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Development of Soya Cheese

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Abstract: **Soymilk is reported to be low in cholesterol and can help to alleviate bone loss and also for preventing heart diseases and certain cancer. In present study an attempt is made to incorporate soymilk for preparing cheese by partially replacing the sole cow milk. Three cheese formulations were prepared by mixing cow milk with soy milk in ratio: 70:30% (v/v); 60:40 % (v/v); and 50:50% (v/v) and they were marked as C1,C2, and C3 respectively. The three soy cheese prepared was compared with control (C0) cheese made up from sole cow milk. All cheese samples were analyze for moisture, protein, fat, total solids, calorific value, minerals content calcium, sodium , and potassium as per the standard laboratories methods. Also sensory evaluation was carried out on 9 point hedonic scale. Result showed that the cheese(C3) prepared by mixing 50% soy milk with 50% cow milk is found to be most sensory acceptable when compared with control cheese. The %fat and calorific value/100 g of C3 cheese was found to be lesser by 50% and 60% as compared to control cheese, while for calcium and potassium an increase was observed by 14% and 44% respectively. All the soya cheese formulations were tested for safety using HPLC detection method and were found to be absent in Aflatoxin B1, B2, G1 and G2.The C3 cheese can be supplemented in diet to supply lower calorie through dairy product consumption.**

Keywords: Soy milk, Cow Milk, Soy Cheese, Aflatoxin.

I. INTRODUCTION

Soymilk, a diluted extract is one of soybean products. It is a infusion that offers both refreshment and nutrition and can be labelled as a healthy food because of its composition[1].Soy milk, sometimes called soy drink or soy beverage, is a white suspension which resemble cow milk in both form and evenness [2],[3]. The amino acids distribution of soybean is close to that recommended by Food and Agricultural Organization (FAO) of United Nations for human nutrition in terms of essential and nonessential amino acids.[4]Over the years, it has been developed into a food for infant suffering from various forms of malnutrition [5]**.** Soybean, the vital raw material for the product, has great nutritional (source of proteins, minerals, etc.) and therapeutic values (e.g. prevention of chronic diseases such as menopausal disorder, cancer, atherosclerosis and osteoporosis), [6]**.**On an average, dry soybean contains roughly contain 40% protein, 20% oil, and insoluble (dietary fiber) carbohydrate and 5% ash [7].About 92-100% of soy protein is digestible in humans [8]**.**The deficiency of lactose in soymilk also positions it as a alternative to lactose intolerance for some consumers of dairy milk, particularly infants with such biochemical challenge. It promotes growth in children who are allergic to cow milk [9]**.**Soybean is also known to contain anti nutritional and flatus factors, beany flavour, disagreeable taste and cooking difficulty. The unwanted beany flavour of the bitterness of soymilk can be eliminated by cooking in an aqueous sodium bicarbonate at a temperature of about 80°C followed by extraction of protein and other water-soluble components [10]**.** The composition of soymilk varies with the variety of soybean used and the method of production [11].Several processes have been adopted in the production of soymilk. The processing method varies from one place to other. The most common method of soymilk production is the Traditional Oriental method in which soybean is soaked overnight, crushed wet and sieved to get soymilk. Johnson and Snyder[12] described two other methods of processing termed Illinois and Cornell methods.

These methods were aimed at getting better the acceptability of soymilk in terms of odour, and flavour. [13].The basic reason for intentionally processing milk into cheese is to preserve a perishable food and to convert it into a stable and storable product. It also expands the variety of food. The objective of the study is to incorporate soy milk for making cheese of comparative better nutrients at par with consumer acceptability.

II. MATERIALS AND METHODS

Soybean (JS 335) and cow milk (Vikas milk) were procured from local market of Jalgaon.

Soymilk Preparation method:

Soybeans were cleaned to remove stones, Soybean was soaked into water (1: 3) with 0.3% Sodium bicarbonate (NaHCO3) for 6-8hrs.Followed by boiling for 30 min with continuous stirring, de-hulled, filter& cooled[14].

