INTERNATIONAL JOURNAL OF AGRICULTURE & BIOLOGY
1560–8530/2002/04–1–148–149
http://www.ijab.org

Exploitation of Genetic Variability for Grain Yield Improvement in Chickpea

SHAUKAT ALI, AHMAD BAKHSH MAHER, M. ANWAR AND A.M. HAQQANI
Pulses Program, National Agricultural Research Centre, Islamabad, Pakistan

ABSTRACT

A set of twenty elite lines of chickpea was planted in the field to estimate the genetic variability for different quantitative traits. The results revealed that secondary branches per plant, total weight of plant, pods per plant and seed yield per plant reflected good response to selection. Genotypic differences were found to be significant for all the parameters studied.

Key Words: Variation; Heritability; Genetic advance; Chickpea

INTRODUCTION

Chickpea is one of important Rabi legume crops of Pakistan. Phenotypic variation in quantitative characters includes components due to genotype and environment and interaction between the two. Its area exceeds one million hectares with average yield of 696 kg ha^{-1} (Agriculture Statistics of Pakistan, 1997-98). Studies on variability of traits affecting yield are limited. Malik *et al.* (1988) reported that genotypes having proportion of genotypic variance might not be easily affected by environment. Jahargirdar *et al.* (1996) reported high heritability values coupled with genetic advance for secondary branches per plant, pods per plant and seed yield per plant, were due to large additive gene effects. Wanjari *et al.* (1996) observed a moderate value of heritability for yield per plant. Chavan *et al.* (1996) showed that high heritability coupled with genetic advance in pods per plant and seed yield was due to additive genetic variance. They recommended that branches per plant and pods per plant should be used as selection criteria. Kumar *et al.* (1999) observed high genotypic and phenotypic coefficients for pods per plant and seed yield per plant. They also reported high heritability value and genetic advance as per cent of mean of these traits. The present investigation was made to estimate genetic variability and response to selection in 20 diverse genotypes of chickpea.

MATERIALS AND METHODS

The experimental material used in the study comprised 20 elite lines/varieties of chickpea i.e. PCH-15, 1049, 4001, 2008, 4005, 660, 4008, 1084, 288, 4012, 1128, CS-30, 1117, AUG-480, 1265, 679,1034, 1114, Paidar-91 and C 44. The breeding material was planted in a triplicate fashion using a Randomized Complete Block Design. The plant to plant and row to row distances were kept as 15 cm and 30 cm, respectively. The data were collected on eight quantitative traits and were subjected to analysis of variance according to Steel and Torrie (1980). Phenotypic and genotypic coefficients of variability, heritability and genetic advance were computed in normal way.

RESULTS AND DISCUSSION

Data (Table I & II) showed a considerable variation among genotypes for the parameters studied and, therefore,

Table I. Means squares of various quantitative traits

S.O.V	D.F	D.Fl.	D.M	P.H	P.B/P	S.B/P	T.W.P	P/Pt.	Y/Pt.
Genotypes	19	8.34**	11.399**	42.21**	0.39**	2.21**	140.21**	215.53**	31.72**
Replication	2	2.09**	2.757**	19.16**	0.14**	0.73**	49.29**	81.10**	8.09**

**= Highly significant at p< 0.01; D.F.= Days to flowering; D.M.= Days to maturity; P.H.= Plant height; P.B./P= Primary branches per plant; S.B./P= Secondary branches per plant; T.W.P.= Total weight of plant; P/Pt.= Pods per plant; Y/Pt.= Yield per plant

Table II. Range, coefficients of varibility, estimates of heritability and genetic advance of various traits under selection

Trait	Range	Coefficient of variability (%)		Heritability (%)	Genetic Advance as %age of mean
		Phenotypic	Genotypic		
Days to flowering	115.67-122.33	1.74	1.21	47.84	1.46
Days to maturity	171.67-178.67	1.35	0.96	51.09	1.21
Plant height (cm)	51.67-67.53	9.05	4.84	28.61	4.54
Primary branches per plant	2.87-4.30	12.50	7.59	36.40	8.04
Secondary; branches per plant	3.33-7.40	18.30	11.61	40.04	12.91
Total weight of plant (g)	15.77-39.24	21.10	15.49	38.21	13.50
Pods per plant	44.37-72.83	19.08	10.64	64.45	10.09
Yield per plant (g)	8.92-19.67	26.86	18.92	49.96	23.46

selection can be exercised. The phenotypic coefficients of variability were higher than the genotypic ones, being highest for the total weight of plant, yield per plant, pods per plant and secondary branches per plant. The highest value for genotypic coefficient was for yield per plant, led to a good value of broad sense heritability and expected genetic advance (Table II). Secondary branches per plant, total weight of plant and pods per plant also had a good level of genotypic component of variability and showed a good response to selection like yield per plant. For the parameters, primary branches per plant and plant height, a moderate value of genetic advance was observed since the genotypic coefficient of variability was not as much as secondary branches per plant, total weight of plant pods per plant and yield per plant. The remaining parameters expressed a low level of expected genetic advance and ranked lowest in terms of response to selection (Table II). Although the parameters days to flowering, days to maturity, primary branches per plant and plant height exhibited reasonable heritability values, yet the expected genetic advance due to selection was low because of narrow variation. So from the results, it is clear that selection progress can be expected to be the greatest for seed yield per plant, total weight of plant, secondary branches per plant and pods per plant. Moderate progress can be expected for plant height and primary branches per plant especially if the environmental effects are countered (Adhikari & Pandey, 1982) by growing larger populations. Little progress can be expected from selection for remaining characters to improve the yield potential of chickpea lines/genotypes. The breeders need to concentrate on the parameters that have a minimum of moderate genotypic coefficient of variability and expected genetic advance in chickpea breeding programmes to achieve a breakthrough in yield potential.

REFERENCES

Adhikari, G. and M.P. Pandey, 1982. Genetic variability in some quantitative traits in chickpea. *Int. chickpea Newsletter*, 7: 4–5.

Chavan, V.P., H.S. Patil and R.N. Rassal, 1996. Genetic variability, correlation studies and their implication in the high yielding genotypes of chickpea. *Madras Agric. J.,* 81: 463–5.

Jahargirdar, J. E., R.A. Patil and V.M. Dhond, 1996. Genetic variability and its relevance in chickpea improvement. *PKV Res. J.,* 20: 13–4.

Kumar, V., C.S. Kar, P.C. Sharma and V. Kumar, 1999. Variability, correlation and path analysis in chickpea (*Cicer arietinum*). *Environment and Ecology*, 17: 936.

Malik , B.A., I.A. Khan and M.R. Malik, 1988. Genetic variability and correlations among metric traits in chickpea. *Pakistan J. Res.*, 9: 352–4.

Steel, R.G.D. and J.H. Torrie, 1980. Principles and Procedures of Statistics. McGraw Hill Book Co. Inc. New York.

Wanjari, K.B., A.J. Patil and P.B. Ghawghawe, 1996. Genetic variability in F5 progenies derived from bulk populations in chickpea. *Ann. Pl. Phsiol.,* 10: 83–6.

(Received 09 November 2001; Accepted 10 December 2001)