

SALINITY EFFECTS ON GERMINATION OF SELECTED PASTURE GRASS SPECIES USED FOR COAL MINE REHABILITATION

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INTRODUCTION



- ❑ Coal mining destroys the environment and soil structure
 - Coal mine deposits contain pyrite formation
 - Annual discharge of 65 million m³ of wastewater: CaSO₄
- ❑ Coal mining in South Africa leaves a lot of land requiring rehabilitation
- ❑ Various grass species are used in rehabilitation programmes

CONT. INTRODUCTION



**Sulphate-encrusted soil
caused by seepage of
acidic water**



Disturbed land

**Kleinkopje:
rehabilitated site**



Irrigating with wastewater

INTRODUCTION CONT...



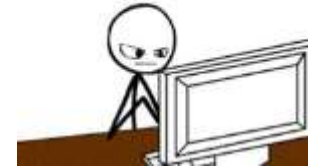
- These grasses are able to germinate and grow under saline conditions
- Planted seeds from the seed pack: some survive and some thin-out:
 - is it because of;
 - high salinity or (EC) in mine water used for irrigation?

HYPOTHESIS



- ❑ Variation exists amongst grasses with regards to grass species germination under saline conditions

OBJECTIVE



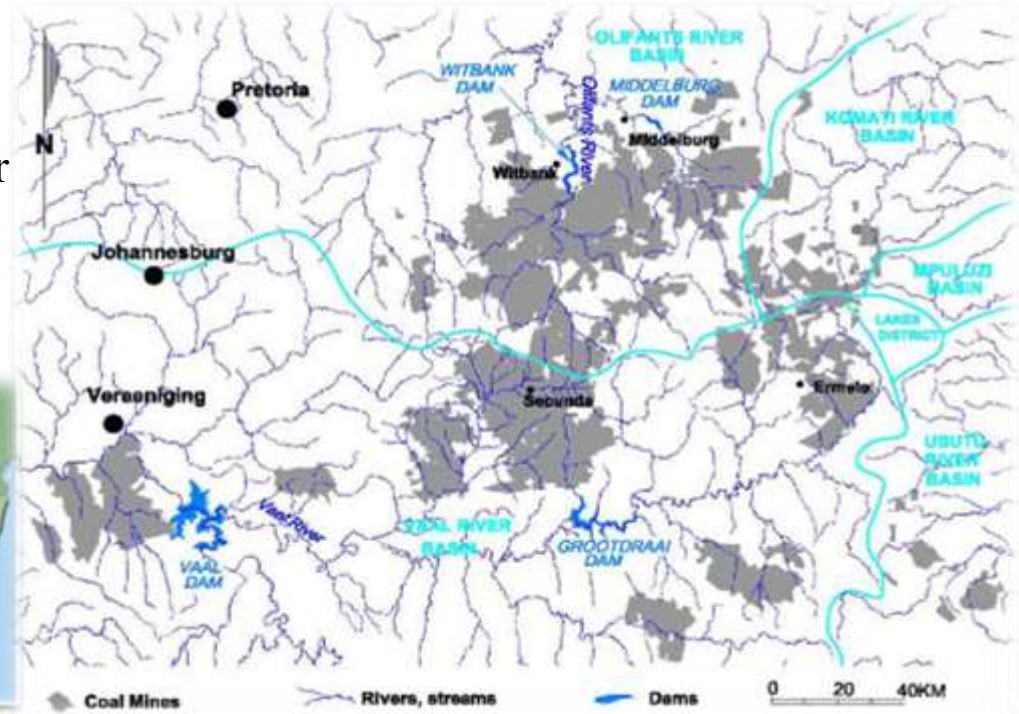
- ❑ To evaluate germination of commonly used grasses under solutions of varying EC

METHODOLOGY



Site description

- University of Pretoria, South Africa
(25.7536° S, 28.2297° E)
- Average temp = 24° C in summer
and 12° C in winter
- Annual rainfall = 140mm



METHODOLOGY



❑ Germination trial

❖ Seeds used:

- *Cynodon dactylon*
- *Digitaria eriantha*
- *Panicum maximum*



METHODOLOGY



- ❑ **Experimental set-up**
 - CRD, 4 replicates and trial repeated once (x2 runs)
- ❑ **Treatments**
 - **Distilled water** (control) or **Solutions** of **100, 200, 400, 600, 800, 1000 mS/m** (using NaCl) or **Mine water** with **405 mS/m**
- ❑ **100** seeds / 9 cm Petri dishes
- ❑ Filter paper Watman # **42** (kept moist with treatment solution)
- ❑ Growth chamber: **25 °C** and **8hrs** light

METHODOLOGY

TDS Salinity Meter



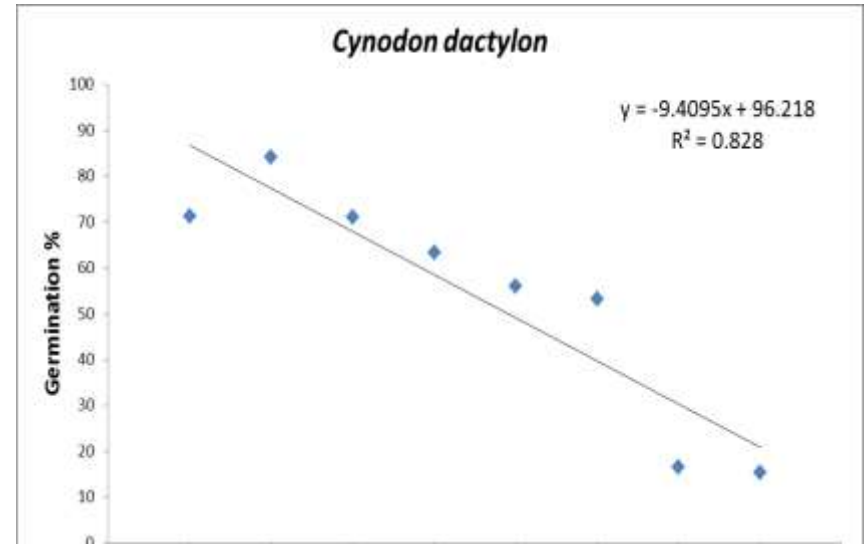
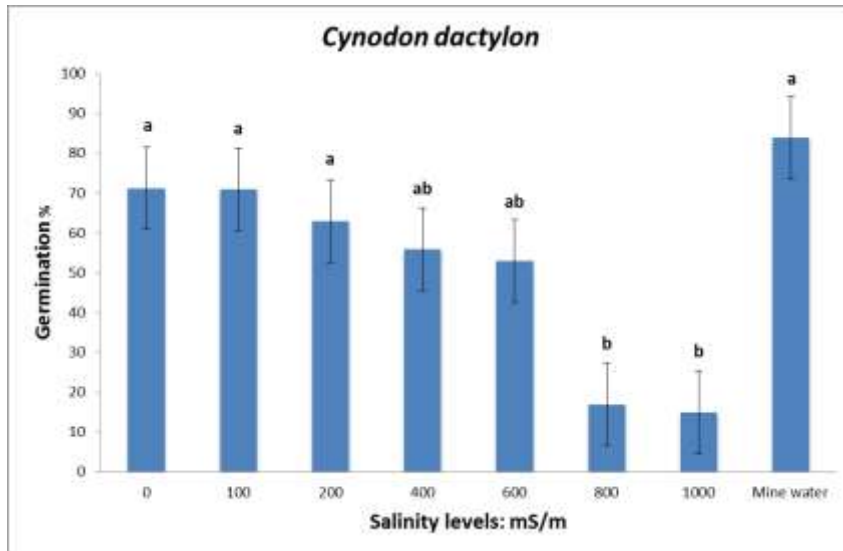
Distilled water and the Sodium Chloride

