

**Performance of botanicals and fungicides against blast of pearl millet  
(*Pennisetum glaucum*)**

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**ABSTRACT**

Pearl millet [*Pennisetum glaucum* (L) R.Br ] also known as Bajra is an important grain and forage cereal of India. The blast also referred as leaf spot caused by *Pyricularia grisea* (Cooke) Sacc. [Teleomorph: *Magnaporthe grisea* (Herbert) Barr.] has emerged as a serious disease affecting both forage and grain production in pearl millet. Field experiment was conducted to study the effect of botanicals (Neem seed kernel extract (NSKE) @20%, Aloe vera (leaf) @20% and Lantana camera (leaf) @20%) and fungicidal (Iprobenphos (Kitazin) 48 EC @ 0.1%, Tricyclazole (Beam) @0.1%, Azoxistrobin 25 EC @0.05%, Propiconazole @0.05%, Trifloxystrobin + Tebuconazole @0.05% and Hexaconazole @0.1%) foliar sprays on blast disease using susceptible variety RHB-177 in a randomized block design with four replications. The two years pooled data showed that the minimum blast PDI was obtained in treatment Trifloxystrobin + Tebuconazole (18.9), followed by Propiconazole (20.0), Tricyclazole (22.5), Iprobenphos (24.2), Hexaconazole (25.0), Azoxistrobin (24.4), Neem seed kernel extract (31.9), Aloe vera (36.4) and Lantana camera (38.6), while it was maximum in control (44.4). Trifloxystrobin + Tebuconazole was significantly superior to all the three botanicals. It was also superior to Azoxistrobin and Hexaconazole but it was at par with Propiconazole, Tricyclazole, Iprobenphos. Propiconazole was significantly superior Azoxistrobin but was statistically at par over rest of the tested fungicides. Performance of fungicides/botanicals on grain and fodder yield of pearl millet was also recorded.

**Keyword-** Management, botanicals, fungicides, pearl millet

**INTRODUCTION**

Pearl millet [*Pennisetum glaucum* (L) R. Br] is an important grain and forage cereal of India. In India, it is popularly known as bajra grown for grain and fodder purpose and cultivated over an area of 6.98 million ha with the production of 8.06 million tones and the productivity is 1154 kg/ha(Anon. 2016). Madhya Pradesh occupies 0.27 million ha with an annual production 0.59 million tones and productivity is 2203 kg/ha(Anon. 2016). Pearl millet encounters number of diseases which attack the crop during its growth, cause low yield and economic loss to the peasant and finally to the nation as a whole. Among several diseases that affect pearl millet such as; downy mildew or green ear disease (*Sclerospora graminicola*) a major problem of pearl millet hybrids, rust (*Puccinia substriata* var. *indica*), smut (*Tolyposporium penicillariae*) and sugary disease or ergot of bajra (*Claviceps fusiformis*) have been major concern to cultivator and researchers alike. However, leaf spots due to several pathogens like; *Pyricularia grisea*, *Bipolaris setariae*, *Cercospora penniseti*, *Curvularia penniseti*, *Drechslera dematioidea* and *Exserohilum rostratum* etc. are also taking toll on crop destroying foliage and thus reducing yield and yield attributes. The blast also referred

as leaf spot caused by *Pyricularia grisea* (Cooke) Sacc. [Teleomorph: *Magnaporthe grisea* (Herbert) Barr.] has emerged as a serious disease affecting both forage and grain production in pearl millet. Hence a study was undertaken to study the performance of botanicals and fungicides against blast of pearl millet.

**MATERIALS AND METHODS**

A field experiment on effect of botanicals (neem seed kernel extract (NSKE) @ 20%, Aloe vera (leaf) @ 20% and Lantana camera (leaf) @ 20%) and fungicidal (Iprobenphos (Kitazin) 48 EC @ 0.1%, Tricyclazole (Beam) @ 0.1%, Azoxistrobin 25 EC @ 0.05% , Propiconazole @ 0.05%, , Trifloxystrobin + Tebuconazole @ 0.05% and Hexaconazole @ 0.1%,) foliar sprays on blast disease using susceptible variety RHB-177 in a randomized block design with four replications at Pathology field during *Kharif* seasons of the year 2015-16 and 2016-17. Artificial inoculated was done after fifty five days after sowing. The first spray was done given just after the appearance of the disease and subsequent three spraying were given at an interval of 15 days. Observations on disease incidence were

