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# A Comparative Study on the Udder and Gut Health among Three Goat Breeds of Northwest Himalayan Region

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***Authors' contributions***

*This work was carried out in collaboration among all authors. Authors AP, VS and AG did data curation, wrote and prepared the original draft of the manuscript. Authors AT, AK, DK and BB searched for resources, supervised the work and did validation. All authors read and approved the final manuscript.*

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## ABSTRACT

**Aims:** India ranks second in goat population (148.88 million) globally after China and contributes 9% in livestock GDP. Goat is multifaceted animal which provide meat, milk, hide, wool and manure. Goats contribute significantly to livelihood of small, marginal and poor households**.** Somatic cell counts (SCC) and faecal egg count (FEC) both are indicator of health status of goats; therefore, this study was done with the objective to access health status of three goat breeds found in north west himalayan region.

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**Methodology:** This study was conducted at Division of Livestock production Management, F.V.Sc & AH, Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu.
Samples were randomly collected from animals of same age group to keep variation minimum. Sixty milk and sixty faecal samples from each breed were considered for study.
**Results:** The Somatic cell count is represented in log10 form. There was no significant difference among breeds was observed, highest log SCC/ml was found in Beetal and minimum was observed in Gaddi. All animals observed from different breeds were infested with severe (500-1000) parasitic burden. Maximum FEC/gm was observed in Bakarwali and least was observed in Gaddi. Significant difference in FEC/gm was found in Gaddi and Bakarwali ($p=0.05$), Bakarwali and Beetal ($p<0.01$) whereas no significant difference was found between Gaddi and Beetal.
**Conclusion:** The lower and normal somatic cell count of Gaddi and Bakarwali indicates good udder health of observed herds while moderately high somatic cell count in Beetal breed represents poor udder health. High number of faecal eggs were found in studied population of all breeds reflecting high prevalence of endoparasitic disease. High incidence of parasitic disease severely affects the health status of goats, which results in poor production ultimately leading to economic loss.

*Keywords: Goat; North-west Himalayan region; somatic cell count; faecal egg count.*

## 1. INTRODUCTION

India ranks second in goat population (148.88 million) globally after China and contributes 9% in livestock GDP. The goat is a multifaceted animal which provide meat, milk, hide, wool and manure. Goats contribute significantly to livelihood of small, marginal and poor households (Singh et al., 2013; DAHD,2019; Singh et al., 2023). The productivity of native Indian goats is lower than their genetic potential. The poor productivity can be attributed to poor adoption of scientific management, depletion of grazing land, low input system and unorganized market (Singh et al., 2018). Milk from cattle and buffalo contributes >94% of total global milk production. Goats are important minor milk producing animals (Verma et al., 2020). The global goat milk production in 2018 was more than 18.71 million out of which India contributes about 33% (6.09 million tonnes). India ranks first in global goat milk production and goats are third largest species contributing in milk production (DAHD 2019, FAOSTAT 2018).

Gaddi and Bakarwal are two important breeds of north-west himalayan region while Beetal belongs to native state Punjab and popular for semi-intensive and intensive rearing. The productivity of these goats however remains marginal because of high parasitic load leading to high economic loss. Endo-parasitism negatively affects the goat health. The consequences of endo-parasitism include poor fertility, milk production, high medicinal cost, morbidity and mortality. Gastrointestinal parasites multiply and proliferate during warm, humid conditions as they are sensitive to temperature and moisture (Ndlela et al., 2023). Somatic cells are defence cells, which release to check intramammary infections. Somatic cells also have ability to repair damage tissue. Hence somatic cells are indicator of quality of raw milk and udder hygiene (Flere at al., 2016). Intra-mammary infection leads to increase in number of macrophages, lymphocytes, and neutrophils hence number of somatic cells increase to check the infection. High values of SSC above physiological range are indicator of microbial inflammation in mammary gland (Podhorecka et al., 2021). Somatic cell counts (SCC) and faecal egg count (FEC) both are indicator of health status of goats; therefore, this study was done with the objective to access health status of three goat breeds found in north west himalayan region.

