Beneficial Effects of Cellulosic Bioenergy Crops on Soil Salinity

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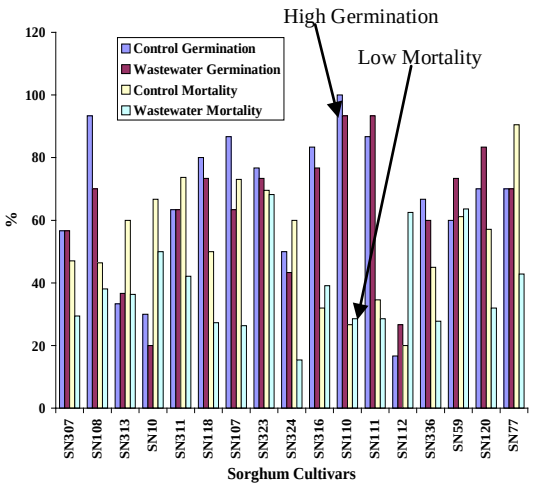
BACKGROUND

In the Far West Texas region, long-term irrigation with water having elevated salt concentrations has lead to serious salinity and sodicity problems. Elevated salinity and sodicity have resulted in poor soil conditions, reduced crop yields, and declining farm profitability. In the recent years, bioenergy is gaining popularity and demand for bioenergy is increasing. Far West Texas region has enormous potential for bioenergy crop production on marginal (salt affected/abandoned farm) lands using marginal quality water (treated urban wastewater/brackish groundwater) for a greater farm return. Bioenergy crops such as sorghum (*Sorghum bicolor*), miscanthus (*Miscanthus* spp.) and switchgrass (*Panicum virgatum*) may have beneficial effects on salt affected soils because of acidification of rhizosphere due to greater respiration (CO_2 production) of fibrous roots, which may ensure long-term sustainability. This greenhouse study evaluates effects of marginal quality water irrigation on ii) salt tolerance and performance of sorghum, switchgrass and miscanthus cultivars, ii) selected soil properties and iii) beneficial effects of fibrous roots on representative salt affected soil of the Far West Texas.

OBJECTIVES

- Evaluate salinity tolerance of sorghum, switchgrass and miscanthus cultivars for production under marginal water quality irrigation on salt affected soil.
- Evaluate performance of tolerant cultivar (s) sorghum, switchgrass and miscanthus bioenergy crops on salt affected soil under marginal quality water irrigation.
- Evaluate sustainability of marginal quality water irrigation by understanding the beneficial effects of sorghum, switchgrass and miscanthus roots on soil salinity.



Salinity tolerance of different sorghum cultivars

Sorghum (SN 110) grown on salt affected soil using marginal quality water.

BENEFITS

Results of salinity tolerance showed that sorghum cultivars "SN110" and switchgrass cultivar "Alamo" were most salt tolerant among cultivars tested. Results of this project may help to utilize potentially large amounts of marginal quality water for irrigating bioenergy crops while having beneficial effects on soil salinity. Outcomes of this project can help to understand sustainability issues associated with production of bioenergy crops on marginal lands irrigated with marginal quality waters. Use of marginal water to irrigate bioenergy crops in the far west Texas has several potential benefits such as extending the existing freshwater supplies, increased bioenergy feedstock production and improved farm income.

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