recorded after 15 days of last spraying. After the maturity of the crop grain and fodder yield will be recorded replication & treatment wise. Thereafter the grain and fodder yield will be converted in kg/ha and q/ha respectively. Standard agronomical practices were followed as per recommendations. Percent disease control over control was calculated by following formula:

$$\text{Percent disease control} = \frac{C - T}{C} \times 100$$

Where, C = growth of fungus in control,  
T = growth of fungus in treatment

## RESULTS AND DISCUSSION

Data (Table 1) reveal that all the fungicides significantly controlled the disease during both the years of testing. Among the botanicals neem seed kernel extract also significantly controlled the disease but these botanicals were less effective as compared to the fungicides. During 2015 the minimum blast PDI was recorded in Trifloxystrobin + Tebuconazole (17.8%) followed by Propiconazole (19.4%), Tricyclazole (20.0%), Iprobenphos (22.8), Hexaconazole (25.0%), Neem seed kernel extract (30.0%), Aloe vera (33.3%) and Lantana camera (35.5%) while maximum disease was recorded in control (38.9). Trifloxystrobin + Tebuconazole was significantly superior to Lantana camera, Aloe

vera, Neem seed kernel extract, Azoxistrobin and Hexaconazole were statistically at par with Propiconazole, Tricyclazole and Iprobenphos. The minimum PDI during 2016 was again recorded in the treatment Trifloxystrobin + Tebuconazole (20.0), followed by Propiconazole (20.6), Azoxistrobin (24.4), Tricyclazole (25.0), Hexaconazole (25.0), Iprobenphos (25.5), Neem seed kernel extract (33.9), Aloe vera (39.4) and *Lantana camera* (41.6), while a maximum (50.0%) PDI was recorded in control. Trifloxystrobin + Tebuconazole was significantly superior over all the botanicals but it was statistically at par with the fungicides except Iprobenphos. The pooled data (table-1) reveal that the minimum blast PDI was obtained in treatment Trifloxystrobin + Tebuconazole (18.9), followed by Propiconazole (20.0), Tricyclazole (22.5), Iprobenphos (24.2), Hexaconazole (25.0), Azoxistrobin (24.4), Neem seed kernel extract (31.9), Aloe vera (36.4) and *Lantana camera* (38.6), while it was maximum in control (44.4). Trifloxystrobin + Tebuconazole was significantly superior over all the three botanicals. It was also superior over Azoxistrobin and Hexaconazole but at par with Propiconazole, Tricyclazole, Iprobenphos. Propiconazole was significantly superior Azoxistrobin but was statistically at par over rest of the tested fungicides.

Table 1: Field evaluation of selected fungicides/botanicals against blast

Treatment	Blast % (PDI)			Blast % (PDC)		
	2015	2016	Mean	2015	2016	Mean
Iprobenphos (Kitazin)48 EC @ 0.1%	22.8 (28.52)	25.5 (30.33)	24.2 (29.47)	41.3 (39.93)	49.0 (44.40)	45.4 (42.19)
Tricyclazole (Beam) @ 0.1%	20.0 (26.57)	25.0 (30.00)	22.5 (28.32)	48.5 (44.11)	50 (44.98)	49.3 (44.55)
Azoxistrobin 25 EC @ 0.05%	27.2 (31.44)	24.4 (29.60)	25.8 (30.53)	30.0 (33.19)	51.2 (45.69)	41.8 (39.43)
Propiconazole @ 0.05%	19.4 (26.13)	20.6 (26.99)	20.0 (26.57)	50.1 (44.98)	58.8 (50.05)	54.9 (47.54)
Trifloxystrobin + Tebuconazole @ 0.05%	17.8 (24.95)	20.0 (26.57)	18.9 (25.77)	54.2 (47.42)	60 (50.76)	57.4 (49.06)
Hexaconazole@0.1%	25.0 (30.00)	25.0 (30.00)	25.0 (30.00)	35.7 (36.70)	50 (44.98)	43.6 (40.82)
Neem seed kernel extract(NSKE)@20%	30.0 (33.21)	33.9 (35.61)	31.9 (34.39)	22.8 (28.45)	32.2 (34.57)	28.1 (31.53)
Aloe vera(leaf)@20%	33.3 (35.24)	39.4 (38.88)	36.4 (37.11)	14.3 (22.10)	21.2 (27.40)	18.0 (24.80)
Lantana Camera(leaf)@20%	35.5 (36.57)	41.6 (40.16)	38.6 (38.41)	8.7 (17.18)	16.8 (24.12)	13.0 (20.66)
Control (Untreated)	38.9 (38.59)	50.0 (45.00)	44.4 (41.78)	0.0 (0.00)	0.0 (0.00)	0.0 (0.00)
Sem±	1.25	1.29	1.14	0.761	0.918	1.799
CD at 5 %	3.64	3.78	3.69	2.219	2.679	5.835

