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Evaluation of promising genotypes to select high yielding short duration suitable black gram (*Vigna mungo*. L.) variety for diara Land of Bihar

Rakesh Deo Ranjan, Chandrashekhar Azad, Chandan Roy and Sudhir Kumar and Anil Kumar

Rakesh Deo Ranjan
Department of Biochemistry and Crop Physiology, Bihar Agricultural University, Sabour, Bhagalpur, Bihar, India

Chandrashekhar Azad
Department of Plant Pathology, Bihar Agricultural University, Sabour, Bhagalpur, Bihar, India

Chandan Roy
Department of Plant Breeding & Genetics, Bihar Agricultural University, Sabour, Bhagalpur, Bihar, India

Sudhir Kumar
Department of Plant Breeding & Genetics, Bihar Agricultural University, Sabour, Bhagalpur, Bihar, India

Anil Kumar
Department of Plant Breeding & Genetics, Bihar Agricultural University, Sabour, Bhagalpur, Bihar, India

Corresponding Author:
Rakesh Deo Ranjan
Department of Biochemistry and Crop Physiology, Bihar Agricultural University, Sabour, Bhagalpur, Bihar, India

Abstract
Black gram (*Vigna mungo* L.) belongs to family Fabaceae sub family papilionaceae, is being grown as one of the principle pulse crops popularly known as Urd bean. In India Urd bean is grown in 3.11 Mha areas with total production of 1.90MT and average productivity is 642 kg/ha. Presently, available varieties of Urd bean generally mature in 85-90 days which forced delay sowing of rabi crops particularly those who are interested to grow Urd for grain purpose. There are certain local cultivars which matured in 65-70 days like Tinpakhia is still being grown by the farmer but the yielding ability is very poor. Hence, to facilitate timely sowing of Rabi there is urgent need to evolve short duration (70-75 days) high yielding Urd varieties best suited to diara land especially as catch crop. Present experiment was conducted at BAC Farm, Bihar Agricultural College Sabour, Bhagalpur during Kharif, 2012 to study the response of thirteen cultivars viz. Pant U-31, Mash-1-1, Mash-114, Mash-338, Utra, IPU-02-43, Shekhar, PU-19, PU-31, IPU-94-1, T9, SU-10-724 and SU-10-726. Significant difference was observed among the entries for yield, 1000 grain weight and maturity. The variety IPU-02-43 produced significantly highest yield (9.44q/ha) and mature in 71.00 day; was significantly superior to the check T9 (4.30q/ha). The promising genotypes were IPU-02-43, Utra, IPU-94-1, PU-19 and SU-10-724 on the basis of their yield performance with 1000 grain weight of 56.93gm, 54.73gm, 54.70gm 51.00gm and 51.30gm respectively. Earliest maturing genotype was IPU-02-43 in 71.00 days with maximum production of 9.44 q/ha. Among different genotype minimum disease incidence was recorded in IPU-02-43 (15.00%) which was followed by Utra (18.90%) as compared to check T9 (60.50%). On the basis of yield, maturity and minimum disease incidence it can be suggested the entries IPU-02-43, Utra, IPU-94-1, PU-19 and SU-10-724 for cultivations in diara land of Bihar.

Keywords: Black gram, short duration, diara land, Bihar

Introduction
Pulses are the major source of dietary protein especially for country's poor who cannot afford a non-vegetarian diet to supplement their protein requirements and also for vast majority of vegetarian population. Beside proteins, pulses are also source of starch, fibre, lipid, vitamins and minerals. The importance of Black gram as the source of vegetable protein and its role in sustainable agriculture in Indian situation is well known. Though, tremendous progress has been made in achieving quantum jumps in cereal crops, which ushered in an era of green revolution, the gains made in improvement of productivity of pulses in general and Black gram in particular are very less. In Agriculture, legumes have been important from the ancient times. Whyte *et al.* (1953) [19] reported that legumes are being grown as economic crops since last 6000 years.

