WHAT SOIL FACTORS ARE INFLUENCING THE DISTRIBUTION OF SPEKBOOM (*PORTULACARIA AFRA*) IN SUBTROPICAL THICKET??

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(Van Cotthem, 2010)

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livinglands

Presence

Gamtoos Irrigation Board
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Introduction

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(Becker 2011)

Success?? 13 – 72% [10]

(Becker 2012)

(Mills *et al*. 2010)

???

(Becker 2011)

???

Introduction

Spekboom:

→ Grows on all geologies [8]

→ Patchy distribution??

→ Since 1830's: hills slopes, stony ridges and decreases down slope [1]

→ Moderately deep, well-drained fertile soils [5, 11, 13]

→ Steep North & West facing slopes [2, 3]

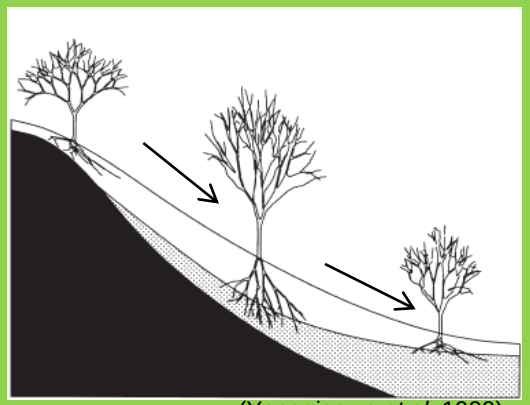
→ Constrained at (high & low levels) of E.C., sand %, Ca, Zn & Al [8]

→ Catena effect

→ lack of spekboom on alluvial soils → high in Na?

(Becker 2012)

(Becker 2012)



(Yanagisawa *et al*. 1999)

(Becker 2012)

Landscape distribution

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→Which soil factors (particle size, pH, Na, depth, electrical conductivity) govern spekboom distribution?

→ What other factors responsible for patchy spekboom distribution?

→ Sample North and South facing slopes and valley/ bottomland area

→ Selected 10 sites: Grahamstown, Addo areas, Baviaanskloof, Uitenhage, Oudtshoorn

(Becker, 2012)

(Becker, 2012)

(Becker, 2012)

Landscape Distribution

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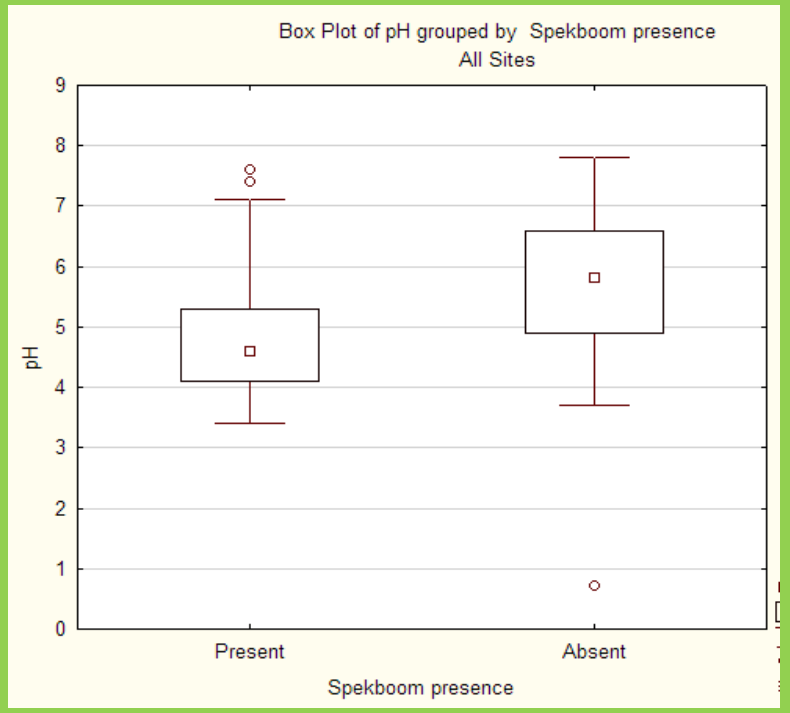
Results

