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EFFECT OF CUTTING HEIGHT ON LUCERNE *(MEDICAGO SATIVA)* CULTIVARS

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SUMMARY

Six lucerne cultivars were mown for two years at four different heights (<2 cm, 2.5 cm, 5.0 cm and 7.5 cm) above ground level. The cultivars varied in winter activity from semi-dormant (Hunter River) to highly winter active (Matador). All were mown when basal shoots were approximately 2.5 cm long. Dry matter yield and plant persistence were the same at the two lowest cutting heights. Higher cutting decreased yield by up to 4.7 t ha^{-1} over two years but had no effect on persistence. There were no significant cultivar/cutting height interactions.

INTRODUCTION

Cutting too frequently rapidly decreases lucerne yields (Judd and Radcliffe 1970), mainly through loss of plants (Leach 1976). The influence of cutting height is less than that of cutting frequency, but stand damage can occur from low cutting heights (Smith 1972). Generally, however, it has been found that increasing cutting height, significantly and progressively reduced yields per unit area of herbage, IVDDM, protein and carotene (Ogden and Kehr 1968).

The availability of new lucerne cultivars in Australia, with differing winter activity levels and different regrowth rates after defoliation, complicates management compared to that needed for the only previous cultivar, Hunter River. Time of cutting is now determined by the stage of development of basal shoots rather than the older, 'one-tenth bloom' technique used previously (Gramshaw *et al.* 1981). Alternatively a fixed time schedule could be utilized but it would have to be varied depending on the winter activity level of the cultivar (D. Gramshaw, personal communication). On the other hand, the responses of cultivars with different activity levels to cutting height has not been established and needs to be clarified.

Many lucerne growers in the Moreton region cut stands very close to ground level, damaging the crowns and cutting the new shoots. This practice could decrease stand persistence, particularly in the more winter-active cultivars with higher crowns and more rapid basal shoot growth.

This investigation looked at the effect of cutting height including a treatment which duplicated local growers' management of very close cutting, on the growth and persistence of six lucerne cultivars with varying winter activity levels.

MATERIALS AND METHODS

Site

The experiment was located on a black earth (Ug 5.15, Northcote 1972) at Gatton, south-eastern Queensland (see Powell 1982).

Treatments

The treatments included six lucerne cultivars ranging from semi-winter dormant through to highly winter active (Table 1) and four cutting heights arranged in a strip design with four replicates. The stands were part of a larger area that had previously been used for a herbicide experiment and were approximately eight months old. The plant populations of the area were tested for homogeneity prior to the imposition of the treatments; only differences between cultivars were detected at this time. Herbicide influences had disappeared previously (Schrodter *et al.* 1984).

Cutting heights were—< 2 cm (the lowest possible cutting by mower), 2.5 cm, 5 cm and 7.5 cm above ground level. All cutting was done with a Jari autoscythe; cutting height was adjustable.

TABLE 1

The effect of cutting height on lucerne cultivars harvested when the crown shoots reached 2.5 cm in height

Treatment	Dry matter yield (t ha^{-1})					
	Year 1		Year 2		2 year aggregate	
	Lucerne	Weeds	Lucerne	Weeds	Lucerne	Weeds
Effect of Cutting Height						
Less than 2 cm	22.1	0.2	19.6	0.2	41.7	0.4
2.5 cm	21.0	0.2	19.3	0.3	40.2	0.5
5.0 cm	19.8	0.3	18.8	0.3	38.5	0.6
7.5 cm	16.9	0.2	16.9	0.2	33.8	0.4
LSD P = 0.05	0.5	0.1	0.5	0.1	0.8	0.2
Effect of Cultivar						
Condura 73*	16.7	0.2	18.1	0.1	36.8	0.3
Pioneer 581	19.6	0.5	19.2	0.1	38.8	0.1
Hunter River	17.8	0.5	19.2	0.3	40.4	0.6
DK 185	19.3	0.1	18.0	0.1	37.3	0.2
CUF 101	22.2	0.3	19.0	0.6	41.1	1.0
Matador	22.1	0.2	18.3	0.4	37.0	0.7
LSD P = 0.05	1.3	0.3	1.1	0.2	2.2	0.4

* Listed in order of increasing winter activity (Lowe *et al.* 1985).

Management

Cutting was matched to growth, and was timed to coincide with the elongation of secondary basal shoots to approximately 2.5 cm above the soil surface. This entailed cutting different cultivars at different times. Generally it was found that the highly-winter active lines were able to be cut together (i.e. CUF 101, Matador) while the defoliation times of the winter active and semi-dormant types (i.e. DK 185, Hunter River, Pioneer 581 and Condura 73) also coincided.

The area was fully irrigated, with applications of 50 mm every two weeks. To counteract a possible sulphur deficiency (Dickson and Asher 1974), superphosphate was applied at the end of the first year of the experiment (20 months after sowing the original, herbicide experiment).

