

<http://www.pjbs.org>

PJBS

ISSN 1028-8880

**Pakistan
Journal of Biological Sciences**

ANSI*net*

Asian Network for Scientific Information
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan

Study on the Qualitative Traits of Milk Collected from Different Kids Bearing and Different Lactating Black Bengal Goats

M.M.H. Khan, ¹M.A. Islam, ²M.M. Hossain, M.M. Rahman and ³M.N. Islam
Proshika, 2/2 Gha, Section-2, Mirpur-2, Dhaka-1216, Bangladesh

¹Department of General Animal Science and Animal Nutrition,

Dinajpur Government Veterinary College, Basherhat, Dinajpur, Bangladesh

²Animal Health and Nutrition Division, Eskayef Bangladesh Ltd. Gulshan, Dhaka-1212, Bangladesh

³Department of Dairy Science, Bangladesh Agricultural University, Mymensingh-2202, Bangladesh

Abstract: Milk samples from single, twin and triplet or 1st, 2nd and 3rd lactation bearing Black Bengal goat were collected to monitor the physical (organoleptic, specific gravity and pH value) and chemical (acidity, fat, SNF, total solids, protein, lactose and ash content of milk) quality of milk. From the above tests, it was observed that the color, flavor, taste and texture of milk samples were normal; yellowish white, normal (goaty), slightly sweet and free flowing liquid. Except acidity and protein content, all other chemical traits varied significantly among different kid bearing goats milk. Chemical parameters were similar in different lactations except fat and total solids percentage. Results of the above experiments indicated that milk obtained from single kid bearing and 2nd lactating goats were better than the other number of kids bearing or lactating goats.

Key words: Black Bengal goat, kid, lactation, milk, physical, chemical traits

INTRODUCTION

In the present agro economic situations, increasing human populations are pressing to use land for food production in the developing countries. Rearing of large animal like cattle and buffaloes is very difficult whereas smaller animals like goat is easier to rear, it can offer more befitting economy giving milk, meat, fiber and skin for various use of human being.

Black Bengal goat is the asset of Bangladesh which is famous for quality skin and meat production. It can produce milk by 560 ml day⁻¹. It has the high potentiality for multiple births among caprines. It has the breeding ability of two times with 2-4 kids in a year. Bangladesh has taken goat revolution program to increase income generation. That is why, goat as well as milk yield will be increased^[1]. Goat milk fat is considered as an ideal food for infant where cow's milk may create allergy^[2]. Brody^[3] pointed out that goat milk is higher energetic than in good cows milk. Chemical composition of milk depends on breed, season, feed, climatic condition^[4]. In USA goat milk is used for cheese making^[5]. Milk proteins are of high biological value (BV) due to its high co-efficient of digestibility (97-98%) than those of others and lactose as milk sugar is an excellent food for babies^[6]. Composition of goat milk has been investigated by some authors^[7-11]. But none of work has been done yet on the estimation of

quality traits of Black Bengal goat milk. Therefore, the present study was aimed at to evaluate the physical and chemical qualities of Black Bengal goat milk

MATERIALS AND METHODS

The experiment was carried out at the Dairy Technology Laboratory, Department of Dairy Science, Bangladesh Agricultural University and Mymensingh, Bangladesh for the period of January 3, 2002 to March 30, 2002. Milk samples were collected from different areas of Mymensingh Districts considering single, twin and triplet kids or 1st, 2nd and 3rd lactating goats. Milk sample in every case was taken 5 times treated as 5 replications of 200-250 ml in each. Physical and chemical tests of the collected samples were performed and recorded the following parameters:

Physical tests: Color, flavor, texture and taste as organoleptic test and sp.gr. and pH values were recorded.

Chemical test: Acidity, fat, solids not fat (SNF), total solids (TS), ash, lactose and protein content were determined and recorded.

