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TSSK Patro
Acharya N.G. Ranga Agricultural University, Agricultural Research Station, Vizianagaram, Andhra Pradesh, India

S Raj Kumar
Acharya N.G. Ranga Agricultural University, Agricultural Research Station, Vizianagaram, Andhra Pradesh, India

A Meena
Acharya N.G. Ranga Agricultural University, Agricultural Research Station, Vizianagaram, Andhra Pradesh, India

N Anuradha
Acharya N.G. Ranga Agricultural University, Agricultural Research Station, Vizianagaram, Andhra Pradesh, India

U Triveni
Acharya N.G. Ranga Agricultural University, Agricultural Research Station, Vizianagaram, Andhra Pradesh, India

P Joga Rao
Acharya N.G. Ranga Agricultural University, Agricultural Research Station, Vizianagaram, Andhra Pradesh, India

Corresponding Author:
TSSK Patro
Acharya N.G. Ranga Agricultural University, Agricultural Research Station, Vizianagaram, Andhra Pradesh, India

Screening of finger millet varieties for major diseases and identification of resistant varieties

TSSK Patro, S Raj Kumar, A Meena, N Anuradha, U Triveni and P Joga Rao

Abstract
The present investigation was undertaken to evaluate the resistant genotypes amongst 26 varieties of finger millet against major diseases during *kharif*, 2018 at Agricultural Research Station, Vizianagaram, Andhra Pradesh. Among them none of the variety could exhibit the immune reaction, in which two varieties are found to be highly resistant and twenty two varieties are resistant whereas check, Udurumalliga recorded as highly susceptible to leaf blast. The percent disease incidence of neck blast ranged from 13.2 to 78.9 % where it was 10.0% in resistant check GE 4449 and 80.0% in susceptible check Udurumalliga. In case of finger blast, it was ranged from 13.0 to 78.9%, whereas the incidence was 79.5% in check. In case of banded blight, it was ranged from 26.9 to 93.3%, whereas the incidence was 94.9% in check.

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

Introduction
Finger millet (*Eleusine coracana*) is one of the important cereal crop, originated in East Africa, belonging to the family Poaceae. This small millet is rich in protein, iron and calcium. The fodder is fed to cattle; the malted grain is used as food for infants. It contributes to about 10 per cent of the total area (34.6 m ha) planted to millets. In India, finger millet ranks next to pearl millet and is cultivated on 2.6 m ha area with a production of about 3.0 m t and accounts for 81% of the minor millets produced (Shastri, 1989) [15]. It is commonly referred to as ragi, chodi, birds foot, nagli, mandua in different regions of the country. It is nutritionally rich in proteins, minerals, dietary fiber and phytochemicals and having more calcium than rice and wheat and is recommended for diabetes and other cardiovascular diseases. They are grown in soils which are typically poor to support any other crop.

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) [7] 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) [9]. 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) [5]. *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, 26 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 26 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:

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

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

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

The data on evaluation of 26 varieties against *P. grisea* revealed that none of the variety could exhibit the immune reaction, in which leaf blast grade ranged from 1 to 5 among those five varieties *viz*., KMR 650 and RAuF 17 are found to be highly resistant and twenty two varieties *viz*., WN 562, GPU 99, GPU 67, KMR 652, VR 1117, VL 394, GPU 45, HR 13, TNEc 1299, WN 591, VL 376, VR 1110,VL 382, BR-14-27, PR 202, TNEc 1297, GPU 98, OEB 604, PR 639, IIMRFM-8023-17, IIMRFM-8011-17 and GSMC-1 are resistant whereas Udurumalliga recorded as highly susceptible to leaf blast. The percent disease incidence of neck blast ranged from 13.2 (KMR 650) to 78.9 (PR 202) where it was 80.0% in susceptible check Udurumalliga. In case of finger blast, it was ranged from13.0 to 78.9%, in which lowest incidence was found in KMR 650 (13.0%) followed by RAuF 17 (16.8%) and highest was found in PR 202 (78.9%) followed by WN 591 (75.2%) whereas the incidence was 79.5% in check Udurumalliga. The percent disease incidence of Banded blight ranged from 26.9% (RAuF 17) to 93.3% (GPU 98) where it was 94.9% in susceptible check Udurumalliga.

Patro and Madhuri (2014) [12] 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) [11] 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) [14] 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) [14] 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. Patro *et al.* 2018 [13] evaluated 30 varieties of finger millet in which five varieties are found to be highly resistant and nineteen varieties are resistant whereas VR 708 recorded as highly susceptible to leaf blast. The percent disease incidence of neck blast ranged from 13.67 (WN 550) to 84.13 (VL 352) where it was 91.11 in susceptible check VR 708. In case of finger blast, it was ranged from 11.58 to 82.56, in which lowest incidence was found in WN 550 (11.58) followed by PR 1507 (15.53) and highest was found in VR 352 (82.56) followed by VL 389 (80.67) whereas the incidence was 92.26 in check.

