DHANDAPANI, N. AND KUMARASAMY, T. 1983. Persistence of toxicity of some foliar insecticides against some sucking pests on chillies. **Indian J. Pl. Prot.,** 11: 20 - 23.

JAGAN MOHAN, N., KRISHNAIAH, K. AND PRASAD, V.G. 1980. Evaluation of insecticides for the control of pests of sweet pepper (**Capsicum annuum** var **grossum** Linn.) **Pestology.,** 4 (10): 13-15

MALLIKARJUNA RAO, D. AND KHALID AHMED, 1985. Evaluation of certain insecticides for the control of pest complex on chilli (**Capsicum annuum** L.) in Andra Pradesh. **Pesticides,** 19 (2): 41-44.

RAMUDU, A.V. AND REDDY, G.P.V. 1983. Efficacy of certain insecticides on the pest complex of chillies. **Andhra agric. J. 31:** 20-22.

RANGARAJAN, A.V., JANAGARAJAN, A. AND SIVAGAMI, R. 1974. Experiments on the control of chilli thrips **Scitothrips dorsalis** on chilli. **Andra agric. J., 21:** 95-96.

REDDY, D.N.R. AND JAGADISH, A. 1980. Insecticidal control of chilli thrips, **Scirtothrips dorsalis** Hood. (Thysanoptera: Thripidae). **Pesticides.,** 14 (10): 22-23.

SREE RAMULU, C. 1976. Improved varieties of chillies. **Arecanut and Spices Bulletin,** 7 (3) : 65-68.

THAKRE, S.M., TIKAR,D.T. AND BORLE,M.N. 1979. Efficacy of some insecticides in the control of thrips of chilli. **Pesticides.,** 13 : 31-32.

THIRUMAL RAO, V., RAMANADHA RAO, P. AND KOTESWARA RAO, M. 1950. A note on chillies thrips control in seed bed areas in Guntur district. **Madras Agric. J.,** 37: 62-65.

Madras Agric. J. 77(3 & 4): 172-175 Mar-Apr. 1990 https://doi.org/10.29321/MAJ.10.A01939

DIVERGENCE ANALYSIS IN CHICKPEA AS INFLUENCED BY ENVIRONMENTS

K.P.Singh, B.D. Chaudhary and V.P.Singh
Haryana Agricultural University, Hisar

ABSTRACT

Sixty diverse genotypes of chickpea evaluated in three environments revealed six clusters formed in environments 1 and 2, whereas seven clusters were formed in environment 3. The number of clusters and constituents of the clusters varied with the environment. Similar was the pattern of intra and inter- cluster distances.

KEY WORDS: Chickpea, genetic divergence, D^2 analysis.

Hybridization has been and will continue to be the most important tool in the hands of breeder in releasing useful variablity for subsequent use. While adopting hybridization as the method of breeding, the breeder is always confronted with the choice of the most suitable parents. The problem appears all the more in self pollinated crops. Genetically diverse parents have been considered to have different genetic constitution and hence are likely to produce large variability in F_2 due to genetic recombination. Keeping this in view, the present investigation was undertaken to assess genetic divergence among 60 commercial varieties of chickpea under three environments.

MATERIALS AND METHODS

Fourty four desi and sixteen kabuli diverse genotypes of chickpea (*Cicer arietinum L.*) were evaluated in randomized block design with four replications in each of the three environments. Two of the environments were created by sowing the material at an interval of a fortnight, whereas in the third environment, the material was sown during subsequent year.

Mean of the five random and competitive plants was used for multivariate analysis (Mahalanobis, 1928). The D^2, i.e., divergence between every varietal combination was obtained as the uncorrelated sum of squares of the differences in the values of corresponding uncorrelated variables. In turn, the uncorrelated variables were computed by multiplying original data with trasformation equations. The coefficients for these transformation equations were obtained by dividing the first row of reduced error variance covariance matrix by the square root of the corresponding pivotal condensation elements. The genotypes were clustered following Tocher (Rao, 1952).

RESULTS AND DISCUSSION

The diverse the parents, within limits of fitness, the greater are the chances of obtaining higher amount of heterotic expression in the hybrids and broad spectrum of variability in segregating generations. Mahalanobis' D^2 permits precise comparison among all possible pairs of population in the given group before effecting actual crosses.

Wilks' criteria, a simultaneous test of differences between mean values of a number of correlated variables indicated that the differences between the means in respect of the pooled effect of 'p' characters between different populations were significant for each of the three environments. It indicated that grouping of genotypes can be conducted in the present experiment and will be fruitful. The sixty genotypes were grouped into six clusters in environments 1 and 2 whereas in seven clusters in environment 3. Thirty five, twentyseven and thirtyone genotypes of environments 1,2 and 3 respectively clustered in group 1 (Table 1). Thus fifty per cent of the genotypes are genetically similar. However, only ten genotypes were common in all the three environments, whereas twentythree genotypes were common in two of these three environments. Similar was the trend in remaining clusters. The clustering pattern varied with the environments. The number of clusters and constituents differed in different environments. The influence of environments was so much that eleven genotypes of cluster II in environment 3 were present in cluster I of environment 1. Similarly, another genotype 'ICCC 11' which made cluster VII of enviroment 3 was grouped in cluster II of environments 1 and 2. Jain *et al.* (1981) also observed that clustering pattern is influenced by environments to a quite large extent.

