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**Rajendra Nasnwa**  
 Department of Plant Pathology,  
 COA Bikaner, Rajasthan, India.

**SL Godara**  
 Professor, Department of Plant  
 Pathology, COA Bikaner,  
 Rajasthan, India.

**GL Kakraliya**  
 Ph.D. Scholar, Department of  
 Plant Pathology, SKNCOA  
 Jobner, Rajasthan, India.

**Sajjan Choudhary**  
 Ph.D. Scholar, Department of  
 Plant Pathology, SKNCOA  
 Jobner, Rajasthan, India.

**Dinesh Kumar**  
 Department of Plant Pathology,  
 COA Bikaner, Rajasthan, India.

**Ramraj Choudhary**  
 Department of Plant Pathology,  
 SHIATS, Allahabad, India

**Correspondence**  
**Rajendra Nasnwa**  
 Department of Plant Pathology,  
 COA Bikaner, Rajasthan, India.

## Evaluation of genotypes of pearl millet against leaf spot disease

**Rajendra Nasnwa, SL Godara, GL Kakraliya, Sajjan Choudhary, Dinesh Kumar and Ramraj Choudhary**

### Abstract

About forty genotypes of pearl millet were screened under artificial conditions during *kharif*-2015, only one genotype was found resistant (R), five genotypes were found moderately resistant (MR), fifteen genotypes low resistant (LR), five genotypes mesothetic (M), seven genotypes low susceptible (LS), five genotypes moderately susceptible (MS), two genotypes susceptible (S), and none of genotypes were found under highly susceptible (HS), respectively.

**Keywords:** Leaf Spot, Resistance, Field Screening, *Drechslera setariae*

### 1. Introduction

Pearl millet [*Pennisetum glaucum* (L.) R. Br.]  $2n = 14$  locally known as bajra, bari, sajja, combo, ganti or kambam, is an allogamous crop having protogynous in nature. It belongs to the family *Poaceae*. It is an important food and forage crop in Africa and Asia and important forage in America. It has great potential because of its suitability to the extreme limits of agriculture. The pearl millet grains are very nutritious and form the staple diet of approximately 10 per cent of the population in India. It has high protein with slightly superior amino acid profile. It is a good source of protein (11.5%), fat (4.1-6.4%), carbohydrate (59.8-78.2%) and also rich good amount of minerals particularly phosphorus and iron (2.8%). India is the largest producer of pearl millet with an annual production of 9.25 million tonnes from an area of 7.0 million hectares with productivity being 1250 kg/ha (Anonymous, 2014-15a) <sup>[1]</sup>. Pearl millet is mainly grown in Rajasthan, Uttar Pradesh, Gujarat, Maharashtra, Haryana, Karnataka, Tamil Nadu, Madhya Pradesh, and Andhra Pradesh states of the country. Rajasthan occupies first position in area and production of pearl millet in India. In Rajasthan, it is cultivated on 40.76 lac hectares area with the production of 44.56 lac tonnes and productivity of 1093 kg/ha (Anonymous, 2014-15b) <sup>[2]</sup>. Major pearl millet producing districts of Rajasthan are Alwar, Bharatpur, Karoli, Dholpur, Swai Madhopur, Jaipur, Jhunjhunu, Churu, Bikaner, Jaisalmer and Barmer.

Leaf spot of pearl millet caused by *Drechslera setariae* is a common foliar disease. *Drechslera setariae* was isolated from the rotted seeds and infected parts of seedlings. The seed used was obtained from Mysore, India, and was found to be infected with *D. setariae*, which has been reported from the United States to be seed-borne in pearl millet, causing seed rot, blight and leaf spotting (Wells & Winstead, 1965 and Wells & Burton, 1967). The disease has also been noticed in India by Bhowmik (1972) <sup>[4]</sup>. And Balasubramanian (1980) <sup>[3]</sup>.

### Materials and Methods

Forty pearl millet genotypes were collected from Agricultural Research Station (ARS), Beechwal, Bikaner and screened against leaf spot disease under artificial inoculation conditions during *kharif*-2015. In the experiment, row to row spacing 45 cm and plant to plant spacing 15 cm was maintained at the experimental farm of Agricultural Research Station (ARS), Beechwal, Bikaner. The sources of genotypes/germplasms were:

Source	Genotypes
AICRP on pearl millet, ARS, Bikaner	KBH-223, 86M86, Pusa composite-383, JBV-2, ICMV-221,9450, 86M74, 86M84, MPMH-17, Dhanshakti, Tejas, Marutej, 86M18, 86M38,RHB-173,GHB-558, GHB-905, RHB-121, Nandi -61, Proagro-9444, HHB-226, HHB-67,MP-7792, RHB-177, 9444Gold, HHB-197, Raj-171, GHB-223, GHB-732, Kaveri Super Boss, RHB-154, KBH-108, RHB-90, MH-180, ICMH-356, MH-1553, MH-1642, HHB-60, HHB-68 and GHB-758

Observations of disease (Percent leaf area covered) were recorded on five randomly selected diseased plants in each

line on 0- 9 scale basis (Neal *et al.* 1971)<sup>[9]</sup>. The following rating scale will be used of leaf spot disease of pearl millet.

