THE EFFECT OF GRAZING MANAGEMENT ON THE BOTANICAL COMPOSITION OF ANNUAL PASTURES GRAZED BY CATTLE

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SUMMARY

Botanical composition of annual pastures in two cattle grazing experiments each lasting four years is reported. The pattern of rainfall in late summer and autumn affected the clover proportion in both experiments. Conserving a third of the area in spring as baled hay but not standing pasture tended to increase the proportion of weeds at the expense of grass. Stocking rate had no significant effect on botanical composition.

INTRODUCTION

Purser (1981) suggests that the well defined herbage phases in the Mediterranean environment may provide cause and scope for more supplementary feeding than in temperate environments. However, benefits of supplementary feeding need to be carefully investigated not only for specific animal production purposes but also for between year effects on pasture yield and botanical composition. Conserving surplus forage in spring, to supplement animals in late summer-autumn, not only transfers nutrients but also affects the botanical composition of the sward (McIver and Smith 1973; Reeves and Smith 1975). Such changes in composition may affect production in winter (Hamilton 1974) or mineral status of the sward (Greathead and Barker 1985). This paper describes the effects of grazing management on botanical composition of annual pastures in two cattle grazing experiments in south western Australia.

MATERIALS AND METHODS

Experiment 1

This experiment was conducted at Mt Barker Research Station (1972 to 1975) on established pastures consisting of subterranean clover (Trifolium subterraneum cvv Mt Barker, Woogenellup and Yarloop), barley grass (Hordeum leporinum), winter grass (Poa annua), silver grass (Vulpia spp), capeweed (Arctotheca calendula) and wild geranium (Erodium botryis). Details of the experiment and seasons are reported by Greathead et al. (1978). Two systems of fodder conservation (BAL, STA) were compared with continuous grazing (NIL) for steers grazed at three stocking rates (2.5, 2.0 and 1.75 steers/ha). Six steers, weaned at eight months of age in December, were allocated to each plot and removed the following December. The continuously grazed steers had access to the whole plot all this time, In BAL a third of each plot was excluded from grazing from early September until hay was cut, baled and removed in November, hay was fed back after the break of season in April. In STA a third of each plot was excluded from grazing from early October until mid February, when animals were transferred from the grazed area. From the break of season until October the steers grazed the whole area. The three by three factorial design was arranged in two randomized blocks with six animals per plot.

Experiment 2

Breeding cows were run from 1977 to 1981 on the same site as experiment 1. Continuous grazing (NIL) was compared with a baled hay system (BAL) as for experiment 1 at 1.1 (HI) and 0.9 (LO) cows/ha. The two by two factorial design

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was arranged in two randomized blocks with eight cows per plot. A description of animals used and background to the site are reported by Greathead and Barker 1985.

The botanical composition of the pasture was estimated in both experiments. In autumn, subsamples were sorted from the bulked herbage from 60 cores (10 cm diameter) per plot. In winter and spring, subsamples were sorted from the bulked material from 50 cuts (10 cm x 30 cm) per plot or the estimate was made from ranking on dry weight (Mannette and Haycock 1963). At all samplings conserved areas were proportionally represented and values reported are means of the whole plot. Spring samplings were recorded when hay conservation commenced in mid September. In experiment 1, the pasture samples had been bulked across replicates, so the results could not be analyzed statistically. In experiment 2, an analysis of covariance was used to compare the effects of conservation and stocking rate. This analysis was done on the arcsin transformed percentages of clover, weeds and grasses using the pre-experiment percentages of spring 1977 as covariates.

RESULTS

Experiment 1

![Fig. 1. Percentages of clover , weed and grasses in spring in:
(a) steer pastures grazed continuously (NIL) or with part conserved in spring as baler hay (BAL) or standing pasture (STA).
(b) pastures with 2.5 (HI), 2.0 (MED) and 1.75 (LO) steers per ha.]

Only the spring results are reported, because they represent the treatment patterns earlier in the year as well. The average results during the experiment and for the year preceding it are shown in Fig. 1 for experiment 1 and in Fig. 2 for experiment 2.

In experiment 1, in the spring preceding the experiment the pasture contained about equal proportions of clover, weeds and grasses. During the experiment, the only marked difference in botanical composition between years was the relatively low proportion of clover and relatively high proportion of weeds (mainly capeweed) during 1974. The only marked effects of the conservation
method on botanical composition was a tendency for the proportion of weeds to increase and the proportion of grasses to decrease with the BAL system from 1973 onwards. There was no appreciable difference in botanical composition between stocking rates.

In experiment 2, in the spring preceding the experiment the pasture contained more grass than clover and only a small proportion of weeds. There was no interaction of the treatments on botanical composition. During the experiment here was a difference among years in the proportion of weeds (P<0.05) and grasses (P<0.1). Botanical composition did not differ (P>0.05) with stocking rate and with conservation there was an increase (P<0.01) in the proportion of weeds and a decrease (P<0.05) in the proportion of grasses in all years.

The effect of conservation within the cut areas on botanical composition was greatest in the first year after cutting, still evident in the second year, but negligible in the third.

**DISCUSSION**

The largest variation in botanical composition, especially that of the clover component is between years and it appears to be related to weather conditions early in the season. Early "breaks" (rainfall events supporting widespread germination) followed by a dry period were experienced in 1974 and 1978 to 1981. In three of these years the clover component was low and weed levels were high, which fits the pattern of poor clover seedling survival relative to that of capeweed and erodium. However, in 1979 and 1981 early false breaks were followed by relatively late subsequent germinating rains, where survival of weed and grass seedlings was also likely to have been reduced. The effects recorded generally support other citations and recordings (Rossiter 1966).

Cutting pasture in spring for conservation as hay led to increased proportions of weeds in the pastures of both experiments. A similar effect occurred in a pasture including perennial ryegrass at Denmark Research Station (Greathead et al. 1989). In this experiment cutting silage resulted in a higher proportion of weeds, mainly sorrel (Rumex acetosella), and a lower proportion of subterranean clover than where the pasture was continuously grazed. The perennial grass proportion was not significantly affected. In the annual swards (experiments 1 and 2), weeds displaced grasses, probably a result of harvesting the erect grass seed heads at cutting, while not affecting the proportion of clover. In the perennial ryegrass experiment the displacement of clover by sorrel was probably associated with different mechanisms, such as potassium nutrition and substitution of silage for paddock feed in autumn (Greathead et al. 1989).
The effect on botanical composition of the standing conservation system was little different from the continuously grazed. The increased grazing pressure on the areas not being conserved in spring i.e., 2/3 of the BAL (experiment 1 and 2) and STA (experiment 1) treatment would not necessarily decrease barley grass seed set and hence subsequent proportion of grass in the sward (Smith 1968). However, Davies (1966) reported a large decrease in the grass proportion, increase in the weed proportion and little change in the subclover proportion of an annual pasture associated with an increase in sheep stocking rates. There was no significant effect of stocking rate on botanical composition in experiments 1 and 2 or in the perennial grass experiment at Denmark. This is probably because grazing pressures required for optimum production by cattle are likely to be lower than for sheep (Hamilton 1975).

In experiments 1 and 2 botanical composition is reported as plot averages. Conservation was practiced on only one third of the area and not in the same area in consecutive years. If an area is repeatedly cut it is likely composition changes would be more dramatic (Crocker and Tiver 1948).

The effect of botanical composition on animal production could not be determined from these data as composition changes are confounded with conservation system. However botanical composition changes of pastures over time should be considered when planning conservation management systems as they can affect the quality (Greathead and Barker 1985) and pattern of production (Hamilton 1974) of subsequent pasture.

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REFERENCES