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Dry Matter Intake and Growth Performance of Post weaned Nellore Lambs Supplemented with *Moringa oleifera* Leaf Meal

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ABSTRACT

The effect of incorporation of *Moringa oleifera* leaf meal (MOLM) on dry matter intake and growth performance of post-weaned Nellore lambs was investigated in a completely randomized design. Eighteen Nellore lambs with average initial weight of 11.70 kg were offered experimental diet containing MOLM at 0, 15 and 30% protein (soyabean meal and gingelly cake) replacement level in T0, T1 and T2 groups, respectively. MOLM had nutrient profile of 20.94% crude protein, 16.85% crude fibre, 5.70% ether extract, 42.50% nitrogen-free extract and 12% ash contents. Incorporation of MOLM as protein supplement increased DMI especially at higher (30%) inclusion rates. The final body weights were 16.71±0.22, 17.58±0.17and 17.84±0.20 kg in groups T0, T1 and T2, respectively with significant difference between T0 and MOLM supplemented groups (T1 and T2). The total weight gain and average daily gain were significantly ($P < 0.05$) higher in T2 group. It was concluded that MOLM up to 30% level could be a replacer of traditional protein supplements used in concentrate diets for feeding growing Nellore lambs.

KEY WORDS: Dry matter intake, Growth performance, *Moringaoleifera*, Nellore lambs

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INTRODUCTION

In India sheep rearing contributes around 8.5 percentof total value of output from livestock agrarian economy especially in the arid and semi-arid and mountainous area where cropsand dairy farming are not economical (Shilpa et al., 2018). Gradual deterioration of grazing land, over-dependence on poor quality roughages are the major challenges faced by sheep farmers. It is suggested to feedsupplements such as concentrates as a part of diet to improve the productivity of small ruminants (Nurfeta, 2010). However, small-holder livestock rearing systems rarely use such concentrate feeds due to unavailability and high cost of concentrate ingredients (Sultana et al., 2015). In order to alleviate the prevailing problems, there has been a growing interest in many countries to identify potentially important feed resources among shrubs and trees for inclusion in the ruminant diets. One of such trees is *Moringa oleifera* which contains more than hundred bioactive constituents like vitamins, alkaloids, flavonoids, and several essential amino acids along with other nutrients (Pareek et al., 2023). The leaves of *Moringa oleifera* contain negligible amounts of anti-nutritive compounds (Makkar and Becker, 1996). However, there is a limited literature available on the feeding value of dried MOLM in relation to sheep performance. Therefore, the aim of this study was, to explore the viability of MOLM as a partial protein feed replacement in the diets of Nellore growing lambs.

MATERIALS AND METHODS

Experimental site

This experiment was conducted for 90 days at the sheep unit, Livestock Farm Complex, NTR College of Veterinary Science, Gannavaram, Krishna District of Sri Venkateswara Veterinary University,Andhra Pradesh.

Experimental animals and management

Eighteen post-weaned Nellore lambs of3 monthsage and uniform conformation were selected

and allocated into three groups (T0, T1 and T2) with 6 lambs per treatment in completely randomized block design.

Experimental diet

Moringa leaves were harvested from Moringa plots of the Livestock farm complex. The harvested leaves were allowed to dry under shade for three days and finely ground to powder for incorporation in the concentrate mixture. All the ingredients used in the preparation of concentrate mixture (maize, de-oiled rice bran, gingelly cake, soybean meal, mineral mixture and salt) were procured from the local market. Ingredient composition of experimental diets is given in Table 1.

The lambs under control (T0) group were fed formulated concentrate mixture (at the rate of 1% of body weight) without MOLM supplementation, while those under treatment group T1and T2 were fed concentrate mixture incorporated with MOLM at 15% and 30% protein (soybean meal and gingelly cake) replacement levels respectively. Allowance of concentrate mixture to be offered was adjusted at fortnightly interval according to change in body weight and growth rate of lambs. Proper feeding schedule was followed according to ICAR (2013) recommendations for lambs. Leftover feed and fodder, if any, was recorded next day morning at 24 hourly intervals to calculate total dry matter intake per day.

Table 1. Percent ingredient composition of experimental feeds

Ingredient	Control (T0)	Treatment 1(T1)	Treatment 2(T2)
Maize	25.5	25.5	25.0
Deoiled rice bran	33.0	33.0	33.0
Gingelly cake	33.5	22.5	12.2
Soybean meal	5.0	10.2	15.2
Mineral mixture	2.0	2.0	2.0
Salt	1.0	1.0	1.0
Moringa leaf meal	0.0	5.8	11.6

Data collection

Live weight of each animal was recorded prior to the start of the experiment. Subsequently, the body weights of all the lambs were recorded at fortnightly intervals before offering the morning feed using the electronic weighing balance to study the growth rates. The average daily gain (ADG) and the feed conversion ratio (FCR) were calculated.

Chemical analysis.

Dried MOLM as well as the 3 experimental diets T0, T1 and T2 were analyzed in duplicate for proximate constituents like dry matter, crude protein, ether extract, total ash, crude fibre and nitrogen free extracts as per the methods described by AOAC (2005).

