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Evaluation of Donor Screening Nursery (DSN) of finger millet against *Rhizoctonia solani*, the cause of Sheath blight

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Abstract
The present investigation was undertaken to evaluate the resistant genotypes amongst 21 varieties of finger millet against major diseases during *kharif*, 2017 at Agricultural Research Station, Vizianagaram, Andhra Pradesh. Among them none of the variety could exhibit the immune reaction, in which nine varieties are found to be highly resistant and four varieties are resistant whereas DAPOLI-I recorded as highly susceptible to leaf blast. The percent disease incidence of neck blast ranged from 18.84 (GPU-28) to 60.45 (GPU-45) where it was 91.07 in susceptible check VR 708. In case of finger blast, it was ranged from 12.46 (GPU-26) to 61.15 (Indaf-7), whereas the incidence was 93.78 in check. The mean of all locations revealed that three varieties are found to be resistant to leaf blast. The incidence ranged from 18.84 to 61.24 and 12.46 to 61.64 in neck blast and finger blast respectively.

Keywords: finger millet, blast, screening, resistant, susceptible

Introduction
Millets are small-seeded grasses that are hardy and grow well in dry zones as rain-fed crops, under marginal conditions of soil fertility and moisture. Millets are also unique due to their short growing season. Millets are one of the oldest foods known to humans and possibly the first cereal grain to be used for domestic purposes. Finger Millet (*Eleusine coracana)* also known as ragi is an important millet grown extensively in various regions of India and Africa. It ranks sixth in production after wheat, rice, maize, sorghum and bajra in India. In India, ragi (finger millet) is mostly grown and consumed in Karnataka, and to a limited extent in Andhra Pradesh, Tamil Nadu, Odisha, Maharashtra, Uttarakhand and Goa. Finger millet is considered one of the most nutritious cereals. Finger millet contains about 5–8% protein, 1–2% ether extractives, 65–75% carbohydrates, 15–20% dietary fiber and 2.5–3.5% minerals. Of all the cereals and millets, finger millet has the highest amount of calcium (344 mg%) and potassium (408 mg%). The cereal has low fat content (1.3%) and contains mainly unsaturated fat. Finger millet is an excellent source of natural calcium which helps in strengthening bones. Finger millet's phytochemicals help in slowing digestion process. This helps in controlling blood sugar level in condition of diabetes. Finger millet consumption helps in relaxing body naturally. Green ragi (finger millet) is recommended for conditions of blood pressure, liver disorders, asthma and heart weakness. So, finger millet is an extremely nutritious cereal and is very beneficial for maintaining a good health. Therefore have received attention for their potential role as functional foods.

The total area under finger millet in different states - is around 2.5 million hectares. The nine states Karnataka, Tamil Nadu, Andhra Pradesh, Orissa, Maharashtra, Uttar Pradesh, Bihar, Gujarat and Madhya Pradesh account for nearly 98 per cent of the total area under this crop. The Karnataka state has the largest area, with about 40 per cent followed by Orissa, Andhra Pradesh. Tamil Nadu and Maharashtra - each having 10-12 per cent of the total area (Seetharam, 1988) [8].

By any nutritional parameter millets are miles ahead of rice and wheat in terms of their mineral content compared to rice and wheat (Gopalan *et al.* 2007). Staggered use of chemicals for the management of crop disease is often associated with problems such as pollution hazards and residual toxicity. Of course the diseases can effectively be controlled by application of fungicides.

However, the poor farmers required only varieties with resistance to the diseases. A genotype with resistance to banded blight offered scope in breeding programme to evolve multiple disease resistant variety combined with good yield potential. Hence, the study was undertaken to identify the millet genotypes resistant to banded blight disease.

Material and Methods

Twenty one varieties of finger millet collected from GKVK, Bangalore were screened at Agricultural Research Station, Vizianagaram. The genotypes were screened under field conditions during *kharif*, 2017 for selection of resistant genotypes with recommended agronomic practices. And the same trial was also carried out at six centers *viz*., Jagadalpur, Ranichauri, Rewa, Athiyandal, Ranchi and Vizianagaram. Five randomly selected plants were selected from each genotype/replication for recording the observations. The genotypes of finger 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, 1995) [1] (Table 1). Neck blast (%) and finger blast (%) was calculated by using the following formula:

$$\text{Neck blast (\%)} = \frac{\text{No.of infected panicles}}{\text{Total no.of panicles}} \times 100$$

$$\text{Finger blast (\%)} = \frac{\text{No. of infected fingers}}{\text{Average no. of fingers} \times \text{Total number of panicles}} \times 100$$

Table 1: Standard Evaluation System (SES) scale for leaf blast disease

Score	Description	Reaction
0	No lesions/symptoms on leaves	No disease/HR
1	Small brown specks of pinhead to slightly elongate, necrotic grey spots with a brown margin, less than 1% area affected	R
2	A typical blast lesion elliptical, 5-10 mm long, 1-5% of leaf area affected	MR
3	A typical blast region elliptical, 1-2 cm long, 6-25 % of leaf area affected	MS
4	26-50 % leaf area affected	S
5	More than 50 % of leaf area affected with coalescing lesions	HS

