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VARIABILITY BETWEEN AND WITHIN FAMILIES IN GROUNDNUT

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ABSTRACT

Three-way, back and double crosses were produced involving four parents *viz.*, two bunch type varieties, one in each Virginia and Valencia cultures of groundnut. These crosses were evaluated in S_1 generations for the relative variability generated between and within families. Sufficient amount of variability between families was present for most of the characters and this was found to be more than within family variability for almost all the characters studied in all the crosses. This indicated the possibility of family selection in S_1 generation itself.

KEY WORDS : Groundnut, variability, within families, between families, family selection, leafspot disease

The vegetable oil economy of India depends mainly or groundnut, *Arachis hypogaea* L. But its average yield in India hovers around 1000 kg per ha as against the average of 2760 kg per ha in USA. Some of the main reasons for the low productivity in developing countries ar the occurrence of diseases and lack of agronomically acceptable varieties (Nigam *et al.*, 1991). Several attempts were made to develop disease resistant productive cultivars with limited success, main reason being the use of simple pedigree method of selection in single crosses. Multiple crosses are likely to yield more opportunities to recombine different genes. The S_0 plants in multiple crosses (corresponding to F_1 of single crosses) can be genetically different from one another as variability in multiple crosses involved genetic component also along with environmental component. Hence, it must be rewarding to evaluate different families in multiple crosses in S_1 generation. The relative variability generated between and within various families and their ratios were compared to gain an insight into the extent and pattern of distribution of variability and also to have an effective selection programme.

MATERIALS AND METHODS

Two of the most widely cultivated bunch varieties TMV 2 (mass selection from Gudhiatham bunch) and JL 24 (selection from EC 94943) both highly susceptible to leaf spots, were crossed with two cultures *viz.*, RMP 12 late leaf spot resistant Virginia bunch from Burkina Faso) and PI 393516 late leafspot and rust resistant Valencia from Peru) to produce three-way, back and double crosses. The seeds from individual S_0 plants were sown separately *ie.* the family identity was maintained while sowing the S_1 seeds in the lines with a spacing of 20 cm in rows of 5 m length spaced at 30 cm apart during *Kharif* 1991. No plant protection measures were resorted to against late leafspot disease. Observations were recorded on individual plants in each cross for 12 characters including disease resistance attributes *viz.*, DF (percentage of defoliation), LAA (percentage of leaf area affected by late leafspot) and RGLA remaining green leaf area percentage. The data pertaining to individual characters with respect to each family (plants descended from particular S_0 plant) in every cross were subjected to analysis of variance (Panse and Sukhatme, 1967).

RESULTS AND DISCUSSION

Sufficient amount of variability (CV) between families was present for most of the productivity characters, plant height, number of primary branches and LAA (Tables 1, 2). However, for shelling percentage SMK percentage, pod length and pod breadth, the variability between families was comparatively less. The DF, RGLA and days to flowering exhibited moderate amount of variability between families. The variance between families was more than that within families for almost all the characters in all crosses and the ratio of variance between to within families were always more than one with very few exceptions. The ration was high (5) with respect to length and breadth of pods, plant height, number of primary branches, disease resistance attributes (DF, LAA and RGLA). The ratio in days to flowering was much higher (Table 2). It will be rewarding to employ family

Table 1. Phenotypic variances between and within families and their ratio and coefficient of variation for productivity parameters in S_1 generations in groundnut

