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Assessment of management interventions on growth traits, blood biochemistry and immune status in Mecheri Lambs

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Abstract

The experiment used 18 Mecheri Ram lambs, divided into 3 groups of 6 animals each. The aim was to determine the effect of three different rearing systems on growth performance, haematological, biochemical constituents and immune response of Mecheri Ram lambs. The rearing systems tested were extensive (Grazing), Semi-intensive (grazing + Concentrate supplementation) and intensive (Stall fed) systems. Experiment was conducted for 120 days. The blood and serum samples were collected at the end of the experiment to study the haematology and biochemical constituents of lambs. Three months after the beginning of the experiment, the lambs were injected with chicken RBC's to assess the humoral immune response; PHA-P was injected to assess the cell mediated immune response. System of rearing did not influence the growth performance of the lambs. Haematological and serum biochemical constituents were within the normal range in all the rearing systems. The humoral and cell mediated immune response was significantly ($P < 0.05$) higher in intensive and semi-intensively reared lambs compared to extensively reared lambs. Results indicate that Mecheri Ram lambs could be fed intensively with no requirements of green fodder without altering the welfare of lambs.

Keywords: Mecheri lambs, rearing system, growth, immunity

Introduction

Sheep are most important ruminant species of economic value to the small and marginal farmers and landless labourer in India. It plays important role in supplying animal protein for the people in rural areas. These are traditionally reared on grazing lands which cannot provide sufficient amount of all the nutrients (Karim and Sankhyan, 2009) ^[10] and has high mortality (Chaturvedi *et al.*, 2008) ^[4]. Haematological parameters have been reported to provide valuable information on the immune status of the animal (Kral and Sachy, 2000) ^[11]. Blood profiles can be used as a diagnostic tool to assess the health status of an individual and or a flock (Tras *et al.*, 2000) ^[18]. Haematological changes are used to determine various influences of environmental, nutritional and pathological factors (Garacyk *et al.*, 2003) ^[8]. Thus keeping the present study was carried out to study the growth performance, blood haematology, serum biochemical parameter and immune status at different rearing system of Mecheri lambs, which is well known for its higher growth rates, feed conversion efficiency and better adaptability to semi-arid climate of the country.

Materials and Methods

Eighteen Mecheri Ram lambs (3 months old) were used from the Mecheri Sheep Research Station to evaluate the performance and immune status under different rearing systems. Each group of lambs (6 in each group) was randomly allotted to extensive, semi-intensive and intensive system of feeding. In extensive system of feeding, lambs were allowed for 8 h of grazing with no supplemental feeding. Under semi-intensive feeding lambs were left for 4 h grazing and were supplemented with concentrate mixture to meet the protein requirements of

lambs (ICAR, 2013) [9]. The lambs under intensive system were not allowed to graze and were fed required amounts of concentrate mixture in the morning to meet the protein requirements and the rest of the energy requirements were met by feeding *ad libitum* chopped sorghum straw. All the lambs were weighed individually every fortnight before feeding and watering to assess body weight changes throughout the experimental period of 120 days. Blood was collected end of 120 days growth trail for hematology and serum was collected for various biochemical constituents. The effect of dietary variation on immune response of lambs was assessed using chicken erythrocytes as immunogens. The appropriate dose of antigens was given to lambs and a booster dose of the antigens was given after 15 days. The serum was collected on 7, 14, 21, 28 and 35th day of post sensitization to assess the humoral immune response by haemagglutination

inhibition test (Wegmann and Smithies, 1966) [19]. In-vitro delayed type hypersensitivity (DTH) reaction after 120 days experimental period, all animals were tested for DTH. Media or mitogenic solution contained phytohemagglutinin phosphate (PHA-P) (Sigma Chemical Company) in 10 mL phosphate buffer for skin test to evaluate CMI response at 24 and 48 h post injection as per the procedure described by Quist *et al.*, (1997).

Data was analysed by one-way ANOVA following the completely randomized design (Snedecor and Cochran, 1980) [17]. Comparisons among multiple means were made by Duncan's multiple range test (Duncan, 1955) [7].

Results and Discussions

The results on fortnightly body weights of Mecheri lambs in the present study are given in Table 1.

Table 1: Fortnightly body weight changes (kg) in Mecheri lambs reared under different management systems.

Fortnight	Extensive	Semi-intensive	Intensive	SEM
Initial	11.92	11.5	11.53	0.341
1 st	12.3	12.1	12.4	0.392
2 nd	13.2	12.9	12.92	0.390
3 rd	13.85	13.27	13.55	0.410
4 th	14.50	14.56	14.16	0.412
5 th	15.25	14.91	15.1	0.451
6 th	15.9	15.45	15.8	0.411
7 th	16.25	16.58	16.85	0.399
8 th	17.85	17.40	17.93	0.410
Total weight gain	5.93	5.90	6.40	0.432
ADG (g)	49.42	49.17	53.33	2.595

Rearing systems did not influence the body weight and average daily gain in the present study. In contrary, Munir *et al.*, (2008) [12] reported significantly ($P < 0.05$) higher body weight and weight gain in intensively reared Balochi lambs compared to semi-intensive and extensively reared lambs. However, Bharambe and Burte (2012) [2] reported higher body weight and weigh gains in stall fed Decanni lambs compared to grazing and grazing plus concentrate feed supplemented lambs. The differences among the study may be due to the season of the experimental period; grasses available at grazing area, amount of concentrate fed to the animal and breed.

