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Effect of giloy (*Tinospora cordifolia*) and neem (*Azadirachta indica*) on growth performance of Marwari lambs under arid zone

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Abstract

In an attempt to assess the effect of Giloy (*Tinospora cordifolia*) and Neem (*Azadirachta indica*) alone and in combination on growth performance in Marwari lambs, an experiment was conducted for 12 weeks on 42 Marwari male lambs and divided into seven groups, six lambs in each group in a randomized block design. The lambs of T₁ group were provided only basal diet (grazing + *ad lib.* fodder + 400 g concentrate per lamb per day) and were kept as control group and lambs of all other treatment groups were provided basal diet with herbal supplementation i.e. 0.5 per cent Giloy stem powder in group T₂, 1.0 per cent Giloy stem powder in group T₃, 0.5 per cent Neem leaf powder in group T₄, 1.0 per cent Neem leaf powder in group T₅, 0.25 per cent Giloy stem powder along with 0.25 per cent Neem leaf powder in group T₆ and 0.5 per cent Giloy stem powder along with 0.5 per cent Neem leaf powder in group T₇. At the end of experiment, the highest ADG was recorded in lambs of group T₇ among all treatment groups. At the end of experiment it appears that incorporation of 0.5 per cent Giloy stem powder along with 0.5 per cent Neem leaves powder can be used as a part of strategy to be adopted to improve growth performance of lambs in arid zone of Rajasthan.

Keywords: ADG, giloy, neem, growth, arid region

Introduction

Majority of farmers in arid zone of Rajasthan generally rear sheep in extensive management system with grazing being the only source of nutrition. Nutrition can be a limiting factor in growth of lamb. Plants produce a wide range of low molecular weight secondary metabolites. Bio-active secondary metabolites of herbal plants are used as alternative performance enhancer. The possible mechanisms of action of herb in the animal for growth promotion include changes in the intestinal microbiota, enhanced digestibility and nutrient absorption; increased nitrogen absorption, morphological and histological modifications of the gastrointestinal tract, improvement of the immune response and antioxidant activity. Giloy (*Tinospora cordifolia*) is a large glabrous deciduous climbing shrub belonging to family *Menispermaceae*. It is commonly known as a Rasayan-plant as it contains more than 100 constituents in their structure and widely used in Veterinary folk, Ayurveda and other systems of medicine for its general tonic, antioxidant, antibacterial, immunomodulator, hepatoprotective and anti-inflammatory properties (Krishna *et al.*, 2009) [9]. It is claimed that the plant climbing up the Neem tree is said to be the best as synergy between these two bitter plants enhances Giloy's efficacy. *Azadirachta indica* belongs to the family *Meliaceae*. The neem tree has many bioactive secondary metabolites and the most important bioactive compound is azadirachtin (Nahak and Sahu, 2010) [11]. The leaves of Neem have appreciable amounts of carotene, proteins, minerals and adequate amount of trace minerals (Ogbuewu *et al.*, 2010) [13]. Neem tree has vast range of medicinal properties like antibacterial, antifungal, antiviral, antiprotozoal, anthelmintic, hepatoprotective and several other qualities without showing any adverse effects (Kale *et al.*, 2003) [7]. Keeping the aforesaid facts in view, the present investigation was planned to study the effect of Giloy (*Tinospora cordifolia*) and Neem (*Azadirachta indica*) alone and in combination on growth performance of Marwari lambs under arid zone.

2. Materials and Methods

The present study was conducted on Marwari lambs maintained at Arid Region campus of Central Sheep and Wool Research Institute (ICAR-ARC-CSWRI), Bikaner. The average rainfall is low (250 mm) and erratic. The temperature varies between sub zero (-2°C) during winter and high (49°C) during summer. The experiment was conducted from May to July, 2019. Meteorological data viz. temperature and relative humidity were collected from Agriculture Research Station, Bikaner from May 2019 to July 2019 at weekly intervals. THI values were calculated from recorded meteorological variables as described below by formula given by Marai *et al.* (2007) [10].

$$\text{THI} = \text{db}^{\circ}\text{C} - [(0.31 - 0.31\text{RH}) (\text{db}^{\circ}\text{C} - 14.4)]$$

THI = Temperature humidity index

db = Dry-bulb temperature ($^{\circ}\text{C}$)

RH = Relative humidity as fraction of a unit (%)