Analytical procedure: Organoleptic tests were performed visually and nasally to observe color, flavor, taste and

texture according to Nelson and Traught^[12]. The specific gravity was measured by using quevenne lactometer, lactometer cylinder and floating dairy thermometer as per method described by Aggarwala and Sharma^[13]. The pH value was measured with the help of a pH meter-215 (ciba coming diagnostics Ltd. Sudhury, Suffolk, England Co. 106xd). Fat test was performed by Babcock fat test methods as described by Aggarwala and Sharma^[13]. Acidity test was done by titrating milk with N/10 NaoH solution as per method described by Association of Official Agricultural Chemists^[14]. TS and SNF were measured according to the method of Eckles *et al.*^[15]. Ash content was determined by using muffle furnace method according to AOAC^[14]. Protein content was estimated by Titration method.

Statistical analysis: Data were analyzed using MSTAT computer package program in Completely randomized design (CRD). LSD values were calculated to justify the significance levels measuring difference between treatment means.

RESULTS AND DISCUSSION

Physical tests: Physical traits like color, flavour, taste, texture (organoleptic traits), pH and specific gravity of milk samples collected from different kids bearing or different lactation goats (Table 1 and 2). Milk samples collected from triplet kids or 3rd lactation showed 100% yellowish white, while other milk samples showed 10-15% white and 80-85% yellowish white. The flavour of all milk samples was normal (Goaty).

Taste of milk samples collected from twin and triplet kids bearing goat had 100% normal taste. Milk samples from single kid bearing goats or all lactations had 80% normal taste and 20% flat taste. All (%) the milk samples from single kid bearing goat showed normal (free flowing liquid) texture. Milk samples collected from twin, triplet kids bearing goat or all lactations had 80% normal and the remaining 20 had 80% thin texture. The lowest specific gravity was found in the sample from triplet kid ($p < 0.01$) of all other kid bearing goats. There was no lactation effect on sp.gr. of milk samples ($p < 0.05$). All the milk samples either for kids or lactations showed similar pH.

Color of most samples were yellowish white due to the presence of fat, casein and small amount of coloring matter, supported by Judkins and Mack^[16]. Milk color also depends on breed and nature of the feeds^[15]. Goat milk

flavour detected as goaty flavour due to the presence of higher amount of short chain fatty acids, agreed with the findings of Islam *et al.*^[17]. Taste of majority milk samples were normal sweet consistent with Judkins and Keener^[18]. As per texture quality of milk samples obtained from goat having single kid or 1st lactation was superior to other kid or lactation bearing goats. Average sp. gr. of goat milk is 1.03^[19] which was agreed with the present findings. Rangappa^[20] found that the mean sp. gr. of goat milk was within the range of 1.0278-1.0380 which agreed with the present results. The average pH value of goat milk was 6.57 reported by Voutsinas *et al.*^[21] which was similar to the present findings. Dervisoglu *et al.*^[9], Ali and Hanssan^[7] found that the pH value of goat milk were 6.65 and 6.40, which were similar to the present findings.

Chemical traits: Chemical traits like acidity, fat, solids not fat (SNF), total solids (TS), protein, lactose and ash of milk samples (Table 3 and 4). Number of kids did not affect acidity and protein content ($p > 0.05$), but affected fat, SNF and ash ($p < 0.01$) and TS and lactose ($p < 0.05$) content of milk samples. Fat, SNF, TS and Ash content of milk declined with the increased no. of kids per goat. Fat and total solids were varied in different lactations ($p < 0.01$), but acidity, SNF, protein, lactose and ash content of milk were similar in different lactations ($p > 0.05$). The highest fat and total solid content of milk were found in 2nd lactation.

The range of acidity of goat milk samples in the present study were 0.165-0.167% which was agreed with Parata *et al.*^[19], EI-Alamy and Mohamed^[22], Voutsinas *et al.*^[21]. They reported that the acidity of goats milk were 0.17, 0.16 and 0.16, respectively. The present investigation indicated that all milk samples were fresh during collection from different sources. Agrawal *et al.*^[13] found that the average fat content of Black Bengal goat milk was 4.66% which was similar to the present findings.

