

Characterization of cultivated chickpea and wild relatives



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[Cultural practices](#)

[Descriptors](#)

[Information](#)

Planting and cultural practices for characterization

The following are the procedures recommended in the ICRISAT Genebank Manual (Upadhyaya and Laxmipathi, 2009).

Environment

Chickpea is a dry and cool season crop requiring low ambient relative humidity and absence of rains during flowering and pod maturation.

Soil type

Soils with good water holding capacity with low acidity/alkalinity are ideal for chickpea (well drained and not very heavy soils are good for chickpea). Variable but sandy loam or clay-loam soil with good drainage are preferred.

Use peat potting mix in pots, alkaline clay in the field, or alkaline clay mixed with potting mix in cages.



Evaluation of chickpea germplasm at ICARDA (photo: ICARDA)

Rainfall

Minimum rain 40-70 cm or irrigation during flowering (heavy rains are harmful to chickpea).

Season

According to the ICRISAT Chickpea Germplasm Catalog: Evaluation and Analysis (Pundir et al, 1988a).

Post-rainy season (planting in October or November and harvesting in February or March at ICRISAT, Patancheru, Hyderabad, India).

Autumn planting (mid-November to mid-December) except for spring and cold-susceptible varieties which should be planted in the spring [mid-February to early April in the Central and West Asia and North Africa (CWANA) region].

Plot size

60 cm ridges of 4 m length and 1 m path, row to row distance 30-45 cm (Upadhyaya and Laxmipathi, 2009).

Sampling area/border area

The first 50 cm at the beginning and last 50 cm at the end of the row should not be considered for data recording, neither should the border rows (standard practice based on the number of accessions for characterization).

Plant density

10 cm apart.

Replications

Un-replicated single rows.

Standard check cultivars

Use national checks (standard practice based on the number of accessions and the extent of diversity in the collection).

Frequency of standard checks

At the beginning and one after every nine test entries (standard practice based on the number of accessions and the extent of diversity in the collection).

Time of day for data collection

Between 08:30 and 16:30 hrs for most of the traits and between 10:00 and 16:30 for flower observations (standard practice based on the crop morphology and phenology).

[back to top](#)

Descriptors

Morphological descriptors for characterization

See [chickpea descriptors](#) developed by IBPGR (now [Bioversity International](#)), [ICRISAT](#) and [ICARDA](#) (1993), and [key access and utilization descriptors](#) for chickpea genetic resources developed by Bioversity International and an international advisory group.

Pictures for characterization

They are essential to display variability. They also provide a supplementary description, by images, of the descriptors.

Take photographic records with standard mounted camera.

For each accession, use about 100 seeds in a petri dish with respective ID label.

Take also plant morphology photos especially for wild relatives, as well as for important traits and plant types of interest like growth habit, leaf, stem, seed, whole plant, flower colour, pod and seed size colour and shape.

Herbarium samples for characterization

Collect them for all genetic stock showing morphological diversity and all wild species accessions during multiplication/regeneration.

Molecular descriptors for characterization

SSR, EST-SSR, AFLP, RAPD markers (this are additional DNA fingerprint identification, useful for genetic diversity research).

Cytological characterization

Limited for small numbers of accessions.

Especially useful for genetic stocks and wild species accessions in the areas of chromosome number and pollen fertility for ploidy level, mutants, etc.

Nutritional traits for characterization

Seed protein content (Pundir et al, 1988a).

Cooking ability (according to methods of Jambunathan et al, 1981; Singh et al, 1990).

Others

Climate data of the site for the growing season and reaction to various biotic and abiotic stresses (Pundir et al, 1988a).

Gene transformation (ICARDA is working on genetic transformation of chickpea).

[back to top](#)

Recording information during characterization

The following information must be recorded for each accession:

Flower colour (colour of the ventral surface of the vexillum).

Stem colour (colour of the different parts of the plant expressed as high, low or no anthocyanin).

Growth habit (the angle of the branches from the vertical axis at the pod filling stage as a basis for classification).

Seed colour (colour of the seed coat, recorded from mature seeds that have been stored for less than three months).

Seed shape (shape of dry and mature seeds).

Seed surface (surface of dry and mature seeds).

Days to 50% flowering (number of days from sowing to the day on which 50% plants of an accession have started flowering).

Flowering duration (the number of days from 50% flowering to the date when 50% of the plants of an accession stopped flowering).

Plant canopy height (the average canopy height (cm) of three/five representative plants of an accession).

Plant canopy width (the average canopy width/plant spread (cm) of three/five representative plants of an accession).

Days to maturity (the number of days from date of sowing to the stage when over 90% of pods have matured and turned yellow).

Branching pattern (pattern of emergence of primary, secondary and tertiary branches on the stem).

Basal primary branches (average number of basal primary branches per plant recorded from three/five representative plants in each accession at the time of harvest).

Epical primary branches (average number of epical primary branches per plant recorded from three/five representative plants in each accession at the time of harvest).

Basal secondary branches (average number of basal secondary branches per plant recorded from three/five representative plants in each accession at the time of harvest).

Epical secondary branches (average number of epical secondary branches per plant recorded from three/five representative plants in each accession at the time of harvest).

Tertiary branches (average number of tertiary branches per plant recorded from three/five representative plants in each accession at the time of harvest).

Number of pods per plant (average number of fully formed pods per plant from three/five representative plants in each accession at the time of maturity).

Number of seeds per pod (average of 10 pods each from three/five representative plants at maturity).



Information about seed colour needs to be recorded during characterization. The photo above shows the many colors chickpea seeds can have (photo: ICRISAT)

100-seed weight [the weight of 100 randomly selected seeds (g) of an accession from a sun-dried sample after harvesting].

Seed yield estimate (seed yield from all plants of a plot converted to kg ha⁻¹).

Seed protein content [the crude protein content (%) estimated in the freshly harvested seeds on a dry weight basis].

Screening against diseases (screening for resistance to Fusarium wilt, Colletotrichum blight, Ascochyta blight, Botrytis gray mold).

References and further reading

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[back to top](#)

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