International Journal of Agricultural Sciences
Volume **9** | Issue 1| January, 2013 | 297-300

RESEARCH PAPER

Mating designs for improving late leaf spot resistance in groundnut (*Arachis hypogaea* L.)

C.C. ANGADI*, B.N. MOTAGI[1], G.K. NAIDU[2] AND T.R. SHASHIDHAR[3]
Karnataka State Department of Agriculture, DHARWAD (KARNATAKA) INDIA
(Email : ccangadi70@gmail.com)

Abstract : Different crosses of groundnut were evaluated in generating productive, late leaf spot resistant segregants with desirable agronomic features. A large amount of variability was observed for pod yield and resistance when the single and multiple crosses were advanced from s_1 to s_3 generation by different selection schemes. Back cross and three way crosses were marginally superior over other crosses in mean performance and frequency of desirable segregants for all the yield parameters. On the other hand, single and double crosses were more resistant to late leaf spot. Higher proportion of desirable recombinants in three way and back crosses revealed the possibility of breaking the undesirable linkages in these cross categories. Single and double crosses were poor in giving superior recombinants indicating the need for selective inter-mating between desirable groups.

Key Words : Groundnut, Late leaf spot, Resistance, Mating designs

View Point Article : Angadi, C.C., Motagi, B.N., Naidu, G.K. and Shashidhar, T.R. (2013). Mating designs for improving late leaf spot resistance in groundnut (*Arachis hypogaea* L.). *Internat. J. agric. Sci.,* **9**(1): 297-300.

Article History : Received : 12.09.2012**; Revised :** 15.11.2012**; Accepted :** 18.12.2012

INTRODUCTION

The average groundnut yield in India remains stagnant below 1000 kg/ha as against world average of 1125 kg/ha and 2760 kg/ha realized in U.S.A (Nigam *et al*., 1991).The low productivity is attributed to several production constraints, among which the widespread occurrence of foliar diseases is the most important one. Late leaf spot of groundnut [*Phaeoisariopsis personata* (Berk. and curt.) V.Arx] can cause total defoliation and greatly reduce the yield. Genetic studies indicated that leaf spot resistance is quantitatively inherited with a large additive effect (Walls and Wynne, 1985). Multiple crosses involving three, four or more parents, each with superior characteristics, are expected to produce greater variability and widen the genetic base. In the present investigation an effort was made to elucidate the potentiality different multiple crosses *viz.*, three-way cross, back cross and double cross in generating segregants with late leafspot resistance and productivity.

MATERIALS AND METHODS

The ovule parents TMV2 (designated as A) and JL24 (designated as B) were widely cultivated Spanish bunch varieties but susceptible to late leaf spot disease. The male parents RMP 12 (C) was resistant to late leaf spot and PI 393516(D) was a proven source of late leaf spot and rust resistance (Subrahmanyam *et al.*, 1989). The selection employed was aimed at obtaining superior plants in productivity disease resistance attributes. A total of 6915 plants obtained from 376 F_1 hybrid plants were evaluated crosswise in s_1 generation (Table A). Single cross (SC) and various multiple crosses *viz.*, three way cross (TWC), back cross (BC) and double cross (DC) were generated. Individual plants in each cross that exceeded mean +2 standard deviation with respect to pod weight and remaining green leaf area were

*** Author for correspondence**
[1]Department of Plant Breeding, Seed Unit, University of Agricultural Sciences, DHARWAD (KARNATAKA) INDIA
[2]Department of Genetics and Plant Breeding, University of Agricultural Sciences, DHARWAD (KARNATAKA) INDIA
[3]Department of Horticulture, National Seed Project, Seed Unit, University of Agricultural Sciences, DHARWAD (KARNATAKA) INDIA

Table A : Advancement of segregating material from S_1 to S_3 generation in groundnut crosses

