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Performance of advanced black gram genotypes in different pulse growing regions of Bangladesh

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ABSTRACT

The experiment was conducted at Pulses Research Centre, Ishwardi, Pabna, Regional Agricultural Research Station Jessore and Jamalpur, Regianal Pulse Research Station, Madaripur, Onfarm Research Division, Barind, Rajshahi and Pulses Research Sub Centre, Gazipur during kharif-II, 2015 to find out desirable lines of Blackgram. Six Blackgram lines BBLX-07002-1, BBLX-07002-5, BBLX-06002-10, BBLX-02005-1 and 86337 were used in the experiment where BARI Mash-3 was used as a check variety. The experiment was laid out in a RCB design with three replications seeds were sown in the field on 10 to 20 August 2015. Each entry was sown in 6 rows 4 m long plot with a spacing of 40 cm between rows. Spacing between two plots were 40 cm. The genotypes 86337 gave highest average yield (1206 kg ha^{-1}) among the genotypes followed by BBLX-06002-10(1089 kg ha^{-1}) and BBLX-07002-5 (1076 kg ha^{-1}). It also produced highest seed yield in Joydebpur (1334 kg ha^{-1}) across the locations. Out of six locations 86337 genotypes produced a good yield (1206 kg ha^{-1}) on the other hand, the lowest average yield was obtained from the genotypes BBLX-07002-1 (1043 kg ha^{-1}). The lines 86337, BBLX-06002-10, BBLX-07002-5 and 86337 gave greater seed yield which would be used for crop improvement breeding programs.

Introduction

Blackgram is an important grain legume for South and South East Asia. Presently, it is cultivated in India, Pakistan, Myanmar, Bhutan, Bangladesh, Thailand, Malaysia, Philippines, Afghanistan, Iran, Kenya, Malawi and the United States. India is the most important producer of all. The average production in India is 1.28 Mt annually from an area of 2.96 million ha (Anonymous, 1998). The production in India and Bangladesh is almost entirely for domestic use as food. In Thailand the production ranges between 80,000 and 99, 000 t annually, and is mainly exported to Japan for bean sprouts. In Japan blackgram is preferred to green gram (*Vigna radiata*) for bean sprouts for its longer shelf life. Blackgram is a promising legume crop of South and South East Asia.

Blackgram is one at the major pulse crop and very important grain legume crop in Bangladesh during *Kharif*-II season. It is the most popular pulse crop of some area in our country. It is very nutritious as it contains high levels of proteins, potassium, calcium, iron, niacin (B3), thiamine (B1), Riboflavin (B2). Blackgram has been shown to be useful in mitigating elevated cholesterol levels. Blackgram has received prominence in Indian diets especially for culinary preparation of *dal*. But there are few varieties of blackgram released from different research organization. The Asian Vegetable Research and Development Centre (AVRDC), Taiwan, maintains a collection of nearly 200 accessions, while the National Bureau of Plant Genetic Resources (NBPGR), New Delhi, India maintains about 2100 accessions of which the Indian Institute of Pulses Research holds 829 active collections. The Indian gene centre has been considered an important gene conservation centre for Vigna species (Arora, 1988). Considerable diversity is available in Indian collections (Nautiyal & Shukla, 1999) but its exploitation is not appropriate owing to lack of characterization and classification. The detailed evaluation of germplasm will help identify accessions of potential relevance for improvement programmes and encourage and improve the usefulness and utilization of germplasm collections. The yield of existing cultivars is not satisfactory for its low yield potential and susceptible to pest and diseases. Although blackgram has been traditionally cultivated after rice in Bangladesh, it was consider only as subsistent crop with yields usually below 0.5 t ha^{-1}. Following comprehensive constraint analysis in 1980's cultivar improvement programme was initiated (Satyanarayana, 1994) and the resistant disease resistant varieties LBG-17 (powdery mildew disease), LBG -402 (wilt), LBG – 645 banda polish (wilt) etc. with yields exceeding 2.5 t ha^{-1} under with minimal management conditions. The above cultivars catalyzed commercialization of crop on large scale and economy of the farmers as well as sustainability of the production system.

Blackgram production in rice fellows contributed to area and production increase in Bangladesh from 410 kg ha^{-1} on 219 00 ha in 1981-1982 to 737 kg ha^{-1} on 560,000 ha in 1991-1992. Yellow mosaic disease is the most destructive disease on black gram both in *Kharif* and *Rabi* seasons. YMV is most distractive disease not only in India but also in Pakistan, Bangladesh, Sri Lanka and adjacent area of south East Asia. Screening for YMV disease reaction at the present test location was appropriate as it has been considered the hot spot for YMV incidence (Singh & Gurha, 1994)**.** Green type blackgram has been increasingly popular among consumers of certain areas of the country. It could also be exploited for bean sprouts but the delayed maturity and susceptibility to YMV has often restricted its production (Shanmugam & Rangaswami 1984).The present study was taken with eight promising lines to investigate desirable lines of blackgram in *Kharif*-II season under four different pulse growing locations of Bangladesh.

