Vol. 3 No. 3 January 2016 ISSN: 2321 – 788X

QUALITY AND SHELF LIFE ASSESSMENT OF SNACK FOOD PREPARED FROM CO-PRECIPITATE

G.M. Sivakumar[1] and B. Dhanalakshmi

[1]Assistant Professor, Department of Livestock Products Technology (Dairy Science)
Madras Veterinary College, Chennai- 600 007, Tamil Nadu Veterinary and Animal Sciences University

Abstract

This research was conducted to assess the physico-chemical, microbiological and sensory characteristics of snack food prepared from co-precipitate and stored under room temperature condition. A recipe for snack foods was standardized containing co-precipitate, corn flour, salt at 75, 25 and 1.5% respectively. The Standardized recipe of snack food was taken as control; Treatment-I (1.5% chilli powder) and Treatment-II (1.5% masala powder) were added. Results revealed that, the snack food prepared with 1.5% chilli powder was found to be optimum with physico-chemical, and sensory attributes, so which was further subjected to assess the microbiological properties at ambient temperature for 10days. The protein content has showed progressively raising trend whereas fat content was significantly (P<0.01) reduced in all the preparation of snack foods. The microbiological properties of the control and treated product had showed significant (P<0.01) difference and the product is microbiologically safe upto 10 days at room temperature.

Key words: *Physico-chemical characteristics, sensory properties, microbiological quality, snack food*

Introduction

India's status in dairying is characterized by the fact that this country owns one of the largest livestock populations in the world and has now emerged as the largest global producer of milk with a record production level of 108.5 million mt (Economy survey, 2010). About 37.7% of total milk produced in India, is converted into various milk products, which occupies a prominent place in Indian economy (Sahu, 2007). During the production of primary dairy product viz., cream, butter along with that some of the dairy by-product (secondary) product also produced which is really difficult to utilize which require further processing. However, dairy plants, particularly in India, are usually confronted with the problem of by-products utilization, especially that of whey in an economic manner. It is estimated that about 4.84 million tones/annum of whey is generated in India (Raju et al., 2005). Whey has long been considered as waste product and maximum amount of it is either drained or disposed in the fields or used for animal feeding due to several limitations. Regulations for preventing disposal of untreated whey and recognition of the value of whey components accelerated in the late 20th century. Nowadays, it is possible to utilize skim milk and whey in the efficient manner mainly to produce protein rich co-precipitate from the skim milk by acid and heat treatment. Co- precipitate is being highly nutritious especially high in protein and low in fat content which suites remedial measure for the people who prefer to take low fat content food items mainly to avoid risk associated with high fat consumption like coronary heart disease (atherosclerosis). Moreover, incorporation of vegetable protein source into the dairy products has gained significance,

among the consumers who prefer to take more fibre and Poly unsaturated fatty acids (PUFA) rich foods, mainly to avoid colorectal cancers. One such well known vegetable protein source is corn flour (*zea mays*) and its beneficial effect on the health has been well known in the world since pre-historic period. These have cholesterol reducing effect due to high polyunsaturated fatty acids content and high protein content especially rich in sulphur containing amino acids (methionine). However, starch based snack foods are very popular in India and mostly getting commercialized but they contain very little protein, the snacks from co-precipitate could be a novel approach for improving the protein quality of the product. Hence, the present study was undertaken to prepare protein enriched snack food from co-precipitate which has been obtained from skim milk with the following objectives: To standardize the recipe for the protein enriched snack food, and to study the physico-chemical, microbial quality and sensory characteristics under room temperature storage condition.

Materials and Methods

Preparation of Co-precipitate curd: High calcium co-precipitate curd was prepared from standardized cow skim milk as per method of Muller et al. (1967). Milk protein co-precipitate was obtained by precipitation of casein and whey protein from skim milk using a combination of heat treatment (90° C for 1-2 minutes) and addition of calcium salts viz., calcium chloride at the rate of 0.2 percent. The protein concentrate filtered through muslin cloth to drain excessive whey and the co-precipitate curd was obtained.

Preparation of snack food: The co-precipitate curd obtained from skim milk was mixed with corn flour (added at the rate of 25 percent). This mixture was blended with addition of water @ 20 ml and salt (1.5 -2 %) in a mixer till it reaches a homogenous mixture. This mass was spread on a butter paper into circular shapes and then transferred to a microwave oven, where it was allowed to dry for 300 seconds. Thus oil free, crispy, protein rich snack food obtained which was considered as control. In addition to this snack foods were prepared using flavours like chill powders (Treatment I), and masala powder (Treatment II)(Table -1). The protein rich snack foods were packaged separately in polystyrene cups with proper labeling and stored at room temperatures for a period of about 10 days.

