EFFECT OF SOD-SEEDED SIRATRO ON BEEF PRODUCTION AND BOTANICAL COMPOSITION OF NATIVE PASTURE IN SOUTH-EASTERN QUEENSLAND

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ABSTRACT

In an unreplicated experiment, animal liveweight gain per hectare was increased by an average of 41 *per cent over a three year period with the introduction of* Macroptilium atropurpureum *cv. Siratro into a native pasture containing* Heteropogon contortus (*black spear grass*). *One* 21 *ha area was sod-seeded to Siratro and fertilized with superphosphate; a similar area of* 21 *ha was burnt annually but otherwise untreated. Yearling steers were used, grazing commencing in late spring and animals were turned off in early winter. Stocking rate was adjusted depending on feed on offer, the improved area being stocked at a higher rate than the native area in the second and third years.*

The basal area of Digitaria didactyla (*blue couch*) *increased from* 2.8 *to* 24.5 *per cent in the Siratro area from May* 1973 *to May* 1977. *Only minor changes occurred in other pasture components in the improved pasture and in all components of the native pasture.*

INTRODUCTION

Fattening of beef cattle in the West Moreton region of south-eastern Queensland is based on extensive grazing of cleared native grassland. Steers are purchased from other regions when 15 to 20 months old and sold when fat, usually in excess of three years of age. An alternative enterprise uses 12 to 15-month-old stock, fattening the animals before the first winter; this requires better quality pastures. However the use of fully improved pastures for cattle fattening is unattractive because of the high cost of pasture development and lack of cultivation equipment.

The technique of introducing a legume into native pastures has been used successfully in other areas as a means of improving stocking rates and increasing animal performance at reasonable cost. With the addition of superphosphate, Townsville stylo (*Stylosanthes humilis*) has proved successful in northern Australia (Shaw 1961, Shaw and 't Mannetje 1970) but with the shorter growing season in south-eastern Queensland, it has had limited success.

Siratro (*Macroptilium atropurpureum*) has proved the most productive and persistent legume in a wide range of situations (Shaw and Whiteman 1977) and in southern Queensland appears the most suitable legume for this type of development. In this investigation, the value of Siratro introduced into native pasture was studied under a commercial grazing situation.

Preliminary animal production data have been published previously (Lowe 1974). This paper reports animal production from three grazing seasons and botanical composition changes over four years, discussing their implications for pasture development in south-eastern Queensland.

MATERIALS AND METHODS

Site

The experiment was located on undulating forest country 50 km north-west of Ipswich in the Brisbane River catchment. A small creek and associated flats separated

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the two ridges included in the 42 ha experimental area. The ridges were sparsely covered with narrowleaf (*Eucalyptus crebra*) and silverleaf (*E. melanophloia*) ironbark with small clumps of spotted gum (*E. maculata*) and Moreton Bay ash (*E. tessellaris*).

The soil was a solodic with a sandy-loam 'A' horizon of 8–13 cm depth overlying a yellow clay subsoil (Dy 3.41; Northcote 1965), formed on Bundamba sandstone. In the 0–10 cm layer, pH was 5.5, available P was 23 ppm and replaceable K was 0.63 me %.

Design

The paddock was divided into two 21 ha areas, equalizing site characteristics as much as possible. Treatments were randomly allocated to these areas.

Treatments and pasture management

Planting and prestocking details have previously been published (Lowe 1974). One area was cleared of all dead timber, ripped, oversown with Siratro seed (2 kg ha^{-1}) and fertilized with 250 kg ha^{-1} of Mo superphosphate in December, 1971. Maintenance superphosphate (250 kg ha^{-1}) was applied in spring 1972 and 1973. The other area was untreated except for an annual spring burning.

Animal management

The experimental animals were mainly yearling steers of approximately 300 kg liveweight; they included beef and dairy/beef cross stock. Grazing details are summarized in Table 1.

Unfasted cattle weights were recorded every two months in 1972/73 and every month in 1973/74 and 1974/75. At the same time animals were dipped to control ticks.

Animal measurements ceased in 1975, but grazing continued on both areas in 1976 and 1977 at a stocking rate of 1.1 beasts ha^{-1} between November and June.

Botanical composition

Two fixed line transects were located within each paddock. Each was approximately 0.4 km long and sampled a distinct topographical unit, one on a ridge situation, the other on the flat. Basal cover was measured by the point quadrat technique, using points attached to a bicycle wheel (Tidmarsh and Havenger 1955). This was moved between the fixed points of each transect, four readings being taken with each revolution of the wheel. Approximately 500 recordings were taken per transect in May 1973, 1975 and 1977. On tussock forming grasses, a strike was recorded if the point touched the base of a living tiller, while with stoloniferous species, a strike was recorded if the point touched a stolon or rooting position.