Disease rating scale/grade	Per cent leaf area affected	Disease reaction
0	0%	Immune (I)
1	1-10%	Highly resistant (HR)
2	10.01-20.00%	Resistant (R)
3	20.01-30.00%	Moderately resistant (MR)
4	30.01-40.00%	Low resistant (LR)
5	40.01-50.00%	Mesothetic (M)
6	50.01-60.00%	Low susceptible (LS)
7	60.01-70.00%	Moderately susceptible (MS)
8	70.01-80.00%	Susceptible (S)
9	80.01-100.00 %	Highly susceptible (HS)

The per cent disease intensity (PDI) was computed using the following formula, whereas, per cent disease severity was calculated as per Mc Kinney, (1923).

$$\text{Per cent disease intensity} = \frac{\text{Sum of all numerical ratings}}{\text{Total number of plant observed} \times \text{Maximum grade}} \times 100$$

### Results and Discussion

A total forty pearl millet genotypes were evaluated under artificial conditions during crop season *kharif*-2015, at experimental area of Agricultural Research Station (ARS), Beechwal, Bikaner. The results presented in (Table-1). Revealed that the symptom of leaf spot disease of pearl millet caused by *D. setariae* was first observed on low resistant and low susceptible genotypes. The genotypes under the study were scored for their reaction to disease on 0-9 scale basis (Neal *et al.* 1971)<sup>[9]</sup>. and categorized as immune (I); highly resistant (HR); resistant (R); moderately resistant (MR); low resistant (LR); mesothetic (M); low susceptible (LS); moderately susceptible (MS); susceptible (S); highly susceptible (HS); It can be revealed from the Table-2, that out of forty genotypes tested (under artificial conditions) during crop season *kharif*-2015, one genotype *viz.*, 86M84 was category as resistant (R), from leaf spot disease of pearl

millet. However five genotypes *viz.*, Pusa composite-383, 9450, 86M74, 9444 Gold and HHB-60 were categorized as moderately resistant (MR), fifteen genotypes *viz.*, Dhanshakti, Marutej, 86M18, 86M38, JBV-2, GHB-558, HHB-67, Raj-171, KBH-108, RHB-90, ICMH-356, HHB-68, 86M86, ICMV-221 and MP-7792 were assessed as low resistant (LR), five genotypes *viz.*, KBH-223, MPMH-17, Tejas, RHB-173 and RHB-154 were categorized as mesothetic (M), seven genotypes *viz.*, GHB-905, RHB-121, Nandi-61, HHB-226, GHB-223, GHB-732 and Kaveri super boss were assessed as low susceptible (LS), five genotypes *viz.*, HHB- 197, Proagro-9444, MH-180, MH-1553 and NH-1642 were categorized as moderately susceptible (MS), two genotypes *viz.*, RHB-177 and GHB-757 were recorded as susceptible (S) and none of genotype was group under highly susceptible (HS), category during crop season *kharif*-2015.

**Table 1:** Source of resistance against *Drechslera setariae* of pearl millet under artificial inoculation conditions (*kharif*- 2015)

Genotypes	Category of infection	Host reaction
-	0	Immune (0%)
-	1	Highly Resistant (HR) (1 – 10%)
86M84	2	resistant (R) (10.01 – 20.00%)
Pusa Composite-383, 9450, 86M74,9444 Gold, HHB60	3	Moderately resistant (MR) (20.01-30.00%)
Dhanshakti, Marutej, 86M18, 86M38, JBV-2, GHB-558, HHB-67, Raj-171, KBH-108, RHB-90, ICMH-356, HHB-68, 86M86,ICMV-221, MP-7792	4	Lowresistant (LR) (30.01-40.00%)
KBH-223, MPMH-17, Tejas, RHB-173, RHB-154	5	<i>Mesothetic (M)</i> (40.01-50.00%)
GHB-905, RHB-121, Nandi-61, HHB-226, GHB-223, GHB-732, Kaveri super boss	6	<i>Low Susceptible (LS)</i> (50.01-60.00%)
HHB-197, Proagro-9444, MH-180, MH-1553, NH-1642	7	Moderately Susceptible (MS) (60.01-70.00%)
RHB-177, GHB-757	8	Susceptible (S) (70.01-80.00 %)
-	9	Highly Susceptible (HS) (81.01-100%)

The rating scale (0-9) for reaction types (response or infection types) of diseases of cereals as prepared by Neal *et al.* (1971).

