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Effect of supplementation of *Stylosanthes scabra* raised in the hortipasture model on goats

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Abstract
A study was undertaken to find out the effect of supplementation of *Stylosanthes scabra* in coconut based hortipasture model for goats. *S. scabra,* a leguminous green fodder cultivated in the understorey of coconut trees was used to feed the goats by cut and carry method. Fourteen Boer crossbred male goats raised under intensive method of rearing were divided into two groups *viz.,* Group I (stall feeding with *ad libitum* tree fodder + concentrates) and Group II (stall feeding with *ad libitum* tree fodder + concentrates + *S. scabra* one kilogram/day/head). There was no significant difference in weight gain between the treatment groups, however the average daily weight gain (g) of goats in the supplemented group was higher (34.7 *vs* 50.9).

Key words: Agroforestry, Feed Supplementation, Goats, Grazing, Hortipasture, *Leucaena,* Livestock Feeding Economics, S*tylosanthes scabra,* Small ruminants

Introduction

Livestock population in the state of Tamil Nadu is 30 million and there is a green fodder deficit of 42.60 percent (Policy note, Government of Tamil Nadu, 2011) which affects the production performances of animals. Low animal productivity due to deficiency of fodder is common in developing countries including India. To overcome this shortage, fodder from agroforestry models can play a crucial role. *Stylosanthes scabra* is a widely used pasture legume for raising cattle, sheep and goats (Kexian Yi, 2000). *S. scabra* is also a dependable source of protein feed for animals. The present study was undertaken to find out the effect of supplemental feeding of *S. scabra* harvested from coconut based hortipasture model to improve the performance in goats.

Materials and Methods

Location and duration: The experiment was conducted at the Institute of Animal Nutrition, Tamil Nadu Veterinary and Animal Sciences University, Kattupakkam, Tamil Nadu for a period of ninety days.

Hortipasture model of Agroforestry: Hortipasture was established in one hectare land with coconut trees having spacing of 7.5x7.5 m accommodating 177 plants per hectare alongwith understorey of *Stylosanthes scabra*. Organic manure at the rate of 30 kg per palm per year was applied with the onset of south west monsoon.

Stylosanthes scabra is a perennial legume, drought resistant and suitable for cultivation even in degraded calcareous wastelands. The field was ploughed thrice to get good tilth and blanket recommendation of manure was followed @ 10 t / ha. Seeds were broadcast at the rate of 10 kg/ha. Seeds were treated in hot water (80ºC) for 4 minutes and soaked in cold water overnight before sowing. Irrigation was given after sowing, on 3rd day and thereafter once in 7-10 days as required. Weeding was done on 25th day.

Supplemental feeding of S. scabra for goats: Fourteen cross bred male goats (Boer cross) of 6 months age were divided into two groups of 7 goats in each *i.e.*, Group I (stall feeding with *ad libitum* tree fodder + concentrates) Group II (stall feeding with *ad libitum* tree fodder + concentrates + *S. scabra)*. Animals in the first group were given concentrate feed and tree fodders (*Leuceana leucocephala*). The animals in the second group were given one kilogram of *S. scabra* per animal as supplemental feed in the evening besides concentrate feed and tree fodders.

Concentrate feed was provided individually for the goats at the rate of 200 g daily in a separate feeder and the fodders were individually fed to the animals. All the

animals were weighed at fortnightly interval to record the changes in body weight. The feed intake during the trial period was also recorded.

The goats were housed in well lighted and adequately ventilated building with concrete floor. The house was demarcated into fourteen individual pens. Goats were drenched with Albendazole at the rate of 7.5mg / kg body weight prior to the experiment. Floor space of 4 sq. m was given to each goat in the trial

.

Nutrient analysis: The nutrient contents of *S. scabra* were analyzed to determine the quality of fodder which constituted the supplement ration. The nutrient contents of concentrate feed and tree fodder *(Leuceana leucocephala)* was also analysed. These samples were taken randomly and were analyzed (AOAC, 1990) for the dry matter (DM), crude protein (CP), crude fibre (CF), Ether extract (EE), total ash (TA), neutral detergent fibers (NDF), acid detergent fiber (ADF). The calcium content was estimated by the atomic absorption spectrophotometer (Perkin Elmer) and phosphorus by colorimetry.

