



Figure 1. Seeds of 12 perennial *Cicer* species increased under field and greenhouse conditions at Pullman, Washington, USA. 1) *C. acanthophyllum*, 2) *C. anatolicum*, 3) *C. canariense*, 4) *C. flexuosum*, 5) *C. macracanthum*, 6) *C. microphyllum*, 7) *C. montbretii*, 8) *C. multijugum*, 9) *C. nuristanicum*, 10) *C. oxyodon*, 11) *C. pungens*, and 12) *C. songaricum*.

carefully. Be careful to transplant the germinated seed before the radical grows too long and can be easily broken.

6. Maintain plants in well-drained soil. This is critical for survival in the greenhouse. Water sparingly.

For the majority of species, germination occurs in 5–10 days. This procedure has worked well for all *Cicer* species included in this study, except *C. montbretii* which apparently requires additional treatments to break dormancy that we have yet to determine.

We have observed that perennial *Cicer* species frequently fail to flower under greenhouse conditions, and if they do, most of the flowers abort. Therefore, in the early 1980s, perennial *Cicer* nurseries were established at several outdoor sites in the Palouse region of eastern Washington at elevations ranging from 200–750 m in different soil types where other agricultural crops are commonly grown. Temperatures range from a minimum of -30°C (or lower) in the winter when the nurseries may or may not be covered with an insulating snow cover, to a maximum of $30\text{--}35^{\circ}\text{C}$ in the summer months.

During the winter, plants are established in the greenhouse and then transplanted to the field in June–July after the danger from freezing temperatures is over. Plots are watered and weeded regularly and pods must be harvested frequently as many dehisce when ripe. In the Palouse region, all perennial species die back to

ground level in the fall at the end of the growing season (Sep–Oct) and send out new shoots in the spring (Apr–May) with the advent of warmer weather.

Varying quantities of seed have been obtained from most of the perennial species listed in Table 1. With some species, it has taken 3–4 years for plants to flower and produce viable seed in the field nurseries. Some *Cicer* spp, such as *C. anatolicum*, PI 383626, have survived over 10 years in the field nurseries and are still producing seed.

References

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Occurrence of New Characteristics in Chickpea — Purplish Stem with White Flowers

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We have identified a natural mutant in chickpea that combines purplish stem with white flowers. Earlier this trait combination was not known in the *Cicer* genus.

Broadly, two chickpea types are known: i) Plant shoot with purplish-green (low anthocyanin = LA) flowers, seed colors other than white and a conspicuous beak over the micropyle (= angular seed); this type is often called *desi* (Indian vernacular), i.e., indigenous type; and ii) Green plant shoot (no anthocyanin = NA) with white flowers and seeds, and the beak over the micropyle is short (= owl's head shaped seed); this type

is called *kabuli* (Pundir et al. 1988). The name *kabuli* is believed to derive from the city of Kabul (Afghanistan) through which white-seeded chickpeas were transported from the Middle East to India (van der Maesen 1972). There is another smaller group of chickpea landraces in which stem has NA, flower is light pink, and seeds are brownish white and angular. These can be called intermediate type chickpeas.

The desi and *kabuli* types are the most common, and they constitute strong constellations of specific traits. For example, the LA stem, colored flowers and seeds, and the angular seeds are inherited together. However, there are some exceptions. For example, chickpea cv RS 11 (ICC 4992) of Rajasthan (India) origin has NA stem and white flowers but the seeds are of the desi type. We report here the occurrence of a new characteristic in chickpea—LA stem with white flowers. Five plants with this characteristic were located in a plot of chickpea landrace ICC 10412 (origin: Karnataka, India) raised during 1995 at ICRISAT Asia Center (IAC). In subsequent generations, we found this progeny breeding true. The parent line ICC 10412 is a typical desi type with LA stem color, pink flowers, and brown seeds. We assume that this phenotype is a natural mutation of recent origin. This line grew fairly normally, flowering in about 45 days and producing 130 pods per plant with yellow brown seeds. The seeds are angular and weigh about 14.4 g per 100 seeds (Table 1). It is gratifying to

report that we have further identified three plants with similar characteristics (LA stem and white flowers) in a plot of ICC 1551 grown during 1995/96 at IAC.

Scientists have been interested in improving yields of chickpea by crossing desi and *kabuli* types (Hawtin and Singh 1980). However, in the segregating progenies, the trait combination of LA stem and white flower was not realized, nor was this seen in the basic germplasm lines. With that status of knowledge we had presumed that NA stem and white flower vs LA stem and colored flowers are governed by two different alleles of the same gene. With the availability of this mutant, perhaps, we will be able to precisely study the trait constellations of desi and *kabuli* chickpeas.

This mutant line has been registered as ICC 17101 in the ICRISAT chickpea germplasm collection, and a small quantity of seeds can be obtained on request for research.

References

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Table 1. Some features of mutant chickpea in relation to cv Annigeri grown at ICRISAT Asia Center, poststrayn season 1996/97.

Trait	ICC 17101 (mutant)	ICC 4918 (cv Annigeri)
Days to flowering	45	46
Plant height (cm)	42	49
Days to maturity	119	121
No. of pods	130	46.4
Seeds pod ⁻¹	1.1	1.2
Seed yield (3 m ² basis)	590 g	460 g
100-seed mass	14.4 g	20.6 g
Growth habit	Semi-spreading	Semi-erect
Seed shape	Angular	Angular