Original Research Article

The impact of giloy (*Tinospora cordifolia*) and amla (*Emblica officinalis*) herbal feed additives on the morphometric traits of Magra lambs raised underthe extensive rearing system in western Rajasthan, India

Abstract

The objective of this research was to explore the utilization of herbal feed supplements, precisely amla (*Emblica officinalis*) and giloy (*Tinospora cordifolia*), affects the morphometry of Magra lambs under an extensive management system. The study involved 28Magra lambs aged 3-4 months, placed within an extensive system. These lambs were randomly allocated into 04 experimental groups, each consisting of 7 lambs, using a randomized block design (RBD). In an extensive management system, Amla (*Emblica officinalis*) whole fruit powder and Giloy (*Tinospora cordifolia*) stem powder, herbal feed additives, were provided at a dosage of 1.5 gram per kilogram body weight with concentrate for T_1 and T_2 groups, respectively. This supplementation was excluded for the control group, and a different approach was followed for T_3.T_3 group received a combined supplement of Amla whole fruit powder and Giloy stem powder at a concentration of 0.75 gram per kilogram body weight, administered alongside concentrate as oral/feed. By the conclusion of the experiment, notable alterations were observed in measurements such as abdominal girth, chest/heart girth, body height, and body length; however, these changes remained within the standard range of morphometric traits. At the conclusion of the experiment, it seems that integrating 1.5 gram per kilogram body weight of giloy stem powder and amla powder can be considered a viable component of the strategy, as it proves effective in enhancing morphometric traits in lambs within the extensivemanagement system of the arid zone of Rajasthan.

Keywords:-*Body Height, Body Length, Chest Girth, , Extensive system, Lamb*

INTRODUCTION

Magra sheep, a breed native to Bikaner, are known for their unique characteristics and adaptability to the arid desert climate of the region. These sheep have been an integral part of the local economy and culture for centuries, playing a crucial role in providing wool, meat, and milk to the community. Magra sheep is believed to have originated in the Thar Desert of Rajasthan and have been bred by the local communities for generations. They are well-suited to survive in harsh conditions with limited water and forage availability. Their ability to thrive in such extreme environments has made them highly valued by the people of Bikaner and surrounding areas, who rely on them for sustenance and livelihoods. Over time, the breed has evolved to develop certain unique characteristics, such as a dense wool coat that protects them from the scorching heat during the day and keeps them warm during the cold desert nights. Height up to withers refers to the total length from the ground to the top most point of the shoulder blades, while chest circumference is the measurement around the chest just behind the front legs.These measurements provide valuable information about the overall size and conformation of the sheep, which can influence their performance and adaptability to different environments. Additionally, these parameters are often used in breeding programs to select animals with desirable traits and improve the overall quality of the breed. Body length is another important measurement in evaluating the conformation of adult Magra sheep in Bikaner. This measurement, along with height up to withers, aids in assessing the overall size and proportions of the sheep, which can impact their adaptability and suitability for different production systems.

Herbs are used in small quantities as feed additives worldwide to cover the needs of essential nutrients and to increase feed intake, optimize feed utilization and thereby improve animal performance especially in monogastric animals. They contain a high concentration of secondary metabolites and generally used in poultry and swine ration as immuno-stimulants, antibacterial, coccidiostats, anthelminthics, antiviral or antioxidative additives (Haliwell*et al*., 1995; Uegaki*et al*., 2001). Recent research of herbal formulation as feed additives has shown promising results in terms of FCE, growth, decreased mortality and enhanced liveability in poultry birds (Mishra and Singh, 2000). The feed industry has recognized the potential of plant-derived substances for different animal species in the last few years. Modern approaches in the form of feed additives may offer incredible opportunities to make sheep production profitable by getting better outputs. According to Hutjens (1991), a good feed additive can be selected based on 4R's viz., anticipated response, economic return, available research and field responses for ensuring quality and quantity of production.

