International Journal of Chemical Studies

P-ISSN: 2349–8528
E-ISSN: 2321–4902
www.chemijournal.com
IJCS 2020; 8(5): 968-970

Received: 10-06-2020
Accepted: 15-07-2020

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Screening for identification of resistant sources of foxtail millet varieties against banded blight disease incited by *Rhizoctonia solani* Kuhn

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DOI: https://doi.org/10.22271/chemi.2020.v8.i5n.10421

Abstract
Twenty three genotypes of foxtail millet were screened for sheath blight disease severity caused by *Rhizoctonia solani* were studied during *kharif*, 2019 at Agricultural Research Station, Vizianagaram, Andhra Pradesh. The screening revealed that none of the test lines or varieties was immune or highly resistant. However, SIA 4200 (51.0), IIMR FXM 4 (64.0) and DHFT 109-3-2 (65.0) were recorded as susceptible. Percent disease severity ranged from 51.0% (SIA 4200) to 95.7% (SIA 3220) whereas it was 96.9% in susceptible check (SiA 3367).

Keywords: Foxtail millet, screening, resistant, susceptible, blast, banded blight

Introduction
Small millets grown in India mainly constitute Finger millet, Foxtail millet, Kodo millet, Little millet, Proso millet and Barnyard millet. Among the six small millets, Italian millet (*Setaria italica* (L.) P. Beauv) is an important crop next only to finger millet. Foxtail millet is fairly tolerant to drought; it cannot tolerate water logging. It is one of the world's oldest cultivated millet in the Poaceae family, distributed widely among the millets. Foxtail millet, is also known as Italian millet and its other colloquial names Kangni, Navane, Tenai, Korra and Rala. China is regarded as the centre of origin of foxtail millet (Vavilov, 1926) [13]. In India it is cultivated in an area of 5 lakh hectares and the production of 2.9 million tons with productivity of 600 kg per hectare (Anon., 2016) [1]. At present, foxtail millet (*Setaria italica*) is cultivated on a limited area in Andhra Pradesh, Karnataka, Maharashtra, Tamil Nadu, Rajasthan, Madhya Pradesh, Uttar Pradesh and north eastern states. Foxtail millet grains are rich in protein, fibre, β carotene, minerals *viz*., calcium, iron, potassium, magnesium, zinc, antioxidants and vitamins (Rai, 2002) [11]. The grains with husk intact have long shelf life which is a preferable attribute (Ravi *et al*., 2010) [12].
Foxtail millet has been affected with many diseases like blast, rust, smut, brown spot, downy mildew and udbatta have been reported on this crop, blast, rust and downy mildew diseases are the yield limiting biotic constraints (Nakayama *et al*., 2005) [3] and banded blight has been emerged as a dreadly disease in this crop which hinders the yield. Under water logging conditions, found infected with sheath blight disease caused by a soil borne necrotrophic fungi *Rhizoctonia solani* kuhn. causing considerable loss in grain yield under favorable environmental conditions. The disease is characterized by oval to irregular light grey to dark brown lesions on the lower leaf sheath. A temperature of around 28-30 °C and a relative humidity of 70 per cent or above favors the rapid disease development where these lesions enlarge rapidly and coalesce to cover larger portions of the sheath and leaf lamina. At this stage, the disease symptom is characterized by a series of copper or brown color bands across the leaves giving a very characteristic banded appearance.

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 23 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 foxtail 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

Twenty three entries were evaluated during *kharif* 2019 in foxtail millet initial advanced variety trial (FIAVT). The screening revealed that none of the test lines or varieties was immune or highly resistant. However, SIA 4200 (51.0), IIMR FXM 4 (64.0) and DHFT 109-3-2 (65.0) was recorded as susceptible. Percent disease severity ranged from 51.0% (SIA 4200) to 95.7% (SIA 3220) whereas it was 96.9% in susceptible check (SiA 3367) (Table2).

Patro *et al*., 2018 [5] screened 11 varieties and reported that two varieties SiA 2863 (24.00) and ISC 74A (32.00) were found to be resistant. Four varieties were moderately resistant to moderately susceptible. Whereas, SiA 3208 (local check) was recorded 70.67%. Patro and Madhuri (2014) [7] screened 16 foxtail millet genotypes and reported that minimum percentage of disease severity was recorded in VFMC-391. However, eight genotypes were evaluated as resistant. Patro *et al.* (2014) [7] and Nagaraja *et al*. (2016) [2] 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 [4], Patro *et al*., 2013 [6] and Patro *et al*., 2016 [9]. These genotypes would be of immense value to the breeders involved in developing high yielding resistant genotypes of little millet. Patro *et al*., 2019 [10] reported that SiA 3159 (35.5%) and SiA 3274 (38.2%) was recorded as moderately resistant when screened 18 foxtail millet entries against *R. solani.*

Table 2: Evaluation of foxtail millet genotypes against sheath blight

S. No.	Entry	Banded blight (%)	Reaction
1	SIA 3220	95.7	HS
2	FXV 607	88.3	HS
3	SIA 3159	66.7	HS
4	IIMR FXM-2	86.0	HS
5	GPUF 2	64.0	S
6	FXV662	79.7	HS
7	PKS 22	73.3	HS
8	SIA 3303	82.7	HS
9	SIA 4200	51.0	S
10	GPUF 3	73.0	HS
11	GPUF 4	77.7	HS
12	TNSI 363	70.3	HS
13	TNSI 364	87.3	HS
14	IIMR FXM 4	64.0	S
15	IIMR FXM 5	95.3	HS
16	IIMR FT 1	78.0	HS
17	F0XTAIL	91.3	HS
18	DHFT 109-3-1	71.7	HS
19	DHFT 109-3-2	65.0	S
20	SIA 3156	74.3	HS
21	DHFT 109-3	79.3	HS
22	R (Si A 3282)	23.3	MR
23	S(Si A 3367)	96.9	HS
	Mean	75.4	
	C.D. (5%)	13.9	
	C.D. (1%)	18.6	
	C.V. (%)	13.6	

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