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Herbage availability as a stress factor on grazed Coastcross II Bermuda grass

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Experiments were carried out to examine stocking rate and live weight gain (LWG) relationships for Coastcross II Bermuda grass grazed for four consecutive summer periods by young growing beef cattle. Stocking rate affected the daily LWG/animal through its influence on herbage availability. Rotational grazing showed a higher optimum stocking rate than continuous grazing. This was mainly due to the increased advantage of rotational grazing over continuous grazing in terms of herbage availability, as stocking rate increased. However, animals under rotational grazing had a lower LWG at equivalent levels of herbage availability than animals under continuous grazing. Consequently, the difference in daily LWG/ha at the optimum stocking rates was relatively small.

Eksperimente is gedoen om die verwantskap tussen drakrag en toename in lewende gewig (LWG) te ondersoek vir Coastcross II Bermuda gras wat vir vier agtereenvolgende somerperiodes bewei is deur jong, groeiende vleisbeeste. Drakrag het die daaglikse LWG/dier geaffekteer deur die invloed daarvan op die beskikbaarheid van voer. Roterende beweiding het 'n hoër optimum dravermoë getoon as voortdurende beweiding. Dit kan hoofsaaklik toegeskryf word aan die toenemende voordeel van roterende beweiding teenoor voortdurende beweiding ten opsigte van die beskikbaarheid van voer soos die drakrag toeneem. Diere op roterende beweiding het egter 'n laer LWG by gelyke vlakke van beskikbaarheid van voer as diere op voortdurende beweiding. Gevolglik was die verskil in daaglikse LWG/ha by optimum dravermoë relatief klein.

Keywords: Herbage availability, stocking rate, weight gain, continuous grazing, rotational grazing, Coastcross II

Introduction

Stocking rate is known to be one of the most important factors affecting live weight gain (LWG) of animals grazing pastures (Jones & Sandland, 1974). To evaluate pastures with grazing animals, it is therefore important to apply each treatment at a range of stocking rates. By doing this it is possible to establish whether a stocking rate - treatment interaction exists (Riewe, 1961). However, stocking rate affects LWG largely as a consequence of its influence on herbage availability and subsequent stress on the animal. A measure of herbage availability is therefore necessary to facilitate a good understanding of the stocking rate/LWG relationship.

Coastcross II (K11) Bermuda grass is a sterile *Cynodon* hybrid which was introduced to South Africa in 1964 from the Coastal Plain Experiment Station at Tifton, Georgia, USA. In South Africa it has so far been evaluated only in small plots, but is rapidly becoming known amongst local farmers as a grass that is high in quality and tolerant of both drought and low fertility. The object of the research described here was to examine stocking rate – LWG relationships for Coastcross II under continuous and rotational grazing in the light of the stress placed on the animal by decreasing availability of herbage.

Method

Dryland Coastcross II pastures at the University of Natal Ukulinga Research Farm near Pietermaritzburg were grazed for four consecutive summer periods by different groups of young growing beef animals, starting in 1976. The long term mean annual rainfall for the site is 712 mm. The pasture received annual dressings of potassium and phosphate, and 350 kg of nitrogen was applied annually in three equal dressings.

Continuous grazing was applied at eight levels of herbage availability and rotational grazing at four levels of herbage availability. Rotational grazing treatments each consisted of six paddocks. Animals remained in a paddock for about a week and the recovery period was about five weeks. Herbage availability was measured weekly with the pasture disc meter (Bransby, Matches & Krause, 1977) and the average of these values for the season was calculated. On continuously grazed paddocks 50 disc meter readings were taken while on rotationally grazed systems 25 readings were taken on each of the six sub-paddocks, and the mean of these represented the availability on that day in cm of disc height. Variable stocking (Mott, 1960) was used to maintain a more or less constant herbage availability over time. Animal numbers were adjusted on the basis of the weekly disc meter readings.

Mean LWG per animal was calculated from three tester animals which remained on each treatment for the entire summer grazing period. Average stocking rate was calculated by dividing the total number of grazing days from tester and filler animals by the length of the grazing period. Results were analysed by means of regression analysis and analysis of covariance, and are presented in terms of a four-year average.

