The effect of closing date on the performance of beef weaners grazing foggaged *Digitaria eriantha* and *Acroceras macrum*

A.P. van Schalkwyk and W.D. Gertenbach[1]
KwaZulu-Natal Department of Agriculture, P.O. Box 626, Dundee, 3000 Republic of South Africa

Abstract

Digitaria eriantha spp. *eriantha* and *Acroceras macrum* foggage, closed off at three different dates (end of December, end of January and end of February), was evaluated for use as winter grazing for the overwintering of weaner steers in the Sour Sandveld of KwaZulu-Natal. Delaying the closing date led to an improvement in the quality of the herbage, where a higher crude protein content and a reduced crude fibre content were taken as indicators of nutritive value. Closing date had a major effect on dry matter yield, which was directly related to the length of time the pasture was closed off. Closing date significantly affected animal performance. With both pastures, steer growth rate was negative when the pastures were closed off in December, whereas the steers grazing pastures closed off in February achieved the highest live mass gains over the grazing period.

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[1]Author to whom correspondence should be addressed. Present address: KwaZulu-Natal Department of Agriculture, Private Bag X9059, Pietermaritzburg, 3200 Republic of South Africa. Email: gertenbachw@cedara.kzntl.gov.za

Introduction

Meaker (1978) stated that the low nutritional value of veld, especially during the winter, is the major problem for beef cattle production in Bioclimate 8 (Phillips, 1973) of KwaZulu-Natal. This view was supported by Louw (1984), quoting Cross (1979) who stated that wintering beef cattle is a problem both from a nutritional and a cost point of view. Production costs must be reduced to keep pace with cost increases that are not in harmony with increases in beef prices. Increases in the cost of bought feeds will force producers to rely increasingly on roughage production in order to maintain the economic viability of cattle enterprises. I'Ons (1968) and Rethman & Gouws (1973) were of the opinion that foggaging perennial pastures is one possible way of increasing roughage utilization. Evidence is accumulating that *Digitaria eriantha* spp. *eriantha* (Smuts finger grass) has the potential to become one of the most suitable and widely used planted pastures in the summer rainfall areas of South Africa (Rethman, 1987). *Acroceras macrum* (Nile grass) is eminently adapted to the moist, marshy areas of northern KwaZulu-Natal (Rhind & Goodenough, 1979). Although foggage is used on many commercial farms, relatively little research has been undertaken on the subject (Dannhauser, 1988). The objective of this trial was to evaluate foggage from these two pastures, closed off at different dates, as winter feed for weaner steers.

Materials and methods

The trial was run at the Dundee Research Station (altitude 1219 m; latitude 28^0 E 10' S; longitude 30^0 E 19' E), where the winters are dry and the summer rainfall (777.3 s.e. 150.6 mm/annum) is relatively low and erratic. Six ha each of *D. eriantha* and *A. macrum* was established under dry land conditions on soils classified as Longlands (MacVicar, *et al.*, 1977). The pastures were lightly grazed by mature beef cows during the first year after establishment, after which they were used for the three years of the trial. At establishment, superphosphate (10.5% P) and potassium chloride (KCl; 50% K) were applied to achieve soil P and K levels (the P and K levels were determined in ammonium bicarbonate extracts of the soil samples) of 20 and 150 mg/l, respectively. Subsequently, these levels were maintained with annual fertilizer applications in September, dependent on soil testing. Nitrogen (N) was applied annually as limestone ammonium nitrate (LAN, 28%) at the times and at the application rates listed in Table 1.

Table 1 Nitrogen application for *D. eriantha and A. macrum* pastures used in the experiment.