Table 2: Reaction of finger millet entries in Initial Varietal Trial against blast and banded blight

S. No.	Entry	Percent Disease Incidence (%)			
		Leaf Blast (Grade)	Neck Blast	Finger Blast	Banded Blight
1	WN 562	2.4	50.2	70.5	91.2
2	GPU 99	3.0	57.5	70.1	92.2
3	GPU 67	3.4	71.2	62.7	82.3
4	KMR 652	2.0	55.7	51.1	85.9
5	VR1117	3.0	62.0	55.4	87.8
6	VL 394	3.4	52.1	67.1	88.5
7	GPU 45	3.0	58.7	72.4	90.0
8	HR-13	3.7	70.1	72.5	92.9
9	KMR 650	0.0	13.2	13.0	29.5
10	RAUF 17	0.0	16.7	16.8	26.9

11	TNEc 1299	3.7	49.3	43.3	92.7
12	WN 591	1.7	72.8	75.2	93.0
13	VL 376	2.7	53.2	50.5	93.0
14	VR 1110	3.0	39.7	38.7	88.1
15	VL 382	2.7	63.9	55.5	87.2
16	BR-14-27	3.4	65.0	64.3	87.7
17	PR 202	3.0	78.9	78.9	83.8
18	TNEc 1297	3.0	72.0	66.9	91.4
19	GPU 98	2.0	65.5	68.7	93.3
20	OEB 604	3.4	41.0	46.8	91.5
21	PR 1639	2.7	64.0	73.6	85.9
22	IIMRFM-8023-17	3.7	73.8	34.6	88.2
23	IIMRFM-8011-17	3.4	51.1	50.4	87.2
24	GSMC-1	3.4	60.2	59.3	87.9
25	R(GE 4449)	0.4	10.0	11.8	6.9
26	S (Udurumalliga)	5.0	80.0	79.5	94.9
	Mean	2.7	55.7	55.7	81.5
	C.D. (5%)	0.8	9.7	10.6	14.1
	C.D. (1%)	1.1	12.9	14.2	18.8
	C.V. (%)	17.9	10.6	11.6	10.6

Reference

1. Anilkumar TB, Mantur SG, Madhukeshwara SS. Diseases of finger millet. Project coordination cell. All India Coordinated Small Millets Improvement Project. ICAR, GKVK, Bangalore. 2003, 89.
2. Anonymous, Package of practices for high yielding varieties, UAS, Bangalore, India, 1995.
3. Batsa BK, Tamang DB. Preliminary report on the study of millet diseases in Nepal in maize and fingermillet. 10th Summer Crops Workshop, 1982-23.Jan, Rampur, Chitwan, Nepal, 1983.
4. Divya M, Patro TSSK. Sandhya Rani Y, Triveni U, Anuradha, N. Reaction of *Eleusine coracana* (L) Gaertn early and medium duration varieties against major maladies. Progressive Research - An International Journal. 1995; 12(1):30-32.
5. Dubey SC. Banded blight of finger millet caused by *Thanatephorus cucumeris*. Indian Journal of Mycology and Plant Pathology. 1995; 25:315-316.
6. Getachew G, Tesfaye A, Kassahun T. Characterization of finger millet blast pathogen (*Pyricularia grisea*) and its management using biocontrol agents and fungicides. First Bio-Innovate Regional Scientific Conference United Nations Conference Centre (UNCC-ECA) Addis Ababa, Ethiopia, 25-27, 2013, 37.
7. Mc Rae W. Report of the imperial Mycologist. Indian Agricultural research Institute, PUSA Scientific report, 1922, 44-50.
8. Nagaraja A, Bijendra Kumar, Jain AK, Patro TSSK, Nageswar Rao TG. Diseases of small millets. Diseases of field crops and their management. Indian Phytopathological Society. New Delhi. 2016, 295-371.
9. Nagraja A, Kumar J, Jain AK, Narasimhudu Y, Raghuchander T, Kumar B, Gowda BH. Compendium of small millets diseases, AICSMIP, Bangalore, 2007.
10. Neeraja B, Patro TSSK, Rani YS, Triveni U, Geethanjali K. Studies on three forms of blast (leaf, neck and finger) in finger millet (*Eleusine coracana* Gaertn.) incited by *Magnaporthe grisea* [Hebert]. Barr. *In vivo*. 6th International Conference "Plant, Pathogens and People". February, New Delhi, India. 2016; 269:23-27
11. Patro TSSK, Anuradha N, Madhuri J, Suma Y, Soujanya A. Identification of resistant sources for blast disease in finger millet (*Eleusine coracana* Gaertn.). Varietal Improvement of Small Millets. National seminar on Recent Advances of Varietal Improvement in Small Millets. 2013, 5-6.
12. Patro TSSK, Madhuri J. Identification of resistant varieties of finger millet for leaf, neck and finger blast. International Journal of Food, Agriculture and Veterinary Sciences. 2014; 4(2):7-11.
13. Patro TSSK, Meena A, Divya M, Anuradha N. Screening of finger millet for major diseases and identification of resistant varieties. Journal of Pharmacognosy and Phytochemistry. 2018; 7(3):2681-2683.
14. Patro TSSK, Neeraja B, Sandhya Rani Y, Jyothsna S, Keerthi S, ansal A. Reaction of elite finger millet varieties against blast disease incited by Magnaporthe grisea in vivo. 2016; 11(2):209-212.
15. Shastri BN. The wealth of India: A dictionary of Indian raw materials and industrial products. Publication and Information Directorate, CSIR, New Delhi. 1989; 160:6.