**Table 2:** Reaction of genotypes in pearl millet to *Drechslera setariae* under artificial inoculation conditions during *kharif*-2015

S. No.	Genotypes	Disease intensity (%)	Disease reaction
1	KBH-223	46.67	M
2	86M86	34.07	LR
3	Pusa Composite-383	23.70	MR
4	JBV-2	34.80	LR

5	ICMV-221	31.85	LR
6	9450	25.92	MR
7	86M74	28.89	MR
8	86M84	18.52	R
9	MPMH-17	42.96	M
10	Dhanshakti,	39.27	LR
11	Tejas,	49.63	M
12	Marutej,	30.38	LR
13	86M18,	35.58	LR
14	86M38	37.04	LR
15	RHB-173	49.62	M
16	GHB558	38.51	LR
17	GHB-905	57.04	LS
18	RHB-121	55.56	LS
19	Nandi-61	52.58	LS
20	Proagro-9444	60.68	MS
21	HHB-226	50.37	LS
22	HHB-67	38.51	LR
23	MP-7792	39.29	LR
24	RHB-177	73.33	S
25	9444 Gold	21.49	MR
26	HHB-197	60.73	MS
27	Raj-171	36.31	LR
28	GHB-223	57.76	LS
29	GHB-732	54.82	LS
30	Kaveri super Boss	54.80	LS
31	RHB-154	48.15	M
32	KBH-108	34.80	LR
33	RHB-90	33.33	LR
34	MH-180	69.62	MS
35	ICMH-356	37.02	LR
36	MH-1553	60.58	MS
37	MH-1642	62.24	MS
38	HHB-60	20.73	MR
39	HHB-68	30.37	LR
40	GHB-758	73.33	S

S = Susceptible      R = Resistant      LS = Low Susceptible  
 MR = moderately resistant      LR = Low Resistant      M = Mesothetic  
 MS = moderately Susceptible

### Screening of pearl millet germplasm against *Drechslera setariae*

In the present investigation forty pearl millet genotypes were evaluated under artificial conditions, only one genotype *viz.* 86M84 was given resistant (R), reaction. Five germplasms *viz.* Pusa composite-383, 9450, 86M74, 9444Gold and HHB-60 were found moderately resistant (MR), fifteen germplasms *viz.* Dhanshakti, Marutej, 86M18, 86M38, JBV-2, GHB-558, HHB-67, Raj-171, KBH-108, RHB-90, ICMH-356, HHB-68, 86M86, ICMV-221 and MP-7792 found to be low resistant (LR) and five genotypes *viz.* KBH-223, MPMH-17, Tejas, RHB-173 and RHB-154 were categorized as mesothetic (M). The seven genotypes *viz.* GHB-905, RHB-121, Nandi-61, HHB-226, GHB-223, GHB-732 and Kaveri super boss were assessed as low susceptible (LS), five genotypes *viz.* HHB-197, Proagro-9444, MH-180, MH-1553 and NH-1642 were categorized as moderately susceptible (MS), two genotypes *viz.* RHB-177 and GHB-757 were recorded as susceptible (S) and none of genotypes were group under highly susceptible (HS), respectively. To the disease during *kharif*-2015, these germplasms may prove to be good source of resistance against leaf spot disease of pearl millet. These finding are in accordance with the studies of Dhanju and Sain (2005) they evaluated a set of fixed maize inbred lines for the development of stable disease resistant hybrids for resistance to maydis leaf blight under inoculated conditions at Karnal, Haryana. The inbred lines HKI 3-4-1, HKI 3-4-4, HKI 288,

HKI 699, HKI 1094, HKI 1324-2, HKI 1324-5, HKI 1347, HKI 1350, HKI 1351, HKI-1352, HKI 1352-2 and HKI 1352-58-9 were identified as the most stable disease-resistant lines and were recommended to the breeders for their further use in breeding programme. These lines are still being used in breeding programme of AICRIP maize system. Kumar *et al.* (2015) <sup>[8]</sup>. They evaluated about 65 finger millet genotypes and 15 foxtail millet genotypes in field against brown spot disease causing pathogen *Drechslera nodulosa* and *Drechslera setariae*, respectively. Among the 65 genotypes of finger millet, 30 were remaining immune, 24 were highly resistant, 6 resistant and 5 showed moderately resistant reaction. In case of 15 foxtail millet genotypes evaluation against the *Drechslera setariae*, 7 of them remain highly resistant and 7 were resistant while one showed moderately resistant reaction. However, genotypes showing consistently high degree of resistance may be utilized further for the development of high yielding disease resistant in commercial varieties. Dinesh Raj (2009) <sup>[6]</sup>. Screened 185 maize entries against *H. maydis*, none were found free from the disease. Twenty entries namely, C-555, CP-818, G.K-3050, PRO-311, BH-4070, PRO-371, 22 K 40, PAC 740, BH-40703, KDMH-1001, CP-828, BISCO-111, BIO-9637, EH-1561, BH-4068, BH-3438, JH-31172, QPM-3, QPM-4 and QPM-13 showed resistant reaction against maydis leaf blight. Dinesh *et al.* (2010) screened fifty one maize genotypes of 26 were resistant, 8 were moderately resistant, 13 were

moderately susceptible, 2 were susceptible and 2 were highly susceptible to maydis leaf blight. Zamani and Mehriyan (2006) <sup>[13]</sup>. Evaluated showed that the hybrids were more resistant than lines. Meanwhile, line K3547/212 was highly resistant and K3653/111 was highly susceptible. Among cultivars, K3547/212 x MO17 and K SC 604 were highly resistant. Commercial lines, MO 17, K18 and K19 were moderately resistant and B73 was susceptible.

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