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EFFECT ON NITROGEN FERTILIZATION AND SLASHING ON THE PRIEBE PRAIRIE GRASS (BROMUS UNIOLOIDES) COMPONENT OF AN IRRIGATED PASTURE

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SUMMARY

The effect of 200 lb/ac/annum of nitrogen applied as urea in split applications, and of regular slashing after each grazing, was studied for 3 years on an irrigated sward. The pasture initially consisted of 20% Priebe prairie grass and 75% Ladino white clover. Inadequate summer irrigation caused the clover to largely disappear from the sward in the first 15 months of the study. This was accompanied by summer grass invasion.

Very marked responses by the prairie grass occurred as the clover disappeared from the sward and the rate of cool season nitrogen application was increased. Over the 1966 season, nitrogen increased the total yield of prairie grass from 1,105 lb/ac oven-dry matter to 7,618 lb/ac. Nitrogen depressed clover yield on one occasion. At the end of the trial the nitrogen fertilized sward was composed of 75% prairie grass and equal proportions of clover and weeds.

Slashing after each grazing decreased yield of prairie grass on only three occasions.

I. INTRODUCTION

A number of authors, including Bennett (1951), Saxby (1945), and Wheeler and Hill (1957) have claimed that common prairie grass (*Bromus unioloides* H.B.K.) requires a very fertile soil and produces poorly on areas of low fertility. It is also known to lack persistence. Donald (1939), however, found that it was a valuable and persistent constituent of irrigated dairy pastures on many properties on reclaimed swamps along the lower Murray River. He considered that features contributing to its lack of persistence were the use of poorer types, infestation of seed by the smut fungus (*Ustilago bromivora*) and unsuitable grazing management.

With regard to its management he considered that prairie grass was more susceptible than most grasses to continuous or over-frequent grazing because of a rapid rate of shoot elongation, that close grazing injured the crown more than in strongly perennial species, and that it was extremely palatable and susceptible to selective grazing unless forming a major proportion of the pasture.

Donald and Parker (1942) stressed that the species is not strongly perennial. Even commercial types which were supposedly perennial were only weakly so.

The Priebe strain of prairie grass is a smut-free, vigorous, high-yielding cultivar sold commercially as a perennial form. It conforms to the Type VI grouping of strains which Donald (1939) examined. It has shown considerable initial promise as a component of irrigated pastures for the fertile alluvial soils of Callide Creek in subcoastal Central Queensland. This is especially so when combined with Ladino white clover (*Trifolium repens* L.). It has, however, shown poor persistence beyond 18-24 months after planting.

Grof, Cameron, and Courtice (1969) as a result of a study of different recovery intervals between grazings, with and without autumn and spring spelling, and extending over almost 3 years, concluded that some factor other than grazing management was responsible for this lack of persistence. They were able to obtain only a slight, but quite inadequate, increase in prairie grass yields at the lowest level of utilization.

On a 17-month-old pasture at Biloela which contained 20-30% prairie grass, Grof and Courtice (unpublished) were able to increase the prairie grass yield by 170 lb oven dry matter per acre for each 25 lb of nitrogen per acre up to 100 lb/ac they had applied as urea a month previously. This was related to a fall of 4·6% in the proportion of clover for each nitrogen increment. Cameron and Courtice (unpublished), working with the same pasture at 3 years of age, which then contained only 5-10% prairie grass in a clover dominant sward, were unable to obtain any response of prairie grass to 1 cwt of urea per acre.

Saxby (1945) stated that prairie grass should not be grazed closer than 3-4 in. to the ground and it had been observed that the Biloela pastures which were normally cleared of residues after grazing with a rotary slasher cutting at 2-3 in. were possibly showing better prairie grass persistence near irrigation check banks where the slasher had not cut quite so close to the ground.

The present study was designed to explore the effects on prairie grass persistence of regular nitrogen applications and the absence of regular slashing after grazing.

II. EXPERIMENTAL

The experimental area was part of that used by Grof, Cameron, and Courtice (1969), which was planted in April 1960 to 2 lb Ladino white clover and 6 lb Priebe prairie grass per acre. It had been fenced separately and was used as station grazing. In April 1963 the experimental area was heavily grazed and oversown with 6 lb of Priebe prairie grass per acre, using a disc drill.

