IMPACT OF BUSH CONTROL ON SPECIES COMPOSITION, TILLER AND LEAF PRODUCTION OF GRASSES

Authors:

Mndela M, I C Madakadze, F Nherera and S Dube

INTRODUCTION

- Woody encroachment threatens the rangeland ecosystem services
- Reduces rangeland production and grazing carrying capacity
- Non-reversible without human intervention once a critical threshold is surpassed
- Mechanical, chemical and biological measures
- To restore species biodiversity, vigour and biomass production

Objectives

- To assess the short-term effects of bush control on species composition
- To determine short-term changes in tiller and leaf production of grasses

MATERIAL AND METHODS

Site description

- Radi and Kgomokgomo areas of Makapanstad at North West Province
- Springbokvlakte Thornveld
- Turf Thornveld at Radi and Mixed bushveld at Kgomokgomo
- 500 – 600 mm mean rainfall per year
- Solar radiation = 30 & 18 $MJ/m^2/day$
- Black vertic clays at Radi and red-yellow apedal soil at Kgomokgomo

Pre-debushing survey

- Three 50 × 50 m^2 random blocks in each study site
- Each block assigned eight 25 m^2 plots
- Three 1.3 × 1.3 m^2 3-sided quadrants per plot
- Plant identification, tiller and leaf accounting
- Species frequencies were calculated
- Half (25 × 50 m^2) of each block was mechanically cleared in April 2016

Post-debushing survey

- Vegetation survey was conducted a year after bush control
- Each treatment (debushed and undebushed) were assigned 12 plots of 25 m^2
- The same approach as pre-debushing was employed to determine:
  - ✓ Species composition, tiller and leaf production per plant
- The direction of stolons and and rhyzomes was tracked for extravaginal tillers

Data screening and analysis

- Removal of extreme outliers before analysis
- Kolmogorov-smirnov and Brown-Forsythe tests for normality & homoscedasticity
- Mean comparisons between treatments were generated in Systat 13.0
- Significant differences were noted at $P < 0.05$
- Polynomial and linear regressions for tillers and leaves

RESULTS AND DISCUSSION

Table 1: Species frequencies (%) during predebushing (PBD), a year after debushing (DBD) and in undebushed (UBD) treatments at Radi rangeland

Plant form	Species	Family	Ecological group	Life span	% Frequencies		
					PBD	**DBD**	**UBD**
Grasses (16 *spp*)	*E. lehmaniana*	Poaceae	Increaser Ⅱ	Perennial	19.45	14.32	16.39
	A. bipartita	Poaceae	Increaser Ⅱ	Perennial	4.15	7.45	4.88
	D. eriantha	Poaceae	Decreaser	Perennial	11.22	5.29	6.76
	C. dactylon	Poaceae	Increaser Ⅱ	Perennial	7.25	6.06	6.26
	B. insulpta	Poaceae	Increaser Ⅱ	Perennial	1.42	2.02	2.69
	B. eruciformis	Poaceae	Increaser Ⅱ	Annual	4.12	9.62*	3.05
	T. beteronianus	Poaceae	Increaser Ⅱ	Annual	0.82	3.89*	1.26
	I. afrum	Poaceae	Increaser Ⅰ	Perennial	2.96	1.06	3.36
	A. babicolis	Poaceae	Increaser Ⅱ	Perennial	0.01	2.15	0.68
	S. spacelata	Poaceae	Decreaser	Perennial	0.66	0.56	0.69
	P. coloratum	Poaceae	Decreaser	Perennial	1.85	2.89	0.66
	H. contortus	Poaceae	Decreaser	Perennial	0.00	0.23	0.00
	C. virgata	Poaceae	Increaser Ⅱ	Annual	0.03	0.89	0.00
	U. mozambicensis	Poaceae	Increaser Ⅱ	Annual	0.16	0.86	0.36
	S. ioclados	Poaceae	Increaser Ⅱ	Perennial	1.14	0.00	1.31
	F. africana	Poaceae	Increaser Ⅱ	Perennial	0.01	0.06	0.00
Forbs (20 *spp*)	*C. asplenifolius*	Tiliaceae	Invader	Perennial	7.79	5.69	5.02
	C. decumbens	Molluginaceae	Increaser Ⅱ	Annual	4.29	5.42	8.49
	B. integrifolia	Acanthaceae	Increaser Ⅱ	Perennial	1.45	5.43	9.59
Shrubs (5 *spp*)	*Indigofera spp*	Fabaceae	Increaser Ⅱ	Perennial	0.99	0.22	0.33
	R. minima	Fabaceae	Climber	Perennial	0.42	0.45	0.45
	S. italica	Fabaceae	Invader	Perennial	0.27	0.06	0.03
Succulents (2 *spp*)	*P. quadrifida*	Portulacaceae	Invader	Annual	0.16	0.03	0.17
	K. brachyloba	Crasulaceae	Invader	Perennial	0.92	0.26	0.35

