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Sivaramakrishna J

M.V.Sc in Livestock Production
Management, Veterinary
Assistant Surgeon, Department
of Animal Husbandry,
Prakasam, Andhra Pradesh,
India

Suresh J

Professor & Head, Department
of LPM, SVVU, Tirupati,
Andhra Pradesh, India

Gangaraju G

Principal scientist & head, LRS,
Palamaner, SVVU, Tirupati,
Andhra Pradesh, India

Punya Kumari B

Associate Professor & Head,
Department of AGB, SVVU,
Tirupati, Andhra Pradesh, India

Sreedhar S

Professor, LRS, Guntur, SVVU,
Tirupati, Andhra Pradesh, India

Evaluation of lucerne hay on growth performance of Nellore Jodipi lambs

Sivaramakrishna J, Suresh J, Gangaraju G, Punya Kumari B and Sreedhar S

Abstract

A study was conducted to evaluate Lucerne hay supplemented diet on growth performance of twenty four Nellore Jodipi lambs for 90 days. The lambs were divided into 2 groups of each 12 and fed with 3% dry matter basis per kg body weight, out of which 70% of the requirement was supplemented from Super Napier roughage and 30% of the requirement was met from lucerne (T2 group) and compared with T1 group where 70% of the requirement was supplemented with super napier roughage and remaining 30% from conventional concentrate mixture. There was a progressive and significant ($P < 0.05$) increase in weight gain (kg) and average daily gain (g/day) in T1 (7.78 ± 0.68 and 86.48 ± 7.57) followed by T2 (5.95 ± 0.27 and 66.01 ± 3.17) was noticed. The average feed intake (kg/d on DMB) during growth trail in Nellore Jodipi lambs of treatments T1 (1.78 ± 0.08) and T2 (1.59 ± 0.08) respectively. The feed conversion efficiency in Nellore Jodipi lambs of T2 (8.09 ± 0.69) group recorded slightly higher ($P < 0.05$) than T1 (6.97 ± 0.46) group. The daily average total DMI (kg/d) during digestion trail was similar in T1 and T2 groups. The Nutrient Digestibility of CP and EE were not significantly different among the two experimental diets. Whereas, CF and DM digestibility was slightly ($P < 0.05$) higher in T2 group than T1 and the digestibility of OM and NFE was slightly higher in T1 group than T2. The initial glucose, protein and BUN values are not significantly ($P < 0.05$) different among the two experimental groups. The final glucose (mg/dl) value of T1 group recorded a significant ($P < 0.05$) difference compared to T2 group. The final protein (g/dl) value of T2 (7.37 ± 0.19) recorded slightly higher ($P < 0.05$) than T1 (7.00 ± 0.19) group. No significant difference in final BUN values among the experimental groups was observed. The final glucose values are significantly ($P < 0.05$) lower than the initial values. Whereas, the final protein and BUN values are higher than the initial values concluded that Lucerne hay can be recommended as an alternative for better growth rate and feed efficiency in growing lambs.

Keywords: Lucerne hay, Nellore Jodipi lambs, growth performance, glucose, protein

Introduction

Sheep and goats are the most important species of economic value to the small, marginal farmers and landless laborers in the country. Sheep farming, with its multi-faceted utility *i.e.* meat, wool, skin, manure and milk to some extent, plays an important role in the Indian agrarian economy. In India, sheep constitute very valuable and renewable resources across all ecological zones and play an important socio-economic role in the traditional farming system. India ranks third in the world sheep population with 65.03 million accounting for 12.17% the total livestock population in India. Sheep and goats are the principal meat-producing animals in India producing annually 0.235 million tons of mutton and 0.505 million tons of chevon [9]. Their contribution to the economy is quite substantial and constitutes about 6.98 percent of GDP of the agriculture sector (Livestock census 2012) 13. The importance of this species of livestock is not only in number and meat production but also in total production of wool, skin and other by-products. The production potential of sheep and the good economic return has attracted many progressive farmers and unemployed youth towards sheep rearing.

