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Preparation of arrow root powder Chamcham flavored with Pista

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Abstract

The present study was carried out using different levels of pista with a view to optimize the process for manufacture of Chamcham and to study its chemical, sensory and microbiological qualities. Initially the preliminary trials were conducted by blending of different levels of pista @ 0, 1, 2 and 3% in the Chamcham with 93% sugar to finalize the experimental treatments. Experimental Chamcham samples were analyzed for sensory, chemical and microbiological qualities. It was observed that Chamcham samples under different treatments showed significant differences for total solid, fat, protein, ash, moisture and total fiber content. The values were ranged from 53.02, to 58.26, 12.14 to 12.31, 8.27 to 8.56, 1.24 to 1.36 and 41.73 to 46.98%, respectively. Non-Significant difference was observed within the colour and appearance and the body and texture score of different types of Chamcham. The microbial result indicates that SPC was within acceptable upto 7th day. The coliform count was not detected up to 15th days. The yeast and mould count was observed above the acceptable limit from 7th day. This may be due to inadequate cleaning or aseptic condition. Hence it is recommended that the aseptic condition should be maintained during product preparation. So, it is concluded suggested that Chamcham could be prepared successfully by adding different proportion of pista flavour. It was suggested to incorporate pista flavour @ 2% which showed better overall acceptability and result among the all treatments.

Keywords: Pista, Chamcham, production cost, physicochemical, sensory and microbial quality

Introduction

Milk being a perishable product gets spoiled quickly if not treated properly. Besides direct consumption as market milk, surplus milk is converted in to various milk products as per the liking of the people from various regions of the country. Delicious recipes are prepared from the milk by converting it in to desiccated, coagulated or fermented milk products.

In the process, the basic limitation of milk - its perishable nature has been tastefully overcome. It's processing aims to extend the shelf life of milk, while converting it to mouthwatering tit-bits. Thus, diverse methods to prepare as well as preserve milk product have been developed. About 50-55 per cent of milk produced in India is converted in to variety of the traditional milk product. Over the millennia, these processes have largely remained unchanged, being in the hands of hallways, the traditional sweetmeat makers, who form the core of this cottage industry.

Chhana is an indigenous milk product obtained by acid coagulation of hot milk followed by draining of Chamcham. It contains 70 per cent moisture and 50 per cent fat on dry matter basis. About 4 per cent of total milk produced in India is converted in to chhana (Aneja *et al.* 1997) [1]. The production of Chhana is confined mostly to the eastern region of the country notable west Bengal, Bihar and Orissa. It is popularly known in northern part of the country. This product is used as base for preparation of a variety of sweetmeats like Sandesh, rasogolla, Rasmalai, Pantua, Chamcham, etc.

Generally, Cham-cham is made from cow milk, but quantity of Cow milk is not satisfactory round the year in our country. The scarcity of milk hampers the production of sweetmeat as well as cham-cham, which contributes in the rise of price.

Cham - Cham to be prepared from buffalo milk needs to be standardized with respect to quality, uniformity, process adoptability and cost effectiveness. Buffalo milk contains greater proportion of casein and is slightly higher in albumin and globulin. Buffalo milk is an excellent source of fat and protein but no effort has been made to utilize buffalo milk for the

preparation of cham-cham. That is why the present study was carried out to monitor the chemical components of Chamcham made from buffalo milk flavored with the pista.

Material and Methods

The study was carried out at the Department of Animal Biotechnology, College of Agricultural Biotechnology, Loni. The fresh milk was obtained from the Prabhat dairy, Tal-Shrirampur Dist- Ahmednagar (MS). Ingredients like sugar, semolina, pista powder, arrowroot powder was purchased from the local market.

Physico-chemical analysis

The total solid content of Semolina, Chhana, Pista and arrowroot powder were determined by gravimetric method as per IS: 1479 (part II), 1961^[11]. The fat content was determined by using standard Gerber method as described in IS: 1224 (part II), 1977^[9].