Analysis of Nutritional Content:

Milk protein wasestimated as per standard method[15].The energy contentwas determined using Bomb calorimeter. The mineral content was determined using Flame photometer (RSB6). Detection of aflatoxin carried out by using HPLC.[16]

Sensory Evaluation:

The sensory evaluation of cheese carried out by 10 semi-trained panellists. The samples were evaluated for the overall acceptability colour, texture, taste and flavour.The samples rated on nine –point hedonic scale to find the liking and disliking of sample (9-like extremely, 5- neutral not like or not dislike 1- dislike extremely).

III. RESULTS AND DISCUSSION

Formulation of Cheese:

TABLE I- Formulation of cheese was carried out according to formulation of Bhattarai R et al., 2010[17].

Table 1: Composition of cheese

Sample/ Raw material	Control cheese (C0)	Cheese (C1)	Cheese (C2)	Cheese (C3)
Cow milk	100ml	70ml	60ml	50ml
Soy milk	-	30ml	40ml	50ml
Starter culture 1:1 *(Streptococcus thermophilus, Lactobacillus bulgaricus)*	3%	3%	3%	3%
Acid for coagulation	5%	5%	5%	5%
Salting(g/100g)	5	5	5	5

Cheese Analysis:

Sensory Evaluation of Soy Cheese:

The sensory evaluation of soy cheese shows that C3 cheese shows the good in taste (Figure 1) as compared to the other cheese. As the concentration of soy milk was decreased in cheese there is slightly improvement in flavour, these results may be due to the, decreased in level of soy milk, so the taste evaluation shows higher in sensory scores. The highest mean score was obtained by the C3cheese for taste. The colour scores for C3 cheese were much good as compared to other cheese and also control cheese. The texture of C3 cheese was good as compared to the other cheese. The flavour of cheese was affected if level of soy milk is decreased from C1 cheese. The C3 cheese shows highest score for the flavour.

