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Development of herbal shredded mozzarella cheese using *Tinospora cordifolia* (Giloy) extracts

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Abstract
Nowadays people are health conscious, they like value added product as a part of their everyday meal or as well as the foods they eat for pleasure. The composite mozzarella cheese was based on fast food ingredients Giloy. Herbal mozzarella cheese prepared by using cow milk is of good and inexpensive source of protein, vitamin, lactose, ash, are considered as a foodstuff of high nutritional value and one of the most economical sources of energy. Giloy an important herb in India. In this experiment, Giloy was added to mozzarella cheese under three different treatments T_0, T_1, T_2 and T_3 which was 0%, 1%, 2% and 3% respectively. These samples were subjected to analysis of their functional properties. The proximate composition of the various Giloy used for the preparation of herbal mozzarella cheese were determined using standard methods. The Physico-chemical analysis and sensory evaluation was done to know the acceptability of herbal mozzarella cheese. These were evaluated for sensory analysis that included colour, taste, flavor, texture and overall acceptability. The cheese was analyzed for analytical and chemical analysis, which includes moisture content, fat content, total ash content, protein content, and carbohydrate content. On the basis of sensory evaluation, cheese containing Giloy proportion of 3% scored high score for overall acceptability.

Keywords: Herbal cheese, antioxidants; shredded mozzarella cheese, giloy

1. Introduction
Mozzarella cheese is un ripened cheese obtained by coagulating milk with cultures of harmless lactic acid-producing bacteria, suitable enzymes of non-animal origin or by direct acidification. Cheese is primarily used for its organoleptic contributions to a food, but it also provides functionality and nutrition to the finished food. As an ingredient in foods, cheese is required to exhibit functional characteristics in the raw (e.g., sliceability, shreddability, grateability) and cooked (e.g., flowability, mouthfeel, flavour and/or stretchability) forms (Farkye *et al*, 2004) [8]. There is a growing demand for cheeses and/or cheese toppings with customized functional attributes in the pizza trade. Pasta filata cheeses are distinguished by a unique plasticizing and kneading treatment of the fresh curd in hot water, which imparts to the finished cheese its characteristics fibrous structure, and melting and stretching properties (Battistotti and Corradini, 1993) [1].
Giloy (*Tinospora cordifolia*) belongs to the family of Menispermaceae (Gupta and Sharma 2011) [11]. Extensive working Tinospora cordifolia through animal and human studies has established its immunomodulatory activity it has antioxidant and protective effects (Manjrekar 2000) [20]. Due to these effects as well as the anti-hyperglycemic activity, it has been found useful in management of diabetes mellitus and other diseases (Nair 2004) [22]. Despite of its health benefits Giloy is not palatable. Hence, Shredded mozzarella cheese was prepared by incorporated Giloy which not only imported the palatability of Giloy but also improved the antioxidant value of the cheese.

Objectives
1. To study the procedure for the preparation of herbal mozzarella cheese.
2. To assess the physico-chemical, sensory and microbial properties of developed herbal mozzarella cheese.
3. To study the stretchability of shredded mozzarella after addition of Giloy.

2. Material and Method
The experiment "Development of Herbal Shredded Mozzarella Cheese by incorporating Giloy" was carried out at the the quality control and research lab of Kwality Milk food

Limited, Chennai, India. The details of the experimental techniques that were employed during the course of investigation are as follows.

2.1 Procurement and purchasing of raw materials

1. Cow milk: It was procured from Kwality Milk Food Limited, Chennai.
2. Giloy Powder: Giloy Powder was procured from a local market in Kancheepuram.
3. Rennet: Microbial rennet was procured from Essdee Marketing limited.
4. Lactic Acid: Anhydrous Lactic Acid was procured from Kwality Milk Food Limited, Chennai.

2.2 Equipment required in preparation of Herbal Shredded Mozzarella

A laboratory scale water bath, wooden ladder, Cheese vat, vertical and horizontal knives were used during the study. Further, pH meter and thermometer were used to have close control over acidity and temperature. Cheese shredder was used for shredding the prepared cheese. Moreover, digital weighing balance was used for the analytical works.