RESULTS

Climate

Mean annual rainfall at Esk, eight km north, is 957 mm with 826 mm falling between October and June. Rainfall between these months during the experimental period was as follows:

1971/72	1972/73	1973/74	1974/75	1975/76	1976/77
947 mm	955 mm	1223 mm	784 mm	1059 mm	590 mm

Summer temperatures were generally mild with few periods of extreme temperature. Spring temperatures were above average in 1973 allowing pastures to be stocked early because of rapid grass growth. In 1974 spring temperatures restricted growth, especially of Siratro. Severe frosts were recorded in 1972 and 1976.

TABLE 1

Summarized animal performance data from 1972 to 1975 at Esk, south-eastern Queensland.

Year	Grazing Period	Treatment	Stocking rate (beast ha^{-1})	Average finished weight (kg)	Average liveweight gain (kg beast^{-1} day^{-1})	(kg ha^{-1} day^{-1})
1972/73	1/11/72 to 18/5/73	Native pasture	0.6	419.1	0.61	0.38
	(199 days)	Siratro pasture	0.6	441.4	0.73	0.46
1973/74	2/10/73 to 24/6/74*	Native pasture	0.8	389.9	0.46	0.35
	(264 days)	Siratro pasture	1.0*	453.2	0.69	0.67
1974/75	12/11/74 to 13/6/75	Native pasture	0.8	404.7	0.45	0.34
	(213 days)	Siratro pasture	1.1	422.2	0.53	0.67

*Stocking rate on Siratro pasture from 2/10/73 to 21/1/74 was 0.8 beast ha^{-1}. For remainder of this grazing period, S.R. was increased to 1.1 beast ha^{-1} to utilize excess Siratro growth.

Initial botanical composition

Bothriochloa decipiens (pitted blue grass) and *Fimbristylis diphylla* were the species with the greatest basal area in both the ridge and flat transects of the native and improved pastures (Table 2). *Bothriochloa bladhii* (forest blue grass) and *Cymbopogon refractus* (barbed wire grass) were present in the flat transect of the native pasture area but not in the ridge transect. Remaining pasture components showed little variation between the two transects. In the improved area black spear grass and *Aristida benthamii* (a wire grass) only occurred in the ridge transect while *Paspalum dilatatum* and *Paspalidium distans* only occurred in the flat transect. The basal area of Siratro was greater in the ridge transect than on the flat.

Changes in botanical composition

Trends between 1973 and 1975 were similar to the overall trend and have not been presented in Table 2. Between May 1973 and May 1977, the basal area of *Digitaria didactyla* (blue couch) increased substantially in both transects of the improved area (Table 2). Other changes in the improved area were an increase in the basal area of *Bothriochloa bladhii*, *Paspalum dilatatum* (both transects), *Eragrostis leptostachya* (flat only), *Aristida benthamii* and broadleafed herbaceous species (ridge only). The basal area of Siratro and *Fimbristylis diphylla* decreased in both transects, with decreases also occurring in the basal area of black spear grass (ridge only) and *Paspalidium distans* (flat only).

In the native pasture area, decreased basal area was recorded from pitted blue grass and *Cymbopogon refractus*, while the basal area of *Fimbristylis diphylla*, black spear grass, *Eragrostis leptostachya* (both transects) and *Sporobolus creber* (flat only) increased. The basal area of both blue couch and *Paspalum dilatatum* also increased in both native pasture transects, but the increase was much smaller than that in the improved area.

Total ground cover increased by an average of 65 per cent over four years, ground cover being greater in the improved pasture.

Animal production

Final liveweight differed substantially between years (Table 1). Animals on the improved area were always heavier than those on the native pasture despite stocking rate differences.

In the first two seasons, liveweight gain per beast was similar on both pastures until March. From March until June the animals on the improved area continued to gain weight while those on the native pasture maintained (1972/73) or lost weight (1973/74). In contrast, the greatest difference in rate of liveweight gain per beast in 1974/75 occurred in spring and early summer.

Differences in liveweight gain per hectare between the two pastures were also greatest in the March to June period in the first two years (Figure 1). In the third year most of the difference between pastures occurred before March. In contrast to the previous years, there was no increase in liveweight gain per hectare from either pasture in June, 1975. An increase of 22, 81 and 65 kg liveweight gain per hectare was obtained from pasture improvement in 1972/73, 1973/74 and 1974/75 respectively.