The protein content was determined by estimating the per cent nitrogen by Micro-kjeldhal method as recommended in IS: 1479 (part II), 1961^[11]. The per cent nitrogen was multiplied by 6.38 to find out protein percentage in Chamcham. Per cent ash content was determined by the method described in A.O.A.C., 1975. Per cent moisture content was determined by gravimetric method as per IS: 1479 (part II) 1961^[11]. The acidity of Chamcham expressed as per cent lactic acid was determined by the method described in IS: 1479 (part I), 1960^[10].

Sensory evaluation

The fresh sample of pista Chamcham were evaluated organoleptically by nine point hedonic scale for various quality attributes such as general appearance, body, texture and flavour by panel of 8-10 judges. The experimental samples were served to the judges at 7°C. The panelists were instructed to rate each sample on 9 point hedonic scale. They were provided hedonic scale score cards for evaluating the quality of product as described in IS: 6273 (part-II) 1971^[8].

Microbiological analysis

All the treatment samples of pista Chamcham along with control sample were stored at 4°C and analysed for different microbial parameters such as standard plate count, coliform count, yeast and mould count by adopting standard procedure as given by (Dubey and Maheshwari, 2004) throughout the storage period.

Statistical analysis

For the present investigation Randomized Block Design was employed using four treatments and four replications. The data were tabulated and analyzed according to the statistical methods prescribed by Snedecor and Cochran (1994)^[13].

Treatments

Preliminary trials were conducted to find out the blending of chhana and pista flavor, semolina and arrow root powder to have proper aroma and consistency. After trying different levels of chhana and pista powder the following proportion were finalized for study.

T₀ – Chamcham without pista powder.

T₁ – Chamcham + 1 per cent pista powder.

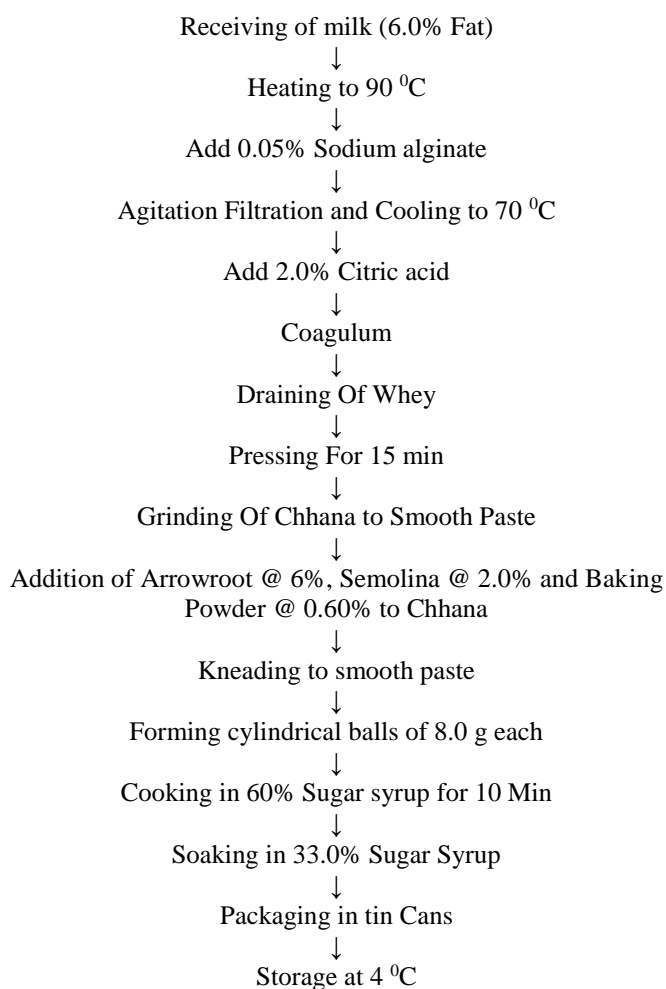
T₂ – Chamcham + 2 per cent pista powder.

T₃ – Chamcham + 3 per cent pista powder.

The mixture of arrowroot powder, semolina, baking powder, Chhana and pista powder were used to prepare Chamcham in the following proportions.

