Resistant source identification in Kodo millet under natural field conditions against sheath blight disease incited by *Rhizoctonia solani* Kuhn

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ABSTRACT

A total of 15 kodo millet varieties including resistant and susceptible checks were evaluated for identification of resistance source against banded blight disease at Agricultural Research Station, Vizianagaram during *kharif,* 2021 under natural field conditions. The screening revealed that none of the test lines or varieties were immune or highly resistant. However, RPS 1005 (20.60%), RPS 1011 (23.0%), GPLM 316 (23.47%) and BK 6 (27.53%) shown resistant reaction. Percent disease severity ranged from 20.6% (RPS 1005) to 40.7% (RPS 1007) whereas it was 70.6% in susceptible check JK-76 and 8.6% in resistant check (RK 390-25).

Keywords: *Banded blight, Kodo millet, Resistance, Screening and Susceptible.*

Small millets are the hitherto staple food for millions of people residing in arid and semiarid regions of Asian and African countries and are currently restricted to certain traditional growing areas. Increased health problems, due to changes in lifestyle, have driven people to rethink their food habits and deliberately shift toward nutritional crops, such as small millets (Anuradha *et al*., 2022). Kodo millet (*Paspalum scrobiculatum*) is one of the hardiest crops grown in Madhya Pradesh, Maharashtra, and Uttar Pradesh and various other parts of India. Kodo millet is also described as nutritious millet and has received far less research and development attention than other crops with regard to crop improvement and utilization. It is the main source of protein and minerals in the daily diets of tribal and weaker section living in remote rural areas. Millets are nutritionally superior than other cereals. The millet contains a high proportion of complex carbohydrate and dietary fiber which helps in prevention of constipation and slow release of glucose to the blood stream. Glycemic index is an important tool used in treating people with diabetes, cardiovascular disease management and weight regulation programs. Millets including Kodo millet contain water soluble fiber and this property may be utilized for maintaining or lowering blood glucose response among diabetic and CVD patients. Glycemic load (GL) representing both quality and quantity of carbohydrate in a food and allows comparison of the likely glycemic effect of realistic portion of the different foods (Neelam *et al.* 2013). However in situ incorporation of legume green manure crops increase the nutrient uptake, productivity of maize and reduce disease incidence (Sandhya Rani *et al.,* 2022). Similarly in ground nut crop simultaneous selection for stable disease resistant and high yielding groundnut genotypes were identified (Patro *et al.*, 2022).

Screening of varieties with inbuilt genetic resistance is the best means for management of this disease, as the crop is predominantly grown by resource poor farmers who can hardly afford using chemicals for its control (Das *et al*., 2021). As it is a low value crop doesn't offer much scope for additional cash inputs like fungicides and chemical methods of control are generally not advisable, hence growing resistant varieties is the best option. Very little efforts have been made to identify the resistant sources of kodo millet against banded leaf blight disease. So, an attempt was made to identify the sheath blight resistant lines.

Material and Methods

Fifteen entries of kodo millet varieties were evaluated at Agricultural Research Station, Vizianagaram. These entries were evaluated in two rows of 3 m length sown at 22.5×10cm spacing in infector row method using JK-76 as a susceptible check so as to ensure the availability of sufficient inoculum during *kharif* 2021. Infected plants were examined for lesion development and disease severity was assessed on the basis of lesion length by using 0 to 5 scale (Anon, 1996).

Table 1: Standard Evaluation System (SES) scale for sheath blight disease

Score	Description	Reaction
0	No incidence	Immune
1	Vertical spread of the lesions upto 20% of the plant height	HR
2	Vertical spread of the lesions upto 21-30% of the plant height	R
3	Vertical spread of the lesions upto 31-45% of the plant height	MR/MS
4	Vertical spread of the lesions upto 46-65% of the plant height	S
5	Vertical spread of the lesions upto 66-100% of the plant height	HS

Percent Disease Index (PDI) was calculated by using the formula

PDI for severity =

$$\frac{\text{Sum of all disease ratings}}{\text{Total no. of ratings} \times \text{Maximum disease grade}} \times 100$$

Results and Discussion

Fifteen kodo millet varieties including checks were evaluated for identification of resistance source against banded blight disease. The screening revealed that none of the test lines or varieties were immune or highly resistant. However, RPS 1005 (20.60%), RPS 1011 (23.0%), GPLM 316 (23.47%) and BK 6 (27.53%) shown resistant reaction. Percent disease severity ranged from 20.6% (RPS 1005) to 40.7% (RPS 1007) whereas it was 70.6% in susceptible check JK-76 and 8.6% in resistant check (RK 390-25) shown resistant reaction. Percent disease severity ranged from 20.6% (RPS 1005) to 40.7% (RPS 1007) whereas it was 70.6% in susceptible check JK-76 and 8.6% in resistant check (RK 390-25) (Table 2).