2.3 Methodology

2.3.1.a Preparation of Giloy Juice

Giloy Jucie was prepared from Giloy Powder by mixing 2 Tbs of Giloy powder to 500 ml of pasteurized water. Thus, prepared juice was stored in a sterile glass container and was subjected to refrigerated storage.

Table 1: Different ratio of Giloy Extracts

Treatments	Giloy
T0	0%
T1	1%
T2	2%
T3	3%

2.3.1.b Preparation of Herbal Shredded Mozzarella

The procured cow milk was preheated to a temperature of 35 ºC and was standardized to make 4% fat and SNF of 8.5%. To the standardized milk, Giloy extracts were added under 4 different treatments namely T0, T1, T2, T3 consisting of 0%, 1%, 2% and 3% of Giloy. The mixture was subjected to heat treatment of 63 ºC for 30 mins in an open vat followed by immediate chilling in cold room to less than 10 ºC. To the chilled milk 10% concentration of lactic acid was added drop wise drop till the pH of 5.5 was reached. Now the milk was preheated to 30 ºC and renneting was done. The milk was left for curd setting and then cutting of cheese was performed. The cut cheese cubes were cooked to 39 ºC for efficient syneresis. Hot water was added to the cooked cheese cubes for plasticizing. Stretchability of cheese was done followed by dipping in 22% concentrated brine solution. Finally, the cheese was shredded into fine shreds and was stored in cold room.

2.3.2 Sensory evaluation: The Sensory quality attributes such as color, flavor, taste, texture and overall acceptability of Herbal Shredded Mozzarella Cheese was evaluated as recommended by (Ranganna, 1986) [25]. This was evaluated using points Hedonic rating test method. This test measures the consumer acceptability. A panel of members of different age groups having different eating habits was selected to evaluate the quality through properly-planned experiment. The panelists were selected from the experienced staff of the KMFL. Numerical scores were allocated for the various sensory attributes and the overall acceptability of the product was evaluated. The sensory quality of the product was indicated by the numerical score assigned to the attributes.

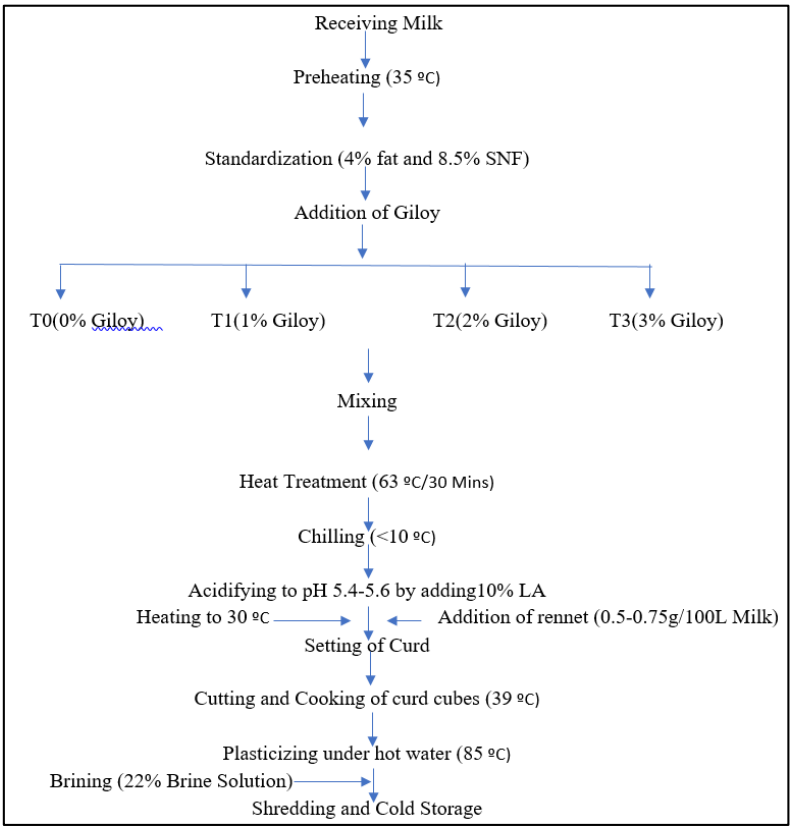

Fig 1: Schematic diagram for the preparing process of Herbal Shredded Mozzarella

2.3.3 Analytical Methods: Various methods that were employed for the physio-chemical and microbiological analysis are mentioned below:

- Total Solids: Total soluble solids were determined was using Mojonnier Milk Tester as suggested by (Milk industry Foundation, 1959) [21].
- Moisture content: Moisture content of the sample was determined by using hot air oven method as recommended by (Milk industry Foundation, 1959) [21].
- Fat: Fat content was determined by using Gerber method. (BIS, 1977)
- Protein: Protein Content was estimated using Kjeldahl Method as suggested by Jayaraman, 1981 [14].
- Ash: Ash content was determined by using BIS method (BIS,1961a, b) [2, 3].
- Titratable acidity: Titratable Acidity was determined by titrating the suspension against 0.1N NaOH solution to an end point using phenolphthalein as an indicator (BIS, 1961a, b) [2, 3].
- Antioxidants: The Antioxidant content was determined by using DPPH method as the metghod suggested by Brand Williams *et al*. 1995 [5].
- pH: The pH was measured using the digital pH meter (Metzer-M, 2001 M) which was calibrated using 7 pH and 4 pH standard buffer solutions.
- Stretchability: Stretchability as analysed by Texture Profile Analyser machine as suggested by USDA 1981 [26].
- Total Plate count: Microbial analysis was done to determine the Total Plate Count (TPC) of the sample on nutrient Agar media for bacterial count as method recommended by (Harrigan and Mc Cance, 2014) [12].

2.3.5 Statistical Analysis: Calculation of the standard deviation (SD) and Analysis of Variance (ANOVA) were the statistical tool used for the statistical analysis.

3. Results and Discussion

The present investigation entitled "Development of Herbal Shredded Mozzarella Cheese by incorporating *Tinospora Cordifolia* (Giloy)" was carried out in the Quality Control and research lab of Kwality Milk Foods, Chennai in the year 2021.

3.1 Physio-chemical characteristics of Giloy Powder

The moisture content in the Giloy Powder was found to be 7.8%. The Giloy Powder contribute 92.2% total soluble solids, with an appreciable amount of antioxidant (85mg), Protein (11.2%), Carbohydrate (61.6%), fat (3.1%), Fibre (15.8%), Iron (0.28%) and Calcium (0.13%). Thus, keeping in view of the nutritional value of the Giloy, Mozzarella Cheese was prepared with an acceptable acidity, colour, flavour without the addition of any exogenous ingredients.

Table 2: Composition of Giloy Powder. (Chaudhary *et al*., 2012) [6],

Constituents	In Grams/100 Gm
Protein	4.5-11.2
Carbohydrate	61.66
Fat	3.1
Iron	0.28
Calcium	0.131
Fibre	15.9
Moisture	7.72-14.42

3.2 Standardization of recipe for cheese preparation

The result corresponding to the sensory evaluation of the herbal shredded Mozzarella prepared by incorporating different levels of Giloy extract is tabulated in table 3. As regards sensory evaluation T3 (3% Giloy) showed better results with respect to high colour score (8.6), taste (8.0) better body and texture (8.4) and overall-acceptability (8) as shown in table 3. Thus, this proves that mozzarella cheese with added level of Giloy was more acceptable than other treatments. The treatment T0 (0% Giloy) was better with respect to taste and flavour among all other treatments. From ANOVA for the sensory characteristic of herbal shredded mozzarella it concluded that Giloy addition has significant effect on sensory parameters of cheese.

3.4 Physio-chemical characteristics of Herbal Mozzarella cheese

The data in table 3 shows the physio-chemical characteristics of the herbal mozzarella cheese. The herbal mozzarella cheese thus prepared (T3) had moisture content of 45.16%, Total soluble solids 54.84%, Titratable acidity of 0.77%, antioxidant content of 8.5mg/100g, fat content of 22.6%, protein content of 25.85%, carbohydrate content 3.4%and 2.99% ash content. The ash and carbohydrate content seemed to be higher in the cheese with Giloy as compared to that of control. There seemed to be a slight reduction in the fat and protein content due to Giloy addition.