Cross & No. of plants	No. of families		Pod yield per plant BF	Pod yield per plant WF	Pod yield per plant PV (BF)/PV (WF)	Shelling percentage BF	Shelling percentage WF	Shelling percentage PV (BF)/PV (WF)	100-seed weight BF	100-seed weight WF	100-seed weight PV (BF)/PV (WF)	SMK percentage BF	SMK percentage WF	SMK percentage PV (BF)/PV (WF)	Pod length BF	Pod length WF	Pod length PV (BF)/PV (WF)	Pod breadth BF	Pod breadth WF	Pod breadth PV (BF)/PV (WF)
Ax(BxC)		PV	253.9	68 2		130.6	25.9		335 8	352		576.9	158.1		0.4	0.05		0.4	0.006	
844	38				3.7			5.0			9.6			3.6			7.2			7.0
		PCV	101.8	52.8		16.2	7.2		16.6	19.9		28.3	14.8		26.6	9.9		18.5	7.0	
Ax(BxD)		PV	112.4	51.6		113.3	24.1		208.6	45.3		260.1	170.3		0.4	0.06		0.06	0.008	
382	15				2.2			4.7			4.6			1.5			5.6			6.9
		PCV	80.9	54.8		14.5	6.7		50.6	23.6		17.9	14.5		26.4	11.1		22.4	8.3	
Bx(AxC)		PV	256.0	48.3		164.3	29.0		191.9	52.4		551.3	153.1		0.42	0.06		0.04	0.006	
448	25				5.3			5.7			3.7			3.6			5.2			6.2
		PCV	120.9	52.3		17.7	7.4		42.5	22.2		27.5	14.5		24.9	11.0		16.7	6.7	
Bx(AxD)		PV	160.9	72.1		226.4	23.4		147.9	46.4		220.9	114.6		0.5	0.12		0.04	0.007	
490	24				2.2			9.8			3.2			1.9			4.5			5.8
		PCV	68.9	46.1		21.0	6.7		35.1	19.5		16.5	11.9		26.9	12.9		17.4	6.9	
Ax(AxC)		PV	253.4	53.7		114.8	40.9		262.7	57.9		354.2	123.8		0.4	0.08		0.04	0.01	
462	22				4.7			2.8			4.5			2.9			5.2			4.3
		PCV	110.3	50.8		14.9	8.9		49.8	23.4		20.5	12.1		26.5	11.6		17.5	8.4	
Ax(AxD)		PV	76.3	28.7		128.0	21.7		127.6	19.5		174.2	89.6		0.7	0.36		0.04	0.005	
990	45				2.7			5.9			6.6			1.9			2.1			8.2
		PCV	81.6	50.0		15.4	6.3		46.2	18.0		14.6	10.5		38.6	26.8		18.9	6.6	
Bx(BxC)		PV	187.8	50.8		151.6	26.5		145.7	56.6		516.9	136.5		0.3	0.08		0.02	0.006	
437	26				3.7			5.7			2.6			3.8			3.5			3.8
		PCV	94.9	49.4		17.0	7.1		34.9	21.8		25.7	13.2		20.3	10.7		12.8	6.6	
Bx(BxD)		PV	58.5	65.3		19.5	11.9		18.7	35.1		146.2	90.7		0.12	0.07		0.01	0.003	
364	12				0.9			1.6			0.6			1.6			1.8			1.9
		PCV	41.2	43.5		5.9	4.6		11.5	15.8		13.2	10.4		12.4	9.4		6.4	4.6	
(AxD)x(BxC)		PV	199.2	51.6		152.6	28.3		359.4	59.4		365.7	158.2		0.7	0.14		0.07	0.013	
677	39				3.9			5.4			6.0			2.3			5.4			6.7
		PCV	94.1	47 9		18.0	7 7		61.2	24.9		22.2	14.6		33.2	14.3		22.4	9.7	

A - TMV 2 B JL 24 C - RMP 12 D - PI 393516 BF - Between families WF - Within families

Table 2. Phenotypic variances between and within families and their ratio and coefficient of variation for disease resistance and other attributes in S_1 generations in groundnut