Closing date	Date applied	N applied (kg/ha)
End of December	September	75
	End of December	120
End of January	September	75
	End of November	75
	End of January	120
End of February	September	75
	End of November	75
	End February	120

For three consecutive years (1984/85 (Y1), 1985/86 (Y2) and 1986/87 (Y3)), each pasture was divided into three blocks of equal size and each block was subjected to one of three closing dates for foggaging i.e. end of December (C1), end of January (C2) and end of February (C3). Summer grazing in each of these treatments was ceased 14 days before the official closing date, after which the relevant pasture was mowed to a constant height of approximately 10 cm. Thereafter the pasture was closed off to foggage. The same blocks were subjected to the same treatments during all three years of the trial. Grazing of the foggage commenced annually in June after the first frost. For each closing date, there were two levels of feed allocation, namely three (A3) or five (A5) kg dry matter (DM)/steer/day. The DM allocation was achieved by strip-grazing the foggage of the respective sub-paddocks using electric fencing. The size of the strips within each sub-paddock was adjusted according to the DM yield to allow each steer access to either three or five kg DM/steer/day. The electric fence was moved forward once a week and there was no back fencing. The date at the end of the week during which the last strip of a sub-paddock had been grazed was taken as the closing date for the relevant treatment for that season. Grazing days were calculated according to these dates. The DM (kg of foggage) available for grazing in the respective blocks allocated to C1, C2 and C3 was determined for each pasture by cutting and weighing the grass from five randomly selected areas of $1m^2$ each. The DM content of these samples was determined by drying a composite sub-sample for each closing date to a constant weight in an oven at $80^{O}C$ (AOAC, 1965). The same composite sample was used to determine the crude protein (CP) and crude fibre (CF) contents of the foggages (AOAC, 1965).

One hundred and forty four Sussex weaner steers (mean live mass 194.8 s.e. 0.98 kg), were divided into 12 comparable groups of 12 steers each. Each group was allocated randomly to one of each of the twelve treatments of two pastures, three closing off dates and two stocking rates, providing one replicate per year of each treatment. A non-protein nitrogen supplement was provided *ad lib* throughout the grazing period. The supplement consisted of 49.2% salt, 6.5% feed-lime, 19.7% maize meal, 8.2% di-calcium phosphate and 16.4% feed grade urea.

The initial live mass, final live mass and live mass gain of the steers was compared between treatments by analysis of variance (ANOVA) with years as blocks. ANOVA was used to compare the mean DM yield, CP and CF contents of the pastures.

Results and discussion

The results obtained in this trial confirmed the common finding that foggage quality is inversely related to the length of the resting period. Crude protein content increased and crude fibre content decreased with deferment of closing date (Figure 1). Crude protein content of *D. eriantha* increased from 3.95% at C1 to 7.36% at C3. The respective crude protein content of *A. macrum* was 4.97% (C1) and 7.9% (C3). These values are lower than the figures of 8.3% for *D. eriantha* and 11.9% for *A. macrum* reported by Rethmann (1984). The greatest increase in crude protein content was measured for *D. eriantha* between C2 and C3 i.e. 47.8%, whereas the corresponding increase for *A. macrum* was only 25.2%. This could indicate that the crude protein content of *A. macrum* reaches a peak at an earlier stage of the growing season. It is also possible that the crude protein content of pastures closed off earlier in the season is affected by the loss of more mature leaves, while the younger leaves remaining on the plant have a higher crude protein content. There was a gradual decrease in crude fibre content of the foggage with later closing off dates concomitant with the increase in crude protein content.

