Investigating the Effect of Amla (*Emblica officinalis*) and Giloy (*Tinospora cordifolia*) Herbal Additives on the Morphometric Parameters of Magra Lambs in the Semi-intensive Management System in the Arid Zone of Western Rajasthan

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ABSTRACT: This study aimed to investigate the impact of herbal feed additives, specifically amla (*Emblica officinalis*) and giloy (*Tinospora cordifolia*), on the biometrical measurements of Magra lambs in a semi-intensive management system. The experiment was performed on twenty-eight magra lambs of three to four months of age under the semi-intensive system, which were randomly distributed into four experimental groups of seven lambs in each group in a randomized block design (RBD). Herbal feed additive Amla (*Emblica officinalis*) fruit powder with seed and Giloy (*Tinospora cordifolia*) stem powder were supplemented at level of 1.5g/kg body weight with concentrate as oral/feed supplemented in T_1 and T_2 group, respectively except control group and T_3 in semi-intensive management system. Group $T_3$was supplemented with the combination of Amla (*Emblica officinalis*) fruit powder and Giloy (*Tinospora cordifolia*) stem powder at the level of 0.75g/kg body weight with concentrate as oral/feed. At the end of experiment, significant changes were found in heart girth, abdominal girth, body length and body height though; they were within normal body measurement range. At the end of experiment it appears that incorporation of 1.5g/kg body weight giloy stem powder can be used as a part of the strategy as it is effective to improve morphometric parameters in lambs in the semi-intensive system of arid zone of Rajasthan.

Keywords: Magra, Heart Girth, Lamb, Body Length, Body Height.

INTRODUCTION

Magra sheep prevails in Bikaner district of Rajasthan which is located in thar desert of Rajasthan. Theselambs are medium to large in size. Face is white with brown circular patches around the eyes, which is a characteristic of this breed and hence also named as Rata Chakria/Bikaner chokla. Age at first breeding in males is 18–24 months. In ewes, age at first lambing is 18–24 months. Based on the data, it can be observed that the average body weight varies at different stages of development. For males, the average body weight at birth is 2.2 kg, which increases to 15.9 kg at 3 months, 21.5 kg at 6 months, and 29.1 kg at 12 months. On the other hand, females have an average body weight of 2.4 kg at birth, which then decreases to 14.7 kg at 3 months, 19.4 kg at 6 months, and 25.6 kg at 12 months. The breed is known for lustrous and carpet quality wool production. Animals undergo shearing three times a year, specifically in March, July, and November. Average greasy wool production is 1.5 to 2.5 kg/annum in three clips. Sheep farming is an important source of income for the marginalized section of rural population that owns majority of the small ruminants. The physical parameters of Magra lamb, including its height, length, and girth, play a vital role in understanding and evaluating the breed's characteristics. These measurements provide valuable insights into the lamb's overall size, body composition, and potential for growth, making them essential considerations for farmers, researchers, and enthusiasts alike. By analyzing the height of a Magra lamb, farmers can determine its ability to graze effectively and reach forage at different heights. The length measurement helps researchers understand the lamb's body proportions and how well it can move and navigate its environment. Additionally, girth measurements offer valuable information on the lamb's muscle development

and overall health, enabling farmers to make informed decisions about breeding and nutrition. Overall, these physical parameters serve as important indicators of the Magra lamb's quality and potential in various agricultural and research settings.

MATERIALS AND METHODS

The lambs were divided into four experimental groups of seven lambs each in a semi-intensive system. The distribution was done randomly, following a randomised block design (RBD), ensuring that the initial body weights were similar across all groups. Herbal feed supplement Amla (*Emblica officinalis*) fruit powder with seed and Giloy (*Tinospora cordifolia*) stem powder were supplemented at a rate of 1.5g/kg body weight with concentrate as an oral/feed supplement in the T1 and T2 groups, respectively, with the exception of the control and T3 groups in the semi-intensive management system. Group T3 received a 0.75g/kg body weight supplement of Amla (*Emblica officinalis*) fruit powder and Giloy (*Tinospora cordifolia*) stem powder as an oral/feed supplement. Body measurement of each lamb was recorded at monthly interval using measuring tape on cm scale. Following body measurements were taken when lambs were standing squarely on hard plain ground. Body length (cm) was measured by measuring the distance from the point of the shoulder to the point of the pin bone. Body height (cm) was measured from ground level to the highest point of withers. Heart girth (cm) was measured by taking smallest circumference immediately behind the shoulder, when animals were standing squarely. Abdominal girth (cm) was measured by taking circumference immediately before the hind legs, when animals were standing squarely.