3.5 Microbiological characteristics of Herbal Mozzarella cheese

The data in table 3 shows the microbiological characteristics of the herbal mozzarella cheese. The herbal mozzarella cheese thus prepared (T3) had SPC count of 7.4 Cfu/gm, Yeast and mold count of 2.8 cfu/gm and coliform count was nil. The SPC count of cheese with added Giloy was found to be lesser than the control sample while the Yeast and mold count was found to be high in cheese with Giloy. All the values of microbial load were under the FSSAI regulation for cheese cc

3.6 Stretchability of Herbal Mozzarella cheese

The stretchability of mozzarella cheese was found to decrease slightly due to the addition of Giloy. The value for stretchability for different treatments T0, T1, T2 and T3 were 73.27, 70.10, 68.60 and 68.02 respectively.

Table 3: Physico-chemical and Microbiological analysis of Herbal Shredded Mozzarella Cheese

Parameter	Score /value based on mean value of different parameter of treatment			
Treatments	T0	T1	T2	T3
Moisture %	45.54	45.48	45.33	45.16
Ash %	2.36	2.47	2.79	2.99
Total solid	54.46	54.52	54.67	54.84
Fat %	23.5	23.29	23.05	22.6
Protein %	26.5	26.35	26.13	25.85
Total carbohydrates	2.11	2.40	2.7	3.4
Acidity	0.70	0.72	0.75	0.77
SPC×10^{-3} (cfu/gm)	9.5	8.5	7.9	7.4
Yeast and mould (cfu/gm)	2.5	3.4	2.6	2.8
Coli form	Nil	Nil	Nil	Nil
Colour and appearance	7.20	8.20	8.40	8.60
Flavor and taste	8.60	8.40	8.20	8.00
Body and texture	7.20	7.40	7.60	8.40
Overall acceptability	7.40	6.80	7.40	8.00

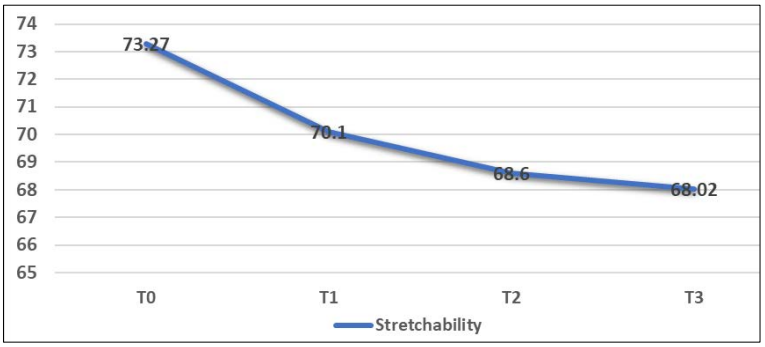

Fig 2: Stretchbility Curve for different treatments of mozzarella cheese

4. Conclusion

The present study has shown that Giloy can be successfully used to prepare herbal mozzarella cheese. Out of different treatments T3 with 3% Giloy was found to be with the desired incorporated mozzarella cheese as per sensory attributes. Thus, it can be concluded that Giloy tried in this study could be successfully incorporated in mozzarella cheese without adversely affecting the sensory quality of the existing mozzarella cheese. The mozzarella prepared was found to be safe on microbiological parameters and can be safely consumed. ingredients like Giloy have beneficial role in cardio vascular diseases, natural antioxidants, which are effective in reducing the risk of heart disease, cancer, immune-system decline, cataracts and different inflammatory processes.

