

largely on natural rangelands for their feed requirements, a situation unlikely to change in the foreseeable future. Goats are increasingly popular in most communities as “cash cows”, rather than a “poor man’s cow” as in the past. Tropical rangelands are endowed with flora that are rich in protein. Most rangelands in Zimbabwe are dominated by *Acacia* species and other pod or fruit bearing trees, including *Dichrostachys cinerea*, genera of *Piliostigma* and *Guibortia*. Also the rangelands products can be supplemented by grown forages such as *moris alba* and sweet sorghum cultivars (*Sorghum bicolor*). In the past decade attempts have been undertaken to evaluate the value of local indigenous plants as feed supplements for goats during the dry season. The dry season period in Zimbabwe extends from six to nine months, and this is the time when livestock experience serious shortages of feed, which in turn causes pressure on the rangelands, resulting in degradation. The utilisation of protein rich trees and shrubs as feed supplements can counter the seasonal shortage of good quality forage for livestock.

Research activities

Studies were conducted to investigate the potential of commonly occurring tree species: *A. nilotica*, *A. tortilis*, *A. erioloba*, *A. erubescens*, *D. cinerea*, *P. thonningii* and *G. coleosperma*. Feeding trials were undertaken to assess the performance of different groups of goats to tree fruits or pods supplements. The pods were collected when ripe and then crushed before feeding. Positive responses observed in animal performance, included enhanced growth rates in kids. Chemical analysis of the pods showed that crude protein ranged from 11 to 20 per cent. Intake ranged from 511 to 843 g/DM/day. Low intakes were ascribed to anti-nutritional factors (tannins) and attempts to deactivate the influence of tannins were undertaken. Mixing of wood ash with crushed pods was found to be effective.

On going studies include the evaluation of *moris alba* leaves and sweet sorghum cultivars as feed for small ruminants. Preliminary analysis show that *moris alba* leaves and stover from sweet sorghum cultivars have a crude protein content of about 22 and 5 per cent respectively.

Conclusion

Tree fruits, or pods, are high in protein and can be collected and stored to be fed when required to goats of all ages. Pods crushed (by grinding or pestle and mortar) can be mixed with hay or crop residues for feeding to all domestic ruminants, including goats. Throughout the developing world a wide range of trees still need to be fully evaluated in order to reduce the cost of feed. For example, fallen leaf litter from browse trees containing about 11% crude protein) can be used as a feed supplement to livestock. Increasing the base for feed options (forages) with high quality feed will support the ever increasing demand for livestock products. Feed is the most important factor influencing livestock production in the developing countries. Efficient utilisation of the available feed resources is a key factor in smallholder goat production. Goats are now being used as means of improving livelihoods of resource-poor communities and increase opportunities for the provision of animal protein in the forms of meat and milk. Cheap protein sources will be a prerequisite for viable and sustainable goat production enterprises.

References

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Integration of *Enterolobium cyclocarpum* Jacq. Griseb tree with hair sheep production in the dry tropics

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Introduction

Foliages and pods (whole fruits, seeds plus hull) of tropical trees and shrubs have good nutritive value (crude protein, NDF, digestibility) and hold potential for sheep feeding in tropical regions under small-commercial farmer conditions. Ground pods of the legume tree *Enterolobium cyclocarpum* Jacq. Griseb, have been used for sheep feeding with modest weight gains (125 g/d) when included at 30% of ration DM. The purpose of this work was to assess nutritive value and potential of *E. cyclocarpum* ground pods for sheep feeding when included at 50% of ration DM, under commercial farming conditions.

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Material and methods

Pods yield; Pods falling from eight trees of *E. cyclocarpum* available at two commercial livestock farms were manually collected and weighed weekly until pod production stopped to obtain productivity and availability. **In vivo dry matter digestibility;** Five male Pelibuey sheep of 32 kg live weight housed in metabolic crates were fed increasing levels of *E. cyclocarpum* ground pods in the ration in a 5 × 5 Latin Square design. Levels of incorporation of *E. cyclocarpum* pods were 0 (control; concentrate based ration), 20, 30, 40 and 50% of ration dry matter. The rest of the ration was composed of sorghum grain, soybean meal, cane molasses and minerals. **Animal performance;** In a commercial sheep farm forty male Pelibuey sheep of 20.6 kg live weight were allocated randomly to one of two groups of 20 sheep each and fed either a 1) commercial concentrate ration (pelleted; 17% CP), or 2) ration containing 50% dry matter as ground pods of *E. cyclocarpum* mixed with ground corn, soybean meal, cane molasses and minerals. Sheep were fed *ad libitum* for 42 days and weight gain was recorded every 14 days after 18 h fast.

Results

Enterolobium cyclocarpum pods had 16% crude protein, 35% neutral detergent fibre and 1.5% ether extract. Average pod production from *E. cyclocarpum* trees was 86 kg per production cycle. The production of pods from *E. cyclocarpum* was markedly seasonal, mostly involving the months of April–May. **In vitro dry matter digestibility (67%)** of *E. cyclocarpum* pods matched reasonably well with the *in vivo* dry matter digestibility (71%) of rations fed to sheep containing 40–50% of the DM as ground pods of *E. cyclocarpum*. No significant differences ($P > 0.05$) were found for dry matter intake and dry matter digestibility when ground pods of *E. cyclocarpum* were increased in the ration of hair sheep from 0 to 50% of ration dry matter. No significant differences were found for daily DM intake (776 vs 923 g⁻¹ head⁻¹ d⁻¹), weight gain (251 vs 239 g⁻¹ head⁻¹ d⁻¹) and feed conversion efficiency (4.3 vs 4.6 intake gain⁻¹) for the concentrate (pelleted) and the *E. cyclocarpum* (50% of DM) ration fed to Pelibuey sheep in a commercial farm. Weight gain of hair sheep was comparable to that found by Moscoso *et al.*, (1995) in hair sheep (223 g d⁻¹) fed 36% of the ration DM as ground pods of *E. cyclocarpum*. *E. cyclocarpum* pods have good chemical composition (15–16% CP, 30–35% NDF). Rumen degradability (a + b) of DM of *E. cyclocarpum* pods was high (86%). DM intake (1.2–1.4 kg sheep⁻¹ d⁻¹) and DM digestibility (71%) of rations containing *E. cyclocarpum* pods (50% of DM) are relatively high for hair sheep. Weight gain (239 g/day) and feed conversion efficiency (4.6:1) of rations containing high levels (50% of DM) of pods are reasonable good in hair sheep. Secondary metabolites (saponins) in *E. cyclocarpum* may reduce protozoa numbers in the rumen and exert a beneficial effect on efficiency of microbial protein synthesis in the rumen (Koenig *et al.*, 2007).

Conclusions

The availability of *E. cyclocarpum* pods during the dry season (April–May), and their good nutritional value have potential for sheep feeding under conditions faced by small commercial mutton producers in South Mexico.

References

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Valorisation of mango peels and seed kernels in animal feeding: Nutritive value and voluntary feed intake by sheep

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Introduction

The spreading of industries that process fruits and vegetables produce enormous quantity of waste that is mostly unexploited and only occasionally used for animal feeding. The processing of dried mango is an emerging activity in Burkina Faso. It is undertaken by many individual processors or in socio-professional cooperatives to produce organic dried mangos especially for export. Mangoes are peeled and sliced by hand; the slices are then dried while the peel and seed are thrown away which constitutes various nuisances to the environment as the waste equates to 50 to 65% of mango weight depending on variety of mango. The peelings and seeds could be used as unconventional

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