Table 2: Species frequencies (%) during predebushing (PBD), a year after debushing (DBD) and in undebushed (UBD) treatments at Kgomokgomo

Plant form	Species	Family	Ecological group	Life span	% Frequencies		
					PBD	DBD	UBD
Grasses (16 *spp*)	*E. pseudosclerantha*	Poaceae	Increaser Ⅱ	Perennial	13.03	11.97	2.27
	C. dactylon	Poaceae	Increaser Ⅱ	Perennial	18.00	7.20	4.27
	D. eriantha	Poaceae	Decreaser	Perennial	14.63	5.53*	5.23
	U. mozambicensis	Poaceae	Increaser Ⅱ	Annual	4.00	8.50*	4.50
	P. maximum	Poaceae	Decreaser	Perennial	9.67	4.17*	10.03
	T. beteronianus	Poaceae	Increaser Ⅱ	Annual	0.80	7.03	5.80[a]
	S. pappophoroides	Poaceae	Decreaser	Perennial	0.90	0.57	0.17
	A. babicolis	Poaceae	Increaser Ⅱ	Perennial	0.17	1.37	0.70
	D. aegyptium	Poaceae	IncreaserII	Annual	0.01	0.27	0.11
	P. coloratum	Poaceae	Decreaser	Perennial	0.57	1.01	0.07
	H. contortus	Poaceae	Decreaser	Perennial	0.01	2.54	0.01
	E. paspaloides	Poaceae	Decreaser	Perennial	0.21	0.17	0.01
	E. biflora	Poaceae	Increaser Ⅱ	Annual	0.01	0.21	1.04
	P. stapfianum	Poaceae	Decreaser	Perennial	2.35	0.61	5.27
	Sporobolus spp	Poaceae	Increaser Ⅱ	Perennial	2.44	3.34	0.84
Forbs (19 *spp*)	*L.viscosum*	Molluginaceae	Increaser Ⅱ	Annual	0.24	2.20	0.60
	B. integrifolia	Acanthaceae	Increaser Ⅱ	Perennial	1.33	5.53	14.63
	C. benghalensis	Commelinaceae	Invader	Perennial	2.80	2.20	2.43
	H. strigosum	Boraginaceae	Increaser Ⅱ	Annual	0.57	0.74	4.13
Shrubs (9 *spp*)	*T. longipes*	Fabaceae	Increaser Ⅱ	Perennial	1.47	1.80	1.1
	C. sphaerocarpa	Fabaceae	Invader	Annual	0.04	0.24	0.14
	R. torta	Fabaceae	Climber	Perennial	2.35	0.01	0.07
Succulents (4 *spp*)	*P.pillosa*	Portulacaceae	Invader	Annual	8.57	17.17	21.17
	P. quadrifida	Portulacaceae	Invader	Annual	2.34	10.37	1.53
Sedges (2 *spp*)	*C. rotundus*	Cyperaceae	Invader	Perennial	0.11	0.11	0.43