## 2. MATERIALS AND METHODS

### 2.1 Location of Study and Experimental Animal

This study was conducted at Division of Livestock production Management, F.V.Sc & AH, Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu. The goat breeds included in this study are native to different locations of North-Western Himalayan region. The samples of Gaddi breed were collected from migratory flocks of Palampur, Himachal Pradesh, samples from Bakarwali breed were collected from flocks in premises of Jammu and Udhampur.

## 2.2 Sampling

The sampling of Beetal goat was done from Kathua, Samba and Jammu regions. Samples were randomly collected from animals of same age group to keep variation minimum. Six milk and faecal samples from each flock were collected and ten flocks per breed were considered for study making sixty samples for each breed. Detailed sampling technique is presented in Table 1.

## 2.3 Somatic Cell Count

Milk samples were collected from animals having healthy udder. The udder was washed and wiped with antiseptic (1% potassium permanganate) solution before collecting the sample, initial few drops of milk were discarded after that 1 ml of milk was collected in sterile tube. Smear of 10 microlitre milk was prepared on premarked 1 cm × 1 cm area of slide and dried in air. Slides were air dried and transported to laboratory in slide box for staining and Somatic Cell count.

Smeared slides were stained with modified Newman's Lambert stain and somatic cell count was performed by Direct Microscopic Somatic Cell Count (DMSC) method. The milk smear was immersed in coplin jar filled with stain for 2 minutes, then slides were washed under tap water and dried in air. Microscopic examination for somatic cells was done under 100X under oil immersion. The SCC was calculated by following formula described by Gondim et al., (1998).

Cumulative cell count of 20 microscopic fields = N

$$SCC(cells/ml) = (N \times 100 \times 1000)/(0.11\times 20 \times 10)$$

The results are represented in form of log10 SCC/ml of milk sample.

On basis of number of somatic cells in milk, counts were further characterized as follows:

**Chart 1. Somatic cell count with gradation**

| Somatic cell count (in lakhs) | Grade |
|---|---|
| <1 | Low |
| 1-2 | Normal |
| 2-5 | Moderate high |
| 5-7.5 | High |
| >7.5 | Very high |

## 2.4 Faecal Egg Count

Faecal egg count was done using modified McMaster technique (Cringoli et al., 2004). This method uses McMaster slide to count faecal egg per gram of faeces. Two gram of faecal sample was measured and homogenized in 60 ml of floatation solution (180 gm NaCl in 500 ml of water) using pestle and mortar. The solution was filtered through cheese cloth and filtrate was kept in another clean beaker. The filtrate was again homogenized using micropipette, upper layer of filtrate was used to load first chamber of McMaster slide. The remaining filtrate was again filtered twice and upper layer of filtrate was used to load second chamber. The McMaster slide was observed under 100X magnification. Total egg count was determined by following formula-

Total egg count = Number of eggs in (chamber 1 + chamber 2) × 50 eggs per gram (EPG)

**Table 1. Sampling technique**

| | Gaddi | Bakarwali | Beetal |
|---|---|---|---|
| Number of herds visited for sample | 10 | 10 | 10 |
| Number of milk samples from each flock | 6 | 6 | 6 |
| Number of faecal samples from each flock | 6 | 6 | 6 |
| Total number of samples | 60 | 60 | 60 |

On the basis of EPG counts, level of infestation further characterized as follows:

**Chart 2. Number of eggs per gram of faeces**

| EPG (number of eggs per gram of faeces) | Infestation level |
|---|---|
| <200 | Normal |
| 200-500 | Mild |
| 500-1000 | Severe |
| >1000 | Pathogenic |

## 3. RESULTS AND DISCUSSION

Somatic cell count of milk samples taken from different breeds has been represented below in Table 2. The Somatic cell count is represented in log10 form. There was no significant difference among breeds was observed, highest log SCC/ml was found in Beetal and minimum was observed in Gaddi.

