The Influence of Tree Thinning on Grass Dry Matter Yield, With and Without Grazing by Herbivore Game Species in the Marakele Park, South Africa

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Key words : bush encroachment , grasses , productivity , savanna

Introduction In semi-arid savannas of South Africa an increase in woody plant density (bush encroachment) results in the suppression of grasses . Bush encroachment is of great concern in the Marakele Park and a mechanical tree thinning program was applied during 2002/03 . There were , however , concerns about the effectiveness of this measure , especially in view of high numbers of grazing game species that were re-introduced into the park . The objective of the study was to quantify the effect of the mechanical tree thinning on grass dry matter (DM) yield in areas protected from and exposed to grazing .

Materials and methods Marakele Park is located adjacent to the Marakele National Park in South Africa . Three vegetation types based on the dominant species were identified : *Acacia mellifera-Grewia flava* (Am-GF) , *Combretum apiculatum-G . flava* (Ca-GF) , *A .erubescens-Dichrostachys cinerea* (Ae-Dc) . Two experimental plots (100 x 200 m) were demarcated in each vegetation type , one each in a thinned (Treatment) and an untreated (Control) plot . Enclosures were placed randomly in each plot and yield determinations done by cutting at the end of the 2004/05 season . Tree density of each plot was quantified in terms of Evapotranspiration Tree Equivalents (1 ETTE＝leaf volume equivalent of a 1 .5 m tree) (Smit 1989) .

Results In areas exposed to grazing the grass DM yields in the Treatment plots did not differ substantially from the Control plots (Table 1) . This is confirmed by non-significant (P＞0 .05) relations between tree density and grass DM yield (Table 2) . In contrast , much higher grass DM yields were recorded in areas protected from grazing (Table 1) , though the differences between the control and treatment plots were still relatively small . The ineffectiveness of the tree thinning treatment is again demonstrated by non-significant (P＞0 .5) relations between tree density and grass DM yield (Table 2) . With the exception of annual grasses this relation was mostly positive , which suggest that trees at these densities and in the absence of grazing , contributed positively to the grass DM yield . This was mainly due to the strong association of *Panicum maximum* with the canopies of trees , notably those of larger trees .

Table 1 *Total grass DM yield in areas exposed and protected from grazing at the end of the* 2004 /05 *growing season in the various experimental plots .*

Exp plot	Tree density (ETTE ha^{-1})	DM yield (kg ha^{-1}) Exposed	DM yield (kg ha^{-1}) Protected
Am-Gf (T)	8 691	1 055	2 662
Am-Gf (C)	10 331	1 357	2 068
Ca-Gf (T)	4 551	847	1 363
Ca-Gf (C)	7 799	891	1 216
Ae-Dc (T)	4 328	533	1 204
Ae-Dc (C)	8 676	1 067	1 237

(T)-treatment plot , (C)-control plot

Table 2 *Regression analyses of the relations between the DM yield of grasses in the areas exposed and protected from grazing (dependent variable) and tree density (independent variable) .*

Grasses	Regression equation	r	n	P
	Exposed			
Annual	$y=26 .033+0 .002309x$	0 .018	6	0 .677 ns
Perennial	$y=185 .87+0 .062170x$	0 .434	6	0 .158 ns
Combined	$y=201 .77+0 .102300x$	0 .442	6	0 .149 ns
	Protected			
Annual	$y=141 .96-0 .01379x$	-0 .779	6	0 .431 ns
Perennial	$y=-1854 .0+0 .37430x$	0 .959	6	0 .183 ns
Combined	$y=-1690 .4+1 .27100x$	0 .906	6	0 .278 ns

ns＝non-significant P＞0 .05 .

Conclusions The objective of the initial tree thinning treatments to increase grass DM yield was not achieved and this is ascribed to the nature of the tree thinning operation and the high grazing pressure . It is concluded that the tree densities of the treatment plots were still too high to have a significant effect of grass DM yields , partly due to re-encroachment that occurred since the initial tree thinning operation . Furthermore , the current grazing pressure appears to have effectively neutralised the anticipated positive effect of the reduced competition from the woody layer . This emphasises the importance of conservative stocking rates during the implementation of restoration measures such as tree thinning .

Reference
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