



ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2023; 12(3): 657-661
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www.thepharmajournal.com
Received: 25-12-2022
Accepted: 29-01-2023

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Sensory evaluation of quarg type cheese fortified with lime and honey

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Abstract

India has been identified as the world's largest and fastest-growing market for milk and milk products. Most of the milk in the country is produced by small, marginal farmers and landless laborers. Milk production in India has latest growth at rate of 6.2% per annum. Therefore, strengthening of dairy processing infrastructure is required for catering to the growing dairy market in the country (Anonymous, 2022). Dairy products are categorized as heat desiccated, fat rich, frozen, heat acid coagulated, and fermented dairy products are the most prevalent dairy products. Fermentation has been shown to increase mineral bioavailability and digestibility of proteins and carbohydrates, as well as improve the product's organoleptic properties. Development of best quality *quarg* type cheese with mild acidic flavor, smooth and creamy texture can be made by addition of lime and honey. Lime and honey levels were tried separately in quarg type cheese. The level of lime was finalized on the basis of sensory sensory evaluation with 0.7 percent lime and which was kept constant for each level with honey. From the above, this was clear that the combination of lime and honey gave better results than alone, therefore possible combinations were tried and superior five treatments of each combination was selected in the experimental for further study. All the samples were acceptable but the *quarg* type cheese prepared by 0.7 percent lime juice + 18 percent honey showed highest overall acceptability with 95.86 sensory score. The chemical compositions of quarg type cheese were fat (9.86%), Protein (10.91%), lactose (13.57%), total solid (35.59%), Ash (1.10%), Acidity (0.79%) and pH (4.28).

Keywords: Cheese, quarg, lime, honey, fermented

Introduction

Cheese is one of the most popular produced milk products among the dairy products. All around the world, cheese has been a part of a well-balanced diet. Cheese production is centered in western countries, and it is one of the classic instances of food preservation created by fermentation and ripening (Singh, 2011) [17]. The variety is attributable to a growing understanding of cheese-making technologies as well as the biochemistry and microbiology of cheese ripening (Farkye, 2004) [6]. Cheese seems to have an abundance of casein, which is a protein that stores a lot of bioactive peptides that are released by proteases. These peptides have biological properties such as anti-carcinogenic, anti-hypertensive, anti-oxidative, and opioid action, among others (Gomez of Ruizet *et al.*, 2002) [8]. Apart from these bio-active peptides, cheese is high in calcium and has a great health benefit (Kansal and Chaudhary, 1982) [12]. Cheese also includes more CLA, a fatty acid that has been linked to weight loss, cancer prevention, and immunological modulation. When processed cheese is made from natural cheese, the amount of CLA in it increases even more.

Quarg, or Speisequark in German, is a natural, unripened, fresh cheese that is manufactured in large quantities in Germany and is very popular there. It's essentially a milk protein paste made by acid coagulating milk with proper bacterial cultures (e.g. *Streptococcus cremoris* and *Leuconostoc citrovorum*) with addition of a small amount of rennet to help separate the protein coagulum from the whey and thus better yields. This is a popular cheese in Central Europe (e.g. Germany, Poland and Austria). Kvarg, tvarog, tworog, twarog, Sauermilchquark, and Speisequark are some of the other names for this product in different countries (Gahane, 2008) [7].

Lime (*Citrus aurantifolia*) is the plants that traditionally used as medicine by the community since its availability, the low cost and has minimum side effects. As a medicine, lime is used as an appetite enhancer, antipyretic, diarrhea, anti-inflammatory, and is used as an antibacterial. Lime juice is known to have antibacterial activity; therefore, it can be used to treat various infectious problems because it contains citric acid, amino acids, glycosides, citric

acid, fat, calcium, phosphorus, iron, vitamin B₁ and vitamin C (Aini *et al.*, 2017)^[1]. Honey is used as a sweetening agent and few additives to enhance its flavours and medicinal properties like lime. It has been used as a natural sweetener. The antimicrobial activity in most honeys is due to the enzymatic production of hydrogen peroxide. Several substances with antibacterial activity are found in honey in small quantities *e.g.* Pinocembrin, Terpenes, Benzyl alcohol, Syringic acid etc (Molan, 1992)^[14]. Honey is used internally in treatments of cough, cold, hay fever, gastro-intestinal disorders, etc. (Dunford *et al.*, 2000)^[4].

Material and Methods

The present research work entitled “Sensory Evaluation of Quarg type Cheese Fortified with Lime and Honey” was undertaken in the section of AHDS, Post Graduate Institute, M.P.K.V., Rahuri, during the year 2018-23.

The following materials were used while performing the experiments of present investigation.

Milk

Milk sample of cow milk was obtained from Research-Cum Development Project on Cattle, located at Central Campus, at Post Graduate Institute, M.P.K.V., Rahuri.

Starter culture

Cheese culture (NCDC-149) was procured from National Collection of Dairy Culture, Dairy Microbiology Division, NDRI, Karnal (Haryana).

Rennet

Microbial “Meito” rennet was purchased from CHR Hansen Ltd. Mumbai to make the firm and desirable Quarg type cheese.

Muslin cloth

The muslin cloth of 1x1m size (90 mesh) was used for draining of whey.

Lime

Fresh lime fruits were obtained from Department of Horticulture, MPKV Rahuri.

Honey

Fresh and natural honey was procured from “Hemantgiri Madh” centre, Ahemadnagar.

Equipments/Utensils

Vessels (Containers)

Stainless steel vessels of various capacities were used in manufacturing process of quarg type cheese.

Cheese Vats

Stainless steel made cheese vat of size 25×16×16 cm was used for coagulation purpose.

Cheese Knives

MS Framed with nylon wire knife both of vertical and horizontal was used for cutting the curd.

B.O.D. Incubator

B.O.D. Incubator manufactured by M/S. Newtronic, Mumbai (India) was used for incubation.

Weighing balance

Electronic precision weighing balance (ET 2245, Sartorius ISO: 9001) was used for weighing samples, ingredients and chemicals etc.

Laminar air flow Kirloskar electrodyne Ltd., Pune laminar air flow was used for transfer of culture and microbiological work.

Autoclave

An instrument manufactured by M.K. Oswal Laboratories Corporation, J.P. Industrial Corporation, Mumbai (India) was used for sterilization of glasswares.

Hot air oven

Lab Hosp make laboratory hot air oven of 45x45x45 cm size was used to determine the moisture content and total solid in the quarg type cheese samples.

Refrigerator

Samples were kept in refrigerator (Godrej Ltd., Mumbai) at 4± 1 °C for cooling.

Methodology

Preparation of Quarg type cheese

The quarg type cheese was prepared by using technology developed at NDRI for manufacturing of quarg cheese, prescribed by Gahane (2008)^[7] with some minor modifications.

Standardization of milk

Fresh sample of milk was analyzed for fat content and required quantity of cream was separated by using ‘Alfa Felix’ hand operated cream separator. The milk was standardized at 4 percent fat level using Pearson’s square method.

Pasteurization of milk

Standardized milk was heated to 85 °C for 15 min and mixed thoroughly and cooled to 30-37 °C.

Inoculation

The milk was inoculated by adding 1 percent starter culture (NCDC-149) and incubated at temperature 37 °C.

Renneting

Two and half hrs after the addition of starter culture, microbial rennet @ 200-300mg/100 lit. of milk was added and mixed thoroughly.

Incubation

The content was left undisturbed for curd setting in incubator at 37 °C, which took around 8-10 hrs starting from culturing.

Cutting and Stirring

The coagulum was then cut using knives and it was again left undisturbed for about 10-15 minutes.

Cooking/Heating

The curd was heated slowly and gradually increasing temperature to 55-60 °C @ 1 °C per minute and curd hold for 10 minutes at 60 °C.

Cooling and Whey off

Cooked curd was then cooled to room temperature and filled in muslin cloth hanging for 3 to 4 hrs.

