EVALUATION OF THREE TROPICAL LEGUMES IN DIETS FOR GROWING RABBITS

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Summary

Three tropical legumes, very different in growth form, but believed to be of potential value for animal production were evaluated by substituting the leaf meal made from each for lucerne at the level used in a standard diet for growing rabbits (50%). Each leaf meal had a nitrogen content of close to 3.5% and contributed about 60% of the crude protein in the diet. *Albizia lebbeck* and *Clitoria ternatea* showed no evidence of toxic or antinutrient effects. The protein digestibility of the complete diets were 66 and 61% respectively, implying a protein digestibility of the leaf of at least 50%. Both species would be suitable for practical production diets for rabbits and should be excellent for ruminants. In contrast, the diet containing *Desmanthus virgatus* had a protein digestibility of only 40%, implying that only about 15% of the leaf protein was available. The leaves showed marked non-enzymic browning on drying. When dried this species is clearly unsuitable as a feed for rabbits and possibly also for ruminants. However it may well be valuable as fresh forage.

(Key Words: Rabbits, *Albizia lebbeck*, *Clitoria ternatea*, *Desmanthus virgatus*)

Introduction

In many tropical countries rabbits represent an important opportunity for increasing animal production (Cheeke et al., 1982). They have advantages in terms of suitability for intensive husbandry, for village production, marketability without religious constraints, and for better utilisation of feed resources. It is now known that rabbits do not effectively utilise lignocellulose fibre, but make efficient use of high-protein high-digestibility forages through their ability to retain fine particles in the caecum and rapidly void less digestible particles.

Although hardly appropriate as a nutritional model for the ruminant, as a small herbivore the rabbit can be a convenient animal for the preliminary evaluation of forages which are not available in sufficient quantity for experiment with ruminants. The rabbit could well provide useful indications of palatability, toxicity and nitrogen availability, if not of fibre degradability.

This experiment is concerned with three tropical legumes that in Australia were of potential interest for the pastoral industry but which in Southeast Asia could well be used in feeding of rabbits, and for which little nutritional information was available. The species were as follow:

Albizia lebbeck ("siris"). A mimosoid tree legume, widespread in the semi-arid tropics of Asia and Australia. It appears to have high potential for increasing pastoral production (Lowry, 1989a). Although the leaf could be harvested in bulk, there has so far been no suggestion of a role in intensive animal production.

Clitoria ternatea ("clitoria"). A vigorous twining herb, palatable to cattle, but not so far brought into commercial use as a pasture plant. It is common as a village plant in Asia and under evaluation as a pasture plant in Australia (Hall, 1986), and a candidate for intensive production of hay as a "tropical lucerne".

Desmanthus virgatus ("desmanthus"). This is a small mimosoid shrub with fine bipinnate leaves and highly variable habit. A large number of accessions from South America are under evaluation in Australia and some have been released

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for use in pasture systems.

Although fresh forages can be fed directly to rabbits, preliminary experiments showed that rabbits would not readily eat the loose dry leaflets of the species under investigation. Each was thus prepared as a leaf meal which was then incorporated into a standard pelleted diet for growing rabbits in which each species under test was substituted for lucerne.

Materials and Methods

New Zealand White rabbits (mean liveweight 1.87 kg) in a colony at the Oonoonba Veterinary Laboratory, Townsville, were kept in individual cages that allowed full recovery of feed residues and collection of faeces and urine. Prior to the experiment they were supplied with the regular diet, a commercial pelleted poultry layer feed. For a three-week period, three groups of four animals each were supplied the diets formulated for the experiment, while a fourth group continued to receive the original diet. All diets were supplied *ad libitum* and the intakes measured daily. Water was freely available in each cage. Animal liveweights were measured weekly.

Leaves of siris were harvested in February from mature trees at Lansdown Research Station near Townsville (latitude 19°S). Branches were air-dried and then leaflets separated on a 50 mm screen. Additional samples were collected at intervals during the year. The other species were obtained from seed multiplication plots, also at Lansdown Research Station. Whole plants of clitoria at the early flowering stage were harvested from weed matting and air-dried. Branches of mature desmanthus were cut and dried and the leaflets separated.

