

EFFECT OF SUPPLEMENTATION OF NON PROTEIN NITROGEN AND CARBOHYDRATE SOURCES ON GROWTH AND COST OF PRODUCTION IN GOATS

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Abstract: Urea as an inexpensive NPN source and highly soluble in rumen can be supplemented to provide rumen degradable protein, along with highly soluble carbohydrates to support growth in goats maintained mainly by full time grazing. Hence, a study was conducted in eighteen weaned male goat kids of age three to four months with a mean body weight of 7.70 kg divided into three groups (T1, T2 & T3) with six animals in each group to assess Control group (T1) was maintained only on grazing and T2 group animals were supplemented with a mixture containing 2 g urea, 25 g ground maize grain, 3 g mineral mixture and T3 group animals were supplemented with a mixture containing 2 g urea, 25 g cane sugar, 3 g mineral mixture in addition to grazing daily for ninety days. The effect of supplementing urea along with maize grain or cane sugar in addition to grazing on body growth and cost economics of the experimental goats was assessed. It was observed that kids in T2 and T3 gained additional body weight of 1.18 and 1.46 kg respectively compared to T1 (control). The cost per kg body weight gain decreased in T2 (19.57%) and T3 (22.19%) groups and hence income and profit margin was increased by 31.35; 38.90 and 93.39; 113.20 per cent in T2 and T3 groups respectively. Hence, it was concluded that supplementation of urea irrespective of the added carbohydrate source was found to be effective in increasing the growth performance of goats with economic benefits.

Keywords: Goats, urea supplementation, maize grain, cane sugar, body weight gain.

Introduction

Goats, the poor man's cow are the important livestock species for the livelihood of majority of landless, small and marginal farmers in Tamil Nadu. The goat population in Tamil Nadu as per 20th Livestock Census is 98.89 lakhs and mostly concentrated in southern parts of Tamil Nadu. Goats are reared mainly on full time grazing in waste lands and are offered available house hold agricultural byproducts in the sheds upon return from grazing. Since natural rangelands are characterized by poor quality forage containing more fibre and less protein, negatively affects the animals' feed intake and maintenance of body mass in dry seasons. Moreover, concentrate supplement may be essential to address the nutrient requirements of

grazing animals and maintain their body weight during the drought season. As a low cost alternate approach to feeding concentrates, the rumen microbial biomass could be enhanced by supplementing non protein nitrogenous sources (NPN) along with carbohydrate sources (1:10) so as to increase the bioavailability of protein to goats for body weight gain. Urea, an inexpensive NPN source, highly soluble in rumen can be supplemented to provide rumen degradable protein to improve microbial protein production and animal performance (Zhang *et al.*, 2016). In low quality forages, urea increased crude fiber digestibility, and crude protein content, that led to increase in feed intake and feed efficiency (Salam *et al.*, 2021) and hence it may be useful to use NPN sources such as urea along with highly soluble carbohydrates to reduce the diet costs. Hence, a study was conducted to assess the effect of supplementing urea as NPN source along with maize grain or cane sugar as carbohydrate source on the growth and cost economics in goats maintained under grazing in farmer's field conditions.

Materials and methods

This study was conducted in a farmer's goat flock at Seithunganallur village of Thoothukudi District of Tamilnadu from February 2024 to April 2024. Eighteen weaned male kids of age three to four months with a mean body weight of 7.70 kg were randomly divided into three groups with six animals in each group. Goat kids maintained only on grazing without urea supplementation were kept as control group (T1). In addition to grazing, T2 group animals were supplemented with a mixture containing 2 g urea, 25 g ground maize grain, 3 g mineral mixture and T3 group animals were supplemented with a mixture containing 2 g urea, 25 g cane sugar, 3 g mineral mixture daily. The feeding experiment was conducted for a period of ninety days. The initial and final body weights of kids in all the three groups were recorded. The total body weight gain (kg), average daily gain (g/day) and the cost economics of growth were calculated. The data collected were statistically analysed as per Snedecor and Cochran (1994).

Results and Discussion

The mean initial body weights of T1 (control), T2 (Urea +Maize grain) and T3 (Urea + Cane sugar) groups were 7.68 ± 0.03 kg, 7.72 ± 0.02 kg and 7.70 ± 0.04 kg respectively and final body weights after 90 days of T1 T2 and T3 groups were 11.43 ± 0.04 kg, 12.65 ± 0.05 kg and 12.91 ± 0.05 kg, respectively (Table 1).

Table 1. Growth performance of Goats on Supplementation of Urea with Maize grain or Cane sugar

Parameters	T1 (Control)	T2 (Urea + Maize grain)	T3 (Urea + Cane sugar)
Initial body weight (kg)	7.68±0.03	7.72±0.02	7.70±0.04
Final body weight (kg)	11.43 ^a ±0.04	12.65 ^b ±0.05	12.91 ^b ±0.05
Total body weight gain (kg)	3.75 ^a ±0.05	4.93 ^b ±0.04	5.21 ^b ±0.06
Average Daily Gain (g/day)	41.70 ^a ±0.58	54.78 ^b ±0.43	57.92 ^b ±0.62
Average additional gain above Control group (kg / goat)	-	1.18±0.07	1.46±0.04

Values with different superscripts vary significantly (P<0.05)

