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Development of soy incorporated chocolate flavored chhana podo

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Abstract
Chhana podo is a popular traditional dairy product of Odisha state. It is milk based indigenous dairy product that is prepared by baking. During the preparation of chhana podo two different types of cow milk and soy milk ratio was used i.e. (40:10), (30:20) and (25:25) indicated as T_1, T_2 & T_3 respectively, T_0 being the control sample with no soy milk. Soy milk and cow milk was standardized to 4% fat and 8.5% SNF for manufacturing chhana. The treatments were evaluated for various Physico-chemical, sensory and parameters. The Organoleptic characteristics like (flavor, color and appearance, body and texture and overall acceptability) for all treatment were evaluated by trained panelist using 9 point hedonic scale. After sensory evaluation of T_2, average score for flavor is 8.24, color and appearance is 8.14 body and texture is 7.68 and over all acceptability is (7.98). The highest value for overall acceptability was observed in treatment (T_2) with cow milk: soy milk in ratio of (30:20). Soy incorporated chocolate flavored chhana podo was best Organoleptic evaluation. The chemical evaluation of best rated podo were T_2 protein (18.2%), fat (23.97%) ash (1.36%), moisture (31.78%), carbohydrate (24.80 %), acidity (0.55) & pH (5.50) as comparable to control without adversely affecting the sensory parameters. analysis parameters were analyzed by two way ANOVA to obtain a predicted optimum result. Prepared podo was subjected to chemical, sensory and analysis to evaluate the suitability of podo for consumption. Based on the results it was indicated that beneficial components of cow milk and soy milk made them more favorable choice for food technologist to develop soy incorporated chocolate flavored chhana podo especially for protein disease patients.

Keywords: Chhana podo, soy milk

Introduction

India ranks first in milk production, accounting for 18.5 per cent of world production, achieving an annual output of 146.3 million tons during 2014-15 as compared to 137.69 million tonnes during 2013-14 recording a growth of 6.26 per cent. The demand for milk is forecast as 150 MT during 2016-17 and over 200 MT during 2021-22 (Anon, 2012) [2].

Chhana podo is a popular dairy product of Oddisha state. It is probably the only milk based indigenous dairy product that is prepared by baking. Traditionally, it is prepared by mixing chhana, semolina (suji) and sugar and baking it slowly by keeping red hot burnt wood on top and bottom of the vessel for about 2-4 h. A modern and more hygienic method of preparation involves mixing *chhana*, sugar and semolina in 20:6:1 ratio, and kneading for 2-5 min using a planetary mixer attached with a hook type beater to smooth consistency, weighing to 280g and spread in aluminum casseroles, and baking in an oven at 145°C for 90 min (Emerald *et al*., 2005) [8].

Baking is the key step in the preparation of chhana podo. It is a complex process in which the physical, chemical and biochemical changes occur simultaneously throughout the process. Similarly, simultaneous mass and heat transfer, involving convective, irradiative and conductive modes or their different combinations from the oven cavity toward the product surface, and followed by an internal heat and moisture diffusion either as liquid or vapor (Sakin *et al.*, 2007) [12].

Soya bean is a leguminous crop and is rich in proteins. Many value-added products are made from it like milk, sauce, paneer etc. Soya products are increasingly becoming popular especially amongst health conscious people. This product has potential in states like; Maharashtra, MP, and Gujarat etc. But this note considers Madhya Pradesh as the preferred location.

The Soyabean is often called the —golden miracle bean and is the world's foremost provider of protein and used for health food, feed sources and industrial products.

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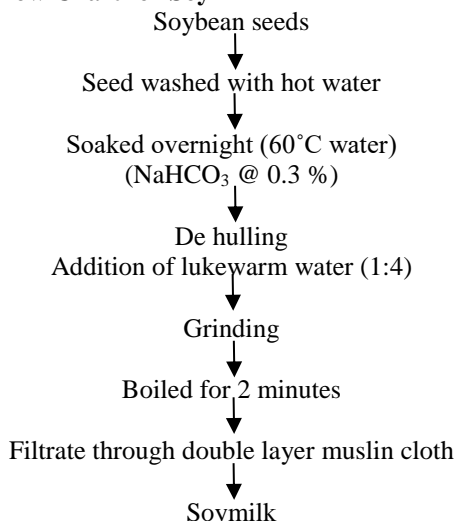SHUATS, Naini, Allahabad,
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It contains about 20% oil and 40% high quality protein (as against 7.0% in rice, 12% in wheat, 10% in maize and 20-25% in other pulses). Soybean products also have protective properties against breast, prostate, colon and lung cancers because of the isoflavones content. Other than the whole seed, many processed soy products are available in the market. They include soya milk, soya flour, soya curd and tofu (soya paneer).