Statistical analysis

The recorded data related to parameters was tabulated and statistically analyzed as per Snedecor and Cochran (1994) for interpretation of the results. Analysis of variance was used to test the significance of variance and the treatment means were tested for significance by Tukey's HSD test.

RESULTS AND DISCUSSION

Chemical composition of MOLM and experimental diets

Proximate composition of MOLM and the three experimental diets were depicted in Table 2. It indicated that MOLM contained 20.9% CP,16.8% CF. The CP value obtained in the present study was almost similar to the value of 20.9 and 21.37 % as

reported by Babeker and Bdalbagi (2015) and Choudhary et al. (2018), respectively.However, higher values of 25.1% and 24.39 % were reported by Makkarand Becker(1996) and Manikrao (2020), could probably be attributed to climatic differences, time of harvest, variety, stage of maturity, leaf to stem ratio, various inputs used for Moringa cultivation and the part of the plant analyzed.

Table 2. Chemical composition of MOLM and experimental diets (on % DM basis)

Nutrient	MOLM	T0	T1	T2
Organic matter	88.0	85.9	88.3	88.4
Crude protein	20.9	21.34	21.2	20.2
Ether extract	5.70	0.99	1.24	1.18
Crude fibre	16.8	14.0	14.1	14.4
Nitrogen free extract	42.5	46.7	49.0	52.8
Acid insoluble ash	1.85	4.96	2.95	2.35

Dry matter intake

The mean values of total daily dry matter intake of lambs from both green fodder and concentrates were presented in Table 3 which indicated that DMI was significantly (P<0.05) higher for T2 group lambs and lower value for T0 group with significant difference among all the three groups. Similar findings were reported by Fadiyimu et al.(2016) in West African dwarf sheep; Sarwatt et al.(2002), Murro et al.(2003), Moyo et al.(2012) in goats. In contrast to our findings, Mahamoud (2013) and Punitha (2021) reported significantly lower intake in moringa supplemented lambs than control group.

Significantly higher feed intake in T2 group could be due to low CF and higher CP and total ash of the Moringa leaves and thereby enhancing the palatability and consumption.

Growth performance

Average fortnightly body weights

The final body weight was significantly (P<0.05) higher in in T2 group than T0 and T1. Present findings were corroborated with earlier findings of Adegun et al(2011) in sheep; Asaulo et al. (2012), Moyo et al. (2011), Tona et al. (2014) in goats. However, Haridas (2018), Manikrao (2020) reported non-significant difference in final body weights of growing lambs.

Average daily body weight gains (ADG) and total body weight gain

Perusal of table 3 indicated that significantly (P<0.05) higher ADG and total body weight gain was observed in T2 group than T0 and T1. The present observations are in agreement with Adegun et al. (2011), Babiker et al.(2017), Manikrao (2020) who reported a higher body weight gain in Moringa supplemented lambs. Present findings are not in agreement with findings of Mahamoud (2013) and Haridas (2018) in sheep supplemented Moringa containing diets(Aregheore, 2002, Yusuf et al., 2018; Syed Ali, 2017).

The positive relationship between body weight gain and MOLM supplementation probably a reflection of higher protein content of Moringa increasing quality of diets containing high protein, palatability and minerals of the dietary organic matter which enhanced the growth performance of lambs.

Feed conversion ratio

The FCR values of lambs in T1 and T2 groups were significantly (P<0.05) lower when compared to the T0 group lambs. However, the FCR's of lambs in T1 and T2 group did not differsignificantly (P<0.05) in any week.The observations made in present study are in agreement with Adegun et al. (2011), Tona et al. (2014), Oyedele et al. (2016) who reported similar values in sheep. The results are in disagreement with Mahamoud (2013),Manikrao (2020) in lambs.(Aregheore, 2002; Sultana et al., 2015; Syed Ali, 2017;Manmohan Kumar, 2018 and Srivastav, 2019)

The improved feed efficiency of T1 and T2group lambs in the current study may be due to the higher crude fiber content of MOLM, which increased the availability and utilization of nutrients in the rumen.

Table 3. Overall Mean values of growth parameters of Nellore lambs fed with different experimental diets

Parameter	T0	T1	T2
Average total dry matter intake (g)	**408±24.41c	**422±24.51b	**430±25.96a
Initial body weight (kg)	11.7± 0.24	11.7±0.17	11.7±0.19
Final body weight (kg)	**16.7±0.22a	*17.5±0.17b	*17.8±0.20b
Total weight gain (kg)	**5.02±0.07c	**5.86±0.08b	**6.13±0.03a
Average daily gain (g)	**55.8±0.73b	*65.1±1.40a	*68.0±1.93a
FCR	**7.27±0.11a	*6.44±0.09b	*6.24±0.03b

* non-significant; ** significant difference (P<0.05) between control and experimental groups.
Mean values in the rows bearing different superscripts differ significantly (P<0.05)

CONCLUSION

Dry matter intake, average daily weight gain and feed efficiency were better in Moringa leaf meal supplemented lambs. It can be concluded that *Moringa oleifera* leaf meal can be incorporated in post weaned Nellore lamb's diet up to 30% protein replacement level without having deleterious effect on growth performance.

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