

HD Upadhyaya*, N Lalitha, RK Varshney, HC Sharma, J Kashiwagi, CLL Gowda and SL Dwivedi

*International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), Patancheru, 502 324, India
e-mail: h.upadhyaya@cgiar.org

About the chickpea crop

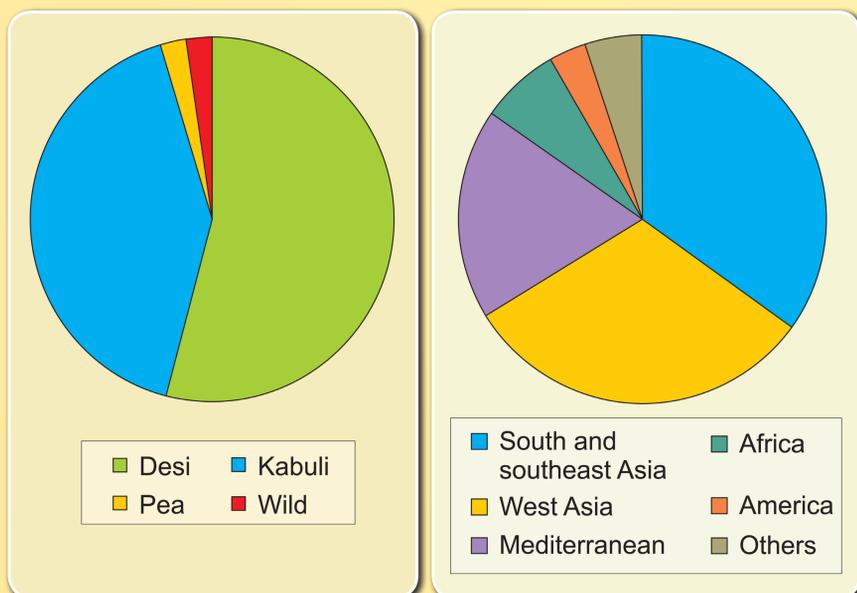
- Second in area and third in production among pulses, grown over 45 countries; annual production 9.3 mt from 11.7 mha (<http://apps.fao.org/>)
- Originated in an area of present day southeastern Turkey and adjoining Syria, around the upper regions of the Tigris and Euphrates rivers
- A cool season highly self-pollinated crop with 2n=16 and genome size 732Mb
- Grains, the primary source of dietary protein for rural people, are rich in carbohydrate, protein, minerals and vitamins
- Several biotic and abiotic stresses, in addition to narrow genetic base and lack of adapted varieties, contribute to variation in yield across regions
- ICRISAT genebank contains 19,916 cultivated accessions from 60 countries and 224 wild *Cicer* accessions from 18 species.



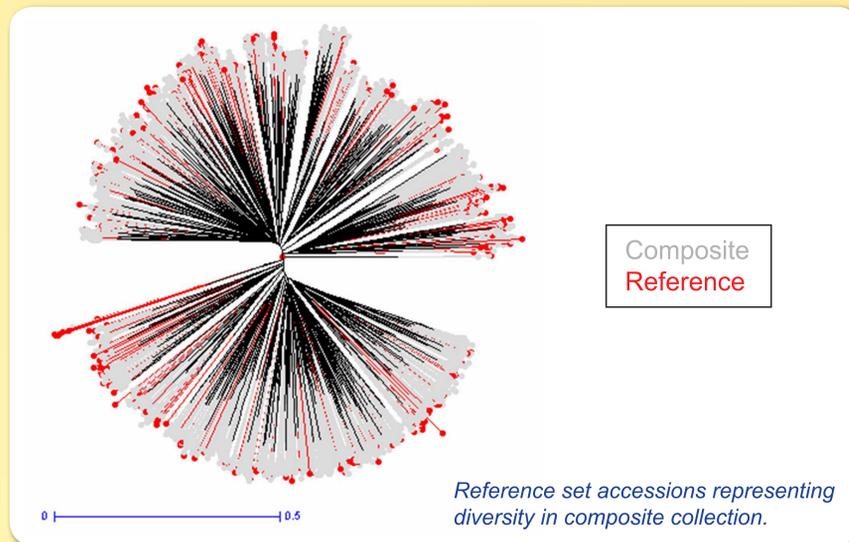
Genetic diversity in chickpea germplasm: pod number and maturity.

