

Original Research Article

Genetic Variability Studies in Chickpea (*Cicer arietinum* L.)

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ABSTRACT

This study carried out to investigate variability parameters in sixty elite chickpea genotypes including two standards. The experiment laid out by using randomized complete block design with three replications. Heritability estimates were maximum for 100 seed weight followed by day to maturity, number of pod per plant, plant height, seed yield per plant, number of primary branches, number of secondary branches, protein content, and number of seed per pod. Genotypic and phenotypic coefficient variation highest for seed yield per plant. Genetic advance highest for pod per plant. These are important parameters for selecting maximum yielding genotypes in chickpea.

Keywords

Genetic
Variability,
Heritability,
Genetic
advance

Introduction

Pulses are the important source of protein in our country in vegetarian diet. Pulses, have the unique ability to fix atmospheric nitrogen and thus play a vital role in sustainable agriculture. Pulses are unique crops having in-built mechanism to trap atmospheric nitrogen in their root nodules and restore soil fertility. They are capable of thriving in harsh and fragile environments. Pulses are richest and cheapest source of protein and form major part of protein diet of vegetarian population of the country. This contains 20 to 25 % proteins as against 8 to 15 % in cereals. Chickpea is rich source of proteins, carbohydrates, minerals and possesses 358 calories of energy which is higher as any of the legume except groundnut and lupine seeds.

Being fairly tolerant to soil moisture stress, they occupy important position in different cropping systems (Anonymous, 2006). Genetic variability prerequisite for any breeding programme. However, information on association between yield and its various components provides basic for selecting improved varieties. Wahid and Ahmad reported high estimate of genetic coefficient of variability for plant height and seed per pod. Tripathi and Kumar *et al.*, reported high genetic and phenotypic coefficient of variability of pod per plant, 100 seed weight, and seed yield per plant. Sial *et al.*, examined that genotypic coefficient of variation was lower for all the characters, except plant height than phenotypic coefficient of variation. The

present study conducted to gather information on genetic variability and interrelationship for grain yield and its components in chickpea for future breeding programme.

Materials and Methods

Sixty elite line chickpea namely BDNG 9-3, DIGVIJAY, VISHAL, JAKI 9218, SAKI 9516, BDNG 2013-1, BDNG 2013-2, BDNG 2003-1, BCP 26, PHULE G-0302-10, PHULE G 08108, PHULE G-0611-14, AKG 1103, AKG 1106, AKG 1108, BDNGK 798, KRIPA, VIRAT, PKV KABULI 2, PKV KABULI 4, BDNGK 799, BDNGK 807, PHULE G 12310, PHULE G 12313, PHULE G 12318, AKG-1208K, AKG-1304K, BCP 49, GJG 09-06, ICC 14870, ICC 33121, ICC 5034, ICC 33129, BCG-13-16, ICC 16348, ICC 1042, BCG-19-17, BCG-25-1, BCG-36, HK-08-208, ICC4958, ICC-1433, IC-33132, ICC-8111, ICC-20882, ICC-9503, ICC-12735, ICC-117751, ICC1696, ICC5255, ICC-33259, ICC-5783, ICC-15105, ICC-33141, ICC-33148, ICC-33103, ICC-13812, ICC-117619, ICC-33212, ICC-33271 and two standard check variety BDNG 797 and VIJAY were sown in the field in the three replication using as Randomized Complete Block Design in a plot size 4 meters keeping plant to plant distance of 15 cm and rows 45cm apart Data for seed yield and 9 other character were recorded. Estimation of heritability and genetic advance were calculated as described by Falconer

Results and Discussion

Genotypic and phenotypic coefficients of variation

Genotypic coefficient of variation (GCV) was highest for seed yield per plant (35.83 %) followed by number of 100 seed weight

(34.31 %), Number of pod per plant (25.68 %), number of secondary branches per plant (24.54 %) and number of primary branches per plant (21.77 %). The maximum phenotypic coefficient of variation was recorded for seed yield per plant (37.03 %) followed by 100 seed weight (34.40 %) number of secondary branches per plant (27.17 %), pod per plant (26.11 %) and number of primary branches per plant (24.07 %).

In general, the magnitude of phenotypic coefficient of variation was higher than the genotypic coefficient of variation.

Heritability and genetic advance

Maximum heritability was observed for 100 seed weight (99.50 %) followed by days to maturity (97.60 %), number of pods per plant (96.70 %), plant height (96.01 %), seed yield per plant (93.60 %), number of primary branches per plant (81.80 %), number of secondary branches per plant (81.60 %), days to 50 % flowering (74.40 %) protein content (66.80 %) and number of seed per pod (14.20 %) High heritability (> 70 %) was observed in most of the characters studied.

The estimates of Genetic Advance ranged from 0.06 to 27.51 with the highest estimate in case of number of pods per plant (27.51 %), 100 seed weight (25.70 %), days to maturity (16.73%), plant height (15.34 %), seed yield per plant (12.05 %), number of primary branches per plant (7%), days to 50 % flowering (5.69 %), number of secondary branches per plant (5.5 %) and protein content (1.88 %). simple selection where finding supported by similar noting of Dumbre *et al.*, (1984), Samal and Jagdev (1989), Sharma *et al.*, (1990), Jahagirdar *et al.*, (1994), Sable *et al.*, (2000), Borate *et al.*, (2010), Dar (2012)and Jadhav *et al.*, (2012).

