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Effect of Inclusion of Tanniferous Leaf Meal Mixture on Growth Performance and Helminth Control in Nellore Brown Lambs

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ABSTRACT

Background: Parasitic infestation is a major constraint in sheep husbandry and this condition results in over usage of antihelminths leads to drug resistance and presence of residues in meat. To counteract this problem use of tanniferous leaves is promising approach both in terms of health of animals and in decreasing the economic burden on farmer.

Methods: A total of 30 Nellore brown lambs aged 3-4 months with a mean live weight of 12.10±0.31 kg, tested positive for parasitic infestation were selected and randomly divided into five groups (NC, C, T1, T2 and T3) of 6 animals each in a completely randomized design.Treatment groups were fed with complete diet incorporated with Tanniferous Leaf Meal Mixture at different levels and both control groups were fed with complete diet without Leaf Meal Mixture.Body weights, ADG, FCR and faecal egg count were observed at fortnight intervals.

Result: The mean final body weights were significantly (P<0.05) lower in C group compared to treatment and NC groups. Among the treatment and NC groups, the mean final body weights were significantly (P<0.05) higher in T2 group, while the difference was not significant among other groups. The mean faecal egg counts (Egg per gram) on day 120 of the experiment were reduced by 66.67%, 85.85% and 71.63% in T1, T2 and T3 groups, respectively, when compared with the day one of the experiment.

Key words: ADG (Average daily gain), Antihelminths, Body weight, Condensed tannins (CT), Faecal egg count, FCR (Feed Conversion ratio), Nellore brown lambs, Parasitic infestation, Tanniferous Leaf Meal Mixture.

INTRODUCTION

The Gastro intestinal parasites, predominantly Nematodes are a serious problem to the small ruminants, particularly those whose nutritional status is poor. Infestation with internal parasites causes significant production losses, ranging from 13 to 33% in grazing ruminants, which typically have reduced immunity to nematode parasites (Kaplan, 2004 and Stuedemann *et al*. 2005).

Nutritional modulation of infected animals in order to improve the host resistance and resilience to GIN infections appears to be one of the best alternatives to control GIN infections and also to limit the dependence on conventional chemotherapy. To achieve this target, the alternative nutritional strategies should be developed and these should include feed supplementation by use of tanniferous leaf meal mixture (TLMM) (Singh *et al*. 2015). Hence, the present study was planned at NTR College of Veterinary Science, Gannavaram to assess the effect of dietary supplementation of LMM through *Leucenea leucocephala, Ficus bengalensis and Psidium guajava* on body weight and parasitic burden of Nellore brown lambs.

MATERIALS AND METHODS

This experiment was carried out to study the effect of different levels (0%, 2.0, 3.0 and 4.0% on DM basis) of TLMM supplementation on the performance and reduction in faecal egg count of Helminths in lambs. The study was carried out at ILFC, NTR College of Veterinary Science, Gannavaram in 2019-2020.

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Experimental animals

A total of 30 Nellore brown lambs aged 3-4 months with a mean live weight of 12.10±0.31 kg tested positive for parasitic infestation was selected and randomly divided into five groups of 6 animals each in a completely randomized design.

Group I lambs were fed with normal complete diet with deworming (-ve control “NC”).

Group II lambs were fed with normal complete diet without deworming (+ve control “C”).

Groups III (T1), IV (T2) and V (T3) Lambs were fed with complete diet or TMR having part of the roughage portion was replaced with tanniferous herbage for 2, 3 and 4% condensed tannin(CT) levels, respectively and maintained without deworming throughout the experiment.

All the animals (lambs and ewes) were kept under uniform managemental conditions by housing them in a well-ventilated shed with facilities for uniform feeding and watering. The lambs and ewes of NC (Negative control) group were treated with broad-spectrum anthelminthic (Albomar suspension @ 2 ml 10 kg body Wt.) before the start of study and sixty days after the start of experiment.

Feeds and feeding

All the experimental animals were offered TMR to meet their nutrient requirements for maintenance and growth as per NRC requirements (2007) for a period of four months. The C and NC group lambs were fed total mixed ration containing concentrate and roughage (ground nut straw) in the ratio of 60: 40. The T1, T2 and T3 groups were fed TMR in which part of groundnut straw was replaced with dried and grounded tree leaves mixture of *L. leucocephala, F. Benghalensis* and *P. guajava* at 40:40:20 proportions so as to bring the condensed tannin (CT) levels to 2.0, 3.0 and 4.0 percent of diet, respectively. The ration schedule was changed every fortnight after recording the body weights of each animal to meet the nutrient requirements for growth (Kearl, 1982).

Growth performance and fecal egg count

Fortnightly body weight (kg) of all the lambs was recorded before feeding in the morning throughout the study.The feed conversion ratio (kg DM intake/ kg live weight gain) was calculated for all the five groups.

Faecal samples were collected (per rectum) from experimental animals at 15 days interval. Each sample was put in a plastic bag bearing a number of corresponding tag number of the animal. After collection, the samples were taken to the laboratory and egg counts were made using the modified McMaster technique (Zajac *et al.* 2012).