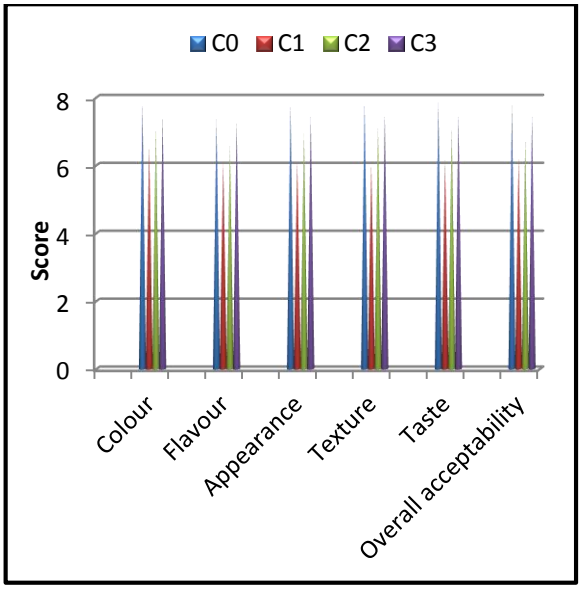

Figure 1: Graph for sensory evaluation of soya cheese

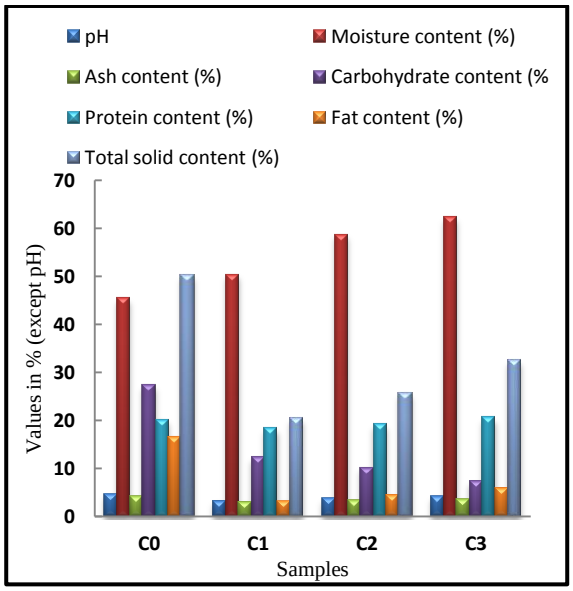

Figure 2: Graph for proximate analysis of soya cheese

Proximate analysis: The proximate analysis of soy cheese formulations respectively. The pH of C3 cheese decreased from 4.57 to 4.13 of sample when compare to control cheese. Change in pH, % titrable acidity depends upon the effect of cheese ripening & state of storage after cheese production [18].They prepared soft ripened cheese by incorporation of bambaranut milk. They found that pH of cheese sample fill in the range 5.88-6.11.The moisture content of C3 cheese increased (62.26%) as compare to the control cheese (45.36%). The ash content of C3 cheese is decreased (3.54%) as compare to the control cheese (4.18%). The carbohydrate content of C3 cheese decreased (7.32%) as compare to the control cheese (27.3%). The protein content of C3 cheese (20.53%) as compare to the control cheese (20.10%). It may be due to the high protein content of soybean, high protein utilization leading to the higher amount of protein gained. The fat content of C3 cheese decreased (5.80%) as compare to the control cheese (16.46%). It may be due to the increase in proportion of soy milk; therefore fat content depends upon cow milk. Similar result was reported by [19].They prepared cheese from soy and coconut milk. The fat content of soy-coconut cheese (50:50) is higher 9.8% as compare to the control cheese.

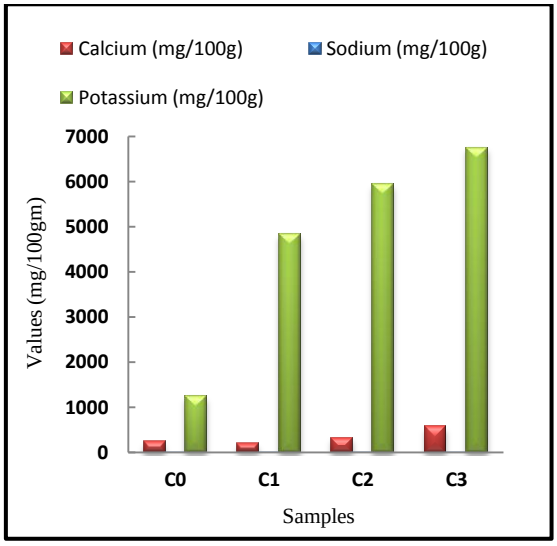

Figure 3: Graph for mineral analysis of soya cheese

From Figure 3, calcium content of C3 cheese increased (573.33mg/100g) as compare to the control cheese (232.6mg/100g).The potassium content of C3 cheese increased (6755.2mg/100g) as compare to the control cheese (1236.2mg/100g).The energy value of C3 cheese is less (140kcal/100g) as compare to the control cheese (283.83kcal/100g).It may be due to the less amount of fat and carbohydrate.

Detection of aflatoxin in soy cheese:

The HPLC chromatograms of standard and soy cheese samples were shown in figure (4)to (7) respectively. Figure(4) shows the standard peaks of aflatoxin G1, B1, G2 and B2,detected at retention time of 6.627; 7.781; 11.738 and 15.151 min, respectively. Figure (5) to (7) shows the HPLC chromatogram of soy cheese C1, C2, C3 in which absorbance occurred at retention time such as 2.3500, 2.5667, 3.000, 3.6500, 4.5500, 4.9567, 7.333, 11.1167 and 12.6500 respectively. That indicates no one retention time or peak match with retention time of aflatoxin that shows in figure (). The level of aflatoxin in this product was below the maximum limit regulated by European Union (2 ng/g) and USA Food and Drug Administration (20 ng/g). [20]Therefore the result showed that the aflatoxin G1, G2, B1 and B2 in soy cheese sample C1,C2 and C3 was absent and it was safe for substitution of soy milk with cow milk in cheese.

