HIGHWORTH LABLAB GRAIN AS A SUPPLEMENT FOR BEEF CATTLE ON NATIVE PASTURE

K.B. ADDISON*, D.G. CAMERON** and G.W. BLIGHT**

SUMMARY

Highworth lablab grain at 1 kg/head/day was compared with 0.2 ha/head of leucaena rotationally grazed in either a four-weekly (4 paddocks) or eight-weekly (2 paddocks) cycle as a post-weaning supplement to steers grazing native pastures over winter and early spring (June to October). The unsupplemented control steers lost 30.5 kg/hd over five months, those receiving lablab grain lost 6.9 kg/hd but leucaena at four and eight weeks cycles gave gains of 20.3 and 10.1 kg/hd, respectively. Initially the lablab grain proved to be unacceptable to the weaners and, when eaten, gave liveweight responses less than its chemical analysis would suggest could be expected. Possible reasons are advanced.

INTRODUCTION

Native pastures containing speargrass (Heteropogon contortus) are the main source of feed for beef cattle in sub-coastal central Queensland (Keating 1967) but these suffer from shortages of protein from autumn to early spring. The deficiency can be corrected by supplementation with cotton seed meal (Addison 1970) or legume nitrogen. The browse shrub leucaena (Leucaena leucocephala) is well adapted to the area and was superior to peanut meal as an autumn supplement but its winter-early spring usefulness was restricted by heavy autumn utilization (Addison et al, in press). There is also the prospect of using both the protein-rich hay and grain of annual legumes. Wildin (1974) suggested the grain of lablab (Lablab purpureus) cv. Highworth, an early flowering, dark seed cultivar, could be useful.

The present experiment, at Brian Pastures Research Station (lat. 25° 38'S long. 151° 47'E) was designed to compare crushed grain of Highworth lablab with depleted leucaena stands as a supplement for recently weaned beef steers grazing native pasture over winter and early spring. The effect of lengthening the grazing cycle on the efficiency of using the leucaena was also tested.

MATERIALS AND METHODS

Details of the native pastures and soils of the site are given by Addison (1970) and Addison et al (in press). The twelve 3.24 ha paddocks of native pasture from the earlier studies were used in a randomised block design with three replications of four treatments (a) 1 kg/hd/day crushed lablab grain (b) 0.2 ha/hd leucaena fenced into four plots rotationally grazed, one week in and three weeks out (four-week cycle) (c) 0.2 ha/hd leucaena fenced into two plots rotationally grazed, four weeks in and four weeks out (eight-week cycle) (d) No supplement. In 1969 the leucaena (cv Peru) had been planted in rows (3.05 m apart) in 0.81 ha of six of the 3.24 ha paddocks.

The native pasture and leucaena areas were not grazed from September 1973 to March 6, 1974. They were then grazed in a previous study until May 28, 1974 by steers weighing 296 kg/hd in May at a stocking rate of 1.24 steers/ha. At the end of May, native pasture on offer, estimated by cutting six 18.36 m² quadrats with an autoscythe in each paddock, ranged from 3 800 to 5 300 kg/ha (Mean 4 400) DM/paddock. This was sufficient to provide all animals with their dry matter requirements. Leucaena populations, estimated by counting stems at ground level in 9.14 m of row at 10 random sites in each 0.81 ha area, ranged from 7 300 to 9 400.

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* Brian Pastures Pasture Research Station, Gayndah, Qld. 4625.
** Qld Dept. Primary Industries, Brisbane and Rockhampton, respectively.

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10 200 plants/ha (Mean 8 300) and were stable. On the other hand, edible leucaena on offer, estimated by removing and drying leaves, inflorescences, pods and stems less than 6 mm diameter from 10 random plants in each 0.81 ha area, ranged from only 400 to 800 kg/ha ODM (Mean 540) and was heavily depleted. The leucaena contained 1.6% nitrogen and 0.19% phosphorus.

Grain of Highworth lablab, grown at Brigalow Research Station in Central Queensland, was roller-milled and initially mixed with an equal quantity of wheat meal to overcome poor acceptance. The proportion of wheat was gradually reduced until June 27, when it was possible to feed the lablab grain alone. Eight chemical analyses of the grain during feeding gave average concentrations of 4.35% nitrogen and 0.44% phosphorus.

Experimental grazing commenced on May 28, 1974 using 48 weaner steers, six to eight months old, with a mean liveweight of 175 kg/hd (range 144 to 234). The steers were allocated to the twelve paddock groups of four animals each by stratified randomization on the basis of their weaning weights. A stocking rate, including leucaena areas, of 1.24 steers/ha was used. The steers were weighed unfasted and faeces sampled (for nitrogen determination) every three weeks until October 23, 1974, when the experiment was terminated.

Analysis of variance was used to test the effect of treatments using an estimate of error based on animal to animal variation from which a term for animal blocks was isolated. The treatment means were compared using the protected LSD procedure, operating at the 5% level of significance (Fisher 1937).