Sr. No.	Ingredients	Per cent composition			
		T ₀	T ₁	T ₂	T ₃
1	Chhana	91.40	90.40	89.40	88.40
2	Arrowroot	6.00	6.00	6.00	6.00
3	Semolina	2.00	2.00	2.00	2.00
4	Baking powder	0.60	0.60	0.60	0.60
5	Pista powder	0.00	1.00	2.00	3.00
	Total	100	100	100	100

Flow diagram for preparation of pista Chamcham



Results and Discussion

Table 1: Chemical analysis of buffalo milk, chhana, pista powder, semolina and arrow root powder

Sr. No.	Constituents	Buffalo milk	Chhana	Pista powder	Semolina	Arrow root powder
1	Total Solid	15.30	48.31	93.16	92.82	84.70
2	Fat	6.01	31.16	20.10	0.86	0.26
3	Protein	3.4	14.76	21.26	9.94	0.90
4	Acidity	0.14	0.84	0.48	0.62	0.46
5	Ash	1.38	2.48	3.08	1.06	1.40

These observations indicate that the buffalo milk used in the present investigation was of good quality. Chhana used for Chamcham preparation had on an average fat content 31.16 per cent, acidity 0.84 per cent, protein 14.76 per cent and total solids 48.31 per cent.

Table 2: Effect of different levels of pista on total solids of Chamcham (percent)

Treatment	Replication				Mean
	I	II	III	IV	
T ₀	52.60	52.84	53.70	52.94	53.02 ^a
T ₁	56.10	56.18	56.27	56.80	56.33 ^b
T ₂	57.04	57.12	57.18	57.44	57.19 ^c
T ₃	58.04	58.22	58.38	58.41	58.26 ^d
Mean	55.94	56.09	56.38	56.39	56.20

Total solid content of Chamcham increased with the increase in the level of pista powder. The maximum total solid content (58.26 per cent) was noticed in Chamcham with 3 per cent pista i.e. T₃, where as the lowest (53.02 per cent) was recorded in Chamcham without pista (T₀). Significant differences were observed in all treatment combinations.

Table 3: Effect of different levels of pista on fat content of Chamcham (Per cent)

Treatment	Replication				Mean
	I	II	III	IV	
T ₀	12.04	12.18	12.10	12.22	12.14 ^d
T ₁	12.12	12.24	12.16	12.26	12.20 ^c
T ₂	12.20	12.28	12.24	12.31	12.26 ^b
T ₃	12.26	12.32	12.30	12.36	12.31 ^a
Mean	12.15	12.25	12.02	12.28	12.22

The mean values of fat increased significantly from T₀ to T₃. The highest fat content (12.31 per cent) was observed in Chamcham with 3 per cent pista (T₃), where as the lowest fat content (12.14 per cent) in case of Chamcham without pista (T₀). Treatment T₃ was found to be significantly superior over the treatments T₀, T₁, and T₂. Significant differences were observed in all treatment combinations.

Table 4: Effect of different levels of pista on protein content of Chamcham (per cent)

Treatment	Replication				Mean
	I	II	III	IV	
T ₀	8.22	8.34	8.28	8.24	8.27 ^d
T ₁	8.30	8.39	8.42	8.39	8.37 ^c
T ₂	8.42	8.46	8.54	8.48	8.47 ^b
T ₃	8.56	8.54	8.58	8.58	8.56 ^a
Mean	8.37	8.43	8.45	8.42	8.41

Table 7: Sugar syrup absorption rate of Chamcham (per cent)

Treatment	Original wt of ball	1 hr	% absorption rate	2 hr	% absorption rate	3 hr	% absorption rate	Mean
T ₀	8.00	9.20	11.5	9.41	17.62	9.59	19.87	12.17
T ₁	8.00	9.10	13.75	9.38	17.25	9.54	19.25	12.32
T ₂	8.00	8.18	22.5	8.45	10.56	9.48	18.5	12.23
T ₃	8.00	8.25	31.25	8.35	10.43	9.44	11.8	12.50
Mean	8.00	8.68	19.75	8.89	13.96	9.51	17.35	12.30

There was significant decrease in sugar syrup absorption rate of Chamcham with the increase in the level of pista. The highest sugar syrup absorption rate was observed in Chamcham prepared with pista @ 3 per cent in treatment T₃ (12.50 per cent), whereas the lowest sugar syrup absorption

The highest level of protein content was noticed at treatment T₃ i.e. Cham-cham with pista@ 3 per cent whereas, lowest (8.27 per cent) at T₀ i.e. Chamcham without pista. It was observed that the protein content showed gradual increase in Cham-cham with the increase in the level of pista.