The objective of assessing somatic cell count in milk is to ensure its consumption suitability, processing suitability and to access the health status of herd or individual animal. Higher number of somatic cells were observed in does and ewes compared to cows because of apocrine pathway of milk secretion (Moradi et al., 2021). Udder health is directly associated with quality of milk, however genetic composition of animal along with several other factors like nutrition, stage of lactation, parturition time, environment and overall health of animal (Ceballos et al., 2009). Somatic cells count is used as indirect indicator of milk hygiene (Podhorecka et al., 2021) and constitutes WBC and epithelial cells. WBC's act as the defence line to protect udder from external pathogens. SSC level may significantly affect technological properties of goat milk (Podhorecka et al., 2021). Goats with high SSC had significantly lower milk yield, lower content of lactose, fat and higher content of protein. Increase in milk amino acids was significantly associated with increased SSC (Slyzius et al., 2023). SSC have direct influence on protease activity with highest being in milk of goat. There is positive correlation between protease activity with stage of lactation and SSC showing direct impact of somatic cells and lactation on it (Gautam et al., 2023). The Somatic cell count in Gaddi breed was low (less than $1x10^5$) and moderately high (2-5 $x10^5$) in Beetal breed, Somatic cell count was normal (1-$2x10^5$) in Bakarwali breed. In present study log10 SSC values in Gaddi, Bakarwali and Beetal breeds were 4.967 ± 0.32, 5.140 ± 53 0.30 and 5.388 ± 0.27 respectively, higher somatic cell count was reported by (Kuchtik et al., 2021). The lower and normal somatic cell count of Gaddi and Bakarwali indicates good udder health of observed herds while moderately high somatic cell count in Beetal breed represents poor udder health. Results of this study are in contrary with Sánchez et al., (2005) who stated that animals reared in intensive farms have lower count of somatic cells compared to animals reared on extensive farming system. The possible reason of low somatic cell count in goats reared under intensive system is proper management and cleaning of floor. The contrary results can be attributed to various intrinsic factors (parity, stage of lactation) and extrinsic factors (season, stress).

**Table 2. Milk Somatic cell count of different breeds**

| | Gaddi | Bakarwali | Beetal |
|---|---|---|---|
| Number of observations | 60 | 60 | 60 |
| log10SCC/ml | 4.967 ± 0.32 | 5.140 ± 0.30 | 5.388 ± 0.27 |

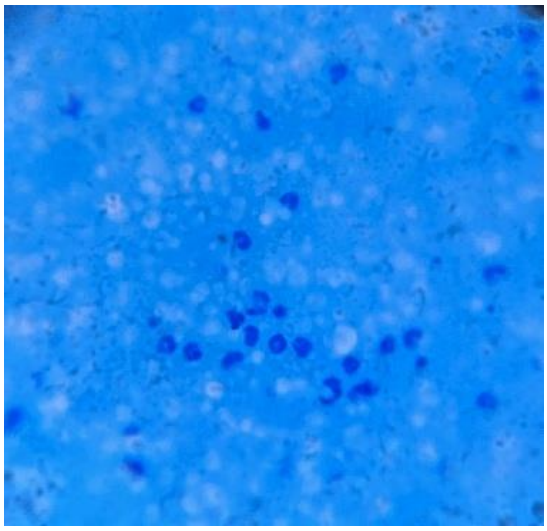

**Fig. 1. Showing Somatic cells under 100X**

**Fig. 2. Strongyle egg in faecal sample of Gaddi goat**

Faecal egg count per gram of faeces observed in different breeds is represented below and in Table 3. All animals observed from different breeds were infested with severe (500-1000) parasitic burden. Maximum FEC/gm was observed in Bakarwali and least was observed in Gaddi. Significant difference in FEC/gm was found in Gaddi and Bakarwali ($p=0.05$), Bakarwali and Beetal ($p<0.01$) whereas no significant difference was found between Gaddi and Beetal.

