The Andhra Agric. J 70 (3): 331-335, 2023
10.61657/aaj.2023.51

Resistant Source Identification in Finger Millet under Natural Field conditions against Blast incited by *Pyricularia grisea* (Cke.) Sacc.

T S S K Patro, Sk Abdul Salam, N Anuradha, Y Sandhya Rani, U Triveni and D Sabina Mary
Agricultural Research Station, ANGRAU, Vizianagaram, Andhra Pradesh

ABSTRACT

A total of 29 finger millet (*Eleusine coracana*) genotypes were evaluated for identification of resistant source against blast caused by *Pyricularia grisea* at Agricultural Research Station, Vizianagaram, Andhra Pradesh, India, during *kharif*, 2022 under natural disease pressure. None of the genotypes were found free from disease incidence. Minimum incidence of neck blast (11.67%) and finger blast (21.67%) were recorded in TNEc 1342 and VL 409 respectively and maximum incidence of neck blast (51.67%) and finger blast (76.67%) was recorded in IIMR-FM-R21-8001 whereas, it was 6.67% &18.33% in resistant check (GE 4449) and 66.0% & 80.0% in susceptible check (KMR 30), respectively.

Keywords: *Blast, Finger millet, Resistant, Susceptible and Screening*

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 is highly nutritious as its grains contain 65-75% Carbohydrates, 5-8% protein, 15 -20% dietary fibre 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. The blast disease caused by *Pyricularia grisea* is a serious threat to the cultivation of finger millet as it causes severe yield losses under favourable environmental conditions. Yield reduction upto 100 per cent was recorded at Rampur, Nepal (Batsa and Tamang, 1983; Getachew *et al.*, 2013). The leaf and neck blast severity varies within the season and also from one season to another. Blast disease is considered prime cause of finger millet yield losses 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). Only a limited data is available on resistant finger millet genotypes suitable to this region. In the present study, 29 entries of finger millet were evaluated against blast diseases under natural epiphytotic conditions during *kharif*, 2022.

MATERIAL AND METHODS

A total of 27 finger millet entries were screened along with resistant (GE4449) and susceptible (KMR 301) checks against blast disease caused by *Pyricularia grisea* during *kharif*, 2022 at Agricultural Research Station, Vizianagaram. The experiment was laid on a plot in Randomized Block Design (RBD) and the entries were replicated three times which was sown in two rows of 3 m length with a spacing of 22.5 x 10 cm. The recommended agronomic practices and other standard package of practices were adopted at the time of crop growth period. Observations were recorded on five randomly selected plants from each replication per each genotype. The genotypes of finger millet were screened under natural epiphytotic conditions and no artificial inoculation was made. Infected plants were examined

for leaf blast development and scored according to size and spread of spots on leaf lamina using 1 to 9 scale (Table 1) (Hariprasanna *et al*., 2022). Neck blast (%) and finger blast (%) was calculated by using the following formula and the disease reaction was given by using 1 to 9 scale (Table 2, Table 3) (Hariprasanna *et al*., 2022).

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

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

Table 1: Leaf blast rating (1-9 scale)

Score	Description	Reaction
1	Small, brown, pinhead size specks without sporulating centre	Highly Resistant (HR)
2	Small (1-2 mm) roundish to elongated, necrotic grey spots with a distinct brown margin covering upto 5% leaf area	Resistant (R)
3	Typical blast lesions (≥3 mm) with sporulating centre, covering 6-10% of the leaf area	
4	Blast lesions covering 11-20% leaf area	Moderately Resistant (MR)
5	Blast lesions covering 21-30% leaf area	
6	Blast lesions covering 31-40% leaf area	Susceptible (S)
7	Blast lesions covering 41-50% leaf area	
8	Blast lesions covering 51-75% leaf area	Highly Susceptible (HS)
9	Blast lesions covering >75% leaf area & plant dead	

Table 2: Neck blast rating (1-9 scale)

