Impact of Pasture Grazing on Hemato-Biochemical Variables in Sirohi Doeling under Semi-Intensive Rearing System

Abstract

The current experiment was carried out at Livestock Research Station (LRS), Bojunda, Chittorgarh (Rajasthan) to study the effect of rearing system i.e. Grazing Versus Stall Feeding System on Hemato-Biochemical Variables of Sirohi Goats. Thirty Sirohi doelings around 6-12 months age group with uniform body size and weight were selected. They were randomly divided into three groups (group 01, group 02, and group 03) of equal number (10 each). Deworming and vaccination carried out routinely as per schedule. Pre adoption period of 15 days was given to all Sirohi doelings before starting research work. The Sirohi doelings selected for the experiment were free from physiological, anatomical, and infectious diseases. The animals of Group 01 were allowed to rear on complete stall feeding with supplementation of commercial concentrate ration, the animals of group 02 were allowed to rear on stall feeding with one time browsing around farm premises while the animals of Group 03 were allowed two times browsing around farm premises without stall feeding. Blood samples was collected at first day (day 0) and after every ten day interval for ninety days (3 months) of experiment to estimate the Red Blood Cell (RBCs), White Blood Cell (WBCs), ~~e~~Estimation of Haemoglobin (Hb), Packed cell volume (PCV), Aspartate amino transferase (AST)/ SGOT, Alanine amino transferase (ALT)/ SGPT, Blood glucose, Total Protein, Cholesterol and Triglyceride. It was found that the system of rearing i.e. grazing and stall feeding didn't affect the blood biochemistry (red blood cell ($\times 10^6$/µL), WBC ($\times 10^3$/µL), Haemoglobin (Hb) (gm/dl), Packed cell volume (PCV) (%), SGOT/AST (U/L), SGPT/ ALT (U/L), Blood glucose (mg/dl), Total protein (mg/dl), Cholesterol (mg/dl) and Triglyceride (mg/dl) and all these are within normal physiological range.

Keywords: Hemato-Biochemical Variables, Grazing, Sirohi doeling, Stall feeding, Browsing.

Introduction:

Goats have been connected with humans since the dawn of agriculture and animal domestication, making them a very significant socio-economic animal that offers a variety of goods and services to man across the world, particularly in developing nations. We now refer to it as an ATM. The modern human race may employ goats in a variety of ways. Each component of its body and every one of its products is significant in its own way (Lata and Mondal, 2021). In India, goats are among the principal livestock used for the production of meat. Chevon, one of the most popular meat~~s~~ is in high demand domestically. The goat is a creature that adapts to practically any environment easily, especially in desert areas (Banerjee, 2004). For 40% of India's rural people who live in poverty, goats are a reliable source of income (Maske and Phule, 2011). With a holding of 11.6% of the global livestock population, India has one of the largest livestock industries in the world (Islam *et al*., 2016). The 20th livestock census estimates that

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there are 535.78 million animals in India (BAHS, 2019), which goats make up 27.78%. There are 861.9 million goats in the globe. In India, there are 148.88 million goats in total. The livestock industry provides 4.11% of GDP, whereas agriculture as a whole accounts for about 25.6% of GDP. The Sirohi goat may be found in Arawali Hills, districts in central and southern Rajasthan, and dry and semi-arid regions. The coat is mostly brown with some pale or dark spots. There are three main techniques for raising small ruminants: extensive, semi-intensive, and intensive. Due to the rangelands' poor production and severe degradation, the animals often have low nutritional levels. A full stall feeding on produced fodders, crop leftovers ~~and concentrates, compound feeds~~, concentrates, compound feeds, or grazing on established pastures mixed with stall feeding are all examples of intensive systems. Small holder farmers are finding intensive production of small ruminants to be an increasingly appealing venture due to the increasing demand for meat and meat products. A considerable portion of small holders and landless workers in rural regions engage in goat-rearing as a livelihood since it consumes a type of feed that would cause other animals to starve (Singh *et al*., 2000 and FAO, 1991). The intensive manner of goat husbandry has its own relevance because of deforestation and the lack of grazing pasture. In order to maintain productivity in the future when raising goats or sheep, shepherds will need to find alternate methods. Stall feeding with very less inputs is one such potential strategy. Therefore, the current experiment was undertaken to compare the grazing system and stall feeding system in small ruminants i.e. goats.

