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Screening of Black Gram Genotypes for Hardseededness and Breaking of Hardseededness by using Various Seed Treatment Methods in Black Gram (*Vigna mungo* L. Hepper)

N. GANGARAJU AND P. BALAKRISHNA

Department of Seed Science and Technology, College of Agriculture, UAS,, GKVK, Bengaluru-560065

ABSTRACT

Laboratory experiments were carried out to study the hardseededness and their management in black gram genotypes.The experiment was laid out in CRD with 25 genotypes for hardseededness and 10 different treatments for management, replicated thrice. The data revealed that the hardseededness varied between 3(IC-282009) to 43 (MBG 1050) per cent. Among the different hardseededness breaking methods, the seedstreated with concentrated sulphuric acid for 60 seconds recorded the highest seed quality parameters like germination (94.67 %), root length (12.63 cm), shoot length (11.22), mean seedling length (23.29 cm), mean seedling dry weight (18.90 g), seedling vigour index I and II (2205 and 1789,respectively) and also recorded lowest hard seed and abnormal seedlings (1 % and 3%) respectively over untreated control (54.00%, 9.08cm,7.87cm, 23.29 cm, 17.28 cm, 15.70 mg, 959 and 869, respectively). The study concluded that genotype MBG 1050 recorded highest harseededness and it could be broken by concentratedH_2SO_4 treatmentfor 60 seconds.

BLACKGRAM (*Vignamungo* L.) is one of the most highly prized pulse crop, cultivated in almost all parts of the country. It has inevitably marked itself as the most popular pulse and can be most appropriately referred to as the "king of the pulses". Blackgram is perfect combination of all nutrients, which includes proteins (25-26%), carbohydrates (60%) and fat (1.5%). Comparedto many pulse cropsa higher per cent of hard seeds were observed in black gram. Environmental conditions play an important role in development of hard seeds (Donelly, 1970).Hard seeds in black gram present a problem to both farmer and the seed analyst, since they fail to germinate even under favourable conditions. The hard seed coat results in fail to germinate, unless the seeds receive an appropriate dormancy-breaking treatment, which results loss to seed grower and also farmer. However, information's lacking about the extent and cause of hard seeds and techniques for breaking hardseededness in black gram. The studies were conducted to evaluate suitable methods for breaking hardseededness in black gram (Tomar and Pramila Kumari, 1991).

An experiment was conducted to know the best method to break hardseededness in black gram. The freshly harvested seeds of 25 blackgram genotypes brought to laboratory and screened for hard seed percent by using germination test. Among different genotypes, the genotype MBG-1050 resulted the highest hard seed (43 %) followed by MBG-1041 (30.5 %) (Table I). Finally, selected MBG 1050 which recorded highest hard seed percent for conducting the experiment. With this, theexperiment was initiated at Department of Seed Science and Technology, University of Agricultural Sciences, GKVK, Bengaluru during 2015. The experiment was laid out in CRD with three replications to study the effect of different hardseededness breaking methods *viz*., Scarification with sand paper for 2 minutes (T_1), treatment with concentrated sulphuric acid for 60 seconds (T_2), treatment with concentrated sulphuric acid for 90 seconds(T_3), treatment with concentrated sulphuric acid for 120 seconds (T_4), treatment with concentrated nitric acid for 60 seconds (T_5), treatment with concentrated nitric acid for 90 seconds(T_6), treatment with concentrated nitric acid for 120 seconds(T_7), pre chilling at 10^0 C for 7 days (T_8), hot water treatment at 80^0 C for 2 minutes (T_9) and control (T_{10}) on seed quality parameters of black gram genotype MBG-1050. The seed quality parameters like germination per cent, root length, shoot length, mean seedling length, mean seedling dry weight, percentage of hard seed

TABLE- I

Germination and hard seed percentage of different genotypes of black gram

Genotypes		Germination (%)	Hard seed (%)
G_1	BG-6	81.00	17.50
G_2	MBG-1050	54.00	43.00
G_3	RF-U-1310	83.00	16.50
G_4	MBG-1045	80.00	13.50
G_5	MBG-207	78.00	19.50
G_6	BG-9	81.50	13.00
G_7	LBG-645	88.00	9.00
G_8	RU-13-101	88.00	8.00
G_9	LBG-623	77.50	15.50
G_{10}	LBG-22	89.50	6.50
G_{11}	PU-94-2	88.00	5.50
G_{12}	RU-13-108	73.00	16.50
G_{13}	MBG-1041	60.00	30.50
G_{14}	MBG-1061	77.00	16.00
G_{15}	BG-2 MLT	61.00	27.50
G_{16}	IC-282009	90.50	3.50
G_{17}	KPU-07-08	78.00	13.50
G_{18}	M-414	77.00	14.00
G_{19}	GP-723	82.00	13.00
G_{20}	IC-281999	89.00	6.50
G_{21}	K-07-07	79.00	11.50
G_{22}	MBG-1051	80.50	12.50
G_{23}	IC-281974	80.00	12.50
G_{24}	IC-426495	75.00	14.50
G_{25}	DU-1	88.50	8.00
	SEm±	2.44	0.62
	CD (P=0.05)	7.12	1.81
	CV (%)	4.36	5.96