Results and Discussion

In accordance with the Jones & Sandland (1974) model, the stocking rate (x) – daily LWG/animal (y) relationship took the form y = a – bx for both continuous and rotational grazing (Figure 1). For continuous grazing the equation was y = 1,16 – 0,074x with $r = -0,93$ ($P < 0,01$) and for rotational grazing the equation was y = 0,69 – 0,24x with $r = -0,9125$, which was not significant. The slopes of these two lines are significantly different ($P < 0,01$) and this can be interpreted as a significant stocking rate – method of grazing interaction (Riewe, 1961).

Daily LWG/ha (y) was calculated by means of the equation $y = ax - bx^2$ using the 'a' and 'b' values from the corresponding linear equations described above. This identified the stocking rate at which maximum LWG/ha was achieved (optimum stocking rate) as 7,82 animals/ha and

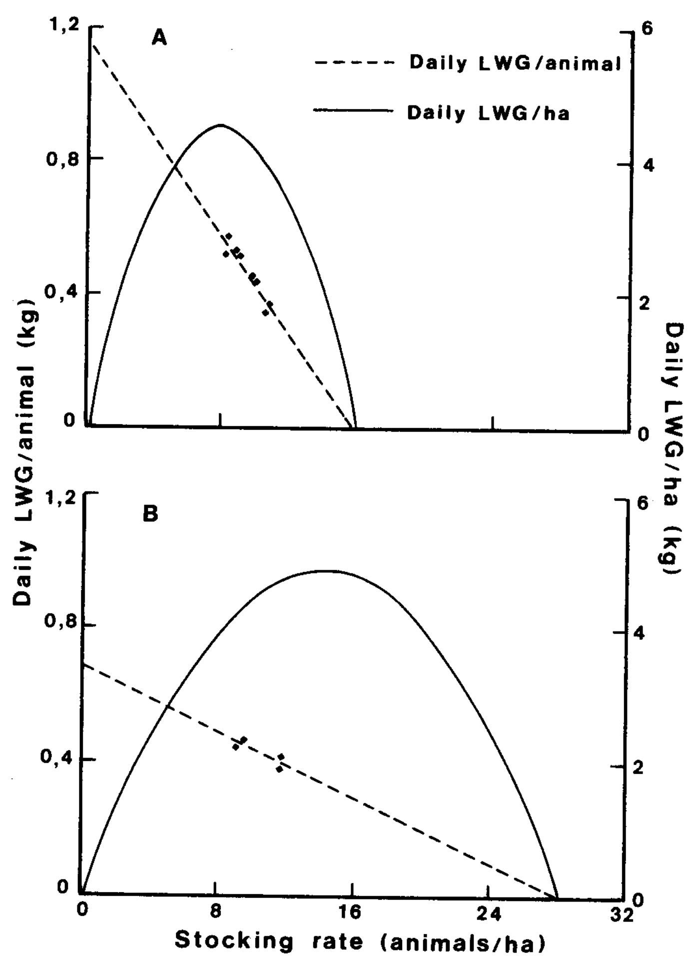

Figure 1 The relationships of daily LWG/animal and daily LWG/ha to stocking rate for young beef cattle grazing Coastcross II pastures under continuous grazing (A) and rotational grazing (B).

14,29 animals/ha for continuous and rotational grazing respectively. Daily LWG/ha at these optimum stocking rates were 4,55 kg for continuous grazing and 4,90 kg for rotational grazing, which means that the relatively large difference in optimum stocking rates was not reflected in LWG/ha.

The stocking rate (x) – herbage availability (y) relationships were also linear (Figure 2A). The equations were $y = 24{,}0 - 1{,}69x$ and $18{,}29 - 0{,}7x$ with r values of $-0{,}94$ ($P < 0{,}01$) and $-0{,}999$ ($R < 0{,}01$) for continuous and rotational grazing respectively. A significant stocking rate – method of grazing interaction was also indicated here by a significant difference ($P < 0{,}01$) between the slopes of the lines. It is clear that as stocking rate was increased rotational grazing had an increasing advantage over continuous grazing in terms of available herbage, and this is probably the main reason why rotational grazing had a higher optimum stocking rate.

