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Genetic Variability in Flower Shedding and its Impact on Yield in Blackgram (*Vigna mungo* (L) Hepper.)

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The genetic Variability in flower production, flower shedding and pods produced per plant and its impact on seed yield of blackgram (*Vigna mungo* (L) Hepper) was studied in thirty five cultivars. There were significant differences for these traits between the different genotypes studied. Flower shedding is found to be a heritable trait with 63.04 per cent heritability. The seed yield of the crop is determined by the number of flowers produced and the number of pods set per plant, since these two traits are positively correlated with seed yield. The greater the number of flowers produced the lesser is the percentage of flowers shed as indicated by the significant negative correlation between these traits. The high co-heritability estimates between flower shedding and flower production and also between pod number and seed yield suggest that desired recombination could be made between genotypes possessing high flower production and pod setting traits, and genotypes possessing low flower shedding percentage. It is really the flower production and pod setting potential matter much in determining the yield potential than the flower shedding percentage in blackgram.

To improve pulses production in the country, evolution of high yielding varieties under different pulses is necessary. It is commonly understood that the most deterrent causes for low yield in pulses are higher shedding percentage of flowers and low pod setting percentages. These being the key factors for low productivity in pulses, the genetic causes for higher flower shedding and low pod setting resulting in low grain yield were investigated in detail.

MATERIAL AND METHODS

Thirty five cultivars of blackgram (*Vigna mungo* (L) Hepper) from various parts of India were studied for flower production, flower shedding, pod setting and their relationship for yield potentials. Randomised block design, replicated twice was adopted for this experiment at the Millets Breeding Station, Tamil Nadu Agricultural University, Coimbatore. Twenty plants were chosen at random in each replication. From the opening of the first flower, number of fully opened flowers were counted and recorded daily for a period of thirty days. Similarly pod setting was also counted. The difference between the total number of flowers produced and total number of mature pods set per plant indicated the total

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number of flowers shed per plant. Seed yield was also recorded per plot.

Analysis of variances and co-variances were worked out. Genotypic and phenotypic correlations and co-heritability were estimated based on the method adopted by Miller *et al.* (1958). Heritability was worked out after Johnson *et al.* (1956). Co-efficient of genetic variability and genetic advance were worked out after Burton (1952) and Robinson *et al.* (1949).

Based on the absolute values of the four characters recorded, the thirty five cultivars were ranked in the descend order for number of flowers shed per plant and in the ascending order for the number of flowers per plant and number of pods set per plant, for comparison between the varieties.

RESULTS AND DISCUSSION

Significant differences were noted between varieties for all the characters understudy. The percentage of flower shedding ranged between 29.25 and 45.23 (Table I).

The rankings of the varieties for different characters showed that variety No. 55 had produced the maximum number of flowers per plant (82.4) and also had maximum shedding (32.60) while the variety G. 1 had produced the lowest number of flowers per plant (24.7) and minimum shedding. For number of pods set per plant, again variety No. 55 ranked first (49.8) while variety G. 1. ranked last (16.0). In the case of seed yield per plot (8.64 m^2 size) variety PLS. 364 had recorded the maximum value of 1.410 g while variety G. 31 had recorded the lowest value of 0.505 g.

Genotypic variance was high for total number of flowers produced per plant (78.30), medium for number of pods set per plant (35.83) and very low for percentage of flowers shed (7.13) and seed yield (0.025). The same trend was observed with regard to phenotypic variance and genetic co-efficient of variation. Heritability was high and more or less of the same level (66.22 to 66.37 per cent) for the three traits namely number of pods set per plant, number of flowers per plant and percentage of flowers shed. The heritability for grain yield was 41.66 per cent. The estimate of genetic advance was high for number of flowers per plant (14.70) and number of pods per plant (9.92) (Table II).

Seed yield was positively correlated with number of pods per plant (0.473) and number of flowers per plant(0.373). The correlation between seed yield and flower shedding percentage though negative was not significant. The number of flowers produced per plant was negatively correlated with percentage of flowers shed but positively correlated with the number of pods set per plant. The co-heritability was the highest (171.45) between the number of flowers produced and the percentage of flowers shed.

Flower shedding in plants is considered as physiological phenomenon controlled by environmental, internal