Patro *et al.* (2021) evaluated 20 kodo millet varieties including resistant and susceptible checks were evaluated for identification of resistance source against banded blight disease at Agricultural Research Station, Vizianagaram during *kharif*, 2021 under natural field conditions. The screening revealed that none of the test lines or varieties were immune or highly resistant. However, KMNDL-1 (24.23%), RPS 1009 (23.07%), DK 151 (25.10%), DK 159 (27.60%) and TNPsc 313 (27.63%) shown resistant reaction. Percent disease severity ranged from 23.07% (RPS 1009) to 54.6% (IIMR-KM-1) whereas it was 68.7% in susceptible check 8.27% in resistant check

Patro *et al.* (2017) screened 10 kodo millet entries and the disease intensity ranged from 78.00% (DPS-118) to 98.67% (RK-64) in which it was 97.33% in the check. However, kodo millet varieties KAVT 5, KAVT 20 and KAVT 22 were found as resistant genotype. Patro *et al.* (2016) screened six varieties in which RK 390-25 (20.5) was found to be highly resistant. However, DPS 118 (21.7) was recorded as resistant, TNAU 86 (63.6) and RK 153 (64.4) as susceptible, GPUK 3 (70.2) and TNAU 26 (87.4) was found to be highly susceptible. The mean performance of six centers as revealed that RK 390-25 (8.8), DPS 118 (17.1) as highly resistant, GPUK 3 (21.0), RK 156 (23.0) and TNAU 86 (30.0) as resistant varieties. Patro *et al.* (2016) evaluated 27 genotypes and revealed that DHKM 3 (24.0) and BK 20 (25.5) showed less severity of banded blight as compared to control TNAU 26, whereas hundred percent disease severity was recorded in DHKM 3-3, BK 10 and DHKM 3 genotypes. Patro *et al.* (2014) and Nagaraja *et al.* (2016) reported that all the small millet crops were found infected with *R. solani*. Similar research was also done in other small millet crops by Neeraja *et al.* (2016), Patro *et al.*

(2013) and Patro *et al.* (2016). Eleven entries were evaluated against banded blight and reported that TNAU 86 (53.33) and BK 48 (53.33) were recorded as moderately susceptible varieties by Patro *et al* 2018. A total of 15 kodo millet varieties including check were evaluated for resistance to banded blight and revealed that none of the test lines or varieties were immune or highly resistant. Whereas, RPS 1005 (57.7) and RPS 1007 (59.7) were recorded as susceptible. These genotypes would be of immense value to the breeders involved in developing high yielding resistant genotypes of kodo millet.

Table 2: Reaction of Kodo millet varieties to banded blight

S.No.	Entry	Banded blight (%)	Yield/ plot (g)
1	BK 6	27.53	139.93
2	BK 28	40.07	82.07
3	GPLM 254	35.33	133.53
4	GPLM 273	32.9	158.33
5	GPLM 276	44.93	69.03
6	GPLM 316	23.47	166.53
7	RPS 716	37.53	28.6
8	RPS 1005	20.6	192.57
9	RPS 1007	40.77	93.53
10	RPS 1008	29.93	127.93
11	RPS 1009	30.47	108.83
12	RPS 1011	23	170.17
13	TNPsc 176	30.83	124.93
14	RK 390-25	8.6	213.17
15	JK-76	70.73	41.97
	Mean	**33.11**	**123.41**
	C.D. (5%)	**7**	**15.3**
	C.D. (1%)	**9.5**	**20.5**
	C.V. (%)	**12.6**	**7.1**

Eighteen genotypes of kodo millet were screened with one resistant and one susceptible check. None of the genotype found to be immune against banded blight. Genotypes RPS 1005 (20.60%), RPS 1011 (23.0%), GPLM 316 (23.47%) and BK 6 (27.53%) were found to be promising entries for banded blight resistant during the one year experimentation.

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