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Evaluation of High Yielding and Blast Resistant Finger Millet (*Eleusine coracana*) Varieties in North Eastern Zone of Tamil Nadu

Sendhilvel V[1] and Veeramani P[2]

Krishi Vigyan Kendra, Tamil Nadu Agricultural University, Vellore – 632 014 (Tamil Nadu)

ABSTRACT

Finger millet (*Eleusinecoracana*) is the major staple food crop cultivated in rain fed and irrigated condition in the zone of North Eastern Region of Tamil Nadu. However the productivity of the crop is affected by blast disease caused by *Magnaporthe grisea*and lack of high yielding varieties. An investigation was made to identify suitable high yielding and blast resistant varieties through on farm trials in Velloredistrict during 2017-18. The results of the study revealed that TNAU Finger millet Co15 recorded the higher plant height (128 cm), number of tillers per plant (8.0), number of ear head per square meter area (76.2). The reaction to the blast incidence was moderately resistant to leaf blast with the disease score of 2.1. The per cent incidence of neck and finger blast was 5.2 and 5.7, respectively against ruling variety GPU 28 which recorded 14.3 and 19.2 per cent. The maximum grain yield (2268 kg/ha) was recorded in finger millet CO15followed by ML 365. The feedback from the farmers also revealed exultant with CO 15 due to its high tillering per plant, more number of ear head per square meter and moderately resistant to blast disease and high yielding nature. The economical parameter such as maximumnet income of Rs.44,850 /ha and benefit cost ratio of 2.93 was recorded in CO 15 compared to the other finger millet varieties. Considering the above facts, CO 15 would be a better option to the farming community for enhancing the productivity of finger millet in North Eastern Zone of TamilNadu.

Key Words: Blast, Farmers, Finger millet, Variety and Yield.

INTRODUCTION

Among the coarse cereals, finger millet accounts for 7 per cent area and 11 percent of production in India. The major finger millet growing states in India are Karnataka, Tamil Nadu, Andhra Pradesh, Orissa, Maharashtra, Uttar Pradesh, and Gujarat. Thoughthe finger millet is considered as one of the hardiest crops, it is affected by several diseases such as blast, foot rot and streak. Among these, blast caused by fungus *Magnaporthegrisea (anamorph Pyricularia grisea)* is the most devastating disease affecting different aerial parts of theplant parts like stem, leaf, neck, and fingers and thedisease is accordingly termed as stem blast, leaf blast,neck blast, and finger blast. In Tamil Nadu, the neck and finger blast are causing the significant yield loss up to 37.5 per cent. The average loss dueto blastdisease hasbeen reported to be around 28 per cent and has been reported ashigh as 80-90 per cent in endemic areas Ramappa *et al*(2002).

Finger millet grains produced from the blast infected crop are poor in quality and are unfit for utilization in preparation of value added products. The disease is known to occur almostevery year during rainy season in all major finger millet growingareas and is perceived as one of the major disease causingrecurring yield losses in all the states of India. The irrelevant and indiscriminative use of pesticides may enhance resistance in phytopathogens and cause environmental and groundwater pollution. Traces of such chemicals have been reported to get deposited in agricultural produce Bhanti and Taneja (2007) and Gurusubramanian *et al* (2008).

Corresponding Author's E mail: veera.agri@yahoo.com

[1]Department of Plant Pathology, TNAU, Coimbatore – 641 003 (Tamil Nadu)

Consumption of such contaminated produces may cause serious health problems in human being.

Keeping hazardous effects of plant protection chemicals into consideration, development of alternate ecofriendly means of disease control has become quite necessary. One such alternative is exploration of resistance genotypes against the target pathogen.Varieties play an important role in crop production and the potential yield of a variety within genetic limit is determined by its environment. The release of high yielding varieties has contributed a great deal toward the improvement of finger millet yield. The yield of any crop depends on the production potential of the cultivar and climatic, edaphic and management practices to which the cultivar is exposed. Plant disease resistance though remains the mosteffective strategy of disease management at the endof farmers, yet sources of stable resistance to thepathogen remain elusive. Plant protection measuresare uneconomical and hence are not quite oftenconsidered by resource poor farmers. Accordingly, the objective of the present investigation was aimed to evaluate thehigh yielding variety with blast resistantsuitable for North Eastern Zone of Tamil Nadu to manage the blast disease.