Forty-two growing male Marwari lambs (3-4 months old) were divided into seven groups T₁, T₂, T₃, T₄, T₅, T₆ and T₇ having six lambs in each group on body weight basis. The lambs of T₁ group were provided only basal diet (grazing for a period of 8 hours + *ad lib.* fodder + 400 g concentrate per lamb per day) and were kept as control group. The lambs of T₂ group were provided basal diet supplemented with 0.5 per cent Giloy stem powder. The lambs of T₃ group were provided basal diet supplemented with 1.0 per cent Giloy stem powder. The lambs of T₄ group were provided basal diet supplemented with 0.5 per cent Neem leaf powder. The lambs of T₅ group were provided basal diet supplemented with 1.0 per cent Neem leaf powder. The lambs of T₆ group were provided basal diet supplemented with 0.25 per cent Giloy stem powder and 0.25 per cent Neem leaf powder. The lambs of T₇ group were provided basal diet supplemented with 0.5 per cent Giloy stem powder and 0.5 per cent Neem leaf powder. Individual body weight of all the lambs were recorded by digital balance on the first day of the experiment and thereafter, regularly at weekly interval up to the end of the experiment. The weekly body weight gain was calculated by difference between weight recorded during the present and previous week. Average daily gain (ADG) in grams was estimated by dividing the total body weight gain by number of days. The data obtained in the study was analyzed in one-way ANOVA using SPSS 20.00 statistical analysis software.

3. Results and Discussion

The values of average temperature ($^{\circ}\text{C}$), average relative humidity (%) and average THI at weekly intervals have been presented in Table 1. Marai *et al.* (2007) [10] established THI threshold of 25.6 for sheep. In present study, the calculated THI values revealed that the experimental lambs were in extreme severe heat stress, during the course of experiment. The mean values of body weight of lambs under different treatment groups at weekly intervals have been presented in Table 2. The mean values of live body weight of lambs were increased in twelve weeks of trial from 18.92 to 27.57 kg in T₁ (Control), from 19.10 to 29.60 kg in T₂, from 18.93 to 29.45 kg in T₃, from 18.88 to 28.85 kg in T₄, from 18.62 to 29.00 Kg in T₅, from 18.92 to 30.12 Kg in T₆ and from 19.00

to 31.25 kg in T₇ group. Statistical analysis of variance revealed no significant effect of Giloy and Neem on the average body weight of lambs during the entire period of experiment. The mean values of average daily gain of lambs under different treatment groups at weekly intervals have been presented in Table 3. The mean values of overall average daily gain of lambs in different treatment groups were recorded to be 102.97 g in T₁ (control), 125.05 g in T₂, 125.21 g in T₃, 118.6 g in T₄, 123.57 g in T₅, 133.37 g in T₆ and 145.88 g in T₇. Statistical analysis of variance revealed significant effect ($P < 0.05$) on the average daily gain of lambs during 3rd, 5th and 6th week and highly significant ($P < 0.01$) effect was observed during 4th week and from 9th to 12th weeks. Highly significant ($P < 0.01$) effect was also observed on overall average daily gain. Results of present study showed that there was improvement in body weight and ADG in all treatment groups over control group at the end of trial. Mean value of body weight was numerically highest in group T₇ among all treatment groups, but the difference was non-significant. The present findings are in agreement with Ahmed (2009) [2] who also reported positive changes in body weight of dairy goats when added fenugreek seeds in diet. The result of the present study suggested that the supplementation of Giloy stem powder and Neem leaves powder positively influenced ADG in lambs. The present findings are similar to the findings of Sharma and Mamta (2007) [14] who reported significant increase in body weight gain in goats supplemented with Tulsi and Ashwagandha. Similar findings were also observed by Naser *et al.* (2014) [12] who reported higher body weight gain in sheep supplemented with *Tinospora crispa*. Several workers (Attia-ismail, 2000[4]; Deka, 2009[5]; Karami *et al.*, 2010[8] and Jibrin *et al.*, 2018[6]) reported significant effect of herbal supplementation on average daily gain in animals. Attia-Ismail (2000) [4] reported significant effect of fenugreek seeds on average daily gain in lambs. On the other hand, Karami *et al.* (2010)[8] reported significantly higher average daily gain on supplementation of Turmeric powder in bucks. On contrary, Al-Wazeer (2017)[3] observed that increasing level of fenugreek seeds did not improve live weight gain of Awassi lambs. Abdoun *et al.* (2014) [1] observed that average daily gain was not affected by inclusion of dietary Seaweed (*Ulva lactuca*) in lambs.