Cross	F_1 Hybrid plants	No.of S_1 plants	Single plant yield (g)		Single plants selected for yield	Green Leaf area (%)		Single plants selected for green leaf area
			Mean	S.D.		Mean	S.D.	
A×C	25	373	14.6	7.8	10	46.5	7.8	1
A×D	35	370	10.2	6.8	15	41.7	7.8	4
B×C	25	338	14.1	7.6	10	50.1	7.2	3
B×D	45	740	12.7	7.5	32	41.9	6.2	21
A×(B×C)	38	844	15.7	8.7	38	50.0	7.6	19
A×(B×D)	15	382	13.1	7.3	5	46.8	6.8	13
B×(A×C)	25	448	13.2	7.7	20	54.5	6.6	6
B×(A×D)	24	490	18.4	8.7	18	47.6	6.6	13
A×(A×C)	22	462	14.4	7.9	19	52.3	7.5	6
A×(A×D)	45	990	10.7	5.3	32	47.4	6.9	21
B×(B×C)	26	437	14.4	7.7	17	52.5	8.4	5
B×(B×D)	12	364	18.6	8.1	20	44.4	5.3	5
(A×D)×(B×C)	39	677	15.0	7.7	23	44.9	10.7	12
Total	376	6915			269			129

selected for yield and resistance respectively (Abdul Khader., 1993).

Sixty plants per cross and ten plants per parent were chosen for recording observations on the yield parameters *viz.*, pod yield per plant in g (PY), shelling percentage (SP) and hundred seed mass (HSM) and disease resistance parameters *viz.*, defoliation percentage (DF), leaf area affected (LAA) and remaining green leaf area percentage (RG).

Phenotypic co-efficient of variation (PCV), broad sense heritability (H), genetic advance over mean (GAM) and frequency of desirable segregants and recombinants and other statistical estimates were computed using individual plant observations.

RESULTS AND DISCUSSION

Groundnut being a self fertilized allotetraploid; it has some inherent problems in combining desirable genes from different botanical groups especially through single crosses. Multiple crosses, particularly back crosses to the adapted parent may be useful in incorporating exotic germplasm into adapted population (Kenworthy and Brim, 1979; Lawrence and Frey, 1975 and Reddy, 1984). In the present study single crosses and various multiple crosses were comparable in variability (PCV) in S_3 generation for most of the characters (Table 1). Different types of crosses have not exhibited much difference and there was no definite trend for the heritability estimates except for SP, where back crosses and three way crosses have shown distinctly lower values. In case of expected GAM multiple crosses were marginally better for disease resistance parameters than yield components. Multiple crosses *viz.*, three way and back crosses were not superior over single crosses in generating variability especially for productivity parameters.

The crosses were assessed for their potential to release desirable recombinants for selected characters along with high yield and disease resistance. The plants which have exceeded the means of commercial check JL24 for PY, SP, HSM and RG and those plants which remained below the means of JL24 for LAA and DF were considered to be superior segregants. The plants superior to different character combinations were considered as desirable recombinants for that set of characters (Table 2). In general back crosses and three way crosses were superior to single and double crosses in producing desirable segregants for most of the character combinations. Double cross was the poorest with respect to frequency of desirable plants except for the combination pod yield with resistance. When pod yield along with other yield components and resistance was considered, double cross did not give even a single superior segregant (Table 2).

The higher frequencies of desirable plants for selected character combinations in back and three way crosses were expected as these crosses possess genes from adapted cultivars in increased proportion than the single crosses. Genetic analysis of different characters has revealed the existence of gene interaction in crosses involving different botanical types and subspecies (Wynne and Coffelt, 1982). It is expected in groundnut being an allotetraploid with two genetically similar genomes. The results in the study provide strong evidence that back cross and three way crosses are ideal method for building up a foundation population for yield and disease resistance. Even in these crosses frequencies of superior recombinants were relatively low due to the existence of undesirable

Table 1 : Phenotypic coefficient of variation, heritability and genetic advance for yield and resistance parameters in different cross categories of groundnut

