



Variability Studies in F₃ population of Three Crosses in Groundnut (*Arachis hypogaea* L.)

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Groundnut is an important legume crop and is used as a food, oil and cash source. Mean and variability are the important factors for selection and they overcome the problems of handling larger segregating populations. Among the three crosses studied in the F₃ generation, the cross TMV 2 x COG 0437 had superior mean performance for plant height, number of branches per plant, number of pods per plant, pod yield per plant, kernel yield per plant, hundred kernel weight, rust and late leaf spot severity score and also on par with the genotype TMV 2 for shelling percentage. All the progenies of the cross TMV 2 x COG 0437 were recorded superior mean performance for number of pods / plant, pod yield / plant, kernel yield / plant, hundred kernel weight, rust and late leaf spot severity score. The crosses viz., TMV 2 x COG 0437, TMV 2 x COG 0438 and TMV 2 x ICGV 97150 also recorded high or moderate coefficient of variation for all the characters.

Key words: Groundnut, mean performance, coefficient of variation.

Groundnut (*Arachis hypogaea* L.) is the most important crop grown mainly under rainfed regions of the semi-arid tropics (SAT). In India, it is grown on an area of 6.41 million ha with a production of 9.36 million tonnes, which accounts for a productivity of 1460 kg/ha during 2007-08 (Anonymous, 2008). Plant breeders are commonly facing the problems in handling larger segregating populations. Mean and variability are the important factors for selection; mean serves as a basis for eliminating undesirable crosses and variability helps to choose a potential cross since variability indicates the extent of recombination for initiating effective selection procedures. Selection for the improvement of quantitative characters can be effective only when the segregating generations possess the potential variability. Many quantitatively inherited characters are fixed rapidly, emphasizing the need to test for character expression in large populations in F₃. Breeding potential of a cross between varieties is judged by the number of transgressive segregants. The probability of obtaining superior lines can be worked out in early generation provided estimates of first and second degree of statistics of genetic variation are available (Jinks and Pooni, 1976). Such information will be of immense use to plant breeders for differentiating crosses (Snape, 1982). In the present study, mean and variability studies of F₃ generation of three crosses in groundnut are estimated and presented.

Materials and Methods

The field experiment was carried out at

Department of Oilseeds, Centre for Plant Breeding and Genetics, Tamil Nadu Agricultural University, Coimbatore during kharif 2009. By using four groundnut genotypes consist of three late leaf spot and rust resistant genotypes viz., COG 0437, COG 0438, ICGV 97150 and one susceptible genotype TMV 2, three cross combinations viz., TMV 2 x COG 0437, TMV 2 x COG 0438 and TMV 2 x ICGV 97150 were made and selected for the present study. The variation of individual F₃ progenies of this three crosses for the morphological traits viz., plant height (cm), number of branches / plant, number of pods / plant, pod yield / plant (g), kernel yield / plant (g), shelling percentage (%), hundred kernel weight (g) and disease scoring for rust and late leaf spot (LLS) were analyzed in terms of mean, range, coefficient of variation. Nine point disease scale suggested by Subrahmanyam *et al.* (1995) was used to screen the lines for sources of resistance to rust and LLS. The range of coefficient of variation (CV) was categorized as per Sivasubramanian and Madhava Menon (1973); below 10 per cent - Low coefficient of variation; 11-19 per cent - moderate coefficient of variation; 20 per cent and above - high coefficient of variation. The significance for mean values was arrived by the critical difference (CD), standard error difference (SE_d) between F₃ progenies and check variety TMV 2 as follows, SE_d = (SE₁² + SE₂²)^{1/2}; SE₁ = SE of F₃ progeny number 1; SE₂ = SE of TMV 2 and CD = SE_d × t_{at} 5%.

