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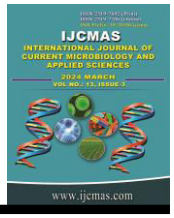

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Effect of Concentrate Feeding Frequency on Hematological Parameters of female *Sirohi* Goat kids

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A B S T R A C T

Goat farming is a significant contributor to India's livestock sector, with Rajasthan being a prominent region in terms of goat population. Nutrition and feeding practices are vital aspects of goat husbandry, influencing growth, health, and productivity. This research explores the effects of feeding frequency of concentrate on hematological parameters in growing female *Sirohi* goat kids. The experiment was conducted over 90 days, and examined three feeding groups viz., T_1: feeding once a day, T_2: feeding twice a day, and T_3: feeding thrice a day. Hemoglobin concentration, red blood cell count, white blood cell count, packed cell volume, and erythrocyte sedimentation rate were measured at fifteen-day intervals. Three times a day feeding (T_3) significantly ($P<0.05$) increased Hb (gm/dl) due to haemodilution by increasing water intake with feeding frequencies of concentrate compared with other groups. The PCV (%) and RBC count were significantly ($P<0.01$) higher T_3 group but WBC count and ESR values were non-significantly affected by the feeding frequency of the concentrate. Results demonstrate significant variations in hematological profiles among the feeding frequency groups, highlighting the importance of tailored feeding strategies in goat farming.

Introduction

India, with its substantial livestock population, holds a significant share of the global livestock count. Rajasthan, one of India's states, ranks prominently in goat population with 20.8 million, reflecting the importance of goat farming in the region.

Nutrition and feeding practices are crucial determinants of goat health and productivity, impacting the overall performance of the animal husbandry sector. Goat farming supports the national economy and socio-economic growth of small and marginal farmers as well as landless laborers. Feeding frequency influences the production of the animal by affecting microflora in the rumen. When an animal is fed once or twice daily, the ruminal microbes work for a short period, thus decreasing microbial activity due to the diluting effect of feed, saliva, and passage of some organisms from rumen to abomasum. The small ruminants need more feeding frequency due to they have high basal metabolism compared to the large ruminants. The blood composition of animals might be influenced by various factors such as

nutrition, management, and great of animals, sex, age, diseases, and stress factors that might affect blood values. The hematological and biochemical parameters are indicative of the metabolism and health status of small ruminants (Al-Eissa *et al.,* 2012). The red blood cells of goats are smaller in size compared to other species. The blood constituents are used as markers to determine the efficacy of feed nutrients and their utilization (Belewu & Ogunsola, 2010).

Materials and Methods

The experiment was conducted at Livestock Research Station (LSR), Boujunda, College of Veterinary and Animal Science, Navania, Udaipur (RAJUVAS). Twenty-one growing female *Sirohi* goat kids were selected as experimental animals and allocated into three groups based on age and body weight comprising seven kids in each group viz., T_1: feeding once a day, T_2: feeding twice a day, and T_3: feeding three times a day concentrate but other feeding and watering facilities were similar for all experimental kids.

The duration of the experiment was 90 days under an intensive rearing system. Kids of the T_1group were offered concentrate at 9.00 A.M., whereas the T_2 group at 9.00 A.M. And 12.00 P.M., and the T_3 group at 9.00 A.M., 12.00 P.M., and 6.00 P.M. only. The blood samples were collected every fifteen days intervals during different feeding frequencies in the whole experimental period, from the jugular vein under aseptic precaution in EDTA containing test tube/vial. Fresh whole blood was used to estimate hematological parameters like Hb, PCV, RBC, and WBC values by using an automatic hemato-analyzer (Rescholar 303). ESR was measured by the Westergren method at the Department of Veterinary Physiology and Biochemistry, College of Veterinary and Animal Science, Navania, Udaipur, Rajasthan.

Statistical Analysis

Using the analysis of variance technique, data were statistically evaluated on a computer with the SPSS statistical software, which was designed in compliance with the Completely Randomized Design (CRD) concept. When an ANOVA revealed significant differences between treatment means, Duncan's Multiple Range Test was used to analyze variations within those means.

Results and Discussion

According to Tewe (1982) determining the blood composition is crucial for differentiating between a stress-related condition and a normal one. The effect of feeding frequency of concentrate on blood components is influenced by the rate of nutrient absorption through the gut membrane. While animals may absorb nutrients at a relatively constant rate over time, feeding once a day can lead to fluctuations in blood components and metabolic responses. Results of hematological parameters of *Sirohi* goat kids under different feeding frequencies of concentrate are presented in Table 1.

