

IMPROVING REVEGETATION AND RECLAMATION OUTCOMES WITH GRASS PLUGS USING PEPSYSTEMS® TECHNOLOGIES

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Revegetation of disturbed soils arising from oil & gas related activities can be challenging, especially when surface soil is of poor quality and/or devoid of top soil or organic matter. Earthmaster Environmental Strategies Inc. (Earthmaster) has developed PGPR (plant growth promoting rhizobacteria) Enhanced Phytoremediation Systems (PEPSystems®) which have been successfully deployed across Canada for treatment of soil contaminated with petroleum hydrocarbons (PHCs), salt, trace metals, and organic solvents. To determine if PEPSystems could be used in disturbed site revegetation reclamation applications, Earthmaster conducted laboratory and field trials to assess the ability of PGPR to assist grass plug growth and health when planted into stressful growing conditions.

LABORATORY TRIAL

Laboratory studies were conducted using subsoil that contained elevated salt concentrations. Laboratory analyses of the soil showed an average E_{Ce} of 17 dS/m, SAR of 18, sodium concentration of 1,360 mg/kg, and chloride concentration of 2,250 mg/kg. Blue grama grass plugs (*Bouteloua gracilis*) were planted in pots containing the saline soil and were left untreated or were treated with either 2 ml or 10 ml of PGPR solution. The pots were placed in an environmental growth chamber, were watered regularly, but were not fertilized throughout the

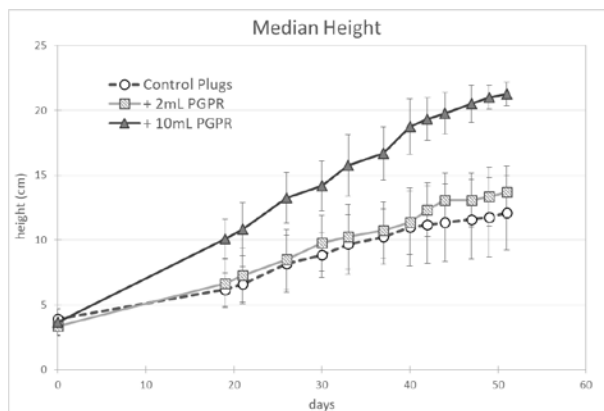


Figure 1. Median plant height of blue grama grass plugs planted in saline subsoil. Plugs were grown in controlled growth chamber conditions and were untreated (control) or received a solution containing PGPR. Error bars represent standard deviation of n=3 plugs.

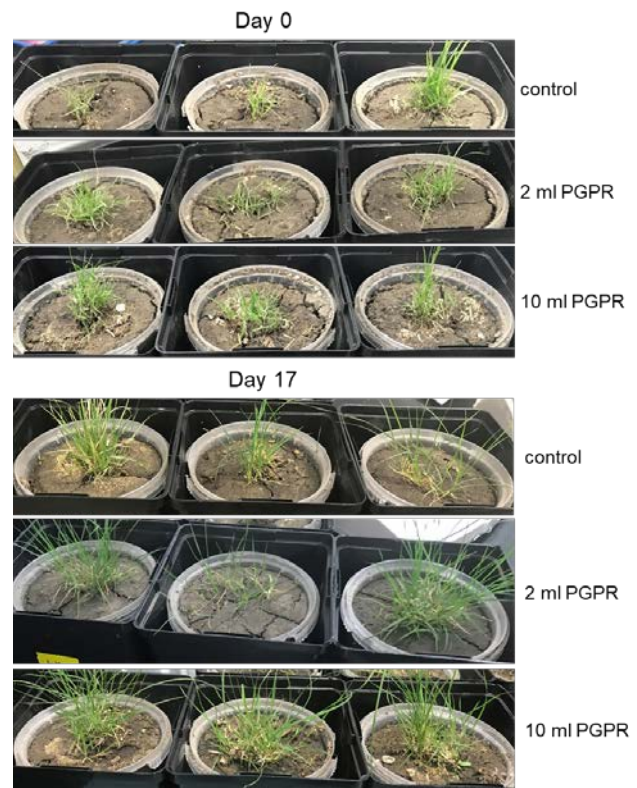
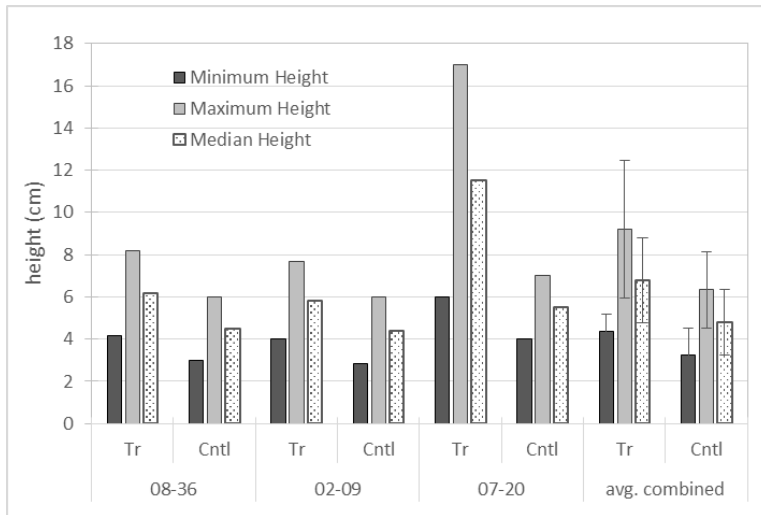


