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Genetic variability for salinity tolerance in chickpea

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Salinity is an ever increasing problem in agriculture, either because of raising saline water table due to changes in land use, or because of salt accumulation over time due to mismanaged irrigation. The salinity problem is particularly serious in Australia, and is also present in large areas of Asia (Bangladesh, Pakistan, India) where chickpea is widely grown. Improved genotypes, able to cope with saline conditions, are needed to sustain production in these areas. Here we report the results of a two-year screening of 270 accessions of chickpea to assess the range of variation in salinity tolerance in chickpea. The genotypes tested included 211 accessions of ICRISAT's mini-core collection (10% of core, 1% of entire collection) plus breeding lines, some accessions of wild species, and genotypes reported to have salinity tolerance. Although it has been previously reported that there was a limited variation for salinity tolerance in chickpea, we found a six-fold range of variation for seed yield under salinity, with several genotypes yielding about 15% better than the previously released salinity tolerant genotype CSG8962. Salinity tolerance was found more in the Desi types (dark colored and angular shaped seeds) than in the Kabulis types (beige colored and owlhead shaped seeds). We found no significant relation between the biomass under salinity taken at 50 days after sowing and the final seed yield, meaning that reproductive and vegetative structures were affected differently by salinity. We found a parabolic relation between flowering date and seed yield under salinity, with an extreme at 54 days, which indicates that late flowering genotypes were more sensitive to salinity. The reduction in pod number per plant under salinity was relatively less in salinity tolerant than in susceptible genotypes. In contrast, the reduction in seed size under salinity did not differ between tolerant and sensitive genotypes. These data indicate that salinity affects the reproductive phase relatively more than the development of reproductive structures. Genotypic data for approximately 50 SSR markers on a sub-set of the genotypes has been produced and is being analysed for possible associations with salinity tolerance and identifying genetically diverse salinity tolerant genotypes.