Growth rate and feed conversion efficiency during the postweaning feeding phase are important production traits as they influence the marketing weight and age of the animals. However, post weaning growth mainly dependent upon nutrition offered to lambs. Feeding concentrate mixture to lambs shortens the slaughter age, improves carcass quality and sensory panel evaluation of tenderness [14]. Feeding lambs with conventional protein supplements like concentrate mixtures are expensive and are not always readily available at affordable prices. This necessitates finding a new, inexpensive and alternate protein source. The availability of energy and protein resources for livestock feeding is short by 37 and 34 percent, respectively [2].

Corresponding Author:**Sivaramakrishna J**

M.V.Sc in Livestock Production
Management, Veterinary
Assistant Surgeon, Department
of Animal Husbandry,
Prakasam, Andhra Pradesh,
India

To mitigate this shortage, some new feed ingredients need to be exploited for economic livestock production.

Legume hays are of the locally available low-cost feed sources having many characteristics that make it of special value in the feeding of animals. Leguminous roughages being a good protein source, also provide dietary fibres⁴. Supplementation of legumes or legume crop residues has been shown to increase their digestibility^[6, 12, 15, 18]. They have got more digestible protein because of high protein content ranging from 12-16% on a dry matter basis. Furthermore, the protein of legumes is of superior quality as compared to that of other plants. Wellcured legume hays are particularly rich in carotene and vitamin D and vitamin E. The legume hays are particularly rich in calcium and are generally palatable. They can be incorporated in small ruminant rations to improve intake and productivity. The study was carried out to evaluate lucerne hay as an alternative to concentrate mixture in growing Nellore Jodipi lambs.

Materials and Methods

Experimental animals

Twenty four growing lambs of both sexes of Nellore Jodipi sheep with an average body weight of 12.63 ± 0.25 kg were selected from weaners flock of ICAR Network Project on sheep improvement located at Livestock Research Station, Palamaner. These lambs were divided into 2 treatments with 4 replicates in each treatment and each replicate containing three weaners. The experimental diets were allotted to 2 treatments of lambs at random while maintaining equal body weight among groups. The lambs were dewormed before the start of the experiment and vaccinated against enterotoxaemia.

Experimental diets

Concentrate mixture with 14 per cent CP using, maize, rice bran and groundnut cake was prepared for control group. The experimental diets for T1 containing 70% super napier roughage + 30% concentrate and T2 with 70% super napier roughage + 30% lucerne hay.

Growth performance studies

Housing, feeding and management of experimental animals

All the lambs of each replicate consisting of 3 lambs were housed in individual pens in a well-ventilated elevated animal shed with the provision for feeding and watering. All the two groups were offered respective experimental rations daily at 9:00 and 11:00 and 16:00 h by weighing in electronic balance and residue if any leftover was weighed after 24 h for 90 days. Concentrate mixture or Lucerne were offered initially in the morning followed by chaffed super napier green. Supplements were adjusted according to body weights recorded at 15 d intervals. All the experimental animals were offered clean and fresh drinking water round the clock. Strict hygienic and management practices were followed throughout the experimental period.

Nutrient digestibility (%)

A digestibility trial was conducted during the finisher phase of the experiment. One animal from each replicate, thus a total of 4 animals per treatment were kept separately and fed with respective experimental diets consecutively for 7 days and the total feed offered and feed left over were weighed and recorded for each animal. Similarly feces voided for each animal carefully collected, pooled and recorded. The representative samples of experimental diets offered and fecal

samples from each animal were analyzed for proximate principals and cell wall constituents.

Serum biochemical parameters

The blood samples were collected from each animal at starting and a week before the ending of the experiment and serum was separated. The separated serum was then made clear by centrifuging at 3000 RPM for 10 minutes and transferred to dry, clean eppendorf tubes and stored in a refrigerator at (-20 °C) for estimation of serum parameters. Serum glucose, protein and BUN were estimated calorimetrically using diagnostic kit (TRANSASIA BIO-MEDICALS LTD (ERBA diagnostics)) by the biochemical analyser.

