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Application of Novel Fungicide Compounds to Control the Finger Millet Blast caused by *Pyricularia grisea*

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ABSTRACT

The field experiment was conducted at Agricultural Research Station, Vizianagaram against finger millet blast caused by *Pyricularia grisea* using different fungicides. The per cent disease intensity of leaf blast ranged from 2.0 to 4.7%, neck blast ranged from 9.3 to 83.7% and finger blast ranged from 10.7 to 85.7%. Among all the treatments, T6 (propiconazole) was proved to be best with least incidence of leaf blast (2.0%), neck blast (9.3%) and finger blast (10.7%) and also recorded highest grain yield (1543.3 kg/ha) and fodder yield (4133.7 kg/ha). Treatments, Tebuconazole+ Trifloxystrobin, Tricyclazole, Tricyclazole+ Mancozeb, Isoprothiolane, Azoxystrobin + Difenoconazole, Carbendazim + Mancozeb and Carbendazim were also found superior over control in controlling finger millet blast.

Keywords: *New fungicides, finger millet, propiconazole and blast*

Millets are the most important cereals food grain crops, especially grown in arid and semi arid regions of the Asia and Africa. Finger millet (*Eleusine coracana*) is popularly known as ragi. It is one of the major food crop and feed as fodder for cattle especially in tribal belt of India. It is a good source of carbohydrates and thus supplies high amounts of energy. It is also rich in sulphur containing amino acids, proteins due to its low glycemic index with high fibre. Increased health problems, due to changes in lifestyle, have driven people to rethink their food habits and deliberately shift toward nutritional crops, such as small millets (Anuradha *et al*., 2022). Hence, it is recommended for diabetic patients as it is very effective in controlling blood glucose levels of diabetics. High calcium, high soluble fibre, low fat, high diastatic power of malted grains renders finger millet unique. Consumption of finger millet prevents cholesterol and constipation. However, it is traditionally grown in marginal soil conditions with low inputs. The major constraint in the millet growing regions is blast (*Pyricularia grisea*). Blast pathogen attacks all aerial parts of finger millet plant causing leaf, neck and finger blast and disease appears on leaf lamina with typical spindle shaped spots. The blast disease in finger millet often results in more than 50% yield losses (Esele, 2002) and it is as high as about 80-90% in endemic areas (Viswanath, 1997). Ramappa *et al*. (2002) recorded upto 70 % finger blast and 50 % neck blast during kharif, 2000 in Mandya and Mysore districts. Blast disease is considered as number one in the form of yield loss in Andhra Pradesh, Madhya Pradesh, Haryana, Mysore and Maharashtra reported that the ultimate loss in yield is due to enhanced spikelet sterility and reduction in grain weight and number. The most efficient, feasible, ecofriendly and cheapest way to control the plant diseases is the host plant resistance. Efforts are being made to develop finger millet resistance lines to understand inheritance of resistance to *P. grisea*. (Patro *et al*., 2013; Patro and Madhuri, 2014; Patro *et al*., 2016; Patro *et al*., 2018). However, in rice blast disease is managed primarily through host plant resistance. As, the pathogen has the ability to develop new pathogenic races leading to breakdown of resistance within few years (Ahn, 1994), attempts have been made to manage blast disease in different crops using fungicide chemicals (Lukose *et al*., 2007; Narayana Swamy *et al*., 2009; Netam *et al*., 2014; Pagani *et al*., 2014). However in situ incorporation of legume green manure crops increases the nutrient uptake, productivity of maize and reduce disease incidence. Similarly in groundnut crop simultaneous selection for stable disease resistant and high yielding groundnut genotypes were identified (Patro *et al.*, 2022). Although, host plant resistance is the most economical and viable disease management strategy to control finger millet blast, screening of varieties with inbuilt genetic resistance is the best means for management of this disease, as the crop is predominantly grown by resource poor farmers who can hardly afford using chemicals for its control (Das *et al.*, 2021). In the absence of blast-resistant cultivars, the disease can be best managed with fungicides. Hence, the present study was planned to evaluate eight fungicides against finger millet blast under *in vivo* conditions.