Dried leaf from each species was hammer-milled, mixed with the other components of the diet and pelleted in a commercial feed mill. All mixtures were readily pelleted.

The composition of the diets (g/kg) were as follows: leaf meal (clitoria, siris or desmanthus), 500; maize, 240; barley, 120; wheat bran, 50; meat meal, 50; soybean meal, 20; mineral mix, 20.

Nitrogen in compounded feeds, feed ingredients and faeces was measured in a Kjeltec micro-Kjeldahl system.

Results

Rabbits gained weight over the feeding period, but the differences were non-significant.

Intakes of the legume-based diets, but not the concentrate diet, increased over the treatment period (table 1). Dry-matter digestibilities were similar for the three leaf-based diets and substantially lower than that for the concentrate diet. For all animals intake and digestibility were

TABLE 1. INTAKE, DRY MATTER AND NITROGEN DIGESTIBILITY FOR RABBITS ON LEGUME-BASED DIETS.

	Clitoria	Siris	Desmanthus	Concentrate
Intake (g/kg l.w./day)				
week 1	44	54	51	n.a.
week 2	53	63	54	38
week 3	69	74	70	38
Liveweight gain (g)	33	125	25	70
s.e.	170	150	40	50
Dry matter digestibility (week 3)				
mean (%)	61	66	58	84
s.e.	3	5	4	3
Nitrogen in diet (%)	3.07	3.04	3.09	
Nitrogen digestibility (week 3)				
mean (%)	61	66	40	
s.e.	4	7	5	

negatively correlated (regression equation: DMI = 273 − 2.33 DMD).

Nitrogen digestibility was similar for the clitoria and siris diets, and substantially lower in the case of desmanthus.

Discussion

Rabbits were able to increase intake of the less digestible leaf-based diets, with some adaptation apparently occuring throughout the feeding period, so that intake of digestible dry matter was higher on the leaf-based diets than the concentrate diet in week 3. There was no indication of any toxic or antinutrient effects as intakes increased throughout the feeding period. There were however marked differences in nitrogen digestibility. Leaf meal contributed 59–62 % of total nitrogen in each diet. Assuming nitrogen digestibility of c. 80% for the concentrate components of the diets, siris and clitoria leaf had nitrogen digestibilities of 50–55% while for desmanthus it was only 15%.

Based on recommended intakes of digestible dry matter and nitrogen (Cheeke et al., 1982), siris and clitoria would be excellent feeds for rabbits and could be used in intensive production systems. The results also indicate their value as feed for other livestock. As a tree legume, siris is remarkable for the apparent absence of antinutrient factors (Lowry, 1989b). The results are in marked contrast to those with leucaena which, even after reduction of mimosine, caused marked growth depression at 60% of the diet (Tangendjaja et al., 1990). Clitoria is highly palatable to ruminants and is clearly an excellent feed. It has another interesting attribute, in that the intense blue flower pigment which has traditional uses in Asia (Lowry and Chew, 1974) is now of interest as a commercial food colouring (Timberlake and Henry, 1986). Desmanthus is palatable to grazing ruminants but there are clearly problems with protein availability in the dried material. Unlike the other species there was marked browning on drying. This was probably non-enzymic as laboratory examination of fresh material showed polyphenoloxidase activity no greater than in other species. Desmanthus leaf contains an array of quercetin and myricetin glycosides that vary markedly between different lines (Lowry et al., unpubl.). *Desmanthus illinoensis* contains myricetin gallates (Nicollier and Thompson, 1983). It may be that the trihydroxy phenolics bind irreversibly to protein in the dry material. It is of interest that when a number of pasture legumes were compared in a rumen simulation device, desmanthus was the only one that had an adverse effect on fermentation (Morrison, unpubl.). However this may bear no relation to the quality of fresh material.

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