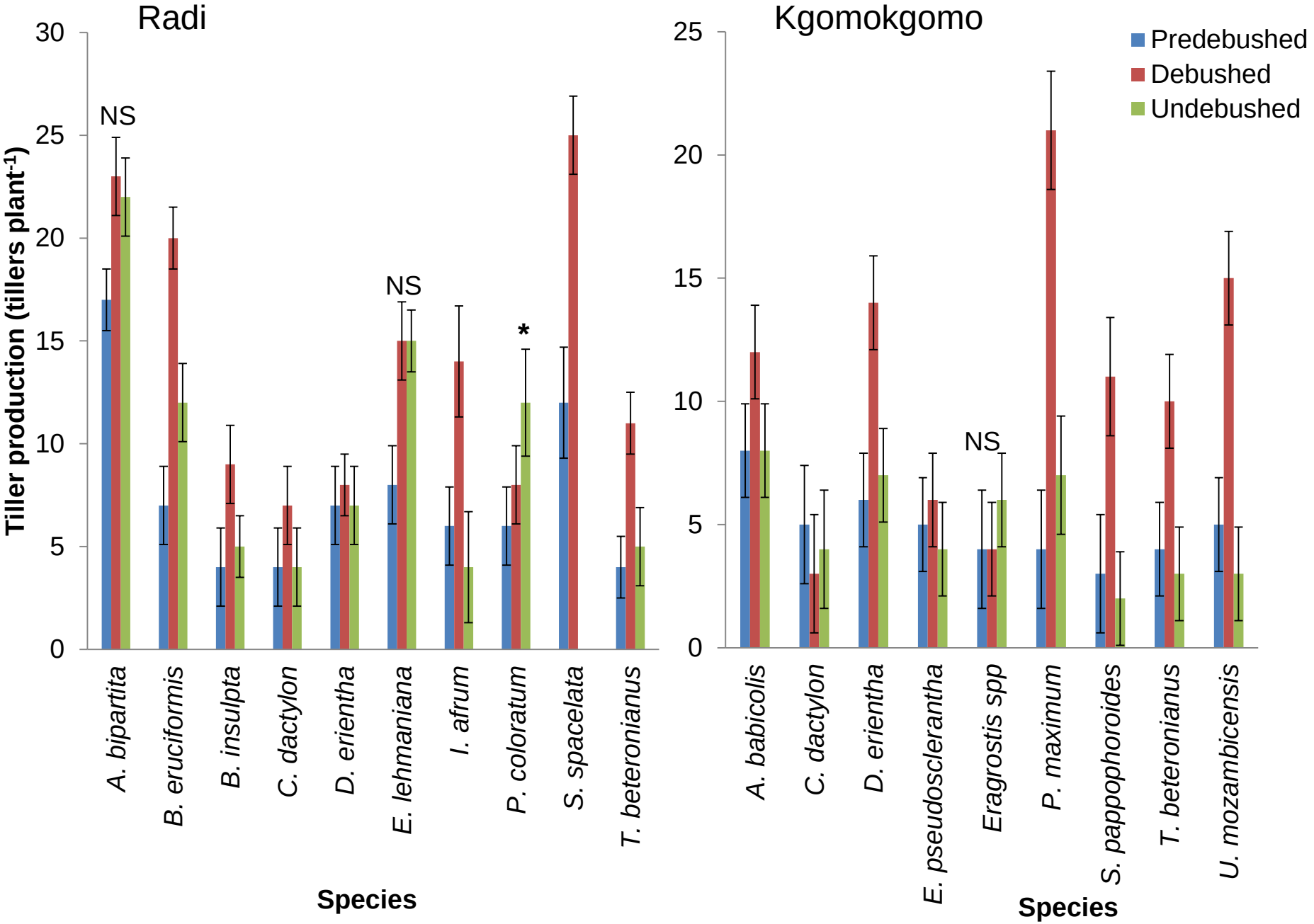

Figure 1: Changes in tiller production following debushing at Radi and Kgomokgomo rangelands