Developing genotype-based reference set

A composite collection consisting of 3000 accessions developed, molecularly profiled using 48 SSRs, and a reference set of 300 accessions representing 78% (1315 of 1683 alleles) allelic diversity of the composite collection extracted (<http://www.generationcp.org>). Both biological and geographical diversity adequately represented in this reference set.



Biological and Geographical diversity in reference set.

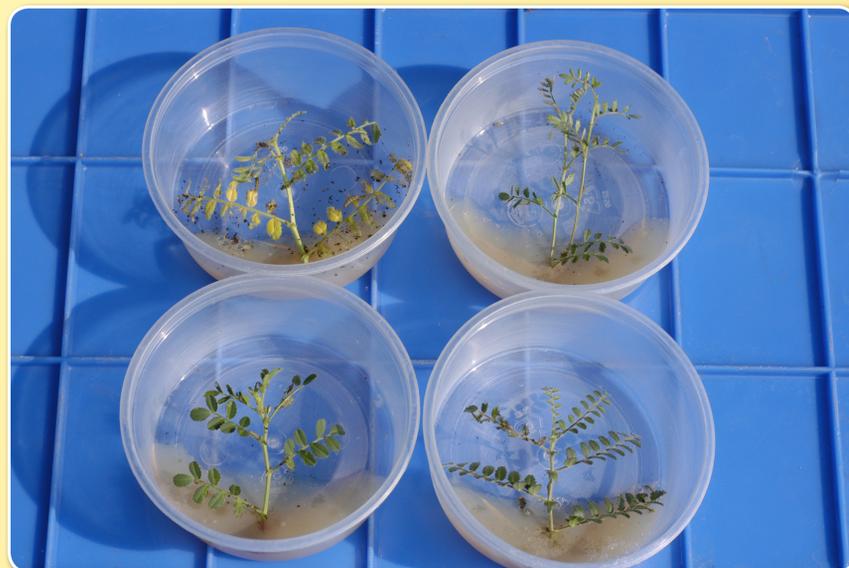


Identifying trait-specific germplasm

Reference set with five control cultivars (Annigeri, G130, ICCV10, L550 and KAK 2) evaluated for agronomic, quality traits and resistance to pod borer.

Trait	Accession Identity
Yield and seed size	ICC 1880, 2263, 6802, 13892, 15868 (3.1 to 3.7 t ha ⁻¹) ICC 8155, 12328, 16654, IG 6905 (2.4 to 3.5 t ha ⁻¹ and 39 to 44 g 100-seed weight)
Earliness	ICC 14595, 8318, 16374, 1083, 8621 (38 to 44 days)
High Protein	ICC 12654, 11903, 9418; IG 69974 (26% to 27%)
Pod borer tolerance ¹	ICC 3218, 15294; IG# 6067, 6905, 73074

¹ 2.0 to 2.5 score on 1 to 9 scale (G 130, 5); larval survival 35% to 65% (Annigeri, 76%), larval weight 0.61-2.04 mg larva⁻¹ (G 130, 3.85)



Detached Leaf Bioassay for pod borer screening test.

Association mapping for allelic variation with beneficial traits

- Genotyping with additional 100 SSRs to buildup 150 SSR loci data in reference set
- Using fluorescent-based multiplex genotyping system - multiplexes each with four SSRs and high throughput platform (ABI3130)
- Phenotyping reference set for agronomic traits and stress tolerance (*Helicoverpa*, drought and salinity)

¹ GCP.SP1 (1d): Completing genotyping of composite germplasm set of chickpea