Table.1 Estimates of variability parameters for ten quantitative characters in chickpea

Sr. No.	Name of the characters	Range	Mean	σ^2_g	σ^2_p	σ^2_e	GCV (%)	PCV (%)	h^2 (b.s.) (%)	G.A.	G.A. as % of mean
1.	Days to 50 % flowering	46.67-58.67	51.75	6.27	8.427	2.16	4.84	5.61	74.40	5.69	11.01
2.	Days to maturity	92.67-120.67	106.34	41.18	42.22	1.03	6.04	6.11	97.60	16.73	15.74
3.	Plant height (cm)	24.57-49.30	36.50	35.14	36.57	1.43	16.24	16.57	96.01	15.34	42.04
4.	Number of primary branches per plant	7.67-20.67	13.96	9.24	11.28	2.05	21.77	24.07	81.80	7.25	52.01
5.	Number of secondary branches per plant	4.80-17.00	9.43	5.35	6.56	1.20	24.54	27.17	81.60	5.51	58.54
6.	Number of pods per plant	20.83-66.07	41.27	112.32	116.18	3.85	25.68	26.11	96.70	27.51	66.66
7.	Number of seeds per pod	1.00-1.60	1.15	0.04	0.03	0.02	5.86	15.57	14.20	0.06	5.82
8.	100 seed weight (g)	11.80-48.13	28.46	95.33	95.84	0.50	34.31	34.40	99.50	25.70	90.34
9.	Protein content (%)	18.03-21.60	19.74	0.76	1.14	0.38	4.43	5.42	66.80	1.88	9.56
10	Seed yield per plant (g)	6.37-24.50	13.17	22.26	23.78	1.52	35.83	37.03	93.60	12.05	91.53

Genotypic and phenotypic variance

The magnitude of genotypic variance was highest for number of pods per plant (112.32) followed by 100 seed weight (95.33), days to maturity (41.18) and plant height (35.14). The phenotypic variance, ranged between 0.03 and 116.18 (Table 1). The Pod per plant recorded highest phenotypic variance (116.18) followed by 100 seed weight (95.84) and Day to maturity (42.22). The environmental variance ranged from 0.02 (Number of Seed per pod) to 3.85 (Number of pods per plant)

References

- Anonymous, 2006. Review Manual, AICRP on chickpea, IIPR, Kanpur.
- Borate, V.V. Dalvi, V.V. and Jadhav, B. B. 2010. Estimates of genetic variability and heritability. *J. Maharashtra Agric. Univ.*, 35(1): 47-49.
- Dar S.A., Ishfaq A., Khan M.H., Pir F.A., Ali Gowhar and Abu Manzar 2012. Genetic variability and interrelationship for yield and yield component characters in chickpea. *Trends in Biosciences*, 5(2): 119-121
- Dumbre, A.D., Deshmukh, R.B. and Navale, P.A. 1984. Analysis of genetic variability in chickpea. *J. Maharashtra agric. Univ.* 9(3): 283
- Falconer, D S 1989. Introduction to quantitative Genetics 3rd Logman Scintific and Technical, Logman House, Brunt mill Harlow Essex, England
- Jadhav, R.S., Mohir, M.N. and Ghodke M.K. 2012. Genetic variability in chickpea. *Bioinfolet*, 9(2): 199-201.
- Jahagirdar, J.E., Patil, R.A. and Khapre, P.R. 1994. Genetic variability and its relevance in chickpea improvement. *Indian J. Pulses Res.*, 7 (2): 179- 180.
- Kaur C.S., P.C. Sharma and V Kumar 1999. Variability, correlation and path analysis chickpea (*cicer arientinum* L.). *Environment Ecol.* 17(4): 936-939. [Pl.Br Absts 70 (5): 4912; 2000].
- Kwon, S.H. and J.H. Torrie, 1964. Heritability and inter-relationship of traits of two soybean population. *Crop Sci.*, 4: 196-9
- Sable, N.H., Khorgade, P.W. and Narkhede, M.M. 2000. Genetic parameters and formulation of selection indices in chickpea. *Ann. Plant Physiol.*, 14 (1): 83-87.
- Samal, K.M. and Jagdev, P.N. 1989. Genetic variability studies and scope for improvement in chickpea. *International Chickpea Newsletter*.20: 6.
- Sharma, B.D., Sood, B.C. and Malhotra, V.V. 1990. Studies on variability, heritability and genetic advance in chickpea. *Indian J. Pulses Res.* 3(1): 1-6.
- Sial, P., P K Mishra and R.K. Patnaik 2003. Studies on genetic variability, heritability and genetic advance in chickpea (*cicer arientinum* L.) *Environment and Ecology* 2(1): 210-213 [Pl Br Absts 73(6): 5417; 1999]
- Tripathi, A. K., Pathak, M. M., Singh, K. P. and Singh, R. P. 1995. Path coefficient analysis in chickpea. *Indian J. Pulses Res.*, 8(1), 71-72.