METHODOLOGY



- ❑ Germinated seeds with **3mm** radicle appearance
 - Removed once a day
- ❑ After 3 consecutive days of no germination the trial was terminated
- ❑ **Parameters measured**
 - Total germination
 - Mean germination %

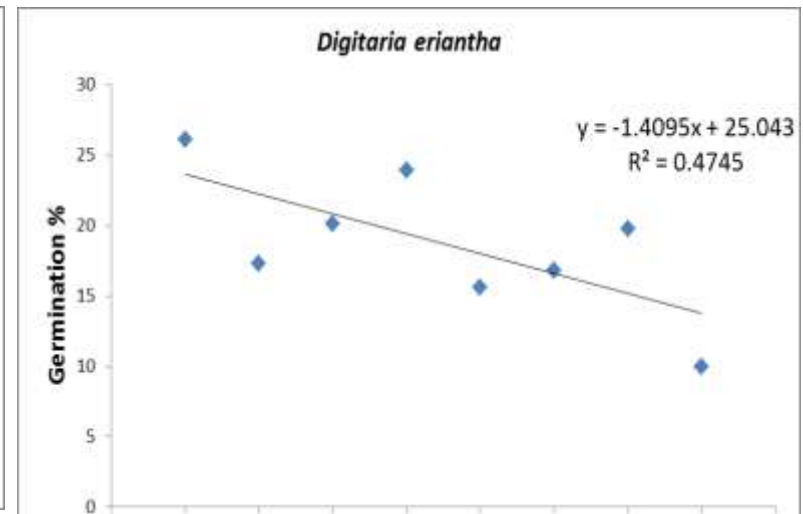
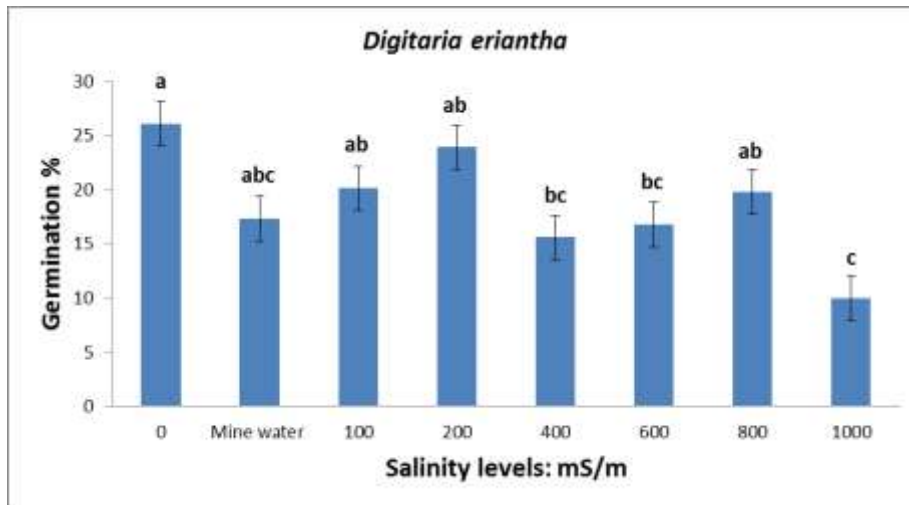
RESULTS



Different superscripts denote significant differences on mean germination % ($p \geq 0.05$)