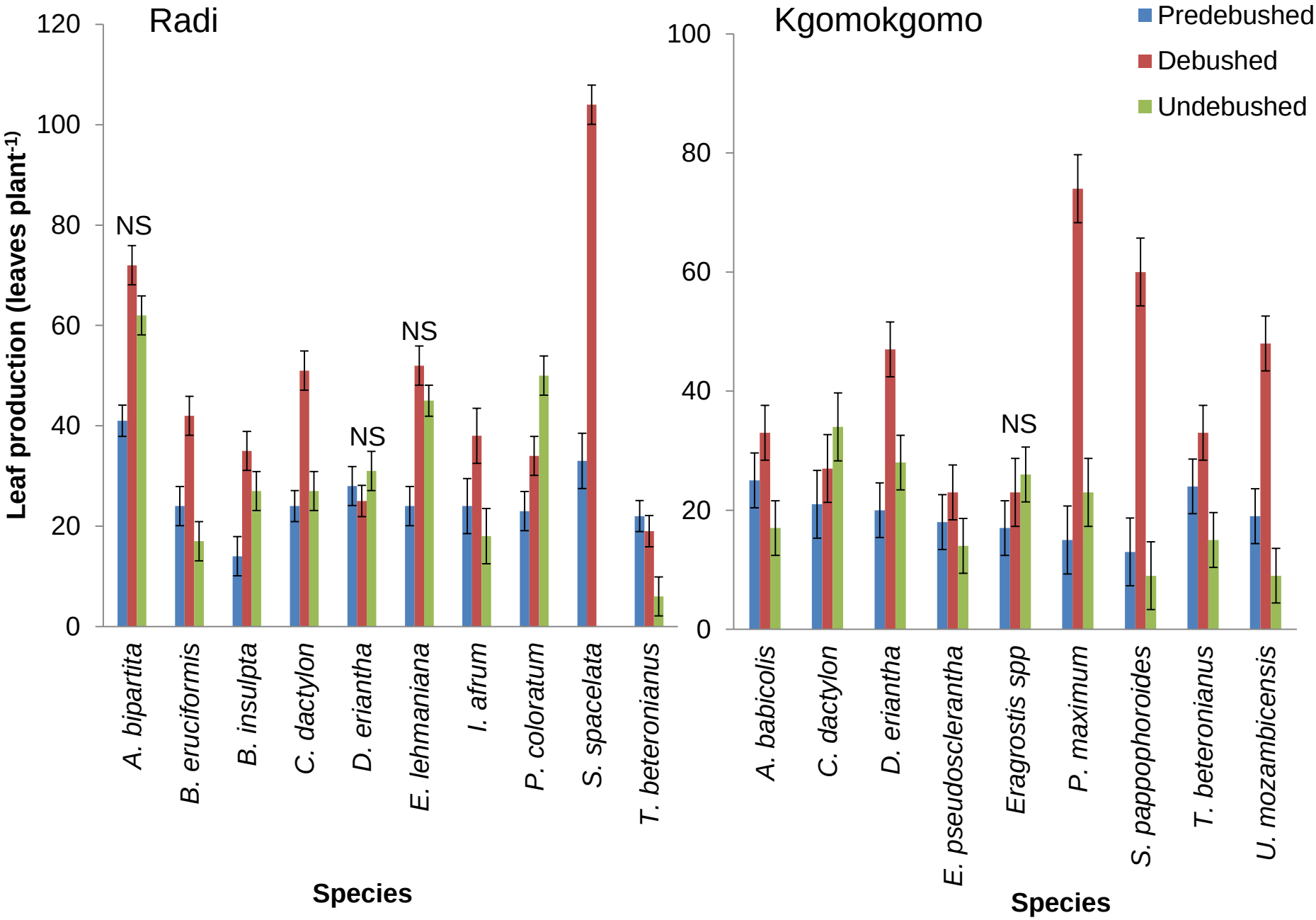

Figure 2: Changes in leaf production of grasses following debushing at Radi and Kgomokgomo rangelands

