Dry Matter Production and Partition of Two Palatable Karoo Shrubs

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Introduction It is taken for granted that Karoo shrubs (bushes) are well adapted to only the soils and climate of the Nama Karoo biome in South Africa . The easterly movement of Karoo vegetation into the Grassland biome (dominated by grasses) is however well documented , while ecosystems responding to global climate change are a new debate . The dry matter (DM) production and structure of two palatable shrubs from the Nama Karoo biome were evaluated on two different soil types .

Material and methods The plants *Nenax microphylla* and *Pentzia incana* , and one soil type were collected from Grootfontein Agricultural Development Institute at Middelburg Eastern Cape in the Nama Karoo biome (Valsrivier form-40 % clay content , annual rainfall 365mm) , while the other soil type was from Bloemfontein in the Grassland biome (Bainsvlei form-14 % clay content , annual rainfall 530mm) . One plant of each species was vegetatively multiplied by means of stem cuttings . This means that six clones of each species were used and therefore the different plants of each species were genetically identical . Three plants of each species were planted in each soil type in pots in a glasshouse . Pots were watered once a week with the same volume of water . Dry matter production and its partition (roots , inedible stems , edible stems and leaves) were determined by harvesting all plants destructively after six months of growth .(Malan , 2000) . Edible stems were those with a diameter of less than two millimeters (Du Toit , 1996) .

Results The total DM production (above ground plus below ground) of *P . incana* was on average 58 .97 g/plant on the Grassland soil and only 44 .74 g/plant on the Karoo soil , while that of *N . microphylla* was also higher in the Grassland soil at 63 .93 g/plant compared to 51 .53 g/plant on the Karoo soil . The percentage contributions of different plant components was virtually the same for each species in both soil types , with *N . microphylla* producing a higher percentage of edible material than *P . incana* . Root development and production of both species was higher in the Grassland soil with the lower clay content (Table 1) . Plants in the Grassland soil wilted earlier than those in the Karoo soil , which might be due to the higher clay content (40%) of the Karoo soil (Table 2) . Even though the mineral content of the grassland soil was slightly lower (Table 2) , it still showed the highest production . The higher soil pH level of the clay soil might inhibit the availability of the soil nutrients .

Table 1 *Percentage contribution of different plant components to average DM production per species , as well as the root/shoot ratio .*

Species	Roots	Leaves and edible twigs(%)	Inedible twigs	Root/shoot ratio
Grassland soil				
N . microphylla	15	81	4	0 .18
P . incana	17	73	10	0 .20
Karoo soil				
N . microphylla	13	82	6	0 .14
P . incana	12	76	12	0 .16

Table 2 *Soil analysis results for the two soil types .*

Ca	K	Mg	Na	P	Clay	pH
ppm					(%)	
Grassland soil (Bainsvlei form)						
486	200	154	254	22	14	6 .1
Karoo soil (Valsrivier form)						
1908	320	900	320	11	40	7 .8

Conclusions Surprisingly , plants generally grew better on the Grassland soil than on the Karoo soil , which might be ascribed to the better root development in the Grassland soil . The plants might persist longer in the Karoo soil with its higher clay content , which will enhance water retention , and higher nutritional value . Although a lower DM production in the Karoo soil over the short term , the tested plant species might over a longer period survive better in the Karoo soil . This study clearly indicated the adaptability of Karoo shrubs to different soil types which might be important for vegetation changes and movements due to global warming .

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