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Identification of resistant sources of barnyard millet varieties against sheath blight caused by *Rhizoctonia solani* Kuhn

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Abstract
Barnyard millet is the second important small millet after finger millet in India. In this present study, eighteen barnyard millet varieties including check were evaluated for resistance to banded blight at Agricultural Research Station, Vizianagaram during *kharif*, 2019. The experiment was conducted under field condition. The screening revealed that none of the test lines or varieties was immune or highly resistant. However, TNEF 317 (63.3%) and TNEF 318 (64.7%) were recorded as susceptible; it was 97.5% in susceptible check. The disease intensity was ranged from 63.3 (TNEF 317) to 89.3 (DHBM 93-3), where it was 20.0% in resistant check (PRB 903) and it was 97.5% in susceptible check (LDR-1).

Keywords: Barnyard millet, banded blight, screening, *Rhizoctonia solani*, resistant, susceptible

Introduction
Small millets are warm-season cereals largely grown in the semi arid tropical regions of Asia and Africa, under rainfed farming systems (Rai *et al*., 2008) [15]. Small millets includes finger millet (*Eleucine coracana*), Kodo millet (*Paspalum scrobiculatum*), proso millet (*Panicum miliaceum*), foxtail millet (*Setaria italica*), little millet (*Panicum sumatrance*) and barnyard millet (*Echinocloa frumentacea*). Small millets grains are rich in dietary energy, vitamins, several minerals (especially micronutrients such as iron, calcium and zinc), insoluble dietary fiber and phyto chemicals with antioxidant properties (Bouis, 2000) [2] and are considered as "Nutri-cereals". They are rich in compounds that help against several chronic diseases like isthemic strokes, cardiovascular diseases, cancers, obesity and Type II diabetes (Jones *et al*., 2000, Jones, 2006) [5, 4]. Barnyard millet (*Echinochloa frumentacaea*) is one of the hardiest millets, which is called by several names *viz*., Japanese barnyard millet, ooda, oadalu, sawan, sanwa, and sanwank. Nutritionally, Barnyard millet is an important crop. It is a fair source of protein, which is highly digestible and is an excellent source of dietary fibre with good amounts of soluble and insoluble fractions (Veena *et al*. 2005) [16]. The carbohydrate content is low and slowly digestible (Veena *et al*. 2005) [16], which makes the Barnyard millet a natural designer food. In the present days of increased diabetes mellitus, barnyard millet could become an ideal food. Although barnyard millet like any other minor millet is nutritionally superior to cereals, yet its utilization is limited. Besides, barnyard is a fastest multipurpose crop, which yields food and forage in a short duration and at low inputs even under adverse climatic conditions. The crop Barnyard millet ids prone to many diseases and of course the diseases can effectively be controlled by application of fungicides and practicing suitable management practices. However, the poor farmers required only varieties with resistance to the diseases. Hence, the study was undertaken to identify the millet genotypes resistant to banded blight disease.

Materials and Methods
A field experiment was conducted against sheath blight caused by *Rhizoctonia solani* during *kharif*, 2019 at Agricultural Research Station, Vizianagaram. The experiment was laid on a plot in Randomized Block Design, with 18 varieties, replicated three times which was sown in two rows of 3 m length with a spacing of 22.5 x 10 m. The recommended agronomic practices and other standard packages of practices were adopted at the time of crop growth period.

Five randomly selected plants were selected from each genotype/replication for recording the observations. The genotypes of barnyard millet were screened under natural epiphytotic conditions and no artificial inoculation was made. 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) [1].

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

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

Results and Discussion

Eighteen barnyard millet varieties were screened for banded blight reaction. Among those, no variety was found to be immune to *R. solani* also none found to be resistant. However, TNEF 317 (63.3%) and TNEF 318 (64.7%) were recorded as susceptible; it was 97.5% in susceptible check. The disease intensity was ranged from 63.3 (TNEF 317) to 89.3 (DHBM 93-3), where it was 20.0% in resistant check (PRB 903) and it was 97.5% in susceptible check (LDR-1). (Table2).

Patro *et al*., (2017) [11] evaluated ten varieties where the disease intensity ranges from 85.33% (VL 207) to 97.33% (DHBM 18-6, VL 249 and DHBM 99-6) while it was 98.67% in the local check. Divya *et al*., (2016) [3] evaluated thirteen varieties the percentage disease intensity ranged from 27.9% (ACM 10-082) to 92.5% (RBM 7-2) whereas it was 93.7% in susceptible check. Mean of all five locations revealed that ACM 10-082 as highly resistant, VL 172 and DHB 23-3 as resistant and remaining varieties as moderately resistant. Patro *et al.* (2014) [12] and Nagaraja *et al.* (2016) [6] reported that all the small millet crops were found infected with R. solani, whereas in the screening of little millet LAVT 19 and LAVT 14 were found as resistant genotypes. Similar research was also done in other small millet crops by Neeraja *et al*., 2016 [7], Patro *et al*., 2013 [10] and Patro *et al.*, 2016 [13]. Patro *et al.*, 2018 [8, 9] evaluated Twenty three barnyard millet varieties and reported that no variety was found to be immune to *R. solani* also none found to be resistant. However, varieties VB-16-7 (40.00), VB-16-8 (46.67), VB16-20 (49.33), LRB-9 (44.00) and LRB-19 (49.30) were found to be resistant. Varieties VB-15-3 (56.00), VB-15-6 (57.33), VB-16-31 (52.00), PRB 903 (54.67), LRB-1 (52.00) and LRB-26 (56.00) as moderately resistant to moderately susceptible. Whereas, VB-15-1 (80.00) and LRB-21 (81.33) were found to be as susceptible. Whereas, VMBC-331 (local check) was recorded 86.67%. Patro *et al.*, 2018 [8, 9] evaluated 9 genotypes and reported that TNEf 204 (49.33) and VL 172 (45.33) was recorded as moderately susceptible and DHBM 99-6, DHBM 19-7 and RBM 36 (73.33) were recorded as susceptible, VMBC 331 (local) as highly susceptible, it was 90.67% in susceptible check. Patro *et al.*, 2019 [14] evaluated 14 genotypes and reported that disease intensity was ranged from 53.8 (DHBM 33) to 97.5 (TNEf 204) which were recorded susceptible. These genotypes would be of immense value to the breeders involved in developing high yielding resistant genotypes of barnyard millet.

Table 2: Reaction of Barnyard millet entries in Initial and Advanced Varietal Trial against banded blight

S. No.	Entry	Banded blight (%)
1	BMV 583	67.3
2	DHBM 19-7	69.3
3	VL 254	79.3
4	BMNDL-1	79.0
5	BMV 591	88.7
6	BMNDL-2	66.7
7	BMNDL-3	85.3
8	IIMR BM-2-17	86.0
9	IIMR BM-29-17	77.3
10	TNEF 317	63.3
11	TNEF 318	64.7
12	VMBC 332	67.3
13	VMBC 333	77.3
14	VL 270	77.3
15	VL 207	66.0
16	DHBM 93-3	89.3
17	R (PRB903)	20.0
18	S (LDR-1)	97.5
	LOC. MEAN	73.4
	C.D. (5%)	13.4
	C.D. (1%)	18.0
	C.V. (%)	13.4

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