Statistical analysis

The results obtained were subjected to analysis of variance using SPSS 25.0 software and treatment means were ranked using Duncan's multiple range tests. Data were analyzed using one-way ANOVA to distinguish the impact of different dietary treatments. Significance was declared at P<0.05 unless otherwise stated. All the statistical procedures were done as per Snedecor and Cochran (1994).

RESULTS AND DISCUSSION

Effect of TLMM supplementation on growth performance of lambs

The body weights (kg), ADG (g/d) and FCR of lambs were measured at fort nightly intervals. The mean initial body weights (kg) of lambs selected for the experiment were 12.10 ± 0.31Kg. The mean final body weights (kg) were significantly (P<0.05) lower in C group compared to treatment and NC groups. Among the treatment and NC groups, the mean final body weights (kg) were significantly (P<0.05) higher in T2 group, while the difference was not significant among other groups. At the end of the experiment, the body weights (kg) of T1, T2 and T3groups were found to be 21%, 23% and 18% higher than the control group.

Similar to present findings were observed by Iqbal *et al*. (2007) in lambs where maximum weight gain was recorded in animals fed diets containing 3% CT. Similar trend of increased growth in sheep supplemented with CT was reported by Ngwa *et al.* (2002). Pathak *et al.* (2017) obtained similar results of increased body weights in lambs by feeding tannins from *Ficus infectoria* and *Psidium guajava* leaf meal mixture.

Improved performances have been frequently observed in animals fed with tree leaves (Leng, 1997). In the present study the body weights of T1, T2 and T3 groups were found to be 21%, 23% and 18% higher than the control group. In consistent with the present findings, Montossi *et al.* (1996) observed 23% improvement in live weight gain in lambs grazed on *Holus lanatus* (4.2 g CT kg^{-1} DM). Similarly, increased live weight gain, carcass weight, dressing per cent was reported in lambs grazed on *L. corniculatus* (34 g CT kg^{-1} DM) by Wang *et al.* (1996).

Effect on average daily weight gain (ADG) (g/day)

In the present study the mean daily weight gain (g/day) was found to be high in T2 group of lambs (114.31 g/day) followed by T1 group (110.83 g/day), T3 group (105.69 g/day), negative control (97.50 g/day) and the lowest values were recorded in control group (74.03 g/day). The mean average daily weight gains (Table 1) differed significantly (P<0.05) among different treatment groups.

In consistent with the present findings, higher growth rate was reported in kids fed oak leaves based diet (Singh *et al.*1996) and in calves fed on *Q. semecarpifolia* and *Q. leucotricophora*, based diets (Sharma *et al.*2008). Rubzana*et al.* (2007) also reported that leaf meal supplementation of *Acacia nilotica* (52.8 g CT Kg^{-1} DM) and *A. polyacantha* (98.3 g CT Kg^{-1} DM) showed significant (P<0.05) increase in ADG (114.3 vs 42.9 g/day) in goats.

Table 1: Effect of feeding TLMM incorporated TMR on mean body weight (kg) of lambs at fortnight intervals.

	I	II	III	IV	V	VI	VII	VIII	IX
NC	12.12±0.81	13.48±0.85	14.88±0.89	16.32±0.88	17.78±0.89	19.28±0.95^{ab}	20.83±0.90^{ab}	22.43±0.84^{b}	23.82±0.82^{b}
C	12.08±0.88	13.12±0.88	14.18±0.90	15.27±0.85	16.38±0.78	17.53±0.74^{a}	18.75±0.77^{a}	19.88±0.78^{a}	20.97±0.80^{a}
T1	12.13±0.58	13.62±0.59	15.13±0.63	16.75±0.65	18.45±0.64	20.20±0.66^{b}	22.00±0.59^{b}	23.77±0.50^{b}	25.43±0.38^{bc}
T2	12.08±0.80	13.55±0.81	15.12±0.76	16.77±0.77	18.55±0.75	20.38±0.75^{b}	22.25±0.78^{b}	24.07±0.52^{b}	25.80±0.27^{c}
T3	12.10±0.65	13.45±0.64	14.92±0.62	16.43±0.62	18.02±0.54	19.68±0.58^{ab}	21.43±0.52^{b}	23.13±0.51^{b}	24.78±0.44^{bc}

^{abc}means with different superscripts with in a column differ significantly (P<0.05).

Effect on feed conversion ratio (kg DMI/ kg gain)

The present study observed significantly (P<0.05) lower feed conversion ratio (FCR) (kg DMI/kg gain) in lambs fed TLMM incorporated TMR containing 3% CT compared to either 2 or 4% levels (Table 2).

The positive response of ADG and FCR for the diets fed at 3% level of CT in the present study gives an indication that the binding effect of tannins was pronounced only at this level which aids in bypassing the protein to the lower gut and subsequently it's more efficient use for tissue growth. Hence, 3% CT is apparently the optimum level, at which there are enough tannins to exert beneficial effects on performance of lambs. However, the present findings are contrary to the findings of Dey *et al.* (2008) who reported that positive impact was evident on the overall performance of lambs supplemented with *F. infectoria* leaves to 1.5% CT in the supplement and decrease in the performance of lambs at 2%. This may be due to the difference in the source of tannins.