Statistical analysis: An independent student's t-test was performed to compare the mean body weight between different treatment groups.

Results and Discussion

The results of the proximate composition of *S. scabra* fodder harvested from the trial plot along with concentrate feed and *L. leucocephala* are presented in Table 1.

Table 1. Proximate composition (%) of *S. scabra, L. leucocephala* and goat concentrate feed (on DM basis).

Nutrients	*Stylo-santhes scabra*	*Leucaena leuco-cephala*	Goat concen-trate feed
Crude protein	21.83	17.45	17.76
Crude fibre	33.81	19.81	8.65
Ether extract	3.32	4.54	1.77
Total ash	4.86	9.66	11.14
Nitrogen Free Extract	36.18	48.54	60.68
Acid detergent fibre	27.60	16.15	16.22
Neutral Detergent fibre	39.10	40.08	35.82
Calcium	1.12	2.35	1.02
Phosphorus	0.26	0.06	0.70

During the trial period of ninety days samples were collected once every month and analysed for its nutrients. The crude fibre and crude protein was high in *S. scabra* compared to *L. leucocephala*. The composition in the present study for *S. scabra* corresponds with reported values of Mupenzi *et al*., (2009) except a lower total ash value.

Table 2. Body weight gain of goats fed with supplemental *Stylosanthes* feeding for 90 days

Body weight (BW)	Group -I	Group-II
Initial weight (kg)	12.25±0.69	12.28±0.67
Final weight (kg)	15.38±1.06	16.87±1.16
Weight gain (kg)	3.13±0.44	4.59±0.84
Average daily gain (g/day)	34.77±0.36	50.92±0.87

There was an increase in body weight of 1.46 kg at the end of the experimental period in the Stylosanthes supplemented group when compared to control group. A similar result was also obtained when goats fed signal grass hay with supplementation of Stylo 184 hay (Sukkasem *et al.,* 2002). Inclusion of Stylo 184 in a diet based on Gamba grass improved the quality of the diet, which resulted in higher intake and growth rate (Phonepaseuth and Ledin, 2003). Clavero and Razz (2003) studied the utilization of *L. leucocephala* and concentrate feed as supplement to normal grazing on milk production in goats.

The goats supplemented with *S. scabra* showed a higher body weight gain of 1.46 kilograms at the end of the ninety days experimental period. With the recorded biomass yield of *S. scabra,* 60 goats can be supplemented at one kilogram daily for one year. The overall increase in the weight gain of 60 goats in supplemental group would be 87.6 kilogram (Table 3) which would result in increased additional revenue generation through sale of live goat. The cost benefit ratio revealed that *S. scabra* as supplemented feed in goats integrated in hortipasture model results in higher growth rate in goats and found economical. In an integrated silvipastoral based farming system for drylands, 18.63 t/ha of grass legume fodder production was obtained and rearing goats recorded higher income followed by milch animal (Vairavan *et al*., 2000). Santhi *et al.* (1996) reported that highest benefit cost ratio of 1: 1.28 was obtained with crop and livestock integration than cropping alone.

Conclusion

It was concluded that supplemental feeding resulted in increased body weight gain which further results in higher revenue generation by integration of *Stylosanthes scabra* in hortipasture model of agroforestry.

Table 3: Economics of supplemental feeding of *S. scabra* in goats

Cost of cultivation of *S. scabra* in one hectare (Including seeds, fertilizers and labour cost)	Rs. 12,000/-
Fodder yield in the hortipasture model	23.5 tonne / hectare
Assuming feeding *S. scabra* @1 kg for one year	60 goats
Weight gain in one goat in supplemented group	1.46 kg
Live weight gain in 60 goats (60 x1.46 kg)	87.6 kg
Sale price of live goat at University farms	Rs.200 / kg
Income generated through sale of goat	Rs. 17,520/-
Cost benefit ratio	1:1.46

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