ONLINE ISSN : 1349-1008
PRINT ISSN : 1343-943X

Plant Production Science
Vol. 11 (2008) , No. 1 3-11

Improving Drought-Avoidance Root Traits in Chickpea (*Cicer arietinum* L.) —Current Status of Research at ICRISAT

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(Received: October 20, 2006)

Abstract: Chickpea (*Cicer arietinum* L.), an important food legume grown in the semi-arid tropical and Mediterranean regions, suffers substantial yield loss due to drought at the end of the growing season (terminal drought), as the crop is largely grown rainfed in post-rainy season on progressively receding soil moisture conditions. Root traits have been identified to postpone dehydration (drought avoidance hereafter) under moisture stress. The root length density (RLD) in the relatively shallow soil layers and the maximum root depth (RDp) were found to positively influence the seed yield under terminal drought environments. Considerable progress has been made to improve the methodology for sampling and analysis of roots. Using a PVC cylinder technique, the mini-core collection (n=211) of chickpea germplasm was evaluated for a number of root traits, including root biomass, RLD and RDp. A few germplasm accessions were identified to have a more prolific root system than the previously identified germplasm line ICC 4958, the best-known source of high root biomass. The germplasm accession ICC 8261 was identified to have the best combination of both RLD and RDp. Molecular markers have been identified for one major quantitative trait locus (QTL) that accounts for about one-third of the variation in root biomass (as measured by total root dry matter) and RDp from study of recombinant inbred lines (RILs) derived from a cross between ICC 4958 and Annigeri. New RIL populations, developed from two other crosses (ICC 8261×ICC 283 and ICC 4958×ICC 1882) involving parents having larger variation for root traits than between Annigeri and ICC 4958, are being studied to identify additional QTLs for root traits. Marker-assisted breeding for improvement of root traits in chickpea is expected to promote the development of varieties with greater drought avoidance.

Keywords: Chickpea, *Cicer arietinum* L., Drought avoidance, Root traits, Terminal drought

doi:10.1626/pps.11.3

JOI JST.JSTAGE/pps/11.3