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**WABPT** ISSN 0976-4550 **Research** Article

## COMPARISION OF CLUSTER FORMATION BY MAHALANOBIS' D<sup>2</sup> AND **METROGLYPH ANALYSES IN GROUNDNUT (ARACHIS HYPOGAEA L.)**

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**ABSTRACT** : Fifty genotypes of groundnut were classified into five and seven clusters in  $D^2$  and Metroglyph methods of analyses respectively. Harvest Index and 100-seed weight were the main contributors to total divergence as per metroglyph analysis. The characters on X and Y axes in scattered metroglyph diagram determine the grouping of genotypes, hence it poses a problem for judicious selection of these characters. The comparative study of these methods indicated that metroglyph analysis would be suitable for preliminary grouping when large number of genotypes are considered at a time. The differences between the two methods, the number of clusters formed, inter cluster distance, characters considered for grouping and superimposition of genotypes within the cluster indicated that  $D^2$  analysis was more effective compared to metroglyph analysis.

Key words : Groundnut, Genetic divergence, D<sup>2</sup> Analysis, Metroglyph analysis

## **INTRODUCTION**

Genetic diversity is generally considered as an important criterion for choosing genetically diverse parents required for efficient and successful hybridization programme, which in turn results in the production of high yielding lines. Greater the genetic diversity in crop species, better is the chance of evolving promising and desired types. In the resent study, fifty groundnut genotypes are classified into different clusters through metroglyph and D2 analyses. The genotypes were compared for determination of genetic proximity and for assessing diversity among the genotypes.

# MATERIALS AND METHODS

The experimental material consisted of 50 genotypes of groundnut obtained from .A.R.S Trupati. The experiment was carried out in a Randomized Block Design with two replications during late Rabi 2004-2005. Each genotype was sown in two rows of 3m length in each replication with a spacing of 30cm X 10cm. Recommended package of practices were followed to raise the crop. Observations were recorded on randomly chosen ten competitive plants in each genotype in each replication for all the quantitative characters except for days to 50 per cent flowering and days to maturity. The observations on days to 50 per cent flowering and days to maturity were recorded on per plot basis. D2 analysis and Metroglyph analysis were carried out as given by Mahalanobis (1936) and Anderson (1957) respectively.

# **RESULTS AND DISCUSSION**

The genotypes exhibited wide variability and were grouped into five clusters by using Tocher's method (Table 1). Cluster I had a maximum of 41 genotypes representing different eco-geographical regions of the country and world. In the present study, the clustering pattern revealed that the distribution of genotypes from different clusters was at random and independent of their geographical origin. The genotypes originating from India (Andhra Pradesh, Uttar Pradesh, Maharashtra, Tamilnadu and Karnataka), Zaire, Argentina and U.S.A. had been grouped together in cluster I. On the contrary, the genotypes originating from Andhra Pradesh were distributed in different clusters indicating that geographic diversity though vital, may not necessarily be the factor in determining the genetic diversity. Navak and Patra (1997) and Singh et al. (2004) reported similar results regarding genetic divergence.

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The cluster means for different characters indicated considerable differences among themselves (Table 2). ICGV -86564 of cluster V recorded highest pod yield per plant and 100-seed weight (Table 3). Similarly, the genotypes of cluster I for shelling percentage and harvest index and cluster II recorded increased mean values for primary branches per plant and kernel yield per plant respectively. The genotypes of cluster III recorded high mean values for total pods per plant and mature pods per plant.

Intercrossing the genotypes from these clusters might result in a wide array of variability for exercising effective selection for these traits. The characters 100-seed weight and harvest index contributed maximum towards genetic divergence among the genotypes. It has been suggested that characters with maximum contribution towards divergence should also be given due consideration for groundnut improvement programmes.