Score	Description	Reaction
1	<1% plants infected with neck blast	Highly Resistant (HR)
2	1-5% plants infected with neck blast	Resistant (R)
3	6-10% plants infected with neck blast	
4	11-20% plants infected with neck blast	Moderately Resistant (MR)
5	21-30% plants infected with neck blast	
6	31-40% plants infected with neck blast	Susceptible (S)
7	41-50% plants infected with neck blast	
8	51-75% plants infected with neck blast	Highly Susceptible (HS)
9	>75% plants infected with neck blast	

Table 3: Neck blast rating (1-9 scale)

Score	Description	Reaction
1	<1% fingers infected with finger blast	Highly Resistant (HR)
2	1-5% fingers infected with finger blast	Resistant (R)
3	6-10% fingers infected with finger blast	
4	11-20% fingers infected with finger blast	Moderately Resistant (MR)
5	21-30% fingers infected with finger blast	
6	31-40% fingers infected with finger blast	Susceptible (S)
7	41-50% fingers infected with finger blast	
8	51-75% fingers infected with finger blast	Highly Susceptible (HS)
9	>75% fingers infected with finger blast	

Table 4: Evaluation of finger millet varieties for resistance against all forms of blast disease

S. No.	ENTRY	Leaf blast (G)	Reaction	Neck blast (%)	Reaction	Finger Blast (%)	Reaction	Yield (kg/ha)
1	CFMV 2	2.67	R	18.33	MR	35	S	2656
2	VR 1163	4.33	MR	26.67	MR	44	S	3029
3	VR 1171	3.33	R	16.67	MR	31	S	2207
4	CFMV 1	2.33	R	33.33	S	60	HS	2582
5	TNEc 1341	1.33	HR	21.67	MR	32.67	S	1698
6	KIFMG 211	5.33	MR	38	S	66.67	HS	3182
7	KMR 654	2.33	R	28.67	MR	46.67	S	2049
8	KMR 655	6.33	S	47.33	S	73.33	HS	1523
9	VL 409	0.67	HR	16.67	MR	21.67	MR	3467
10	WN 660	3.33	R	22.33	MR	31.67	S	1811
11	WN 666	1.33	HR	16.67	MR	34.33	S	3193
12	GPU 105	3.67	R	28.33	MR	41	S	1792
13	GPU 67	1.67	HR	20	MR	38.67	S	2235
14	PPR 1216	2.67	R	24.33	MR	23.33	MR	1844
15	BUFM 19-E-1	5.33	MR	36.67	S	45	S	1409
16	PR 1734	4.33	MR	36.67	S	33.67	S	1827
17	TNEc 1342	0.67	HR	11.67	MR	23.33	MR	3461
18	GE 6541	3.67	R	25	MR	33.33	S	1756
19	IIMR-FM-R21-8011	2.67	R	20	MR	40.67	S	2181
20	IIMR-FM-R21-8006	4	MR	28.33	MR	46.33	S	2017
21	IIMR-FM-R21-8001	6.67	S	51.67	HS	76.67	HS	1556
22	IIMR-FM-R21-8012	2.33	R	18.33	MR	36.67	S	2085
23	VL 402	2.67	R	25	MR	52.67	HS	1317
24	VL 376	4.67	MR	40	S	55	HS	1894
25	WN 577	2.67	R	25	MR	53.33	HS	2776
26	GPU 106	5	MR	33.33	S	23.33	MR	1662
27	PPR 1272	2.67	R	23.67	MR	25.33	MR	2220
28	**GE4449 (R)**	1.33	HR	6.67	R	18.33	MR	4199
29	**KMR 301 (S)**	8.33	S	66	HS	80	HS	831

