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The influence of degree of defoliation on the Grazing Capacity in the Camel Thorn Savanna

INTRODUCTION

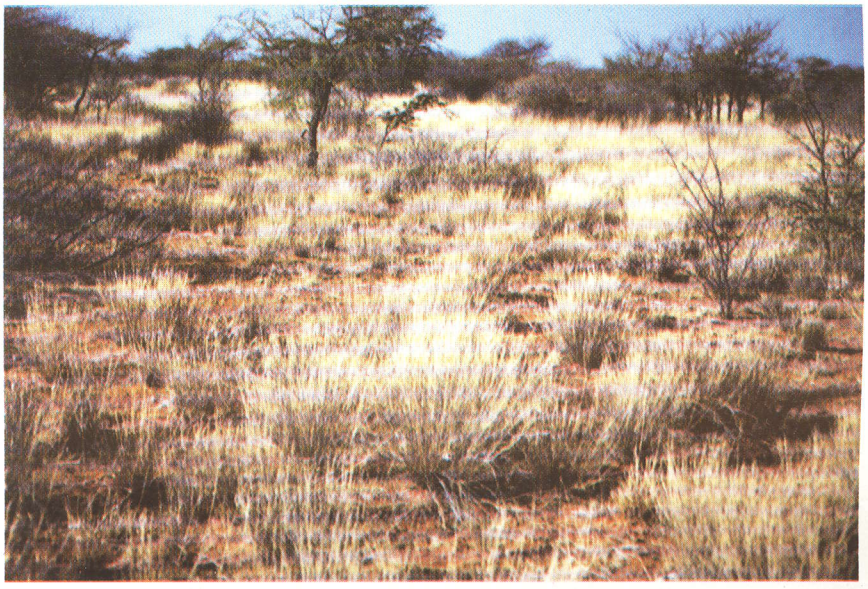
It has been established that the grazing animal prefers certain grass species above other grass species and therefore will utilize the more preferred species first, before utilizing the less preferred species (Bester, 1977; Van der Westhuizen, 1977). As the stocking rate increases, the degree of defoliation of the individual grass species increases (Bester, Van Eck & Steyn, 1984). Roberts and Opperman (1974) introduced the so-called "Key species" and "proper use factor", and proposed a generalized use factor of fifty percent defoliation in the growing season, as an interim guide for grassveld management. At a stocking rate of 45 kilograms live animal mass per hectare, Kruger (1998) found that the degree of defoliation of the key species at the end of the grazing period ranged between 70 and 90 percent. This suggests that the key species were over-utilized under the prevailing circumstances. At a stocking rate of 6ha/LSU, Bester, Van Eck and Steyn (1984) found that the degree of defoliation at the end of the grazing period, of grass species such as *Schmidtia pappophoroides, Stipagrostis uniplumis* and *Eragrostis rigidior* was in the order of 60%, 33% and 17%, respectively. The two experiments were conducted in the Camel Thorn Savanna and Thorn Tree Savanna of Namibia. This paper attempts to indicate the grazing capacity of the Camel Thorn Savanna at different stocking rate regimes were different degrees of defoliation of the individual grass species are used to calculate the grazing capacity.

METHODOLOGY

In order to determine the total dry-material grass production and the grazing capacity, a total of 40 one m^2 quadrates were harvested in 48 camps at Sandveld Research Station. The total grass production included annuals and perennial grasses on a species basis, harvested at ground level at the end of the growing season during June 1998 and 1999. Aristida species were not included. The grazing capacity is calculated (Bester, 2003) and expressed as kilogram live animal mass per hectare. The results presented, is the average grazeable grass production, in kilogram per hectare, of the 1998 and 1999 rainy seasons. Taking into account the degree of defoliation (Bester et al., 1984), the degree of defoliation of the individual grass species used to calculate the grazing capacity are adjusted as follows: (a) annual grass species 100%, (b) *Eragrostis pallens, E. rigidior* and *S. uniplumis* 30% and (c) the other grass species 50%. The calculated grazing capacity figure is an indication of the kilogram live animal that the rangeland can carry from the end of the growing season until the beginning of the next rainy season. For this study the period would be from June until January when the rainy season commences.

RESULTS AND DISCUSSION

The rainfall for the rainy seasons 1997/98 and 1998/99 was 706 and 322 mm, respectively. The average (1998 and 1999) grazeable grass production of the individual species and groups, total grazeable production and grazing capacity at the end of the growing season for the three stocking rate treatments are presented in Table 1. The grazeable production is that portion allowed to be removed by the grazing animal during a grazing period. The grazing capacity of three stocking rates is compared. They are 15, 35 and 45 kilograms live animal mass per hectare.