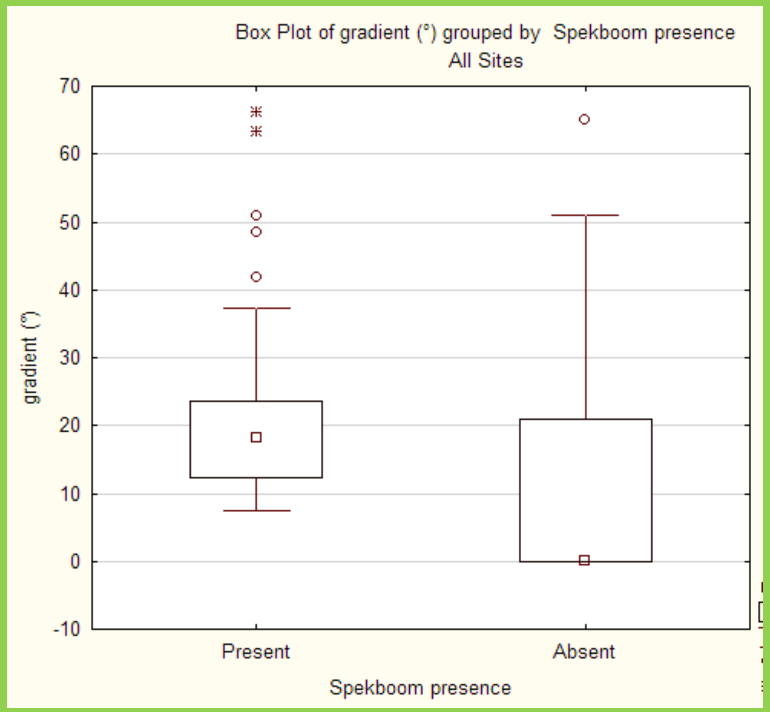
Spekboom presence significantly influenced by:

→ gradient

→ pH

→ Electrical Conductivity





Restoration sites

At 3 Working for Water restoration planting sites: Calitzdorp, Addo & Baviaans:

Is spekboom:

1) survival related to soil nutrients (Ca, Mg, Na, P, K), texture , pH?
2) avoiding soils with higher concentrations of sodium?
3) related to other factors (aspect, infiltration)?

Calitzdorp

Baviaanskloof

(Becker, 2011)

(Becker, 2012)

(Becker, 2012)

(Becker, 2012)

