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M Pandiyan

Agricultural College and Research
Institute, Vazhavachanur, Tamil
Nadu Agricultural University
Tiruvannamalai District,
Tamil Nadu, India

A Krishnaveni

Agricultural College and Research
Institute, Vazhavachanur, Tamil
Nadu Agricultural University
Tiruvannamalai District,
Tamil Nadu, India

M Sivaji

Agricultural College and Research
Institute, Vazhavachanur, Tamil
Nadu Agricultural University
Tiruvannamalai District,
Tamil Nadu, India

M Vaithiyalingan

Agricultural College and Research
Institute, Vazhavachanur, Tamil
Nadu Agricultural University
Tiruvannamalai District,
Tamil Nadu, India

C Sivakumar

Agricultural College and Research
Institute, Vazhavachanur, Tamil
Nadu Agricultural University
Tiruvannamalai District,
Tamil Nadu, India

P Sivakumar

Agricultural College and Research
Institute, Vazhavachanur, Tamil
Nadu Agricultural University
Tiruvannamalai District,
Tamil Nadu, India

M Yuvaraj

Agricultural College and Research
Institute, Vazhavachanur, Tamil
Nadu Agricultural University
Tiruvannamalai District,
Tamil Nadu, India

Corresponding Author:**M Pandiyan**

Agricultural College and Research
Institute, Vazhavachanur, Tamil
Nadu Agricultural University
Tiruvannamalai District,
Tamil Nadu, India

Intraspecific hybridization in greengram genotypes

M Pandiyan, A Krishnaveni, M Sivaji, M Vaithiyalingan, C Sivakumar, P Sivakumar and M Yuvaraj

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Abstract

The hybridization was made between the primary gene pool which has diverse parent of greengram (*Vigna radiata* (L.) wilczek) genotypes. Four well known genotypes used for hybridization to yield improvement. Four cross combination were obtained. Out of four crosses the cross L2 x T1 recorded more number characters improvement through these parents combination, number of branches per plant, days to fifty percent flowering, number of cluster per plant, number of pods per plant, single plant yield, dry matter production and days to full maturity while L2 x T2 showed none of the improvement.

Keywords: Greengram, intraspecific hybridization, MYMV resistant, genotypes

Introduction

Vigna radiata (L.) wilczek, is commonly known as greengram or mungbean or pachapayaru in Tamil. It is the most widely cultivated species among the six Asiatic cultivated *Vigna* species. It has cheapest protein with high quality for health of human and animals. It has some added features compared to other pulses. It is highly drought tolerant and well adapted to varied range of soil conditions including light soils and can thrive even under limited irrigation, moreover, it is suited for crop rotation and crop mixtures (Baldev, 1988) [2] and Sadaphal, 1988) [10]. Presently, the yield level of greengram is very low due to genetical factor and also some biotic devastating disease like MYMV can reduce the yield drastically. This is the disease involved for major constrains in the production and productivity of greengram. Besides other management factors the prime cause for the low productivity can be ascribed to the inherently low yielding potential of the cultivars coupled with susceptibility to other diseases.

The varietal breeding program is very easy and time saving for developing new varieties. In this study the genotypes KMG 189 and KMG 242 having resistant against MYMV. The crossing programme taken up in this crop had resulted only with somewhat limited variability success and as far as yield improvement is concerned its very good. The basic reason for limited success had been due to the limited variability prevailed among the parents used for hybridization in most of the studies. There had been always possibility of improving the crop by incorporating donor genes to the available ruling varieties. For this study utilization of primary gene pool itself of this crop can result in tremendous improvement in yield. In order to utilize the variability available in the primary gene pool can be given improvement in the greengram new varietal development.

For utilizing the variability available in the primary gene pools, it is essential to attempt intraspecific crosses and to develop hybrids. These hybrids need to be critically evaluated as such and in the segregating generations for improvement in yield and yield components. The introgressed materials developed through wide crosses can also contribute as genetic reservoirs for novel genes apart from contributing to the improvement of yield and yield components. To the view to evaluate the available parents for attempting intra specific hybridization to generate segregants for better yield along with biotic resistant like MYMV was made in greengram.

Materials and Methods

To generate and characterize variability through intra specific crosses hybridization involving

Vigna radiata with another diverse parent in greengram. The intraspecific hybridization among greengram accessions was attempted by using female parents namely VRM (Gg) 1 (L₁), Pusa bold (L₂) and male parents KMG 189 (T₁) and ML. 682 (T₂). The crossing block was raised in the TNAU, Agricultural Research Station, Virinjipyam, Vellore, Tamil Nadu during 2013 (Fig-1 and Fig-2). The male and female parents were raised in row basis with 2-meter length, plant to plant spacing is 20 cm row to row 50 cm. The biometrical observations for 13 characters were recorded. Observations were recorded on ten randomly selected plants for each parent and F₁. The mean values were subjected to statistical analysis the statistical analysis by Excel was used.



L1xT1 **L1 xT2**

Fig 1: Crossing of L1 x T1 and L1 x T2



L2xT1 **L2 xT2**

Fig 2: Crossing of L2 x T1 and L2 x T2

Results

Programmed for four hybrids and 13 traits in terms of mean performance was studied. The analyses of variance for different characters were studied. The females Vs male

parents' variance was significant for all the characters studied (Table 1). Parents Vs crosses showed significant variance for all the traits. Mean performance of parents and hybrids (Table 2) were studied for finding out the superiority of cross and also suitable parents. Wide range of variation was observed among parents and hybrids for various traits studied. The mean value of parents toward the different character like plant height ranged from 27.05 to 72.00 whereas no. of branches per plant ranged from 16.78 to 52.73 cm. The days to fifty percent flowering ranged from 33.00 to 48.00 days. The character like number of clusters per branch was lowest of 1.30 and to the highest of 9.40. The number of clusters per plant ranged from 3.50 to 1.50 and number of pods per plant ranged from 8.60 to 58.15 and pod length was 6.72 to 8.00cm. The number of seeds per pod ranged from 9.50 to 10.55. Hundred seed weight ranged from 3.00 to 3.80 where as single plant yield is 6.55 to 7.18 g and dry matter production recorded from 3.8 g to 20.93 g while days to full maturity from 60 days to 80 days.

In the hybrids shows wide variation for various traits in parents and hybrids. The crosses L1 x T1, L1 x T2 in (Fig 1) and L2x T1, L2 x T2 in (Fig.2). The characters for plant height were ranged from 32.65 in L2 x T2. The number of branches per plant ranged value from 1.92 L2 x T2to 2.50 in L2 x T1 where as length of branches per plant ranged from 21.80 L2 x T2 to 41.70 L1 x T2. The characters days to fifty percent flowering lowest value of 37.00 observed in the cross L2 x T1 and highest in L2 x L2. The traits number of clusters per branch ranged from 3.15 in L2 x T2 to 4.50 in L1xT1. Number of pods per plant is ranged from 21.38 L2 x T2 to 41.00 in L2 x T1. Pod length is ranged from 7.25 in L2xT2 to 9.58 in L1x T1. The number of seeds per pod lowest in 10.20 in L2 x T2 and highest in 11.40 in L1xT2. The hundred seed weight value ranges highest of 3.40 in L1xT1 and lowest of 2.76 in Lx T1. The single plant yield is ranged from 3.11 in L1x T1 to 10.63 in L2 xT1. The dry matter production lowest value in 9.50 in L1 x T1 to 13.91 in L2 x T1 whereas days to full maturity lowest value in the cross is 64.00 in L2xT1 and highest value is 73.00 in L1xT1.

Table 1: Analysis of variance for all the 13 characters in greengram genotypes.