S. uniplumis at 30% defoliation.

The total available production of the three stocking rate treatments, where all grass species are allowed to be defoliated to the degree of fifty percent is 443, 536 and 383 kg/ha (Bester et. al., 2004). Using the degrees of defoliation presented above, the grazeable grass production of the individual grass species presented in Table 1 differs from those of Bester et. al. (2004). The total grazeable production of all the species will therefore also differ. The total grazeable production of all the grass species for the three stocking rate treatments is 353, 388 and 267 kg/ha, respectively.

Table 1: The average (1998 and 1999) grazeable grass production of the individual species and groups and the grazing capacity at the end of the growing season for the three stocking rate treatments.

Species and grazing capacity	Years and stocking rate (kg/ha)			
	15 kg/ha	35 kg/ha	45 kg/ha	Average
Annuals	30.01	38.57	32.18	33.59
Highly desirable spp.	14.88	0.90	0.80	5.53
S. papaphoroides	128.03	85.28	25.23	79.51
S. uniplumis	130.74	166.22	140.94	145.97
E. pallens	5.81	15.38	22.97	14.72
E. rigidior	20.55	69.14	32.94	40.88
Eragrostis spp.	9.26	6.16	7.08	7.50
Other spp	13.88	6.28	5.33	8.49
Total	353	388	267	336
Grazing capacity	32	35	24	31

S. pappophoroides, S. uniplumis and *E. rigidior* contributed the largest portion of grazeable material to the total dry-material production. Expressed as percentage of the total production these three species contributed 79.09%, 82.66% and 74.44% to the total grazeable grass production for the 15, 35 and 45 kg/ha stocking rate treatments, respectively. The average production of the three treatments is in the order of 86.11%. The average percentage contribution of the grazeable production of the annuals for the three treatments is 8.5%, 9.94% and 12.03%, respectively. The percentage contribution of grazeable material of the three species for the three stocking rate treatments, allowing a defoliation rate of 50%, is in the order of 85.82%, 89.09% and 82.26%. Calculating the grazing capacity using the two different approaches, the difference in the percentage contribution of the grazeable production to the total production of these three species for the three stocking rates is in the order of 6.86%, 6.43% and 7.82%, respectively. The contribution of *S. pappophoroides* remained the same and this difference therefore can possibly be regarded as negligible.

Comparing the two different approaches to calculate the grazing capacity, based on the total grazeable production of three of the less desirable grass species in the sward, namely *Eragrostis pallens, E. rigidior* and *S. uniplumis*, the picture changes. The average production for the two years at a 50% degree of defoliation of the three stocking rate treatments is 262, 418 and 328 kg/ha (Bester et al., 2004). The average production at a 30% degree of defoliation of *E. pallens, E. rigidior* and *S. uniplumis* for the three stocking rate treatments is 157, 251 and 197 kg/ha. The difference in the percentage contribution of the grazeable production for the three stocking rate treatments is 14,64%, 13,36% and 12,15%, respectively. The overall decrease in production comparing the two different approaches to calculate the grazing capacity, is in the order of 14.08%.

The average grazing capacity for the two years at a 50% degree of defoliation of the three stocking rate treatments is 40, 49 and 35 kilograms live animal mass per hectare. The average stocking rate of the three treatments is in the order of 41 kg/ha. Comparing these stocking rates (grazing capacities) with those presented in Table 1, the difference in the calculation of grazing capacity for the two methods is 20.88%, 34.44% and 27.05%, respectively. The average grazeable production of the three stocking rate treatments is 25.81%.

CONCLUSIONS

- From the results it is clear that an increase in stocking rate resulted in a decrease in the grazeable production of the sward.
- Species composition and the method of calculating the grazing capacity of the rangeland both have a major influence on the overall grazeable grass production of the sward.
- The degree of removal of above-ground bio-mass allowed when calculating the grazing capacity, will influence the degree of defoliation of the individual grass species during the grazing period.
- Should the degree of removal of the above ground bio-mass of the less desirable species be the same as the highly desirable species, when calculating grazing capacity, the highly desirable species will be over-utilized.
- It can be concluded that a realistic grazing capacity for the Camel Thorn Savanna for the short term would be 35 kilograms live animal mass per hectare and for the long term in the order of 30 kg/ha.

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