

EFFECTS OF SALINITY ON GERMINATION PERFORMANCE OF SELECTED *LOLIUM* AND *ERAGROSTIS* GRASS SPECIES

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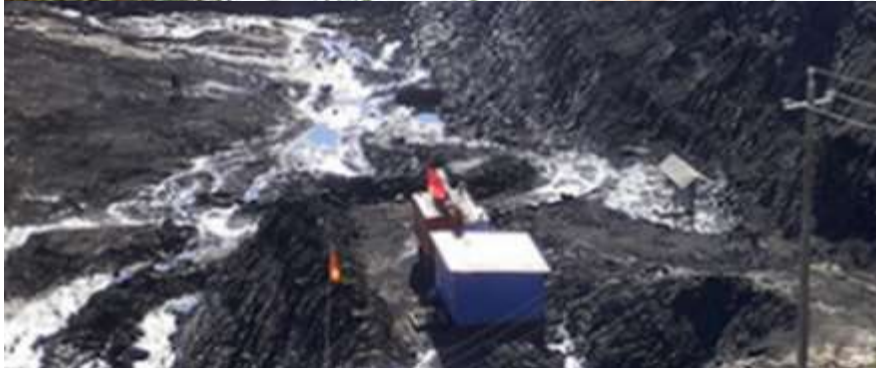
INTRODUCTION



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- ❑ Coal mining destroys the environment and soil structure
 - Coal mine deposits contain toxic elemental compounds
 - A large volume of mine wastewater is generated
 - ❑ Coal mining in South Africa leaves a lot of land requiring rehabilitation
 - ❑ Various grass species are used in rehabilitation programmes



CONT...



CONT...



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- These grasses are able to germinate and grow under saline conditions
 - Cool and warm season grass species are used during rehabilitation: some survive and some thin-out:
 - is it because of;
 - high salinity in mine water used for irrigation?



HYPOTHESIS

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





OBJECTIVE

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



MATERIALS AND METHODS

Study Site

- University of Pretoria, South Africa (**25.7536° S, 28.2297° E**)
- Average temp = **24°C** in summer and **12°C** in winter
- Annual rainfall = **573mm**



MATERIALS AND METHODS

- ❑ **Experimental set-up**
 - CRD, 3 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 557 mS/m**
- ❑ **Two grass species were selected with two cultivars: 100 seeds / 90 mm**
Petri dishes
- ❑ **60 mm** Filter paper Watman # **42**: kept moist with treatment solution
- ❑ **Growth chamber: 25 °C** and **8hrs** light



MATERIALS AND METHODS

TDS Salinity Meter



Distilled water and the Sodium Chloride



Germinated seeds



MATERIALS AND METHODS

- ❑ Germinated seeds with **3mm** radicle appearance
 - Removed once a day
- ❑ After 3 consecutive days of no germination the trial was terminated
- ❑ **Parameters measured**
 - Cumulative germination
 - T_{50}



RESULTS

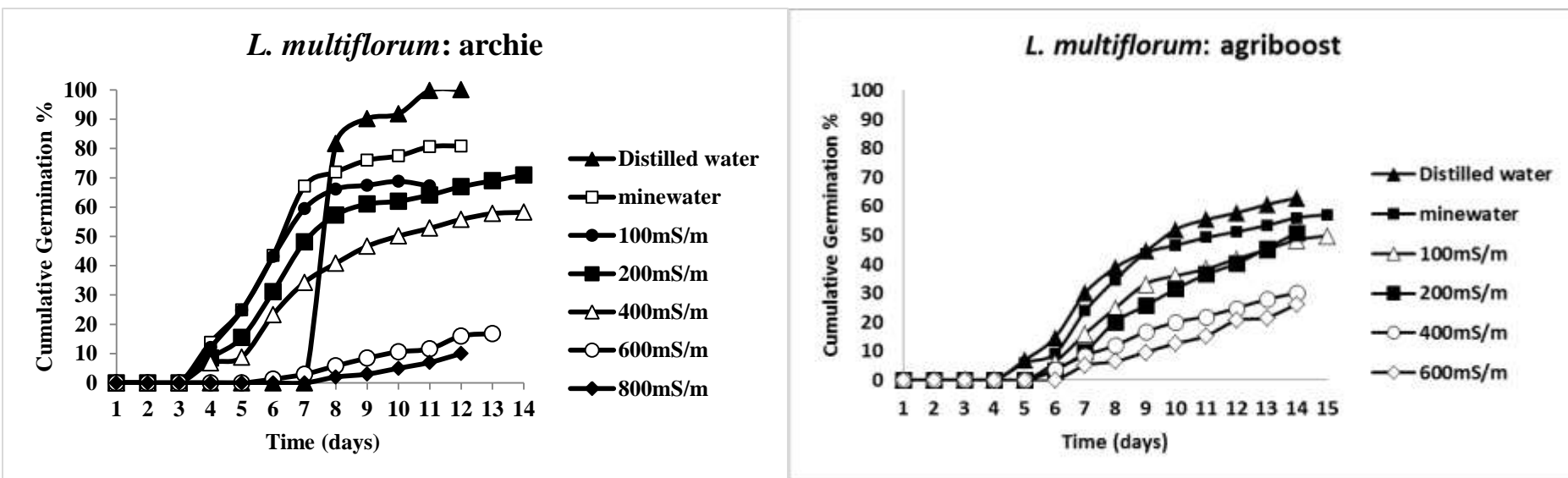


Figure 1: Germination response of *L. multiflorum: archie* and *agriboost* under varying salinity levels