The average SNF percentage of the collected goat milk sample was 9.38% which was in agreement with Knowles and Watkin^[23]. They found 9.35% SNF of Nubian breed goat milk. Total solid was found by 13.7-14.9%, supported by Dervisoglu *et al.*^[9] but contradicted with Agrawal and Bhattacharyya^[24]. They found that the average total solid of Black Bengal goat was 15.23%. Protein content of milk samples in every case was slightly higher than Pinto *et al.*^[25] but slightly lower than Agrawal and Bhattacharyya^[24]. Pinto *et al.*^[25], Agrawal and Bhattacharyya^[24] observed 3.65 and 5.84% protein of goat milk samples, respectively. Qureshi *et al.*^[26] obtained

Table 1: Physical traits of milk collected from single, twin and triplet kid bearing goats

Different No. of kids bearing goats milk					
Traits	Single kid	Twin kid	Triplet kid	LSD	Level of Significance
Colour	Yellowish white 90% white 10%	Yellowish white 90% white 10%	Yellowish white 100%	-	ND
Flavour	Normal (Goaty) 100%	Normal (Goaty) 100%	Normal (Goaty) 100%	-	ND
Taste	Slightly sweet 80% Abnormal 20%	Slightly sweet 100%	Slightly sweet 100%	-	ND
Texture	Free flowing liquid 100%	Free flowing liquid 80% Thin 20%	Free flowing liquid 80% Thin 20%	-	ND
Sp. gr. ($\bar{x}\pm sd$)	1.03±0.00 ^a	1.03±0.00 ^a	1.033±0.00 ^b	0.12	**
pH ($\bar{x}\pm sd$)	6.46±0.08	6.50±0.09	6.48±0.09	-	NS

\bar{x} =Mean; sd=Standard deviation; ND=not done; **, p<0.01 LSD=Least significant difference
Means with common superscripts in the same row do not differ significantly

Table 2: Physical traits of milk collected of collected from 1st, 2nd and 3rd lactation bearing goats

Different lactating goats milk					
Traits	1st lactation	2nd lactation	3rd lactation	LSD	Level of Significance
Colour	Yellowish white 90% white 10%	Yellowish white 85% white 15%	Yellowish white 100%	-	ND
Flavour	Normal (Goaty) 100%	Normal (Goaty) 100%	Normal (Goaty) 100%	-	ND
Taste	Slightly sweet 80% Abnormal 20%	Slightly sweet 100%	Slightly sweet 80% abnormal 20%	-	ND
Texture	Free flowing liquid 100%	Free flowing liquid 80% Thin 20%	Free flowing liquid 80% Thin 20%	-	ND
Sp. gr. ($\bar{x}\pm sd$)	1.03±0.00	1.03±0.00	1.03±0.00	-	NS
pH ($\bar{x}\pm sd$)	6.50±0.09	6.48±0.08	6.47±0.09	-	NS

\bar{x} =Mean; Sd=Standard deviation; ND=not done; NS, p>0.05

Table 3: Chemical traits of milk collected from single, twin and triplet kid bearing goats

Different No. of kids bearing goats milk					
Traits	Single kid ($\bar{x}\pm sd$)	Twin kid ($\bar{x}\pm sd$)	Triplet kid ($\bar{x}\pm sd$)	LSD	Level of Significance
Acidity%	0.16±0.01	0.16±0.01	0.16±0.01	-	NS
Fat (g kg ⁻¹)	49.74±0.22 ^a	46.75±0.62 ^b	45.35±0.34 ^b	0.58	**
SNF (g kg ⁻¹)	94.92±0.18 ^a	94.20±0.15 ^b	92.44±0.34 ^b	0.30	**
Total solids (g kg ⁻¹)	149.42±0.39 ^a	141.06±0.69 ^a	137.44±0.51 ^b	0.65	*
Protein (g kg ⁻¹)	40.18±0.32	39.24±0.18	39.26±0.30	-	NS
Lactose (g kg ⁻¹)	46.64±0.20 ^a	47.48±0.19 ^a	45.33±0.26 ^b	0.22	*
Ash (g kg ⁻¹)	07.43±0.02 ^a	07.37±0.0 ^a	07.29±0.01 ^a	0.51	**

