A COMPARISON OF STEER GAINS ON CUNNINGHAM LEUCAENA AND SOME ALTERNATIVE PSYLLID-TOLERANT SHRUB LEGUMES

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ABSTRACT

Five shrub legumes, *Leucaena leucocephala* cv.Cunningham, *L. leucocephala* cv.Tarramba, *L. diversifolia* CPI 33820, *L. pallida* CQ 3439 and *Calliandra calothyrsus* CPI 115690 were compared for yield and steer gain in comparison to an all-grass control. Shrubs were sown in rows 4 m apart and all treatments, including the control, were sown with the grass *Urochloa mosambicensis* cv.Nixon.

Edible legume yield was highest for *L. leucocephala* cv.Tarramba and lowest for *L. leucocephala* cv.Cunningham. In the absence of psyllid attack, liveweight gains over a 5-week period in summer were highest with cv.Cunningham (1170g/d) and lowest for *C. calothyrsus* (391 g/d) and the grass control (393 g/d). The steer gains ranked in a similar order to the *in-vitro* digestibility of the dried leaf material. The gains generally reflected lower digestibility and high fibre, lignin and tannin levels in the psyllid-tolerant material.

KEYWORDS

Leucaena species, *Calliandra calothyrsus*, psyllids, shrub legumes, steer gains

INTRODUCTION

Leucaena leucocephala has an enviable reputation for the ability to promote live weight gain of cattle (Jones 1994). However, the advent of the psyllid insect into most leucaena-growing countries has greatly reduced yields (Palmer *et al*., 1989) and subsequently animal production potential (R.J. Jones, unpublished data).

Interest in alternative shrub legume species has increased since the advent of the psyllid and there has been extensive testing of alternatives, including other Leucaena species.

We know of no grazing studies where psyllid-resistant shrub legumes have been evaluated in comparison with a standard *L. leucocephala* cultivar. We sought to make such a comparison.

MATERIALS AND METHODS

The experimental site was an area of red earth soil on the CSIRO Lansdown Research Station, 50 km S of Townsville, Queensland, Australia (19°40'S, 146°51'E).

Shrub species

The five legumes sown were:

1. *Leucaena leucocephala* cv.Cunningham
2. *Leucaena leucocephala* cv.Tarramba
3. *L. diversifolia* CPI 33820
4. *L. pallida* CQ 3439
5. *Calliandra calothyrsus* CPI 115690

The leucaenas were inoculated with TAL 1145 (CB3060) and *Calliandra* with a mixture of CB 3040, TAL 33 and INA46. *Calliandra* was sown in two paddocks, for the remainder there was only one paddock. Each paddock was 1.5 ha in size, treatments were allocated at random. Three interconnected areas between and alongside the planted paddocks and measuring 2.2 ha served as a control area sown only to *Urochloa mosambicensis* cv.Nixon (Nixon) but fertilised as for the shrub legume paddocks.

Seeds of the shrubs were sown in rows 4 m apart in January 1994. Gaps in the rows were filled with transplants to achieve a spacing of 0.5 m. Irrigation by drip line tubing along the rows was used to aid establishment. Two years after sowing the trial was established and ready for grazing.

Yield on-offer was estimated before grazing. The grass understorey was measured using the BOTANAL technique (Tothill *et al*., 1992) from 120 1 m quadrats/paddock. The edible paddock DM yield of shrubs was estimated by harvesting by hand all leaf and soft stem <6 mm in diameter along nine 3 m lengths of row. The material was dried at 80°C and weighed. Cattle were allocated at random to the paddocks, weighed on entry, after one week, and then after a further 5 weeks from 30 January to 5 March 1996.

The object was to have ample feed on offer to the cattle to assess the quality of the pastures in the experimental grazing period. The second weighing, one week after entry, was designed to overcome possible variable gutfill. The weights recorded at this second weighing were used as the initial weights for the experimental phase. The difference in live weight between this weighing and 5 weeks later was taken as the live weight gain.

Since there was adequate feed on offer on all paddocks for the 5 week grazing period, animals were used as replicates in the statistical analysis as for a pen feeding trial.

RESULTS AND DISCUSSION

Only cv.Cunningham had any psyllid attack from establishment to the first experimental grazing. Psyllids were first seen on 28 June 1994. They built up rapidly and control was effected by spraying with 'Rogor' on 29 July, 17 August and 15 September 1994 and September 1995. At the time of sampling and grazing there were no psyllids. This provided an environment for assessing the potential of the shrubs in the absence of insect damage. The grass was flowering and 1 m tall, the shrubs were actively growing and 1.5 - 3 m tall with cv.Tarramba the tallest and cv.Cunningham the shortest.

Understorey yields were very similar for all shrubs at about 4,600 kg/ha. These were higher than measured in the control paddock (Table 1). Grasses dominated the understorey with the sown Nixon making the greatest contribution.

Edible yield of the shrubs ranked *L. leucocephala* cv.Tarramba > *C. calothyrsus* > *L. diversifolia* > *L. pallida* > *L. leucocephala* cv.Cunningham (Table 1).

Animal performance

Steers accepted all of the shrub legumes. At the end of grazing, there was visually more leaf left on *C. calothyrsus* and *L. pallida* than on the other shrubs.

Steer gains differed widely between treatments ($P<0.01$). *L. leucocephala* cultivars gave higher gains than the other *Leucaena* species and *C. calothyrsus* (Table 1). The steers on the grass control had similar gains to those on *C. calothyrsus.*

The ranking of the live weight gains were similar to the rankings for digestibility, fibre, lignin and tannin levels for the three leucaena species (Shelton and Jones, 1995; Jones *et al*., 1995). The low gains on *C. calothyrsus* were not in keeping with the good digestibility values of fresh material. Rather, they were more in keeping with the low digestibility of wilted *C. calothyrsus* (Palmer and Schlink, 1992). Although some leaf wilting of *C. calothyrsus* occurred towards the end of the experimental grazing period, it was not a permanent wilting.

The poorer steer gains on the psyllid-tolerant shrubs obtained in this preliminary study compared to the susceptible standard cv.Cunningham is cause for concern. Shrub legumes are often difficult and invariably costly to establish and more difficult to manage under grazing than, say, stylo-based pastures. A major reason for using *L. leucocephala* is its known high potential for fattening cattle (Jones 1994). Any reduction in this potential will serve to make the plantings of shrub legumes less economic.

In any search for psyllid-tolerant material, it is imperative that nutritional quality not be sacrificed. The leucaena germplasm available is now very wide - including hybrid material - (Shelton and Jones, 1995). There could well be scope for obtaining material from this which is productive, psyllid-resistant and of good nutritive value. Another option is to identify and use rumen micro-organisms better able to digest these fibrous, tanniniferous feeds and so increase animal production potential (Shelton and Jones, 1995).

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Table 1
Shrub and understorey pasture DM yields and steer liveweight gains for the six treatments

Species	Edible shrub yield (kg/ha)	Pasture yield (kg/ha)	Steer live weight gain(g/d)
L. leucocephala cv Cunningham	506	4210	1170(5)°
L. leucocephala cv Taramba	788	4680	891(5)
L. diversifolia CPI*33820	650	4610	617(5)
L. pallida CQ†3439	525	4640	486(10)
C. calothyrsus CPI 115690	711	4710	391(10)
Nixon Sabi grass control	-	3770	393(4)
EMS#	-	-	243

° Number of steers
* Commonwealth Plant Introduction number
# Error mean square value
† Commonwealth Queensland number