Sl. No	Characters	Mean sum of squares			
		Hybrids (19)	Parents (8)	Hy X Sp (1)	Error (28)
1	PHT (cm)	363.82**	583.44**	28.24**	27.21
2	NOB	1.13	0.53	0.24	0.48
3	BRL (cm)	293.10**	324.49**	98.80**	42.03
4	DFF	9.66**	109.21**	0.00	2.14
5	NCB	13.33**	33.26**	15.28**	10.57
6	NOC	40.33**	68.20**	29.63**	17.84
7	NPP	142.17**	443.45**	281.05**	222.67
8	POL (cm)	0.47	0.30	0.12	0.30
9	NSP	1.59	2.24	0.58	0.78
10	HSW (g)	0.18	0.18	0.17	0.24
11	SPY(g)	19.97**	0.31	3.71	2.21
12	DMP(g)	42.91**	97.21**	24.14**	4.89
13	DFM	11.51**	187.09**	99.04**	2.87

* Significant at 5% level

** Significant at 1% level

Values in parenthesis indicate d.f

Table 2: Mean performance of green gram genotypes

Line / Tester	PHT	NOB	BRL	DFP	NCB	NOC	NPP	POL	NSP	HSW	SPY	DMP	DFM
L1	72.00**	2.72	52.73**	48.00**	9.40	18.50	58.15	7.30	10.55	3.00	7.18	20.93**	80.00**
L2	30.65	2.40	18.21	37.00	9.00	12.00	23.45	6.72	9.55*	3.20	6.55	11.00	67.00
T1	27.05	1.71	16.78	33.00	1.30	3.50	8.60	8.00	9.50	3.80	7.00	3.80	60.00
T2	43.10	2.12	20.23	38.00	4.22	8.22	17.40	7.00	10.40	3.10	7.10	8.15	67.00
CD 5%	12.25	1.60	15.13	3.38	7.30	10.01	34.48	1.30	2.05	1.16	3.44	5.11	3.91
CD 1%	17.83	2.35	22.01	4.92	10.52	14.57	50.18	1.89	2.98	1.68	5.01	7.43	5.69

*Significant at 5 per cent level

**Significant at 1 per cent level

Discussion

The present investigation deals with intraspecific hybridization in greengram for assessment of their breeding value. There are many approaches for selection of parents for hybridization programme viz., selection of parents based on *per se* performance, if parents are identified on the basis of divergence analysis, the resulting recombinants through hybridization would be more heterotic with the possibility of obtaining larger frequency of better segregants in subsequent generations (Reddy. 1998)^[9] and Aher *et al.* (2001)^[1].

For intraspecific hybridization the parents selected for represent maximum genetic diversity. The parents were selected from based on the number of characters improved over the parental combination. The lines as female and testers as males were selected based on the understanding of performance in the field experience the parents were selected. By considering all the genetical factors, parental lines viz. VRM (Gg) 1, Pusa bold as female, KMG 189 and ML 682 were selected for performing intraspecific crosses.

In this cross combination based on the hybrid performance of the parent's ability were judged by contribution of parental combination, four cross combination namely L1 x L1, L1 x T2, L2 x T1, L2x T2 were studied by the many characters. Out of four cross combination the cross L2 x T1 (Pusa bold and KMG189) parental combination has showed their improved performance for many characters like number of branches per plant, days to fifty percent flowering, number of clusters per plant, number of pods per plant, single plant yield, dry matter production and days to full maturity. Other cross combination L1x T1 contributing to improve the character viz., number of clusters per branch, pod length and hundred seed weight where as L1x T2 for improved characters were plant height, length of branches and number of seeds per pods. The cross L2 x T2 not contribution to the characters improvement. From this study the some of parental combination not improvement characters which means there is no diversification which shows the genetic closeness of varieties.

These effects it is clear that additive effects were predominant for all the characters Gamble (1962)^[3] reported that reduction in magnitude of additive effect was met within crosses involving parents that had undergone selection for the characters in question. Narayanan (1978)^[6] and Kadambavanasundaram (1980)^[5] in cotton and Iyemperumal (1983)^[4] in greengram reported the influence of dominance and epistasis when widely divergent parents were used. It may also be due to the fact that the characters concerned possessed complexity of inheritance with low magnitude of additive effect with high *per se* and heterotic performance as opined by Rathnaswamy and Jagathesan, (1984)^[8] and Aher *et al.* (2001)^[1].

Conclusion

Appreciable heterosis is present in the hybrids investigated. However, the development of commercial hybrids does not seem to be a possibility at present due to lack of male sterile mechanisms and low amount of natural crossing in greengram. Alternatively, the possibility of development of high yielding homozygotes equal to or better than the heterotic F₁ hybrids in green gram can be developed through proper and efficient handling of the cross combinations.

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