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TRANSGRESSIVE SEGREGATION IN THE WIDE AND VARIETAL CROSSES OF BLACKGRAM (*VIGNA MUNGO* L. HEPPER)

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ABSTRACT

In general, significantly superior transgressive segregants were obtained in the BC_1F_2 population for all the important characters, viz., pods/plant, pods/cluster, seed weight and yield/plant. This reveals that introgression of wild germplasm created large amount of genetic variability and ultimately the frequency of transgressive segregants for yield increased. These results suggested that only one backcross with the recurrent parent may be enough to achieve higher proportion of transgressive segregation in the wide crosses of blackgram.

Key words: Blackgram, *Vigna mungo*, wide crosses, transgressive segregation.

Blackgram is one of the important grain legumes and is widely cultivated in different seasons in India. However, the average yield is very low. To improve yield, the breeding strategy aims at creating sufficient variability for characters of economic importance either by attempting intra- and/or interspecific crosses. Exploitation of wild species is reasonable approach in breeding programme for introgression of genes from wild germplasm to the cultivated species to generate superior genotypes [1] Due to genetic remoteness of these wild species from the cultigens, there is a good possibility that they may possess variation in characters of economic importance. However, the information on these aspects in grain legumes, in general, and blackgram, in particular, is meagre. In view of this the present investigation has been conducted.

MATERIALS AND METHODS

The experimental materials for the present investigation consisted of four cultivated lines of blackgram (i.e. Pant U-19, UPU 82-5, RU-2 and UL-2) and one strain of *Vigna mungo* var. *silvestris* (IW-3390). Pant U-19, RU-2, UPU 82-5 and

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UL-2 were crossed with IW 3390 to get wide crosses, viz., Pant U-19 × IW-3390, UPU 82-5 × IW-3390, RU-2 × IW-3390, and UL-2 × IW-3390. Three varietal crosses, viz., UL-2 × UPU 82-5, Pant U-19 × UL-2, and UPU 82-5 × RU-2, were also made. The F_1 plants were backcrossed to the recurrent parents (Pant U-19, UPU 82-5, RU-2 and UL-2 in the four crosses, respectively) in wide crosses and varietal crosses with UPU 82-5, UL-2 and RU-2 to get BC_1 generation. The BC_1F_1 plants were again backcrossed to get BC_2F_1 seeds. The F_1, BC_1F_1 and BC_2F_1 seeds were multiplied to get F_2, BC_1F_2 and BC_2F_2 seeds, respectively. The F_2, BC_1F_2 and BC_2F_2 were grown in kharif (rainy) season of 1985 in randomized block design with three replications in four-row plots of 5 m length. The plant-to-plant spacing was 10 cm and inter-row distance 60 cm. Observations were recorded on 10 randomly selected competitive plants from the two central rows, leaving the border rows on days to first flower, clusters/plant, pods/plant, pods/cluster, seeds/pod, 100-seed weight, and yield/plant. Percentage of transgressive segregants in the lines derived from F_2, BC_1F_2 and BC_2F_2 of inter- and intraspecific crosses of blackgram for yield contributing characters was calculated by defining extreme progeny types as transgressive (i.e. the lines that exceeded their better parent mean) or significantly transgressive (i.e. the lines that exceeded their better parent mean at LSD 0.05) segregants. The transgressive segregants in the desirable direction only were considered for analysis.

RESULTS AND DISCUSSION

The analysis of variance for different characters revealed that the differences among treatments were highly significant for all characters. The frequency of transgressive segregants in different crosses for various characters is presented in Table 1.

In general, the backcross populations of all the crosses, distant as well as intervarietal, had higher percentage of significantly transgressive segregants (0-46%) than their corresponding F_2 populations (0-44%) for all the characters studied. The BC_2F_2 population of cross RU-2 × IW-3390 manifested highest frequency (19%) of transgressive segregants, significantly superior at 0.05 probability level as compared to other populations of hybrid origin for days to first flower. The varietal crosses generally yielded more transgressive segregants (29.3%) in the F_2 population for this character, however, significantly superior transgressive segregants were more (3.0%) in the BC_2F_2 population (Table 1). For clusters/plant BC_1F_2 generation of all the crosses revealed higher frequency (30.8%) of transgressive segregants than their respective F_2 and BC_2F_2 populations, except in the wide cross Pant U-19 × IW-3390 (13%) and a varietal cross UL-2 × UPU 82-5 (29%). For pods/plant, more transgressive and significantly more transgressive segregants appeared in the BC_2F_2 populations of all crosses, except in crosses RU-2 × IW-3390 and UPU 82-5 × RU-2. Cross UPU 82-5 × IW-3390 (BC_1F_2, BC_2F_2) yield significantly more (27 and 28%) transgressive segregants for pods/plant. Higher frequency of transgressive segregants for pods/plant has been reported in F_2 of blackgram cross UL-2 × EMSD earlier [2] as well as in soybean varietal crosses M 59-213 × Adepta and Amsoy × Adepta and wide cross Merit × *Glycine ussuriensis* var. *augusta* [3]. The BC_2F_2

