

Does the soil seed bank of veld dominated by *Pteronia paniculata* change as a result of brush-cutting?

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Introduction

Pteronia paniculata is an indigenous, unpalatable dwarf shrub that increases in veld that was subjected to poor grazing and cultivation practices over the long-term. In the Central Mountain Renosterveld of the Little Karoo it forms in some places monospecific stands. The objective of this paper is to show whether brush-cutting of *P. paniculata* has an effect on the soil seed bank. Brush-cutting was done in an attempt to inhibit the growth *P. paniculata* enough to enhance the plant species composition, grazing potential and biodiversity of the area.

Study area

The study was done on the farm Kleinvlakte, 33°50'S 20°40'E, which forms part of the Koktyls Private Nature Reserve in the district of Barrydale, Western Cape

The area falls within the Central Mountain Renosterveld as classified by Low and Rebelo (1996) and

Southkloof Randteveld as classified recently by Vlok *et al.* (2005). The dominant plant species are *Pteronia paniculata* and *Pteronia sordida*.

The average annual rainfall of the area is 274.6 mm. Soils are mainly sandy loam in texture and have a pH of 5.5.

Methods

Brush-cutting was done in 2001. There were two treatments, namely 5 cm-cut and 20 cm-cut and a control, with two replications of each. Soils samples of 15 x 23 cm of the top 2 cm were taken at 5 randomly located places within each replication of each treatment in October of each year from 2001 to 2005. The soil was placed in seed trays in a nursery at the Worcester Veld Reserve where it was watered every day and all emerging seedlings were counted and identified on a weekly basis, whereafter the seedlings were carefully removed.

Table 1: Density of species (seeds.m⁻²), grouped according to family, present in the different treatments in the seed bank at Koktyls in 2001 and 2005 (Continued on next page)

Species	Treatments					
	Control	2001 5 cm cut	20 cm cut	Control	2005 5 cm cut	20 cm cut
Asteraceae						
<i>Pseudognaphalium luteo-album</i>	223.19	269.57	492.75	92.75	142.03	124.64
<i>Conyza canadensis</i>	211.59	249.28	156.52	0.00	17.39	8.70
<i>Sonchus oleraceus</i>	40.58	52.17	37.68	40.58	11.59	14.49
<i>Lactuca serriola</i>	34.78	11.59	11.60	246.38	269.57	272.46
<i>Galinsoga parvifolia</i>	179.71	179.71	165.22	2.90	5.80	2.90
<i>Cichorium intybus</i>	5.80	11.59	14.49	2.90	0.00	5.80
Cyperaceae						
<i>Bulbostylis hispidula</i>	11.59	2.90	2.90	0.00	5.80	0.00
Solanaceae						
<i>Sutera</i> sp	0.00	17.39	0.00	2.90	0.00	0.00
Oxalidaceae						
<i>Oxalis corniculata</i>	34.78	28.99	31.88	0.00	0.00	0.00
Fabaceae						
<i>Indigofera heterophylla</i>	0.00	0.00	0.00	2.90	0.00	2.90

Results

Twenty species from 9 families were present in the seed bank of the different treatments over 5 years. These were mainly annual and bi-annual species with a low grazing value. Most plants were forbs, of which Asteraceae was the dominant family with *Pseudognaphalium luteo-album* the most common species in 2001, contributing up to 44% of all the seed found, and *Lactuca serriola* the most common

species overall in 2005 ($p < 0.0001$; $F = 115.89$), contributing more than 53% of all seed found (Table 1).

The density of most families, including Asteraceae and Poaceae, decreased over time in the different treatments, while that of Mesembryanthemaceae and Fabaceae, consisting of *Indigofera heterophylla*, increased from 2001 to 2005 (Table 1).

The density of the seeds of the different species show no significant differences between the treatments

Table 1 (continued)

Species	Treatments					
	2001			2005		
	Control	5 cm cut	20 cm cut	Control	5 cm cut	20 cm cut
Polygonaceae						
<i>Platago lanceolata</i>	5.80	20.29	17.39	2.90	2.90	2.90
Poaceae						
<i>Echinochloa colona</i>	23.19	28.99	89.86	0.00	5.80	0.00
<i>Lolium temulentum</i>	11.59	49.28	89.86	0.00	0.00	0.00
<i>Phalaris minor</i>	0.00	0.00	0.00	2.90	0.00	0.00
Crassulaceae						
<i>Crassula</i> sp	0.00	0.00	0.00	2.90	5.80	0.00
Mesembryanthemaceae						
<i>Ruschia</i> sp	0.00	0.00	0.00	2.90	0.00	2.90
<i>Ruschia indurata</i>	0.00	0.00	0.00	0.00	0.00	0.00
<i>Drosanthemum</i> sp	0.00	0.00	0.00	0.00	0.00	2.90
Mesemb sp 4	0.00	0.00	0.00	14.49	0.00	0.00
Mesemb sp 5	0.00	0.00	0.00	0.00	0.00	0.00
Mesemb sp 6	5.80	5.80	2.90	0.00	0.00	0.00
Unknown						
Sp 1	0.00	5.80	0.00	11.59	17.39	66.67
Sp 2	0.00	0.00	0.00	0.00	0.00	2.90

($p=0.1067$; $F=8.38$).

Discussion and conclusions

The species present in the seed bank were not present in the above-ground vegetation, as was also found in work done by Wellstein, Otte and Waldhardt (2007) in mesic grasslands, and were mainly small seed, pioneer species as were

found in the present study.

The absence of palatable species in the seed bank can possibly be ascribed to the fact that the seeds of these species are not normally long-lived and therefore do not survive in the seed bank, as well as that they are not present in the aboveground vegetation. In the same instance is the seed of *P. paniculata* also not long-lived and



Seed trays at the nursery at Worcester Veld Reserve.

does not survive for more than a season in the soil seed bank. However, the plants are present in large numbers, produce large quantities of seed and there is reduced competition from desirable species, making their chances of establishment and survival better (Milton 1994).

Although there are differences in the density of the different species in each treatment, there are no differences between the treatments, and therefore it can be concluded that brush-cutting did not have an effect on the seed bank.

References

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