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Effect Of Breed and Method Of Preparation On Fat Loss In Whey Of Goat Milk Mozzarella Cheese

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Abstract

The composition of cheese is strongly influenced by the composition of the cheese milk, especially the content of fat, protein, calcium and pH. The study was conducted at Goat Products Technology Laboratory of Central Institute for Research on Goats, Makhdoom, Farah,Mathura, Uttar Pradesh and Department of Animal Husbandry and Dairying, R.B.S. College Bichpuri, Agra (U.P.). The fat loss in whey of mozzarella cheese made from Jakhrana and Jamunapari goat milk was found to be 0.262±0.018 and 0.256±0.010 respectively. Similarly the fat loss in whey of mozzarella cheese made by direct acid, starter culture and modified method was found to be 0.266±0.022, 0.267±0.015 and 0.243±0.014 respectively. The overall average value of fat loss in whey of goat milk mozzarella cheese was 0.259±0.010. The statistical analysis revealed that the breeds of goat and methods of manufacture did not have any significant effect on fat loss in whey of mozzarella cheese.

Key Words: Effect of breed and method, Fat loss in whey, Goat milk, Preparation mozzarella cheese.

Introduction

Cheese making is a process concentrating milk components, in particular fat and protein contents which are determinant factors of cheese yield (Banks et al. 1981). Cheese yield is vital in an economic sense for cheese makers since small differences in yield translate into big differences in profits. A difference of 1% in the moisture of Cheddar cheese is equivalent to a difference in yield of 1.8%. Measurement of yield should become a tool not only of cheese making but also of management (Emmons 1993 b, Lacroix et al. 1993).

Goat milk is the proprietary item for a few varieties of soft, hard and semi-hard cheese which are being marketed as Premium Cheese in many European countries. Greece and France have the largest goat milk cheese production. Ripened goat milk cheeses are characterized by a piquant and peppery sharp flavor due to the presence of greater proportion of short and medium chain fatty acids in goat milk fat (Tziboula-Clarke, 2003).

In India, cheese prepared exclusively from goat milk is hardly available. However, technology has been developed for cheddar type cheese using admixture of buffalo and goat milk (80:20 or 90:10). Addition of 10-20% goat milk improves the sensory attributes of cheddar type cheese prepared from buffalo milk. In such admixture, goat milk acts as synergistic tonic in the manufacture of this type of cheese by improving rate of acid development, reducing cheddaring time, increasing moisture retention in cheese curd, stimulating growth of starter microflora, improving the rate of glycolysis and lipolysis, reducing hardness and improving the cohesiveness of cheese and eliminating the incidence of bitterness (Kanawjia *et al.*, 1992; Singh *et al.*, 1992a).

Direct acid mozzarella cheese manufactured from admixture of goat and buffalo milk (50:50) showed maximum stretchability and sensory scores. The meltability and fat leakage were found to be optimum (Sabikhi and Kanawjia, 1992). Direct acid mozzarella cheese prepared exclusively from goat milk with acceptable meltability and stretchability values has been reported (Pal and Agnihotri, 2000).

It has also been reported that supplementation of buffalo milk with goat milk (at 5, 10 and 15% levels) enhanced flavour development in Gouda cheese. Supplementation with goat milk enhanced the moisture retention, total solid recovery and yield of cheese. A faster rate of proteolysis and lipolysis was observed for goat milk supplemented cheeses which increased with increasing levels of goat milk (Singh *et al.*, 1992a).

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Cheese yield potential of milk is largely dependent on milk composition, particularly fat and protein (Barbano and Sherbon 1984, Gilles and Lawrence 1985, Banks et al. 1986, Lawrence 1993 a, Lou and Ng-Kwai-Hang 1992, Lucey and Kelly 1994, Van den Berg 1994, Brito et al. 2002, Guo et al. 2004). Various factors may affect the quality of goat milk like that the specific gravity of milk of Jamunapari goat under field and farm rearing conditions in summer, rainy and winner seasons it was 1.0292±0.0004 and 1.0302±0.00038, 1,0282±0.00038 and 1.0280±0.00038 and 1.0284±0.00039, and 1.0300±0.00039, respectively. The fat of milk of Jamunapari goat under field and farm rearing conditions for the aforesaid seasons was found to be 4.70±0.049 and 4.88±0.050, 4.94±0.046 and 5.10±0.047 and 4.80±0.043 and 4.98±0.048, respectively. The protein content of Jamunapari milk under field and farm rearing conditions in aforesaid seasons was 3.11±0.028 and 3.02±0.039, 3.23±0.026 and 3.10±0.036 and 3.32±0.026 and 3.15±0.032 per cent, respectively. The total solids per cent were found to be 13.17±0.040 and 13.10±0.034, 13.21±0.033 and 13.16±0.033 and 13.28±0.040 and 13.20±0.038, respectively. The statistical analysis revealed that solids-not-fat content was significantly greater in field rearing samples than farm rearing samples in all seasons. Seasons had a significant effect on specific gravity and fat content in Jamunapari goat breed under field or farm rearing conditions at 1% level of significance (Singh and Sharma, 2014).

