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Effect of feeding fallen leaf meal mixture-based total mix ration on growth, nutrient utilization and cost of feeding of Assam hill goat

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Abstract

Eighteen (18) numbers of Assam Hill Goat kids of 3 to 4 months of age were randomly distributed into three groups as T₀, T₁, and T₂ by using randomised block design (RBD) and fed with Total Mix Ration (TMR) containing Napier grass and concentrate mixture, where the concentrate mixture was replaced with Fallen Leaf Meal Mixture (FLMM) at 0, 25 and 50 per cent levels. The FLMM was prepared by mixing fallen Jack fruit leaf (*Artocarpus heterophyllus*), Moringa (*Moringa oleifera*) and Neem (*Azadiracta indica*) leaves at 30:40:30 proportions. The trial was conducted for a period of 90 days, including a 5-day digestive trial.

The total and average daily feed intake showed no significant difference between group T₀ and T₁, but the group T₂ was significantly ($p < 0.05$) lower than the other two groups. The total gain and average daily gain in body weight were significantly ($p < 0.05$) lower in group T₂ than T₁ and T₀ groups. The Feed Conversion Ratio in groups T₀, T₁ and T₂ were 8.26 ± 0.15 , 8.43 ± 0.41 and 11.76 ± 0.25 , respectively, where the T₂ group is significantly ($p < 0.01$) different from the other two groups.

The cost of feeding (₹) per kg gain in body weight was lowest in group T₁ (134.12 ± 5.32). It may be concluded that, Total Mix Ration incorporating 25.00 per cent Fallen Leaf Meal Mixture can be fed to Assam Hill Goat kids with better performance and distinct economic advantage.

Keywords: Fallen leaf meal mixture, growth performance and Assam hill goat kids

Introduction

Goat farming plays an important role in rural livelihoods, but seasonal feed shortages often limit productivity. Total mix ration is a precise blend of all the essential feed ingredients like forage, grains, proteins, mineral and vitamins, which are thoroughly blended into a single, uniform, balanced diet for livestock. Feeding a Total Mixed Ration (TMR) containing mixed tree leaves to goats generally improves growth performance, nutrient digestibility, and meat quality while reducing feeding costs. Tree leaves are naturally rich in proteins and minerals like calcium and phosphorus, providing a steady supply of nutrients across seasons. Diets containing high-quality tree leaves like Moringa or Mulberry (up to 40% of the TMR) significantly increase average daily gain (ADG) and total weight gain compared to conventional feeding systems.

Jack fruit leaf (*Artocarpus heterophyllus*), Moringa (*Moringa oleifera*) and Neem (*Azadiracta indica*) leaves are abundant throughout Assam and neighbouring states, which can be designated as fallen waste material or waste agricultural byproducts. These are rich in various nutrients and can easily be fed to the ruminant livestock to achieve better growth performance as well as to reduce the feed cost.

Feeding these TMR containing fallen tree leaves is significant from the point of feeding management during the scarcity period or during the period of natural calamity like flood.

Hence, keeping in view to the availability of fallen tree leaves in our places and their significance as feed during the time of scarcity, it was thought desirable to undertake a study on 'Effect of feeding Fallen Leaf Meal Mixture based total mix ration on growth, nutrient utilisation and cost of feeding in Assam Hill Goat.

Materials and Methods

The study was conducted in the Goat Research Station, Burnihat, Assam Veterinary and Fishery University. Eighteen (18) numbers of Assam Hill Goat kids were randomly distributed into three groups as T₀, T₁, and T₂ by using randomised block design (RBD) and fed with Total Mix Ration containing Napier grass and concentrate mixture, where the concentrate mixture was replaced with Fallen Leaf Meal Mixture (FLMM) at 0, 25 and 50 per cent levels. The FLMM was prepared by mixing fallen Jack fruit leaf (*Artocarpus heterophyllus*), Moringa (*Moringa oleifera*) and Neem (*Azadirachta indica*) leaves at equal proportions. The trial was conducted for a period of 90 days, including 5days digestive trial. During the period of trial, a measured quantity of TMR was fed to the kids twice a day; viz morning and evening. The residue left was weighed every day to calculate the daily feed consumption by the kids. Blood was collected, and a 5-day digestive trial was conducted at the end of the trial.

Table 1: Experimental treatments used for the feeding of kids in different groups

Group	Dietary treatment
T ₀	TMR (Napier grass +Concentrate mixture)
T ₁	TMR by replacing concentrate with 25% FLMM
T ₂	TMR by replacing concentrate with 50% FLMM

Table 2: Ingredient Composition of the Concentrate Mixture

Ingredient	T ₀	T ₁	T ₂
Maize	37	35	23
Wheat bran	18	5	0
Deoiled rice bran	16	5	0
GNC	22	23	20
FLMM	0	25	50
Molasses	5	5	5
Mineral mixture	1	1	1
Salt	1	1	1
DCP (%)	16.43	16.71	16.22

Result and Discussion

Growth performance

The total and average daily feed intake, total gain, average daily gain and feed conversion ratio have been presented in Table: 3. The total and average daily feed intake showed no significant difference between group T₀ and T₁, but the group T₂ is significantly ($p<0.05$) lower than the other two groups. The total gain and average daily gain in body weight were significantly ($p<0.05$) lower in group T₂ than T₁ and T₀ groups. The Feed Conversion Ratio in group T₀, T₁ and T₂ was 8.26 ± 0.15 , 8.43 ± 0.41 and 11.76 ± 0.25 , respectively, where the T₂ group is significantly ($p<0.01$) different from the other two groups, and no significant difference was observed between group T₀ and T₁ indicating that, at 25% level of inclusion of FLMM in concentrate has no significant difference than the control.