RESULTS AND DISCUSSION

A. Heart girth
The mean values of Heart girth of lambs under various treatment groups were recorded at fortnightly intervals of experiment and have been presented in Table 1 and the statistical analysis of the data for the effect of treatment i.e. supplementation of different feed herbal additives with diet has been presented in Table 1. Due to the effect of treatment, the mean values of heart girth of lambs were increased in thirteen weeks from 64.39 cm to 71 cm in control, from 64.43 cm to 71.85 cm in T_1, from 64.75 cm to 72.81 cm in T_2 and from 64.36 cm to 72.18 cm in T_3, group in the semi-intensive system. Statistical analysis of variance of data revealed highly significant effect ($P<0.01$) on average heart girth at III, IV and VI fortnights of experiment, while significant ($P<0.05$) effect was observed at III, IV, V and VI fortnight of experimental trial and remained non-significant for rest of the period in the semi-intensive system. At III, IV, V and VI fortnights highest increase in heart girth was observed in T_2, which was significantly higher than rest of the treatment groups, while lowest average heart girth was observed in control group. Though, the average chest girth of the lambs of control, T_1 and T_3 treatment groups at the III, IV, V and VI fortnights of experiment was comparable with each other.

Table 1: Heart/Chest girth (cm) of lambs at fortnight intervals in different treatment groups in semi-intensive system.

Treatment groups	Period (fortnights)						
	0	I	II	III	IV	V	VI
C	64.39	65.70	66.94	67.70[a]	68.36[a]	69.97[a]	71.00[a]
T_1	64.43	65.89	67.30	68.80[b]	69.84[b]	70.67[ab]	71.85[ab]
T_2	64.75	66.02	68.05	69.72[b]	70.60[b]	71.34[b]	72.81[b]
T_3	64.36	65.91	67.74	68.98[b]	70.27[b]	70.91[ab]	72.18[ab]
SEM	0.091	0.067	0.244	0.417	0.495	0.286	0.379
Note: Means with different superscripts in a column differ significantly							

The chest girth ranged from 71 cm to 72.18 cm in the semi-intensive system. The chest girth observed in Magra lambs was smaller than Bonpala sheep (82.44±1.87) reported by Vij *et al*. (1997), Mehrabani sheep (91.28±0.55 cm) by Shirzeyli *et al*. (2013) and higher than Pugal sheep (71.83±0.20) by Gopal (2007), Malpura sheep (70.11±0.21) by Kumar *et al*. (2008) and Coimbatore sheep (69.8 ±0.4 cm) by Devendran *et al*. (2009).

B. Abdominal Girth
The mean values of abdominal girth of lambs of various treatment groups were recorded at fortnightly intervals of experiment and have been presented in Table 2 and the statistical analysis of data for effect of treatment i.e. supplementation of different feed herbal additives with diet has been presented in Table 2. Due to effect of treatment, the mean values of abdominal girth of lambs were increased in thirteen weeks from 71.26 cm to 79.09 cm in control, from 71.47 cm to 79.31 cm in T1, from 71.43 cm to 80.15 cm in T_2 and from 70.99 cm to 79.71 cm in T_3, group in the semi-intensive system. Statistical analysis of variance of data revealed highly significant effect ($P<0.01$) on average abdominal girth at VI fortnight of experiment, while significant ($P<0.05$) effect was observed at II and VI fortnight of experimental trial and remained non-significant for rest of the period in the semi-intensive system. At II fortnight highest abdominal girth was observed in T_2, which was though comparable with T_1 and T_3 in statistical terms. At VI fortnight highest abdominal girth was observed in T_2, which was significantly higher ($P<0.01$) than rest of the treatment groups, though the abdominal girth of control, T_1 and T_3 groups were comparable with each other in statistical terms.

Table 2: Abdominal girth (cm) of lambs at fortnight intervals in different treatment groups in semi-intensive system.

Treatment groups	Period (fortnights)						
	0	I	II	III	IV	V	VI
C	71.26	72.27	73.11[a]	74.83	75.66	77.10	79.09[a]
T$_1$	71.47	72.76	73.97[b]	75.46	75.99	77.73	79.31[ab]
T$_2$	71.43	72.59	73.88[b]	75.01	76.19	78.13	80.15[b]
T$_3$	70.99	72.35	73.31[ab]	74.99	75.68	77.77	79.71[ab]
SEM	0.109	0.112	0.210	0.135	0.126	0.215	0.233
Note: Means with different superscripts in a column differ significantly							

The abdominal girth ranged from 79.09 cm to 80.15 cm in the semi-intensive system. The abdominal girth observed in Magra lamb was smaller than Malpura sheep (92.59±0.42 cm) reported by Arora *et al.* (2014), Chokla sheep (81 cm) by Kushwaha *et al.* (1999); Bonpala sheep (90.33±1.45 cm) by Vij *et al.* (1997).

