EFFECT OF FEEDING MAIZE SILAGE SUPPLEMENTED WITH CONCENTRATE AND LEGUME HAY ON NUTRIENT UTILISATION IN NELLORE RAM LAMBS

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ABSTRACT

To develop a suitable feeding regime in Andhra Pradesh for growing lambs to obtain optimum weight gains, an on-farm experiment was conducted in growing Nellore ram lambs (n = 42, 3–4 months old) by feeding intensively for five months period with sole maize (Zea mays) silage (R-I), silage + concentrate at 0.5 (R-II), 1.0 (R-III) and 1.5 (R-IV) per cent body weight, silage + lucerne hay (R-V) and silage + groundnut haulms/straw (R-VI) and compared with the performance of ram lambs fed sweet sorghum bagasse based complete diet (R-VII). The results showed that, the dry matter intake (DMI) in g/d was significantly (P<0.01) higher by 25.19, 29.74, 34.82, 31.04, 27.6 and 26.56 per cent respectively with R-II, R-III, R-IV, R-V, R-VI and R-VII rations in comparison to R-I ration (sole silage). The DMI (g/d) was almost similar in lambs fed rations R-III, R-V and R-VI. The lowest DMI (g/d) was observed in ram lambs fed R-I ration. The DMI (g/kg w0.75) in ram lambs was also significantly (P<0.01) different among the seven rations and was highest in ration R-III and lowest in ration R-I in comparison to the other rations. Almost similar DMI/kg w0.75 was observed in ram lambs fed rations R-II, R-V, R-V and R-VI. Mean digestibility coefficients (%) of dry matter, organic matter, crude protein, ether extract, crude fibre and nitrogen free extract in ram lambs fed R-I, R-II, R-III, R-IV, R-V, R-VI and R-VII rations were non significantly different among the seven rations. Average neutral detergent fibre, acid detergent fibre, hemicellulose and cellulose digestibilities were comparable and insignificantly increased as the level of concentrate increased in the ration. Based on these results, it was concluded that the maize silage can be supplemented either with lucerne hay, groundnut haulms (to meet 25% of dry matter requirement) or concentrate at 1.5% of body weight depending on the availability for obtaining optimum growth rate in growing Nellore ram lambs.

Keywords: Maize Silage, Concentrate, Legume Hay, Nutrient Utilisation, Nellore Ram Lambs.

1. INTRODUCTION

Maize (Zea mays) is the nutritive feed for small and large ruminants have high Protein Efficiency Ratio (PER), relatively high Digestible Energy (DE) and total digestible nutrients and thus maize fodder can play an important role in supplying animal feed throughout the year if we cultivate them (Desai, and Deore, 1984). Feeding of silage based rations is becoming popular among the farmers rearing sheep on commercial basis in India particularly in Andhra Pradesh and Karnataka. However, a feeding system based on silage needs to be developed for rearing of ram lambs on commercial basis since literature on silage feeding in ram lambs is limited. Silage, which is anaerobically fermented green fodder, is valued throughout the world as a source of animal feed during lean months (Ragothaman Venkataramanan et al., 2010). Maize is the third most important cereal crop of the world. It is used as food, feed and forage. Maize fodder can safely be fed at all stages of growth without any danger of oxalic acid, prussic acid as in case of sorghum or other fodders. Therefore, green maize fodder is referred as ‘king of crops’ suitable for good silage making (Muhammad et al., 1990). Very limited numbers of sheep farmers are feeding their ruminants with silage in India. Farmers in Andhra Pradesh are showing interest in preparing and feeding of silage to their ruminant animals particularly small ruminants like growing sheep to obtain optimum body weight.

In view of the farmers’ awareness on feeding of silage to small ruminants for meat production, an attempt was made to feed the maize silage by supplementing concentrate and legume hay at certain levels to study the digestibilities of various nutrients in growing Nellore ram lambs.
2. MATERIALS AND METHODS

This experiment was carried out on-farm with maize silage at Indugula village in Tipparthy mandal of Nalgonda district, Andhra Pradesh which is 140 km away from Hyderabad. The main source of irrigation for food crops or forage crops here is by rains, bore wells and small tanks. Average rainfall was 50–60 mm per annum and occurs chiefly due to southwest monsoons every year from June to September. Soil is of mostly red (chalka) type. The experimental animals faced the maximum environmental temperature of about 44°C in the month of May and the minimum was about 23°C during the entire experimental period.