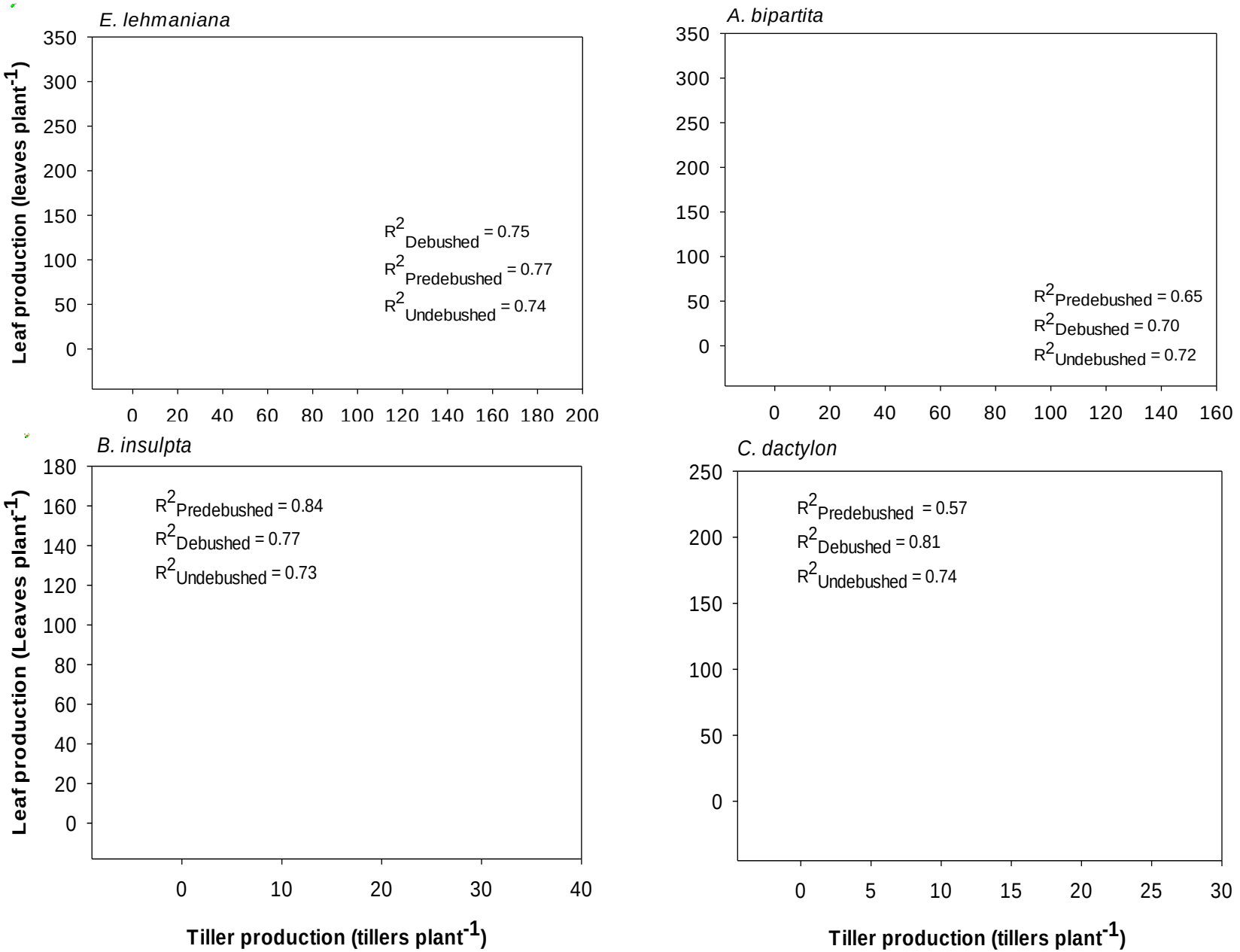

Figure 3: Relationships between tiller and leaf production of common grass species at Radi