Blackgram (*Vigna mungo* L. Hepper) commonly known as mash is one of the most important pulse crops of India. It is very rich in protein containing about 25 per cent protein in its seed and is the richest in phosphoric acid content among all pulses. In addition, its green stover also provides an excellent feed for milch animals. In Bihar, about 5.35 lac hectare of Agricultural land comes under diara land originated from entry point of holy river Ganga at Buxar to end point of Pirpaiti which usually undulated during rainy season and spread over both side of river embankment.

However, Presently the available varieties of Urd bean generally mature in 85-90 days which forced delay sowing of rabi crops particularly those who are interested grown Urd for grain purpose. There are certain local cultivar which matured in 65-70 days like Tinpakhia is still being grown by the farmer but the yielding ability is very poor on one hand and very limited number of recommended varieties like $T_{9,}$ Pant Urd, Pand Urid-19 and Navin other hand which units the option on the hand. Hence, to facilitates timely sowing of Rabi there urgent need to evolve short duration (70-75 days) high yielding Urd varieties best suited to diara land especially for catch crop, but research work on this aspect in blackgram under Bihar conditions has not been investigated. It was, therefore felt necessary to evaluate response of local as well as promising culture to select short duration high yielding Urd variety for Diara land of Bihar.

Materials and methods

A field study was carried out at Bihar Agricultural University, Farm at Sabour (Bihar) during the rainy season (kharif) of 2012. The soil of the experimental site was sandy loam in texture having 0.82% organic carbon, 233 kg nitrogen,12.5 kg P_2O5 and 213 kg K_2O/ha before the start of experiment. The soil was acidic with 5.7 value of soil pH.

The experiment consisting of 13 thirteen varieties viz. Pant U-31, Mash-1-1, Mash-114, Mash-338, Utra, IPU-02-43, Shekhar, PU-19, PU-31, IPU-94-1, T9, SU-10-724 and SU-10-726 was laid out in a randomised block design with three replications. A basal dose of 20 kg N/ha through urea and phosphorus as per treatment through single super phosphate was applied. The crop was sown on 20th August 2012 by kera method in rows 30 cm apart using 20 kg seed/ha. Primary branches per plant at pod formation stage, No. of seeds per pod, plant height, days to maturity and disease incidence was at different dates were recorded from the ten tagged plants from the net plot area seed yield from net plot area was recorded after drying the seeds to 12% moisture. Powdery mildew disease incidence was recorded at scale 0-5, 0 shows No infection, 1 indicated 0.1-10%, 2 indicated 10-25%, 3 indicated 25-50%, 4 indicated 50-75% and 5 >75% level of infection. Days to 50% flowering was noted in terms of days from sowing of seeds to 50% plants with flowering, Number of branches/plants on per plant basis was counted at the time of harvesting and averaged. Plant height was measured in cm from ground level to tip of main axis of the plant, Number of clusters bearing pods were counted on five randomly selected plants and averaged. Number of seeds of five pods from each plant were counted and averaged, Days to maturity was recorded in days from sowing to 80% pods matured, 1000 seed weight (g) was recorded in grams for individual genotype and yield/plot (kg/ha) of sun-dried seeds per plot (4-meter size) was recorded.

Results and discussion

Physiological characters like Days to 50% flowering, Number of branches/plants, Plant height (cm), Number of pod clusters/plant, Number of seeds/pod and Days to maturity were recorded Table 1. Among all genotypes IPU-02-43 and Utra recorded significant growth and compared to T9 check.

Days to 50% flowering

The range of variation for this character was from 40.33 days to 59.33 days with an average of 48.31 days. The genotype T9 (59.33 days) and Mash-1-1 (58.00 days) were recorded as late flowering type and IPU-02-43 (40.33 days) as early flowering type.

Number of branches/plants

The number of branches per plant ranged from 3.60 to 9.80 with an average of 5.77 branches. The maximum number of branches per plant was recorded in IPU-02-43 (9.80) whereas, the lowest number of branches per plant was recorded in T9 (3.60). Sharma *et al*. (2006) [15] for number of branches/plants are in agreement with the present findings. Similar findings were also reported by Sagar & Sekhar (2001) [13] and Mansingh and Singh (2003) [8] for this trait in urdbean at phenotypic level.