MATERIALS AND METHODS

The Magra lambs were categorized into 04treatments, each comprising seven lambs, within an extensive system. The allocation was carried out in a random manner, employing a randomized block design (RBD), to ensure uniform initial body weights across all groups.The present experiment was conducted for three months at Arid Region Campus of ICAR, Central Sheep and Wool Research Institute, Bikaner for semi-intensive system and Udeshiyan village, Lunkaransar Tehsil for extensive system with the help of Department of Livestock Production and Management, College of Veterinary and Animal Science (Bikaner), Rajasthan University of Veterinary and Animal Sciences, Bikaner.In the extensive management system, the herbal feed supplement, consisting of amla (*Emblica officinalis*) whole fruit powder and Giloy (*Tinospora cordifolia*) stem powder, was administered at a dosage of 1.5 gram per kilogram body weight along with concentrate as an oral/feed supplement. This supplementation applied to T_1 and T_2 groups, while the control and T_3 groups followed a different regimen. T_3 group was provided with an oral/feed supplement consisting of amla (*Emblica officinalis*) fruit powder and giloy (*Tinospora cordifolia*) stem powder at a rate of 0.75 gram per kilogram body weight.The measurements of each lamb were documented monthly, utilizing a measuring tape with centimetre markings.The recorded body measurements were obtained while the lambs were positioned evenly on a firm, level surface. The measurement of body length (in centimetres) involved determining the distance from the shoulder point to the pin bone.The measurement of body height (in centimetres) was conducted by gauging the distance from ground level to the highest point of withers. Heart girth (in centimetres) was determined by recording the smallest circumference directly behind the shoulder when the animals were standing squarely. Abdominal girth (in centimetres) was assessed by measuring the circumference just before the hind legs while the animals were positioned evenly.

The Table 1 is showing chemical composition of Amla and Giloy.

Table 1: Chemical composition of Giloy and Amla (%DM basis)

Sr.no.	Chemical composition	Giloy stem powder	Amla pulp powder	Amla seed powder	Amla seed coat powder	Whole powder
1.	Dry matter	91.78	92.31	94.31	90.87	93.49
2.	Organic matter	92.51	96.49	96.09	98.48	96.97
3.	Crude Protein	1.53	5.89	13.99	7.01	9.96
4.	Ether Extract	1.29	0.49	8.54	2.29	5.77
5.	Crude Fibre	14.67	2.65	3.61	4.51	3.59
6.	Total Ash	7.49	3.51	3.91	1.52	3.03
7.	NFE	75.02	87.46	69.95	84.67	77.64

RESULTS AND DISCUSSION

Chest girth

The mean values of chest girth of magralambs under four treatment groupsin the extensive management system were recorded at fifteen days intervals of experimental trial and have been presented in Table 01. Due to influence of treatment, the mean values of chest girth of magralambs were increased in 13 weeks from 64.24 centimetre to 71.23 centimetre in control, from 64.45 centimetre to 72.22 centimetre in T_1, from 64.63 centimetre to 72.75 centimetre in T_2 and from 64.26 centimetre to 72.37 centimetre in T_3, group in the extensive management system.

Treatments groups	**Period (fortnights)**

It is evident from the ANOVA that there was a highly significant (P<0.01) impact on the average diameter of the chest girth during the 3,4,5 and 6 fortnights of the experiment.Additionally, a significant effect (P<0.05) was found during the 3,4,5 and 6 fortnights of the experimental trial, with no significant impact noted for the remaining duration within the extensive system.

During the 3^{rd},4^{th},$5^{th}$and 6^{th}fortnights, the most substantial rise in chest girth was noted in T_2, and this increase was significantly greater compared to the other treatment groups. Conversely, the control treatment group exhibited the lowest average heart girth. However, the average diameter of chest girth of the lambs in the control, T_1, and T_3 treatment groups during the 3^{rd},4^{th},5^{th} and 6^{th}fortnights of the experiment exhibited similarity among them.

The chest girth varied from 71 centimetre to 72.18 centimetre in the extensive system and 71.23 centimetre to 72.75 centimetre in the extensive system. The chest girth found in Magra lambs was smaller than the Bonpala sheep (82.44±1.87) reported by [10], Mehrabani sheep (91.28±0.55 centimetre) by [09] and higher than the Pugal sheep (71.83±0.20) by [04], Malpora sheep (70.11±0.21) by [05] and Coimbatore sheep (69.8 ±0.4 centimetre) by [02].