DISCUSSION

The introduction of Siratro into native pasture allowed an increase in carrying capacity and also resulted in an improvement in liveweight gain per beast. As a consequence, production from the improved pasture was higher and more reliable.

The animal production levels on the improved pasture (average of 135 kg ha^{-1}) were higher than those obtained on similar pastures in southern Queensland (Bisset and Marlowe 1974, Tothill 1974). The higher liveweight gains from our experiment were mainly because the animals were not carried through winter on the pasture.

TABLE 2

Botanical composition (expressed as a percentage of basal area) of native and improved pasture in May 1973 and May 1977 using the point quadrat technique.

Species present	Siratro (improved) area				Native pasture area			
	'Ridge' transect		'Flat' transect		'Ridge' transect		'Flat' transect	
	1973	1977	1973	1977	1973	1977	1973	1977
GRASSES								
Aristida benthamii	2·1	5·4	0·0	0·0	0·7	2·8	2·1	4·4
Bothriochloa bladhii	0·8	4·3	1·4	7·0	0·0	2·1	5·2	5·1
Bothriochloa decipiens	6·8	6·5	4·9	5·7	10·3	9·0	8·4	2·9
Chloris sp.	0·0	0·0	0·6	1·9	0·4	1·3	2·1	4·4
Cymbopogon refractus	0·0	0·0	0·0	0·0	0·2	0·0	4·3	0·0
Cynodon dactylon	0·0	0·0	1·9	1·3	0·0	1·3	0·7	0·0
Dichanthium spp.	0·0	0·0	0·0	0·0	0·5	0·0	0·9	0·0
Digitaria didactyla	1·0	31·2	4·6	17·7	0·9	4·1	0·7	2·2
Digitaria spp.	0·0	0·0	0·2	0·0	0·4	0·0	0·0	0·0
*Eragrostis leptostachya**	3·1	1·1	8·2	14·6	6·6	17·2	4·3	16·8
Eremochloa bimaculata	0·0	0·0	0·0	0·0	0·5	2·1	0·0	0·0
Heteropogon contortus	6·0	0·0	0·0	0·0	1·2	3·4	0·5	3·6
Panicum effusum	0·0	0·0	0·0	0·0	0·0	0·0	1·1	0·0
Paspalidium distans	0·5	1·1	6·1	1·9	1·9	0·0	0·5	0·0
Paspalum dilatatum	0·0	2·2	2·7	15·8	0·0	0·7	1·1	2·9
Paspalum distichum	0·0	0·0	0·0	0·0	0·0	0·0	0·7	0·0
Sporobolus creber	2·6	1·1	3·1	1·3	2·3	0·7	3·9	8·8
Unidentified grasses	1·6	0·0	0·2	0·0	0·0	0·0	0·0	0·0
LEGUMES								
Glycine tabacina	1·6	0·0	0·2	0·0	0·0	0·0	0·0	0·0
Macroptilium atropurpureum	6·5	2·2	1·7	0·0	—	—	—	—
OTHER PLANTS								
Fimbristylis diphylla	7·1	1·1	11·3	3·8	6·5	10·3	4·6	3·6
Broad leafed herbs	1·6	4·3	0·6	0·6	1·4	2·1	1·1	3·6
BARE GROUND	58·8	39·8	52·4	28·5	66·8	42·8	57·7	41·6

*Small amounts of *Erogrostis sororia* were included with *E. leptostachya*.