3. RESULTS AND DISCUSSION

Metabolism Study

3.1 Dry Matter Digestibility

Dry matter digestibility coefficients determined was 65.67±3.22, 66.94±2.30, 69.54±2.67, 70.94±1.99, 70.83±0.65, 68.46±2.78 and 64.29±1.03 per cent, respectively (Table 1) for the silage rations R-I (sole silage), R-II (silage + concentrate mixture @ 0.5% body weight), R-III (silage + concentrate mixture @ 1.0% body weight), R-IV (silage + concentrate mixture @ 1.5% body weight), R-V (silage + lucerne hay to meet 25% DM requirement), R-VI (silage + groundnut haulms to meet 25% DM requirement) and R-VII (sweet sorghum bagasse based complete ration). DM digestibility was increased non significantly by 1.9, 5.57, 7.43, 7.29 and 4.08 per cent with R-II, R-III, R-IV, R-V and R-VI rations, respectively in comparison to R-I ration and DM digestibility of SSB based ration was 2.15 per cent lower in comparison to R-I ration. Chauhan and Brar (1989) reported increased DM digestibility with supplementation of concentrates to maize silage based rations in buffalo calves. Devasena and Krishna, (1996) reported increased DM digestibility with supplementation of legume forages in sheep. Veereswara Rao et al. (1993) also reported increased DM digestibility with supplementation of legume forages to basal forage of NB21. Singh and Samantha (1998) reported increased DM digestibility with supplementation of legume forages to basal forages.

3.2 Organic Matter Digestibility

Organic matter digestibility of experimental rations R-I, R-II, R-III, R-IV, R-V, R-VI and R-VII was 68.96±2.82, 70.64±2.41, 72.15±0.52, 73.01±1.52, 71.66±3.74, 69.95±3.57 and 65.06±2.06 per cent, respectively (Table 1). Non significantly increase in OM digestibility by 2.38, 4.42, 5.55, 3.77 and 1.42 per cent was observed with R-II, R-III, R-IV, R-V and R-VI rations, respectively in comparison to R-I ration. OM digestibility of SSB based ration was 5.93 per cent lower in comparison to R-I ration. Chauhan and Brar (1989) reported increased OM digestibility with supplementation of concentrate to maize silage based rations in calves. Veereswara Rao et al. (1993) also reported increased OM digestibility with supplementation of legume forages to basal non legume forages. Insignificant increase in OM digestibility was observed by Veereswara Rao et al. (1993) in lambs by supplementing NB21 green forage with legume fodder.
3.3 Digestibilities of Proximate Principles

Crude protein digestibility coefficient (%) was 62.60±3.54, 63.82±2.50, 70.63±4.85, 71.15±6.03, 69.49±5.03 and 67.25±1.28 for the silage rations R-I, R-II, R-III, R-IV, R-V and R-VI respectively (Table 1). CP digestibility was increased insignificantly by 1.91, 3.97, 11.37, 12.02, 9.92 and 6.91 per cent in R-II, R-III, R-IV, R-V, R-VI and R-VII rations, respectively in comparison to R-I ration. Pratap Reddy et al. (1989) reported insignificant increase in CP digestibility when concentrate was supplemented with basal forage rations. Increased CP digestibility with supplementation of concentrates at different levels with maize silage based rations in calves was reported by Chauhan and Brar (1989). Varaprasad et al. (1995) reported increase in CP digestibility in lambs fed Co-1 grass supplemented with concentrate. This increase in CP digestibility in the present experiment might be due to gradual increase in dietary CP concentration which might have satisfied adequate N concentration for rumen microbes (Russel et al., 1992). These CP digestibilities were almost similar with the results of Das (2010) in Sikkim local male kids fed mixed grass supplemented with concentrate @ 0.5, 1.0 and 1.5% of body weight.

Ether extract digestibility coefficient determined were 62.43±1.93, 62.94±2.29, 63.15±1.78, 63.72±3.01, 66.68±2.80, 64.01±2.67 and 60.08±2.67 per cent for the rations R-I, R-II, R-III, R-IV, R-V, R-VI and R-VII, respectively (Table 1). Numerical increase (P>0.05) in EE digestibility by 0.81, 1.14, 2.02, 6.37 and 2.47 per cent with R-II, R-III, R-IV, R-V and R-VI rations, respectively in comparison to R-I ration and EE digestibility of SSB based ration was 3.91 per cent lower than R-I ration. Chauhan and Brar (1989) reported non-significantly increased EE digestibility with supplementation of concentrates to maize silage based rations in calves. Pratap Reddy et al. (1989) reported insignificant increase in EE digestibility when concentrate was supplemented to basal forage rations.

Crude fibre digestibility of the silage rations R-I, R-II, R-III, R-IV, R-V, R-VI and R-VII was 60.26±4.80, 60.95±3.93, 61.57±4.40, 62.45±4.88, 65.08±4.05, 62.75±5.28 and 57.41±5.00 per cent, respectively (Table 1). Non significant increase in CF digestibility by 1.13, 2.13, 3.51, 7.41 and 3.97 per cent with R-II, R-III, R-IV, R-V and R-VI rations, respectively in comparison to R-I ration and CF digestibility of SSB based ration was 4.94 per cent lower than R-I ration. Pratap Reddy et al. (1989) reported insignificant increase in CF digestibility when concentrate was supplemented to basal forage rations. Varaprasad et al. (1995) reported increase in CF digestibility in lambs fed Co-1 grass supplemented with concentrate. Devasena and Krishna, (1996) reported increased CF digestibility with supplementation of legume forage to basal ration in sheep.