"Brian Pastures" has an average annual rainfall of 750 mm and receives an average of 38 frosts each year. Temperatures can be high (43.1°C absolute maximum) in summer and low (-10°C absolute grass minimum) in winter. Rainfall was above average from September 1973 to February 1974 and from August to October 1974. It was below average from March to July 1974. This, and the cold autumn, winter, and early spring of 1974 (40 frosts), restricted plant growth until mid September.

RESULTS

All steers lost weight until September 11 after which all gained weight. Liveweight losses in the leucaena-eight-week cycle and lablab treatments were similar but losses were significantly smaller (P< 0.05) than for the unsupplemented steers which had lost 36.3 kg/hd by September. The leucaena-four-week cycle steers stopped losing weight at the end of July, and by September 11 were significantly heavier than the eight-week cycle animals (P<0.05). Weight gains from mid-September were similar for both leucaena treatments and were significantly greater (P<0.05) than the lablab supplemented animals, which in turn were significantly greater (P<0.05) than the unsupplemented steers (Fig. 1).

Animals supplemented with lablab had the highest faecal nitrogen concentrations until late September when both leucaena treatments gave rapid increases in faecal nitrogen. The unsupplemented steers had the lowest faecal nitrogen concentrations throughout and had not reached 1.3% faecal nitrogen by the end of the trial (Fig. 1). On September 11 faecal nitrogen concentrations were 1.63% for lablab; 1.09% and 1.01% for leucaena four-week cycle and eight-week cycle, respectively, and 0.96% for no supplementation.
DISCUSSION

The daily requirements of feed for a 175 kg beef steer to gain 0.25 to 0.5 kg/ha/day are 3.9 kg DM containing 1.6% N (NRC 1970). Despite their need to consume only 17% of the native pasture initially on offer, the unsupplemented animals lost 36.3 kg/hd and had an average faecal nitrogen concentration of only 0.87% during the 106 days of winter. This indicates that the quality of the native pasture on offer was lower than over the previous 3 years when losses of liveweight by unsupplemented animals over winter averaged only 22.5 kg/hd and faecal nitrogen concentrations 0.98% (Addison et al, in press). Rain and rising temperatures in spring promoted pasture growth leading to a mean faecal nitrogen concentration of 1.22% and a liveweight gain of 5.8 kg/hd over the 42 days of spring.

The relationship between faecal nitrogen and pasture nitrogen established by Mir (1960) suggests that the average pasture nitrogen concentration over winter was only 0.45%. As the leucaena had a nitrogen concentration of 1.6% in late May, a pure legume diet requiring some 413 kg/hd leucaena would have been necessary to produce the NRC postulated liveweight gains over the 106 days of winter. Only 108 kg/hd was on offer at the commencement of the season and the cold, dry autumn and early winter restricted further growth. As a result, the four- and eight-week cycle steers lost 11.6 and 19.3 kg/hd, respectively. However, spring growth of both the native pasture and leucaena increased faecal nitrogen concentrations to 2.29 and 2.27% and produced liveweight gains of 31.8 and 29.3 kg/hd, respectively.

Despite the depleted amount of leucaena initially on offer it was sufficient
to **substantially** reduce the winter liveweight loss that occurred on unsupple-mented native pastures. Using an eight-week cycle instead of the four-weeks cycle used by Addison et al, (in press) was not satisfactory, especially over winter, and other means of increasing efficiency of use of leucaena are necessary.

Compared with native pasture crushed **lablab** grain was useful in reducing liveweight loss over winter and increasing gain in spring but was inferior to the depleted supply of leucaena, especially under the four-week cycle, throughout the experiment. **Lablab** suffered from four problems. (i) It had to be hand fed. (ii) It was poorly accepted by the steers and, initially, had to be mixed with wheat to make it palatable. (iii) With the season experienced, the 1 kg/ha/day fed was below the requirement of 1.23 kg/ha/day (NRC 1970) by late winter, although improved native pasture quality reduced this requirement to 0.58 kg/ha/day by late spring. (iv) Finally, there was a major problem with reduced biological value of its nitrogen. Faecal nitrogen concentrations above the 1.3% considered necessary for liveweight maintenance by Winks and Laing (1972) were measured from feeding **lablab** grain almost throughout the experiment but liveweight performance was inferior to that at lower faecal nitrogen levels from leucaena. Positive liveweight gains were recorded after September 11 when the **lablab** faecal nitrogen value of 1.63% was substantially higher than the other three treatments (0.96 to 1.09%). The reasons for this are unknown, but Pradke and Sohomie (1962 a, 1962 b) reported growth inhibition of rats fed raw **lablab** grain. They postulated the presence of some heat-labile growth inhibitor and concluded that the antigrowth factor was neither a protein nor a **peptide** but was associated with the protein component of the grain. The type of **lablab** used in their studies was not indicated, but there are references to some forms containing cyanogenetic glucosides (Whytte et al, 1953) and prussic acid in the dark seeded forms (Bailey 1949). Highworth has a dark seed. Rongai, the other cultivar available in Queensland, has a pale seed coloration and it would be interesting to see if it gave superior animal performance to that recorded here from Highworth.

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