Examination of the herbage availability – daily LWG/animal relationship showed no difference in the slopes of the lines for continuous and rotational grazing but there was a significant common slope ($P < 0{,}01$). This justified the fitting of two parallel lines to the data and these had significantly different locations ($P < 0{,}01$). The implication here is that at equivalent levels of herbage availability, daily LWG/animal for continuous grazing is higher than that for rotational grazing over the range of stocking rates applied. These lower weight gains were probably caused in a number of ways. Firstly, animals under rotational grazing were taking in herbage that was five weeks old and therefore lower in quality than the much younger herbage that was available on continuously grazed paddocks. Secondly, the physical confinement of the animals in a small paddock may have affected animal LWG under rotational grazing and furthermore, excessive fouling of a pasture, particularly by the end of the grazing period, could have reduced intake substantially.

In conclusion, stocking rate affected daily LWG/animal through its influence on herbage availability which was the primary stress factor. Rotational grazing on Coastcross II showed a higher optimum stocking rate than continuous grazing. This was primarily owing to the increased advantage of rotational grazing over continuous grazing in terms of herbage availability, as stocking rate increased. However, as a result of other stress factors such as herbage quality, fouling of the pasture and a high stocking density, animals under rotational grazing had a lower daily LWG at equivalent levels of herbage availability than animals under continuous grazing. Consequently, the difference in daily LWG/ha at the optimum stocking rates was relatively small.

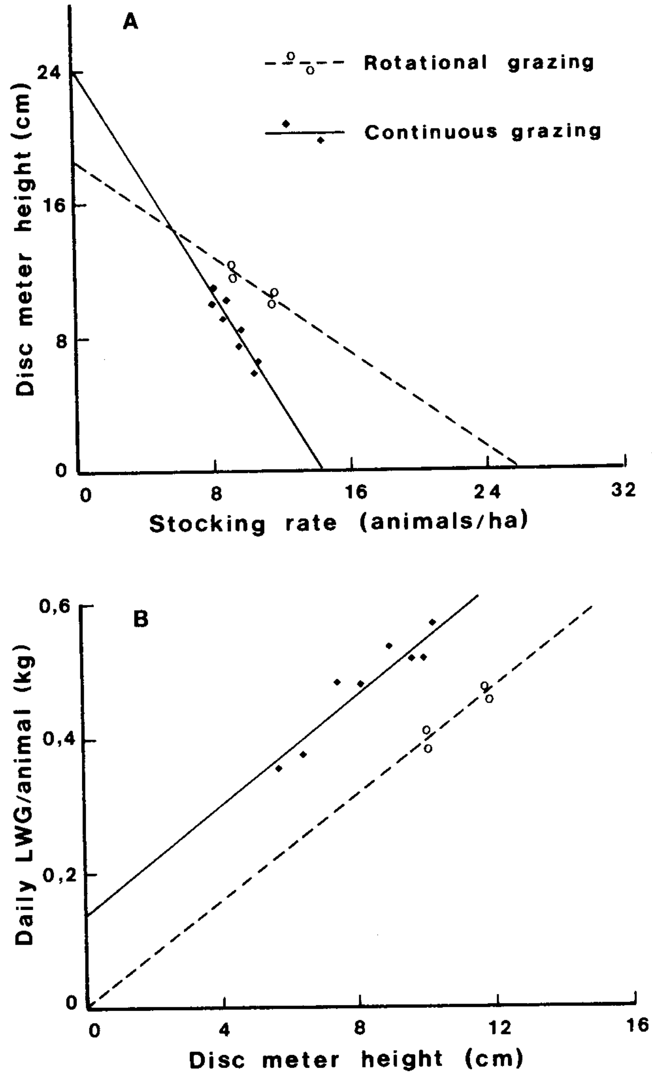

Figure 2 The relationships between stocking rate and herbage availability (A) and between herbage availability and daily LWG/animal (B) for young beef animals grazing Coastcross II pastures under continuous and rotational grazing.

References

BRANSBY, D.I., MATCHES, A.G. & KRAUSE, G.E., 1977. Disk meter for rapid estimation of herbage yield in grazing trials. *Agron. J.* 69, 393.

JONES, R.J. & SANDLAND, R.L., 1974. The relation between animal gain and stocking rate. *J. Agric. Sci., Camb.* 83, 335.

MOTT, G.O., 1960. Grazing pressure and the measurement of pasture production. *Proc. 8th Int. Grassld Cong.* 8, 606.

RIEWE, M.E., 1961. Use of the relationship of stocking rate to gain of cattle in an experimental design for grazing trials. *Agron. J.* 53, 309.