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## IDENTIFICATION OF BLAST RESISTANT HYBRID PARENTS AND THEIR PERFORMANCE IN HYBRID COMBINATIONS OF PEARL MILLET [*Pennisetum glaucum* (L.) R. Br.] IN FIELD CONDITIONS

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### ABSTRACT

Thirty three hybrid parents of pearl millet (26 females and 7 males) were planted at ICRISAT, Patancheru during rainy season and 182 crosses were generated from 33 parents, planted in RCBD. Both parents and their hybrids were scored for blast disease using foliar blast severity scale 1 to 9. Among females 18 were found moderately resistant, 4 found resistant and 4 were showed susceptible reaction for Patancheru pathotype. Whereas, in case of males, 6 parents showed moderately resistant and 1 found susceptible. While among 182 hybrids, 28 hybrids were showed resistant reaction for blast, 126 hybrids were found moderately resistant and 28 hybrids were recorded susceptible reaction against Patancheru pathotypes. The present study reveals that the disease reaction of the parents and  $F_1s$  gives us the preliminary information about inheritance of blast and resistant parents could be either used in the crossing programs to develop blast resistant hybrid parents or to diversify the genetic base for blast resistance in future pearl millet hybrids.

**Keywords :** *Pennisetum glaucum*, foliar blast, RBD, hybrids and inheritance

### Introduction

Pearl millet (*Pennisetum glaucum* (L.) R. Br.) is one of the most widely grown millet and an important crop in India and Africa, extensively cultivated in arid and semi-arid regions after rice, wheat and sorghum. India is the single largest producer of pearl millet in the world, Rajasthan state being the largest producer of pearl millet in India. The crop is best suited for areas with low soil fertility, drought, high temperature, low pH or high salinity.

Many delegates from the private seed companies highlighted the increased occurrence of Magnaporthe blast in the seed production plots and the damage caused to the crop. In continuation of the discussion the scientific group felt the need to consolidate the available information on pearl millet blast disease and to give more importance to understand the biology of the pathogen, epidemiology of the disease and disease management aspects.

During the year 2009-2012 the average blast disease ranged 7.2 to 24% and the incidence ranged from 01 to 99%. In the XII plan period the disease marginally increased in majority of the pearl millet hybrids, disease ranging from 13.8 to 24.7% and the incidence in individual field ranged from 0.1 to 92% (Chandra *et al.*, 2017).

The wide host range, continuous genetic variation, evolution of virulent pathotypes and host shifts (Gladieux *et al.*, 2018; Huang *et al.*, 2014; Saleh *et al.*, 2014; Sharma *et al.*, 2013; Couch *et al.*, 2005) are the major concerns that make blast pathogen, a continuous worry for the farmers as well as researchers around the globe and demands rapid and

timely action to diagnose and contain this destructive pathogen. 3–35% dry matter reduction was reported by Wilson *et al.*, 1993. By considering above need and facts this study was conducted to identify the blast tolerant or resistant parents and to see their reaction in hybrid combinations.

Present study was conducted to identify new blast tolerant hybrid parents at ICRISAT and their cross combinations evaluation on field condition.

### Material and Methods

Thirty three seed and restorer parents and their hybrids were planted during rainy season of 2018 at ICRISAT, Patancheru (Table 1). The scoring for blast reaction was done at dough stage of the crop. The parents were planted in randomized block design with two rows and two replications with 75 cm row to row spacing and 15 cm plant to plant spacing. 182 hybrids were planted along with commercial hybrid checks in alpha lattice design, with 75 cm plant to plant and 15 cm row to row spacing. Blast scoring was done by using blast scale of 1-9 (Highly resistant (1-2.9), Resistant (3-3.9), moderately resistant (4-5.9), Susceptible (6-7.9), highly susceptible (8-9).

### Results and Discussion

Among the 26 hybrid parents involved in parental trial, four seed parents were found highly resistant (1) to resistant (3) respectively viz., MBL-6, MBL-10, MBL-22 and MBL-24. Six restorer parents were found moderately resistant viz., MRL-2, MRL-3, MRL-4, MRL-5, MRL-6 and MRL-7 (Table 1 and Table 2). Grain yield (kg/ha) of highly resistant

to resistant hybrid parents ranges from 2168.3 to 4455.0 kg/ha except for MRL-3 this may be due to bird damage. Whereas for susceptible parents ranges from 1599.2 to 3700.0 kg/ha.

Days to 50% flowering range for highly resistant to resistant seed parents ranges from 50 to 56 days which comes

under med-late maturity group, while for restorer parents bloom ranges from 42 to 53 days which comes under early to medium maturity group (Table 2). This provides information that we can use these resistant parents to develop early to medium maturity hybrids with blast resistance.

**Table 1:** Frequency distribution of parental lines as per blast severity scale

Parents	No of lines in the category					Total
	Highly resistant (1.0-2.9)	Resistant (3.0-3.9)	Moderately resistant (4.0-5.9)	Susceptible (6.0-7.9)	Highly susceptible (8.0-9.0)	
Females	1	3	18	4	-	26
Males	-	-	6	1	-	7