Table 1: Temperature ($^{\circ}\text{C}$), Relative humidity (%) and THI

Weeks	Temperature ($^{\circ}\text{C}$)	Relative humidity (%)	THI
1	33.6	59.0	31.15
2	30.6	44.1	27.78
3	33.8	54.6	31.04
4	39.5	83.9	38.20
5	38.2	82.4	36.93
6	37.1	61.5	34.40
7	34.1	79.4	32.85
8	34.3	77.1	32.87
9	36.4	87.9	35.58
10	34.6	54.5	31.79
11	33.7	56.5	31.10
12	32.0	64.9	30.10
Average	34.8	67.1	32.74

Table 2: Body weight (kg) of lambs at weekly intervals in different treatment groups

Treatment Groups	Period (weeks)												
	0	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
T ₁	18.92	20.19	21.04	21.90	22.72	23.46	24.20	24.90	25.51	26.10	26.61	27.13	27.57
T ₂	19.10	20.35	21.39	22.31	23.36	24.24	25.30	26.15	26.89	27.59	28.36	29.06	29.60
T ₃	18.93	20.16	21.12	22.07	23.25	24.31	25.20	26.13	26.94	27.70	28.47	29.03	29.45
T ₄	18.88	19.86	20.72	21.58	22.47	23.41	24.24	25.16	25.95	26.78	27.56	28.23	28.85
T ₅	18.62	19.71	20.74	21.55	22.46	23.29	24.15	25.00	25.76	26.61	27.56	28.30	29.00
T ₆	18.92	20.10	21.09	22.02	23.12	24.30	25.10	26.14	26.98	27.76	28.64	29.51	30.12
T ₇	19.00	20.20	21.32	22.47	23.69	24.91	26.09	27.07	27.88	28.91	29.75	30.51	31.25
SEM	1.00	1.03	1.05	1.07	1.09	1.09	1.11	1.14	1.14	1.13	1.14	1.15	1.17

Table 3: Average daily gain (g) of lambs at weekly intervals in different treatment groups

Treatment Groups	Period (weeks)												Average
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
T ₁	182.36	120.47	123.98 ^A	116.26 ^a	106.39 ^A	104.69 ^A	100.69	86.82	84.29 ^a	73.70 ^a	74.37 ^a	61.66 ^a	102.97 ^a
T ₂	179.04	148.65	131.31 ^A	149.53 ^{abc}	125.84 ^{AB}	151.19 ^{BC}	120.98	106.72	99.88 ^{ab}	109.05 ^b	100.19 ^{bc}	78.19 ^b	125.05 ^{bc}
T ₃	175.94	136.74	134.72 ^A	168.92 ^c	151.35 ^{ABC}	127.83 ^{AB}	133.25	114.66	109.55 ^{ab}	109.40 ^b	80.61 ^{ab}	59.49 ^a	125.21 ^{bc}
T ₄	139.56	122.61	122.74 ^A	128.07 ^{ab}	133.81 ^{ABC}	118.83 ^{AB}	130.67	113.91	118.05 ^b	111.65 ^b	95.40 ^{abc}	87.93 ^{bc}	118.60 ^b
T ₅	156.23	146.84	115.75 ^A	130.18 ^{ab}	118.10 ^A	122.84 ^{AB}	121.30	108.92	121.82 ^{bc}	135.78 ^b	105.35 ^{cd}	99.77 ^{cd}	123.57 ^{bc}
T ₆	169.05	141.31	133.25 ^A	157.18 ^{bc}	168.56 ^{BC}	114.04 ^{AB}	148.16	120.00	111.58 ^{ab}	125.91 ^b	123.78 ^d	87.64 ^{bc}	133.37 ^c
T ₇	171.43	159.86	164.90 ^B	173.81 ^c	173.67 ^C	168.69 ^C	139.99	116.02	147.74 ^c	119.83 ^b	108.89 ^{cd}	105.73 ^d	145.88 ^d
SEM	11.90	9.78	9.00	10.75	14.36	12.54	13.36	9.40	9.48	9.36	7.47	5.62	4.02

Note: Means with different superscripts (a,b,c) in a column differ significantly ($p < 0.01$), Means with different superscripts (A,B,C) in a column differ significantly ($p < 0.05$)

4. Conclusion

Supplementation of Giloy (*Tinospora cordifolia*) and Neem (*Azadirachta indica*) may be a positive indicator of immune response in lambs during heat stress condition. At the end, based on the growth performance of lambs, it appears that incorporation of 0.5 per cent Giloy stem powder along with 0.5 per cent Neem leaves powder can be used as a part of strategy to be adopted to improve performance of lambs in arid zone of Rajasthan.

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