Materials and Methods

The experiment was conducted at Pulses Research Centre, Ishwardi, Pabna, Regional Agricultural Research Station Jessore and Jamalpur, Regional Pulse Research Station, Madaripur, On Farm Research Division, Barind, Rajshahi and Pulses Research Sub Centre, Gazipur during *Kharif*-II, 2015 to find out desirable lines of Blackgram.

The experiment was laid out in a randomized complete block design with three replications. Seeds were sown in the field on 10 to 20 August 2015. Each entry was sown in 6 rows 4 m long plot with a spacing of 40 cm between rows. Spacing between two plots were 40 cm. Irrigation was given to ensure seed germination. Mulching was done and soil crusts were broken. Each of the entries were investigated from seedling to harvest and compared with check. From each plot 10 plants were selected randomly to compute data. Yield data was recorded from the whole plot and converted into kg ha^{-1}. Data was recorded on days to flowering, days to maturity, plant height, pod $plant^{-1}$, 100- seed weight and yield (kg ha^{-1}).

Data on MYMV disease were taken on a 0-8 scoring scale (Malik, 1991) where 0 = no infection, 1 = 0-6% plant part infected (I), 2 = 6-10% plant part infected (HR), 3 = 11-20% plant part infected (R), 4 = 21-30% plant part infected (MR), 5 = 31-40% plant part infected (T), 6 = 41-50% plant part infected (MT), 7 = 51-80% plant part infected (S), 8 = 81-100% plant part infected (HS).

The data were analyzed by computer using MSTAT-C Package while the mean separation was done by Duncan's Multiple Range Test (Steel & Torrie, 1960).

Results and Discussion

Performance of blackgram genotypes in terms of growth characters

Performance of blackgram genotypes in regards to growth parameters were varied significantly in different locations (Table 1). The maximum plant height was observed from the genotypes BBLX-07002-1 and minimum was observed from the genotypes BBLX-02005-1. The genotypes BBLX-07002-1 was matured earlier (72 days) followed by BBLX-06002-10, BBLX-07002-5 and 86337 and later maturity recoded from genotypes BBLX-02005-1(75 days and BARI Blackgram-3 (74 days). No significant difference was observed for days to flower across the all locations except Madaripur. The highest days to flower (41 days) obtained from BBLX-02005-1 than others.

Performance of blackgram genotypes for yield contributing traits

The yield parameters showed significant difference among the genotypes in all locations (Table 2). The genotype 86337 and BBLX-06002-10 showed the highest number of pods per plant (28) and the genotype BBLX-02005-1 showed the lowest number of pods per plant (24). In all the locations 100 seed weight showed significant difference among the genotypes. The highest 100 seed weight obtained from BBLX-07002-1(5.2 g) and the lowest from BBLX-02005-1 (4.6 g). The genotypes 86337 gave highest average yield (1206 kg/ha) among the genotypes followed by BBLX-06002-10(1089 kg/ha) and BBLX-07002-5 (1076 kg/ha). It also produced highest seed yield in Joydebpur (1334 kg/ha) across the locations. Out of six locations 86337 genotypes produced a good yield (1206 kg/ha) on the other hand, the lowest average yield was obtained from the genotypes BBLX-07002-1 (1043 kg/ha).

Performance of blackgram genotypes on BYMV disease occurrence

All the entries showed moderate resistance to BYMV (Table 3). Among the locations Jamalpur and Madaripur showed higher disease prevalence while among the genotypes, BBLX-07002-1 and BBLX-06002-10 had higher BYMV occurrences.

Table 1. Performance of blackgram genotypes in terms of growth characters different locations *Kharif*-II 2015.

Genotypes	Plant height (cm)							Days to maturity							Days to 50% flowering						
	Joy	Jes	Isd	Jam	Bar	Mad	Mean	Joy	Jes	Isd	Jam	Bar	Mad	Mean	Joy	Jes	Isd	Jam	Bar	Mad	Mean
BBLX-02005-1	32	53	37	35	44	47	41	75	70	67	82	79	76	75	35	37	39	43	41	51	41
BBLX-07002-5	36	51	43	39	47	46	44	75	70	67	76	74	77	73	35	36	39	42	38	51	40
BBLX-07002-1	43	53	41	38	48	45	45	70	68	66	76	75	78	72	33	38	39	44	37	51	40
BBLX-06002-10	39	51	37	34	47	47	43	73	67	68	76	77	74	73	31	36	38	43	40	50	40
86337	36	56	37	32	45	45	42	73	71	67	83	73	78	74	30	38	40	41	37	52	40
BARI Mash -3	41	53	36	30	46	44	42	74	68	68	78	75	78	74	34	37	39	43	37	51	40
Mean	38	53	39	35	46	46		73	69	67	79	76	77		33	37	39	43	38	51	
Significance	*	*	ns	*	**	ns		ns	**	**	ns	*	ns	-	ns	**	ns	*	ns	ns	-
CV (%)	2.41	5.47	11.5	-	4.81	3.77		2.55	0.9	0.54	3.4	2.42	0.43	6.53	1.69	1.53	-	6.53	3.02	0.31	
LSD (0.05)	2.13	5.25	-	10.5	-	0.39		2.34	1.13	0.44	4.9	3.22	2.19		2.39	1.03	2.77	-	2.12	2.36	