Materials and Methods:

The proposed work was carried out at "Goat Unit" of Livestock Research Station (LRS), Bojunda, Chittorgarh, Rajasthan with due care that Sirohi doeling should be well identified by use of tagging for different groups. Thirty Sirohi goat doelings around 6-12 months age group with uniform body size and weight were selected. They were randomly divided into three groups (01, 02 and 03) of equal number (10 each). Deworming and vaccination carried out routinely as per schedule. Pre adoption period of 15 days was given to all kids before starting research work. The Sirohi doelings selected for the experiment were free from physiological, anatomical, and infectious diseases. Group 01 allowed to rear on complete stall feeding with supplementation of commercial concentrate ration, group 02 allowed to rear on stall feeding with one time browsing (daily 4 hours) around farm premises while Group 03 allowed two time browsing (daily 8 hours) around farm premises without stall feeding. Blood samples was collected at first day (day 0) and after every ten day interval for ninety days (3 months) of experiment to estimate the Red Blood Cell (RBCs), White Blood Cell (WBCs), Estimation of Haemoglobin (Hb), Packed cell volume (PCV), Aspartate amino transferase (AST)/ SGOT, Alanine amino transferase (ALT)/ SGPT, Blood glucose, Total Protein, Cholesterol and Triglyceride. It was found that the system of rearing i.e. Grazing and Stall feeding didn't affect the blood biochemical (red blood cell (million/mm3), WBC (thousand/mm3), Haemoglobin (Hb) (g/dl), PCV Packed cell volume (%),

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SGOT/AST (U/L), SGPT/ ALT (U/L), Blood glucose (mg/dl), Total protein (g/dl), Cholesterol (mg/dl) and Triglyceride (mg/dl).

The data obtained during the experiment were analysed for one way ANOVA using SPSS statistics software version 20 package as method depicted by Snedecor and Cochran (1994).

Table 01: Management of protocols was followed for different groups of animals.

System of Rearing	Concentrate	Roughage	Dry Fodder	Management
Intensive (T1) (n=10)	150 gms per day	No grazing, roughage offered on DM Basis-200 gms per goat in the stall	1 Kg / day	No grazing, both concentrate and roughages were offered in the pen only
Semi-intensive (T2) (n=10)	100 gms per day (Restricted)	Restricted grazing (8AM to 12 Noon)	1 Kg / day	Restricted grazing followed by offering restricted concentrate in the pen
Extensive (T3) (n=10)	No Concentrate offered	Full grazing (8 AM to 12 Noon & 2PM to 6 PM)	1 Kg / day	Animals were not offered anything in the shed and kept in the pen only during night hours

Results and Discussion:

The red blood cell ($\times 10^6/\mu L$), white blood cell ($\times 10^3/\mu L$), Haemoglobin (Hb) (gm/dl), Packed cell volume (PCV) (%), SGOT/AST (U/L), SGPT/ ALT (U/L), Blood glucose (mg/dl), Total protein (mg/dl), Cholesterol (mg/dl) and Triglyceride (mg/dl) are estimated and are presented in table 02.