Metroglyph Analysis: The fifty genotypes of groundnut were plotted on the metroglyph plot considering 100-seed weight and harvest index as X and Y ordinates. The other characters were represented by rays at different positions on the glyph. On observation, the scattered diagram (Fig.1) revealed seven clusters on the basis of morphological variation. The possible reason for cluster difference in D2 and metroglyph analyses could be that only two highly variable characters *i.e.*, 100-seed weight and arvest index were considered for cluster formation in metroglyph nalaysis without considering the other major character. Clusters VI and VII of metroglyph analysis disappeared in D2 analysis due to their merging with clusters I, II, III, IV and V respectively. Some of the genotypes were found to be superimposed over each other in the ultimate configuration as compared to clustering on the basis of D2 values. Similar report was made by Vijayasekhar (2002) for metroglyph analysis utilizing 100-seed weight and harvest index displaying wide variation.

The study reveals that metroglyph analysis would be suitable for preliminary grouping of large number of germplasm lines considered at a time. In metroglyph analysis, the characters on X and Y axes determine the grouping of genotypes. Hence it poses a problem for judicious selection of genotypes. The D2 values obtained by Tocher's method prove better over values obtained by metroglyph analysis since the D2 values are based on pooled mean of all the characters considered together, while the values are based on only two most variable characters in metroglyph analysis.

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Cluster	No. of genotypes	Genotypes	Place of origin
Ι	41	TCGS-27, TCGS-91, TCGS-150, TCGS-156, TCGS-320, TCGS-341, TCGS-596, MLTG-1, MLTG-2, MLTG-5, MLTG-6, MLTG-7, MLTG-8, MLTG-11, MLTG-13, MLTG-16	Andhra Pradesh,
		ICGV-86552, ICGV-89025, ICGV-89104, ICGV- 94361,	ICRISAT, Hyderabad, A.P.
		ICG-1326, ICG-3542	India
		ICG-3245	Zaire
		ICG-4893	Argentina
		ICG-7633	U.Š.A
		TG-34, TG-40,	Maharashtra
		K-134,K-1238,K-1240, TPT-4, TCG-4, Local Red,	
		GPB-2,	Andhra Pradesh
		SVGS-1	
		TMV-2	Tamil Nadu
		JL-24	Jalagaon, Maharashtra
		Faizapur Local	Uttar Pradesh
		DH-3-30	Dharwad, Karnataka
		TAG-24	BARC, Trombay
		CV-26	-
II	1	ISK-9109	-
III	6	TCGS-29,TCGS-617, TCGS-626, ICGV-86388	Andhra Pradesh
		M-13	Junagadh, Gujarat
		ISK-91013	-
IV	1	TG-49	Maharashtra
V	1	ICGV-86564	ICRISAT Hyderabad A P

## Table 1 : Cluster composition of 50 genotypes of groundnut in (Tocher's Method)



## Fig 1 : Scattered diagram of 50 groundnut genotypes on the Metroglyph plot



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	Table 2 : Cluster means for 15 characters in 50 groundnut genotypes and their relative contribution to genetic diversity														
Cluster Number	Days to 50% flowering	SCMR	Days to maturity	Primary branches per plant	Plant height	Total pods per plant	Mature pods per plant	Kernel yield per plant	Shelling percentage	Root weight	Shoot weight	Root weight to shoot weight ratio	Harvest index	Hundred seed weight	Pod yield per plant
I	33.71	44.12	110.11	4.28	219	26.12	20.39	1530	71.11	0.69	17.60	4.11	53.89	52.78	21.44
II	36.00	40.08	110.50	5.00	25.8	2535	19.50	17.41	69.42	1.04	33.85	3.07	41.76	60.51	25.05
ш	39.44	44.91	11092	4.85	21.94	32.20	22.56	11.74	59.52	1.09	38.97	2.83	32.37	44.11	1981
IV	32.00	46.35	111.50	4.00	19.40	14.30	9.70	11.07	69.93	0.71	10.31	6.85	50.52	75.53	1586
v	35.25	53.13	110.50	4.40	18.40	25.73	20.92	16.52	56.76	1.39	28.82	4.82	49.04	97.18	29.08
Times ranked First	0	11	0	0	4	3	0	27	9	64	634	208	10	252	3
Contribu tion(%)	0.00	0.90	0.00	0.00	0.33	0.24	0.00	2.20	0.73	5.22	51.76	16.98	0.82	20.57	0.24