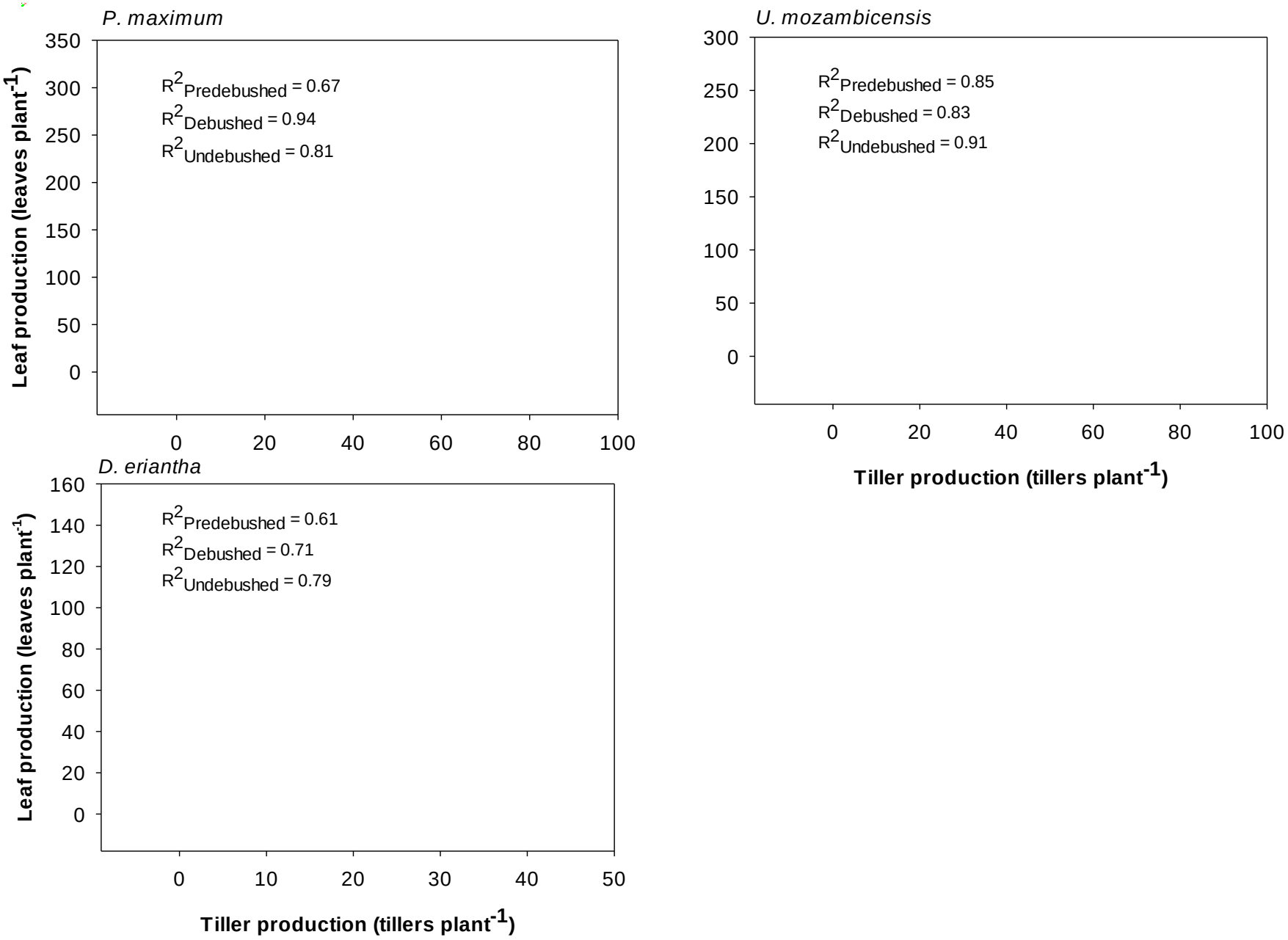

Figure 4: Relationships between tiller and leaf production of common grass species at Kgomokgomo

CONCLUSION AND RECOMMENDATIONS

- Debushing did not improve species composition one year after mechanical control
- However, increased forage production through increased tiller and leaf production were evident
- Management aimed at higher tiller production is necessary to increase leaf production
- Long-term monitoring of species composition to ensure an in depth understading of vegetation dynamics after bush control

ACKNOWLEDGEMENTS

ARC • LNR
Excellence in Research and Development

MAKAPANSTAD
BUSH ENCROACHMENT PROJECT

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA