) exhibit strong basic cocoa notes, whereas fine varieties (Criollo, Nacional) show aromatic, floral, or smoother flavor characteristics in ice cream. The obtained ice cream made from coca and sago powder is effective in thickness and stability quality. The role of sago powder was as astabilizer. A combination of coca and sago powder was used ratio (1.5:2), (1.5:3), (1.5:4) for different treatment i.e. for the combination was effective in ice cream without affecting the physic-chemical analysis and sensory of formed ice cream. The microbiological analysis was performed to study the consumption quality of the manufactured ice cream. The standard plate count was highest $2.40x10^3$, coli form count was NIL and highest yeast and mould 10 indicating that the product is safe for consumption. According to the analysis, treatment T_2 with 1.5% sago powder and 3% coca powder was found the best among the four.

Keywords: coca powder, sago powder, Ice Cream.

1. Introduction
Ice cream is a frozen food made from milk fat, milk solids-not-fat, sweeteners, and flavorings; a variety of fruits, nuts, and other items also may be added. Ice cream in the United States has a legal definite, which can be found in the Code of Federal Regulations (CFR 2003b), which specifies solids, fat, and air contents. These specifications state that vanilla ice cream must contain a minimum of 10% milk fat by weight, a minimum of 20% milk solids and at least 192g of total food solids per liter of ice cream, with each liter of ice cream weighing a minimum of 540 g. Other ice cream categories exist, such as reduced calorie ice creams, which in the United States must meet the nutrient claims that comply with "reduced fat." (CFR 2003a) These legal requirement soften dictate the types and ratios of ingredients used in frozen desserts as well as some of the processing conditions. Because minimum contents (except air content) normally are stated in the federal requirements, commercial ice creams vary considerably in body, flavor, melt, and texture characteristics. Recent statistics have shown that 61% of all frozen dessert products manufactured in the United States fall into the ice cream category and 26% into the non fat and low fat ice cream category. The remaining portions of frozen dessert products consist of frozen yogurt (5%), water ices (4%), sherbets (3%), and other (1%) categories [International Dairy Foods Association (IDFA) 2002].
Cacao is a top source of antioxidants, and it contains an abundance of magnesium and iron. To make our cacao powder, the finest cacao beans are milled at low temperature to protect the nutrients and flavor. Our cacao powder is a healthy alternative to conventional over-processed “cocoa” used for baking, hot chocolate, desserts and smoothies.
The present study was planned and conducted to evaluate the suitability of sago (tapioca starch) as a functional ingredient in ice cream. In this study an attempt was made to prepare a regular fat (10.0%) ice cream using a combination of sago and whey protein concentrate (WPC-70) as stabilizer and emulsifier respectively and see whether it can compare favourably with premium ice cream. The experimental ice cream (10.0% fat) was compared against two control ice creams, one having 10.0 % fat and other having 14.0% fat using commercial stabilizer (Na-alginate) and emulsifier (glycerol monostearate). The tentative formulation of sago and WPC based ice cream was studied using vanilla as flavouring. Sago and WPC was incorporated in experimental ice cream mix at 1.0 and 0.5% (w/w) respectively.

Sago in combination with WPC helped in imparting desired body and texture, and richness quite similar to premium ice cream. The sensory characteristics of experimental ice cream were at par with those of premium ice cream but significantly greater than those of regular control ice cream. It can be concluded that regular ice cream can be successfully prepared using sago and WPC with sensory characteristics at par to that of premium ice cream. Such ice cream was sensorilys more acceptable than regular ice cream made using commercially available stabilizer and emulsifier.

Nutritional information of sago powder

Characteristics	Amount persent per 100 gram
Carbohydrate	94gm
Protein	0.2gm
Fat	0.2gm
Calcium	10mg
Iron	1.2mg
Potassium	5mg

There are several health benefits of sago powder

- Sago or sabudana is a food which is full of energy and carbohydrates. It is extracted from the centre of sago palm stems in the form of starch.
- Pearl sago is used as one easily digestible non-irritating baby food as well as a food in inflammatory cases.
- Sago grains are about 2mm in diameter. They are source of pure carbohydrate with very little protein, vitamin C, calcium and minerals.
- The main content of sago is carbohydrate and has an ancient history in aiding to certain herbal medicines. Sago along with rice is used to cool the body.
- Various dishes are made from sago as it is easily mixed with wide variety of tastes and spices. However, sago is low in proteins, vitamins and minerals, its combination with other supplements can result into high nutrition and taste.
- Sago food is full of energy, and often served as a food to break the fast. It has high beneficiaries for sick people as a supplement providing enough energy to combat the weakness and ailments.
- In weeks only you can gain weight with the help off sago. People who are suffering from eating disorder or lack of appetite can increase their weight with the help of the rich calories containing in the tapioca.
- Five milligrams of potassium is contained by 100 grams of sago. Potassium is known for improving the circulation of blood and also the whole cardiovascular system.

Materials and Methods
Plan of Work
FCM: Milk was collected from local market of Allahabad.

SMP: Skim milk powder was collected from local market of Allahabad.

CREAM: Cream was collected from local market of Allahabad.

STABILIZER&EMULSIFIER: Stabilizer and emulsifier was collected from local market of Allahabad.

SUGAR:-Sugar collected from local market of Allahabad.

COCOA POWDER: cocoa powder was collected from local market of Allahabad.

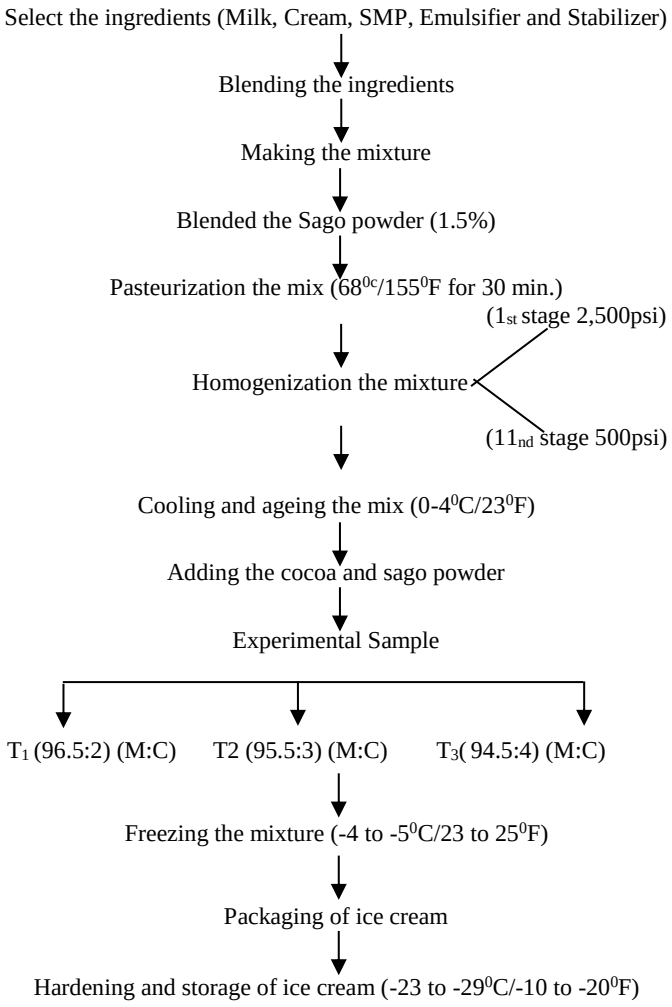
SAGO POWDER: sago powder was collected from local market of Allahabad.

Tretments Combination
Composition of Ice cream mixture control

Parameter	Amount in %
Fat	10
Sugar	15
Milk SNF	12
Stabilizer & Emulsifier	0.5

- T_0-Control prepared from ice cream (100:00:00)
- T_1-Experimental sample prepared from ice cream with sago &cocoa powder (96.5:1.5:2)
- T_2- Experimental sample prepared from ice cream with sago &cocoa powder (95.5:1.5:3)
- T_3- Experimental sample prepared from ice cream with sago &cocoa powder (94.5:1.5:4)

Plan of Work
Flow diagram for manufacturing of sago ice cream blinded with cocoa powder
(Experimental sample)



Average of data obtain on different parameter of fortified cookies by using wheat flour, flaxseed flour and Dried carrot Pomace

The different parameter of control and experimental Ice Cream

Parameter	TREATMENT				C.D VALUE
	T_0	T_1	T_2	T_3	
CHEMICAL ANALYSIS (%)					
Fat	10.11	10.20	10.39	10.52	0.16
Protein	3.54	3.57	3.61	3.64	0.06
Carbohydrates	22.94	23.20	23.47	23.83	0.39
Moisture	62.68	62.25	61.72	61.15	0.55
Total Solids	37.32	37.75	38.28	38.85	0.55
Acidity	0.16	0.18	0.21	0.23	0.02
Ash	0.73	0.77	0.82	0.86	0.04

Organoleptic Scores (9 Point Hedonic Scale)

Colour & appearance	8.15	7.96	7.64	7.83	0.49
Flavour & taste	8.20	7.75	8.13	8.19	0.33
Body & texture	7.96	7.56	7.84	7.56	0.19
Melting resistance	8.10	7.69	7.87	7.68	0.18
Overall acceptability	8.10	7.72	7.88	7.82	0.17

Microbiological Analysis

SPC(10^3cfu/g)	1.60	2.60	2.20	2.40	1.14
Coliform test (10^2cfu/g)	N	N	N	N	-
Yeast&Mould count(10 cfu/g	0.20	0.60	1.00	0.80	1.09

Cost Analysis

Ice cream Rs./Liter	101.70	101.19	101.09	101.29	-

Result and Discussion

Chemical Parameters of Ice Cream

Fat

The highest Fat percentage was recorded in the sample of T_3(10.52),followed byT_2(10.39) T_1(10.20) and T_0(10.11).There was non-significant difference b/w T_0-T_1,T_2-T_3 and there was significant difference b/w the all treatment.

Protein

The highest Protein percentage was recorded in the sample of T_3 (3.64), followed byT_2 (3.61) aT_1 (3.57) and T_0(3.54). There was non-significant difference b/w T_0-T_1, T1-T_2, T2-T_3 and there was significant difference b/w the all treatment.

Carbohydrate

The highest Carbohydrate percentage was recorded in the sample of T_3 (23.83), followed by T_2 (23.47), T_1 (23.20) and T_0 (22.94). There was non-significant difference b/w T_0-T_1, T_1-T_2 T_2-T_3 and there was significant difference b/w the all treatment.

Moisture

The highest Moisture percentage was recorded in the sample of T_0 (62.68), followedbyT_1 (62.25) T_2(61.72) and T_3(61.15). There was non-significant difference b/w T_0-T_1, T1-T_2 and there was significant difference b/w the all treatment.

Total Solids

The highest Total Solid percentage was recorded in the sample of T_3 (38.85), followedbyT_2 (38.28), T_1 (37.75) and T_0(37.32). There was non-significant difference b/w T_0-T_1, T_1-T_2 and there was significant difference b/w the all treatment.

Acidity

The highest mean acidity percentage was recorded in the sample of T_3 (0.23), followedbyT_2 (0.21), T_1 (0.18) and T_0 (0.16). There was non-significant difference b/w T_0-T_1, T2-T_3 and there was significant difference b/w the all treatment.

Ash

The highest mean Ash percentage was recorded in the sample of T_3 (0.86), followedbyT_2 (0.82) T_1 (0.77) and T_0 (0.73). There was non-significant difference b/w T_0-T_1, T2-T_3 and there was significant difference b/w the all treatment.

OrganolepticParameters of Ice Cream

Color & Appearance

The highest mean Color & Appearance score was recorded in the sample of T_0 (8.15), followedbyT_1 (7.96), T_3 (7.80) and T_2 (7.64). There was non-significant difference b/w T_0-T_1, T0-T_3, T1-T_2, T_1-T_3, T_2-T_3 and there was significant difference b/w the all treatment.

Flavor & Taste

The highest mean Flavor & Taste score was recorded in the sample of T_0 (8.20), followedbyT_3 (8.19), T_2 (7.40) and T_1 (7.75). There was non-significant difference b/w T_0-T_2, T0-T_3, T_2-T_3 and there was significant difference b/w the all treatment.

Body & Texture

The highest mean Body & Texture score was recorded in the sample of T_0 (7.96), followedbyT_2 (7.84), T_1 (7.56) and T_3 (7.56). There was non-significant difference b/w T_0-T_2, T_0-T_3, T_1-T_3 and there was significant difference b/w the all treatment.

Melting Resistance

The highest mean Melting Resistance percentage was recorded in the sample of T_0 (8.10), followedbyT_2 (7.87), T_1 (7.69) and T_3 (7.38). There was non-significant difference b/w T_0-T_2, T_1-T_2, T_1-T_3 and there was significant difference b/w the all treatment.

Overall Acceptability

The highest mean highest overall acceptability score was recorded in the sample of T_0 (8.10), followedbyT_2 (7.88), T_3 (7.82) and T_1 (7.72). There was non-significant difference b/w T_0-T_2, T_1-T_2, T_1-T_3, T_2-T_3 and there was significant difference b/w the all treatment.

Microbial Parameters of Ice Cream

S.P.C (x 10^3)cfu/g

The highest mean S.P.C (x 10^3) cfu/g highest percentage was recorded in the sample of T_1 (2.60), followedbyT_3 (2.40), T_2 (2.20) and T_0 (1.60). There was all non-significant difference b/w The treatments.

Coli form (x 10^2)cfu/g

None of the samples of coca ice cream samples showed the presence of the coli forms at 0 day which indicates that proper hygienic conditions were maintained during the preparation and storage of the product.

Yeast and Mould

The highest mean yeast and mould highest percentage was recorded in the sample of T_2 (1.0) followed by T_3 (0.80), T_1 (0.60) and T_0 (0.20). Ther was all non-significant difference b/w the treatments.

Based upon the above study the following inferences can be drawn:

- Ice cream was prepared using Coca powder i.e. **H_{01}**is accepted.
- Ice Cream of acceptable sensory qualities i.e. **H_{02}** is accepted.

Conclusion

In view of the experimental result obtain during the present investigation, it may be concluded that the Ice-cream made from Ice cream mix with 2%, 3% 4% coca powder with 1.5% sago powder i.e. T_0 received highest score and was liked very much by the panel of judges in the Organoleptic evaluation, best in chemical characteristic (maximum total solids, acidity, protein, carbohydrate and ash), best in microbial analysis (minimum yeast and mould count; and negative in coli form test) thereby indicating good storage stability of Ice cream. The cost of preparation of Ice-cream in T_2 101.09 per liter of ice cream. However, since this is based on one-time experiment, further trial may be needed to substantiate the results.

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