Table 2: Chest girth (centimetre) of magralambs at fifteen days intervals in 4 treatment groups in the extensive management system

	0	1	2	3	4	5	6
C	64.24	65.73	67.19	67.88^{a}	68.80^{a}	70.24^{a}	71.23^{a}
T_1	64.45	66.43	67.51	69.15^{b}	69.98^{b}	71.10^{b}	72.22^{b}
T_2	64.63	65.68	67.39	69.86^{b}	71.18^{b}	71.36^{b}	72.75^{b}
T_3	64.26	66.12	68.47	69.48^{b}	70.47^{b}	71.33^{b}	72.37^{b}
Standard Error of Mean	0.092	0.175	0.284	0.431	0.501	0.262	0.323

Note: A column with different superscripts has significantly different means.

Abdominal Girth

The average values of abdominal girth for lambs in four treatment groups were recorded at 15 days intervals throughout the experiment and are presented in Table 02. Due to the influence of the treatment, the mean abdominal girth values for lambs increased over 13 weeks, ranging from 71.36 centimetre to 79.16 centimetre in the control group, 71.36 centimetre to 79.68 centimetre in T_1, 71.42 centimetre to 80.06 centimetre in T_2, and 71.12 centimetre to 79.99 centimetre in T_3 within the extensive system.

The analysis of variance showed a highly significant impact ($P<0.01$) on the average abdominal girth during the 5thfortnight of the experiment. Additionally, a significant effect ($P<0.05$) was observed during the 5thfortnight of the experimental trial, while the impact remained no significant for the rest of the trial within the extensive system.

During the 5thfortnight, the highest abdominal girth was found in T_2, and this was significantly greater ($P<0.01$) than in the other treatment groups. However, the abdominal girth of the control, T_1, and T_3 groups were statistically comparable during this period.

Table 3: Abdominal girth (centimetre) of magralambs at fifteen days intervals in 4 treatment groups in extensive managementsystem

Treatment groups	**Period (fortnights)**						
	0	**1**	**2**	**3**	**4**	**5**	**6**
C	71.36	72.38	73.31	75.00	76.15	77.16	79.16^{a}

T_1	71.36	72.84	74.16	75.89	76.37	77.76	79.68^{ab}
T_2	71.42	72.39	73.65	74.90	76.03	77.83	80.06^{b}
T_3	71.12	72.40	73.59	75.25	75.87	77.62	79.99^{ab}
Standard Error of Mean	0.066	0.113	0.178	0.223	0.106	0.149	0.205
Note: A column with different superscripts has significantly different means.							

The abdominal girth varied from 79.09 centimetre to 80.15 centimetre in the extensive system and 79.16 centimetre to 80.06 centimetre in the extensive system. The abdominal girth found in Magra lamb was smaller than the Malpura sheep (92.59±0.42 centimetre) reported by [01], Chokla sheep (81 centimetre) by[07] and Bonpala sheep (90.33±1.45 centimetre) by [10].

Body Length (centimetre)

The average body length values for lambs across various treatment groups in an extensive system were documented at biweekly intervals throughout the experiment, as presented in Table 03. Due to the influence of the treatment, the mean body length values for lambs increased over 13 weeks, ranging from 54.27 centimetre to 68.57 centimetre in the control group, 54.66 centimetre to 69.75 centimetre in T_1, 54.72 centimetre to 70.53 centimetre in T_2, and 54.76 centimetre to 69.95 centimetre in T_3 within the extensive system.

Statistical variance analysis of the data indicated a highly significant impact ($P<0.01$) on 1^{st}, 2^{nd},3^{rd}, 5^{th}, and average body length during the 5^{th}fortnight of the experiment. The effect was no significant for the rest of the experimental trial and showed a significant impact ($P<0.05$) on 1^{st}, 2^{nd},3^{rd}, 5^{th}, and average body length during the 5^{th}fortnight in the extensive system. During the 5^{th}fortnight, the highest body length was observed in T_2, significantly surpassing ($P<0.01$) the other treatment groups. However, the body length of lambs in T_1, T_3, and the control group were statistically comparable during this period, with the control group exhibiting the lowest average body length.