Results and Discussion

Mean and CV percentage of all the three crosses are listed in Table 1. Among the crosses, the cross

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Table 1. Estimates of mean, Range and CV percentage of F₃ generation crosses viz., TMV 2 x COG 0437, TMV 2 x COG 0438 and TMV 2 x ICGV 97150 in groundnut

Traits	Crosses	Mean	Range	CV%
Plant height (cm)	TMV 2 x COG 0437	23.54*	18.22-27.42	20.01
	TMV 2 x COG 0438	25.01*	18.10-32.79	21.23
	TMV 2 x ICGV 97150	24.17*	17.08-30.86	25.04
Number of branches/ plant	TMV 2 (C)	29.98	-	-
	TMV 2 x COG 0437	5.82*	3.90-7.75	23.18
	TMV 2 x COG 0438	4.54	3.75-7.38	21.24
	TMV 2 x ICGV 97150	4.67	3.50-6.56	27.51
Number of pods / plant	TMV 2 (C)	4.00	-	-
	TMV 2 x COG 0437	19.61*	13.29-24.86	50.13
	TMV 2 x COG 0438	17.66*	10.43-25.29	36.71
	TMV 2 x ICGV 97150	14.50*	8.88-21.29	52.83
Pod yield / plant (g)	TMV 2 (C)	7.30	-	-
	TMV 2 x COG 0437	16.37*	12.89-20.45	50.29
	TMV 2 x COG 0438	14.40*	8.80-22.58	39.19
	TMV 2 x ICGV 97150	11.28*	5.13-18.99	59.75
Kernel yield / plant (g)	TMV 2 (C)	5.53	-	-
	TMV 2 x COG 0437	12.27*	9.42-15.87	56.79
	TMV 2 x COG 0438	10.79*	6.43-18.60	43.95
	TMV 2 x ICGV 97150	7.78*	3.63-15.13	67.99
Shelling percentage (%)	TMV 2 (C)	3.87	-	-
	TMV 2 x COG 0437	74.32	64.56-83.81	16.06
	TMV 2 x COG 0438	74.07	64.67-86.55	16.18
	TMV 2 x ICGV 97150	67.32	55.47-81.02	17.91
Hundred kernel weight (g)	TMV 2 (C)	73.66	-	-
	TMV 2 x COG 0437	34.60*	28.45-43.89	25.58
	TMV 2 x COG 0438	33.78*	22.67-44.50	22.56
	TMV 2 x ICGV 97150	30.03*	21.59-38.23	27.08
Rust severity score	TMV 2 (C)	18.56	-	-
	TMV 2 x COG 0437	1.85*	1.00-3.14	38.98
	TMV 2 x COG 0438	3.67*	1.24-7.67	47.19
	TMV 2 x ICGV 97150	4.10*	1.44-7.50	34.41
LLS severity score	TMV 2 (C)	7.90	-	-
	TMV 2 x COG 0437	2.71*	2.13-3.50	34.22
	TMV 2 x COG 0438	4.43*	2.50-7.67	24.93
	TMV 2 x ICGV 97150	4.51*	2.00-7.50	32.21
	TMV 2 (C)	7.90	-	-

* Significantly superior than check variety TMV 2

TMV 2 x COG 0437 recorded significantly shorter plant height (23.54 cm) and also recorded significantly superior mean for number of branches per plant (5.82) than other two crosses. The range was varied from 18.22 cm to 27.42 cm (plant height) and 3.90 to 7.75 for the trait number of branches per plant. Zaman *et al.* (2011) reported that the range of plant height varied from 17 cm to 38 cm and 8 to 15 for number of branches per plant. The cross TMV 2 x COG 0437 also recorded higher number of pods (19.61), significantly superior pod yield per plant (16.37 g) and higher kernel yield (12.27 g) than other two crosses. The range of the above cross was varied from 13.29 to 24.86 for the trait number of pods per plant, 12.89 g to 20.45 g for pod yield per plant and 9.42 g to 15.87 g for kernel yield per plant. John *et al.* (2006) studied that range of pod yield per plant was varied from 1.82 g to 15.64 g on hundred numbers of germplasm accessions in groundnut.

