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Screening for identification of finger millet early and medium duration varieties against major diseases

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Abstract
Nineteen finger millet (*Eleusine coracana*) genotypes were evaluated for resistance to blast (*Pyricularia grisea*) at Agricultural Research Station, Vizianagaram, Andhra Pradesh, India, during *kharif*, 2018 under natural disease pressure. None of the genotypes was found free from disease incidence. Minimum percentage of neck and finger blast severity was recorded in VR 1101 (16.5 and 18.6%) and the maximum percentage of disease severity was observed in RAuF (81.3 and 80.1%) whereas it was 83.3 and 83.0% in Udurumalliga (check) respectively. Minimum percentage of banded blight was recorded in VR 1101 (25.6%) and the maximum percentage of banded blight was observed in PR 1511 (92.7%).

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

Introduction
Finger millet (*Eleusine coracana*), is an important small millet grown extensively in diverse regions of India and Africa. Among small millets, finger millet ranks first in area and production. Among cereals and millets its position in production is sixth after wheat, rice, maize, sorghum and bajra. Finger millet consumption has wide range of advantages because of its high nutritive values. Finger millet is highly nutritious as its grains contain 65-75% Carbohydrates, 5-8% protein, 15 -20% dietary fiber and 2.5-3.5% minerals. It contains 5-8% good quality protein, *eleusinin* which our body can easily absorb. It also has key essential amino acids, tryptophan, methionine, threonine, valine, isoleucine and cystine which are required for good health. It is lower in fat content (1.3%) and majority is unsaturated fat. It is the richest source of calcium (344 mg/100 g), iron (3.9 mg/100 g) and other minerals. It is also rich in phosphorus (283 mg/100 g) and potassium (408 mg/100 g). It is highly valued as a reserve food in the times of famine.

Finger millet is affected by several diseases *viz.*, blast, brown leaf spot, foot rot and viral diseases. Among the various diseases that affect finger millet, blast disease affects adversely the crop from economic point of view, whenever it occurs. In fact the impact of the disease on growth and grain yield of the crop is so high. Under favourable environmental conditions yield reduction upto 100 per cent was recorded at Rampur, Nepal (Batsa and Tamang, 1983 and Getachew *et al*., 2003) [3]. The leaf and neck blast severity varies within the season and also from one season to other. Mc Rae (1922) reported this disease for the first time from India and gave an estimate of loss due to the impact of the disease. Blast disease is considered as number one in the form of yield loss in Andhra Pradesh, Haryana, Madhya Pradesh, Maharashtra and Mysore. The ultimate loss in grain yield is due to the cumulative effect of reduction in grain number and weight as well as enhanced spikelet sterility (Nagaraja *et al.,* 2007) [8]. Banded blight disease was observed in severe form at the university farms in Vizianagaram, Andhra Pradesh and Berhampur (Anilkumar *et al*., 2003) [1]. The disease is characterized by oval to irregular light grey to dark brown lesions on the lower leaf sheath. The central portion of the lesions subsequently turns white to straw with narrow reddish brown border. Symptoms produced on every part of the plant thus gives a characteristic banded appearance, due to which the disease has been named as banded blight (Dubey, 1995) [4]. *Rhizoctonia solani* is a very common soil borne pathogen with a great diversity of host plants. Hence the diseases caused by this fungus are more serious and is of major importance throughout the world. Limited information is available on resistant genotypes/varieties of these diseases for this

region. In the present study, 19 entries of finger millet were evaluated against finger millet diseases under natural epiphytotic conditions during *kharif*, 2014.

Materials and methods

An Initial Varietal Trial was conducted against finger millet blast cause by *Pyricularia grisea* during *kharif*, 2018 at Agricultural Research Station, Vizianagaram. The experiment was laid on a plot in Randomized Block Design, with 19 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 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) [2] (Table 1). Neck blast (%) and finger blast (%) was calculated by using the following formula:

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

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

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

Results and Discussion

Symptoms of blast were observed and percentage of disease severity was recorded (Table 2) revealed that a total of 19 finger millet genotypes were evaluated against major diseases, out of which none of the genotype could exhibit immune reaction. Among the genotypes screened, leaf blast grade ranged from 1-5 in which minimum grade (1.7) was found in KOPN 942 as resistant and maximum (4.7) is in Udurumalliga as highly susceptible. Minimum percentage of neck and finger blast severity was recorded in VR 1101 (16.5 and 18.6%) and the maximum percentage of disease severity was observed in RAuF (81.3 and 80.1) where it was 83.3 and 83.0% in Udurumalliga (check) respectively. Minimum percentage of banded blight was recorded in VR 1101 (25.6%) and the maximum percentage of banded blight was observed in PR 1511 (92.7%).

Patro and Madhuri (2014) [11] evaluated 32 finger millet genotypes and 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) [10] 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) [12] and Nagaraja *et al* (2016) [7] 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) [9, 12] 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.

Table 2: Evaluation of finger millet early and medium duration varieties for resistance to major diseases

S. No	Entry	Percent Disease Incidence (%)			
		Leaf Blast	Neck Blast	Finger Blast	Banded Blight
1	WN 585	2.7	72.7	72.6	91.2
2	RAuF	2.3	81.3	80.1	91.7
3	VL 352	2.3	54.0	53.7	90.4
4	PR 10-35	2.0	65.7	67.0	90.8
5	PR 1511	3.7	63.7	61.6	92.7
6	KOPN 1059	3.3	77.3	76.0	85.5
7	OEB 601	2.3	52.7	52.2	90.1
8	PR 202	1.7	50.3	50.2	91.4
9	WN 559	2.7	59.0	60.7	90.7
10	KOPN 942	1.7	69.7	68.5	92.1
11	ML 322	3.3	75.3	71.6	88.0
12	WN 550	1.7	81.3	79.6	88.6
13	GPU 67	3.7	61.7	61.5	90.3
14	OEB 602	3.0	77.7	78.5	90.4
15	VR 1101	0.0	16.5	18.6	25.6
16	RAuF 13	3.0	27.3	69.6	76.4
17	GPU 45	2.7	65.0	70.0	90.7
18	R (GE 4449)	0.3	13.9	15.5	20.0
19	S (Udurumalliga)	4.7	83.3	83.0	95.2
	Mean	2.7	60.4	62.7	82.8
	C.D. (5%)	0.9	8.4	10.0	14
	C.D. (1%)	1.2	11.3	13.4	18.8
	C.V. (%)	19.5	8.4	9.6	10.2

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