RESULTS AND DISCUSSION

Symptoms of all forms of blasts were observed and disease incidence was recorded (Table 4). A total of 27 finger millet genotypes were evaluated against blast disease, out of which none of the genotype could exhibit immune reaction and none of the genotypes were found free from disease incidence. Minimum incidence of neck blast (11.67%) and finger blast (21.67%) were recorded in TNEc 1342 and VL 409 respectively and maximum incidence of neck (51.67%) and finger blast (76.67%) was recorded in IIMR-FM-R21-8001. The neck and finger blast incidence was 6.67% &18.33% in resistant check (GE 4449) and 66.0% & 80.0% in susceptible check (KMR 30) respectively. However among 27 entries, 5 entries were found to be highly resistant and 13 entries were resistant to leaf blast whereas, 19 entries were moderately resistant to neck blast and 5 entries were moderately resistant to finger blast. Among all the entries, VL 409, TNEc 1342 and WN 666 recorded superior grain yields of 3467, 3461 and 3193 kg/ha compared to the yield in susceptible check (831kg/ha).

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) screened 12 elite finger millet cultivars among them, GE 4449 and GPU 28 were reported to be resistant 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. Patro *et al.* (2020) screened 29 entries against blast and banded blight and revealed, none of the genotypes was found free from disease incidence. Minimum percentage of neck and finger blast severity was recorded in VL 399 (19.0% and 15.0%) and the maximum percentage of disease severity was observed in PR 1643 (69.3% and 62.3%) whereas, it was 73.5% and 74.0% in Udurumallige (check) respectively.

Under the present investigation, out of the 27 finger millet genotypes there were no entries recorded resistant resistance to either neck blast or finger blast. For leaf blast five entries (TNEc1341, TNEc1342, VL409, WN666 and GPU67) were found highly resistant. Of all the three forms of blast disease, neck blast and finger blast are really damaging to finger millet cultivation. The genotypes identified as highly susceptible and susceptible for neck and finger blast disease can be included as parents in disease resistance breeding programmes.

LITERATURE CITED

Batsa B K and Tamang D B 1983. 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.

Getachew G, Tesfaye A and Kassahun T 2013. 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, 2013, 37. Mc Rae W. Report of the imperial Mycologist. Indian Agricultural research Institute, PUSA Scientific report, 1922, 44-50.

Hariprasanna K, Prabhakar B, Bhat V, Kumari A N, Sukanya T S, Palanna K B, Ganiger P C, Sooganna, Ganapathy K N, Das I K, Prasad G S and Tonapi V A 2022. Standard operating procedures for conducting field trials of small millets. ICAR- Indian Institute of Millets Research. 1-81. ISBN: 81-89335-98-7.

Nagaraja A, Kumar B, Jain A K, Patro T S S K and Nageswar Rao T G 2016. Diseases of small millets. Diseases of field crops and their management. Indian Phyto pathological Society. New Delhi, 295-371.

Nagaraja A, Kumar J, Jain A K, Narasimhudu Y, Raghuchander T, Kumar B and Gowda B H 2007. Compendium of small millets diseases, AICSMIP, Bangalore, 2007.

Neeraja B, Patro T S S K, Rani Y S, Triveni U and Geethanjali K 2016. 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, 269.

Patro T S S K, Anuradha N, Madhuri J, Suma Y and Soujanya A 2013. 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.

Patro T S S K and Madhuri J 2014. Identification of resistant varieties of finger millet for leaf, neck and finger blast. *International Journal of Food, Agriculture and Veterinary Sciences.* 4 (2): 7-11.

Patro T S S K, Neeraja B, Sandhya Rani Y, Jyothsna S, Keerthi S and Bansal A 2016. Reaction of elite finger millet varieties against blast disease incited *Magnaporthe grisea in vivo*. *International Journal of Chemical Studies.* 11 (2): 209-212.

Patro T S S K, Raj Kumar S, Meena A, Anuradha N, Triveni U and Joga Rao P 2019. Screening for identification of finger millet early and medium duration varieties against major

diseases. *International Journal of Chemical Studies*. 7 (6): 954-956.

Patro T S S K, Georgia K E, Raj Kumar S, Anuradha N, Sandhya Rani Y, Triveni U and Joggarao P 2020. Screening for identification of finger millet varieties against blast and banded blight. *International Journal of Chemical Studies.* 8 (5): 965-967.

Received on 29.06.2023 and Accepted on 04.08.2023