Material and Methods

The experimental work based on development of soy incorporated chocolate flavored chhana podo prepared by using cow milk and soy milk was carried out in the research laboratory of Warner College of Dairy Technology, SHUATS, Allahabad. The experimental samples used for this study were cow milk and soy milk.

The soy milk was prepared as per method given by Kapoor *et al.* (1977) [11] and Grover *et al.* (1983). 250 g of soybean seeds were weighed and washed with water. After washing soak the seeds over night in water with addition of ($NaHCO_3$ @ 0.3 %) for removal of beany flavor. De hulling of seeds was done followed by addition of lukewarm water at ratio of 1:4 proportions and then blended in mixer. The milk was then filtered through double layered muslin cloth. Boil the milk for 2 minutes to detect its heat stability.

Process Flow Chart for Soy Milk

Soybean seeds

↓

Seed washed with hot water

↓

Soaked overnight (60°C water)
($NaHCO_3$ @ 0.3 %)

↓

De hulling
Addition of lukewarm water (1:4)

↓

Grinding

↓

Boiled for 2 minutes

↓

Filtrate through double layer muslin cloth

↓

Soymilk

Treatments

T_0- Chhana podo prepared by cow milk (5:0)

T_1- Chhana podo prepared by blending cow milk with soy milk (4:1)

T_2- Chhana podo prepared by blending cow milk with soy milk (3:2)

T_3 - Chhana podo prepared by blending cow milk with soy milk (2.5:2.5)

Statistical analysis

The data will be analysed statistically by analysis of variance at 5% level of significance.

- Treatment - 4
- Replication -5
- Total no of trails- 20

The data obtained from the physico-chemical analysis and microbiological analysis data were statistically analysed by using analysis of variance two way classification, critical difference. Panse and sukhatme (1997).

Process flow chart for chhana podo.
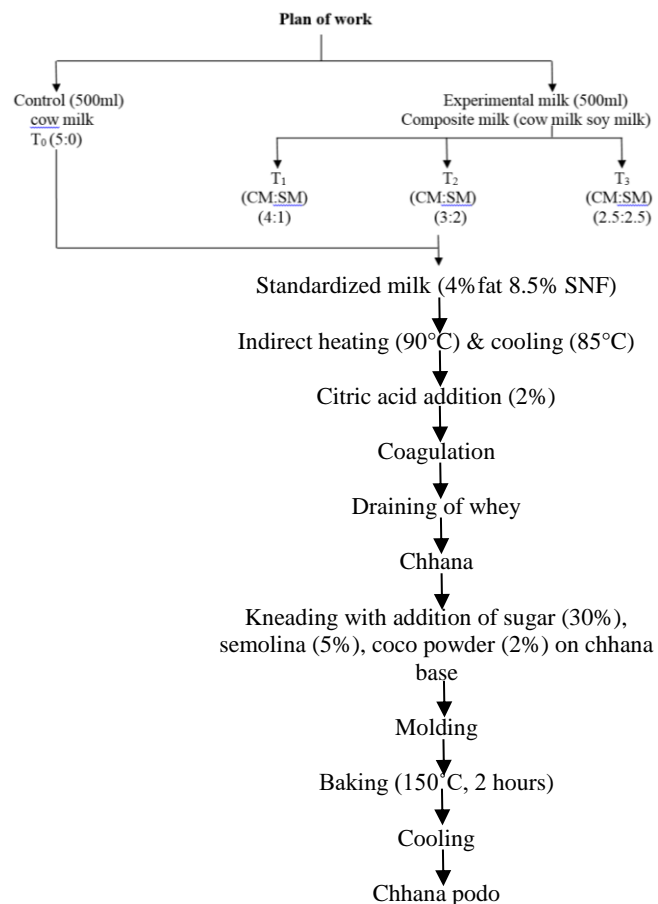
Average data for different Parameters of control and experimental chhana podo:

Parameters	Treatments			
	T_0	T_1	T_2	T_3
1. Physic- Chemical analysis.				
Moisture (%)	31.57	31.66	31.78	31.86
Fat (%)	23.96	23.94	23.86	23.82
Protein (%)	17.20	17.78	18.20	18.60
Ash (%)	1.32	1.34	1.36	1.38
Carbohydrate (%)	25.96	25.20	24.80	24.34
Alcoholic Acidity (%)	0.45	0.48	0.55	0.58
pH	5.70	5.60	5.50	5.40
2. Organoleptic Score (9-Point hedonic scale).				
Color and appearance	8.30	7.34	8.24	7.00
Body and texture	7.36	7.20	7.68	7.00
Flavor	7.90	7.70	8.14	7.50
Overall Acceptability	7.82	7.38	7.98	7.14

Result and Discussion

Moisture percentage: There was non-significant difference in moisture content of different treatment combinations. Maximum moisture percent was recorded in the sample of T_3 (31.86) followed by T_2 (31.78), T_1 (31.42) and T_0 (31.57).

The difference in moisture was due to the composition difference of cow milk and soy milk which are used in different propositions in different treatments
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Ash percentage: There was non-significant difference in ash content of different treatment combinations. Maximum ash percent was recorded in the sample of T_3 (1.38) followed by T_2 (1.36), T_1 (1.34) and T_0 (1.32).

The difference in ash was due to the composition difference

of cow milk and soy milk which are used in different propositions in different treatments

Protein percentage: There was significant difference in protein content of different treatment combinations. Maximum ash percent was recorded in the sample of T_3 (18.60) followed by T_2 (18.20), T_1 (17.78) and T_0 (17.20).
The difference in protein was due to the composition difference of cow milk and soy milk which are used in different propositions in different treatments.

Fat percentage: There was non-significant difference in fat content of different treatment combinations. Maximum fat percent was recorded in the sample of T_0 (23.96) followed by T_1 (23.94), T_2 (23.86) and T_3 (23.82).
The difference in pH was due to the composition difference of cow milk and soy milk which are used in different propositions in different treatments

Carbohydrate percentage: There was significant difference in carbohydrate content of different treatment combinations. Maximum ash percent was recorded in the sample of T_0 (25.96) followed by T_1 (25.20), T_2 (24.80) and T_3 (24.34).
The difference in carbohydrate was due to the composition difference of cow milk and soy milk which are used in different propositions in different treatments

Alcoholic acidity percentage: There was significant difference in alcoholic acidity content of different treatment combinations. Maximum ash percent was recorded in the sample of T_3 (0.58) and T_2 (0.55) followed by T_1 (0.48) and T_0 (0.45).
The difference in alcoholic was due to the composition difference of cow milk and soy milk which are used in different propositions in different treatments

pH: There was significant difference in pH of different treatments combinations. Maximum pH percent was recorded in the sample of T_0 (5.70) followed by T_1 (5.60), T_2 (5.50), T_3 (5.40)
As acidity increases pH decreases
The difference in pH was due to the composition difference of cow milk and soy milk which are used in different propositions in different treatments

Organoleptic analysis
Color and appearance score: There was significant difference in Color and appearance score of different treatments combinations. Maximum Color and appearance score percent was recorded in the sample of T_2 (8.14) followed by T_0 (7.90), T_1 (7.70), T_3 (7.50).
The difference in Color and appearance score was due to the composition difference of cow milk and soy milk which are used in different propositions in different treatments.

Body and texture score: There was significant difference in Body and texture score of different treatments combinations. Maximum Body and texture score percent was recorded in the sample of T_2 (8.14) followed by T_0 (7.90), T_1 (7.70), T_3 (7.50).
The difference in Body and texture score was due to the composition difference of cow milk and soy milk which are used in different propositions in different treatments.

Flavor:-There was significant difference in Flavor and taste

score of different treatments combinations. Maximum Flavor and taste score percent was recorded in the sample of T_0 (8.30) followed by T_2 (8.24), T_1 (7.34), T_3 (7.00).
The difference in Flavor and taste score was due to the composition difference of cow milk and soy milk which are used in different propositions in different treatments

Over all acceptability score: There was significant difference in Over all acceptability score of different treatments combinations. Maximum overall acceptability score percent was recorded in the sample of T_2 (7.98) followed by T_0 (7.82), T_1 (7.38), T_3 (7.14).
The difference in overall acceptability score was due to the composition difference of cow milk and soy milk which are used in different propositions in different treatments.

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