Table 5: Effect of different levels of pista on ash content of Chamcham (per cent)

Treatment	Replication				Mean
	I	II	III	IV	
T ₀	1.26	1.24	1.26	1.20	1.24 ^c
T ₁	1.20	1.30	1.33	1.24	1.29 ^b
T ₂	1.32	1.32	1.32	1.30	1.31 ^b
T ₃	1.34	1.38	1.34	1.40	1.36 ^a
Mean	1.30	1.31	1.31	1.28	1.03

The increase in the level of pista resulted in significant increase in ash content of Chamcham.

The highest ash content (1.36 per cent) was observed in Chamcham prepared 3 per cent pista (T₃), whereas the lowest percentage (1.24 per cent) in case of Chamcham blended without pista powder (T₀). Treatment T₁ found at par with the treatment T₂.

Table 6: Effect of different levels of pista pulp on moisture content of pista Chamcham (per cent)

Treatment	Replication				Mean
	I	II	III	IV	
T ₀	47.40	47.16	46.30	47.06	46.98 ^a
T ₁	43.90	43.82	43.70	43.20	44.90 ^b
T ₂	42.96	42.88	42.82	42.56	42.80 ^c
T ₃	41.96	41.78	41.62	41.59	41.73 ^d
Mean	44.05	43.91	43.61	43.60	44.10

The increase in the level of pista resulted in significant decrease in moisture content of Chamcham. The highest moisture content (46.98 per cent) was observed in Chamcham prepared without pista (T₀), whereas the lowest percentage (41.73 per cent) in case of Chamcham with 3 per cent pista powder (T₃).

Significant differences were observed in all treatment combinations.

rate was noticed in treatment T₀ i.e. Chamcham without pista (12.17 per cent).

Sensory evaluation of pista Chamcham

Table 8: Score for Colour and appearance of Pista Chamcham (out of nine)

Treatment	Replication				Mean
	I	II	III	IV	
T ₀	6.9	7.5	7.45	7.75	7.4 ^a
T ₁	7.4	7.2	7.95	7.2	7.4 ^a
T ₂	7.0	8.45	8.0	8.15	7.9 ^a

T ₃	6.8	7.3	7.9	7.4	7.35 ^a
Mean	7.02	7.61	7.82	7.62	7.51

Score for colour and appearance was increased due to addition of pista. The highest score (7.90) was obtained by the treatment T₂ i.e. Chamcham with addition of pista @ 2 per cent and this highest score may be due to its peculiar slight milky appealing colour and appearances which was liked most by the judges. Lowest score (7.35) was observed for treatment T₃ i.e. Chamcham blended with 3per cent pista. This lowest score may be due to its dark colour as well as rough crack surface, which was not accepted by the judges.

Table 9: Score for body and texture of pista Chamcham (out of nine)

Treatment	Replication				Mean
	I	II	III	IV	
T ₀	6.65	7	7	7.6	7.06 ^a
T ₁	6.6	7.35	7.5	7.05	7.12 ^a
T ₂	6.4	8.5	7.9	7.8	7.62 ^a
T ₃	6.75	7.3	7.2	7.1	7.08 ^a
Mean	6.6	7.5	7.4	7.38	7.22

Chamcham prepared from T₂ level recorded highest score for body and texture (7.62). The sensory score increased upto T₂ i.e. 2 per cent level of pista. Lowest score was noticed for Chamcham blended without pista powder (T₀). Chamcham with 2 per cent pista possessed soft body with spongy and porous texture, which obtained highest score. The addition of pista more than 2 per cent affected the body and texture of the product. Lack in porousness affects the rate of sugar syrup absorption and the Chamcham with 3 per cent pista lacked in porousness.