MATERIALS AND METHODS

The present study was carried out by KrishiVigyan Kendra, Tamil Nadu Agricultural University, Vellore in Gudiyatham block which is located in North eastern Zone of Tamil Nadu during *Rabi* season 2017-18. A total of five fields were selected to conduct the experiment under assured irrigation during maturity stage. On the receipt of monsoon, the sowing was performed by the farmers as per the scientist guidelines. Two improved varieties like CO 15 and ML 365 varieties along with the ruling variety (GPU 28) were taken for the trial purpose. Each variety sown in an area of 0.2 ha in each farmer's field and the recommended cultivation practices were followed. Thinning was done on 15 days after germination tomaintain the plantpopulation. Weeding was done twice to keep the crop free from weed.The trial was laid out in randomized block design (RBD) with three treatments and five replications and data were analysed statistically. Five plants were selected at random from each net plot forrecording observation. The periodical observations on growth characters and yield contributing characters of finger milletwere recorded. The blast (leaf, neck and finger) disease incidence were recorded and per cent disease incidence (PDI) was calculated using the given score chart. The resistance of the varieties to leaf blast was scored at vegetative stage using the following rating as given by Nagaraja *et al* (2007). The varieties 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 scales (Anon, 1995).

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

Table 2. Disease reaction for neck blast.

Reaction	Disease rating (%)
Immune (I)	0.0
Resistant (HR)	0.1-5
Moderately susceptible (R)	5.1-10
Susceptible (MS)	10.1-25
Highly susceptible (S)	Above 25

Neck blast

For recording the incidence of finger millet neck blast, thetotal numbers of healthy panicles and total numbers of blastinfected panicles were counted in the dough stage at each fiverandom sites of 1 x 1 square meter area and percent incidence wascalculated by using the following formula as adopted by Ravi kumar (1988). The maximum grades out of recordedobservations were considered as final reaction of therespective entry. According to grades exhibited, the entrieswere categorized as I (Immune), H R (Highly resistant), R (Resistant), M S (Moderately susceptible) and S (Susceptible) (Hittalmani, 2004)

Neck blast (%)=Numberof infected panicles/Total Numberof panicles×100

Finger blast

For recording the incidence of finger blast, three middle linesin a plot were selected. Total numbers of healthy fingers andtotal numbers of blast infected fingers were recorded fromeach variety. Counting of healthy and blast infected finger was done at dough stage and percent finger blast incidencewas calculated by using the following formula as adopted by Ravi kumar (1988). The maximum grades out of recordedobservations were considered as final reaction of therespective entry. According to grades exhibited, the entrieswere categorized as I (Immune), R (Resistant), M S (Moderately susceptible), S (Susceptible) and H S (Highlysusceptible) Babu *et al* (2013).

Finger blast (%) = Number of infected fingers / Average number of fingers X Total number of panicles X 100

RESULTS AND DISCUSSION

Growth attributes

Different varieties exerted significant influence on growth attributes of finger millet, the data (Table 4) showed that the plant height was significantly higher under CO 15 (128 cm) followed ML 365 (120 cm) and minimum plant height was recorded under GPU 28 (112 cm). Variation among the varieties in respect of plant height appears due to influence of genotypic variation.The variation in plant height due to the characteristics features of the plant and management practices adopted by the farmers. The findings of the present study were in line with the findings of Hiremath and Nagaraju

Table 3. Disease reaction for finger blast.

Reaction	Disease rating (%)
Immune (I)	0.0
Resistant (R)	0.1-10
Moderately susceptible (MS)	10.1-20
Susceptible (S)	20.1-30
Highly susceptible (HS)	Above 30

Table 4. Effect of finger millet varieties on growth parameters and blast incidence.

