GAU Res. J. 1995. 21 (1) : 207-212



Genetic Divergence in Chickpea

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Genetical adversity among genotypes to be used in breeding programme is a must, which can be ascertained by D^2 analysis. In the present study 76 chickpea genotypes were studied for their diversity.

The experimental material was planted on Instructional farm of Agriculture College, Navsari during rabi 1991-92, following randomised block design and 3 replications. The each genotype consisted of single row plot of 5 m length having a planting distance of 30 x 10 cm. The observations were recorded on 5 randomly selected plants for 10 agronomical characters. D^2 analysis was done as per Mahalanobis (1936) and clustering of groups was done by Tocher method (Rao, 1952).

TABLE 1

Cluster group of seventy six genotypes on the basis of D^2 – statistics.

Cluster	*Number of genotypes*	*Genotypes*	*Source/origin*
1.	*2.*	*3.*	*4.*
I	35	BDNG 154,	Maharashtra
		ICCV 89230, 8120002-23, 810098-3.	ICRISAT
		ICC 2662, ICC 6384, ICC 8397;	
		ICCL 86213, ICCV 88105	
		RSG 180, RSG 47	Rajasthan
		DPC (K) 14	U.P.
		P 47	Haryana
		JCP 6, JCP 28, JCP 29, JCP 39,	Gujarat
		JCP 45, JCP 46, JCP 49, JCP 50,	
		Chaffa, D. Yellow, Godhara,	
		Ghelod, JCP 13, JCP 192, JCP 233	
		Kharad, Khedbrahma, LS 48,	
		Puhari, SPS 136/129, JCP 5	

1.	2.	3.	4.
II	20	BKG 21, DGM 713	Rajasthan
		BG 364, BG 361	Delhi
		ICCV 88110, ICCC 32, ICCC 4, ICC 51254	ICRISAT
		KPG 24, KPG 160-3, K 173-4,	U.P.
		DPC (K) 10, DPG (K) 12 mDPC (K) 15.	
		Phule G 5	Maharashtra
		HK 88-232	Haryana
		LS 50	Punjab
		JCP 40, JCP 112, JCP 72	Gujarat
III	8	BKG 45	Rajasthan
		JCP 52, JCP 65, JCP 71, JCP 98	Gujarat
		ICC 10399	ICRISAT
		IG 226-18	M.P.
		K 1122	UP
IV	4	JCP 109, JCP 167	Gujarat
		ICCY 820487, ICC 12266	ICRISAT
V	2	ICCL 820128	ICRISAT
		LS 25	Gujarat
VI	2	K 8	U. P.
		L 144	Punjab
VII	2	PDG 85-11	U.P.
		ICCV 90301	ICRISAT
VIII	1	BDNG 345-19	Maharashtra
IX	1	ICC 9944	ICRISAT
X	1	Punia	Gujarat

Significant variation was noted among genotypes for all the characters. On the basis of D^2 analysis 76 genotypes were grouped in 10 clusters (Table 1). The cluster I was the largest comprising 35 genotypes of different origin. Cluster II possessed 20 genotypes whereas III and IV accommodated 8 and 4 genotypes, respectively. The clusters V, VI and VII had 2 genotypes each, while the remaining clusters were of single genotype. It was noted that the genotypes of same state, scattered into different clusters and of different states into same cluster. Thus the grouping pattern of the varieties was spread accross their geographical boundaries.

The inter and intra-cluster distance (Fig.1, Table 2) revealed that the former was higher in magnitude than later. The lowest intra-cluster distance was in cluster V (D = 6.72) and the highest in cluster II (D = 15.83). The high intra-cluster distance was because of wider genetic diversity among its genotypes.