MATERIAL AND METHODS

The field experiments were conducted at Agricultural Research Station, Vizianagaram for the management of blast disease in finger millet by fungicides. The experiment was laid out in randomized block design (RBD) with three replications at spacing of 22.5×10 cm with 3×3 m plot size. Standard agronomic practices of NPK-50kg, 40kg, 25kg were followed at the time of crop growth period. A susceptible variety VR 708 was used in this experiment by imposing the following treatments (Table 1). First foliar spray of fungicides was given at the time of flowering followed by second spray at 10-15 days after first spray. Observations were recorded for leaf, neck and finger blast separately. Leaf blast severity was recorded on 0- 5 scale (Mackill and Bonman, 1992). Whereas, neck blast and finger blast incidence was recorded by counting the number of infected panicles and fingers from total population (Mackill and Bonman, 1992). Disease severity scoring for leaf blast was recorded at seedling and booting stage, whereas for neck blast and finger blast at the physiological maturity and at harvest. The grain yield was recorded after harvesting of crop from individual plots.

RESULTS AND DISCUSSION

The data presented in Table 1 revealed that all the treatments significantly reduced the blast disease when compared to control. The per cent disease intensity of leaf blast ranged from 2.0 to 4.7%, neck blast ranged from 9.3 to 83.7% and finger blast ranged from 10.7 to 85.7%. Among all the fungicides, propiconazole was effective in managing the blast disease with least percent disease incidence of leaf blast (2.0%), neck blast (9.3%) and finger blast (10.7%) followed by azoxystrobin + difenconazole with leaf blast (2.7), neck blast (16.0) and finger blast(15.0%). The maximum percent disease incidence was recorded in control with leaf blast (4.7), neck blast (83.7) and finger blast (85.7). Propiconazole recorded the maximum grain yield (15.4 q/ha) and fodder yield (41.3 q/ha) followed by azoxystrobin + difenoconazole with grain yield (14.0 q/ha) while the minimum grain yield (5.8 q/ha) and fodder yield (22.0 q/ha) was recorded in control. Fungicides showed effective control against blast disease in rice ecosystem (Prajapati *et al.*, 2004; Dutta *et al*., 2012). Carbendazim and tricyclazole showed effective control against pearl millet blast under field conditions (Lukose *et al*., 2007; Joshi and Gohel, 2015). However, rice blast pathogen isolates showed differential sensitivity to tricyclazole and carbendazim. (Mohammad *et al*., 2011). Narayana Swamy *et al*. (2009) and Ganesh Naik *et al*. (2012) reported that tebuconazole+ trifloxystrobin is effective against rice blast. Sharma *et al*. (2018) reported that blast disease can be effectively managed with three sprays of tebuconazole + trifloxystrobin or propiconazole in pearl millet. The results of earlier workers are also in line with the results obtained in the present investigations. Hence, propiconazole @ 1ml/l was effective in managing all the three blasts, *i.e*., the leaf blast, neck blast and finger blast disease under *in vivo* conditions in finger millet.

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Table: 1 Management of Finger millet blast with new fungicide molecules

S.No.	Treatments	Percent Disease Incidence (%)			Grain yield (kg/ha)	Fodder yield (kg/ha)
		Leaf blast	Neck blast	Finger blast		
1	Tebuconazole 50% + Trifloxystrobin 25 WG	3.7	26	30	897.8	2554.2
2	Tricyclazole 75% WP	3.3	25.7	24	1079.5	3032.8
3	Tricyclazole 75% WP + Mancozeb 62% WP	4	22.3	19.3	1302.5	3226.1
4	Isoprothiolane 40% EC	4.3	44	39.7	801.1	2261.6
5	Azoxystrobin + Difenconazole	2.7	16	15	1403.7	3315.5
6	Propiconazole 25% EC	2	9.3	10.7	1543.3	4133.7
7	Carbendazim + Mancozeb	3.7	17.3	18.7	1306	3706.2
8	Carbendazim 50% WP	4.3	28.3	29	992.8	2748.3
9	Control	4.7	83.7	85.7	580.5	2203.3
	CD (5%)	0.9	5.5	6.31	194.04	377.9
	CV (%)	14.4	10.5	12.06	10.19	7.23

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