

Erosion Control/Water Quality Improvement on Saline Agricultural Land (Saline Site Revegetation Trials)



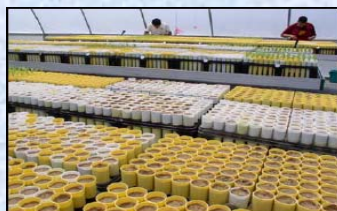
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OBJECTIVES

In order to solve erosion problems and increase the productivity on saline impact range sited in Zapata County and other areas in the South Texas region, it is critical to know the tolerance of plant species to varying levels of salt. This assessment is necessary for seed germination and at the young seedlings stage

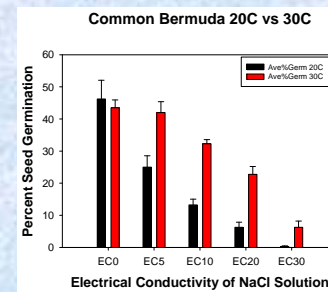
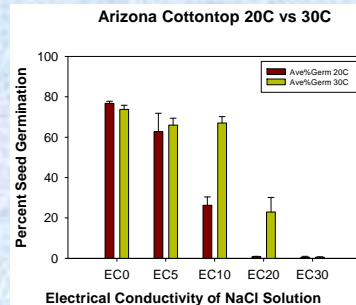


Materials & Methods

ABSTRACT

An estimated 600 thousand acres of South Texas are affected by alkaline and saline soil conditions. Natural mineralization, but mostly past oilfield activity, has been a culprit to the increase in soil salinity. High soil salt concentrations lead to the depletion of vegetated areas, especially if the ratio of Na ions exceeds other minerals found in the soil. The loss of vegetation exposes the soil to erosion thus, soil structure and fertility deteriorates over time. Therefore, establishment of vegetation in saline sites by direct seeding of saline sites poses a challenge. The high concentration of dissolved salt in the soils, in particular Na ions, hinders seed germination. Temperature and soil moisture also interact with salinity, producing a significant but highly variable environmental window for seed germination. Therefore, both seed germination and young seedling responses to varying salinity levels needs to be determined. The study focuses on 21 plant species in response to saline and alkaline conditions in a controlled greenhouse environment as well as testing two saline-affected sites; one in Zapata County and another in Kleberg County, Texas over the course of a year.

Starting in June of 2005, LeeRoy Rock, a student at Texas A&M Kingsville, began seed germination trials at the Plant Material Center (PMC.) Tests were done on 21 plant species. These trials were performed using a Hoffman “Controlled Environment Chamber”. The first trial was run at 5 salinity levels; 0, EC-5, EC-10, EC-20, EC-30 at a constant temperature of 68°F with 12 hrs light /12 hrs of dark. The second trial was run in the same manner as above, but with constant temperature of 86°F. Germination was recorded at 2-day intervals for 28 days. Seeds were placed in covered clear plastic boxes on blotter paper underlain by a layer of creped cellulose. The substrate was moistened with 100 ml of treatment solution and remoistened when necessary. Each treatment was conducted 4 times with 100 seeds per box. Green house testing consists of a set-up of 3 ebb-flow tables to handle watering at an EC of 0, 10, and 20. Nine species have been selected and seeded into 36 trays each holding 98 cone shape containers. This has been randomly replicated four times in each of the 3 salinity treatments. Once the plants reach the 3-leaf stage these plants will be subjected to the salinity treatments. Importance of how salt levels will change in the soil over time so, data-logging equipment for soil moisture and electrical conductivity will also be used to measure salinity changes over time.



RESULTS

Most of the species germinated better under the higher temperatures even when the salinity levels were high. Six plant species responded better than the other tested species at salt levels with an EC of 20 or greater. These were bundleflower (*Desmanthus virgatus*), orange zexmenia (*Zexmenia hispida*) and sorghum with greater than 30 %germination at temperatures at 86°F and two-floweredtrichloris (*Chloris crinita*), Arizona cotton top (*Digitaria californica*) and Bermudagrass with greater than 20 %germination at temperatures at 86°F. Data from the saline irrigation reviled species that tolerated high salinity levels while soil moisture was maintained. After the final harvest saturate paste extract been collected for this phase of the experiment.