Analysis of data

The proximate analysis of feeds, faeces and residues was performed as per the methods described by AOAC (1997). The data on growth performance, nutrient digestibility and serological parameters were analyzed by applying one-way analysis of variance through a generalized linear model using SPSS, 2015 (version 23.0) and Duncan's multiple range test with a significance at $P < 0.05$ (Duncan, 1955) was utilized to find out the differences between the means among treatments. The data were analysed as per the procedures laid down by Snedecor and Cochran (1994).

Results and Discussion

The proximate composition and fibre fractions of lucerne hay and concentrate mixture were presented in Table 1. They contained DM, OM, CP, EE, CF, NFE, total ash, NDF, ADF, hemicellulose, cellulose and lignin content of 89.51, 85.99, 17.38, 2.83, 26.85, 38.92, 14.0, 45.74, 31.34, 14.40, 18.15, 9.95; 89.27, 89.9, 14.25, 3.94, 9.61, 64.19, 10.0, 26.58, 16.54, 10.04, 5.94 and 7.62, respectively on % DM basis. These values are in agreement with findings of^[3, 10, 1, 11] reported higher CP values for lucerne hay compared to present findings, which might be due to loss of leaves during preparation and processing of hay. There was a progressive and significant ($P < 0.05$) increase in weight gain (kg) and average daily gain (g/day) in T1 (7.78 ± 0.68 and 86.48 ± 7.57) followed by T2 (5.95 ± 0.27 and 66.01 ± 3.17) was noticed (Table 2). These results corroborated with the findings of^[22] who supplemented silage plus concentrate at 1.5 percent body weight to lambs and the observed weight gain was coinciding with the recorded gain of T1 group fed lambs in the present study. Some research workers^[23] fed ad lib either chopped alfalfa or mixed grass hay and a corn/soyabean meal at 1.5% body wt for 102 days and the observed weight gain was correlating with recorded gain of T2 (Lucerne). The average feed intake (kg/d on DMB) during growth trail in Nellore Jodipi lambs of treatments T1 (1.78 ± 0.08) and T2 (1.59 ± 0.08) respectively. The total feed intake was higher in lambs of T1 group agree with the findings of^[17]. The total feed intake was higher by 21.08 % in T1 fed group than T2 fed group. The feed conversion efficiency in Nellore Jodipi lambs of T2 (8.09 ± 0.69) group recorded slightly higher ($P < 0.05$) than T1 (6.97 ± 0.46) group. The feed conversion efficiency of T1 is better than T2. This might be due to an increased level of supplementation associated with higher energy, CP intake and lower fibre intake^[16]. These results were in agreement with findings of^[20] and FCR was almost close to the recorded FCR of T1 fed group in present study. The daily average total DMI (kg/d)

during digestion trail was similar in T1 and T2 groups (Table 3). These values were similar to the finding of [19]. The Nutrient Digestibility of CP and EE were not significantly different among the two experimental diets. Whereas, CF and DM digestibility were slightly ($P<0.05$) higher in T2 group than T1. The results were in agreement with the finding of [8]. This might be due to higher concentrate intake and low roughage intake and possibly synchronized with better nutrient availability for optimum rumen fermentation and microbial growth, which in turn improved intake and DM digestibility as the level of supplementation increased [26]. Digestibility of OM and NFE was slightly higher in T1 group than T2. The results were in agreement with the finding of [23]. The initial glucose, protein and BUN values are not significantly ($P<0.05$) different among the two experimental groups (Table 4). Other research workers [21] reported glucose value in young goats offered with lespedeza or alfalfa hay was close to the T2 fed group in the present study. The final glucose (mg/dl) value of T1 group recorded a significant ($P<0.05$) difference compared to T2 group and the values are in normal physiological ranges and corroborated with findings [17] who fed lambs with lucerne, barley and 200g concentrate mixture and are in agreement with T1 and T2 fed groups in the study. The final protein (g/dl) value of T2 (7.37