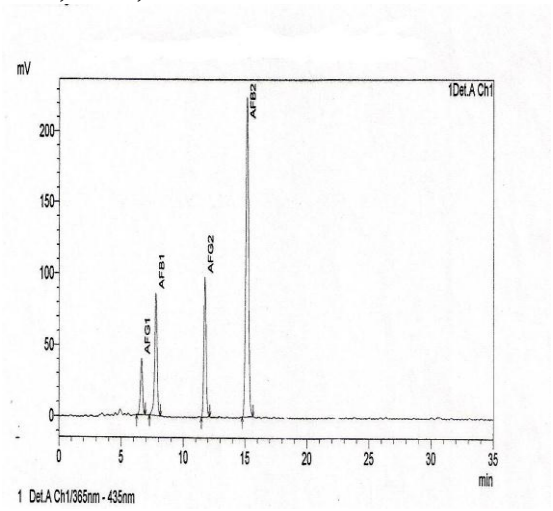

Figure 4: Standard HPLC chromatogram of aflatoxin

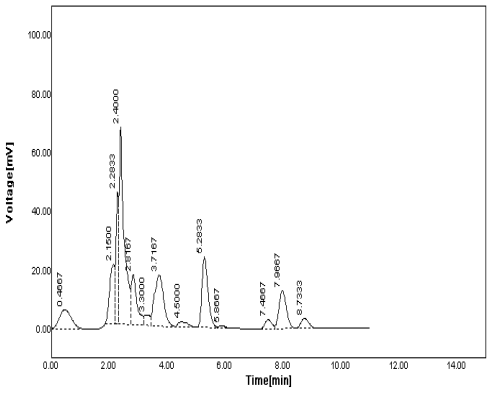

Figure 5: HPLC Chromatogram of C1 cheese sample

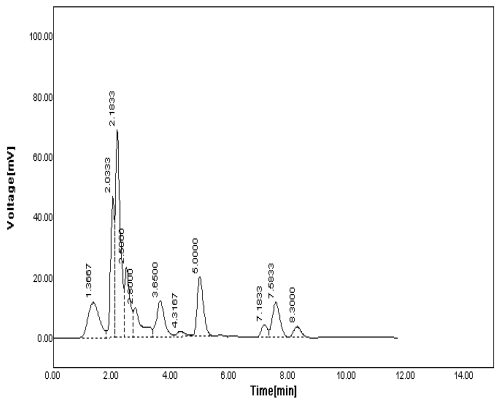

Figure 6: HPLC Chromatogram of C2 cheese sample

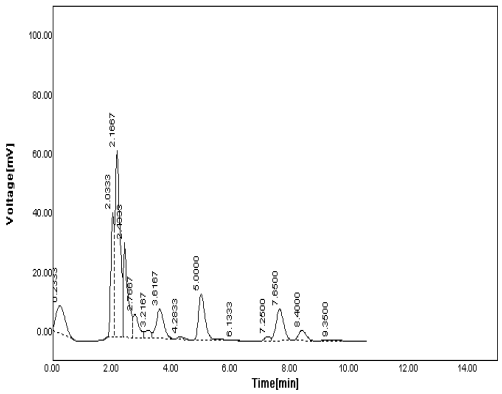

Figure 7: HPLC Chromatogram of C3 cheese sample

IV CONCLUSION:

Our study showed that sensory acceptable cheese C3 can be prepared by 50% soy milk, 50% cow milk respectively. This cheese reported to less energy value (140kcal/100g) and 5.40% fat content, 14% calcium content and 44% potassium content when compared with sole cow milk cheese. It can be conclude that such soy prepared cheese may be deemed to be or presumed to be functional food and can provide better useful minerals and nutrient content than the normal cheese and can be recommended where low fat diet is required. Aflatoxin B1, B2, G1 and G2 were not detected in the soy cheese suggested that the soy cheese is a safe food product.

