



## Changes in population parameters due to generation advancement in single seed descent in chickpea (*Cicer arietinum* L.) I. Flowering and plant height

Anil Kumar and Ram Kumar

Department of Plant Breeding, CCS H.A.U. Hisar 125 004

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Various conventional methods like pedigree, bulk population, mass selection, single seed descent (SSD) and single pod descent have been used in crop improvement programmes to handle large segregating populations. SSD has been stated to be a good substitute to handle large genotypic variability with considerably lesser efforts [1, 2]. The serious drawbacks of SSD has been reported to be population loss up to 55 per cent [3] which lead to genetic drift and loss of valuable transgressive segregants. The present investigations were carried out to find out the quantum of loss in population mean and variability from F<sub>3</sub> to F<sub>4</sub> generations by single seed descent in chickpea (*Cicer arietinum* L.).

The experiment material consisted of seed of each of the 300 plants harvested from F<sub>3</sub> population of two crosses H82-2 × H86-18 (CI) and H82-2 × H91-36 (CII), grown in SSD fashion in F<sub>4</sub> generation

in ten different sets for each cross, each set having 300 plants. Each seed of a set was numbered and grown in natural field conditions with 45 × 10 cm distances. Field emergence observations were recorded 20 days after sowing and the surviving plants were counted at harvesting to find out the population loss. Observations were recorded on a number of traits including days to flower initiation (DFI) and plant height (PH) for each plant. This publication includes the findings on these traits only. Shifting observations of the relevant plants from the nearest set completed the observations of missing plants in first set. The population parameters worked out included mean, range, variance and phenotypic coefficient of variation (PCV).

The population loss was cross specific and was higher (Table 1) in CII (61.2%) than CI (50.4). The loss in population in CII included 45.1% loss in germination and 16.1% due to other reasons possibly

**Table 1.** Comparative population parameters in completed and incomplete sets of two crosses for plant height and days to flower initiation in chickpea

Sets	Population		Cross-I				Cross-II					
	Size	% loss	DFI		Plant height (CI)		Size	% loss	DFI		Plant height CII	
			Mean	Var.	Mean	Var.			Mean	Var.	Mean	Var.
Com	300	-	92.8±0.44	59.2	46.6±0.55	90.8	300	-	102.8±0.42	66.9	39.6±0.49	71.4
1	117	-	95.7±0.65	48.6	47.0±0.82	79.0	132	56.0	102.5±0.89	55.5	40.0±0.76	75.7
2	166	44.7	91.1±0.38 <sup>↑</sup>	62.6	44.9±0.68	76.6	147	51.0	103.4±0.39	22.8 <sup>**</sup> ↓	37.3±0.59	51.7 <sup>↓</sup>
3	151	49.7	91.1±0.38	22.1 <sup>**</sup> ↓	44.9±0.76	88.4	117	61.0	103.3±0.45	23.7 <sup>**</sup> ↓	39.8±0.96	108.0 <sup>**</sup> ↑
4	158	47.3	91.7±0.39	24.3 <sup>**</sup> ↓	45.1±0.81	104.7	125	58.3	104.7±0.45	26.0 <sup>**</sup> ↓	41.5±0.81	81.9
5	154	49.0	92.3±0.49	37.6 <sup>**</sup> ↓	46.4±0.81	100.0	111	63.0	102.4±0.54	58.5	42.3±0.90	89.9
6	147	51.0	92.9±0.38	21.3 <sup>**</sup> ↓	42.9±0.76 <sup>↓</sup>	86.5	114	62.0	104.7±0.46	24.6 <sup>**</sup> ↓	39.5±0.77	68.2
7	140	53.3	92.2±0.57	45.4 <sup>↓</sup>	40.5±0.7 <sup>**</sup> ↓	62.0 <sup>**</sup> ↓	96	68.0	104.8±0.53	27.3 <sup>**</sup> ↓	41.1±0.82	65.3
8	155	48.3	92.2±0.84	110.5 <sup>**</sup> ↓	46.2±0.78	94.7	69	77.0	104.9±0.67	30.7 <sup>**</sup> ↓	42.4±1.12	86.9
9	142	52.7	93.0±0.51	36.5 <sup>**</sup> ↓	47.1±0.74	77.4	136	54.7	104.1±0.43	25.4 <sup>**</sup> ↓	40.3±0.71	59.3
10	158	47.3	98.4±0.5 <sup>**</sup> ↑	33.5 <sup>**</sup> ↓	46.7±0.69	74.5	118	60.7	102.5±0.60	42.1 <sup>**</sup> ↓	40.2±0.25	60.2
***	149	50.4					116.5	61.2				

\*,\*\* Significant at 5% & 1% level of significance respectively; ↑ increase; ↓ decrease; \*\*\*Mean of ten incomplete sets

seedling lethality, fungal diseases, soil salinity and insect attack. In CI, however, the germination loss was 27.9% and loss due to other reasons was 22.5%. There was not a single case in which a plant was absent in all the ten sets of either cross. CI had at least one parent (H 86-18) resistant to wilt, blight and root rot. A loss of up to 55% of original population at the end of the three generations has been reported [4]. The cross specificity of the loss could be attributed to the varied effects of natural selection. The varied population loss in different sets of same cross could be described due to the block effects.

The effect of population loss on various parameters of population including mean, variance and PCV was worked out. For DFI the population mean has remained almost the same as in the completed set except in two incomplete sets of each cross (Table 1). Mean PH has been decreased only in two incomplete sets of CI. Natural selection did not cause significant differences in mean performance of incomplete sets though with varied reduction in population. Similar observations have been made in three soybean hybrids [5]. The variance in case of DFI decreased significantly in 7 and 8 incomplete sets in cross I and II, respectively; remained same in two incomplete sets of each cross and increased in only one incomplete sets of cross I. Both early as well as late blooming plants have been

lost randomly. The range indicated considerable variation in most of the incomplete sets for this character. The situation for plant height is different (Table 1). The variance in incomplete sets remained unchanged in 8 cases of each cross whereas it decreased in two and one set in C-I and II, respectively, and it increased only in one incomplete set of C-II. Generally the variation in all the populations is considerable as revealed by PCV. Hadad and Muehlbauer [6] observed similar diversity in SSD in different population sizes.

#### References

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