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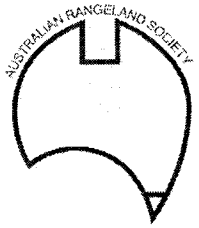

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PLANT SPECIES RESPONSES TO GRAZING IN *ASTREBLA* GRASSLAND

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INTRODUCTION

There is increasing interest in the impact of grazing by domestic livestock on biodiversity in *Astrebla* (Mitchell grass) grasslands (Woinarski 1999). A long term grazing study in *Astrebla* grasslands in Queensland (Orr 1998) provides an opportunity to examine the impact of different grazing pressures on pasture species diversity. This paper presents data on the germinable soil seed banks of eight pasture species in response to four grazing pressures when meaned across the period 1984 to 1999.

METHODS

A grazing study incorporating four levels of forage use (utilisation rates) was established in *Astrebla* grassland at "Toorak" Research Station, Julia Creek, Queensland. Sheep numbers are set annually at the end of the summer period so that anticipated proportions of 10, 30, 50 or 80% of the total forage will be consumed over the ensuing year. Grazing commenced in 1984 and remains current in 2000.

Population dynamics of *Astrebla* spp. are monitored annually in permanent quadrats (Orr 1998). Germinable soil seed banks are monitored to complement population changes in *Astrebla* spp. and *Iseilema* spp. Fifteen soil cores, each 12 x 12 cm, are collected each spring in each paddock and seeds are germinated (Jones and Bunch 1988) and seedlings identified and counted.

RESULTS

Grazing resulted in substantial differences in the germinable soil seed banks of a wide range of species (Figure 1). Of the major grasses, *Astrebla* spp. showed little variation with grazing whereas *Iseilema*

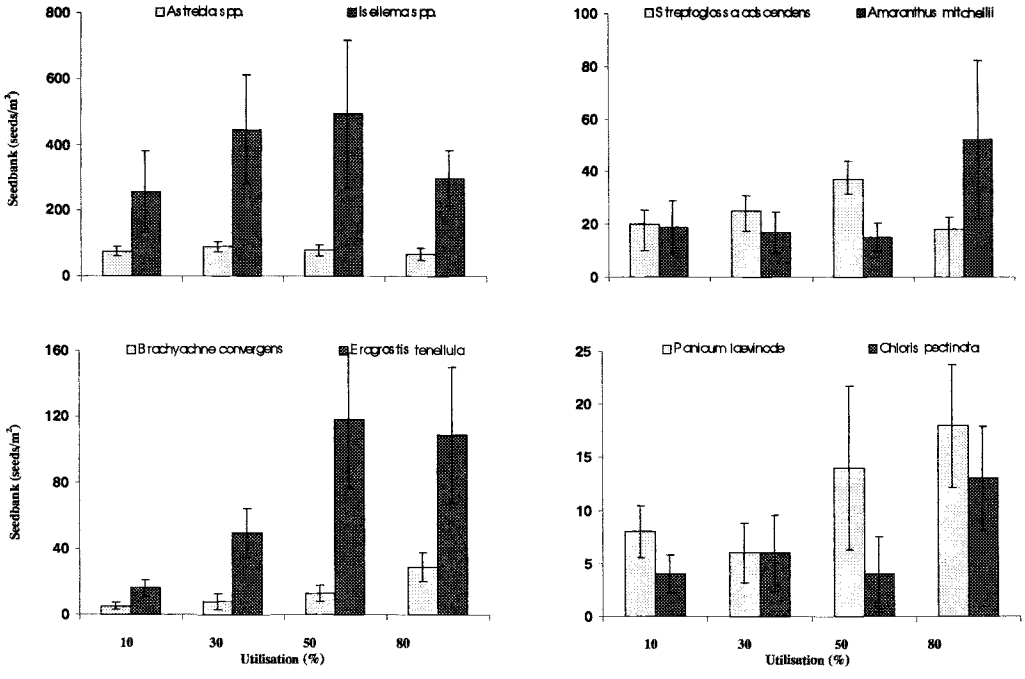

Figure 1. Effects of utilisation (%) on the mean germinable soil seed bank (seed/m^2) of (a) major species *Astrebla* spp. and *Iseilema* spp., (b) annual forbs *Streptoglossa adscendens* and *Amaranthus mitchellii*, (c) major annual grasses *Brachyachne convergens* and *Eragrostis tenellula* and annual grasses *Panicum laevinode* and *Chloris pectinata*. (Vertical bars are standard error of the mean).

spp. increased with grazing up to 50% utilisation and declined at 80% utilisation. Of the annual forbs *Streptoglossa adscendens* also increased with grazing up to 50% utilisation and declined at 80% utilisation whereas the summer annual forb *Amaranthus mitchellii* was highest at 80% utilisation. Of the annual grasses *Brachyachne convergens* and *Chloris pectinata* were highest at 80% utilisation whereas *Eragrostis tenellula* and *Panicum laevinode* were highest at both 50% and 80% utilisation.

DISCUSSION

Different grazing pressures have impacted on overall species diversity despite large seasonal variation in occurrences between 1984 and 1999. At light grazing (10% utilisation), relatively high yields of *Astrebla* spp. probably reduce the growth of other species. Increasing grazing pressure to moderate (30 and 50% utilisation) reduces *Astrebla* spp. yields resulting in the growth of species such as *Iseilema* spp. and *S. adscendens* and this growth increases their soil seed banks. However, these two species are preferentially grazed by sheep (Pritchard *et al.* 1986) so that heavy grazing pressure (80% utilisation) reduces their occurrence and these species are replaced by the less preferred species *Brachyachne convergens* and *Amaranthus mitchellii* (Orr 1980).

The germinable seed bank values presented underestimate the total seed banks for two reasons. Firstly, the capillary watering method employed here underestimates the seed bank compared with an overhead method (Orr *et al.* 1996). Secondly, these values are from one wetting cycle whereas Orr (1999) has indicated that not all seeds germinate in the first wetting cycle.

These data indicates that the impact of heavy grazing in *Astrebla* grasslands may be detected through the high incidence of those species which are less preferred for grazing by domestic livestock. This could be achieved through the use of soil seed bank measurements even during dry periods which restrict pasture growth.

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