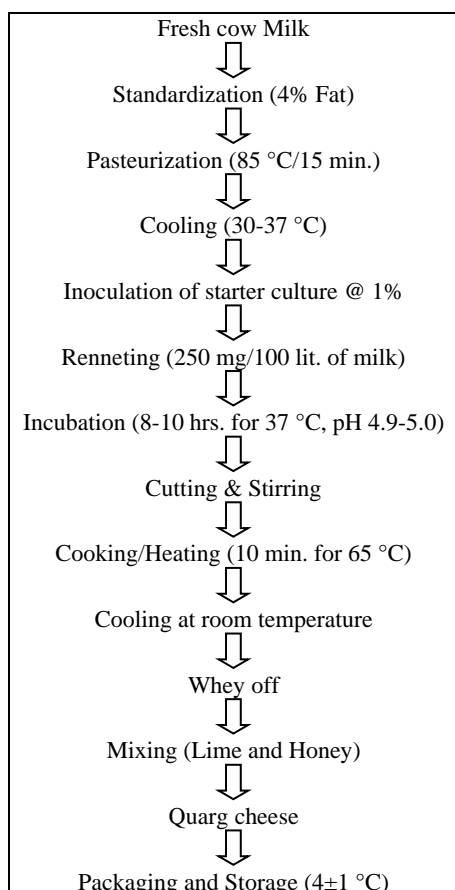
Mixing

The obtained quarg type cheese was homogenized by mixing herbs thoroughly.

Packaging and storage

The quarg type cheese prepared by using cow milk and stored in refrigerator at 4 ± 1 °C.

Flow chart for manufacture of Quarg type cheese



Flow chart for manufacture of Quarg type cheese (Gahane, 2008)^[7]

Experiment

Preliminary trials were conducted for finalizing the level of lime and honey in quarg type cheese. Firstly, level of lime was finalized on the basis of sensory sensory evaluation *i.e.* 0.7 percent and which was kept constant for different level of honey. From those combinations five superior treatments were selected. These treatments were analyzed for its sensory parameter.

The beaker trials were conducted to finalize the levels of lime and honey separately. For finalizing level of lime, percent lime juice was added in 0.1%, 0.2%, 0.3%, 0.4%, 0.5%, 0.6%, 0.7% and 0.8%. Amongst the various levels of lime tried, 0.7 percent was finalized on the basis of sensory evaluation. The level of lime *i.e.* 0.7 percent was kept constant and tried with various level of honey *i.e.* 12, 14, 16, 18, 20, 22, 24 and 26 percent respectively. This was carried out for finalizing the combination of different levels of lime and honey to be used for manufacturing of Quarg type cheese. The treatment details

are given below. On the basis of sensory evaluation, the levels were finalised alone for pre-experimental trials.

Sr. No.		Percent of Lime and Honey							
		0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8
1.	Lime juice	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8
2.	Honey	12	14	16	18	20	22	24	26

Lime and honey levels were tried separately in quarg type cheese. The level of lime was finalized on the basis of sensory sensory evaluation with 0.7 percent lime and which was kept constant for each level with honey. The superior treatments were subject to sensory evaluation and physicochemical analysis.

T₀: Control (Quarg type cheese)

T₁: Quarg type cheese + 0.7% lime juice + 14% honey

T₂: Quarg type cheese + 0.7% lime juice + 16% honey

T₃: Quarg type cheese + 0.7% lime juice + 18% honey

T₄: Quarg type cheese + 0.7% lime juice + 20% honey

Sensory evaluation

Sensory evaluation of dairy products are strong influence on consumer acceptability, preferences and market price. The quarg type cheese prepared under different treatments the investigation was subjected to the sensory evaluation by a panel of five judges. The product was judged for different quality attributes by 100 point quarg cheese score card.

Effect of lime and honey sensory score of quarg type cheese

Treatments	Flavour	Body and Texture	Colour and Appearance	Overall acceptability
T ₀	47.62 ^c	34.46 ^a	14.52 ^a	96.61 ^a
T ₁	47.80 ^d	33.81 ^b	14.13 ^b	95.74 ^{cd}
T ₂	47.91 ^b	33.79 ^{bc}	14.12 ^{bc}	95.82 ^{bc}
T ₃	47.98 ^a	33.78 ^{cd}	14.11 ^{bcd}	95.98 ^b
T ₄	47.89 ^{bc}	33.71 ^e	14.02 ^e	95.61 ^{de}
SE _±	0.010	0.008	0.011	0.056
CD@ 5%	0.030	0.024	0.032	0.169

The values with different small letters superscripts row wise differ significantly at 5 percent level of significance.