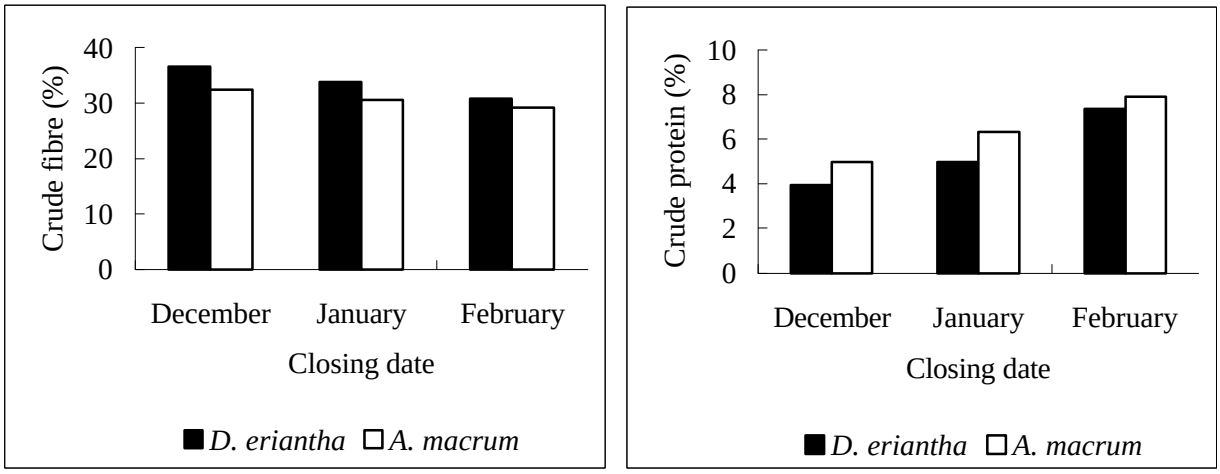

Figure 1 The effect of losing date for foggaging (December, January or February) on crude protein and crude fibre content of foggage (means for three consecutive seasons).

The crude fibre content of *D. eriantha* decreased from 36.5% to 30.9% between C1 and C3, whereas the crude fibre content A. *macrum* decreased from 32.5% to 29.3%. Figure 1 shows that *A. macrum* foggage had a higher CP and lower CF content than the *D. eriantha* foggage at all closing dates. Closing date had a major effect on DM yield, with yield decreasing at later closing dates (Figure 2).

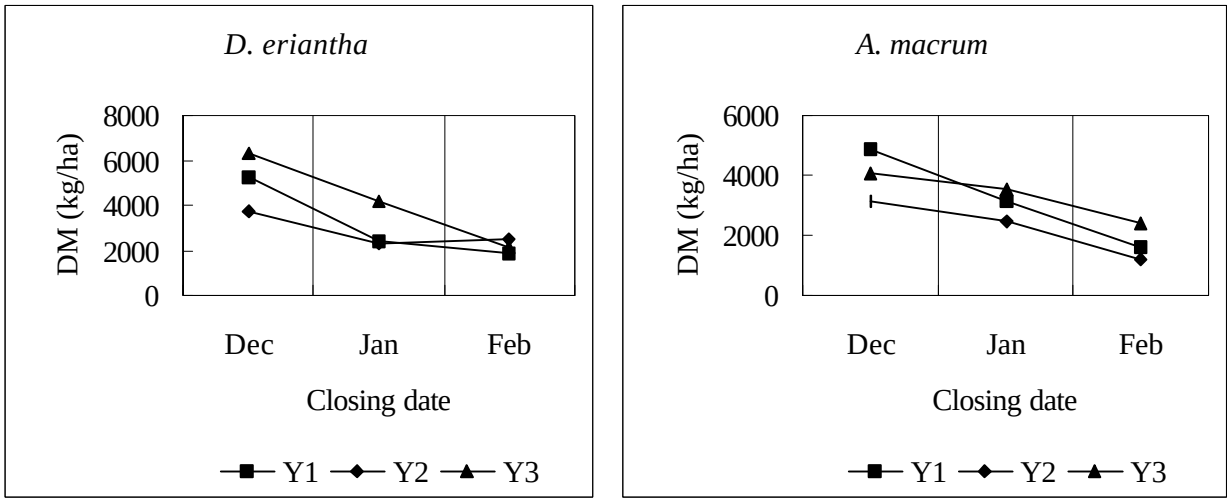

Figure 2 The effect of closing date on dry matter yield of *D. eriantha* and *A. macrum* pastures during the first (Y1), second (Y2) and third (Y3) years of the experiment

A loss of plant material caused by weathering and rotting is usually associated with earlier closing off dates (Gardner, 1958). At the experimental site, 71.8% of the annual rainfall occurs between the beginning of October and the end of January (Table 2). The relevant proportions for 1984/85, 1985/86 and 1986/87 were 59.0%, 73.1% and 66.9% respectively. The higher DM production on both pastures during the third year of the trial could be the result of the greater proportion of rain that fell after January during that year compared with the higher proportion of rain that fell earlier in the season during the first two years of the trial, associated with the single application of 120 kg N/ha. The DM production was higher during the third year of the trial than during the second year for both pastures (4 208 vs. 2 874 kg DM and 3 341 vs. 2 258 kg DM for *D. eriantha* and *A. macrum* respectively).

Table 2 Rainfall at the experimental site from October to March and rainfall distribution (mm) for 1984/85, 1985/86 and 1986/87.