Plant height (cm)

The plant height varied from 28.06 cm to 48.80 cm with an average plant height of 36.57 cm. Among all genotypes, IPU-02-43 (48.80 cm) and Utra (46.40) was recorded as taller height and T9 (28.06 cm) as dwarf genotype. The above results are in support with the results obtained by Natarajan and Rathinasamy (1999) [10], Natarajan and Rathinasamy (2000) [9] for seed plant height. Yadav *et al*. (2001) [19] reported similar result for Plant height (cm) in black gram.

Number of pod clusters/plant

The average number of pod clusters/plant was 38.37 with a range of 27.00 to 59.93. The genotype IPU-02-43 (52.93) recorded the highest number of clusters per plant and T9 (27.00) had lowest number of clusters per plant. Previous results reported by Babu *et al*. (2010) [1], Revanappa and Kajjidoni (2005) [12] was in agreement with present findings. Similar findings for number of branches with number of pod clusters/plant and number of pods/plants have also been reported by Gupta *et al*. (2003) [2]. Sharma *et al*. (2006) [15] for number of branches/plants are in agreement with the present findings.

Number of seeds/pods

The average number of seeds/pods was 7.04 with range of 6.13 to 7.93 seeds/ pod. The genotype IPU-02-43 (7.93) was having maximum number of seeds/pod and T9 had lowest number (6.13) of seeds/pod. Yadav *et al*. (2001) [19] reported similar result for number of seeds/pods in black gram.

Days to maturity

The average maturity period was 78.31 days with minimum of 81.00 days and maximum of 71.00 days. The genotype IPU-02-43 (71.00 days) recorded as early maturing and T9 (81.00 days), Mash-114 (81.00 days) as late maturing genotype.

Yield attributing characters

Yield attributing characters like 1000 grain weight (g) and optimum yield (q/ha) was recorded Table 2. Among all genotypes IPU-02-43 and Utra recorded maximum significant yield as compared to T9 check.

Table 1: Performance of different genotypes on physiological parameters

Sl. No.	Entries	Days to 50% flowering	No. of primary branches/plant	Plant height (cm)	No. of pods/plant	No. of seed/pod	Days to maturity
1	Pant U-31	47.00	6.33	35.80	36.93	7.53.	80.00
2	Mash-1-1	53.33	5.67	34.06	33.20	6.87	80.00
3	Mash-114	58.00	4.33	29.06	29.06	6.73	81.00
4	Mash-338	54.33	4.33	32.80	30.60	6.67	80.00
5	Utra	41.67	8.53	46.40	49.20	7.80	75.00
6	IPU-02-43	40.33	9.80	48.80	52.93	7.93	71.00
7	Shekhar	46.67	6.53	36.13	37.53	7.20	80.00
8	PU-19	44.67	6.13	38.13	42.60	7.20	77.00
9	PU-31	48.00	5.27	34.06	35.46	6.51	80.00
10	IPU-94-1	43.00	7.20	38.53	43.46	7.07	76.00
11	T9	59.33	3.60	28.06	27.00	6.13	81.00
12	SU-10-724	45.67	6.20	37.00	41.00	7.20	78.00
13	SU-10-726	46.00	6.20	36.60	39.86	7.20	79.00
	Mean	48.31	6.16	36.57	38.37	7.04	78.31
CD at 5%		1.72	0.47	1.63	3.87	0.86	2.61
CV		2.11	4.80	2.65	5.97	7.65	4.75
SeM±		0.58	0.16	0.56	1.32	0.29	1.45

Table 2: Performance of different genotypes on Yield (q/ha) and disease incidence