Table 1. Percentage of transgressive (TTS) and significantly transgressive segregants (STS) in F_2, BC_1F_2 and BC_2F_2 populations exceeding their higher parental mean from intra- and interspecific crosses of blackgram

Cross	Generation	Days to first flower		Clusters per plant		Pods per plant		Pods per cluster		Seeds per pod		100-seed weight		Yield per plant	
		TTS	STS	TTS	STS	TTS	STS	TTS	STS	TTS	STS	TTS	STS	TTS	STS
UPU 82-5 × IW-3390	F_2	3	0	21	13	21	9	3	0	29	8	3	0	3	0
	BC_1F_2	19	1	28	19	38	27	23	4	38	13	19	1	38	27
	BC_2F_2	13	3	13	1	39	28	39	21	19	7	7	4	23	17
Pant U-19 × IW-3390	F_2	29	10	35	17	21	11	4	0	16	11	24	1	33	19
	BC_1F_2	17	14	13	6	31	17	32	23	20	12	24	8	36	26
	BC_2F_2	18	16	11	4	37	24	36	27	23	14	25	11	37	25
UL-2 × IW-3390	F_2	34	1	33	21	37	17	3	0	12	11	19	9	29	17
	BC_1F_2	23	6	46	36	41	23	13	0	15	13	23	7	39	26
	BC_2F_2	27	1	36	19	43	26	25	5	14	14	25	6	31	22
RU-2 × IW-3390	F_2	44	0	22	19	19	13	8	0	44	9	29	8	16	8
	BC_1F_2	19	5	38	19	27	16	21	11	39	14	38	5	32	19
	BC_2F_2	32	19	19	14	19	14	13	9	38	14	37	13	29	14
UL-2 × UPU 82-5	F_2	40	1	33	18	19	14	7	5	34	21	28	4	22	9
	BC_1F_2	31	2	29	9	31	19	13	3	23	13	13	2	27	16
	BC_2F_2	23	5	31	24	37	27	22	4	37	18	24	13	18	10
Pant U-19 × UL-2	F_2	39	1	24	9	21	12	15	1	12	3	23	8	21	9
	BC_1F_2	8	2	29	12	36	16	14	6	14	5	23	3	36	18
	BC_2F_2	10	3	16	1	39	19	22	6	9	6	7	3	37	20
UPU 82-5 × RU-2	F_2	9	0	9	0	10	3	5	2	26	6	19	6	15	2
	BC_1F_2	1	0	33	15	46	22	12	6	31	11	28	11	37	14
	BC_2F_2	1	1	22	14	40	22	15	12	35	11	25	12	33	22

generation of wide crosses UPU 82-5 × IW-3390 and Pant U-19 × IW-3390 revealed more (39 and 36%) and significantly more (21 and 27%) transgressive segregants for pods/cluster. In general, the backcross populations of inter- and intraspecific crosses produced more transgressive segregants than their corresponding F_2 populations for seeds/pod, except wide cross RU-2 × IW-3390, where the F_2 population showed higher frequency (44%) of transgressive segregants than the backcross population.

Backcross populations of cross RU-2 × IW-3390 manifested greater transgressive and significantly greater transgressive segregation for seed weight. In all the interspecific crosses, higher (32–39%) and significantly higher (19–27%) frequency of transgressive segregation for yield/plant was recorded in BC_1F_2 generation, except in cross Pant U-19 × IW-3390, where frequency of transgressive segregation was higher (37%) in BC_2F_2 population. The BC_1F_2 generation of cross UL-2 × IW-3390 manifested highest frequency of transgressive (39%) and significantly transgressive (26%) segregants for

yield/plant. Introgression of genes from wild germplasm results in large amount of genetic variability and ultimately very high frequency of transgressive segregation for yield [4]. Similar results for yield were also reported in other distant crosses: *Avena sativa* × *A. sterilis* L. [1], *Triticum aestivum* × *T. durum* [5], *Hordeum vulgare* × *H. spontaneum* [6], *kabuli* × *desi* chickpea [7], and *Glycine max* × *G. ussuriensis* var. *augusta* [3].

In general, the BC_1F_2 populations of all the wide crosses were superior for higher frequency of transgressive segregants for all the important yield attributes, viz., pods/plant, clusters/plant, seed weight, and yield/plant. This suggests that only one backcross with the recurrent parent may be enough to achieve higher proportion of transgressive segregants in the wide crosses of blackgram.

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