Variety/ Parameter	Plant height (cm)	Number of tillers/plant	No. of ear heads /m^2	Leaf blast	Neck blast (%)	Finger blast (%)
GPU 28	112	6.3	69.7	4.0	14.3	19.2
CO 15	128	8.0	76.2	2.1	5.2	5.7
ML 365	120	7.2	72.4	3.3	10.9	13.3
SEd	3.37	1.01	2.01	1.26	2.37	2.10
C.D (P=0.05)	7.65	2.15	4.20	2.73	5.21	4.52

(2009) and Dhaka *et al* (2010) that the vigor of the crop is positively correlated with disease resistance.

Yield attributes

All the yield attributes had significantly influenced by different varieties of finger millet (Table 5). Among the varieties CO 15 recorded significantly more number of ear headper Sq. meter (76.2) which were significantly superior to ML 365 (72.4) and GPU 28 (69.7). The grain yield was greatly influenced by different varieties of finger millet (Table 5). Among them CO 15 recorded the statistically highest grain 2268 kg/ha followed by ML 365 (2045 kg/ha) and GPU 28 (1896 kg/ha). Higher yield of CO 15 was due to the production of better growth and yield parameters by these varieties. Similarly the use of improved variety CO 15 produced significantly higher yield than the local varieties.

Blast disease

The data on evaluation of different finger millet varieties against blast disease revealed that the leaf blast grade ranged from 1 to 5. The minimum disease score (2.1) was recorded in finger millet CO15 against 4.0 in existing variety finger millet GPU 28 whereas neck blast ranged from 5.2 (CO15) to 14.3 (GPU 28). In case of finger blast, it ranged from 5.7 to 19.2, in which lowest incidence was found in CO 15 (5.7) followed by ML 365 (13.3) and highest in GPU 28 (19.2). Among the three varieties, the finger millet CO15 was found to be resistant to all the stages of the blast viz., leaf, neck and finger blasts. Our findings get support from Kumar and Kumar (2011), who reported the suppression of finger millet blast disease by Induced Systemic Resistance using the seed treatment and foliar sprays of *P. fluorescens* even under field conditions. Similarly, Karthikeyan and Gnanamanickam (2008)

Table 5. Effect of different finger millet varieties on yield parameters and economics.

Variety/ Parameter	Grain yield (kg/ha)	Straw yield (kg/ha)	Gross cost (Rs./ha)	Gross Return (Rs./ha	Net Return (Rs./ha)	Benefit cost ratio
GPU 28	1896	3654	25450	56880	31430	2.23
CO 15	2268	4067	23190	68040	44850	2.93
ML 365	2045	3802	24350	61350	37000	2.51
SEd	63.8	43.56	-	-	-	-
CD (P=0.05)	152.3	98.20	-	-	-	-

found that fluorescentpseudomonads could suppress 88 percent of disease (Setaria blast) under field conditions by triggering the defense mechanisms in the cultivars. Neeraja *et al*(2016) reported that 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. The yield attributes were positively correlated with the resistance sources.

ECONOMICS

Among the different finger millet varieties, the highest netincome obtained from CO 15 finger millet variety wasRs.44,850 /ha. In case of local finger millet variety GPU 28 was Rs. 31,430 /ha. The additionalincome obtained from the CO 15 finger millet variety was Rs. 13, 420 /ha. The highest benefit cost ratio of 2.93 recorded in CO 15 followed by 2.51 in ML 365. Mechanical harvesting was the only source to Reduction of cost of cultivation in finger millet, similar findings reported Syed Mazaril *et al* (2017) farmers opinedthat adoption of mechanization not only reducesthe drudgery, reduces cost of cultivation but alsoincreases more returns per unit time and area.

CONCLUSION

Based on the results of the present investigation, it can be concluded that for obtaining higher grain yield, high tillering capacity, more of ear heads and Blast Disease Resistance realized in finger millet variety CO 15 would be identified as a better variety for sown under irrigated conditions during Rabi season under North Eastern Zone of Tamil Nadu.

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