Nitrogen free extract digestibility coefficient of the rations R-I, R-II, R-III, R-IV, R-V, R-VI and R-VII were 64.08±2.27, 65.77±2.95, 66.39±3.16, 66.78±2.04, 65.39±1.86, 64.12±2.69 and 61.10±1.97 per cent, respectively (Table 1). Numerical increase in NFE digestibility by 2.57, 3.48, 4.04, 2.00 and 0.06 per cent in lambs fed R-II, R-III, R-IV, R-V and R-VI rations, respectively in comparison to those fed R-I ration and NFE digestibility of SSB based ration was 4.88 per cent lower than R-I ration. Pratap Reddy et al. (1989) reported insignificant increase in NFE digestibility when concentrate was supplemented to basal forage rations. Varaprasad et al. (1995) also reported increase in NFE digestibility in lambs fed Co-1 grass supplemented with concentrate. Similar findings were noticed by Devasena and Krishna (1996) in sheep fed colonial guinea grass supplemented with groundnut cake plus maize premix.

Table 1: Effect of Feeding Maize Silage based Rations on Apparent Nutrient Digestibility (%) in Growing Nellore Ram Lambs

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Ration</th>
<th>SEM</th>
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<tbody>
<tr>
<td>Proximate principle</td>
<td></td>
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<tr>
<td>Dry matter</td>
<td>65.67±3.22</td>
<td>0.88</td>
</tr>
<tr>
<td>Organic matter</td>
<td>68.96±2.82</td>
<td>0.99</td>
</tr>
<tr>
<td>Crude protein</td>
<td>62.60±3.54</td>
<td>1.34</td>
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<tr>
<td>Ether extract</td>
<td>62.43±1.93</td>
<td>1.61</td>
</tr>
<tr>
<td>Crude fibre</td>
<td>60.26±4.80</td>
<td></td>
</tr>
<tr>
<td>Nitrogen-free extract</td>
<td>64.08±2.27</td>
<td></td>
</tr>
<tr>
<td>Cell Wall constituent</td>
<td></td>
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</tr>
<tr>
<td>Neutral detergent fibre</td>
<td>62.32±2.42</td>
<td>0.91</td>
</tr>
<tr>
<td>Acid detergent fibre</td>
<td>59.43±3.37</td>
<td>0.81</td>
</tr>
<tr>
<td>Hemicellulose</td>
<td>60.94±0.48</td>
<td>0.83</td>
</tr>
<tr>
<td>Cellulose</td>
<td>57.56±2.24</td>
<td></td>
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</tbody>
</table>

Each value is the average of four observations.
3.4 Digestibilities of Cell Wall Constituents

The mean NDF, ADF, hemicellulose and cellulose digestibility coefficients of R-I, R-II, R-III, R-IV, R-V, R-VI and R-VII rations were 62.32±2.42, 59.43±3.37, 60.94±0.48, 57.56±4.24; 64.51±2.68, 60.44±0.88, 62.49±2.00; 59.63±2.35; 65.65±2.37, 62.28±2.27, 65.41±2.21 and 62.07±3.11; 65.81±3.10, 62.29±2.98, 66.63±3.55, 64.00±2.51; 62.58±1.53, 62.14±1.05, 64.23±2.95, 61.61±2.15; 62.09±2.50, 59.79±2.97, 62.83±1.39, 58.37±1.24 and 60.86±2.81, 58.61±1.06, 60.31±1.90 and 57.17±2.42, respectively (Table 1). The digestibility coefficients of fibre fractions were comparable among the experimental maize silage based and SSB based rations. However, insignificantly numerical increase in digestibility of fibre fraction in the silage rations supplemented with concentrate at 0.5%, 1.0% and 1.5% of body weight as well as silage supplemented with legume hay and legume straw was observed. Cell wall constituent digestibility of SSB based ration (R-VII) was comparable with sole silage ration (R-I). Singh and Samantha (1998) reported increased NDF digestibility with supplementation of legume forages to basal non legume forages. Marina et al. (2007) reported almost similar results in sheep fed maize silage alone as noticed in the R-I ration (sole silage) of present study.

Increased digestibility of forage based rations supplemented with concentrate mixture is due to improved fermentation facilitated by improved availability of higher digestible nutrients to the microbes (Sehgal et al., 1999). Supplements which provide critical nutrients enhance the rumen ecosystem so as to increase the microbial growth, rate of fibre digestion and propionate production (Lindsay, 1970). Digestibility of total diet generally increased with increased proportions of concentrates in the diet (Xu et al., 2008). Numerically lower digestibility of nutrients in R-I ration in comparison to other R-II, R-III and R-IV rations indicated that without concentrate supplementation it was not possible to supply sufficient amount of rumen degradable N and other nutrients required by rumen microbes for optimum rumen microbial activity (Leng, 1990).

Based on these results, it was concluded that the maize silage can be supplemented either with lucerne hay, groundnut haulms (to meet 25% of dry matter requirement) or concentrate at 1.5% of body weight depending on the availability for obtaining optimum growth rate in growing Nellore ram lambs.

REFERENCES


