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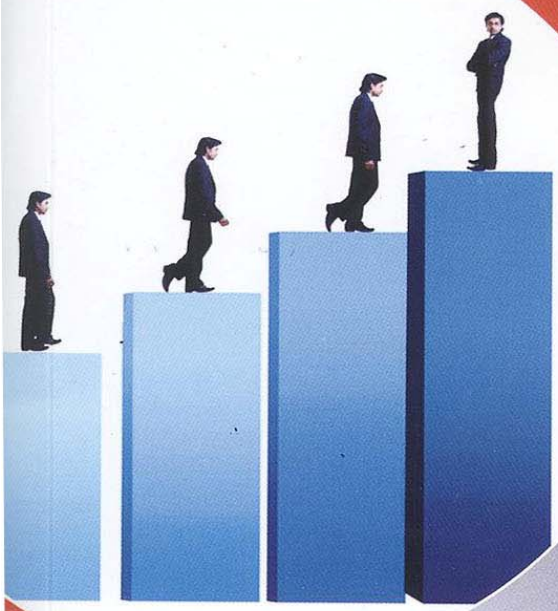
PAKISTAN (HEC) - U.S. Research Projects



Pakistan - United States Science & Technology Cooperation Program

A NEW HOPE AGAINST SALINITY

Finding Resilient **Plant Species**

Project Title:

Building Capabilities for the Molecular and Biochemical Characterization of Photosynthesis and Oxidative Stress Gene Expression in Halophytes with Potential Use as Non-Conventional Crops.

Research Project by:

Dr. M. Ajmal Khan
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Dr. M. Ajmal Khan

The outcome of this research will contribute to the utilization of brackish/seawater and saline lands, which are currently considered unsuitable for the production of economically valuable crops.

Desmostachyabipinnata, Suaedafruticosaand Salvadoraoleoides. Salt tolerance of these species needs to be studied in detail using modern biochemical methods for a better understanding at molecular/genetic level so that their growth may be optimized.

Tilling the ground- Objectives

- Characterize the general properties of each halophyte species (Demostachyabipinnata, Suaedafruticosa and Salvadoraoleoides), including growth, ion levels, eco-physiology and biochemistry.
- Examine levels of photosynthesis and expression of photosynthesis protein genes in each species grown under various salinity treatments.
- Determine chloroplast DNA and mitochondrial DNA copy number changes in plants growing at different salinity levels.
- Determine oxidation levels and activities of antioxidant proteins at different salinity treatments.

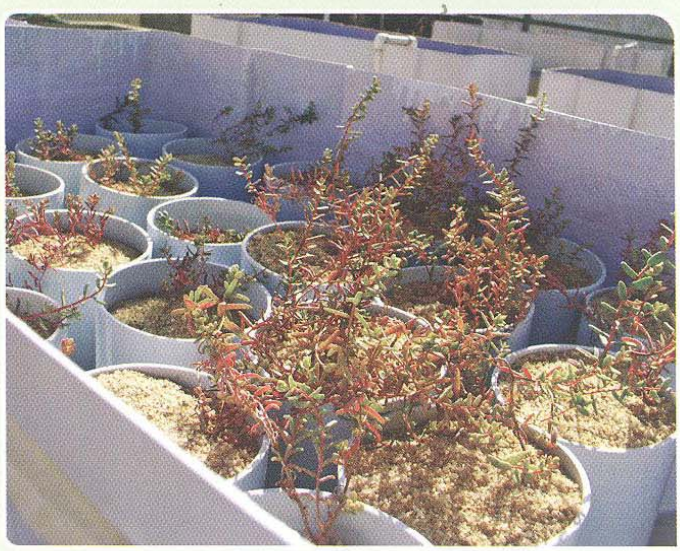
A greener harvest - Achievements

- Dr. Gul completed one year of research as a visiting professor at BYU at the end of May, 2012 (started June 1, 2011).
- Dr. Khan visited USA for three weeks in August-september 2011, for discussion on the project details.

Green house experiments

The bare truth - Combating salinity

Salinity, a consequence of mostly mismanaged irrigated agriculture, is responsible for significant loss to crop yields worldwide as all plants are adversely affected to certain degree by this hazard. The trend is unlikely to reverse; hence there is a need to search for alternatives. Considerable effort is being made to improve stress tolerance in crop plants, including those species with some existing salt-tolerance capabilities. Halophytes may meet many of our demands e.g. supplement or partly replace the conventional green and dry fodders, serve as source of good quality edible oil, biofuels, chemicals etc. However, the potential of halophytes,



natural flora of saline habitats, has been under-examined and their utilization may allow production of considerable plant biomass under these conditions. This could provide great economic value to farmers in traditionally poor regions of Pakistan and other countries.

Halophytes are known to successfully complete their life cycle under highly saline conditions and produce considerable biomass. A major challenge is to determine their utilization for commercial purposes and to find an appropriate niche where they could grow optimally with high productivity and be utilized to produce good quality food, forage, fodder, medicine, oilseeds, etc. We have identified three plant species where each have potential

Examining the levels of photosynthesis

- Dr. Gul attended the Proteomics Workshop at the NIH campus in September 2011
- 3 Mphil PhD students enrolled
- Introduced the course functional genomics of halophyte

Salinity, a consequence of mostly mismanaged irrigated agriculture, is responsible for significant loss to crop yields worldwide as all plants are adversely affected to a certain degree by this hazard.

Conclusion

The outcome of this research will contribute to the utilization of brackish/seawater and saline lands, which are currently considered unsuitable for the production of economically valuable crops, for effective production of forage and fodder crops.

This research will substantially contribute to the development of quality fodder crops for livestock and thereby create opportunities for local formers to enhance their economic wellbeing and increase the supply of good quality meat and dairy products.