At 1^{st}, 2^{nd} and3^{rd}fortnights, the highest body length was observed in T_2, significantly exceeding ($P<0.05$) the other treatment groups. Yet, the body length of lambs in T_1, T_3, and the control group were statistically comparable during these periods, with the control group having the lowest average body length. At the IV fortnight, the highest body length was observed in T_3, significantly surpassing ($P<0.05$) the other treatment groups. However, the body length of lambs in T_1, T_2, and the control group were statistically comparable during this period, with the control group exhibiting the lowest average body length. At the V fortnight, the highest body length was observed in the T_3 group. Although the body length of lambs in T_1, T_2, and T_3 groups were not statistically comparable, all three groups were comparable with the control group.

Table 4: Body length (centimetre) of magralambs at 15 daysintervals in 4 treatment groups in extensive managementsystem

Treatment groups	Period (fortnights)						
	0	1	2	3	4	5	6
C	54.27	55.61^{a}	58.21^{a}	61.33^{a}	63.92^{a}	66.14^{a}	68.57^{a}
T_1	54.66	56.25^{ab}	59.49^{ab}	62.20^{ab}	64.41^{ab}	67.17^{b}	69.75^{ab}
T_2	54.72	57.20^{b}	60.79^{b}	63.17^{b}	64.98^{ab}	67.70^{b}	70.53^{b}
T_3	54.76	56.54^{ab}	59.20^{a}	63.01^{b}	65.15^{b}	68.14^{b}	69.95^{b}
Standard Error of Mean	0.111	0.329	0.532	0.423	0.280	0.430	0.411

Note: A column with different superscripts has significantly different means.

The body length ranged from 79.09 centimetre to 80.15 centimetre in the extensive management system and 79.16 centimetre to 80.06 centimetre in the extensive management system. The body length found in Magra lamb was longer than the Coimbatore sheep (62.4±0.4 centimetre) reported by [02], Harnali sheep (61.42±0.69 centimetre) reported by [05] and smaller than the Garole sheep (42.7 ± 0.1 centimetre) reported by [08].

Body Height (centimetre)

The average body height values for lambs across various treatment groups in an extensive system were recorded at biweekly intervals throughout the experiment and are presented in Table 04. Due to the impact of the treatment, the mean body height values for lambs increased over 13 weeks, ranging from 57.62 centimetre to 69.82 centimetre in the control group, 57.41 centimetre to 70.38 centimetre in T_1, 57.83 centimetre to 70.76 centimetre in T_2, and 57.74 centimetre to 70.32 centimetre in T_3 within the extensive system.

Statistical variance analysis of the data indicated a highly significant impact ($P<0.01$) on 1stand average body height during the 5thfortnight of the experiment. The effect was nosignificant for the rest of the experimental period and showed a significant impact ($P<0.05$)

on 1st, 5th, and average body height during the 5th fortnight, while remaining nosignificant for the rest of the experimental period in the extensive system.

At 1st and 5th fortnights, the maximum body height was observed in T_2, significantly surpassing ($P<0.01$) the other treatment groups. However, the body height of lambs in the control, T_1, and T_3 groups were statistically comparable during these fortnights, with the control group exhibiting the lowest average body height at both intervals.

Table 5: Body height (centimetre) of magralambs at 15 days interval in 4 treatment groups in extensive management system

Treatment groups	Period (fortnights)						
	0	**1**	**2**	**3**	**4**	**5**	**6**
Control	57.62	59.61^{a}	61.77	64.18	65.72	67.87^{a}	69.82^{a}
T_1	57.41	60.54^{b}	62.56	64.70	67.11	69.26^{b}	70.38^{ab}
T_2	57.83	60.94^{b}	62.49	64.54	66.96	68.71^{ab}	70.76^{b}
T_3	57.74	60.70^{b}	62.68	64.67	66.90	68.54^{ab}	70.32^{ab}
Standard Error of Mean	0.091	0.290	0.205	0.119	0.321	0.285	0.166

Note: A column with different superscripts has significantly different means.