Table 10: Score for flavour of pista Chamcham (out of nine)

Treatment	Replication				Mean
	I	II	III	IV	
T ₀	6.8	7.15	7.45	7.1	7.12 ^b
T ₁	6.95	7.15	7.2	7.4	7.17 ^b
T ₂	7.05	8.05	7.8	7.65	7.63 ^a
T ₃	6.5	7.5	6.45	7.15	7.15 ^b
Mean	6.82	7.46	7.47	7.32	6.26

Chamcham prepared from T₂ level recorded highest score for flavour (7.63) followed by T₁ (7.17). The sensory score increased upto T₂ i.e. 2 per cent level of pista and decreased simultaneously for T₃. Lowest score was noticed for Chamcham blended without pista powder (7.12). The Chamcham with 2 per cent pista gave characteristic slightly cooked flavour with optimum sweet taste. The pista powder contains higher percentage of carbohydrates. Higher percentage of pista in Chamcham i.e. more than 2 per cent affected acceptable flavour because of its much more sweetness.

Table 11: Score for overall acceptability of pista Chamcham (out of nine)

Treatment	Replication				Mean
	I	II	III	IV	
T ₀	6.78	7.21	7.22	7.61	7.20 ^b
T ₁	6.31	7.47	7.31	7.48	7.14 ^b
T ₂	6.81	8.31	7.89	8.03	7.76 ^a
T ₃	6.68	7.36	7.5	7.14	7.17 ^b
Mean	6.64	7.58	7.48	7.56	7.39

Amongst different level of pista, treatment T₂ (2 per cent pista) was found more acceptable for blending. Good quality

Chamcham was also obtained with 2per cent pista. The results of overall acceptability scores thus indicate that Chamcham blended with 2 per cent pista is superior over rest of treatments. However, pista @ 2 per cent can produce good quality Chamcham. Higher proportion of pista (3 per cent) showed reduction in sensory quality score for Chamcham.

Changes in microbial qualities of Pista Chamcham during storage

Standard plate count

It was observed that standard plate counts of pista Chamcham increased with increase in storage period for samples stored at room temperature of 4°C. The microbial results indicate the SPC was varied among the different treatments. Overall, the Chamcham was acceptable upto 15th day because the count was within the acceptable limit.

Yeast and mould count

A yeast and mould count of fresh Chamcham was measured very less and negligible. It was observed that yeast and mould counts of pista Chamcham increased with increase in storage period for samples stored at room temperature of 4°C.

Coliform count

The *E coli* count was not detected upto 15 days. The microbial load may be due to inadequate cleaning or aseptic condition. Hence, it is recommended that the aseptic condition should be maintained during product preparation.

Production of cost

It is pointed out here that the data indicated the cost of ingredients only and other cost factors remains constant for all treatments and were not accounted for cost estimation. Cost of ingredients increased with the increase in the level of pista. The yield of Chamcham shows increasing trend, which may be due to the level of pista, which resulted in increasing cost of production on weight basis.

The highest cost (T₃) was recorded in case of Chamcham blended with 3 per cent pista, while lower cost (T₀) recorded in case of Chamcham without pista (T₀). It was observed that the cost of Chamcham was increased with the increase in the level of pista flavour. The production cost of most acceptable level (T₂) was Rs.240.11.

Conclusion

From the results of the present investigation, it may be concluded that pista powder could be successfully utilized for the preparation of Chamcham. The most acceptable quality Chamcham can be prepared by using 2 per cent pista. There was some reduction in sugar syrup absorption rate in Chamcham containing pista, but the pista had a positive effect on pista acceptability and its consumption. On the basis of sensory quality use of pista more than 2 per cent level for blending of Chamcham did not show any beneficial effect. Further, it may also be concluded that 3 hours soaking period is an optimum time for sugar syrup absorption in Chamcham.

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