The productivity of goats is severely affected by endoparasites (Ndlela et al., 2023). In present study. The faecal samples examined for all three breeds were infested with severe (500-1000) parasitic burden. Maximum FEC/gm was observed in Bakarwali and least was observed in Gaddi. Significant difference in FEC/gm was found in Gaddi and Bakarwali, Bakarwali and Beetal whereas no significant difference was found between Gaddi and Beetal. Mir et al., (2013) reported high prevalence of gastro intestinal nematodes in goat population of J&K during summer season. Climatic conditions of Jammu viz dry hot summer followed by humid conditions provide suitable environment to flare up the endoparasites. Regular deworming of sedentary herds protects them from gastro-intestinal parasitism, in this study lower number of FEC was observed in Beetal herds in contrast (Agyei, 2003) reported higher number of faecal egg count in animals kept under semi intensive system. The faecal parasitic examination and faecal culture of Gaddi goat breed reared under semi-intensive system revealed that eggs of Monezia expansa and larvae of Haemonchus species were prevalent in both clinically infected and sub-clinically infected animals (Moudgil et al., 2017). In present study there were mixed infections of Strongylids, Haemonchus and Monezia species among all three goat breeds but larvae of Haemonchus species was mostly observed in Beetal breed which are in agreement with Moudgil et al., (2017). Different FEC pattern was found between spring and winter lambing ewes on farms where Haemonchus was prevalent and there was a close association between season and nematode egg count (Hoglund et al., 2021). Poor health status of goats can be attributed to lack of scientific knowledge of farmers. Vocational trainings on health, feeding and breeding, optimizing flock strength and motivating farmers through extension support can help to improve their scientific knowledge and health status of animals (Singh et al., 2017).

**Table 3. Comparison of FEC/gm between the breeds**

| | Gaddi | Bakarwali | Beetal |
|---|---|---|---|
| Number of observations | 60 | 60 | 60 |
| FEC/gm | $806.67 \pm 19.88^{b**}$ | $908.33 \pm 24.34^{a*,b**}$ | $818.33 \pm 24.39^{a*}$ |

**p<0.01* ***p=0.05, different alphabets in superscript varies significantly*

## 4. CONCLUSION

The lower and normal somatic cell count of Gaddi and Bakarwali indicates good udder health of observed herds while moderately high somatic cell count in Beetal breed represents poor udder health. Poor udder health leads to intra-mammary infection and compromise quantity and quality of milk leading to economic loss. High number of faecal eggs were found in studied population of all breeds reflecting high prevalence of endoparasitic disease. High incidence of parasitic disease severely affect the health status of goats, which results in poor production ultimately leading to economic loss.

## DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of this manuscript.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

## REFERENCES


Agyei, A. D. (2003). Epidemiological studies on gastrointestinal parasitic infections of lambs in the coastal savanna regions of Ghana. Tropical Animal Health and Production, 35, 207-217.

Ceballos, L. S., Morales, E. R., de la Torre Adarve, G., Castro, J. D., Martínez, L. P., & Sampelayo, M. R. S. (2009). Composition of goat and cow milk produced under similar conditions and analyzed by identical methodology. Journal of food Composition and Analysis, 22(4), 322-329.

Cringoli, G., Rinaldi, l., Veneziano, V., Capelli, G., & Scala, A. (2004). The influence of flotation solution, sample dilution and the choice of mcmaster slide area (volume) on the reliability of the mcmaster technique in estimating the faecal egg counts of gastrointestinal strongyles and dicrocoelium dendriticum in sheep. Veterinary parasitology, 123(1-2), 121-131.

DAHD (GoI). (2019). Basic Animal Husbandry Statistics 2019-20. Department of Animal Husbandry and Dairying, Government of India, New Delhi. India.

FAOSTAT. (2018). FAOSTAT- (Food and Agriculture Organization of the United Nations) Statistics database. http://www.faostat. fao.org.

Flere, D., Povše, M, P., Škorjanc, D., Janžekovič, M., Jeretina, J. (2016) Evaluation of factors affecting somatic cell count in milk. Acta Agric Slov, 5, 48 53.