**Table 2:** Morphological characters of resistant and moderate resistant hybrid parents of pearl millet

Parents	Pedigree	Days to 50% Bloom	No. of Productive tillers	Panicle length (cm)	Panicle girth (cm)	Grain Yield (kg/ha)
<b>Lines</b>						
MBL-6	MBL-6-K18-TEST	52	2	17.4	3.5	3328.3
MBL-10	MBL-10-K18-TEST	50	2	29.6	3.2	3405.0
MBL-22	MBL-22-K18-TEST	54	2	27.6	3.9	2168.4
MBL-24	MBL-24-K18-TEST	56	1	23.4	3.5	3297.5
<b>Testers</b>						
MRL-2	MRL-2-K18-TEST	50	3	17.4	2.8	4455.0
MRL-3	MRL-3-K18-TEST	53	1	19.2	3.3	1717.5
MRL-4	MRL-4-K18-TEST	43	2	22.3	3.2	3503.4
MRL-5	MRL-5-K18-TEST	42	2	25.4	3.3	3406.7
MRL-6	MRL-6-K18-TEST	47	2	26.9	2.7	4158.3
MRL-7	MRL-7-K18-TEST	46	2	30.4	2.7	3691.7

**Note:** MBL – Millet B line; MRL – Millet R line

**Blast reaction scale** – 1-9 (Highly resistant (1-2.9), Resistant (3-3.9), moderately resistant (4-5.9), Susceptible (6-7.9), highly susceptible (8-9).

Susceptible category involves four seed parents and one restorer parent. Grain yield ranges from 1599.2 to 3700.0 kg/ha. Two parents MBL-12 and MBL-23 showed susceptible reaction but grain yield recorded were 3700.00 and 3266.0 kg per ha respectively (Table 3). This means that these parents are having tolerant genes. So, these lines can be improved further.

**Table 3 :** Morphological characters of susceptible hybrid parents of pearl millet

Parents	Pedigree	Days to 50% Bloom	No. of Productive tillers	Panicle length (cm)	Panicle girth (cm)	Grain Yield (kg/ha)
<b>Lines</b>						
MBL-5	MBL-5-K18-TEST	43	2	20	3.0	1599.1
MBL-11	MBL-11-K18-TEST	53	2	18.9	3.5	2848.4
MBL-12	MBL-12-K18-TEST	47	2	18.4	3.6	3700.0
MBL-23	MBL-23-K18-TEST	57	2	24.6	3.3	3266.6
<b>Tester</b>						
MRL-1	MRL-2-K18-TEST	46	1	17.8	3.3	1882.5

**Note:** MBL – Millet B line; MRL – Millet R line

**Blast reaction scale** – 1-9 (Highly resistant (1-2.9), Resistant (3-3.9), moderately resistant (4-5.9), Susceptible (6-7.9), highly susceptible (8-9)

In case of hybrids, we categorized the combinations based on type of cross viz., resistant x susceptible (4), resistant x moderately resistant (24), susceptible x moderately resistant (24) and moderate x susceptible (18) and recorded the blast reaction and grain yield (kg per ha) data.

Resistant x susceptible type of cross showed that all four hybrids were resistant for blast with grain yield ranges from 4803 to 5788.3 kg per ha, days to 50% flowering ranges from 37 to 45 days, panicle length ranges from 21.7 to 28.5

and panicle thickness ranges from 3.3 to 4.1 cm (Table 4). This reveals that if one of the parents is resistant to blast then you will get blast resistant hybrid, means blast resistance is governed by single dominant gene. Similar results were quoted by (Gupta *et al.*, 2012; Pawar *et al.*, 2016).

Resistant x moderately resistant type of cross showed that all 24 hybrids were resistant for blast with grain yield ranges from 2430.0 to 5605.9 kg per ha, days to 50% flowering ranges from 37 to 48 days, panicle length ranges from 19.4 to 31.4 and panicle thickness ranges from 2.8 to 4.1 cm (Table 5). This type of cross also, reveals that blast resistance is governed by single dominant genes.

Susceptible x moderately resistant type of cross showed that all 24 hybrids were resistant for blast with grain yield ranges from 4049.2 to 8076.7 kg per ha, days to 50% flowering ranges from 41 to 56 days, panicle length ranges from 20.1 to 31.6 and panicle thickness ranges from 2.9 to 3.9 cm (Table 6). this type of cross, reveals that blast reaction female parent decides blast reaction of their hybrids.

Moderately resistant x susceptible type of cross showed that all 18 hybrids were resistant for blast with grain yield ranges from 4239.2 to 6059.2 kg per ha, days to 50% flowering ranges from 39 to 47 days, panicle length ranges from 21.8 to 30.6 and panicle thickness ranges from 3.3 to 3.9 cm (Table 7). This type of cross again reveals that female parent decides blast reaction of their hybrids.

**Table 4:** Cross type (Resistant x Susceptible = Resistant)

Range	Days to 50% Bloom	No. of Productive tillers	Panicle length (cm)	Panicle girth (cm)	Grain Yield (kg/ha)
Min	37	1	21.7	3.3	4803.3
Max	45	2	28.5	4.1	5788.3

**Table 5:** Cross type (Resistant x moderately resistant= Resistant)

Range	Days to 50% Bloom	No. of Productive tillers	Panicle length (cm)	Panicle girth (cm)	Grain Yield (kg/ha)
Min	37	1.3	19.4	2.8	2430.0
Max	48	3.0	31.4	4.1	5605.9

**Table 6:** Cross type (Susceptible x moderately resistant = Susceptible)

Range	Days to 50% Bloom	No. of Productive tillers	Panicle length (cm)	Panicle girth (cm)	Grain Yield (kg/ha)
Min	41	1.1	20.1	2.9	4049.2
Max	56	3	31.6	3.9	8076.7

**Table 7:** Cross type (Moderately resistant x Susceptible = Moderately resistant)

Range	Days to 50% Bloom	No. of Productive tillers	Panicle length (cm)	Panicle girth (cm)	Grain Yield (kg/ha)
Min	39	1.2	21.8	3.3	4239.2
Max	47	1.9	30.6	3.9	6059.2

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