IDT6-035 | Enhancement of pigeonpea productivity through adoption of drought mitigating strategies

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Pigeonpea (*Cajanus cajan* (L.) Millspaugh) is an important drought tolerant legume crop in Indian rainfed agriculture. Though India accounts for nearly 90% of the world's pigeonpea acreage (3.73 million ha) and production (3.07 million t), the productivity is lower at 707 kg/ha than the world average. The Morocco India Food Legumes Initiative in collaboration with the ICRISAT is aimed at improving the livelihood of small farmers to strengthen food and nutritional security through adoption of improved technologies. This paper is focused on developing and disseminating strategies to improve pigeonpea productivity in dryland regions which are characterized by erratic rainfall, frequent and prolonged dry spells and soil nutrient depletion. During 2013-16, demonstrations were conducted in 1200 farmers' fields in Mahabubnagar district, Telangana, India, with an objective of enhancing the productivity of pigeonpea using three drought mitigating strategies: (i) adoption of short-duration cultivar PRG 176, a high-yielding and early-maturing pedigree selection of ICPL 88034 x ICPL 88039 with a duration of 130-135 days; (ii) foliar application of soluble fertilizer to maintain vegetative growth and ultimately improve pod filling; (iii) life saving irrigation at the rate of 20 mm with water harvested from farm ponds during mid season drought and prolonged dry spells. Adoption of PRG 176 resulted in an average yield of 1400 kg/ha compared to LRG 41 (1120 kg/ha). The yield improvement of 25% can largely be attributed to the good branching habit (8-13 primary branches) and high flower to pod conversion ratio of PRG 176 under dryland conditions. Foliar application of multi-K during flowering and pod formation stages enhanced the yield to 1360 kg/ha compared to the yield of 1100 kg/ha obtained in fields without foliar spray. Life saving irrigation in PRG 176 during mid season dry spell which persisted for 17-21 days improved the yields by 20 % compared to the yield of 1200 kg/ha obtained in rainfed crop. In conclusion, the study demonstrated that the productivity of pigeonpea in dryland regions can be enhanced to an average 1560 kg/ha through an integrated drought mitigating approach by exploiting the short-duration and high-yielding potential of PRG 176, providing life saving irrigation during critical growth stages and foliar application of nutrients at flowering and pod formation stages.

IDT6-036 | Phenotyping of plants for drought and salt tolerance using infra-red thermography

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Drought or salt stress induces several common physiological responses in plants such as water relation and photosynthetic capacitiy. It is because both stresses lead to cellular dehydration in the plants, particularly, during the early phase of stress imposition. Drought and salinity decrease CO2 availability for photosynthesis via stomatal limitation, as well as elevate leaf temperature due to partially closed stomata. In this scenario, stomatal regulation and plant water status are important aspects in abiotic stress environment. These physiological responses have a function to stabilize the temperature inside plant/leaf. Therefore, phenotyping through an infrared thermography (heat sensitive sensor) could be a useful tool in the selection of a tolerant genotypes. Infrared thermography is a part of the electromagnetic spectrum which emits a certain amount of radiation as a function of the temperature. In general, plants which have less water would have higher temperature and display more infrared radiation. In abiotic stresses such as drought and salinity, the plant water status is affected and varied from the sensitive to tolerant level. Infrared images of plants are often linked with some of the physiological attributes to the tolerance. This paper covers the limits, advantages, linkages, comparison and other prospective of using thermal imagaes in modern phenotyping techniques.