Characters	Statistical parameters	Types of crosses				Mean
		SC	BC	TWC	DC	
	PCV	60.98	51.04	54.31	50.28	54.15
PY	H	80.58	74.71	80.61	74.60	77.62
	GAM	101.36	79.04	92.07	77.67	87.53
	PCV	10.48	7.14	9.16	10.21	9.24
SP	H	66.41	33.22	51.93	71.42	55.74
	GAM	15.20	6.05	11.62	15.45	12.08
	PCV	24.84	21.99	21.95	26.89	23.91
HSM	H	83.52	78.00	77.10	83.21	80.46
	GAM	43.65	36.23	36.45	46.33	37.68
	PCV	68.47	65.72	57.82	63.22	63.80
LAA	H	59.30	80.76	85.18	76.05	68.66
	GAM	105.20	133.13	111.23	98.39	111.98
	PCV	77.07	45.09	46.59	60.20	57.23
DF	H	71.29	78.98	73.81	77.80	75.47
	GAM	63.58	71.44	71.61	99.39	76.50
	PCV	12.26	14.30	14.38	14.29	13.80
RG	H	57.94	77.21	71.37	77.75	71.06
	GAM	18.28	23.08	23.51	23.84	22.17

Table 2: Per cent superior recombinants over JL 24 for different character combinations in S_3 generation

Character combinations	SC	BC	TWC	DC	Average
PY-SP	6.6	15.0	18.3	5.0	11.2
PY-HSM	7.7	12.4	8.8	2.2	7.8
PY-SP-HSM	1.8	8.5	5.3	0.0	3.9
PY-RG	14.9	14.9	20.8	22.2	18.2
PY-RG-SP	3.2	7.9	10.1	3.3	6.1
PY-RG-HSM	3.5	8.1	4.4	2.2	4.5
PY-RG-SP-HSM	1.2	5.8	3.4	0.0	2.6

associations between yield and resistance which further demands for reshuffling of genes through selective inter-mating till sufficient desirable recombinants are obtained (Gowda *et al*., 1996).

REFERENCES

Abdul Khader, K.M. (1993). Assessment of some selection and mating systems in improving productivity and late leafspot resistance in groundnut (*Arachis hypogaea* L.).Ph.D. Thesis, University of Agricultural Sciences, Dharwad, KARNATAKA (INDIA).

Gowda, M.V.C., Prabhu, T.G. and Bhat, R.S. (1996). Variability and association of late leafspot resistance and productivity in two crosses of groundnut. *Crop Improv.,* **23**:44-48.

Kenworthy, W.J. and Brim, C.A. (1979). Recurrent selection in soybean seed yield. *Crop Sci.,* **19**:315-318.

Lawrence, P.K. and Frey, K.J. (1975). Back cross variability for grain yield in oat species crosses *(Avena sativa* L.×*A.sterilis* L.) *Euphytica,* **24**:77-85.

Nigam, S.N., Dwivedi, S.L. and Gibbons, R.W. (1991). Groundnut breeding constraints: achievements and future possibilities. *Plant Breeding Abst.,* **61**:1127-1136.

Reddy, M.V. (1984). Breeding methodologies for disease and pest resistance in groundnut (*Arachis hypogaea* L.). *Andhra Agric. J.,* **31**:173-183.

Subrahmanyam, P., Ramanatharao, V., Mc Donald, D., Moss, J.P. and Gibbons,R.W.(1989). Origins of resistance to rust and late leafspot in peanut (*Alternaria hypogaea,* Fabaceae).*Eco. Bot.*,**43**:444-455.

Walls, S.B. and Wynne, J.C. (1985). Combining ability for resistance to *Cercosporidium personatum* for five late leafspot resistant peanut germplasm lines.*Oleagineux,* **40**:389-396.

Wynne, J.C. and Coffelt, T.A.(1982). Genetics of *Arachis hypogaea* L. In: Peanut science and technology.(Eds) Patte,H.E.and Young,C.T. American Peanut Research and Education Society Inc.,Yoakum,USA pp.50-94.

*_*_*_*_*_*