Effect on faecal egg count of helminths

TLMM supplementation was found to have significant (P<0.05) effect on the faecal egg counts (Fig 1) and significantly (P<0.05) lower counts were obtained for T2 group, while the difference was not significant among T1, T3 and NC groups. The mean faecal egg counts (Egg per gram) on day 120 of the experiment were reduced by 66.67%, 85.85% and 71.63% in T1, T2 and T3groups, respectively, when compared with the day one of the experiment.

Reduced FEC have been attributed to both direct (reduced fecundity, killing of adult worms, Shaik *et al.*2006) and indirect effect of CT as dietary supplementation of CT improved the immune function against the GI parasites through enhanced protein supply (higher absorption of amino acids) that is required for the repair and immune response (Niezen *et al.*2002).

Similar to the results reported in the present study, Heckendorn *et al.* (2007) observed reduction in daily faecal egg output specific to *H. contortus* by feeding chicory (89%) birdsfoot trefoil (63%) sainfoin (63%) in lambs.

Consistent with the present results, Valderrábano *et al.* (2010) reported that feeding of tanniferous forages like sulla, Sainfoin and wormwood has decreased faecal egg excretion by 22%, 54% and 73%, respectively, in sheep. Minho *et al.* (2008) and Marie-Magdalene *et al*. (2010) also observed reduction in egg counts per gram of faeces and parasite load of *H. contortus* in the abomasum of sheep by feeding tanniferous forages.

The reduced FEC in the sheep decrease the contamination of pasture with infective larvae which in turn results into less infection in the animals grazing on the pasture. Moreover, the mean FECs of the treated groups were much lower than the threshold level, which warrants for anthelminthic medication. Thus, the frequency of using anthelminthic drugs can be minimized. This is especially important in hot and humid climatic conditions like India where frequent medication is the only way to get rid of this menace (Dutta *et al*. 2012).

Table 2: Effect of feeding TLMM incorporated TMR on feed conversion ratio in lambs.

	I	II	III	IV	V	VI	VII	VIII
NC	5.58±0.25^{a}	6.53±0.33^{a}	7.23±0.35^{a}	7.97±0.33^{a}	8.56±0.45^{b}	8.84±0.50^{b}	9.51±0.72^{ab}	11.61±0.61^{ab}
C	7.57±0.37^{b}	8.71±0.41^{b}	8.99±0.51^{b}	9.66±0.62^{b}	9.81±0.59^{c}	10.33±0.42^{c}	12.64±0.64^{b}	14.16±0.52^{b}
T1	5.62±0.26^{a}	6.37±0.40^{a}	6.91±0.30^{a}	7.28±0.31^{a}	7.62±0.29^{ab}	7.57±0.31^{ab}	8.50±0.51^{a}	9.57±0.71^{a}
T2	5.31±0.27^{a}	6.05±0.24^{a}	6.48±0.23^{a}	6.62±0.28^{a}	6.97±0.33^{a}	7.29±0.31^{a}	8.94±0.45^{a}	9.98±0.77^{a}
T3	5.91±0.25^{a}	6.39±0.36^{a}	7.29±0.47^{a}	7.79±0.57^{a}	7.73±0.27^{ab}	7.89±0.53^{ab}	8.32±0.31^{a}	9.01±0.58^{a}

^{abc}means with different superscripts with in a column differ significantly (P<0.05).

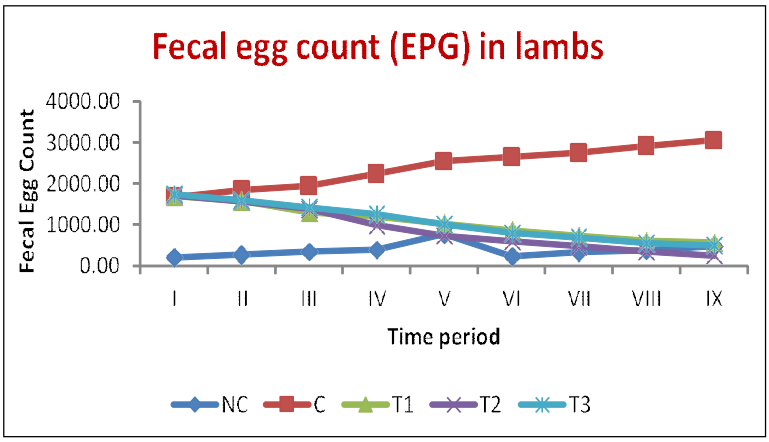

Fig 1: Effect of feeding TLMM incorporated TMR on Fecal egg count in lambs.

CONCLUSION

On the basis of present findings, it may be concluded that dietary supplementation of TLMM has the potential to improve the health status by improving the body weights and decreasing fecal egg count of helminths in lambs.The faecal egg count in sheep may be reduced by feeding CT at 3 % in the diet. Therefore, tanniferous herbages may be routinely included in the diets of small ruminants to prevent helminthes infestation, thereby reduce the use of chemical dewormers.

Conflict of interest: None.

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