The present study commenced in September 1963, using a 2 x 2 x 6 split plot randomized block design with 69 ft x 21 ft main plots (nitrogen) divided longitudinally, giving 10½ ft x 69 ft subplots (slashing).

Treatments were:—

1. Nil nitrogen (N0).
2. Nitrogen (N1). This was applied as urea immediately prior to spray irrigation as follows:

   50 lb N per acre: September 1963; December 1963; March 1964; July 1964; November 1964; May 1965.

   100 lb N per acre: August 1965; April 1966; July 1966.
3. No regular slashing (S0).
4. Slashed after each grazing (S1).

In the summer of 1962-63 a pump breakdown resulted in death of much clover in the pasture. The stand recovered when watering was resumed but in subsequent summers difficulty was experienced in maintaining adequate irrigation. As a consequence both clover and prairie grass were lost through severe summer moisture stress on several occasions. Heavy weed invasion resulted, especially of the summer grasses—barnyard millet (*Echinochloa crus-galli* (L.) Beauv.), couch grass (*Cynodon dactylon* Pers.), Rhodes grass (*Chloris gayana* Kunth) and paspalum (*Paspalum dilatatum* Poir.). The prairie grass and clover, however, re-established in the pasture each autumn although from 1964-65 summer onwards regrowth of clover was poor. Because the summer fertilizer applications appeared to be stimulating weed invasion and the winter applications of 50 lb N per acre appeared inadequate to compensate for the loss of the clover, the autumn and winter applications were made at a double rate from August 1965 and the spring and summer applications were discontinued. As a result of the build-up of uneaten trash on the unslashed plots over summer, the entire experimental area was slashed in May 1965 and again in April 1966.

The area was grazed as a general station pasture approximately every 4-6 weeks by dairy cattle.

Sampling was carried out at irregular intervals, using an Autoscythe to cut a 3 ft x 16 ft (3 ft x 32 ft—29.vii.65) strip from each subplot. The green sample was weighed in the field and subsampled for later determination of botanical composition and oven-dry weight.

III. RESULTS

The effect of fertilizer on the yield components of the pasture is shown in Table 1.

At the commencement of this study the pasture contained 20% prairie grass and 75% clover. It was not until July 1965 onwards, when the clover had virtually disappeared from the sward, that there were major responses by the prairie grass to nitrogen. These responses were sufficient to be expressed in the total dry-matter yields. Depression of clover yields by applied nitrogen was recorded only at the last sampling. Nitrogen application did not significantly affect the yield of weeds and inert material.

TABLE 1

Effect of Fertilizer Nitrogen on Yield Components of an Irrigated Pasture
Oven-dry matter (lb/ac)

Sampling Date	30.ix.63	26.vii.64	9.xii.64	29.vii.65	14.ix.65	6.vii.66	29.viii.66	12.x.66
Priebe Prairie Grass								
N0	665	217	419	227	330	129	214	762
N1	763	689	725	1,212	3,574	1,401	2,552	3,665
L.S.D. 1%	884	546	768	592	1,629	827	620	1,191
Significance	N.S.	N.S.	N.S.	N1 ⩾ N0	N1 ⩾ N0	N1 ⩾ N0	N1 ⩾ N0	N1 ⩾ N0
Ladino White Clover								
N0	2,550	445	1,064	3	19	16	100	590
N1	2,543	433	1,007	23	69	7	28	113
L.S.D. 1%	867	642	476	22	145	27	184	273
Significance	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N0 ⩾ N1
Inert Material and Other Species								
N0	140	271	1,217	403	396	915	291	1,048
N1	199	467	1,433	379	523	747	222	1,107
L.S.D. 1%	156	Not	980	302	843	607	258	581
Significance	N.S.	Anal.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.
Total Dry Matter								
N0	3,361	942	2,699	633	744	1,060	605	2,400
N1	3,504	1,589	3,164	1,615	4,165	2,156	2,802	4,886
L.S.D. 1%	390	1,094	1,575	660	1,803	889	552	1,039
Significance	N.S.	N.S.	N.S.	N1 ⩾ N0	N1 ⩾ N0	N1 ⩾ N0	N1 ⩾ N0	N1 ⩾ N0

The effects of slashing after grazing (Table 2) were measurable on prairie grass yields only at samplings relatively distant from complete slashings of the experimental area. Only once was this of sufficient magnitude to significantly influence the total yield. Slashing showed no significant effects on Ladino white clover or inert and other species separates.