Physico-chemical analysis of snack food: pH readings were taken on Systronics digital pH meter; titratable acidity of the snack food was determined by mixing , 10 gram of sample in 100ml of distilled water and resultant homogenous suspension was filtered through Whatman no 40 filter paper. Ten ml of the filtrate was titrated against 0.1 N NaoH using phenolphthalein as indicator. Acidity was expressed as percent lactic acid. Moisture and ash content were evaluated (AOAC, 2005) method No. 950.46 and 920.153) using a binder drying oven (Model No. FD 115/E2, Binder GmbH, Tuttlinen, Germany) and a furnace (Model No. AAF 1100, Carbolite, Hope, UK). Protein content was measured by the Kjehldahl technique (AOAC, No. 928.08) total fat was determined by a solvent extraction method

(AOAC, No.991.36) using the Soxtec. System (Model No. HT6, Tecator AB, Hoganas, Swedan). Measurements on each sample were performed in triplicate.

Microbiological analysis: Microbial analysis viz., standard plate count, coliform and yeast and mould count of samples were determined as per the standard procedure outlined in ISO (2003).

Organoleptic evaluation of the snack food: The sensory quality of protein enriched snack food was evaluated by semi trained panelists. The organoleptic evaluation of the products was carried out by using 10 point score card.

Statistical analysis: The statistical package SPSS 14.0 version (SPCC Inc., Chicago, USA 2005) was used to carry out an ANOVA procedure to analyze the effect of treatment.

Results and Discussions

The data on physico-chemical properties of snack food prepared by using co-precipitate are shown in table 2. The medium acidity and lower pH values of dried snack food were noticed. High protein percentage in control could be due to high protein content of co-precipitate. Addition of chilli powder or masala powder into the samples decreased fat percentage significantly ($P<0.01$) when compared to control. Similarly, moisture, ash and fat percentage had recorded significantly lower value in control than other formulations. These findings are in agreement with (Arun and Patel, 2010) who reported that the similar type of results in dried cheddar and Mozarella chesses.

Table – 3 reveals that the changes in microbial population viz., standard plate count, colifrom count and yeast & mould count of control and different flavour added snack food stored up to 10 days under room (22 $\pm 1^{\circ}C$) temperature. Significant ($p<0.01$) increase of microbial counts noticed in SPC as storage days progressed but no significant differences were noticed on the initial day. Initial microbial counts at zero days were uniformly recorded for the SPC. The microbial counts were within safe limits up to 10 day at room temperature storage. There was very gradual increase in the colonies of yeast and it was 5.2 cfu/g, 4.8 cfu/g, 5.3cfu/g in control, Treatment- 1, Treatment- 2 respectively. This probably may be due to the fact that yeast might have been destroyed with slight increase in temperature and reduced moisture activity in the product. The longer shelf life of the snack food may be due to lower microbial deterioration as reduced water activity of the product. This coincided with the findings of Sharma 1988 who observed a shelf life of 7-10 days for dried cheese; the initial coliform count was absent but during the storage period one or two colonies rarely detected. Colifroms are known to be destroyed completely by the minimum time temperature combination employed for acid heat treatment of skim milk and further processing.

Organoleptic evaluation of the snack food: The sensory evaluation scores of snack food prepared by using co-precipitate along with salt (control), co-precipitate with salt and chilli powder (Treatment-I), and co-precipitate with salt and masala powder (Treatment-II) for colour, texture, taste, and flavour on a 10 point score card. Over all acceptability to

snack food prepared using salt and chilli powder was more acceptable to taste panel when compared to other types of snacks. The scores being 8.9±0.21, 7.5±0.17, 8.3±0.15, 8.5±0.17 for colour, texture, taste, flavour respectively. Statistical analysis of taste panel scores for snack food for colour, texture, taste, flavour showed that there was high significant ($P<0.01$) influence on colour, taste, flavour, while there was no significant difference ($P<0.01$) between snack food for texture. Sensory scores of snack foods prepared by using co-precipitate were presented in the Table 4. There was highly significant($P<0.01$) difference in colour, taste, flavour of snack foods prepared by using co-precipitate with salt, chilli and masala powders while there was no significant ($p<0.01$) difference in texture between the snack foods. Snack food with chilli flavour showed higher values 8.09±0.21, 7.5±0.17, 8.3±0.15, 8.5±0.17 for colour, texture, taste, flavour, these values are in accordance with sensory scores of potato chips reported Waghmare *et al*. (1999).

Conclusion

From this study, it can be concluded that very good quality snack food can be prepared by utilization of co-precipitate. The protein enriched crispy snack food thus obtained with addition of corn flour at the rate of 25% with chilli powder was found organoleptically acceptable. This product could be stored well under the room temperature for about 10 days without any deleterious effect on quality and the product is microbiologically safe.