Measurements

Plant populations were determined by counting 15 random 0.25 m × 0.25 m quadrats per plot prior to the initial harvest and subsequently in April and October for two years.

Dry matter yields were measured by cutting the whole 8.8 m^2 plot area to the particular height, weighing and sorting a sub-sample and drying at 80°C for 48 hours.

RESULTS

Lucerne produced significantly greater yield ($P < 0.05$) when cut at less than 2 cm compared to its production when cut at 2.5 cm in the first, but not the second year (Table 1). Increasing the cutting height above 2.5 cm, by increments of 2.5 cm, to 7.5 cm significantly reduced yield of lucerne in both years. Raising the cutting height from 5 to

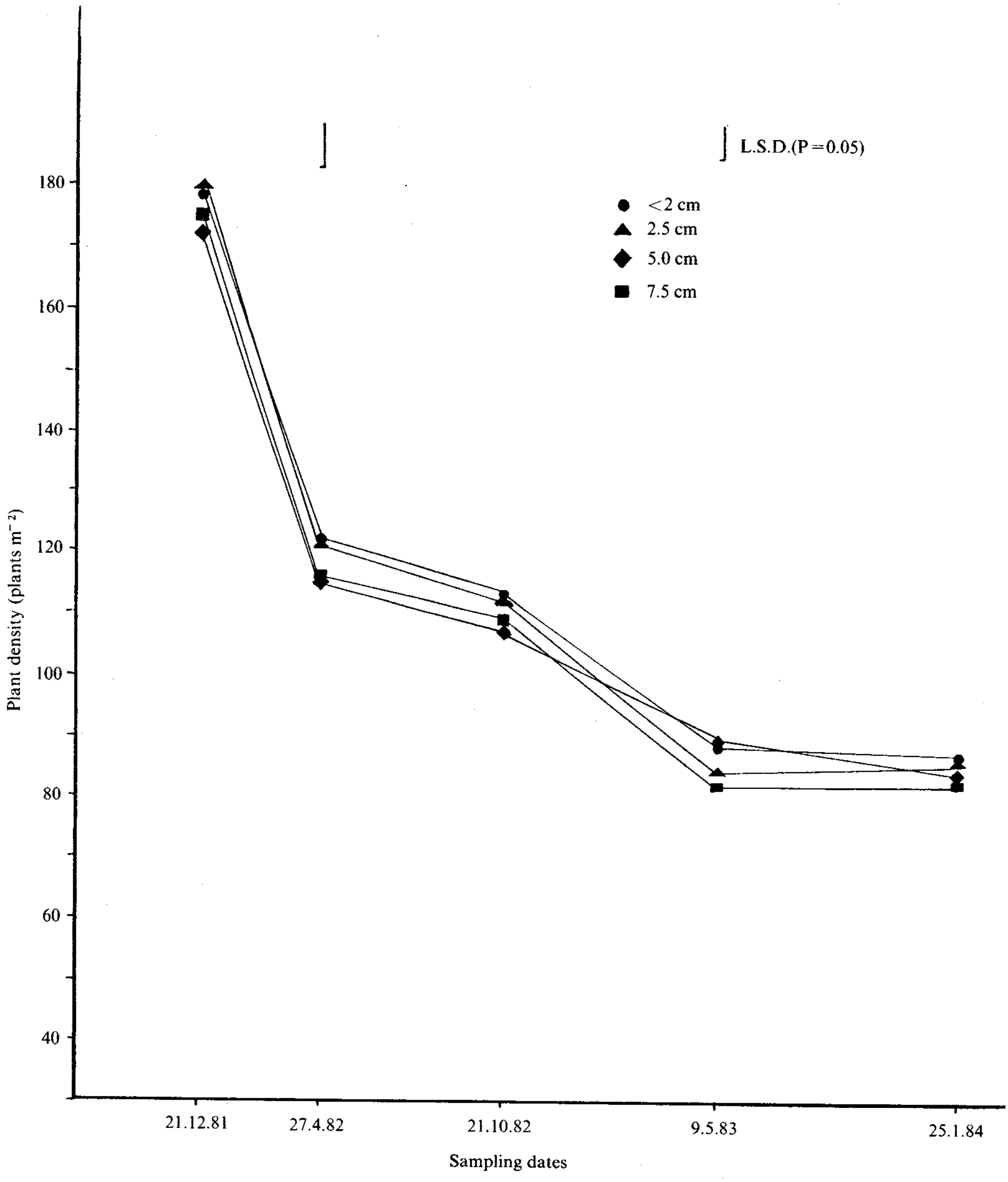

FIGURE 1

Plant density changes in response to different cutting heights over two years (data averaged for cultivars).

7.5 cm reduced yields more than did the other height increments. Over a two year period, the reduced yield incurred by these increments was 1.44 t ha^{-1} (< 2 cm to 2.5 cm), 1.7 t ha^{-1} (2.5 to 5.0 cm) and 4.7 t ha^{-1} (5.0 to 7.5 cm). Weed yields were low (Table 1) and virtually unaffected by cutting height. The 5.0 cm cutting height had higher weed yields ($P < 0.05$), but only in the first year. The main weed during the experiment was nut grass (*Cyperus rotundus*).