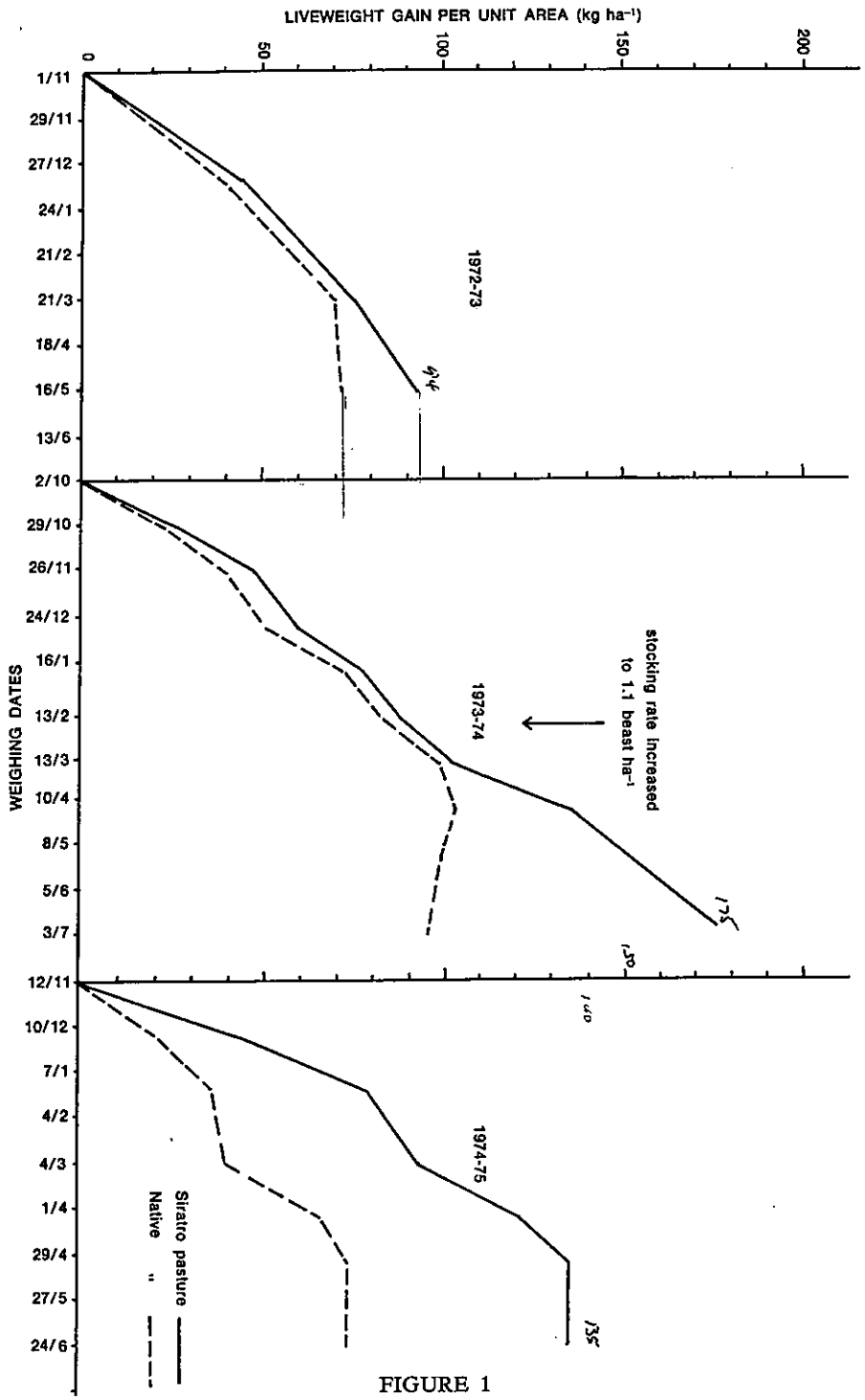

FIGURE 1

Animal liveweight gain (kg ha^{-1}) for three seasons on native and improved native pastures in south-eastern Queensland. Stocking rates were varied between years (see Table 1).

In the second and third years approximately half the stock on the improved paddock were fattened within the grazing period. The remainder and those carried in the first year were in 'forward store' condition by June. None of the animals on the native pasture were fattened. The inability of the improved pasture to fatten animals in the first season appears to be related to the slow development of Siratro in oversown situations (Cook and Lowe 1977), the low legume content limiting animal performance (Evans 1970).

In the first two years, native and improved pastures were capable of similar liveweight gain per beast until March, a similar result being obtained by Bisset and Marlowe (1974). The differences which occurred in autumn could be attributed to increased content of Siratro in the diet of animals on the improved pasture (Stobbs 1977, Walker 1977). Superior animal liveweight gain occurred on the improved pasture throughout the third year. It is suggested that this was due to better grass production as a result of fertility accumulation from Siratro (Tothill and Jones 1977).

Botanical composition of the native pasture was similar to that reported by Murray, Bryan and Steele (1937) on a sandy ridge near Gatton, 32 km to the southwest. Inclusion of a vigorous legume, application of superphosphate and an increase in stocking pressure changed the botanical composition, with a marked increase in the basal area of blue couch and paspalum. The processes involved in this change have been discussed by Tothill and Jones (1977).

CONCLUSIONS

The advantage of low-key pasture improvement with Siratro lies in the ability of the improved pasture to support higher stocking rates while maintaining or improving individual animal performance. Changes in the composition of the associated native pasture can be expected, but in our experiment these changes favoured the more productive species such as *Digitaria didactyla* and *Paspalum dilatatum*.

In practical terms, this type of development can be achieved at low cost relative to alternatives such as full replacement pastures or even the purchase of extra land. This investigation demonstrated that some animals can be fattened in one season on this type of pasture; an alternative feed source (irrigated oats) was needed to finish all animals in time for sale in late winter.

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