Gautam, P. B., Sharma, R., Atbhaiya, Y., Gandhi, K., and Mann, B. (2023). Activities of indigenous proteases in cow, buffalo and goat milk of Indian subcontinent and their correlation with somatic cell count. International Dairy Journal, 139, 105567.

Gondim, I.F., Kohayagawa, A., Alencar, N.X., Biondo, A.W., Takahira, R.K., Franco, S.R., (1998). canine hepatozoonosis in brazil: description of eight naturally occurring cases. Veterinary parasitology. 74 (2), 319–323.

Höglund, J., Carlsson, A., and Gustafsson, K. (2021). Effects of lambing season on nematode faecal egg output in ewes. Veterinary Parasitology: Regional Studies and Reports, 26, 100633.

Kuchtík, J., Šustová, K., Sýkora, V., Kalhotka, L., Pavlata, L., & Konečná, L. (2021). Changes in the somatic cells counts and total bacterial counts in raw goat milk during lactation and their relationships to selected milk traits. Italian Journal of Animal Science, 20(1), 911-917.

Mir, M. R., Chishti, M. Z., Dar, S. A., & Rashid, M. (2013). Bionomics of helminth parasites in goats of subtropical Jammu area of J&K, India. International Journal of Food, Agriculture and Veterinary Sciences, 4, 233-237.

Moradi, M., Omer, A. K., Razavi, R., Valipour, S., & Guimarães, J. T. (2021). The relationship between milk somatic cell count and cheese production, quality and safety: A review. International Dairy Journal, 113, 104884.

Moudgil, A. D., Sharma, A., Verma, M. S., Kumar, R., Dogra, P. K., & Moudgil, P. (2017). Gastrointestinal parasitic infections in Indian Gaddi (goat) breed bucks: clinical, hemato-biochemical, parasitological and chemotherapeutic studies. Journal of Parasitic Diseases, 41, 1059-1065.

Ndlela, S. Z., Mkwanazi, M. V., & Chimonyo, M. (2021). In vitro efficacy of plant extracts against gastrointestinal nematodes in goats. Tropical Animal Health and Production, 53(2), 1-8.

Podhorecká, K., Borková, M., Šulc, M., Seydlová, R., Dragounová, H., Švejcarová, M., Peroutková, J., Elich, O. (2021). Somatic Cell Count in Goat Milk: An Indirect Quality Indicator. Foods, 10, 1046.

Sánchez, A., Sierra, D., Luengo, C., Corrales, J. C., Morales, C. T., Contreras, A., & Gonzalo, C. (2005). Influence of storage and preservation on Fossomatic cell count and composition of goat milk. Journal of dairy science, 88(9), 3095-3100.

Singh, M. K., Dixit, A. K., Roy, A. K., and Singh, S. K. (2013). Goat rearing: A pathway for sustainable livelihood security in Bundelkhand region: Agricultural Economics Research Review 26: 79–88.

Singh, M. K., Ramachandran, N., Chauhan, M, S., and Singh, S. K., (2018). Doubling rural farmer's income through goat farming in India: Prospects and potential. Indian Farming 68: 75–79.

Singh, M. K., Singh, S. K., & Chauhan, M. S. (2023). Exploring potential of goat based dairy farming in India and way forward. The Indian Journal of Animal Sciences, 93(3), 243-250.

Singh, S. K., Singh, R., Kushram, P., and Viswkarma, R. (2017). Adoption level of scientific goat farming practices among goat farmers. Asian Journal of Agricultural Extension, Economics & Sociology, 21(4), 1-6.

Šlyžius, E., Anskienė, L., Palubinskas, G., Juozaitienė, V., Šlyžienė, B., Juodžentytė, R., & Laučienė, L. (2023). Associations between Somatic Cell Count and Milk Fatty Acid and Amino Acid Profile in Alpine and Saanen Goat Breeds. Animals, 13(6), 965.

Verma, M., Dige, M. S., Kaushik, R., Gautam, D., De, S., and Rout, P. K. (2020). Milk composition traits in jamunapari goats: genetic parameter estimation and effect of allelic variation in csn1s1 gene. International journal of dairy technology 73(1):12–21.



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