## Table 3 : Mean performance of 50 groundnut genotypes for pod yield and its attributes

s. No	<sup>G</sup> enotype	Days to 50% flowering	SC MIR	Days to maturity	Primary branches perplant	Plant height (cn.)	Total pods per plant	Mature pods per plant	Kernel yield per plant (g)	Shelling per- centage	Root weight (g)	Shoot weight (g)	Root weight to shoot weight ratio (%)	Harvest index (%)	Hundred seed weight (g)	Pod yieldper plant (g)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1.	TCQS-27	35.77	44.17	111.50	535	2435	26.05	20.87	14.62	66.37	0.90	19.71	4.56	51.66	54.55	22.05
2.	TCGS-29	34.10	39.90	111.00	5.05	25.65	38.00	29.20	1697	62.99	1.09	38.62	2.84	40.41	47.29	26.94
3.	TCQS.91	33.16	42.25	109.50	4.25	23.65	28.33	19.60	15.18	73.43	0.74	13.17	5.64	59.72	50.36	20.65
4.	TCQS-150	32.92	44.72	109.00	430	16.4.2	2232	17.50	18.01	75.38	0.76	18.87	4.03	55.90	61.59	24.89
5.	TCQ5-156	32.90	45.17	110.50	4.45	23.02	23.70	18.10	17 27	74.48	0.79	13.37	595	62.07	60.38	23.19
6.	TCGs-320	32.75	45.20	109.50	4.70	16.02	23.40	18.30	17.48	71.00	0.59	13.87	4.28	62.90	56.35	24.58
7.	TCGS-341	32.25	43.27	111.50	4.15	22.20	20.90	17.20	14.95	71.85	0.67	14.66	4.56	57.48	54.26	20.77
8.	TCGS-596	33.12	46.40	110.50	430	2232	16.10	11.90	11.79	66.90	0.68	14.92	4 59	52.84	69.22	17.62
9.	TCGS-617	41.91	49.05	111.00	5.02	18.26	34.65	21.60	1192	64.09	1.25	40.22	3.11	30.94	51.63	18.60
10.	TCGS-626	38.75	45.55	111.00	4.25	16.12	15.06	12.23	6.14	62.00	1.00	29.94	336	24.25	40.36	991
11.	MLTG-1	32.05	44.82	111.00	4.45	2792	27.20	22.90	20.19	67.07	0.70	29.38	239	49.93	53.63	30.12
12.	MLTG-2	32.00	46.30	110.50	430	20.75	21.80	18.30	12.57	71.22	0.73	12.69	581	56.53	50.57	17.69
В.	MLTG-5	34.75	49.35	111.50	4.25	2130	23.10	16.02	8.72	62.11	0.57	11.15	5.18	54.31	44.52	14.07
14.	MLTG-6	31.50	41.60	109.50	4.10	1990	16.00	12.17	14.58	75.37	0.50	15.67	3.22	54.38	59.31	19.37
15.	MLTG-7	33.00	43.62	109.50	4.05	25.50	15.40	10.32	11.24	70.60	0.60	12.02	5.04	55.60	59.66	15.95
16.	MLTG-8	30.25	41.10	110.50	395	24.85	25.65	21.40	16.78	71.87	0.57	13.62	4.21	62.06	54.55	28.39
17.	MLTG-11	31.00	42.55	110.00	4.55	25.57	32.70	28.35	23.38	75.68	0.73	16.73	435	63.88	61.28	30.88



