Feed the Future Innovation Lab for

Climate Resilient Chickpea

FEED THE FUTURE
The U.S. Government's Global Hunger & Food Security Initiative

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Expanding Chickpea in non-traditional Lowlands of Ethiopia

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Abstract
Frequent drought is affecting the mixed farming and agro-pastoral communities in Ethiopia. In the Agro-pastoral lowlands, maize, sorghum and common bean are the key crops produced by famers when rainfall is favorable. However, during severe drought or erratic rainfall patterns, these crops do not yield enough grain to feed the communities, generate incomes and feed to their livestock. In order to diversify the cropping system in two in irrigated and rainfed lowlands, non-traditional crops (wheat, barley, chickpea, lentil, and cowpea) were evaluated by farmers in 2014/15 cropping season. The season was very dry in the rainfed lowlands, and all crops failed to produce grain for the farming communities. In both rain fed and irrigated sites, the kabuli chickpea cv. Habru was selected by farmers. The average seed yield of chickpea in the rain fed low land was more than 1.5t/ha compared to total failure of maize and other tradition crops grown in the area during severe drought. The introduction of high yielding and Ascochyta blight resistant chickpea in the rainfed lowlands is one of the options to diversify the farming system and prevent complete crop losses due to drought and erratic rainfall patterns. Besides producing acceptable yield, chickpea and cowpea were not attacked by termite which is a key pest in the low lands. In the irrigated areas, the yield was higher than 2t/ha and can be used to improve land productivity in the cotton-fallow cropping system. In conclusion, adoption of new crops like chickpea to diversify farming system can improve the resilience of farmers in dry areas. The breeding programs of EIAR and ICARDA should further develop chickpea cultivars with high yield (seed and biomass),large seeded resistant to foliar diseases and responsive to supplementary irrigation.

Developing a Resource of Wild x Cultivated Introgression Lines for Crop Improvement of Chickpea

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Abstract

The use of crop wild relatives (CWRs) has been a component of cultivar improvement programs since 1920s and 1930s, after Vavilov recognized their value as a source of increased variation. Reduced genetic diversity in elite varieties of modern crop plants derives from a combination of an early domestication bottleneck and subsequent focus on fewer improved genotypes during modern breeding. As a result, the prospects for sustainable genetic gain from elite germplasm is increasingly limited. By contrast, the wild ancestors of crop plants typically possess high levels of genetic diversity and an expanded range of adaptive traits that may be of agricultural relevance. CWRs have been used in the improvement of several crop species, but rarely in a broad and systematic manner. Chickpea (Cicer arientinum L.) is one of the most valuable global crops and suffers from a lack of genetic diversity. With the goal of increasing genetic diversity in chickpea, we initiated a novel and systematic introgression from wild Cicer species (C. reticulatum and C. echinospermum) into cultivated elite germplasm. The approach combines (1) systematic survey of wild diversity, (2) introgression of a representative set of genotypes, and (3) marker-assisted normalization of phenology among segregating progeny. Twenty diverse wild founders of C. reticulatum were selected from 270 wild accessions based on a combination their genomic sequence information and the ecology of their origin sites. Each of the 20 founders was crossed to elite cultivars of India (ICCV-96029), Ethiopia (Habru and Minjar), Canada (CDC Leader and CDC Consul) and Turkey (Gokce). At the F2 stage, a subset of progeny within each lineage were intercrossed to increase chromosomal recombination and thus genetic power in the resulting populations. Early generation segregant populations (e.g., F3 and F4) will be phenotyped for traits at multiple sites in Ethiopia and India beginning with the fall 2016/winter 2017 crop cycle. This resource of introgressed populations will serve as a platform for gene discovery through genomics, modeling and phenotyping, and for the development of tools for marker-assisted selection for breeding. Here we report the status and progress of chickpea population development in the USAID Feed the Future Chickpea Innovation Lab, with a particular focus on populations with elite cultivars from Ethiopia and India.

Transpiration rate of chickpea wild accessions and cultivars in Turkish and Indian locations