The magnitude of inter and intra cluster distances between the groups was similar in environments 1 and 2 whereas, it was lowest in environment 3 (Table 2). The distances were ranked for 6 common clusters in each environment. The rank correlation between environments 1 and 2 was significantly high (0.718). Contrarily, it was nonsignificant and low in environments 1 and 3 (0.300) and environments 2 and 3 (0.300). The ranks in environments 1 and 2 deviated in clusters IV and V followed by I and II. However, ranks in environments 1 and 3 became nonsignificant and low due to cluster combination I and IV followed by II and V, III and IV and V. Similarly, rank correlations in environments 2 and 3 became nonsignificant and low because of cluster combinations I and VI followed by I and V, III and VI, II and V and III and V. From the above discussion, one can easily observe that deviations in three environments were not because of a particualr cluster. The

genotypes shifted from one cluster to another. Secondly, macroenvironments substantially influence the clustering pattern, whereas some deviations are observed even due to microenvironments. Environments 1 and 2 depicted similar trend because the environments were created by altering the dates of sowing within the same year at the same location whereas in environment 3, the experiment was conducted in subsequent year.

REFERENCES

JAIN, K.C., PANDYA, B.P. AND PANDA, K. 1981. Genetic divergence in chickpea, **Indian J. Genet., 41** : 220-225

MAHALANOBIS, P.C. 1928. A statistical study at Chinese head measurment. **J. Asiatic Soc. Bengal, 25**: 301-377.

RAO, C.R. 1952. **Advanced Statistical Methods in Biometric Research.** John Willey & Sons, Inc., New York.

TABLE 1. Clustering pattern of chickpea in three environments.

Cluster	Environments	Total	Genotypes
I	1	35	H77-61, C214, G130, ICCC15,C235, GG602, JG1259, JG84, H77- 52, GNG16, H77-58, HMS23, GL770, GL549, GG588, ICCC14, H73-28, BG404, JG1258, BG216, ICCC18, H77-57, LG231, H192, ICCC21, JG1261,ICCC17,RGL754, GNG15, GL637, GL635, Gora 9, BG410, GL629, Kabuli Local
	2	27	No.132, H77-61, C214, G130, ICCC15,C235, JG84, JG1260, H77- 52, GNG16, H77-58, HMS23, GL770, GL549, GG588, ICCC14, BG404, ICCC20, Pant G114, H192, HMS 90, JG1261, ICCC17, RGL754, GNG15, GL629, Kabuli Local
	3	31	P324, H77-61, H208, G130, ICCC15, JG1259, GNG16, GL886, ICCC19, GL770, HMS23, GL549, ICCC20, JG1258, Pant G114, BG216, ICCC18, K902, LG231, ICCC21, HMS90, JG1261, Gora Hisari, ICCC17, RGL754, H457, Gora 9, BG410, 501/1105, L550, NEC2296
II	1	13	No132, H208, ICCC19, ICCC4, K902, ICCC11, Gora Hisari, H457, BG411, L550, BG409, GL633, 501/1105
	2	20	BG234, GL797, ICCC19, JG1258, ICCC18, ICCC11, H77-57, K902, ICCC21, H457, Gora Hisari, BG411, GL637, GL635, Gora 9, L550, BG409, BG410, GL633, 501/1105
	3	13	C214, C235, GL797, GG602, JG84, JG1260, H77-58, ICCC14, BG404, H77-57, H192, GNG15, GL635
III	1	7	P324, BG234, JG1216, ICCC20, Pant G114, ICCC16, HMS90

	2	8	P324, H208, GG602, JG1259, ICCC4, H73-28, BG216, LG231
	3	9	H73-28, L144, BG411, GL637, BG409, GL633, GL629, L532, Kabuli Local
IV	1	3	GL886, NEC2296, L532
	2	3	GL886, NEC2296, L532
	3	4	BG234, H77-52, GG588, ICCC16
V	1	1	GL797
	2	1	ICCC16
		3	No.132
VI	1	1	L144
		2	L144
		3	ICCC4
VII	3	1	ICCC11

TABLE 2. Inter (diagonal) and intra D ($=D^2$)Values of chickpea in three environments.

Environment	Cluster	I	II	III	IV	V	VI	VII
1	I	3.24	3.63	3.90	5.35	5.40	8.74	-
2		3.41	5.36	4.53	6.13	4.65	11.97	-
3		2.48	3.94	3.84	4.52	5.37	4.39	3.93
1	II		3.10	4.32	5.10	5.89	7.66	-
2			3.74	5.03	5.66	5.79	9.70	-
3			2.88	4.53	5.22	7.80	7.15	4.85
1	III			3.90	6.30	5.92	10.08	-
2				3.62	7.50	5.69	12.89	-
3				3.35	5.85	6.12	5.03	5.04
1	IV				3.90	7.14	6.49	-
2					3.58	5.30	7.98	-
3					3.55	4.05	5.99	4.73
1	V					0.00	9.83	-
2						0.00	11.05	-
3						0.00	5.25	4.02
1	VI						0.00	-
2							0.00	-
3							0.00	5.33
3	VII							0.00