C. Body Length (cm)
The mean values of body length of lambs of various treatment groups were recorded at fortnightly intervals of experiment and have been presented in Table 3 and the statistical analysis of data for effect of treatment i.e. supplementation of different feed herbal additives with diet has been presented in Table 3. Due to effect of treatment, the mean values of body length of lambs were increased in thirteen weeks from 54.29 cm to 68.35 cm in control, from 54.60 cm to 69.18 cm in T$_1$, from 54.82 cm to 70.84 cm in T$_2$ and from 55.68 cm to 69.74 cm in T$_3$, group in the semi-intensive system. Statistical analysis of variance of data revealed highly significant effect (P<0.01) on average body length at VI fortnight of experiment, while non-significant for rest of the experimental period in the semi-intensive system. At VI fortnight highest body length was observed in T$_2$, which was significantly higher (P<0.01) than rest of the treatment groups, though the body length lambs of T$_1$, T$_3$ and control groups were comparable with each other in statistical terms. Lowest average body length was observed in control treatment group.

Table 3: Body length (cm) of lambs at fortnight intervals in different treatment groups in semi-intensive system.

Treatment groups	Period (fortnights)						
	0	I	II	III	IV	V	VI
C	54.29	55.46[a]	58.00[a]	61.03[a]	63.49[a]	66.06[a]	68.35[a]
T$_1$	54.60	56.15[ab]	59.03[a]	62.00[ab]	64.35[ab]	67.06[ab]	69.18[ab]
T$_2$	54.82	57.42[b]	61.10[b]	63.22[b]	65.56[b]	68.13[b]	70.84[b]
T$_3$	55.68	56.88[ab]	59.35[a]	62.77[b]	64.75[ab]	67.66[ab]	69.74[ab]
SEM	0.298	0.427	0.644	0.479	0.430	0.447	0.523
Note: Means with different superscripts in a column differ significantly							

The body length ranged from 79.09 cm to 80.15 cm in the semi-intensive system. The body length observed in Magra lamb was longer than Coimbatore sheep (62.4±0.4 cm) reported by Devendran *et al.* (2009), Harnali sheep (61.42±0.69 cm) reported by Pan and Sahoo (2008).

D. Body Height (cm)
The mean values of body height of lambs of various treatment groups were recorded at fortnightly intervals of experiment and have been presented in Table 4 and the statistical analysis of data for effect of treatment i.e. supplementation of different feed herbal additives with diet has been presented in Table 4.
Due to effect of treatment, the mean values of body height of lambs increased in thirteen weeks from 57.57 cm to 69.65 cm in control, from 57.71 cm to 69.97 cm in T$_1$, from 57.88 cm to 70.21 cm in T$_2$ and from 57.95 cm to 69.98 cm in T$_3$, group in the semi-intensive system.
Statistical analysis of variance of data revealed highly significant effect (P<0.01) on V and average body length at VI fortnight of experiment, while non-significant for rest of the experimental period and a significant effect (P<0.05) on I, II, IV, V and average body height at VI fortnight of experiment, while non-significant for rest of the experimental period in the semi-intensive system.
At V and VI fortnight highest body height was observed in T$_2$, which was significantly higher (P<0.01) than rest of the treatment groups, though the body height of the lambs of control, T$_1$ and T$_3$ groups were comparable with each other in statistical terms. Lowest average body height was observed in control treatment group at both the fortnights.

The body height ranged from 69.65 cm to 70.21 cm in the semi-intensive system. It was found that Magra lamb was taller than Pugal sheep (61.76±0.17cm) reported by Gopal (2007), Malpura breed (64.04±0.22 cm) by Kumar *et al.* (2008) and Garole sheep (49.9 ± 0.5cm) by Pan and Sahoo (2008) and Malpura sheep (76.3 ± 0.33 cm) by Arora *et al.* (2014), Barki sheep (74.9±0.4 cm) as reported by Gad (2014) were taller than Magra lambs.

Table 4: Body height (cm) of lambs at fortnight intervals in different treatment groups in semi-intensive system.

Treatment groups	Period (fortnights)						
	0	I	II	III	IV	V	VI
C	57.57	59.68[a]	61.59[a]	63.92	65.43[a]	67.24[a]	69.65[a]
T$_1$	57.71	60.26[ab]	62.45[ab]	64.43	66.94[ab]	68.96[b]	69.97[ab]
T$_2$	57.88	61.33[b]	62.95[b]	64.91	67.08[b]	69.22[b]	70.21[b]
T$_3$	57.95	60.85[b]	62.52[ab]	64.57	66.56[ab]	68.70[b]	69.98[ab]
SEM	0.086	0.359	0.284	0.204	0.374	0.443	0.115
Note: Means with different superscripts in a column differ significantly							

CONCLUSIONS

Based on the findings, it can be inferred that the incorporation of the herbal feed additives Amla (*Emblica officinalis*) and Giloy (*Tinospora cordifolia*) into the diets of Magra lambs under semi-intensive management significantly impacted the morphometric parameters of the lambs.

FUTURE SCOPE

The morphometric characteristics of Magra lambs were positively impacted by the addition of Amla and Giloy to their diets. Based on these findings, it is recommended to further explore the potential benefits of incorporating Amla and Giloy in the diets of other livestock species. Additionally, conducting long-term studies to evaluate the impact on morphometric characteristics of Magra lambs could provide valuable insights into the future applications of these ingredients in animal nutrition.

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