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Table 02: Mean ± SEM Values of Haemoglobin, Red Blood Cell, White Blood Cell, Packed Cell Volume, AST, ALT, Blood glucose, Cholesterol, Total protein and Triglyceride in the blood samples of *Sirohi* doeling in various trial groups

Parameters	Groups		
	T1(Control)	T2	T3
Hb (gm / dL)	$8.766 \pm .13^{b}$	$7.481 \pm .04^{a}$	$7.488 \pm .04^{a}$
RBC ($\times 10^{6}$ / µL)	$11.577 \pm .05^{b}$	$10.418 \pm .02^{a}$	$10.424 \pm .02^{a}$
WBC ($\times 10^{3}$ / µL)	$8.527 \pm .08^{a}$	$8.873 \pm .06^{b}$	$9.733 \pm .09^{c}$
PCV (%)	$29.955 \pm .51^{b}$	$25.164 \pm .31^{a}$	$25.052 \pm .27^{a}$
AST (U / L)	$71.084 \pm .39^{a}$	$73.703 \pm .48^{a}$	89.045 ± 1.36^{b}
ALT (U / L)	$6.313 \pm .04^{a}$	$6.601 \pm .03^{a}$	$7.850 \pm .15^{b}$
Blood glucose (mg / dl)	$53.524 \pm .56^{b}$	$48.162 \pm .29^{a}$	$48.213 \pm .33^{a}$
Cholesterol (mg / dl)	$103.185 \pm .15^{a}$	$102.653 \pm .10^{a}$	$105.216 \pm .35^{b}$
Total protein (mg / dl)	$6.695 \pm .05^{b}$	$6.277 \pm .03^{a}$	$6.246 \pm .03^{a}$
Triglyceride (mg / dl)	$7.507 \pm .23^{a}$	$7.710 \pm .25^{a}$	$10.179 \pm .40^{b}$

(a, b and c values with different superscripts for the same parameter within the row differ significantly ($p<0.05$))

In the present study the mean ± SEM values of Haemoglobin (Hb) , Red Blood Cell (RBC) and Packed Cell Volume (PCV) were observed significantly ($p<0.05$) higher in Intensive rearing group than Semi-intensive and Extensive rearing groups, as showed in table 02. These results are in agreement with the findings of Patil *et al.* (2014), Kochewad *et al.* (2017) in sheep and Mane *et al.* (2022), who reported significantly ($p<0.05$) higher RBC, Hb and PCV in Intensive rearing group. While, the findings of Kochewad *et al.* (2018a) in sheep, Adenkola *et al.* (2018), Karthik *et al.* (2021) in sheep and Bhinder *et al.* (2023) were in disagreement with the present investigation. Good veterinary care and a lesser parasite challenge may be the cause of the greater erythrocyte count seen in the intensive group. Sufficient balanced diet that has minerals and vitamins required for the best possible production of haemoglobin (Adenkola *et al.*, 2009; Adenkola and Tuleun, 2011). It has been shown that animals fed a high-protein diet were better able to bind iron overall than those fed a low-protein diet. In erythropoiesis, iron has a beneficial effect. Unlike the goats under the extensive system, the goats under intensive management received a high-quality protein concentrate as a supplement in their feed.

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Furthermore, with the gaps within these values and the SEM, there are possibilities for significant differences in their probability values.

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The mean ± SEM values of White Blood Cell (WBC) were observed significantly ($p<0.05$) differed in all rearing groups, as showed in table 02. The finding of Karthik *et al.* (2021) in sheep was similar with the present investigation. While, the findings of Patil *et al.* (2014), Adenkola *et al.* (2018), Singh *et al.* (2020), Mane *et al.* (2022), Bhinder *et al.* (2023) and Yadav *et al.* (2023) were disagreement with the present study. On the other hand, Attia (2016) found that the total leucocyte count had barely changed. Leucocytes' primary functions include phagocytosing foreign organisms to defend the body from invasion, preventing infections, and generating, or at the very least, delivering, and dispersing, antibodies during an immune response.