The body height varied from 69.65 centimetre to 70.21 centimetre in the extensive system and 69.82 centimetre to 70.76 centimetre in the extensive system. It was found that Magra lamb was taller than the Pugal sheep (61.76±0.17centimetre) reported by [04], Malpora breed (64.04±0.22 centimetre) by [06] and Garole sheep (49.9 ± 0.5centimetre) by [08] and Malpura sheep (76.3 ± 0.33 centimetre) by [01], Barki sheep (74.9±0.4 centimetre) as reported by [03] were taller than the Magra lambs.

CONCLUSION

According to the results, it can be concluded that introducing the herbal feed supplements Amla (*Emblica officinalis*) and Giloy (*Tinospora cordifolia*) into the ration of Magra lambs in an extensive management system had a notable positiveeffect on the morphometric traits of the lambs.

ACKNOWLEDGEMENT

We express our sincere gratitude for the assistance provided by Dean of the College of Veterinary and Animal Science in Bikaner, as well as the Head of the ARC-CSWRI in Bikaner, for granting us access to the necessary resources to carry out the experiment. I express my gratitude to Principal Scientist Dr. Nirmala Saini for generously providing financial support to carry out the experiment.

REFERENCES

1. Arora, A. L., Mishra, A. K. and Prince, L. L. L. (2014). Survey and Performance Evaluation of Malpura Sheep in Farmers' Flocks of its Native Tract. Journal of Animal Research, 4(1): 75-84.
2. Devendran, P., Cauveri, D. and Gajendran, K. (2009). Growth rate of Madras Red sheep in farmers' flocks. Indian Journal of Animal Research, 43(1): 53-55.
3. Gad, S. M. A. (2014). Estimation of genetic parameters for body measurements and their relationship with body weight in Barki lambs. Journal of Animal and Poultry Production, 5(8): 517-523.
4. Gopal (2007). Production performance and management practices of Pugal sheep in the home tract. Indian Journal of Animal Science, 77(8): 763-766.
5. Haliwell, B. R., Loeliger, A. J. and Aruoma, O. I. (1995). The characterization of antioxidants. Food and Chemical Toxicology, 33: 601-607.
6. Hutjens, M. F. (1991). Feed additives. Veterinary Clinics North America. Food Animal Practice, 7: 525-535.
7. Kumar, A., Singh, U., Kumar, S., Sharma, R. C. and Arora, A. L. (2008). Malpura: A mutton breed of sheep needs to be conserved. Indian Journal of Animal Science, 78(7): 740–745.
8. Kumar, S., Dahiya, S., & Malik, Z. S. (2019). Genetic and phenotypic correlations among linear type traits in Harnali sheep. The Pharma Innovation Journal, 8(1), 646–649.
9. Kushwaha, B. P., Metha, B. S. and Sushil Kumar. (1999). Survey of Chokla sheep in farmers' flock. Indian Journal of Small Ruminant, 5(1): 14-19.
10. Mishra, S.J. and Singh, D.S. (2000). Effect of feeding root powder of Withaniasomnifera (L.) Dunal. (Aswagandha) on growth, feed consumption, efficiency of feed conversion and mortality rate in broiler chicks. Bioved, 11(1/2): 79-83.
11. Pan, S. and Sahoo, A. K. (2008). The Garole sheep: history, management, production and current status Use of the Fec B (fecundity booroola) gene in sheep-breeding programs. Proceedings of the Helen Newton Turner Memorial International Workshop held in Pune, Maharashtra, India, 10–12 November 2008.
12. Shirzeyl, F. H., Lavvaf, A. and Asadi, A. (2013). Estimation of body weight from body measurements in four breeds of Iranian sheep. Songklanakarin Journal of Science and Technology, 35(5): 507-511.
13. Uegaki, R., Ando, S., Ishida, M., Takada, D., Shinokura, K. and Kohchi, Y. (2001). Antioxidant activity of milk from cows fed herbs. Nippon NogeikagakuKaishi, 75(6): 669-671.
14. Vij, P. K., Tantia, M. S. And Nivasarkar, A. E. (1997). Characteristics of Bonpala sheep. Animal Genetic Resources Information Bulletin, 22: 15-18.