TABLE 2

EFFECT OF SLASHING AFTER GRAZING ON YIELD COMPONENTS OF AN IRRIGATED PASTURE
Oven-dry matter (lb/ac)

Sampling Date	30.ix.63	26.viii.64	9.xii.64	29.vii.65	14.ix.65	6.vii.66	29.viii.66	12.x.66
Priebe Prairie Grass								
S0	594	625	742	721	1,933	887	1,533	2,810
S1	834	281	401	719	1,971	644	1,234	1,616
L.S.D. 1%	876	317	309	406	370	451	442	1,191
Significance	N.S.	S0 ⩾ S1	S0 ⩾ S1	N.S.	N.S.	N.S.	N.S.	S0 ⩾ S1
Ladino White Clover								
S0	2,518	416	982	9	51	7	61	359
S1	2,574	472	1,088	17	36	16	67	345
L.S.D. 1%	625	238	334	27	90	21	153	273
Significance	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.
Inert Material and Other Species								
S0	153	516	1,592	321	377	777	220	1,104
S1	192	223	1,058	462	541	885	293	1,052
L.S.D. 1%	133	Not	1,265	290	369	358	204	581
Significance	N.S.	Anal.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.
Total Dry Matter								
S0	3,265	1,557	3,316	1,051	2,361	1,672	1,813	4,273
S1	3,600	974	2,548	1,197	2,548	1,545	1,594	3,013
L.S.D. 1%	712	781	1,127	441	418	597	456	1,039
Significance	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	S0 ⩾ S1

IV. DISCUSSION

The two treatments imposed on this pasture affected only the prairie grass yield to any extent. Sometimes these effects were sufficient to be expressed also in the total dry-matter yield. Nitrogen application had a very marked effect in stimulating prairie grass yield once the initial clover-dominant phase had passed. With the added nitrogen, especially the higher rates used in late 1965 and 1966, the prairie grass was able to re-establish satisfactorily in the summer growing weedy species and to produce well over winter and spring. The clover, on the other hand, did not readily re-establish amongst these summer species. In unfertilized plots the prairie grass seedlings were present at an equal density but remained small and unthrifty and made little contribution to the forage available.

The effects of slashing are less clear-cut, as the design used did not provide a means of determining whether the increased yields from non-slashing, when these were recorded, were due to better persistence of unslashed plants, more rapid regrowth of these plants or merely a carry-over of ungrazed residues from previous grazing cycles. The main effect of slashing after each grazing was expected to be a reduced season-to-season persistence of old crowns. Lack of adequate summer watering, however, was sufficient to kill all old plants over several summers, so during each season only seedling plants were present. Much heavier seeding was observed on the unslashed subplots but these were too narrow to ensure subsequent higher seedling germination in these plots only. Seed could readily have spread over the full width of the adjacent slashed subplots. It appears that the effects of not slashing regularly were due to accumulations of ungrazed material. There may, however, have been some effects of faster regrowth following grazing.

An impression that more non-gramineous weeds were present in the unslashed plots was not substantiated by the data.

The major conclusion to be drawn is that degenerate white clover-prairie grass pastures can, with minimal summer watering but with adequate autumn, winter and spring watering and with two heavy applications of nitrogen, yield large amounts of prairie grass forage over winter and early spring, frequently a critical period. The rate of application requires further study. It also remains to be seen whether a young pasture containing adequate prairie grass can be maintained in this condition by earlier applications of nitrogen. The role of slashing after grazing of these pastures is still obscure but it appears that the slasher should be used as little as possible, especially in spring, when seed-setting is markedly encouraged by its absence.

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