References

1. AOAC (2005): Official Methods of Analysis of AOAC International (17th edn.) Maryland, USA: Association of Official Analytical Chemistry.
2. Arun, G, Patel and Patel, H, G, (2010): Study of technological parameter for drying of cheedar and Mozzarella cheese. Indian Journal of dairy science 63(5): 358–363.
3. Economy survey (2010): Government of India, Ministry of Finance and Company affairs, Economic Division.
4. ISO (2003). ISO 4833: 2003, Microbiology of food and animal feeding stuffs. Horizontal method for the enumeration of Microbial colony count technique. National Standards Authority of Ireland.
5. Muller, L, L, Hayes, J, F and Snow, M, (1967): Studies on co-precipitate of milk proteins. Aust. J. Dairy Technology, 22(1): 12-18.
6. Raju, P, N, Rao, K, H and Devi, N, L, (2005): Whey proteins and their uses in food industry. Indian Food industry, 24: 19-27.
7. Sahu, J, K and Das, H, (2007): Chhana Manufacturing. Indian Dairy Association (IDA) Monograph, 003/TE/2007, New Delhi, 1-20.
8. Statistical Package for the Social Sciences (SPSS) (2005). SPSS for windows 14.0 User's Guide. Chicago, IL: SPSS Inc.,

9. Waghmare, N, V, Kotecha, P, M and Kadam, S, S, (1999): Effects of pre treatments, storage of potato and anti-oxidants on quality of potato chips prepared from cultivars grown in western Maharashtra. Journal of Food Science and Technology. 36(1): 49–51.

Table 1: Composition of Snack Food Prepared with Co-Precipitate and Non-Dairy Ingredients

Ingredients	Snack food composition (% weight basis)		
	C	T- 1	T-2
Co-precipitate	75	75	75
Corn flour	25	25	25
Salt	1.5	1.5	1.5
Water	10ml	10ml	10ml
Chilli powder	-	1.5	-
Masala powder	-	-	1.5

Table 2: Physico-Chemical Properties of Protein Enriched Snack Food

Parameters	pH, Acidity, Proximate composition (Mean± S.E) of protein enriched snack food (%)		
	C	T- 1	T -2
pH	5.21±0.31	5.32±0.24	5.62±0.04
Acidity	1.91±0.41	2.29±0.31	1.45±0.32
Moisture (%)	8.32±0.92	9.41±0.75	8.5±0.39
Total protein (%)	55.5 ± 0.32^{a}	58.3 ± 0.42^{b}	57.2 ± 0.45^{b}
Fat (%)	2.512 ± 0.31^{a}	2.02 ± 0.34^{a}	3.21 ± 0.41^{b}
Total ash (%)	3.01 ± 0.13^{c}	3.19 ± 0.24^{bc}	3.33 ± 0.17^{ac}

^{abc} Means bearing different superscript in the same row differ significantly (P<0.01)

Table 3: Microbiological status of snack foods during storage

Microbiological count		Storage period (days)			
		0	4	7	10
Standard plate count	C	$6.5\pm0.84x10^{5aC}$	$8.7\pm0.42x10^{5bB}$	$9.6\pm0.64x10^{5cB}$	$12.3\pm0.65x10^{5dC}$
	T-1	$5.3\pm0.42x10^{5aB}$	$6.8\pm0.31x10^{5bA}$	$8.5\pm0.21x10^{5cA}$	$11.4\pm0.42x10^{5dA}$
	T-2	$4.5\pm0.22x10^{5aA}$	$7.2\pm0.72x10^{5bB}$	$9.7\pm0.71x10^{5cB}$	$12.2\pm0.34x10^{5dB}$
Coliform Count	C	ND	ND	ND	Rarely detected
	T-1	ND	ND	Rarely detected	Rarely detected
	T-2	ND	ND	Rarely detected	Rarely detected
Yeast and mould count	C	$1.3\pm0.42x10^{1aA}$	$3.3\pm0.42x10^{1b}$	$3.9\pm0.30x10^{1b}$	$5.2\pm0.20x10^{1c}$
	T-1	$2.1\pm0.37\ x10^{1aB}$	$3.1\pm0.37\ x10^{1b}$	$4.4\pm0.28x10^{1c}$	$4.8\pm0.50x10^{1c}$
	T-2	$1.8\pm0.28\ x10^{1aA}$	$3.0\pm0.28\ x10^{1b}$	$4.2\pm0.45x10^{1b}$	$5.3\pm0.29x10^{1d}$

^{abc} Means bearing different superscript in the same row with small letter and in the column with capital letter differ significantly (P<0.01).

Table 4: Sensory Evaluation of the Snack Food

Parameters	(Mean± S.E) of protein enriched snack food		
	C	T- 1	T -2
Colour	6.8±0.25[a]	8.0±0.21[b]	7.5±0.22[ab]
Texture	7.4±0.22	7.5±0.17	7.5±0.17
Taste	6.5±0.34[a]	8.3±0.15[c]	7.5±0.27[b]
Flavour	6.1±0.18[a]	8.5±0.17[c]	7.4±0.27[b]

[abc] Means bearing different superscript in the same row differ significantly (P<0.01)