The total body weight gain over the experimental period of 90 days in urea supplemented groups - T2 (4.93 kg) and T3 (5.21 kg) irrespective of the supplemented carbohydrate source (Maize grain or Cane sugar) was significantly higher (P<0.05) compared to the control group T1 (3.75 kg). The average daily gain (ADG) (g/day) of urea supplemented groups T2 (54.78 g) and T3 (57.92 g) were significantly higher (P<0.05) compared to control group T1 (41.70 g). The additional gain in body weight of kids in T2 and T3 over and above T1 (control) was 1.18 kg (31.46%) and 1.46 kg (38.93%) respectively. Chellapandian *et al.* (2022) had reported similar increase in live weight gain in grower lambs on feeding urea treated *Acacia nilotica* pods. Murugeswari *et al.* (2024) observed that supplementation of 2% urea along with starchy cooked rice increased digestibility, feed intake, live weight gain and feed conversion efficiency in goats. Similarly, higher body weight gain and higher average daily gain were observed in goats supplemented with 4% UMMB compared to control group fed only with seasonal fodder and concentrates (Megh Raj Tiwari *et al.*, 2012). The higher live weight gain in goats supplemented with urea and maize grains or cane sugar in the present experiment might be due to the increased digestibility of nutrients in the diet since an adequate dietary carbohydrate of rapidly digestible non structural type with sufficient nitrogen may promote rumen micro organism proliferation and increase microbial protein synthesis (Sarkar *et al.*, 2022). Moreover, the higher growth rate observed in goats supplemented with urea and cane sugar (T3) compared to T2 group (urea + maize grain) might be attributed to the availability of water soluble carbohydrates in cane sugar that could ferment faster than starch or fibre in the rumen (Khattab *et al.*, 2013) and thereby faster and higher microbial protein synthesis utilizing the nitrogen from urea.

Table 2. Cost Economics in Goats on dietary supplementation of Urea with Maize grain or Cane sugar

Parameters	T1 (Control)	T2 (Urea + Maize grain)	T3 (Urea + Cane sugar)
Total body weight gain (kg)	3.75 ^a ±0.13	4.93 ^b ±0.10	5.21 ^b ±0.14
Additional feeding cost incurred for 90 days (Rs./goat)	-	59.40	85.50
Cost of body weight gain (Rs.)	1060.95 ^a ±14.21	1120.35 ^b ±14.21	1146.45 ^b ±14.21
Cost of body weight gain (Rs. / kg live weight)	283.00 ^a ±5.91	227.26 ^b ±2.41	220.07 ^b ±3.94
Reduction in cost of body weight gain (%)	-	19.57 ^a ±1.39	22.19 ^b ±0.81
Gross income on body weight gain / goat (Rs.) @ Rs.400 per kg live weight	1501.33 ^a ±20.93	1972.00 ^b ±15.56	2085.33 ^b ±22.34
Increase in income on body weight gain / goat (Rs.) @ Rs.400 / kg live weight	-	470.67 ^a ±27.36	584.00 ^b ±17.32
Increase in income on body weight gain (%)	-	31.35 ^a ±2.19	38.90 ^b ±1.45
Profit margin on body weight gain (Income – Cost of body weight gain) (Rs. per goat)	440.38 ^a ±27.66	851.65 ^b ±14.04	938.88 ^b ±28.79
Increase in Profit margin on body weight gain per goat (Rs.)	-	411.27 ^a ±27.36	498.50 ^b ±17.32
Increase in Profit margin on body weight gain (%)	-	93.39 ^a ±10.80	113.20 ^b ±8.55

Values with different superscripts vary significantly (P<0.05)

The results of the cost economics of the present study (Table 2) demonstrate that achieving growth in goats is economically viable when urea is included in the diet irrespective of the added carbohydrate source, which is in accordance with the findings of Sandra Rozanski *et al.* (2019). Cost per kg body weight gain decreased significantly (P<0.05) in goats from Rs.283.00 in T1 (control with no supplementation) to Rs.227.26 (19.57%) and Rs.220.07 (22.19%), on supplementation of urea with maize grain (T2) and urea with cane sugar (T3) respectively in the present study. This result is in agreement with the report of Sorathiya *et al.* (2011) where the cost per unit weight gain remained lower in treatment group of buffalo heifers fed molasses with urea. The additional income and additional profit margin generated due to additional body weight gain in T2 and T3 groups compared to T1 (control) were

Rs.470.67; 584.00 and Rs.411.27; 498.50 respectively. The increase in income more than control (T1) was 31.35 and 38.90 per cent and the increase in profit margin above T1 was 93.39 and 113.20 per cent in T2 and T3 groups respectively. Sandra Rozanski *et al.* (2019) had also reported that the economic index of BCR (Benefit cost ratio) was higher for the rations with urea compared to the ration without urea and addition of urea led to a 19.0 per cent more economical return compared to the ration without NPN source.

Conclusion

This study revealed that growth in goats could be enhanced by 31.46 and 38.93 per cent on supplementation of urea with maize grain and cane sugar respectively. The cost per kg body weight gain was also reduced on urea supplementation with maize grain (19.57%) and cane sugar (22.19%) thereby increased the income by 38.86 and 46.65 per cent respectively. Hence, it could be concluded that supplementation of urea irrespective of the added carbohydrate source was found to be effective in increasing the growth performance of goats with economic benefits under semi intensive system of rearing.

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