Flavour

From the Table it was revealed that there were significant ($p < 0.05$) difference between the treatments. The flavour score preferably offered by the judges were as T₀ (47.62), T₁ (47.80), T₂ (47.91), T₃ (47.98) and T₄ (47.89). The highest score was recorded for T₃ (47.98) followed by T₂ (47.91), T₄ (47.89), and control T₀ (47.62), where lowest score was recorded for T₀ (47.62). Treatment T₂ is at par with T₄. In accordance with the result obtained, all samples were acceptable by the judges whereas the treatment T₃ (0.7% lime juice + 18% honey) was observed to provide best flavour characteristics in the quarg type cheese. Judges experienced characteristic mild acidic, mid-late light sweetness of honey with slightly tart with addition of sour flavour of lime, distinctive sour-sweet taste in T₃ (0.7% lime juice + 18% honey).

Honey flavour is related with the volatile compounds (Silvano, *et al.*, 2014)^[16]. On the other hand, aroma of honey depends also on the quantity and type of acids and amino acids (Bogdanov, *et al.* 2008)^[3]. On the other hand, mineral content has effect on the stronger taste (Gonzalez *et al.* 2005)^[9] also, Peterson *et al.*, (2006)^[15] mentioned that citrus fruit is very popular in many parts of the world due to its distinctive flavour, taste, and aroma.

Body and texture

Body and texture are an important sensory attribute; next to the flavour while examining organoleptic quality. The values pertaining to body and texture scores of quarg type cheese are affected by the addition of lime and honey in quarg type cheese. From the result obtained it was revealed that there was non-significant ($p < 0.05$) difference between the treatments in respect of body and texture.

The values pertaining to body and texture score of quarg type cheese; it was observed that the score was ranged in between 33.71 to 34.46. All the samples were accepted by the judges but treated samples could not score higher than control sample. The second highest score was recorded to T₁ (33.81) followed by T₂ (33.79) which was at par with T₃ (33.78) whereas comparatively lowest score was recorded to T₄ (33.71). Therefore, it had revealed that T₁ was good in respect of softness, smoothness and spreadability after control sample as compared to other treatments.

Escrache, *et al.* (2009)^[5] reported that the honey can be fluid, viscous, partly or totally crystallized form and appearance is important for commercial honey, as consumers demand a fluid, non-crystallized product. Although raw honey is in a liquid state, it can contain small or big crystals.

Colour and appearance

The result regarding colour and appearance, the scores of quarg type cheese was affected by addition of lime and honey. The changes in score for colour and appearance are presented in Table and it was revealed that there was non-significant ($p < 0.05$) difference between the treatments.

The colour and appearance score were ranged in between 14.02 to 14.52. The highest score recorded for control sample (14.52). The second highest score was recorded for T₁ (14.13) which was at par with T₃ and treatment T₂ at par with T₃. Whereas, the lowest score was recorded to T₄. From the result it had revealed that all samples were accepted imparting minute difference. Treatment T₃ was yellowish white with light golden or amber colour which was most accepted by the judges. This change in colour may be attributed to the presence of golden colour compound in honey (Hirasa and Takemasa, 1998)^[11]. The color of honey varies from very pale yellow through amber and dark reddish amber to nearly black Gundogdul *et al.* (2019)^[10]. On the other hand, mineral content has effect on the darker colour (Gonzalez *et al.* 2005)^[9].

Overall acceptability

The overall acceptability of quarg type cheese with added lime and honey is depicted in Table and it was revealed that the result obtained showed non-significant ($p < 0.05$) difference between the treatments.

The score for overall acceptability was ranged from 95.61 to 96.61. Thus, it was clear that all the treatments were accepted with non-significant difference. Treatment T₁ at par with T₂ also, treatments T₂ at par with T₃. It was clearly noticed that the overall acceptability score for lime and honey added quarg type with addition of honey in cheese observed continues increases up to treatment T₃, and decline at T₄ stage. The highest score was recorded for control sample (96.61) followed by T₃ (95.98) and lowest score was noted for T₄ (95.61). Therefore, in accordance with the result obtained, the treatment T₃ (0.7% lime juice + 18% honey) was most accepted treatment for the preparation of lime and honey

fortified quarg type cheese.

Yadav *et al.* (2018)^[18] concluded that the goat milk shrikhand made with sapota pulp and betel leaf extract with 83:15:2 proportions respectively and this were best in sensory evaluation and also received highest score in sensory evaluation. Kumar *et al.* (2019)^[13] concluded that the highest mean overall acceptability score was recorded in in shrikhand prepared from 67: 20: 13 of Chakka, Ground Sugar and Malta Orange Juice, respectively.