Table 2: Evaluation of finger millet donor screening nursery (DSN)

S. No	Entry	Vizianagaram			Entry	Mean over six centers		
		LB	NB	FB		LB	NB	FB
1	L-5	1.33	56.33	49.50	L-5	4.00	56.33	49.50
2	Indaf-5	1.67	43.11	44.97	Indaf-5	2.11	43.11	44.97
3	Indaf-7	2.33	49.27	61.15	Indaf-7	4.00	49.27	61.15
4	Indaf-9	1.33	37.94	12.70	Indaf-9	3.78	37.94	12.70
5	MR-1	2.33	47.75	32.54	MR-1	4.89	47.75	32.54
6	MR-6	2.00	38.44	39.88	MR-6	4.67	38.44	39.88
7	KMR-204	1.67	47.45	32.26	KMR-204	1.33	47.45	32.26
8	KMR-301	1.33	41.32	50.77	KMR-301	5.56	41.32	50.77
9	KMR-340	2.33	23.00	20.76	KMR-340	4.67	23.00	20.76
10	GPU-26	2.67	42.00	12.46	GPU-26	4.56	42.00	12.46
11	GPU-28	1.33	18.84	34.67	GPU-28	5.00	18.84	34.67
12	GPU-45	1.67	60.45	44.81	GPU-45	3.56	60.45	44.81
13	GPU-48	2.67	48.47	33.24	GPU-48	2.56	48.47	33.24
14	GPU-66	1.67	36.54	19.28	GPU-66	3.44	36.54	19.28
15	GPU-67	3.00	52.88	61.64	GPU-67	5.22	52.88	61.64
16	ML-365	2.67	59.01	38.69	ML-365	3.89	59.00	38.69
17	VL-149	2.67	36.13	47.83	VL-149	1.56	36.13	47.83
18	VL-352	1.67	61.24	27.15	VL-352	1.67	61.24	27.15
19	VR-708	2.33	55.25	14.35	VR-708	4.56	55.25	14.35
20	DAPOLI-1	3.33	43.44	55.41	DAPOLI-1	3.56	43.44	55.41
21	VR 708	2.67	91.07	93.78				
	Mean	2.13	47.14	39.42	Mean	3.73	44.94	36.70
	CD (5%)	2.09	5.87	5.96	CD (5%)	2.11	10.00	9.56
	CV	15.39	8.20	9.37	CV	27.43	13.46	15.75

Results and Discussion

The data on evaluation of 29 varieties against *Pyricularia grisea* revealed that none of the variety could exhibit the immune reaction, in which leaf blast g rade ranged from 1 to 5 among those nine varieties *viz*., L-5, Indaf-5, Indaf-9, KMR-204, KMR-301, GPU-28, GPU-45, GPU-66 and VL 352 were found to be highly resistant and four varieties *viz*., Indaf-7, MR-1, MR-6 and KMR 340 were resistant whereas DAPOLI I was recorded as highly susceptible to leaf blast (3.33) and GPU 67 as 3.00. However, VR 708 (check) was recorded as 2.67. The percent disease incidence of neck blast ranged from 18.84 (GPU-28) to 60.45 (GPU-45) where it was 91.07 in susceptible check VR 708. In case of finger blast, it was ranged from 12.46 (GPU-26) to 61.15 (Indaf-7) and highest was found in VR 708 (93.78).

The mean of six locations revealed that three varieties *i.e.*, KMR 204, VL 352 and VL 149 were found to be highly resistant and three varieties *i.e.*, Indaf-5, GPU 48 and KMR 301 were found to be resistant to leaf blast. In case of neck blast, the incidence ranged from 18.84 to 61.24 in which lowest incidence was found in GPU 28 (18.84) and highest was recorded in VL 352 (61.24). Lowest mean of finger blast incidence was found in GPU-26 (12.46) and highest in GPU-67 (61.64). (Table 2).

Patro and Madhuri (2014) [6] evaluated 32 finger millet genotypes among them, two were susceptible to neck blast

and moderately resistant to finger blast, 14 were moderately resistant and 13 were susceptible to both neck and finger blast. Patro *et al.* (2013) [5] evaluated 16 pre-released and released varieties of finger millet and reported that GPU 28 as immune to blast pathogen and nine varieties were resistant to all three forms of blast disease. Patro *et al.* (2016) [7] and Nagaraja *et al.* (2016) [8] screened 12 elite finger millet cultivars among them, GE 4449 and GPU 28 were reported to be resistance to leaf blast and GE 4440, GE 4449 and GPU 28 were moderate resistance/susceptible to neck and finger blast. Neeraja *et al.* (2016) screened 25 finger millet varieties and reported that nine varieties were resistant to moderately resistant to leaf blast and three were moderately resistance to both neck and finger blast. Divya *et al.* (2017) screened 10 genotypes were evaluated for resistance to blast none genotypes were found free from disease incidence. Minimum percentage of neck blast severity was recorded in VL 379 (14.82%), while the minimum finger blast severity (13.70%), was recorded in GPU 45.

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