In the present study, the mean ± SEM values of Aspartate aminotransferase (AST) and Alanine transaminase (ALT) were observed significantly higher ($p<0.05$) in Extensive rearing group than Intensive and Semi-intensive rearing groups, as showed in table 02. These results are in agreement with the findings of Kochewad *et al.* (2017) in sheep, Adenkola *et al.* (2018), Karthik *et al.* (2021) in sheep and Bhinder *et al.* (2023). While the findings of Indu *et al.* (2014) and Yadav *et al.* (2023) were in disagreement with the present investigation. Muscle enzymes have been demonstrated to rise in animals under the stress and excitement of constraint because of increased cell permeability and cell injury (Duncan and Prasse, 1986). Although no individual animal's results in this study indicated a significant increase of serum AST or ALT, handling-related stress cannot be completely ruled out.

In the present investigation the mean ± SEM values of Serum Glucose and Total Protein (TP) were observed significantly ($p<0.05$) higher in Intensive rearing group than Semi-intensive and Extensive rearing groups, as showed in table 02. These results are in agreement with the findings of Gupta *et al*. (2005), Nayak et al. (2013), Manat *et al.* (2016), Singh *et al*. (2020), Karthik *et al*. (2021) in sheep, Debbarma *et al*. (2022) and Mane *et al.* (2022). While, the findings of Raju *et al.* (2015) in sheep, Attia *et al*. (2016) and Yadav *et al.* (2023) were in disagreement with the present investigation. In nutritional studies, a number of researchers (Okoruwa, 2014; Okoruwa *et al.* 2014; Olafadehan *et al.* 2014) had linked higher serum total protein and albumin to higher protein intake. According to Yadav *et al.* 2023, Compared to a semi-intensive and extended system of raising, the higher total protein in stall-fed systems may be the result of higher concentration intake.

The reported mean ± SEM value of Serum Cholesterol was observed significantly ($p<0.05$) higher in Extensive rearing group than Semi-intensive and Intensive rearing groups, as showed in table 02. These results are similar to the findings of Adenkola *et al.* (2018), Debbarma *et al.* (2022), Mane *et al.* (2022) and Yadav *et al.* (2023). While, the results of Raju *et al.* (2015) in sheep, Manat *et al.* (2016), Singh *et al.* (2020), Karthik *et al.* (2021) in sheep and Bhinder *et al.* (2023) were contrast with present study. The highest increase in cholesterol level was observed in animals raised in intensive systems, which may be related to greater levels of free fatty acids (FFA) brought on by less stress during the trial period. Accordingly, in the current study, higher cholesterol levels (within physiological bounds) in intensive systems are indicative of better physical health and reduced stress in these rearing methods.

The reported mean ± SEM value of Triglyceride was observed significantly ($p<0.05$) higher in Extensive rearing group than Semi-intensive and Intensive rearing groups, as showed in table 02. These results are in agreement with findings of Singh *et al.* (2020). While, the results of Raju *et al.* (2015) in sheep and Bhinder *et al.* (2023) were in disagreement with the present investigation. Smith RW and Walsh A. (1975) reported a higher quantity of these substances in the ewes' liver. Increased lipolysis, which is hormonally controlled and not an indication of energy deficit, may be the cause of the substantial drop in blood triglycerides in intensive systems of rearing (Holtenius P and Hjort M. (1990).

Conclusion:

On the basis of above mentioned findings it was observed that the intensive rearing system (T1) is superior to semi-intensive (T2) and extensive (T3) rearing systems due to its significant advantages concern to physiological and biochemical changes. However, while the intensive rearing system yields better results, it is rather costly. Therefore, the semi-intensive rearing system emerges as a more cost-effective alternative while still being supported by scientific findings.

Based on the results of the present study, it can be concluded that the intensive rearing system is superior to semi-intensive and extensive rearing systems due to its significant advantages. However, while the intensive rearing system yields better results, it is rather costly. Therefore, the semi-intensive rearing system emerges as a more cost-effective alternative while

still being supported by scientific findings. Further studies across different seasons are necessary to validate and optimize these results.

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