The maximum iner-cluster distance (D) was observed between cluster V and IX

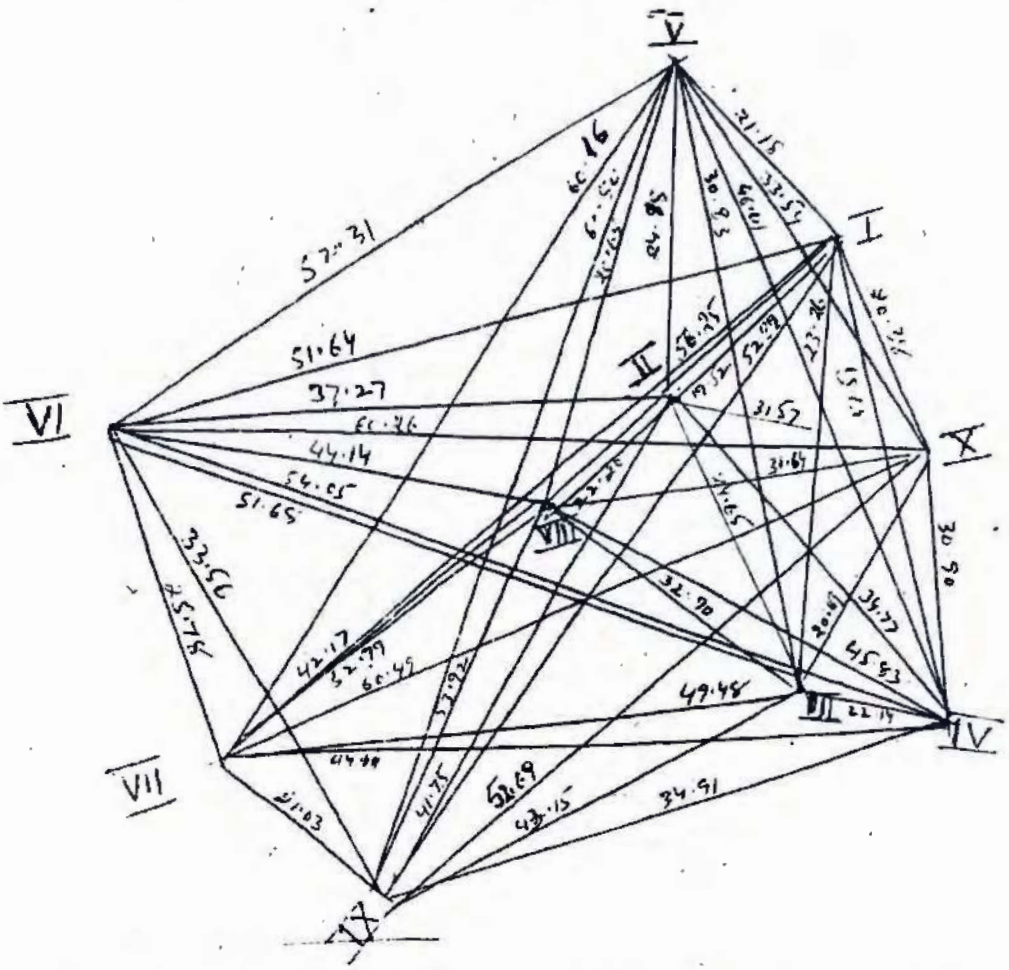

Fig. 1.: Inter cluster distance (D values) between different clusters in chickpea.

(60.50) followed by cluster VII and X (60.49) while the closest proximity was noticed between cluster I and VIII (19.52). The genetically diverse genotypes of cluster V (LS 25 and ICCL 820128), IX (ICCC 9944), VII (PDG 85-11 and ICCV 90301) and)((punia) could well be used in hybridization programme of chickpea for creating variability.

The cluster means of 10 clusters (Table 3) denoted high range in values. The cluster V was good for early flowering (44.0). number of pods per plant (66.53). number of pods per primary branch (18.23), 100 seed weight (20.15) and harvest index (53.86). The cluster VII had the highest mean values for seed yield (18.07) and plant height (52.93). While cluster IV was superior for number of seeds per pod (1.61) and cluster VI for branches per plant (4.93). Hence genotypes of above cluster be utilised for the development of respective characters.

A considerable variation for characters among single and multi genotypic clusters was observed. However, the differences were conspicuous for 100 seed weight, seed yield per plant, number of pods per primary branch and days to flowering and to some extent for number of pods per plant that have contributed largely to the total diversity. Dumbre and Desmukh (1984). Samal *et al.*, (1989), and Mishra and Rao (1990) have also reported significant contribution of these attributes towards total diversity in chickpea.

(Received on 17th May, 1994)

TABLE 2.

Inter and intra-cluster average distance D ($\sqrt{D^2}$) values in chickpea.

Cluster	*I*	*II*	*III*	*IV*	*V*	*VI*	*VII*	*VIII*	*IX*	*X*
I	14.04	23.01	23.26	37.51	21.18	51.44	56.25	19.52	52.88	20.38
II		15.83	24.65	34.77	24.18	37.27	42.17	22.20	41.75	31.57
III			15.34	22.14	30.83	51.68	49.48	32.90	43.15	20.69
IV				13.18	46.01	54.05	44.11	45.83	34.91	30.90
V					6.72	52.31	60.16	20.65	60.50	33.54
VI						9.83	25.78	44.14	33.56	60.26
VII							15.40	52.79	21.03	60.49
VIII								0.00	53.92	31.64
IX									0.00	52.69
X										0.00

TABLE 3
Cluster means for different characters in chickpea.

Cluster No.	Number of populations	Seed yield/ plant (g)	Day to flowering	Day to maturity	No. of primary branches/ plant	Plant height (cm)	Number of pods/ plant	Number of seeds/ pod branch	Number of pods/ primary branch	100-seed weight (g)	Harvest index (%)
		X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9	X_{10}
I	35	11.91	46.70	115.83	4.13	39.51	55.56	1.14	13.51	17.15	49.56
II	20	14.64	53.18	132.00	4.56	46.44	57.14	1.16	12.63	22.55	47.34
III	8	12.00	48.92	129.63	4.06	42.10	58.43	1.37	14.47	15.37	50.95
IV	4	11.37	53.67	130.08	3.82	40.77	58.67	1.61	15.37	14.83	49.85
V	2	17.10	44.00	132.00	3.67	46.50	66.53	1.02	18.23	29.15	53.86
VI	2	13.87	71.50	137.33	4.93	48.57	48.40	1.09	9.86	26.05	44.49
VII	2	18.07	72.50	135.83	4.90	52.93	59.70	1.42	12.29	23.22	51.90
VIII	1	14.13	49.67	108.33	3.93	46.33	53.27	1.02	13.60	26.90	41.64
IX	1	9.20	70.67	136.67	3.80	40.80	42.00	1.53	11.13	13.83	45.51
X	1	7.73	45.00	110.00	4.40	37.73	38.73	1.32	8.82	12.97	45.87
Mean		13.00	55.58	126.77	4.22	44.17	53.84	1.27	12.99	20.20	48.10
S. Em. ±		1.08	3.82	3.70	0.15	1.58	2.84	0.07	0.91	2.01	1.26
C.V. %		24.90	20.61	8.75	10.81	10.72	15.81	16.72	21.04	29.89	7.84

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