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Evaluation of finger millet early and medium duration varieties against blast and banded blight

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Abstract

Sixteen finger millet (*Eleusine coracana*) genotypes were evaluated for resistance to blast (*Pyricularia grisea*) at Agricultural Research Station, Vizianagaram, Andhra Pradesh, India, during *khariif*, 2019 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 GPU 67 (19.3 and 16.7%) and the maximum percentage of disease severity was observed in VL 376 (66.7 and 61.7%) whereas it was 77.0 and 77.7% in Udurumalliga (check) respectively. Minimum percentage of banded blight was recorded in check GE 4449 (25.0%) and all the varieties showed high susceptibility. Maximum percentage of banded blight was recorded in check Udurumalliga (98.4%).

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, *eleusin* 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/100g) and other minerals. It is also rich in phosphorus (283 mg/100 g) and potassium (408 mg/100g). 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, 5]. The leaf and neck blast severity varies within the season and also from one season to other. Mc Rae (1922) [6] 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) [7]. 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, 16 entries of finger millet were evaluated against finger millet diseases under natural epiphytotic conditions during *kharif*, 2019.

Materials and Methods

An Advanced Varietal Trial was conducted against finger millet blast cause by *Piricularia grisea* during *kharif*, 2019 at Agricultural Research Station, Vizianagaram. The experiment was laid on a plot in Randomized Block Design, with 16 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) (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

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 2).

Table 2: 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

Symptoms of blast were observed and percentage of disease severity was recorded (Table 3) revealed that a total of 16 finger millet genotypes were evaluated against blast and banded blight disease, 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 (0.3) was found in FMV 116 as resistant and maximum (4.7) is in Udurumalliga (check) as highly susceptible. Minimum percentage of neck and finger blast severity was recorded in GPU 67 (19.3 and 16.7%) and the maximum percentage of disease severity was observed in VL 376 (66.7 and 61.7%) whereas it was 77.0 and 77.7% in Udurumalliga (check) respectively. Minimum percentage of banded blight was recorded in check GE 4449 (25.0%) and all the varieties

showed high susceptibility. Maximum percentage of banded blight was recorded in check Udurumalliga (98.4%).

Patro and Madhuri (2014) 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) evaluated 16 pre-released and released varieties of finger millet and reported that GPU28 as immune to blast pathogen and nine varieties were resistant to all three forms of blast disease. Patro *et al* (2016) 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) 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. Nineteen entries of finger millet were screened for major diseases by Patro *et al* (2019) and reported that VR 1101 was found to be moderately susceptible to neck and finger blast.

Table 3: Evaluation of finger millet early and medium duration varieties for resistance to blast and banded blight diseases

S. No	Entry	Percent Disease Incidence (%)			
		Leaf Blast	Neck Blast	Finger Blast	Banded Blight
1	VR 1145	1.2	32.0	27.0	87.7
2	BR 14-27	2.1	41.3	36.3	89.0
3	HR-13	0.7	23.0	19.3	90.7
4	FMV 1137	0.7	20.0	17.0	89.3
5	PR 1639	2.2	34.0	29.0	90.7
6	FMV 1151	1.5	32.7	27.7	84.0
7	FMV 1118	1.5	50.3	45.0	85.7
8	FMV 116	0.3	41.7	36.7	86.7
9	PR 1511	1.5	35.0	30.7	88.3
10	FMV 1114	1.7	50.0	45.0	89.0
11	VL 376	2.9	66.7	61.7	84.3
12	GPU 67	0.7	19.3	16.7	85.6
13	GPU 45	1.2	40.7	35.7	88.0
14	PR 202	1.8	63.0	58.0	84.3
15	R (GE 4449)	0.2	16.3	13.0	25.0
16	S (Udurumalliga)	4.7	77.0	77.7	98.4
	Mean	1.8	40.2	36.0	84.2
	C.D. (5%)	0.5	6.3	6.2	11.4
	C.D. (1%)	0.7	8.4	8.3	15.3
	C.V. (%)	17.8	9.4	10.3	10.0

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