Project Proposal:

1. Impact of Saline Irrigation Water on Citrus Rootstocks in the Lower Rio Grande Valley

2. Focus Category:

Agriculture;
Irrigation;
Water quality;

3. Keywords: Citrus, Salinity, Irrigation

4. Duration: March 1, 2010 through February 28, 2011

5. Federal Funds Requested: The amount of federal funds requested is $5,000.

6. Non-Federal (matching) Funds Pledged: The amount of non-federal funds pledged is $13,251.00

7. Principle Investigator (graduate student):

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9. Congressional District (s) where project will occur: 15

10. Abstract:

The citrus industry in the Rio Grande Valley experiences periodic droughts. During such times, water restrictions from the Amistad and Falcon Reservoirs can reduce water available for agriculture. Irrigation in this region is primarily surface waters from the Rio Grande where citrus orchards are flood irrigated. Irrigation practices that use less water are being explored and evaluated. Water used to irrigate crops usually contains between 800 and 900 mg L^{-1} of salt, the equivalent of adding between 2100 and 2400 lbs salt/acre foot. Limiting irrigation in agricultural areas may lead to salt accumulation in the crop rooting depth, especially where low water use systems like drip irrigation is utilized.

Currently, Citrus trees are grafted onto hardy rootstocks in order to ensure tree survival and production. These rootstocks are used to reduce pathogen impacts and enhance their tolerance to thermal, saline and other environmental stressors. It is vital to find saline tolerant citrus rootstocks for soil and environmental conditions in the lower Rio Grande Valley.

This study's objectives are to assess the salinity tolerance of citrus rootstocks using typical soils found in the Rio Grande Valley. We will evaluate irrigation water salinity tolerance levels for these rootstocks during greenhouse trials.

11. Statement of Critical Regional Water Problems:

Drought and water restrictions are an ongoing problem for farmers in the Rio Grande Valley. Finding citrus rootstocks that are able to tolerate increasing salinity while using less water is vital for the agricultural community and water conservation in South Texas.

12. Nature, Scope, and Objectives of the Research.

Citrus (*Citrus spp.*) is an important economic crop in the lower Rio Grande Valley, bringing in more than $50 million for growers annually (Sauls 2008). Citrus trees are traditionally grafted onto sour orange rootstock because of its ability to tolerate the soils and soil conditions in south Texas (Sauls 2008; Louzada et al. 2008). However, the sour orange rootstock is susceptible to a variety of diseases and pathogens that were previously not a problem. Increasing concerns over Citrus tristeza virus transmitted by the new arrival, the Brown Citrus Aphid, and other diseases have initialized more research into finding alternative rootstocks. These pest and pathogen resistant rootstocks must be evaluated for the soil and water conditions found in the Rio Grande Valley.

The decreasing availability of irrigation waters from surface waters due to drought and restrictions have put limitations on irrigation practices in the Rio Grande Valley. On average, typical irrigation practices consist of flooding fields with 0.5 acre-foot /acre between 4 and 6 times during the growing season. This could increase up to 9 times during the growing season in times of drought or water shortage. Given an average EC of 1.33 dS m^{-1} (850 mg L^{-1}), this means that in a growing season as much as 4624 to 10,404 lbs of salt are added annually to citrus orchards. While most salts will be leached away by excess water, some salts will continue to accumulate. This problem will be compounded if water restrictions limit the amount of water farmers will be able to apply to their land.

The intrusion of salt water from the Gulf of Mexico causes high salinity levels in groundwater throughout the Rio Grande Valley. Groundwater in this region has not typically been used for irrigation due to high spatial variability in water quality and quantity (Chowdhury and Mace). Surface water limitations may force farmers to resort to saline or brackish groundwater in order to meet crop water demands. This has led to the need for further development and evaluation of saline tolerant rootstocks.

Objectives

The objectives of this study will be to evaluate and assess the salinity tolerance for several citrus rootstocks. There is also a need to evaluate irrigation water deficits to determine an optimal salinity tolerance level that will also meet the crop's water needs.

To determine these factors we will set up greenhouse trials using various citrus rootstocks. We will use soils typically found in the Rio Grande Valley and water with varying electrical conductivities and apply them at different increments in order to evaluate the optimal salinity tolerance in a water deficit situation.

This study's purpose is to obtain preliminary data in order to further research that may be conducted during field trials of the same rootstocks. This can potentially be valuable information for growers in times of drought or water restriction when they may have few options. Water quality and availability is a problem that is escalating with the increased population strains as well as drought and water restrictions in the Rio Grande Valley.

13. Results Expected from this Project:

This greenhouse-scale project will evaluate salinity tolerance of various citrus rootstocks in typical south Texas soils. This study will also encompass various irrigation application rates for the various salinity levels. The results from these studies will give growers and researcher's preliminary data in order to conduct field scale studies using these factors.

This study will produce to at least 1 scientific presentation at a professional meeting and an academic paper targeted for publishing in a peer reviewed journals and/or conferences in this field.

Citations / References:

Chowdhury AH and Mace RE. Geochemical evolution of the groundwater in the gulf coast aquifer of south texas. Texas Water Development Board Report. http://www.igeograf.unam.mx/aih/pdf/T2/T2-19.pdf Last retrieved: December 17, 2009.

Louzada ES, del Rio HS, Setamou M, Watson JW and Swietlik DM (2008) Evaluation of citrus rootstocks for the high pH, calcareous soils of South Texas. Euphytica 164: 13-18.

Sauls JW (2008) The Texas Citrus Industry. *Agri*Life Extension Publication. http://aggie-horticulture.tamu.edu/citrus/l2286.htm Last retrieved: December 17, 2009.

Sauls JW (2008) Rootstock and Scion Varieties. *Agri*Life Extension Publication. http://aggie-horticulture.tamu.edu/Citrus/cultivars/L2304.htm Last retrieved: December 17, 2009.