Conclusion

All the samples were acceptable but the treatment (T₃) *i.e.* 0.7 percent lime juice and 18 percent honey showed highest overall acceptability with 95.86 sensory score. Besides with the chemical compositions of quarg type cheeses were fat (9.86%), Protein (10.91%), lactose (13.57%), total solid (35.59%), Ash (1.10%), Acidity (0.79%) and pH (4.28).

Reference

1. Aini N, Permatasani B, Khasanah U, Sukmawati A. Antimicrobial Activity of Lime Juice (*Citrus aurantifolia*) Against *Propionibacterium acnes* and *Staphylococcus epidermidis*. J of Computational and Theoretical Nano sci. 2017;23:12443-12446.
2. Anonymous. Annual Report 2021-22, Department of Animal Husbandry, Dairying and Fisheries, Ministry of Agriculture and Farmers Welfare Government of India; c2022. p. 49-66.
3. Bogdanov S, Jurendic T, Sieber R, Gallmann P. Honey for Nutrition and Health: A Review. J Am. Coll. Nutr. 2008;27:677-89.
4. Dunford C, Cooper R, Molan P. Using honey as a dressing for infected skin lesions. Nursing Standard. 2000;96:7-9.
5. Escrache I, Visquert M, Juan-Borrás M, Fito P. Influence of Simulated Industrial Thermal Treatments on the Volatile Fractions of Different Varieties of Honey. Food Chem. 2009;112:329-338.
6. Farkye NY. Cheese Technol. Int. J Dairy Tech. 2004;57(2):91-98.
7. Gahane HB. Development of Quarg type cheese with enriched functional attributes from buffalo milk. Thesis submitted to National Dairy Research Institute, Karnal (Haryana); c2008.
8. Gomez-Ruiz JA, Ramos M, Recio I. Angiotensin-converting enzyme inhibitory peptides in Manchego cheeses manufactured with different starter cultures. Int. Dairy J. 2002;12(8):697-706.
9. González-Miret ML, Terrab A, Hernanz D, Fernández-Recamales MÁ, Heredia FJ. Multivariate Correlation between Color and Mineral Composition of Honeys and by Their Botanical Origin. J Agr. Food Chem. 2005;53:2574-2580.
10. Gundogdul E, Çakmakc S, Gungor I. An Overview of Honey: It's Composition, Nutritional and Functional Properties. J of Food Sci and Engg. 2019;9:10-14.
11. Hirasa K, Takemasa M. Spices Science and Technology. Marcel Dekker Inc. Publication. New York. 1998, 13-23.
12. Kansal VK, Chaudhary S. Biological availability of calcium, phosphorus and magnesium from dairy products. Milchwissenschaft. 1982;37(5):261-263.
13. Kumar D, Rani R, Wasnik P, David J, Kumar S. Development of evaporated milk Shrikhand and vitamin

- C enrichment by using Malta orange juice. *IJCS*. 2019;7(5):2331-2338.
14. Molan PC. The antibacterial activity of honey. 1. The nature of antibacterial activity. *Bee World*, 73:5-28.
 15. Peterson JJ, Beecher GR, Bhagwat SA, Dwyer JT, Gebhardt SE, Haytowitz DB. Flavanones in grapefruit, lemons, and limes: A compilation and review of the data from the analytical literature. *J Food Compos. Anal.* 2006;19:S74-S80.
 16. Silvano MF, Varela MS, Palacio MA, Ruffinengo S, Yamul DK. Physicochemical Parameters and Sensory Properties of Honeys from Buenos Aires Region. *Food Chem.* 2014;152:500-507.
 17. Singh A, Deep A. Piperine: A bioenhancer review article. *Int. J Pharm. Res. Technol.* 2011;1(1):1-5.
 18. Yadav KS, Prasad S, Bharti BK, Singh SB, Singh O. Studies on sensory analysis of preparation of goat milk Shrikhand blended with sapota pulp and betel leaf extract. *Journal of Pharmacognosy and Phytochemistry.* 2018;7(4):3348-3353.
 19. Shah KN, Pawar PA, Wankhade PR. Honey and its properties: A comprehensive review.