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S. No	Genotype	Days to 50% flowering	SC MR	Days to maturi ty	Primary branches per plant	Plant height (cn.)	Total pods per plant	Mature pods per plant	Kernel yield per plant (g)	Shelling per- centage	Root weight (g)	Shoot weight (g)	Root weight to shoot weight ratio (%)	Harvest index (%)	Himdred seed weight (g)	Pod yieldper plant (g)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
18.	MLTG-13	34.25	53.00	110.50	4.00	21.50	23.50	19.00	12.85	78.61	0.51	16.95	3.03	48.36	53.18	16.35
19.	MLTG-16	32.12	44.35	111.00	4.55	19.67	18.70	14.80	10.84	72.13	0.65	12.13	538	53.64	52.56	14.99
20.	IC GV-86388	42.20	43.25	111.00	4.85	28.82	30.03	22.80	11.49	59.24	0.87	41.52	2.09	31.37	43.34	19.40
21.	ICGV-86552	35.75	46.82	111.00	4.10	28.72	21.10	17.15	13.00	72.17	0.89	15.88	5.64	51.74	59.43	18.00
22.	IC GV-86564	35.25	53.12	110.50	4.40	18.40	25.73	20.91	16.52	56.76	1.39	28.81	4.82	49.04	97.18	29.08
23.	IC GV-89025	35.62	44.57	111.50	4.25	22.75	34.60	27.50	20.68	75.64	0.62	27.41	2.25	49.36	54.55	27.36
24.	ICGV-89104	34.00	46.52	108.50	390	1635	27.50	22.20	16.28	71.92	0.75	15.75	4.78	57.75	53.48	22.61
25.	ICGV-94361	32.75	46.17	108.50	390	23.90	23.70	20.10	18.95	72.04	0.66	18.12	3.68	58.31	60.67	26.30
26.	ICG-1326	33.00	41.77	105.50	390	22.50	26 30	20.50	15.61	75.00	0.55	23.00	2.42	46.90	46.80	20.81
27.	ICG-3245	31.25	40.42	107.50	4.00	20.60	4230	32.92	2591	77.42	0.82	26.21	3.13	55.28	57.20	33.50
28.	ICG-3542	32.50	43.72	110.00	4.20	22.40	23.40	16.81	10.91	71.78	0.51	16.99	3.01	46.46	39.21	15.20
29.	ICG-4893	32.25	41.15	109.50	4.15	23.75	28.70	22.50	16.90	75.43	0.80	15.80	5.07	57.31	46.50	22.37
30.	ICG-7633	30.50	42.30	108.50	4.15	20.90	24.50	19.40	15.63	66.70	0.56	11.89	4.74	64.21	43.45	23.46
31.	TG-34	35.25	42.82	111.50	4.45	15.61	38.70	28.20	17.88	66.61	0.60	19.61	3.08	56.99	49.38	26.86
32.	TG-40	37.37	44.75	111.00	4.20	18.15	25.20	20.40	9.97	64.60	0.78	16.34	4.79	47.42	43.47	15.44
33.	TG-49	32.00	46.35	111.50	4.00	19.40	14 30	9.7	11.07	69.92	0.70	10.31	6.85	50.51	75.52	15.86
34.	K-134	33.25	42.67	109.50	4 30	23.75	33.12	26.92	14.56	69.54	0.78	20.03	3.93	50.05	45.63	20.92
35.	K-1238	35.75	43.97	111.50	4.25	2035	30.80	21.60	14.63	75.21	0.48	14.67	3.28	56.22	47.25	19.47
36.	K-1240	38.37	44.37	111.50	4.25	19.52	40.00	28.70	19.78	74.26	1.02	28.69	3.57	47.00	48.22	26.64
				Dave									Boot weight		Himdred	
S. No	Genotype	Days to 50% flowering	SC MR	to maturi ty	Primary branches per plant	Plant height (cm)	Total pods per plant	Mature pods per plant	Kernel yield per plant (g)	Shelling per- centage	Root weight (g)	Shoot weight (g)	to shoot weight ratio (%)	Harvest index (%)	seed weight (g)	Pod yieldper plant (g)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
37.	TAG-24	31.58	46.20	109.50	4.65	12.50	22.53	17.50	12.15	72.10	0.91	22.93	3.99	41.34	53.41	16.84
38.	TMV-2	35.00	42.57	111.50	4.40	24.20	32.50	26.95	17.46	74.53	0.66	12.10	5.44	64.67	43.40	23.43
39.	TPT-4	33.00	43.87	108.50	4 25	17.80	17.50	13.10	10.47	74.66	0.52	15.32	3.44	46.71	54.37	13.99
40.	TCG-4	36.66	43.07	111.00	4.70	25.10	28.30	23.20	20.22	77.50	0.87	17.15	5.10	59.02	64.62	26.10
41.	M-13	38.66	47.68	110.50	4.60	20.27	36.40	22.70	12.65	54.23	1.50	40.34	3.72	35.77	56.40	23.32
42.	Л24	33.50	43.62	109.50	4.10	25.67	28.50	21.60	18.09	71.78	0.67	17.88	3.79	57.59	56.35	25.21
43.	Faizapur local	32.75	43.49	111.00	4.70	2030	28.60	19.55	1535	62.16	0.74	14.61	5.09	61.22	50.31	24.58