Sl. No.	Varieties	1000 grain weight (g)	Yield(q/ha)	Disease incidence PM (%)
1	Pant U-31	50.20	6.79	37.50
2	Mash-1-1	48.00	5.43	40.00
3	Mash-114	46.93	4.50	47.50
4	Mash-338	47.00	5.33	45.00
5	Utra	54.73	8.89	18.90
6	IPU-02-43	56.93	9.44	15.00
7	Shekhar	50.70	7.09	35.00
8	PU-19	51.00	7.71	25.50
9	PU-31	48.00	6.67	38.00
10	IPU-94-1	54.70	7.78	23.50
11	T9 (check)	40.00	4.30	60.50
12	SU-10-724	51.30	7.59	30.00
13	SU-10-726	51.23	7.46	30.00
	Mean	50.05	6.84	34.34
CD at 5%		0.47	0.26	2.15
CV		0.56	2.12	2.34
SeM±		0.16	0.15	0.75

1000 grain weight (g)

The mean 1000 grain weight was 50.05 (g) ranging from 40.00 to 56.93 (g). The genotype T9 (40.00g) recorded minimum and IPU-02-43 (56.93 g) had maximum 1000 grain weight.

Yield (q/ha)

The mean yield was 6.84 and ranged from 4.30 to 9.44 (q/ha). The genotype T9 (4.30 q/ha) recorded the lowest and IPU-02-43 (9.44 q/ha) had the highest Yield (q/ha). These findings are in accordance to the findings of Kumar and Reddy (1986) [5] who reported different genotypes 1000 grain wt and yield/plant. Similar findings were also reported by Urkurkar *et al.* (1999) [17], Sagar and Sekhar (2001) [13] and Raika *et al.* (2000) [11] for seed yield and harvest index suggesting that selection for high harvest index will give higher yield in black gram

Disease incidence (%)

The mean disease incidence was 34.34 (%) ranging from 15.00 to 60.50 (%). The genotype T9 (60.50%) recorded maximum and IPU-02-43 (15.00%) had minimum disease incidence.

Screening of genotypes for powdery mildew disease incidence (0-5 Score)

Powdery mildew disease incidence was recorded on the basis of scale 0-5 and is presented in Table 3. Among all genotypes, none of the genotypes was found as highly resistant and resistant to powdery mildew. Only two genotypes i.e. IPU-02-43 and Utra recorded with Moderately resistance, IPU-94-1, PU-19 and SU-10-724 showed Moderately susceptible, SU-10-726, Shekhar, Pant U-31, PU-31, Mash-1-1 and Mash-338 recorded Susceptible and rests of the genotypes were recorded susceptible Mash-114 and T9 to powdery mildew disease. In accordance with present finding Katiyar *et al.* (2010) [3], Sharma and Singh (2008) [16], Konda *et al.* (2007) [4], Shanthi *et al.* (2006) [14], Lad *et al.* (2005) [6], Manikannan *et al.* (2000) [7] have also reported powdery mildew disease incidence in black gram.

Table 3: Observation on Powdery mildew disease incidence at scale 0-5

Score	Level of infection	Disease reaction	Genotypes
0	No infection	Highly resistance	-
1	0.1 – 10%	Resistance	-
2	10 – 25%	Moderately resistance	IPU-02-43, Utra
3	25 – 50%	Moderately susceptible	IPU-94-1, PU-19, SU-10-724
4	50 – 75%	Susceptible	SU-10-726, Shekhar, Pant U-31, PU-31, Mash-1-1, Mash-338
5	>75%	Highly susceptible	Mash-114, T9

Summary and conclusion

The promising genotypes were IPU-02-43, Utra, IPU-94-1, PU-19 and SU-10-724 on the basis of their yield performance with 1000 grain weight of 56.93gm, 54.73gm, 54.70gm 51.00gm and 51.30gm respectively. Earliest maturing genotype was IPU-02-43 in 71.00 days with maximum production of 9.44 q/ha. Among different genotype minimum disease incidence was recorded in IPU-02-43 (15.00%) which was followed by Utra (18.90%) as compared to check T9 (60.50%). On the basis of yield, maturity and minimum disease incidence it can be suggested the entries IPU-02-43, Utra, IPU-94-1, PU-19 and SU-10-724 for cultivations in diara land of Bihar.

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