Table 4: Chemical traits of milk collected from 1st, 2nd and 3rd Lactating goats

Different No. of kids bearing goats milk					
Traits	Single kid ($\bar{x}\pm sd$)	Twin kid ($\bar{x}\pm sd$)	Triplet kid ($\bar{x}\pm sd$)	LSD	Level of Significance
Acidity%	0.16±0.01	0.16±0.01	0.16±0.01	-	NS
Fat (g kg ⁻¹)	46.5±0.49 ^a	50.39±0.20 ^a	45.55±0.45 ^b	0.59	**
SNF (g kg ⁻¹)	93.43±0.16	94.68±0.17	94.21±0.18	-	NS
Total solids (g kg ⁻¹)	139.99±0.60	145.07±0.30 ^b	139.54±0.53 ^b	0.69	**
Protein (g kg ⁻¹)	39.55±0.15	40.25±0.13	40.47±0.30	-	NS
Lactose (g kg ⁻¹)	46.43±0.20	46.48±0.26	46.97±0.24	-	NS
Ash (g kg ⁻¹)	07.46±0.03	07.46±0.02	07.36±0.02	-	NS

\bar{x} =Mean; Sd=Standard deviation; NS, p>0.05; **, p<0.01; LSD=Least significant difference
Means with common superscripts in the same row do not differ significantly

3.95%lactose in goat milk, which was lower than the present study. But it was similar with the findings of Leonhard^[27]. Ash content of milk samples were 0.729-0.746%. It was lower than 0.78% found by Chang and Kim^[28] but supported by Kadiński^[29]. He found 0.69% ash in goat milk.

The present study reveals that the quality of single kid bearing goat milk was better than that of twin or triplet bearing goat milk. On the other hand 2nd lactating goat milk was better than that of 1st and 3rd lactating goat milk. However, further more research work is needed to draw a final conclusion.

