Journal of Pharmacognosy and Phytochemistry

Available online at www.phytojournal.com

E-ISSN: 2278-4136
P-ISSN: 2349-8234
www.phytojournal.com
JPP 2020; 9(5): 1234-1236
Received: 13-07-2020
Accepted: 25-08-2020

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

KE Georgia
Acharya NG. Ranga Agricultural University, Agricultural Research Station, Vizianagaram, Andhra Pradesh, India

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

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

Y Sandhya Rani
Acharya NG. Ranga Agricultural University, Agricultural Research Station, Vizianagaram, Andhra Pradesh, India

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

P Jogarao
Acharya NG. Ranga Agricultural University, Agricultural Research Station, Vizianagaram, Andhra Pradesh, India

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

Screening for identification of finger millet varieties against major diseases

TSSK Patro, KE Georgia, S Raj Kumar, N Anuradha, Y Sandhya Rani, U Triveni and P Jogarao

Abstract
Twenty two finger millet (*Eleusine coracana*) genotypes were evaluated for resistance to blast (*Pyricularia grisea*) at Agricultural Research Station, Vizianagaram, Andhra Pradesh, India, during *kharif*, 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 VR 1149 (10.0% and 10.3%) and the maximum percentage of disease severity was observed in UURM 2015-1 (75.0% and 65.0%) whereas it was 75.7% and 77.7% in Udurumalliga (check) respectively. Minimum percentage of banded blight was recorded in VR 1149 (22.7%) and the maximum percentage of banded blight was observed in VHC 4087 and UURM 2015-1 (96.0%).

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, 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, 22 entries of finger millet were evaluated against finger millet diseases under natural epiphytotic conditions during *kharif*, 2019.

Materials and methods

A National Screening Nursery Trial was conducted against finger millet blast cause by *Pyricularia grisea* during *kharif*, 2019 at Agricultural Research Station, Vizianagaram. The experiment was laid on a plot in Randomized Block Design, with 22 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

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 22 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) was found in KMR-650 as resistant and maximum (5) is in Udurumalliga as highly susceptible. Minimum percentage of neck and finger blast severity was recorded in VR 1149 (10.0% and 10.3%) and the maximum percentage of disease severity was observed in UURM 2015-1 (75.0% and 65.0%) whereas it was 75.7% and 77.7% in Udurumalliga (check) respectively. Minimum percentage of banded blight was recorded in VR 1149 (22.7%) and the maximum percentage of banded blight was observed in VHC 4087 and UURM 2015-1 (96.0%).

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 thatGPU28 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] 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) [13] and reported that VR 1101 was found to be moderately susceptible to neck and finger blast.

Table 3: Evaluation of finger millet genotypes against blast and sheath blight

S. No.	Entry	Percent Disease Incidence (%)						
		LB	Reaction	NB	Reaction	FB	Banded Blight	Reaction
1	KMR-650	1.3	R	23.3	MS	21.0	50.3	S
2	KMR-644	2.9	R	41.7	S	38.0	77.0	HS
3	VR 1121	2.4	R	13.0	MS	11.7	32.7	MS
4	VR 1130	2.6	R	47.3	S	41.3	84.7	HS
5	BR 14-4	1.8	R	19.3	MS	16.3	44.0	MS
6	BR 8	3.5	MR	50.3	HS	45.0	89.7	HS
7	VR 1146	1.7	R	37.3	S	35.0	60.1	S
8	VR 1148	1.8	R	60.2	HS	55.0	92.4	HS
9	VR 1149	1.5	R	10.0	MR	10.3	22.7	MR
10	VR 1152	2.0	R	15.3	MS	12.7	35.0	MS
11	VR 1159	2.4	R	40.3	S	35.3	77.0	HS
12	VHC 4087	2.5	R	51.0	HS	46.7	96.0	HS
13	VRBMF 1817	3.5	MR	39.0	S	35.7	74.2	HS
14	VRBMF 1817	2.1	R	29.0	S	26.0	57.6	S
15	UURM 2014-1	4.0	MR	60.0	HS	55.0	93.5	HS
16	UURM 2014-2	2.0	R	25.7	S	21.7	46.0	S
17	UURM 2015-1	4.0	S	75.0	HS	65.0	96.0	HS
18	KMR 203	1.4	R	17.7	MS	15.0	39.5	MS
19	KMR 340	4.4	S	55.0	HS	48.3	89.8	HS
20	KMR 630	1.6	R	27.7	S	22.7	48.0	S
21	R (GE 4449)	0.3	HR	9.0	MR	9.0	19.0	R
22	S (Udurumalliga)	5.0	S	75.7	HS	77.7	97.8	HS
	Mean	3.0		37.4		33.8	64.7	
	CD (P≤0.05)	0.2		4.5		4.1	6.6	
	CD(P≤0.01)	0.3		6.0		5.5	8.8	
	CV %	8.4		7.4		7.2	7.1	

References

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. Dubey SC. Banded blight of finger millet caused by *Thanatephorus cucumeris*. Indian Journal of Mycology and Plant Pathology. 1995; 25:315-316.
5. 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 February, 2013, 37.
6. Mc Rae W. Report of the imperial Mycologist. Indian Agricultural research Institute, PUSA Scientific report. 1922, 44-50.
7. 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.
8. Nagraja A, Kumar J, Jain AK, Narasimhudu Y, Raghuchander T, Kumar B *et al*. Compendium of small millets diseases, AICSMIP, Bangalore, 2007.
9. 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 23-27, 2016, New Delhi, India, 2016, 269.
10. 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.
11. 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.
12. Patro TSSK, Neeraja B, Sandhya Rani Y, Jyothsna S, Keerthi S, Bansal A. Reaction of elite finger millet varieties against blast disease incited *Magnaporthe grisea in vivo*. 2016; 11(2):209-212.
13. Patro TSSK, Raj Kumar S, Meena A, Anuradha N, Triveni U, Joga Rao P. Screening for identification of finger millet early and medium duration varieties against major diseases. 2019; 7(6):954-956.