Month	Season			Long term (18 year) average	Percentage deviation from the mean		
	84/85	85/86	86/87		84/85	85/86	86/87
October	111	136	62	76	+46.1	+78.9	-18.4
November	74	91	48	88	-15.9	+3.4	-45.5
December	63	87	181	114	-44.7	-23.7	+58.8
January	93	209	109	149	-37.6	+40.3	+26.8
February	185	99	98	96	+92.7	+3.1	+2.1
March	52	93	100	72	-27.8	+29.2	+38.9
Total	578	715	598	595	-2.9	+20.2	+0.5

On average, the *D. eriantha* foggage was grazed for 50.2 grazing days and the *A. macrum* foggage for 48.4 days. The difference in grazing days was not significant ($p > 0.05$). Grazing days declined from 71.1 through 46.2 to 30.7 days at C1, C2 and C3 respectively.

Initial live mass was 194.8 s.e. 0.98 kg. The mean final live mass differed ($p < 0.01$) between C1 (191.0 s.e. 2.24 kg), C2 (198.5 s.e. 1.76 kg) and C3 (201.3 s.e. 1.54 kg). Live mass gains were -2.26 s.e. 0.52, 3.13 s.e. 0.59 and 6.79 s.e. 0.44 kg/steer for C1, C2 and C3. Mass gain for C3 differed from that of the other two treatments ($p < 0.01$), but there was no difference ($p > 0.05$) between C1 and C2. Final live mass of steers grazing *D. eriantha* and *A. macrum* was 196.2 s.e. 1.73 kg and 197.7 s.e. 1.35 kg respectively. The final live mass of steers was 197.2 s.e. 1.43 kg for those allocated three kg DM/d, and 196.7 s.e. 1.67 kg for steers allocated five kg DM/d; the means did not differ ($p > 0.05$). It is noteworthy that the expected dry matter intake of a steer weighing 200 kg is 4.6 kg/steer/day. Live mass gain per steer differed ($p < 0.01$) between year 1 (4.84 s.e. 0.65 kg), year 2 (3.72 s.e. 0.50 kg) and year 3 (-0.89 s.e. 0.51 kg). This gradual decline in animal performance could have been a seasonal effect, a consequence of soil compaction or could have been caused by a weed and/or pioneer grass invasion of the pastures.

The supplement intake of steers grazing foggage (Table 3) was much lower than that previously recorded for winterveld in this vicinity (300 g/day/animal). Supplement intake was influenced by foggage quality, the highest intakes being recorded at earlier closing dates. With later closing dates, foggage quality improved and supplement intakes declined. Irrespective of closing date, supplement intakes did not differ ($p > 0.05$) between steers grazing the different pasture species. The average intakes were 130.8 and 136.5 g/animal/day for *D. eriantha* and *A. macrum* respectively.

Table 3 Daily supplement intakes of Sussex weaner steers grazing *D. eriantha* or *A. macrum* foggage.

	D. eriantha		*A. macrum*	
DM intake allocation (kg/animal/day)	3	5	3	5
		Closing date: December		
	0.169	0.169	0.178	0.161
Supplement intake (kg/animal/day)		Closing date: January		
	0.135	0.110	0.123	0.159
		Closing date: February		
	0.108	0.094	0.112	0.086

Conclusions

Foggage from either *D. eriantha* or *A. macrum* was insufficient for the maintenance requirements of young growing animals when closed off at the end of December. When closed off in January or February, foggage from either *D. eriantha* or *A. macrum* is adequate for maintenance when grazed by weaner steers. There was, however, usually no foggage remaining by the end of July, and at this location it is most difficult to provide feed during August and September. The amount of re-growth that takes place after closing off a pasture is affected by the climatic conditions prevailing at the time. In dry seasons, a long growing period is necessary for the foggage to

grow out to its full extent, whereas in wet seasons a long growing period will result in foggage that has grown too abundantly. It is known that animal performance is lowered by abundant pasture growth With later closing dates, quality becomes important, and such foggages are best used where the goal is to sustain good live mass gains which were achieved during the preceding summer season. In areas of erratic rainfall, it is not possible to adapt management strategies to each season because of the unreliability of rainfall prediction; in this case it is better to rely on one strategy on the assumption that the desired result will be achieved in the majority of years.

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