TABLE. I Mean performance for flower and pod production in blackgram

Variety	No. of flowers produced per plant	No. of flowers shed per plant	Percentage of flower shedding	No. of pods set per plant	Yield of seed in g/plot
No. 55	82.4	32.6	37.60	49.8	1.222
Killikulam	50.0	15.3	33.78	34.7	1.290
M. 5	49.4	23.5	43.29	25.9	1.292
US. 132	49.1	16.5	35.17	32.6	0.942
Mash-47	48.7	13.6	31.59	35.1	1.125
M.4	48.6	14.4	33.08	34.2	0.882
Safdarganj	48.1	17.2	37.12	30.9	1.105
Musiri	43.1	14.3	34.77	28.8	0.836
T. 27	42.9	13.5	34.32	29.4	1.017
CO. 2	42.8	18.4	40.69	24.4	1.327
Krishna	41.7	19.4	41.76	22.3	1.107
H. 10	41.4	13.8	35.20	27.6	0.705
L. 35-5	41.3	10.9	37.63	30.4	0 930
P.133	39.0	14.1	37.10	24.9	1.300
M. 1	38.1	13.4	37.44	24.7	1.188
UL. 2	37.8	13.0	36.01	24.8	0.752
Urid Ujjain	37.4	15.5	39.05	21.9	0.835
CO. 1	36.8	19.3	45.23	17.5	0.640
Mangalore	36.4	17.0	42.29	19.4	1.002
338/3	34.8	8.8	29.25	26.0	0.995
B.76	34.2	16.4	36.32	17.8	1.140
Khargaone-3	32.7	14.2	41.19	18.5	1.030
H.21	32.3	10.7	35.54	21.6	1.390
PLS.364 (CO.3)	32.2	10.4	33.31	21.3	1.410
US.131	31.5	10.5	35.01	21.0	1.095
M. 3	31.1	10.3	35.15	20.8	1.015
G.31	29.8	10.8	36.87	19.0	0.505
UL. 1	29.6	9.2	33.61	20.4	0.855
P.24	29.0	10.6	37.74	18.4	0.612
T.9	27.2	10.2	37.92	17.0	1.075
VZM.189	27.1	10.0	37.90	17.1	1.345
Urid Pusa-1	26.4	9.1	35.73	17.3	1.325
G.104	25.4	9.0	36.72	16.4	0.880
UPU.2	24.8	10.1	40.60	14.7	0.910
G.1	24.7	8.7	38.83	16.0	0.547
'F' test	**	**	**	**	**
C. D.	12.387	5.06	9.68	8.35	0.530

TABLE. II. Mean and variability parameters for flower and pod characters in blackgram

Parameters	Yield of seed in g/plot	No. of flowers per plant	Percentage of flowers shed	No. of pods set per plant
Range	0.505-1.410	24.2-82.4	29.25-45.23	14.2-49.2
Mean	1.012	37.92	36.99	24.68
Genotypic variance (g)	0.025	78.30	7.13	35.83
Phenotypic variance(ph)	0.060	118.25	11.31	53.98
Genetic co-efficient of variation (GCV)	15.61	206.48	7.19	141.10
Heritability (%)	41.66	66.22	63.04	66.37
Genetic advance	0.31	14.70	4.34	9.92
Genetic advance as percentage of mean	30.43	39.76	11.73	40.19

and genetic factors (Addicot, 1954). Eventhough considerable amount of flower shedding was reported to be a common phenomenon in pluse crops its impact on grain yield has not been anelysed genetically. Bhat *et al.* (1972) reported green gram (*Phaseolus aureus*) had 42 to 72 per cent flower shedding while Anon (1970) reported that in cowpea 80 per cent of the buds open into flowers and 67 per cent of them set into pods. In this study flower shedding was found to be 29 to 45 per cent and was highly heritable but the extent of variability was narrow (7.13). In contrast the variability available for total number of flowers produced per plant and the total number of pods set per plant is encouraging with the genotypic variances of 78.30 and 35.83 respectively. Eventhough the high values of phenotypic variances for the traits, number of of flowers per plant and number of pods per plant suggest considerable environmental influence on them; the high genetic co-efficient of variation is indicative of the variation available for exploitation in these two traits.

From the correlation studies it was evident that greater the number of flowers produced per plant, the lesser was the percentage of flower shedding as these two traits were negatively correlated. Flower shedding by itself had no significant influence in determining the seed yield potential of a plant or a variety in blackgram. However, the number of flowers produced per plant had very high and positive genotypic and phenotypic correlations with number of pods produced per plant which in turn had highly significant, positive but moderate correlation with seed yield. Flower shedding percentage was also negativeiy correlated with number of pods produced per plant and seed yield. These relationships evidently showed that lesser the flower dropping, the greater was the number of pods formed per plant which really matters much in determining the ultimate seed yield of the genotype.

Varieties PLS. 364, H. 21, VZM. 189 and CO. 2 had recorded higher

TABLE. III. Genotypic and phenotypic correlation co-efficients among four characters in blackgram

Characters	Co-efficients	No. of flowers per plant	Percentage of flowers shed	No. of pods set per plant
Seed yield in g/plot	COH %	97.73	100.90	129.90
	rg	0.373*	-0.133	0.473**
	rph	0.199	-0.067	0.193
No. of flowers per plant	COH %		171.45	63.31
	rg		-0.435**	0.939**
	rph		-0.164	0.955**
Percentage of flowers shed	COH %			77.26
	rg			-0.417**
	rph			-0.349*

COH=Co-heritability
rg=Genotypic correlation co-efficient
rph=Phenotypic correlation co-efficient

* Significant at 5% level
** Significant at 1% level

seed yields as compared to other varieties while G. 31, G.1, P.24 and CO. 1 had recorded lower seed yields. Between these two groups of genotype, though there was wide difference in the range of flower shedding percentage was narrow, indicating that the flower shedding had negligible role in determining the yield.

It is evident that there is considerable amount of flower shedding in blackgram but it has no direct impact on the yielding capacity of the plant. It is suggested that genotypes showing higher flower production potential namely No. 55, Killikulam and M.5 can be improved in setting ability, by crossing them with varieties of lesser flower shedding habit namely 338/3, Mash-48, M. 4. The high co-heritability estimate of 171.45 per cent between, number of flower produced and the percentage of flowers shed provide ample testimony to the recombination potential between them.

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