The present study revealed a significant ($P<0.05$) increment in Hb level when kids maintained under three times a day concentrate feeding as compared to twice and once a day kidan indication that increasing the feeding frequency of concentrate improves microbial growth and water intake so enhance the oxygen-carrying capacity of the blood for more metabolism of feed. The 72 hrs watering interval (Adogla and Aganga, 2000) in goats, one time the day watering frequency (Sahana *et al.,* 2020) in sheep, and the feeding frequency of concentrate in *Osmanabadi* goats (Bhandwalkar, 2016) elevated the Hb level is under the present study.

The experimental kids offered three times a day concentrate feed showed significantly ($P<0.01$) higher PCV as compared to other groups, whereas the PCV of kids kept on twice-a-day feeding was at par with once-a-day feeding groups. The Hb and PCV values are indicators of erythrocytic normality and the general well-being of the kids. The PCV values of kids increased with concentrate supplementation and indicated that kids were not suffering from the anaemic condition. PCV is a useful index of the capacity of the bone marrow to produce RBC (Ayele *et al.,* 2017). Adogla-Bessa and Aganga (2000) in *Tswana* goats, Kumar *et al.,* (2014) in goats, Amuda and Okunlola (2018) in sheep and Sahana *et al.,* (2020) in sheep reported PCV values significantly enhanced with watering intervals and watering frequency, respectively.

The WBC Count ($x10^3/\mu L$) was found statistically non-significant affected by feeding frequency in all three groups T_1, T_2, and T_3. The highest average WBC Count was found in T_3 goat kids while the lowest was found in T_1 goat kids. The feeding frequency of concentrate can influence WBC count by modulating immune responses and nutrient intake.

Table.1 Average fortnight Hematological parameters with respective Standard Errors in kids under different feeding frequencies

Hematological Parameters	T_1	T_2	T_3
(a) **Hb level (gm/dl)**	8.93^{a}±0.17	9.45^{ab}±0.169	9.62^{b}±0.208
(b) **PCV (%)**	24.33^{a}±0.293	25.13^{ab}±0.369	25.97^{b}±0.293
(c) **WBC Count (x10^3/µL)**	7.27^{NS}±0.321	7.7^{NS}±0.235	7.95^{NS}±0.226
(d) **RBC Count (x10^6/µL)**	10.72^{b}±0.224	11.29^{ab}±0.186	11.93^{a}±0.254
(e) **ESR (mm/hr.)**	0.25^{NS}±0.012	0.24^{NS}±0.01	0.23^{NS}±0.013

Means with dissimilar superscript (a, b, c) in a row differ significantly. NS = non-significant.

A consistent feeding frequency with sufficient nutrient provision from concentrate may support optimal WBC count and immune function, thereby enhancing disease resistance and overall health in animals. Shaikat *et al.,* (2013) found that WBC numbers were non-significantly different in various breeds of goats. Abdalla *et al.,* (2014) reported that decreased WBC values in both sheep and goat species by restricted feeding.

The RBC Valve (x10^6/µL) was found significantly higher (P<0.01) in the T_3 group in comparison with both T_1 and T_2 groups as well and RBC values were also found significantly higher (P<0.01) in the T_2 group in comparison with T_1 group. In the present study, RBC values ranged between 10.33 to 12.28 x10^6/µL and fell within the normal physiological RBC range of 8 to 18 x10^6/µL reported by Feldman *et al.,* (2000) for goats.

The normal range of RBC supported well health status of kids and hence the kids were not suffering from anaemia. Amuda and Okunlola (2018) reported increased RBC levels with increment concentrate in the diet of West African Dwarf sheep.

Shaikat *et al.,* (2013) resulted in a higher level of RBC in Black Bengal than in Jamunapari goat. In contrast to the present study, Abdalla *et al.,* (2014) recorded more decrease in the RBC values with restricted feeding in goats compared to sheep.

The ESR values (mm/hr.) were found statistically non-significant affected by feeding frequency in all three groups T_1, T_2, and T_3. The highest average ESR was found in T_1goat kids while the lowest was found in T_3goat kids. In the present study, ESR values ranged between 0.19 to 0.28 mm/hr. and fell within the normal physiological ESR range of 0 to 1 mm/hr. reported by Feldman *et al.,* (2000) for goats. The normal range of ESR supported good health status without any infection or diseases in kids.

Feeding frequency significantly impacts hematological parameters in growing female *Sirohi* goat kids, with thrice-daily feeding associated with improved blood profiles compared to less frequent feeding regimens. These findings provide valuable insights for goat farmers and practitioners, emphasizing the importance of optimized feeding strategies in maximizing productivity and health outcomes in goat farming ventures.

Author Contribution

Karishma Choudhary: Investigation, formal analysis, writing—original draft.

Data Availability

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethical Approval Not applicable.

Consent to Participate Not applicable.

Consent to Publish Not applicable.

Conflict of Interest The authors declare no competing interests.

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