Figure 1: Germination response of *C. dactylon* under varying EC

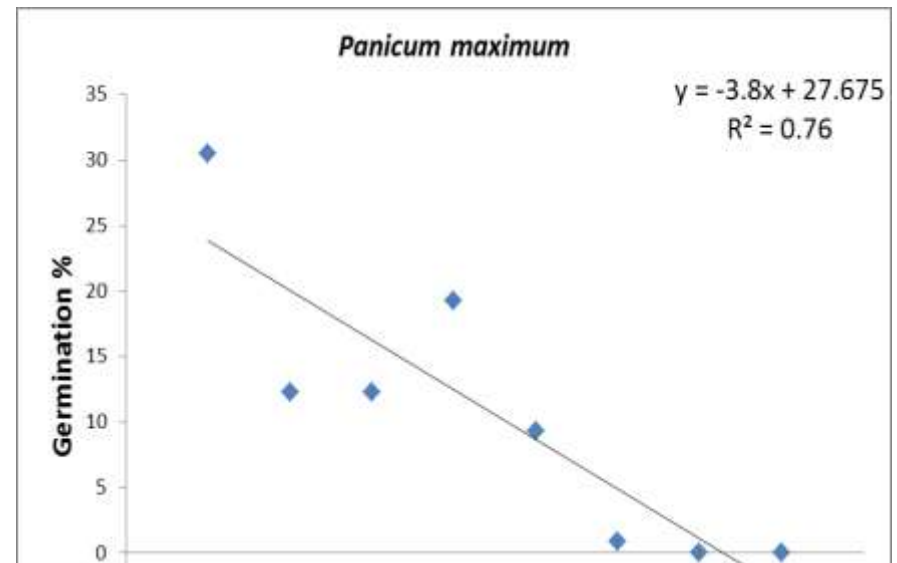
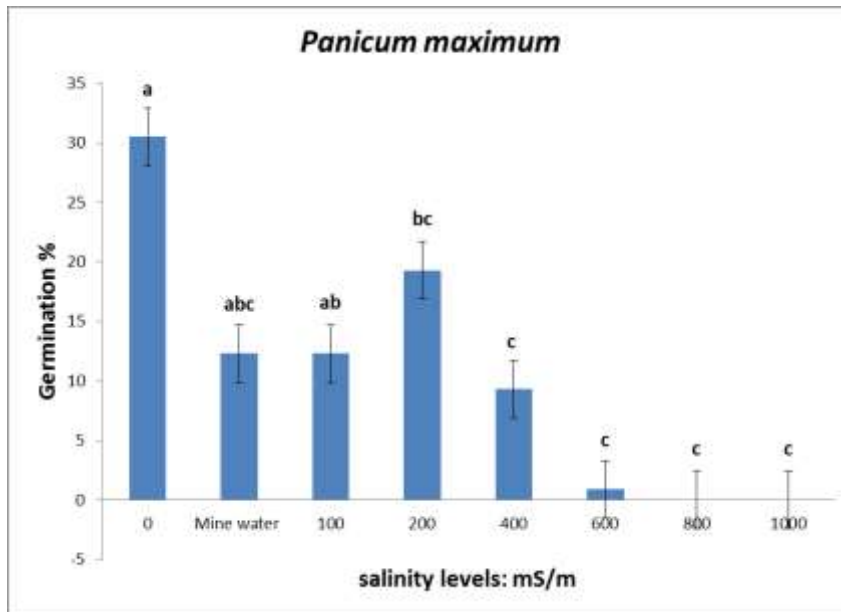
RESULTS



Different superscripts denote significant differences on mean germination % ($p \geq 0.05$)

Fig. 2: Germination response of *D. eriantha* under varying EC

RESULTS



Different superscripts denote significant differences on mean germination % ($p \leq 0.05$)

Fig.: 3 Germination response of *P. maximum* under varying EC

DISCUSSION AND RECOMMENDATION



- ❑ Increase in EC from resulted in a gradual decrease in germination percentage of all grasses
- ❑ Interspecific variations in grass species germination under saline conditions
 - They differ genetically, morphologically and physiologically

DISCUSSION AND RECOMMENDATION

- ❑ This shows two different forms of plant response to salinity levels
 - Halophytes and Glycophytes
- ❑ They can accumulate Na^+ and Cl^-
- ❑ However, some respond differently
 - Lack sequestration and compartmentalization of toxic ions
- ❑ *C. dactylon* performed better than the other species and is the best candidate for rehabilitation
- ❑ However, there is a need for further investigation

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