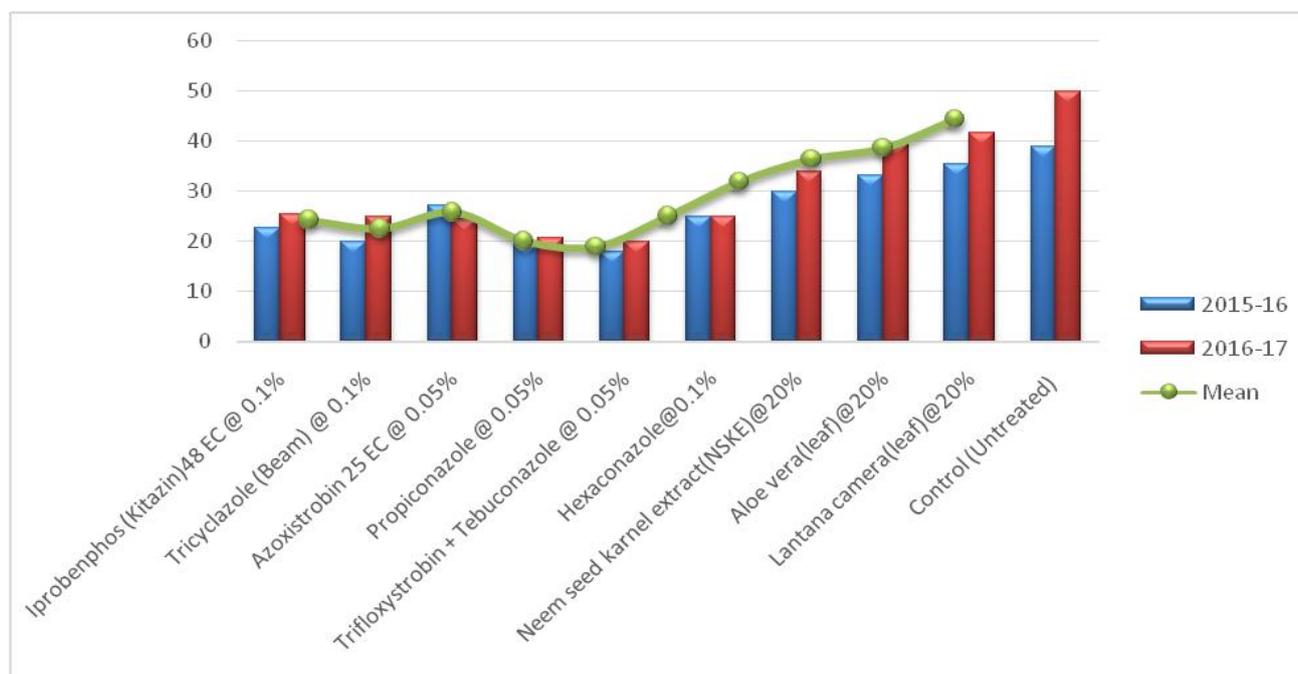


Fig. 1: Evaluation of fungicides and botanicals against Blast of Pearl millet

The grain yield data (Table 2) reveal that the maximum yield in the year 2015 was recorded with Trifloxystrobin + Tebuconazole ( $2878 \text{ kg ha}^{-1}$ ) followed by Tricyclazole ( $2840 \text{ kg ha}^{-1}$ ), Hexaconazole ( $2792.5 \text{ kg ha}^{-1}$ ), and minimum grain yield was recorded in the control ( $2563 \text{ kg ha}^{-1}$ ). During 2016 the maximum grain yield was recorded with Trifloxystrobin + Tebuconazole ( $2616 \text{ kg ha}^{-1}$ ) whereas the minimum yield was recorded in the control ( $2178.25 \text{ kg ha}^{-1}$ ). In the pooled data the maximum grain yield was recorded in the treatment Trifloxystrobin + Tebuconazole ( $2747 \text{ kg ha}^{-1}$ ) and minimum in the control ( $2370.63 \text{ kg ha}^{-1}$ ). In the year 2015, the maximum fodder yield was recorded in Azoxystrobin ( $78.58 \text{ q ha}^{-1}$ ) while minimum yield was recorded in control ( $69.09 \text{ q ha}^{-1}$ ). During 2016 the maximum fodder yield was recorded with Tricyclazole ( $72.97 \text{ q ha}^{-1}$ ) whereas the minimum yield was recorded in the Lantana camera ( $62.75 \text{ q ha}^{-1}$ ). Pooled data showed that the maximum grain yield was recorded in the treatment Azoxystrobin ( $74.86 \text{ q ha}^{-1}$ ), while minimum yield was recorded in the control ( $66.07 \text{ q ha}^{-1}$ ).

