SCREENING AND EVALUATING WILD COTTON FOR SALT TOLERANCE CHARACTERISTICS

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Abstract

Salinity problems have been present through irrigation and deforestation. Salinity affects almost every aspect of the morphology, physiology and biochemistry of plants. Attempts to produce salt tolerant crops have involved from domestication of halophytes and manipulation of existing crop species through conventional plant breeding programs to understand physiological aspects of tolerance to salinity in plants, and to develop salinity tolerant genotypes. The objective of this breeding program is to study the mechanism responsible for metabolizing salts excretion or endurance to salt, and to later identify the genetic composition for this trait.

This study takes place in a greenhouse using a hydroponics system under control conditions. Cotton plants are raised and screen for salt tolerance periodically. Seedlings are soaked overnight, hot treated, or scarified and later placed on germinating paper at 22°C at 22% humidity. After five days, the young embryos are transferred into hydroponic tubs with 30.28 liters of water. Fertilizer is added to each tub after two days. Increments of 91.2 grams of NaCl are added to each tub every 48 hours. While in the hydroponics, the plants are evaluated for plant water relations, biomass, leaf de-coloration, mortality rate, etc. Plants that survive the high concentration of salt are transplanted to soil mediums for additional salt treatments.

Two hundred and twenty wild cotton germplasm have been tested in the hydroponic medium. Results showed a reduction in plants biomass. Interestingly a particular cultivar is able to sustain fruiting at 28,000ppm saline solution in the hydroponics for two months. Excessive intake of the NaCl concentration increases glucose depositions on the leaf tissue as well as on the stem. Using the Fourier Transform Infrared, fraction of alginic acid has been identified, a substance found mostly in halophytic species. Further analysis and a various microscopes indicated salt depositions between cells and a high accumulation of starch within cells. In addition, excreted salts crystals have been evaluated for shape and location using a Scanning Electron microscope. Transmission electron micrographs show high accumulation of starch formed in the chloroplast.

This surviving germplasm under high salinity levels excretes salt crystals found onto the leaves and stem. Some halophytic characteristics appeared to be present in this particular glycophyte. Future studies include: Tricome cell evaluation, osmotic and hormonal adjustment, cell compartmentalization, and adaptation characteristics.