REFERENCES

1. Bangladesh Livestock Research Institute, 2002. Program for poverty alleviation through goat production, April 27, Savar, Dhaka-1341, Bangladesh.
2. Narendran, R., R.R. Hacker, T.R. Batra and E.B. Burnside, 1974. *J. Dairy Sci.*, 62: 1069.
3. Brody, S., 1945: *Bioenergetics and Growth* Reinhold: New York.
4. Berg, V.D.J.C.T., 1988. *Dairy Technology in the tropics and sub-tropics*. Center for Agricultural publishing and documentation, (Puduc), Wageningen, The Netherlands.
5. Rogers, A.L., 1965. *Goat keeping in the United States* Am. Dairy Goat Ass. Handbook.
6. McLester, J.S., 1939. *Nutrition and Diet in Health and Diseases*. 3rd Ed. W.B. Saunders Co., Inc. New York.
7. Ali, M.Y. and A.K. Hasssan, 1988. Physical and chemical properties of goats milk. *Mesopotamia-J. Agril.*, 20: 213-219
8. Mendes, E.S., Carvalho, M.L.de., Costa, V.E. Da., M.L. De Carvalho and V.E. Da Costa, 1988. Physical and chemical characteristics of goats milk from Agresta Pernambucano after defrosting. *Revista-do-instituto-de-Laticinios-Candido-Tostes*, 43: 31-34.
9. Dervisoglu, M., Z. Alpkent and F. Yazici, 2000. Some physical and chemical characteristics of Saanen X Kilis (GI) goat milk. *Ondokuzmayis-University, Ziraat-Fakutesi-Dergisi.*, 15: 9-14.
10. Piccolo, V., G. Moniello, F. Infas Celli and M.I. Cutrignelli, 1988. Chemical and coagulation characteristics of milk and metabolic profile of a goat herd reared in Naples Province. *Selezione-Veterinaria*. No., 1: 1-11.
11. Gonzalez, C.J. and O.I. Roa, 2000. Characteristics of goats milk and cheese in Extramadura. *Alimentaria*, 37: 115-120.
12. Nelson, J.A. and G.M. Traught, 1964. *Judging dairy products*. 4th rev. end. The Olsen pub. Co. Michigan.
13. Aggarwala, A.C. and R.M. Sharma, 1961. *A laboratory manual of milk inspection*. Printed in India by Z.T. Band Kwala at leaders press Private limited, Bombay and Published by P.S. Jayusinghe, 4th Ed. Asia publishing house, Bombay, India.
14. Association of Official Agricultural Chemists (AOAC), 1982. *Official Methods of Analysis*. 10th Ed. Washington D.C.
15. Eckles, C.H., W.B. Combs and H. Macy, 1951. *Milk and milk products* 4th Ed. McGraw-Hill Book company, Inc. New York, pp: 49-67.
16. Judkins, H.F. and M.J. Mack, 1955. *The principle of Dairying*. 3rd Rev. Ed. John Wiley and Sons, Inc. New York, pp: 31.
17. Islam, M.N., S.M.I. Hossain and A.K.M.A. Mannan, 1984. Studies on the physical parameters and chemical qualities of market milk in Mymensingh Town (Bangladesh). *Bang. J. Anim. Sci.*, 13: 52-56.
18. Judkins, H.F. and H.A. Keener, 1960. *Milk production and processing*. John Wiley and Sons. Inc. New York, pp: 27-41.
19. Parata, L.F.A.C., K.T. Ribeiro, M.R.B. Rezende, S.D.A.R. Carvalho and R.G. Costa, 1998. Composition, Nitrogen Fractions and physico-chemical characteristics of Saanen goat milk in the South-Eastern Region of Brazil. *Ciencia-e-Technologia-de-Alimentos*, 18: 428-432.
20. Rangappa, K.S., 1964. *Indian J. Dairy Sci.*, 17: 137.
21. Voutsinas, L., C.P. Pappas and M. Katsiari, 1990. The Composition of Alpine goats milk during lactation in Greece. *J. Dairy Res.*, 57: 41-51.
22. El-Alamy, H.A. and A.A. Mohamed, 1978. The chemical composition and properties of goats milk. *Egyptian J. Dairy Sci.*, 6: 239-245.
23. Knowles, F. and J.E. Watkin, 1938. *J. Dairy Res.*, 9: 153.
24. Agrawal, K.P. and N.K. Bhattacharyya, 1978. Yield and composition of milk in Black Bengal, Barbari and Black Bengal X Barbari nannies. *Indian J. Anim. Sci.*, 48: 882-886.
25. Pinto, C.M., C.C. Brito, L.B. Fraser, C.L.G. Molina, and C.E. Gomez, 1992. Chemical composition of cross bred Saanen goat milk Terra-Arida. No., 11: 138-144.
26. Qureshi, H.A., K.S. Deshpande and H.S. Bonde, 1981. Studies on Chemical composition of goat milk. *Indian Vet. J.*, 58: 212-214.
27. Leonhard, I., 1963. *Roczn. Nauk roln. (Ser. Zootechnika)*, 81: 535.
28. Chang, J.I. and Y.K. Kim, 1978. Physico-chemical properties of Saanen milk. *Korean J. Anim. Sci.*, 20: 207-212.
29. Kadiiski, E., 1952. Study of Indigenous goats in north-West-Bulgaria. *Dairy Sci. Abst.* 16, pp: 797.