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6. References

1. Battistotti, Corradini. 'Italian cheese; in fox P.F., Cheese: chemistry, physics and microbiology, London. 1993;2:337-362.
2. BIS Methods of test for dairy industry -Rapid examination of milk. BIS: 1479(part -1), Indian Standards Institute, New Delhi; c1961a.
3. BIS Methods of test for dairy industry -Chemical analysis of milk milk. BIS:1479 (part -2), Indian Standards Institute, New Delhi; c1961b.
4. BIS Determination of fat by Gerber method. BIS -1224 (part -1), Indian Standards Institute, New Delhi; c1961.
5. Brand-Williams W, Cuvelier ME, Berset C. Use of free radicle method to evaluate antioxidant activity. LWT-Food Sci Technol. 1995;28(1):25-30.
6. Chaudhary, Jahan R, Goyal. Chemo preventive potential of an Indian medicinal plant (*Tinospor*a *cordifolia*) on skin carcinogenesis J environ. Pathol. Toxicol. 2008;27:233-243.
7. Demott BJ. Recovery of Milk Constituents in a Mozzarella-Like Product Manufactured from Non-fat Dry Milk and Cream by Direct Acidification at 4 and 35 °C. J Dairy Sci. 1983;12(66):2501-2506.
8. Farkye NY, Faria HB, Saad J. Cheese technology. J Soc. Dairy Technol. 2004;57:91-98.
9. Ghosh BC, Singh S. Effect of heat treatment on the quality of mozzarella cheese from buffalo milk. Indian J Food Sci. Technol. 1990;27(4):218-220.
10. Gunasekaran S, Kuo MI. Effect of frozen storage on physical properties of pasta filata and nonpastafilata mozzarella cheeses; c2002.
11. Gupta R, Sharma V. Ameliorative effects of Tinospora cordifolia root extract on histopathological and biochemical changes induced by aflatoxin-b (1) in mice kidney. Toxicol Int. 2011;18:94-8.
12. Harrigan WF, McCance ME. Laboratory methods in microbiology. Burlington: Elsevier science; c2014.
13. Innovations in dairy. Improving mozzarella Manufacture and Quality Part I, Processing technologies for efficient manufacture of high-quality mozzarella cheese, available at: ht://www.dairyinfo.com/mozzarella1. pdf Accessed on 25t November 2008.
14. Jayaraman J. In: Laboratory Manual in biochemistry, Wiley eastern ltd, New Delhi; 1981. p. 75.
15. Jagetia GC, Rao SK. Evaluation of the antineoplastic activity of Guduchi (*Tinospora cordifolia*) in ehrich ascites carcinoma bearing mice. Bio Pharm Bull. 2006;29:460-6.
16. Joshi NS, Muthukumarappan K, Dave RI. Understanding the role of calcium in Functionality of part skim Mozzarella cheese. J Dairy Sci. 2003;86:1918-1926.
17. Joshi NS, Muthukumarappan K, Dave RI. Effect of calcium on microstructure and meltability of part skim mozzarella cheese. J Dairy Sci. 2004;87:1975-1985.
18. Karpova EA, Voznyi YaV, Dudukina TV, Tsvetkova IV. 4-Trifluoromethylumbelliferyl glycosides as new substrates for revealing diseases connected with hereditary deficiency of lysosome glycosidases. Bio-chem Int. 1991;24:1135-44.
19. KC JB, Rai BK. Basic food analysis handbook, (1st Edn), Prompt Printers Pvt. Ltd Kathmandu, Nepal. Keller B., Olson N. F. and Richardson T. (1973). Mineral retention and rheological properties of mozzarella cheese made by direct acidification; 2007.
20. Manjrekar PN, Naraynan S. Comparative study of immunomodulatory activity of *Tinospora cordifolia* and *T. sinensis.* Fitoterapia. 2000;71:254-7.
21. Milk industry foundation In: laboratory manual, methods of analysis of milk and its products, 3rd edn., Washington, USA; c1959. p. 283.
22. Nair protective effect of Indian medicinal plants against cyclophorid neutropenia. Journal of postgraduation medicine. 2004;33:185-188.
23. Parthipan M, Aravindhan V, Singh Rajendra A, *et al.* Medico-botanical study of Yercaud hills in the eastern Ghats of Tamil Nadu, India. Anc Sci Life. 2011;30:104-9.
24. Rana V, Thakur K, Sood R, Sharma V, Sharma TR. Bapat. Genetic diversity analysis of *Tinospora cordifolia* germplasm collected from north-western Himalayan region of India. J Genet. 2012;91:99-103.
25. Ranganna S. Manual of analysis of fruit and vegetable products, Tata MC Graw Hill publishing company ltd. New Delhi; c1986.
26. USDA. Specification of mozzarella cheese, Agricultural Marketing Service, United States Department of Agriculture, Washington, DC, USA; c1981.