Figure 2. Representative photographs of blue grama grass plugs grown in saline soil - see Figure 1.



Plot Description		Plug Health	
		# Poor	# Good
08-36	Treated	1	3
	Control	3	0
02-09	Treated	0	3
	Control	2	1
07-20	Treated	0	5
	Control	1	1
Combined	Treated	1	11
	Control	6	2

Figure 3. Plant height measurements (left) and vegetation health assessment (right) from grass plugs planted at three field trial sites near Brooks, AB. Plugs were left untreated (control) or received 10 ml of a solution containing PGPR. Error bars on the left graph represent standard deviation of n=3 plugs.

five week trial. Figure 1 shows grass growth and Figure 2 shows representative photographs of the grass plugs. Results indicated that the plugs which received 10 ml of PGPR solution had significantly more growth during the trial. The plugs that received the smaller amount of PGPR showed no difference when compared to the untreated controls.

FIELD TRIALS

Using data obtained during the laboratory trial, small field trials were conducted at three reclamation sites located southeast of Brooks, AB. The land surrounding the sites was native range and the grass plugs were planted in sparse growth areas that were difficult to re-vegetate by conventional methods. These sparse growth areas did not have elevated salinity levels. Small control (untreated) and treated grass plug quadrants were established at each site. Treated plugs each received 10 ml of PGPR solution when planted. Plant height was measured and the plants were assessed visually for overall health five weeks after planting. Growth results are presented in Figure 3 and representative photographs of the grass plugs are presented in Figure 4. The results indicated that the treated grass plugs showed more growth and appeared healthier than the untreated plugs.

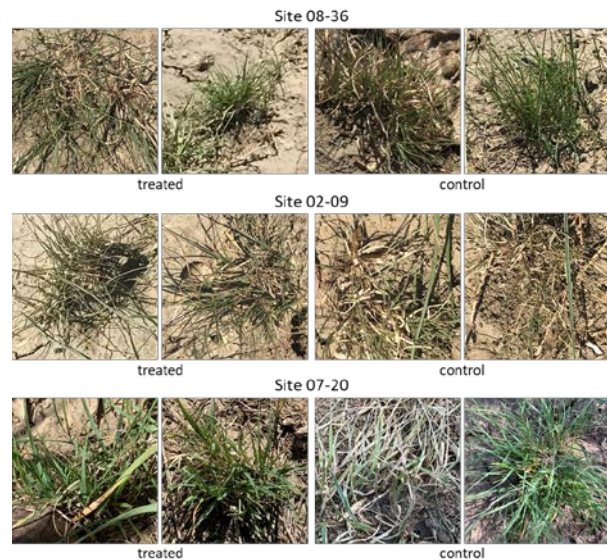


Figure 4. Representative photographs of blue grama grass plugs grown at three field trial sites - see Figure 3.

CONCLUSIONS

Preliminary laboratory growth chamber trials and field trials using PGPR mixtures to treat blue grama grass plugs used for re-vegetation suggest that PGPR provide a growth and health advantage to grass when planted in challenging soil conditions.

For a list of PEPSystems related publications, see the Earthmaster website at www.earthmaster.ca/about-us/publications.