Cross & No. of plants	No. of families		DF BF	DF WF	DF PV (BF)/PV (WF)	LAA BF	LAA WF	LAA PV (BF)/PV (WF)	RGLA BF	RGLA WF	RGLA PV (BF)/PV (WF)	Plant height BF	Plant height WF	Plant height PV (BF)/PV (WF)	Primary branches BF	Primary branches WF	Primary branches PV (BF)/PV (WF)	Days to flowering BF	Days to flowering WF	Days to flowering PV (BF)/PV (WF)
Ax(BxC)		PV	288.6	52.3		13.9	2.5		282.1	47.2		617.7	38.2		11.5	2.4		46.4	6.2	
844	38				5.5			5.6			6.0			16.2			4.9			7.5
		PCV	35.3	15.0		105.5	44.7		33.6	13.7		60.6	15.1		52.9	24.0		19.8	7.2	
Ax(BxD)		PV	273.3	42.3		9.1	1.8		224.7	39.1		467.2	41.5		6.6	2.6		9.0	3.2	
382	15				6.5			5.0			5.7			11.3			2.6			2.8
		PCV	32.2	12.7		83.3	37.1		32.0	13.4		42.9	12.8		36.4	28.8		9.1	5.4	
Bx(AxC)		PV	137.2	37.0		1.2	0.3		144.0	38.1		138.3	27.3		13.0	3.7		45.6	2.1	
448	25				3.7			4.8			3.8			5.1			3.5			21.5
		PCV	26.2	13.6		89.4	40.8		22.0	11.3		33.9	15.1		49.2	26.2		18.9	4.1	
Bx(AxD)		PV	200.5	37.6		40.0	6.0		200.9	35.8		266.7	33.9		12.8	2.3		15.4	2.7	
490	24				5.3			6.7			5.6			7.9			5.6			5.6
		PCV	27.5	11.9		111.3	43.1		29.8	12.6		47.8	17.0		55.2	23.3		11.8	5.0	
Ax(AxC)		PV	218.9	48.0		5.1	0.5		230.1	47.5		280.2	40.9		44.4	3.0		116.5	2.7	
462	22				4.6			9.4			4.8			6.9			14.7			43.0
		PCV	31.4	14.7		209.7	67.9		29.0	13.2		39.1	14.9		85.3	22.2		30.1	4.6	
Ax(AxD)		PV	257.5	41.0		2.8	0.6		257.6	38.8		589.6	49.1		8.2	1.5		13.5	2.8	
990	45				6.3			4.6			6.6			12.0			5.6			4.8
		PCV	31.0	12.4		102.9	47.9		33.8	13.1		54.0	15.6		41.1	17.3		10.9	5.0	
Bx(BxC)		PV	343.9	51.2		1.5	0.3		365.7	53.0		230.5	31.4		66.0	4.3		112.9	3.2	
437	26				6.7			6.1			6.9			7.3			15.5			35.6
		PCV	39.5	15.2		149.3	60.7		36.4	13.9		48.9	18.0		99.1	25.2		29.6	5.0	
Bx(BxD)		PV	58.2	28.0		13.1	2.7		58.0	27.2		71.5	19.2		3.8	2.0		10.3	1.6	
364	12				2.1			4.6			2.1			3.7			1.9			6.4
		PCV	14.0	9.7		127.9	57.8		17.2	11.8		24.7	12.8		26.6	19.4		9.6	3.8	
(AxD)x(BxC)		PV	643.4	83.8		18.9	1.9		686.9	80.5	266.9	42.5			8.7	1.3		60.6	3.6	
677	39				7.7			10.2			8.5			6.3			6.5			16.7
		PCV	46.9	16.9		201.4	63.0		53.8	19.9		44.2	17.6		48.3	18.9		23.0	5.6	

A - TMV 2 B - JL 24 C - RMP 12 D - PI 393516 BF - Between families WF - Within families selection in S_1 generation particularly for those characters showing very high ratios. Further, production of large number of S_0 plants in multiple crosses would be a better strategy to increase the amount of variability. Such suggestion was made by other workers also (Wilcox *et al.*, 1984).

The genomes in groundnuts are genetically related (Wynne and Coffelt, 1982). It is quite possible that the genes pass to the subsequent generation in different blocks reducing within and increasing between family variability (Rachie and Roberts, 1975). In the present study, the crosses involving resistant parent RMP 12 gave higher ratios of between to within family variances as compared to those involving PI 393516 for most of the characters. The Virginia culture RMP 12 belongs to subspecies *hypogaea* while the Valencia culture PI 393516 to subspecies *fastigiata*. The ovule parent *viz.* TMV 2 and JL 24 are Spanish bunch types belonging to subspecies *fastigiata*. Tl higher divergence of RMP 12 from the ovu parents might be the possible reason for the high ratios.

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EFFECT OF CEMENT DEPOSITION ON SOIL HORIZONS AT DIFFERENT LOCATIONS AROUND THE CEMENT FACTORY

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ABSTRACT

A study was undertaken in the area around a cement factory to assess the effect of cement kiln dust on the soil. Cement dust deposit varied with direction and distance from the kiln. The effect of cement kiln dust was comparatively high in east than south, west and north around the factory. In the eastern direction, the effect was more pronounced in the first two horizons. The cement dust showed an increase in bulk density and particle density and a decrease in porosity in E_1 and E_2 pedons. High values of pH and EC were recorded for the E_1 and E_2 pedons. Cation exchange capacity, exchange capacity, exchangeable Ca and K were also found to be high in E_1 and E_2 compared to all other pedons in all the four directions. Pedons E_1 and E_2 recorded comparitively higher content of free $CaCO_3$, sesquioxides and acid insolubles.

KEY WORDS : Cement dust, dust pollution, air pollution

Modern industries produce a variety of pollutants and release them into the atmosphere, water and soil which adversely affect the growth of crop plants. Cement industry is one of the major contributors of air pollution. The accumulation of cement dust varies with the distance from the industry. Chemically, it is a mixture of oxides of calcium, potassium, aluminium, silicon and sodium. It has the property of setting into a hard mass forming a thick crust when it comes in contact with water. It leads to a decrease in water holding capacity of soil, increase in pH, conductivity, Ca and Al, and decrease in nitrogen availability thereby affecting the plant growth. The harmful effects of cement exhausts on soil physico-chemical and biological properties are not fully substantiated hitherto and have been questioned by investigators. The present paper deals with the effect of cement dust pollutant on certain physical and chemical properties of soil.