Gouramanis (2007) reported that the fungicide derosal (carbendazim) @  $1.5 \text{ lb}/100$

gallons and beam (tricyclazole) @  $0.75 \text{ kg ha}^{-1}$  effectively decreased rice neck blast followed by fongoren (pyroquilon) @  $2 \text{ kg ha}^{-1}$  while, kitazin (iprobenfos) @  $750 \text{ g ha}^{-1}$  and bla-s (blasticidin) @  $100 \text{ }\mu\text{g}/\text{ml}$  reduced leaf blast but not neck blast infection. Lukose *et al.*, (2007) reported that the carbendazim at 0.05 per cent was significantly superior in controlling the disease with the lowest disease intensity (28.3%), followed by thiophanate methyl (29.9%) and mancozeb (32.8%). There was also a significant increase in grain yield in carbendazim ( $2239 \text{ kg ha}^{-1}$ ), followed by thiophanate methyl ( $2014 \text{ kg ha}^{-1}$ ) and mancozeb ( $1910 \text{ kg ha}^{-1}$ ). Likewise, the fodder yield also increased significantly in carbendazim treatment ( $3241 \text{ kg ha}^{-1}$ ). The maximum net return of Rs.  $3411 \text{ ha}^{-1}$  was recorded in this treatment with highest ICBR of 1:3.85. Singh and Prasad (2007) evaluated fungicides against rice blast in vivo and reported that tricyclazole 50 WP ( $0.5 \text{ l/ha}$ ) and carbendazim 50 WP ( $1 \text{ l/ha}$ ) resulted in lowest blast incidence and obtained higher grain yield. Vijaya (2002) also found maximum reduction in leaf blast incidence and higher yield by spraying tricyclazole (PDI 17.6), followed by thiophanate methyl (PDI 19.3).

Table 2: Field performance of fungicides/botanicals on grain and fodder yield of pearl millet

Treatment	Grain Yield (Kg ha <sup>-1</sup> )			Fodder Yield (q ha <sup>-1</sup> )		
	2015	2016	Mean	2015	2016	Mean
Iprobenphos (Kitazin)48 EC @ 0.1%	2778	2262.5	2520.25	73.28	68.72	71.0
Tricyclazole (Beam) @ 0.1%	2840	2540.5	2690.25	75.18	72.97	74.07
Azoxistrobin 25 EC @ 0.05%	2789	2545.5	2667.25	78.58	71.14	74.86
Propiconazole @ 0.05%	2575	2593.75	2584.38	70.50	72.19	71.34
Trifloxystrobin + Tebuconazole @ 0.05%	2878	2616	2747	77.09	71.44	74.26
Hexaconazole@0.1%	2792.5	2517.5	2655	74.875	69.38	72.12
Neem seed karnel extract(NSKE)@20%	2745	2447.5	2596.25	73.625	68.63	71.12
Aloe vera(leaf)@20%	2658.75	2366.25	2512.5	71.35	65.88	68.61
Lantana camera(leaf)@20%	2568.75	2227.5	2398.12	69.975	62.75	66.36
Control (Untreated)	2563	2178.25	2370.63	69.09	63.05	66.07
SEM±	152.9	132.0	66.8	2.6	2.7	1.3
CD at 5 %	NS	NS	216.8	NS	NS	4.3

It may be concluded that fungicides can effectively control the pearl millet blast disease and among them Trifloxystrobin + Tebuconazole @ 0.05% was found to be the most effective one with least leaf blast disease PDI (18.9) and maximum disease control (57.4%). The highest grain yield (2747 kg ha<sup>-1</sup>) was recorded from Trifloxystrobin +

Tebuconazole @ 0.05% and highest fodder yield (74.86 q ha<sup>-1</sup>) was recorded from Azoxistrobin 25 EC @ 0.05%. So, it is recommended to use this fungicide against pearl millet leaf blast disease, thrice at weekly interval to have effective control and higher grain and fodder yield under field condition.

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