Table 3: Total and average daily feed intake, total gain, average daily gain and feed conversion ratio of the experimental kids in different group.

Parameters	T ₀	T ₁	T ₂
Total feed intake (g)	36.35 ± 0.92	36.45 ± 0.32	$31^a.3\pm0.45$
average daily feed intake (g)	432.73 ± 0.65	433.92 ± 0.66	$384.52^a\pm0.25$
total gain (kg)	4.40 ± 0.65	4.32 ± 0.23	$2.66^a\pm0.35$
average daily gain (g)	52.3 ± 0.25	51.42 ± 0.35	$31.67^b\pm0.29$
Feed conversion ratio	8.26 ± 0.15	8.43 ± 0.41	$11.76^a\pm0.25$

Meel *et al.* (2019) [2] mentioned that Sirohi goat kids supplemented with different levels of *Moringa oleifera* leaves showed higher feed intake at a 10% supplementation level. Sultana *et al.* (2028) [5] studied the effects of *Moringa oleifera* supplementation on carcass characteristics and meat quality in goat kids, confirming that inclusion of dried leaf meal mixtures increased total feed intake at moderate levels. Khairuddin *et al.* (2023) [8] reported that, feeding growing goats by replacing concentrate feed with *Moringa oleifera* dried leaves up to 10% significantly improved feed intake and utilization, and body weight gain without any harmful effect. Rahman *et al.* (2015) [7] also reported that the diets of goats may be supplemented with tree forages of *S. grandiflora*, *L. leucocephala*, *E. orientalis* and *M. alba* for improved growth performance. The growth performance study results in this study were similar with the reports of these previous studies.

Blood biochemical profile

The blood biochemical parameters viz; Aspartate transferase (U/L), Alanine transaminase (U/L), Alkaline phosphatase (U/L), Lactate dehydrogenase (U/L) and blood glucose (g/dl) are presented in Table: 4. All the groups are significantly ($p<0.01$) different among them in case of Aspartate transferase (U/L), Alanine transaminase (U/L), Alkaline phosphatase (U/L) content in blood. However, values in all the groups are under normal range.

Table 4: That all groups differed significantly ($p<0.01$) in AST, ALT, and ALP levels, though all biochemical parameters remained within the normal range.

Parameters	T ₀	T ₁	T ₂
Aspartate transferase (U/L)	$53.26^a\pm0.24$	$54.58^b\pm0.25$	$55.81^c\pm0.73$
Alanine transaminase (U/L)	$30.33^a\pm0.36$	$32.19^c\pm0.43$	$33.65^b\pm0.52$
Alkaline phosphatase (U/L)	$130.33^a\pm0.45$	$120.14^b\pm0.66$	$123.24^c\pm0.54$
Lactate dehydrogenase (U/L)	$30.49^a\pm0.55$	$28.57^b\pm0.74$	$29.08^c\pm0.33$
Blood glucose (g/dl)	$20.01^a\pm0.77$	$18.58^b\pm0.48$	$21.19^c\pm0.84$
Total serum protein (g/dl)	7.41 ± 0.13	7.42 ± 0.23	7.33 ± 0.24

Lactate dehydrogenase (U/L) and Blood glucose (mg/dl) values in all the groups are below the normal range, and a significant difference ($p<0.01$) exists among the three groups. Low Lactate dehydrogenase is typically not considered as a health problem. The reduction in glucose levels in groups suggests impaired carbohydrate metabolism, possibly due to high fibre content and anti-nutritional factors in the diet. Studies by Makkar *et al.* (2022) [1] reported that high tannin diets in ruminants can reduce glucose absorption by inhibiting carbohydrate-digesting enzymes.

In case of ALT levels, in all the groups, it was under the normal level. However, there is a significant difference among the groups ($p<0.01$), suggesting an increase in liver enzyme activity, potentially due to higher metabolic demands or mild hepatic stress. Kholif *et al.* (2022) [4] reported that goats supplemented with *Moringa* leaf meal showed increased ALT levels, indicating a response to bioactive compounds and secondary metabolites. A similar result was observed in the case of the AST level also. No significant difference was observed in total serum protein content in different treatment groups. The non-

significant changes in total serum albumin levels observed may reveal that the inclusion of Dried Leaf Meal Mixture maintained a stable protein metabolism across all treatment groups. A similar finding was reported by Abdel-Rahman *et al.* (2019) ^[3], who found that feeding *Moringa oleifera* seed meal at different inclusion levels did not significantly affect serum albumin levels in goats.

Inclusion of *Moringa oleifera* leaf meal in the goat ration proved to be effective. Replacement of concentrate mixture @ 50% with *M. oleifera* leaf meal significantly increased haematological parameters (Biswal *et al.*, 2022) ^[6]

Cost of feeding

The cost of feeding (Rs) per kg gain in body weight was lowest in group T₁ (134.12±5.32).

Conclusion

From the above study, it may be concluded that Fallen Leaf Meal Mixture can be incorporated in the total mix ration of goats, replacing 25% of concentrate with enhanced growth performance and distinct economic advantage.

These findings offer practical options for goat farmers to enhance productivity and food security using locally available resources.

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