Results reveals that Hb concentration values were significantly ($P < 0.05$) lower in intensively reared lambs compared to semi-intensive and extensively reared lambs (Table 2).

On the other hand no significant ($P > 0.05$) differences were observed in the value of RBC's and WBC's count in all type of management systems examined during this experiment. The group reared under intensive system had higher value of neutrophils and was significantly higher ($P < 0.05$) than extensive and semi-intensively reared animals, whereas Lymphocyte values in those reared intensively was significantly lower ($P < 0.05$) than others. This study was similar in some regard to observation made in West Africa dwarf sheep Olayemi *et al.* (2000) [13] and white Fulani cattle Olayemi and Oyewale (2002) [14]. Daramola *et al.* (2005) [5] reported that management system favours intensively reared animals with higher PCV, RBC's, WBC's and MCHC values compared to extensively reared animals. However, this study did not reveal any significant difference ($P > 0.05$) in RBC's and WBC's count.

Table 2: Haematological profile in Mecheri lambs reared under various feeding systems

Constituent	Extensive	Semi-intensive	Intensive	SEM
Haemoglobin (g/dl)	10.25 ^{bc}	11.55 ^c	9.50 ^b	0.842
Total erythrocyte count ($\times 10^6/\mu\text{l}$)	7.85	8.15	7.8	0.515
Total leucocyte count ($\times 10^3/\mu\text{l}$)	8.92	9.25	9.55	0.625
Differential leucocyte count				
Neutrophils%	40.67 ^{ab}	38.80 ^b	41.80 ^c	0.100
Lymphocytes%	59.21 ^{yz}	60.23 ^z	55.42 ^y	0.588
Eosinophils%	1.5	1.02	1	0.825
Basophils%	0.5	0.3	0.5	0.624
Monocytes%	1.5	1.6	1.2	0.778

^{abc}Means with differ superscripts in a row differ significantly: $P < 0.05$

Total serum protein and globulin levels were significantly higher ($P < 0.05$) in semi-intensively reared animals compared to other two systems of management (Table 3). Other serum

biochemical parameters were not influenced by system of management.

Table 3: Blood biochemical profile in Mecheri lambs fed under various feeding systems

Days post feeding	Extensive	Semi-intensive	Intensive	SEM
Total protein, g/dl	5.45 ^a	5.70 ^b	5.50 ^{ab}	0.322
Albumin, g/dl	1.65	1.80	1.69	0.110
Globulin, g/dl	3.80 ^a	3.90 ^b	3.81 ^{ab}	0.450
A:G ratio	0.43	0.46	0.44	0.052
Creatinine, mg/dl	0.72	0.80	0.75	0.055
Urea, mg/dl	9.25	10.05	10.51	1.000

^{ab}Means with differ superscripts in a row differ significantly: $P < 0.05$

Nutrient level in blood sample may be considered to be proximate measure of long term nutritional status of animals. From the foregoing it is obvious that when animals are reared intensively or semi-intensively, they have better blood picture result than those reared extensively. However, results from the present study reveals that all the blood parameters are within the normal range (Senthilkumar *et al.*, 2012)^[16]. Since all the animals used in this experiment should averagely adequate values in all parameters assessed, it could be conducted that, irrespective of the management systems semi-intensive or intensively reared lambs had better nutrient status. Further study is recommended in the area of nutrient determination using the blood serum assessment and also to examine if any correlation exists between haematological parameter and blood serum nutrients.

Mean serum concentration of antibody titre (log₂) value against chicken RBC's antigen (Table 4) was significantly ($P < 0.05$) lower in extensively reared lambs compared to other two system of rearing. Similarly, some earlier studies have shown humoral immune response can be affected by rearing system (Dohms, 1991; Arboma *et al.*, 2011)^[6].

Table 4: Humoral immune response in Mecheri lambs against chicken RBC antigen assessed by STAT (log₂ titers)

Days post sensitization	Extensive	Semi-intensive	Intensive	SEM
7	8.35	8.85	8.59	0.140
14	9.49 ^a	9.65 ^{ab}	9.82 ^b	0.125
21	9.30 ^a	9.65 ^b	9.65 ^b	0.122
28	8.49 ^a	8.32 ^a	8.79 ^b	0.152
35	8.25	8.15	8.20	0.114

^{ab}Means with differ superscripts in a row differ significantly: $P < 0.05$

Skin thickness after PHA-P injection was significantly ($P < 0.05$) higher in lambs reared intensive and semi-intensively reared lambs (Table 5). This was lower in extensively reared animal indicating intensive and semi-intensively reared lambs had increased cellular immune reactivity. It is largely known that the immune system is strictly related to animal welfare because it reflects the capability to react against external noxae (Broom, 2006)^[3]. We conclude that intensive followed by semi-intensively reared lambs were to be valid method to promote welfare and sustainability of Mecheri lambs compared to extensively reared lambs.

Table 5: Skin fold thickness (Least square mean) after PHA-P injection

Hours post injection	Extensive	Semi-intensive	Intensive	SEM
24	0.86 ^a	1.55 ^b	1.42 ^b	0.115
48	0.40 ^a	0.61 ^b	0.74 ^b	0.214

^{ab}Means with differ superscripts in a row differ significantly: $P < 0.05$

Growth in Mecheri lambs was not affected by the system of feeding. The humoral and cell mediated immune response in

lambs fed under extensive system was higher in intensively and semi-intensively fed lambs. It is concluded that, mecheri lambs could be fed intensively with no requirements of green fodder without altering the welfare of lambs.

Conflict of Interest

Not available

Financial Support

Not available

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