The F₃ population of all the three crosses had given significantly superior yield performance than the check variety TMV 2. The cross TMV 2 x ICGV 97150 recorded lower mean performance (67.32 per cent) for shelling percentage while the crosses viz., TMV 2 x COG 0437(74.32 per cent) and TMV 2 x COG 0438 (74.07per cent) were on par with TMV 2. All the three F₃ cross derivatives had shown significantly superior mean performance for hundred kernel weight. Among the three crosses studied, the cross TMV 2 x COG 0437 possessed higher hundred kernel weight (34.60 g). For rust severity score, the mean of three F₃ populations was tested against the standard check TMV 2, which in turn revealed desirable mean performance than the check. The cross TMV 2 x COG 0437 had shown lower rust disease score (1.85) and late leaf spot score (2.71) than other two crosses. Mean performance of individual progenies in the F₃ generation of the cross

Table 2. Mean performance of F₃ progenies in the cross TMV 2 x COG 0437

Progenies	Plant height (cm)	No. of branches / plant	No. of pods / plant	Pod yield / plant (g)	Kernel yield / plant(g)	Shelling percentage (%)	100 kernel weight(g)	LLS severity score	Rust severity score
1	26.46	7.75*	20.69*	17.75*	11.81*	65.37	32.63*	1.00*	2.13*
2	23.93*	6.58*	24.67*	20.45*	15.87*	80.89*	33.95*	1.67*	3.42*
3	27.32	5.19*	19.25*	15.67*	11.18*	70.38	30.82*	2.81*	2.25*
4	24.13*	7.00*	18.83*	17.35*	12.92*	72.01	37.69*	2.25*	2.92*
5	26.11*	5.71*	13.29*	12.89*	9.42*	70.72	37.37*	3.14*	3.29*
6	22.83*	5.00*	17.00*	18.28*	14.47*	77.89	40.54*	1.89*	2.67*
7	22.61*	6.50*	24.86*	15.66*	12.26*	78.56	28.45*	1.29*	2.57*
8	18.22*	5.23*	19.00*	12.90*	10.93*	83.81*	29.11*	1.85*	2.54*
9	27.42	6.38*	22.56*	19.17*	12.76*	64.56*	32.83*	1.13*	2.19*
10	19.11*	3.90*	17.95*	13.57*	10.30*	76.65	33.35*	1.29*	2.33*
11	20.79*	4.79	17.57*	16.35*	13.03*	76.72	43.89*	2.00*	3.50*
TMV 2	29.98	4.00	7.30	5.53	3.87	73.66	18.56	7.90	7.90

* Significantly superior than check variety TMV 2

TMV 2 x COG 0437 has presented in Table 2. All the progenies of this cross had recorded superior mean performance for number of pods / plant, pod yield / plant, kernel yield / plant, hundred kernel weight, rust and late leaf spot severity score. Shoba *et al.* (2009) reported that, the cross TMV2 x COG0437 had given higher mean performance for plant height, number of branches per plant, haulm yield per plant, number of pods per plant, pod yield per plant, kernel yield per plant, hundred kernel weight, pod length and pod width followed by the cross TMV2 x COG 438 in F₂ generation. From their studies, the cross TMV 2 x COG 0437 had also shown higher PCV and GCV values, high heritability and high to moderate GAM for most of the characters followed by the cross TMV2 x COG0438.

In any plant breeding programme, mean performance is the foremost important criteria to select an individual. Considering the mean performance, among the three crosses, the cross TMV 2 x COG 0437 had registered superior mean performance for plant height, number of branches per plant, number of pods per plant, pod yield per plant, kernel yield per plant, hundred kernel weight, rust and late leaf spot severity score and also on par shelling percentage with the genotype TMV 2. Being the F₃ generation, the amount of variability should be moderate or less. However, all the crosses recorded high or moderate coefficient of variation for all the characters. Hence, further selection and advancement of progenies is necessary till the attainment of homogeneity. High variability estimate for number of matured pods, kernel yield per plant and hundred kernel weight have been reported earlier by Prasanthi *et al.* (1990), Reddy and Gupta (1992) and Mothilal (2003). From the conducted experiment, based on the mean performance and CV percentage, the promising progenies (eleven numbers in Table 2) obtained from the cross TMV 2 x COG 0437 in F₃ generation could be selected for further advancement.

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