Methodology

The study was conducted at Goat Products Technology Laboratory of Central Institute for Research on Goats, Makhdoom, Farah,Mathura, Uttar Pradesh and Department of Animal Husbandry and Dairying, R.B.S. College Bichpuri, Agra (U.P.).

Fresh Jakhrana and Jamunapari goat milk was collected within 1.5-2 hour of milking from Livestock Units of Central Institute for Research on Goats, Makhdoom, Farah, Mathura (U.P.). The milk was strained through muslin cloth to remove the dirt.

Approximately 100 g portion of the cheese was cut from the center of the ball include the core of the ball as well as the periphery as to ensure a representative sample. All the glassware which were used in the milk and cheese analysis i.e. Petri dish, conical flask, test tube, pipette and glass rod etc. were properly cleaned washed and then sterilized at 120^{O}C for 4 to 5 h in an electric sterilizer.

Samples were prepared in a way to bring out the difference in a particular quality attribute under evaluation. All variables like boiling temperature, time of boiling, quantity and composition of water, etc., were controlled to ensure identical method of preparation for all samples. Care was taken that no loss of flavour occurred and no foreign tastes or odours were impacted by the procedure during preparation, storage, serving, etc. The samples were served to the panelists after one hour to prevent possible changes such as the samples drying-out or developing off-flavour which could occur during holding.

Fat loss in whey of Mozzarella Cheese were determined as per the methods described in IS:SP:18 (Part XI) 1981.

Results and Discussion

The data obtained on effect of breed and method of preparation on fat loss in whey of goat milk mozzarella cheese are presented in Table - 1.

Table-1: Effect of breed and method of preparation on fat loss in whey of goat milk mozzarella cheese

MEAN & S.E. FOR BREED NO. 1	0.262	0.018 (45)
MEAN & S.E. FOR BREED NO. 2	0.256	0.010 (45)
MEAN & S.E. FOR METHOD NO. 1	0.266	0.022 (30)
MEAN & S.E. FOR METHOD NO. 2	0.267	0.015 (30)
MEAN & S.E. FOR METHOD NO. 3	0.243	0.014 (30)
MEAN & S.E. OVER ALL	0.259	0.010 (90)
MEAN & S.E. FOR BREEDNO.1 x METHOD NO. 1	0.279	0.042 (15)
MEAN & S.E. FOR BREEDNO.1 x METHOD NO. 2	0.260	0.024 (15)
MEAN & S.E. FOR BREEDNO.1 x METHOD NO. 3	0.247	0.024 (15)

MEAN & S.E. FOR BREEDNO.2 x METHOD NO.1	0.253	0.017 (15)
MEAN & S.E. FOR BREEDNO.2 x METHOD NO.2	0.273	0.021 (15)
MEAN & S.E. FOR BREEDNO.2 x METHOD NO.3	0.240	0.016 (15)

Note: Figure in parenthesis indicated number of observations.

It is observed from Table - 1 that the fat loss in whey of mozzarella cheese made from Jakhrana and Jamunapari goat milk was found to be 0.262±0.018 and 0.256±0.010 respectively. Similarly the fat loss in whey of mozzarella cheese made by direct acid, starter culture and modified method was found to be 0.266±0.022, 0.267±0.015 and 0.243±0.014 respectively. The overall average value of fat loss in whey of goat milk mozzarella cheese was 0.259±0.010. The interaction between different breeds and methods of manufacture are also presented in above table.

The statistical analysis revealed that the breeds of goat and methods of manufacture did not have any significant effect on fat loss in whey of mozzarella cheese.

Our results are in agreement with the results of Venkateshwarlu et al. 1998 who have reported that the methods of manufacturing had no significant influence on the fat losses in whey and the results are also in agreement with the findings of Ghosh and Kulkarni (1996). The mechanism of entrapping fat globules by the casein micelle, either by the acid precipitation at higher temperatures or by rennet and acid precipitation, seems to be similar.