TABLE- II

Effect of hardseededness breaking methods on germination (%), root length (cm), shoot length (cm) and mean seedling length (cm) of blackgram (Vignamungo L. Hepper) cv. MBG 1050

Treatments	Germination (%)	Root length (cm)	Shoot length (cm)	Mean seedling length (cm)
T_1	87.67	11.23	9.88	21.28
T_2	94.67	12.63	11.22	23.29
T_3	90.67	11.31	10.07	21.49
T_4	92.00	11.42	10.62	21.93
T_5	85.67	11.21	9.87	21.14
T_6	84.67	11.14	9.70	21.09
T_7	82.67	10.92	9.69	20.61
T_8	81.67	10.88	9.69	20.57
T_9	93.67	11.43	10.66	22.36
T_{10}	54.00	9.08	7.87	17.28
SEm±	1.28	0.31	0.27	0.41
CD (P=0.05)	3.79	0.92	0.82	1.21
CV (%)	2.63	4.87	4.85	3.37

Treatments

T_1 – Scarification with sand paper for 2 minutes

T_2 – Treatment with concentrated sulphuric acid for 60 seconds

T_3 - Treatment with concentrated sulphuric acid for 90 seconds

T_4 - Treatment with concentrated sulphuric acid for 120 seconds

T_5 – Treatment with concentrated nitric acid for 60 seconds

T_6 – Treatment with concentrated nitric acid for 90 seconds

T_7 – Treatment with concentrated nitric acid for 120 seconds

T_8 – Pre chilling at 10^0 C for 7 days

T_9 – Hot water treatment at 80^0 C for 2 minuts

T_{10} - Control

and abnormal seedlings were recorded and the results are presented in TableII and III.

Viable seeds sometime do not imbibe water and thus, fail to germinate even when all other conditions like moisture, temperature and oxygen are favourable for germination. Such seeds are called hard seeds. The problem of hardseededness present in very acute form in species of *Leguminaceae* (Harrington, 1916) water impermeability of the testa is physical exogenous dormancy according to Nikolaeva (1969).

Results revealed that significant difference was observed with respect to hardseededness among genotypes. Among the different seed treatments given to break hardseededness found significantly different with respect to seed quality parameters. All the seed quality parameters like germination (94.67 %), root length (12.63 cm), shoot length (11.22), mean seedling length (23.29 cm), mean seedling dry weight (18.90 mg), seedling vigour index I and II (2205 and 1789,respectively) and also recorded lowest hard seed and abnormal seedlings (1% and 3%), respectively over untreated control (54.00%, 9.08cm,7.87cm, 23.29 cm, 17.28 cm, 15.70 mg, 959 and 869, respectively) in seeds treated with sulphuric acid for 60 seconds (Table II and Table III). The same findings were observed in green gram (*Vigna radiate* L.) (Borikar and Katkade, 1985). The similar results were observed in alfalfa (*Medicagosativa* L.) (Tomer and Maguire, 1989). This may be due to application of concentrated sulphuric acid the dehydration of seed coat cells was rapid rather

TABLE- III

Effect of hardseededness breaking methods on mean seedling dry weight (mg), seedling vigour index I, seedling vigour index II, hard seed (%) and abnormal seedlings (%)ofblackgram (Vignamungo L. Hepper) cv. MBG 1050.

Treatments	Mean seedling dry weight (mg)	Seedling vigour index I	Seedling vigour index II	Hard seed (%)	Abnormal seedlings (%)
T_1	18.10	1865	1586	4	5
T_2	18.90	2205	1789	1	3
T_3	18.45	1949	1673	3	4
T_4	18.48	2048	1725	3	5
T_5	18.04	1810	1546	5	7
T_6	16.86	1785	1428	6	5
T_7	16.69	1704	1380	4	10
T_8	16.02	1680	1309	3	10
T_9	18.63	2094	1745	2	3
T_{10}	15.70	959	869	43	2
SEm±	0.40	44.48	43.03	0.30	0.21
CD (P=0.05)	1.20	131.20	126.9	0.88	0.62
CV (%)	4.00	4.256	4.952	6.98	6.85

Treatments

T_1 – Scarification with sand paper for 2 minutes
T_2 – Treatment with concentrated sulphuric acid for 60 seconds
T_3 - Treatment with concentrated sulphuric acid for 90 seconds
T_4 - Treatment with concentrated sulphuric acid for 120 seconds
T_5 – Treatment with concentrated nitric acid for 60 seconds
T_6 – Treatment with concentrated nitric acid for 90 seconds
T_7 – Treatment with concentrated nitric acid for 120 seconds
T_8 – Pre chilling at 10^0 C for 7 days
T_9 – Hot water treatment at 80^0 C for 2 minuts
T_{10}- Control

than its strong oxidising / hydrolytic effect. The palisade layer was completely fragmented, the phenolic compounds of the germinated cells have been strongly oxidised with the application of sulphuric acid.

It could be concluded from the results that the greater number of hard seeds were observed in MBG 1050 compared to all other genotypes. The percentage of hard seeds varied between genotypes. The seeds treated with concentrated $H_2SO_4$for 60 seconds recovered hardseededness followed byhot water treatment at 80^0 C for 2 minutes.

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