RESULTS

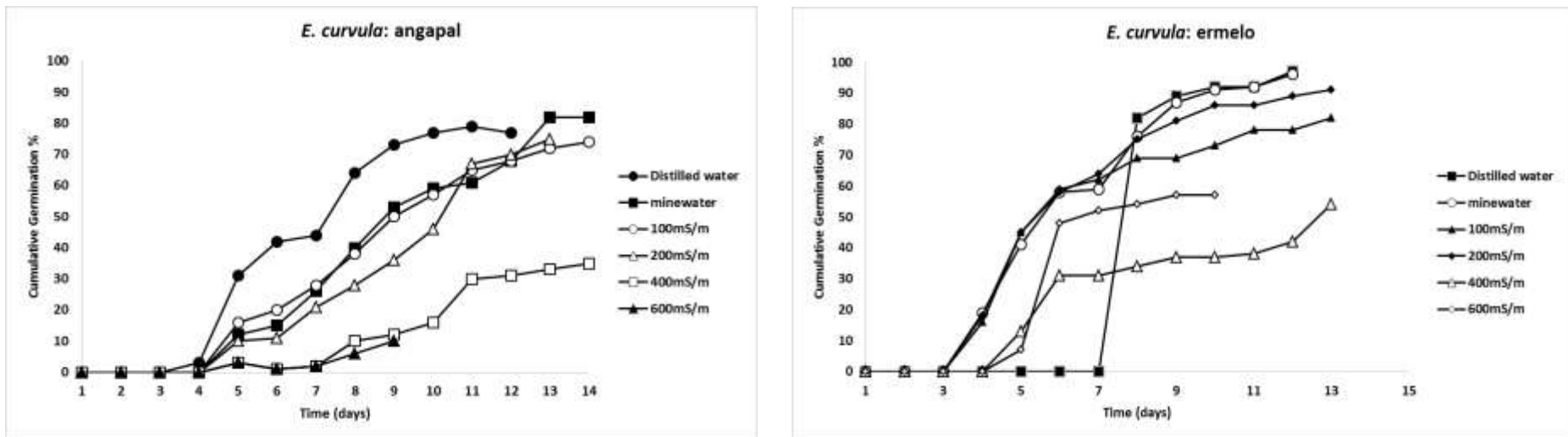


Fig. 2: Germination response of *E. curvula: angapal* and *ermelo* under varying salinity levels



RESULTS

Table 1. Salinity effect seed number of days lapsed to reach 50% of final germination percentage (GT₅₀) on different grass species.

Treatments (mS/m)	Species			
	<i>L. multiflorum</i>		<i>E. curvula</i>	
	<i>Archie</i>	<i>Agriboost</i>	<i>Angapal</i>	<i>Ermelo</i>
0	5.00 ^a	7.16 ^a	6.50 ^b	5.66 ^{ac}
100	6.00 ^a	7.83 ^{ac}	7.00 ^b	5.83 ^{ac}
200	6.50 ^b	9.00 ^{bc}	7.16 ^b	5.66 ^{ac}
400	6.50 ^b	9.33 ^b	7.66 ^b	6.00 ^{abc}
600	7.16 ^b	9.16 ^b	7.33 ^b	7.16 ^{bc}
800	7.83 ^b			
Mine water	5.66 ^a	7.66 ^a	7.00 ^b	6.00 ^{ac}

Means within columns followed by a different superscripts are significant different ($p < 0.05$)

DISCUSSION AND RECOMMENDATION



- ❑ Increase in salinity levels resulted in a gradual decrease in cumulative germination percentage of all grasses
- ❑ Interspecific variations within and among different cultivars germinated under varying saline conditions
 - They differ genetically, morphologically and physiologically
- ❑ This shows two different forms of grass response to salinity levels
 - Halophytes and Glycophytes

DISCUSSION AND RECOMMENDATION



- ❑ They can accumulate Na^+ and Cl^-
- ❑ They demonstrate avoidance and tolerance adaptation strategies
 - sequestration and compartmentalization of toxic ions
- ❑ *L. multiflorum: archie* performed better than the other species and is the best candidate for rehabilitation
- ❑ However, there is a need for further investigation to confirm this under field conditions



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THANK YOU

