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NOTE ON THE EFFECT OF SOWING DATE, DEFOLIATION MANAGEMENT AND CLOSURE DATE ON THE SEED PRODUCTION AND FORAGE YIELD OF BERSEEM CLOVER *(TRIFOLIUM ALEXANDRINUM)*

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ABSTRACT

The influence of sowing date, defoliation management and date of cessation of defoliation on the seed production and forage yields of berseem clover (Trifolium alexandrinum) *was investigated in an irrigated experiment in south-eastern Queensland. Date of closure had the greatest influence on seed yields with closures after early September substantially reducing yields. Seed could only be obtained at the expense of forage yield, with losses of up to 4.3 t ha^{-1} under conditions that produced the best seed yields of 170 to 180 kg ha^{-1}. An August sowing specifically for seed was a viable alternative if an earlier sowing could not be closed for seeding by September, producing seed yields of up to 100 kg ha^{-1}. Forage yields could be increased by up to 6 t ha^{-1} if the stand was sown in April rather than June, but seed yields were unaffected.*

INTRODUCTION

A resurgence of interest in berseem clover (*Trifolium alexandrinum*) in the dairying areas of south-eastern Queensland during the late 1970s resulted in requests for information on seed production. As commercial seed was in short supply, farmers began producing their own seed on the basis of an "opportunity" crop, after the major requirement for animal feed had been satisfied. Stands of berseem clover, closed in mid- to late-October after spring grazing, produced between 50 and 140 kg seed ha^{-1} (Willcox 1980).

The experiment reported herein was designed to determine (a) what effect sowing time, management and closing date had on seed production, and (b) what would be the possibility of sowing an area of berseem early in the spring specifically for seed production. The effects of these changes in management on forage production were also measured, particularly the possibility of loss of forage.

MATERIALS AND METHODS

Site

The experiment was planted on a black earth (Ug 5.1) at Gatton Research Station in south-eastern Queensland during 1980. The climate of this area has been described in detail by Lowe (1973), but briefly the site receives a rainfall of 775 mm and has mean maximum and minimum temperatures of 30.1 °C and 18.8 °C (January) and 21.0 °C and 7.3 °C (July) respectively.

Design and treatments

A 15 × 4 randomized block design was used with plots of 3 m × 3 m. Treatments included 4 sowing times (April, June, August or September) and two seeding rates (10 or 20 kg ha^{-1}, the higher rate only being used with the two later sowing times). Five management techniques (defoliated when warranted, 6-weekly or 8-weekly defoliations, defoliated once or not defoliated) were imposed on these treatments as indicated in Table 1. "When warranted" was defined as the stage of crop development when grazing should have occurred, the number of defoliations being dictated by closure dates.

Seed for the experiment was obtained from a locally grown strain of berseem clover whose origins are obscure (Willcox 1980).

Techniques

Seed was broadcast on to the surface of a fine, firm seed bed, covered by raking and irrigated for establishment. Seed was inoculated before sowing with an appropriate strain of *Rhizobium*. Irrigation was applied at 50 mm every 3 weeks during the growing season, but was withheld during seed ripening to reduce seed losses (Shukla *et al.* 1980).

Measurements

Dry matter yields of forage were measured by defoliating the whole 9 m^2 area at 8 cm, the frequency of defoliation being dependent on treatment (Table 1). Defoliation ceased on plots at predetermined times (Table 1) to allow the crop to set seed.

Seed yields were measured when all plots were mature (January) by mowing the whole plot to ground level, bagging and air drying (at ambient temperatures) the harvested material and threshing in a stationary thresher. The seed obtained from this process was then cleaned using a small wind-screen cleaner ("Bodington" seed grader) and weighed.

RESULTS

Forage yields

Forage yields were highest from April sowings whereas the August sowing (defoliated once) produced no measurable forage yields before it was closed to allow seed production (Table 1). Yields were substantially increased by delaying the date of closure from August to November, irrespective of sowing date. Defoliation management had no significant effect on the yields of April-sown treatments. As forage yields did not include material produced after treatments were closed for seeding, no yield data were obtained from September sowings.