Table-2: ANALYSIS OF VARIANCE

SOURCE OF VARIATION	D.F.	S.S.	M.S.S.	F-VALUE	REMARK
1 BETWEEN BREED	1	0.001	0.001	0.092	N.S.
2 BETWEEN METHOD	2	0.011	0.005	0.557	N.S.
3 ERROR	86	0.817	0.010	------	
TOTAL	89	0.829			

NO.OF OBS.	SE	CD AT 5%	CD AT 1%
BETWEEN TWO BREED NO.1 2 45 45	0.021	0.042	0.057
BETWEEN TWO METHOD NO.1 230 30	0.025	0.051	0.069
BETWEEN TWO METHOD NO.1 330 30	0.025	0.051	0.069
BETWEEN TWO METHOD NO.2 330 30	0.025	0.051	0.069

Conclusion

The breeds of goat and methods of manufacture did not have any significant effect on fat loss in whey of mozzarella cheese.

References

1. **Banks J.M., Banks W., Muir D.D. and Wilson A.G.** 1981. Cheese yield: composition does matter. Dairy Ind. Int. 46 (5), 15, 17, 19, 21-22.
2. **Banks J.M., Clapperton J.L., Muir D.D. andGirdler A.K.** 1986. The influence of diet and breed of cow on the efficiency of conversion of milk constituents to curd in cheese manufacture. J. Sci.Food Agric. 37, 461-468.
3. **Barbano D.M. and Sherbon J.W.** 1984. Cheddar cheese yields in New York. J. Dairy Sci. 67, 1873-1883.
4. **Brito C., Niklitschek L., Molina L.H. and Molina I.** 2002. Evaluation of mathematical equations to predict the theoretical yield of Chilean Gouda cheese. Int. J. Dairy Technol. 55: 32-39.
5. **Emmons D.B.** 1993b. Factors affecting the yield of cheese. Inter. Dairy Fed. Brussels, 8.
6. **Gilles J. and Lawrence R.C.** 1985. The yield of cheese. New Zeal. J. Dairy Sci. Techn. 20, 205-214.
7. **Guo M., Park Y.W., Dixon P.H., Gilmore J.A. and Kindstedt P.S.** 2004. Relationship between the yield of cheese (Chevre) and chemical

composition of goat milk. Small Rumin. Res. 52, 103-107.

8. **Kanawjia S.K., Sabikhi L. and Singh S**. 1992. Admixing of goat and buffalo milk on sensory, compositional and textural characteristics of direct acid Mozzarella cheese. Proceedings of the 5th International Conference on Papers Presented at Goats, March 2-8, New Delhi, India, pp: 1436-1444.
9. **Lacroix C., Verret P. and Emmons D.B.** 1993. Design of experiments and statistical treatment of yield data. In: Monograph on factors affecting the yield of cheese. Inter. Dairy Feder. Brussels,128-150.
10. **Lawrence R.C.** 1993a. Cheese yield potential of milk. In: Factors affecting the yield of cheese. Ed. D.B. Emmons. Inter. Dairy Feder. Brussels, 109-120.
11. **Lou Y. and Ng-Kwai-Hang K.F.** 1992. Effects of protein and fat levels in milk on Cheddar cheese yield. Food Res. Int. 25, 437-444.
12. **Lucey J. and Kelly J.** 1994. Cheese yield. J. Soc. Dairy Techn. 47 (1), 1-14.
13. **Pal U.K. and Agnihotri M.K.** 2000. Quality and shelf-life of direct acid goat milk Mozzarella cheese at refrigeration temperature. Int. J. Anim. Sci., 15: 57-61.
14. **Sabikhi L. and Kanawjia S.K.** 1992. Effect of fat level in yield and quality of direct acid Mozzarella cheese manufactured from goat- buffalo milk admixture. Proceedings of the 5th Internatrional Conference on and Papers Presented at Goats, March 2-8, New Delhi, India, pp: 1470-1478.
15. **Singh G. and Sharma R.B.** 2014. Effect of season on the milk quality of Jamunapari goats under field and farm rearing condition, *Indian Res. J. Genet. & Biotech.* 6(1): 335-339 (2014).
16. **Singh S., Rao K.H., Kanawjia S.K. and Sabikhi L.** 1992. Goat milk products technology-a review. Indian J. Dairy Sci., 45: 572-587.
17. **Tziboula-Clarke A.** 2003. Encyclopedia of Dairy Science. Vol. 2, Academics Press, California, USA.
18. **Van den Berg, M.G.** 1994. The transformation of casein in milk into the paracasein structure of cheese and its relation to non-casein milk components. IDF, Intern. Dairy Feder. Brussels, 35-47.