± 0.19) recorded slightly higher ($P<0.05$) than T1 (7.00 \pm 0.19) group. Some research workers [5] reported similar values in lambs fed with stylo meal based diets agree with the T2 fed group in experiment. No significant difference in final BUN values among the experimental groups was observed. The final glucose values are significantly ($P<0.05$) lower than the initial values. Whereas, the final protein and BUN values are higher than the initial values. This might be due to legume supplementation which increased ruminal NH₃-N concentration but not BUN.

Table 1: Chemical composition (%DMB) of experimental feeds

Nutrient	Concentrate mixture	Lucerne	Super napier
Dry matter	89.27	89.51	30.91
Organic matter	89.99	85.99	85.32
Crude protein	14.25	17.38	6.95
Ether extract	3.94	2.83	1.71
Crude fibre	9.61	26.85	36.58
Nitrogen free extract	64.19	38.92	40.07
Total ash	10.0	14.0	14.6

Each value is the average of duplicate analysis On DMB: dry matter basis

Table 2: Average daily gain (g) of Nellore Jodipi lambs fed with lucerne hay diet

Parameter	T1		T2	
	Mean	S.E	Mean	S.E
Initial b.wt (kg)	12.26	0.65	11.53	0.45
Final b.wt (kg)	20.05 ^b	0.96	17.98 ^a	0.49
Weight gain	7.78 ^c	0.68	5.95 ^b	0.27
ADG (g)	86.48 ^c	7.57	66.01 ^b	3.17
Feed conversion efficiency (kg DMI/kg gain)	6.97 ^a	0.46	8.09 ^{ab}	0.69

Table 3: Dry matter intake and Nutrient digestibility of Nellore Jodipi lambs fed with Lucerne hay during digestion trail

Parameter	T1		T2	
	Mean	S.E	Mean	S.E
Body weight (kg)	22.30 ^b	1.70	18.92 ^{ab}	1.02
Metabolic body weight (kg)	10.24 ^b	0.58	9.06 ^{ab}	0.37
Total DMI(kg/d)	102.15 ^a	4.22	114.59 ^{bc}	3.79

Digestibility(%)	T1		T2	
	Mean	S.E	Mean	S.E
DM	72.07 ^{ab}	3.17	75.13 ^b	2.96
OM	62.06 ^c	3.14	59.68 ^{bc}	1.58
CP	61.84 ^a	4.54	60.14 ^a	2.97
CF	59.50 ^{ab}	2.27	61.29 ^b	2.61
EE	55.55 ^a	2.23	53.70 ^a	2.90
NFE	71.35 ^b	7.24	63.60 ^{ab}	1.76

Table 4: Serological parameters of Nellore Jodipi lambs fed with Lucerne hay diet

Parameter	T1		T2		
	Mean	S.E	Mean	S.E	
Glucose (mg/dl)	Initial	58.91 ^a	4.67	59.41 ^a	4.43
	Final	49.75 ^b	2.43	42.83 ^a	1.65
Protein (g/dl)	Initial	6.89 ^a	0.15	6.81 ^a	0.17
	Final	7.00 ^{ab}	0.19	7.37 ^b	0.19
BUN (mg/dl)	Initial	23.36 ^a	0.12	23.45 ^a	0.11
	Final	23.82 ^a	0.38	23.96 ^a	0.45

Each value is an average of four observations.

^{a,b,c} Means bearing different superscripts in a row differ significantly ($P<0.05$)

Conclusion

The results of study indicated that supplementation of concentrate mixture @ 30% dry matter required can be recommended for better growth rate and feed efficiency in growing lambs compared to legume hays. Alternatively Lucerne hay can be recommended for better growth rate and feed efficiency in growing lambs.

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