Lucerne and weed yields showed no interaction between cutting height and lucerne cultivar in either year ($P < 0.05$). On the other hand, cultivar differences were evident in each year. Matador and CUF 101 were higher yielding ($P < 0.05$) than the other cultivars in the first year, while Pioneer 581 and DK 185 were higher ($P < 0.05$) than Hunter River (Table 1). In the second year, all cultivars except DK 185 gave equivalent yields ($P < 0.05$). There was an increase in the weed content of the two most winter active cultivars, CUF 101 and Matador, in the second compared to the first year although it still represented only 3 percent of the total yield.

Plant population showed a similar decline at all heights. Changes in response to cutting height were small and inconsistent (Figure 1). There were no significant cultivar/cutting height interactions.

Cultivar type influenced persistence because plant populations of cultivars differed significantly at the start of the experiment, but after two years, these differences had disappeared (data not presented).

DISCUSSION

The results of this experiment suggest that when lucerne is cut as regrowth shoots reach 2.5 cm, height of cutting has a major effect on yield but has little influence on persistence. There was a linear decrease in d.m. yields in both years ($r = -0.98$(1982), $P < 0.01$; -0.95(1983), $P < 0.05$) with increasing height of cutting. This agrees with data obtained in the United States (Smith and Nelson 1967; Ogden and Kehr 1968).

Cultivars with different activity levels showed the same response to cutting height. This is somewhat surprising when the different crown structures and differential rate of crown bud regrowth between activity types is considered. Kust and Smith (1962) found that there was an interaction between cutting height and frequency. As all cultivars were cut when their basal shoots reached 2.5 cm, the likelihood of significant damage to buds was not as great as if the cutting was matched to a fixed frequency. Physical damage to the crown structure from the mower blades was not a serious problem in the short term; over a longer period however, the extra damage at the lowest cutting heights may induce a more rapid invasion of crown damaging organisms such as borers and crown rots. The trend for better persistence and improved productivity in the second year of the more crown rot (*Colletotrichium trifolii*) resistant cultivar Hunter River suggests that this may have already been occurring in this experiment. The larger, heavier commercial mowers may result in more severe damage at the lowest cutting height than was experienced with the light, hand operated mower used in this experiment. However, the extra yields obtained from this low cutting compared with the height of 2.5 to 5.0 cm, and the insignificant effect of the lower cutting heights on persistence suggests that a cutting height of about 2.5 cm will achieve maximum yields from all the cultivars.

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DISEASES OF *MACROPTILIUM ATROPURPUREUM*—A REVIEW

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ABSTRACT

Diseases of Macroptilium atropurpureum *cv. Siratro caused by fourteen genera of fungi, one bacterium, one virus and one genus of nematodes are described. Rhizoctonia foliar blight, common bean rust, false-rust and leaf-mottling virus are regarded as major constraints to the further use of Siratro in several regions. The latter two diseases have not yet been detected in Australia and care must be taken to prevent their introduction.*

Resistance to several of the major diseases has been identified, but more screening of existing M. atropurpureum *germplasm collections is needed. This should be given a high future priority, especially with respect to multi-institutional collaborative screening in Central and tropical South America where most of these diseases are endemic.*

INTRODUCTION

Macroptilium atropurpureum (D.C.) Urb. is a tropical pasture legume native to Central and tropical South America (Tothill 1966). It is best known as the cultivar Siratro, a successful pasture legume in the 700–1200 mm rainfall zones of the tropics and subtropics (Jones and Jones 1978). The morphological and agronomic attributes of Siratro have been described in detail by various authors (Hutton 1962; Kretschmer 1972; Shaw and Whiteman 1977; Tothill and Jones 1977).

In 1976, 103,710 ha were estimated to be sown to Siratro pastures in Australia, more than twice the area of any other tropical pasture legume species (Shaw and Whiteman 1977). Apart from its widespread use in Australia, Siratro has been used to a limited extent as a commercial legume in association with *Digitaria decumbens* and *Paspalum notatum* in southern Florida (Kretschmer 1972); it is generally reported to have performed well in various agronomic trials in Mexico, Costa Rica and Brazil where it has naturalized extensively along roadsides; and it has been tested with some success in many countries in southern, eastern and western Africa; in Thailand, India and Indonesia; and in New Guinea and various Pacific islands (Shaw and Whiteman 1977).

Siratro was the subject of an intensive review in Volume 11 (1) of this journal. Although most aspects of its role as a tropical pasture legume were reviewed in detail, few comments were made concerning diseases. A knowledge of the various diseases of Siratro is essential to evaluating its continuing future use. This paper attempts to bring together all the information in the literature and observations made by the authors on