Seed yields

Crops sown in or before June and finally defoliated no later than September produced seed yields of about 180 kg ha^{-1} without any indication of differences due to sowing date or defoliation treatment (Table 1). Delays in sowing or final defoliation beyond those times progressively reduced seed yield to the point where September sowings and November defoliations produced no seed at all. August sowings achieved yields intermediate to those of September and October closures of earlier sowings.

DISCUSSION

This experiment suggests that seed yields of up to 200 kg ha^{-1} can be obtained from stands of berseem clover which are used for the dual purpose of forage and seed

TABLE 1

The effect of time of sowing and date of closure on the forage yield and seed production of berseem clover at Gatton, south-eastern Queensland

Planting date (1980)	Defoliation treatment	Cumulative forage yields (t ha^{-1})				Clean seed yields (kg ha^{-1})				
		Date of Closure								
		Aug. 7	Sept 8	Oct 9	Nov 14	Aug 7	Sept 8	Oct 9	Nov 14	Not defol.
April 17	when warranted	4.86^{+}b^{++}	6.72 ab	8.35 a	9.40 a	168^{+}ab^{++}	168 ab	34 e	0 g	—
June 19	when warranted	0.38 e	0.74 d	2.77 c	5.04 b	184 a	169 ab	55 cde	0 g	—
April 17	6–weekly	—	—	7.16 ab	—	—	—	37 de	—	—
April 17	8–weekly	—	—	6.44 ab	—	—	—	7 f	—	—
August 15	once	—	—	0.00 f	—	—	—	78 bcd	—	—
August 15	nil	—	—	—	—	—	—	—	—	83 bcd*
September 19	nil	—	—	—	—	—	—	—	—	0 g

$^{++}$ Figures followed by same letter are not significantly different at the 5% level

$^{+}$ Yield data transferred by $\log_e$ for analysis of variance

* Average of two seeding rate treatments (range – 72 to 94 kg ha^{-1})

production. These yields are within the range obtained in India by Saini and Malik (1949) but lower than those achieved by Shukla *et al.* (1980) using improved Indian cultivars. The results also indicate that yields obtained under commercial conditions of 50 to 140 kg ha^{-1} (Willcox 1980) could be improved by adopting better seed management strategies. Closure date was the major factor influencing seed yields. If defoliation was continued after early September, seed yields were substantially reduced. Compared to this, sowing date and defoliation management had only minor effects on seed yield.

There is an obvious conflict between obtaining adequate grazing from a stand and achieving a satisfactory seed crop. To obtain seed yields in the region of 180 kg ha^{-1}, a loss in potential forage production of up to 4.3 t ha^{-1} in spring was sustained. The proposal to plant a crop in late winter specifically for seed production could not be justified from the results of this experiment unless feed shortages made it impossible to remove an area from grazing until October. In this instance, a crop planted as late as mid August could achieve seed yields of up to 100 kg ha^{-1}. However, higher seed yields could be achieved by a properly managed grazing stand closed prior to mid September. Whereas delaying planting from April to June did not necessarily reduce seed yields, there was a major loss in forage production of up to 5.9 t ha^{-1}.

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TECHNICAL NOTES

IMPROVED ESTABLISHMENT OF *STYLOSANTHES HAMATA* CV. VERANO USING HEAT-TREATED SEED

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Abstract

*Two heat treatments imposed on seed of Caribbean stylo (*Stylosanthes hamata *cv. Verano) before sowing gave 5- and 10-fold increases in field germination near Katherine and northern Australia. Legume yields from the resultant pastures were 4 and 16 times that of the control treatment.*

Introduction

Improved pastures can be established in parts of northern Australia by broadcasting seed and fertilizer on burnt areas of native pasture when adequate subsoil moisture is present. The inclusion of Caribbean stylo (*Stylosanthes hamata* cv. Verano) improves both the quality and the stability of resultant swards (Winter *et al.* 1978, Gardener 1980). Establishment of Verano is favoured by heavy grazing before sowing and by moderate grazing pressures thereafter, but poor seed germination remains as a major problem reducing effective establishment (Gardener 1975, Mott *et al.* 1976, Mott 1979).