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Short Communication

Diallel analysis for components of genetic variation on traits related to drought tolerance in chickpea (*Cicer arietinum* L.)

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The present study was undertaken to understand the genetic make up of various traits related to drought tolerance. Fifteen biparental chickpea (*Cicer arietinum* L.) hybrids without reciprocal crosses were developed through 6 × 6 diallel mating design using four drought tolerant (ICCV 10, ICC 4958, Pusa 362 and Pusa 256) and two susceptible (Pant G114 and H 208) parents. F_1s and parents were planted in a RBD with three replications under rainfed conditions during *rabi* 2003-04. The estimates of the components of genetic variation and heritability in narrow sense were computed as per procedure suggested by Griffing [1].

Mean sum of squares due to *gca* and *sca* were highly significant for all the characters suggesting thereby, the operation of both additive and non-additive components of gene action in the material studied. However, the ratio of *gca* to *sca* variance i.e. $\sigma^2 gca$ / $\sigma^2 sca$ was less than unity for all the traits indicating the presence of higher proportion of non-additive genetic components of variation in the material (Table 1). The importance of both additive and non-additive gene action was observed for biological yield. However, non-additive gene action was found more important than additive gene action. Other workers also reported similar results [2]. Harvest index showed low σ^2 *gca* than σ^2 *sca* indicating the predominant role of non-additive gene action. Both additive and non-additive variance was important for plant height but non-additive variances was found to be more important. The results on days to flowering and days to maturity indicated that both additive and non-additive gene action were important. However, non-additive gene action was found to be more important than additive action for both the traits. Physiological characters such as relative water content and membrane injury were found to be controlled by both additive and non-additive gene action with predominating non-additive gene action in determining these characters. Similar results were reported by other workers [3] for relative water content. Thus, it is evident from the forgoing discussion that non-additive gene action was more important for all the characters under study even in this self pollinated crop. In order to make an effective breeding programme, biparental mating among randomly selected plants in F_2 and subsequent generations would help in pooling the desired genes together to develop pure lines.

References

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Table 1. Estimates of genetic components of variation and heritability of different traits in chickpea

Sl. No.	Characters	$\sigma^2 gca$	$\sigma^2 sca$	$\sigma^2 E$	$\sigma^2 A$	$\sigma^2 D$	h^2 ns	$\sigma^2 gca/\sigma^2 sca$
1.	Days to flower	16.99	68.25	0.11	33.98	68.25	33.20	0.25
2.	Days to maturity	22.49	78.90	0.12	44.98	78.90	36.26	0.29
3.	Plant height (cm)	35.84	120.45	0.52	71.68	120.45	37.21	0.30
4.	No. of branches	4.21	20.55	0.25	8.42	20.55	28.81	0.21
5.	Pods/plant	317.39	1924.05	1.13	634.78	1924.05	24.80	0.17
6.	Biological yield (g)	57.60	702.45	2.42	115.20	702.45	14.05	0.08
7.	Seed yield plant (g)	87.20	238.05	0.28	174.40	238.05	42.95	0.37
8.	100-seed weight (g)	83.75	94.05	0.06	167.50	94.05	64.03	0.89
9.	Harvest index (%)	94.14	411.30	1.79	188.29	411.30	31.30	0.23
10.	Membrane injury (%)	125.37	220.20	0.66	250.74	220.20	53.17	0.57
11.	Relative water content (%)	41.90	204.90	0.70	83.82	204.90	28.96	0.20

$\sigma^2 gca$: Variance due to general combining ability; $\sigma^2 sca$: Variance due to specific combining ability; $\sigma^2 E$: Variance due to environment; $\sigma^2 A$: Additive variance; $\sigma^2 D$: Dominance variance; h^2 ns: Heriatabilitv in narrow sense