Joy- Joydebpur, Jes- Jessore, Isd- Ishwardi, Jam- Jamalpur, Mad-Madaripur and Bar- Barind

Table 2. Performance of blackgram genotypes for yield contributing traits in different location during *Kharif*-II 2015.

Genotypes	Pods plant^{-1}							100 Seed weight (g)							Yield (kg ha^{-1})						
	Joy	Jes	Isd	Jam	Bar	Mad	Mean	Joy	Jes	Isd	Jam	Bar	Mad	Mean	Joy	Jes	Isd	Jam	Bar	Mad	Mean
BBLX-02005-1	22	29	21	25	21	25	24	3.9	4.1	4.1	4.3	4.6	6.6	4.6	1156	1022	1029	820	1011	1210	1047
BBLX-07002-5	19	31	30	23	15	17	24	5.7	5.0	5.3	5.6	4.2	4.7	5.1	1434	1336	1060	800	1034	750	1076
BBLX-07002-1	21	31	34	24	18	20	26	5.3	4.9	4.8	5.5	4.3	6.2	5.2	1430	1132	1131	684	1012	840	1043
BBLX-06002-10	33	32	29	24	14	21	28	5.8	4.6	4.5	4.6	4.3	6.1	5.0	1350	1344	1118	791	1014	840	1089
86337	29	36	28	30	20	19	28	4.4	4.2	4.0	4.7	3.8	5.2	4.4	1450	1464	1051	1063	1006	1000	1206
BARI Mash -3	24	31	31	32	21	15	27	4.7	4.2	4.2	4.5	4.4	5.8	4.7	1186	1115	987	840	1029	830	992
Mean	25	32	29	26	18	19		5	5	5	5	4	6		5	1334	1236	1063	833	1018	912
Significance	**	*	ns	*	**	ns		**	*	**	*	**	ns	-	**	**	*	**	*	**	ns
CV (%)	9.56	5.83	17.9	12.2	10.5	12.4		2.62	2.2	1.44	5.9	2.6	3.7	-	2.62	21.59	5.23	2.34	3.22	5.34	11.6
LSD (0.05)	2.33	3.38	-	5.84	3.98	NS		0.37	0.18	0.12	0.54	-	0.39	-	0.37	201.54	119.1	45.22	48.8	118.2	190.1

Joy- Joydebpur, Jes- Jessore, Isd- Ishwardi, Jam- Jamalpur, Mad-Madaripur and Bar- Barind

Table 3. Performance of blackgram genotypes on BYMV disease occurrence in different locations during *Kharif*-II 2015.

Genotypes	Disease score (BYMV)						
	Joy	Jes	Isd	Jam	Bar	Mad	Mean
BBLX-02005-1	1	3	2	3	1	3	2
BBLX-07002-5	1	3	1	3	3	3	2
BBLX-07002-1	3	5	2	4	2	4	3
BBLX-06002-10	2	4	2	3	2	3	3
86337	2	1	2	2	1	2	2
BARI Mash -3	1	2	1	2	1	2	2
Mean	2	3	2	3	2	3	

Joy- Joydebpur, Jes- Jessore, Isd- Ishwardi, Jam- Jamalpur, Mad-Madaripur and Bar- Barind

Conclusions

The genotype 86337 and BBLX-06002-10 showed the highest number of pods per plant (28) and the genotype BBLX-02005-1 showed the lowest number of pods per plant (24). In terms of disease, all the entries showed moderate tolerance to BYMV. The genotypes 86337 gave highest average yield (1206 kg ha^{-1}) among the genotypes followed by BBLX-06002-10 (1089 kg ha^{-1}) and BBLX-07002-5 (1076 kg ha^{-1}). It also produced highest seed yield in Joydebpur (1334 kg ha^{-1}) across the locations. Out of six locations 86337 genotypes produced a greater yield (1206 kg ha^{-1}) on the other hand, the lowest average yield was obtained from the genotypes BBLX-07002-1 (1043 kg ha^{-1}). From this evaluation it may be suggested that the test entries BBLX-06002-10, BBLX-07002-5 and 86337 would be used for crop improvement breeding programs.

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