REFERENCES:

[1] Jain, J.D. 1998. Soybean; its value of dietics, cultivation and uses. International Books and Periodicals Supply Service 24-b/5 DeshBandu, Gupta Road, New Delhi110005.

[2] Mayhew, S. and Penny, A. 1998. Tropical and subtropical foods. Macmillan Publishers Ltd. London and Basingstoke.

[3] Williams, S. and A. Akiko, 2000. Tofu' and Soy Milk Production. 3rd Edn., Soy foods Centre, Lafayette, California

[4] Food and Agriculture Organisation, 1971. Technology of products from soybeans. Rome, Italy, FAO Agricultural Service Bulletin 2.

[5] Nwanekesi, E. C. (1984). The Effect Of Partial Substitution With Soymilk On the sensory and chemical quality of Warankasi, A white Nigerian Soft Cheese. Unpublished M.Sc. Thesis - University of Ibadan - Nigeria.

[6] Considine and Considine, 1997. Processing and Production of Soy beans; Improvement, production and uses. Caldwell, B.E., (Ed.), American Society for Agronomy Inc., USA.

[7] Liu,D.M; Li,LYang,XQLiang,S.Z. and Wang,J.S (2006). Food Technol. Biotechnol. 44 ; 417–422.

[8] Liu, K. (ed.), 2004. Soybeans as Functional Foods and Ingredients. AOCS Publishing, USA.

[9] Riaz, M.N., 1999. Soybeans as functional foods.Cereal foods world, 44(2): 88-92.

[10] Onuorah, C. E.,* Adejare, A. O. and Uhiara N. S.(2007). Comparative physico-chemical evaluation of soymilk and soya cake produced by three different methods. Department of Food Science and Technology, VOL. 25, No. 2,28-38

[11] Nwanekesi, E. C. (1984). The Effect Of Partial Substitution With Soymilk On the sensory and chemical quality of Warankasi, A white Nigerian Soft Cheese. Unpublished M.Sc. Thesis - University of Ibadan - Nigeria.

[12] Johnson, W. K. and Snyder, H. E., (1978). Soymilk, Comparison of Processing Method. Yield and Composition. Journal of Food Science 43: 349

[13] Wang, H. L., Mustakas, G. C., Wolt, W.J., Wang, L. C., and Hesseltine, C.W., and Bagley, E. B. (1978) Soybean as Human Food - Unpublished and Simply Processed. U.S. Department of Agriculture, Utilization Research Report, Number 5.

[14] Terna, G. and Musa, A. (1998) Soybeans Yogurt Production Using Starter Culture from "Nono". Nigerian Journal of Biotechnology, 9, 17-23.

[15] Food Safety and Standard Authority of India(FSSAI). Manual for methods of analysis of Milk and Milk Products.

[16] Ignatius S, Mandala W, Indah K (2010).Development of low aflatoxin soy corn milk: optimization of soybean and sweet corn ratio and its stability During storage. International Journal of Food, Nutrition and Public Health, Vol. 3(2):161-170

[17] Ignatius S, Mandala W, Indah K (2010).Development of low aflatoxin soy corn milk: optimization of soybean and sweet corn ratio and its stability During storage. International Journal of Food, Nutrition and Public Health, Vol. 3(2):161-170

[18] AOAC (2000). Official methods of analysis of AOAC international (17 ed.). Arling, VA, USA: AOAC International.

[19] Ranganna (2005). Handbook of analysis and quality control of fruit and vegetable products.p.3-27.

[20] Adejuyitan J. A, Olanipekun B. F.andMoyinwin O (2014). A.Production and evaluation of cheese-like product from the blend of soy milk and coconut milk.Archives of Applied Science Research, 6 (4):263-266.