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
37.	TAG-24	31.58	46.20	109.50	4.65	1250	22.53	17.50	12.15	72.10	0.91	22.93	3.99	41.34	53.41	16.84
38.	TMV-2	35.00	42.57	111.50	4.40	24.20	32.50	26.95	17.46	74.53	0.66	12.10	5,44	64.67	43.40	23.43
39.	TPT-4	33.00	43.87	108.50	4.25	17.80	17.50	13.10	10.47	74.66	0.52	15.32	3.44	46.71	54.37	13.99
40.	TCG-4	36.66	43.07	111.00	4.70	25.10	28.30	23.20	20.22	77.50	0.87	17.15	5.10	59.02	64.62	26.10
41.	M-13	38.66	47.68	110.50	4.60	20.27	36.40	22.70	12.65	54.23	1.50	40.34	3.72	35.77	56.40	23.32
42.	JL-24	33.50	43.62	109.50	4.10	25.67	28.50	21.60	18.09	71.78	0.67	17.88	3.79	57.59	56.35	25.21
43.	Faizapur lo cal	32.75	43.49	111.00	4.70	2030	28.60	19.55	1535	62.16	0.74	14.61	5.09	61.22	50.31	24.58
44.	Localred	30.50	42.32	109.50	430	25.22	30.76	24.96	1538	69.17	0.56	16.95	331	55.82	56.26	22.21
45.	ISK91013	41.01	44.05	111.00	535	22.52	39.07	26.80	11.23	54.58	0.78	43.12	1.82	31.43	25.65	20.65
46.	ISK 9109	36.00	40.07	110.50	5.00	25.80	2535	19.50	17.40	69.41	1.04	33.85	3.07	41.76	60.51	25.05
47.	GPB-2	36.73	47.60	111.00	4.55	2490	23.12	18.35	17.65	71.39	0.80	22.22	3.62	51.71	65.40	24.71
48.	DH-3-30	36.06	39.05	111.50	4.05	19.57	23.20	17.40	9.30	63.53	0.52	23.83	2.19	37.51	50.42	14.65
49.	CTV-26	34.20	42.13	109.50	4.05	25.0.5	27.20	22.20	9.73	64.52	0.60	18.00	335	44.59	41.60	15.05
<i>5</i> 0.	SVGS-1	40.52	45.07	110.50	3.85	23.52	24.10	19.40	10.10	61.07	0.77	20.95	3.70	42.80	36.48	16.58
	General Mean	34.43	44.36	110.25	435	21.86	26.59	20.42	14.85	69.37	0.76	20.56	4.00	50.89	53.23	21.35
	Range	30.25 to 42.20	39.05 to 53.12	105.50 to 111.50	3.85 to 5.35	1250 to 28.82	1430 to 4230	9.70 to 32.92	6.14 to 2591	54.23 to 78.61	0.48 to 1.50	10.31 to 43.12	182 to 685	24.25 to 64.67	25.65 to 97.18	991 to 33.50
	SEd	0.95	091	0.59	0.17	1.65	3.25	2.65	1.25	1.02	0.03	0.57	0.13	1.83	1.07	1.84
	CD at 5%	2.71	2.60	1.69	0.48	4.71	9.23	7.55	3.55	291	0.11	1.59	0.38	5.20	3.06	524
	CD at 1%	3.62	3.47	2.26	0.64	6.28	1232	10.07	4.73	3.88	0.14	2.12	0.51	6.94	4.08	699

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