Restoration sites

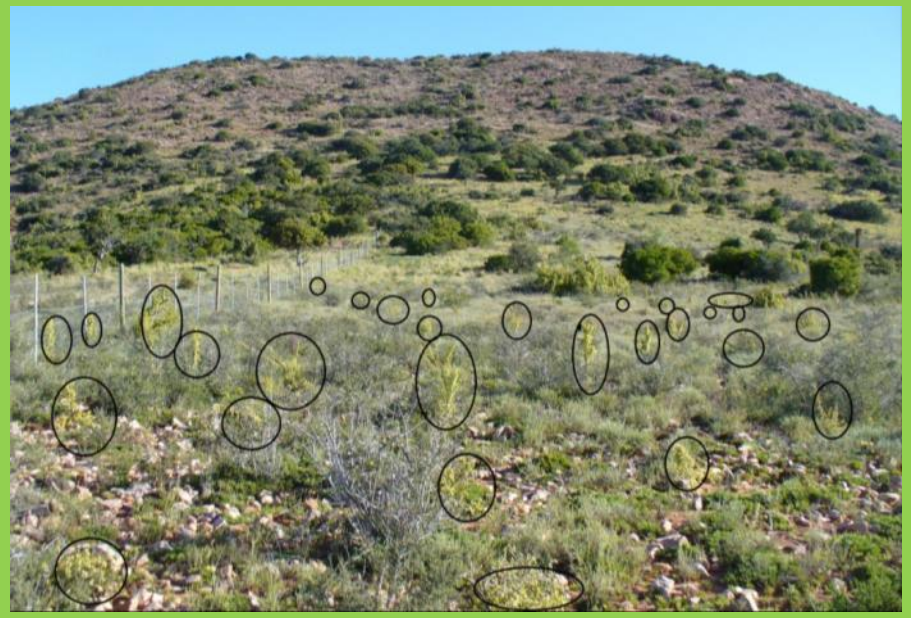
Results

→Site location NB (Addo & Baviaanskloof more successful than Calitzdorp)

→significantly indicate that:

1) Survivorship & growth higher on:
   → North facing slopes
   → steeper slopes (> 15˚)
   → at infiltration rates 2.7 - 7.6 ml /min
   → Clay (>15%)
   → Phosphorous <61 mg/ kg

3) pH is a limiting factor at > 6.7



(Becker 2011)

Experimental trials

Aim

→ Salinity & sodium

→ Investigate the responses of spekboom cuttings to:

- Soils: 1) sand-rich, sodium-poor & 2) clay-rich, sodium-high
- Water: 1) Rain, low sodium chloride & 2) borehole, high sodium chloride
- Combination of these factors

(Becker, 2011)

Soil	Na (mg/kg)	Sand (%)	Silt (%)	Clay (%)
River sand	8	90	3	7
Clay	473	70	11	19

Water Source	Na (mg/l)	Cl (mg/l)
Rain	1	3.55
Borehole	348	1242.50

(Becker, 2011)

(Becker, 2011)

Experimental trials

Results

1) Number of leaves

→ Only the water type played a significant role

→ Rain water groups 39.4 % increase

→ Borehole water 29.5 % increase

2) R:S ratio

→ Not significantly affected by 4 treatments

→ But trend that rain water treatments had higher R:S ratios

(Becker, 2012)

Experimental trials

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3) Leaf colour

- normally grey-green colour
- "yellowish and slightly more pulpy" with plant age & stress [1]

→ definite change from the start to the finish

→ 16 plants died (14 from borehole water groups)

→ rain water groups >50% in the C4 category

	Treatment	Leaf colour					
		C1	C2	C3	C4	C5	C0 (dead)
Start	W1-S1	13.3	80%	0%	5%	1.7%	
	W1-S2	11.7%	58.3%	0%	11.7%	18.3%	
	W2-S1	15%	61.7%	0%	11.7%	11.7%	
	W2-S2	8.3%	75%	0%	6.7%	10%	
	Totals	29	165	0	21	25	
Borehole water groups		28.3%	18.3%	0%	53.3%	0%	0%
		16.7%	5%	0%	75%	0%	3.3%
		60%	16.7%	0%	11.7%	3.3%	8.3%
		35%	28.3%	3.3%	15%	3.3%	15%
	Totals	84	41	2	93	4	16

Rainwater groups

(Becker, 2012)

Experimental trials

4) Stem diameter

NB: 0 ≠ dead

→ Significant dependency between treatment & stem diameters

→Rain water groups most growth

→Borehole water groups > 50% no increase

Treatment	Diameter classes (mm)			
	0	1 - 4	5 - 8	> 9
W1-S1	9	**35**	10	6
W1-S2	13	**37**	9	1
W2-S1	**38**	16	6	0
W2-S2	**37**	19	2	2
Totals	97	107	27	9

Rain water groups

Bore hole water groups

Experimental trials

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Rain water group

Borehole water group

Experimental trials

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Rain water groups

River sand

Clay soil

Borehole water groups

River sand

Clay soil

Conclusions

- Soil factors?

→ Yes - pH, Clay , Phosphorous, Electrical conductivity

→ But not as dominant, Temperature?

- Other environmental factors?

→ Yes – gradient & Aspect

- Salinity?

→ possible, could also be a chloride factor in the water

(Becker 2012)

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Thank you

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