



P-ISSN: 2349-8528
 E-ISSN: 2321-4902
 IJCS 2019; 7(5): 2098-2101
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 Received: 11-07-2019
 Accepted: 13-08-2019

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International Journal of Chemical Studies

In vivo* efficacy of fungicides on leaf spot of pearl millet caused by *Curvularia hawaiiensis

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Abstract

Pearl millet (*Pennisetum glaucum* L.) is being affected by several fungal diseases. However, leaf spot, caused by *Curvularia hawaiiensis* has been leaf spot is gaining importance in recent years by causing considerable losses in high yielding varieties and hybrids, than native cultivars. It reduces the productivity of Pearl millet and became a major limiting factor in pearl millet cultivation. Therefore, present study was planned and conducted *in vivo*, the experiment was planned and conducted in RBD with seven treatments replicated thrice, at the Department of Plant Pathology, College of Agriculture, Dhule (MS), during 2018-19.

The *in vivo* studies showed that Mancozeb @ 0.3% recorded maximum percent disease control (88.30%) and were found significantly superior over rest of fungicidal treatments. The next best treatment was Hexaconazole @ 0.1% with (70.76%) percent disease control, followed by the treatment Copper oxychloride @ 0.2% with (53.22%) percent disease control. While Azoxystrobin @ 0.05%, Carbendazim @ 0.1% and Captan @ 0.2% with (41.93%), (38.69%) and (35.96%) showed percent disease control respectively.

Keywords: Pearl millet, *Curvularia hawaiiensis*, Fungicides, Yield.

Introduction

Pearl millet (*Pennisetum glaucum* L.) is an important warm season cereal grown primarily for grain production in some of the most marginal environment in the arid and semi-arid tropical (SAT) region of Asia and Africa. The area under cultivation of pearl millet was 7.128 million ha with grain production of 10.08 metric tons and productivity of 1132 kg ha⁻¹ in India (Anon., 2017a). In Maharashtra state area is about 6.47 lakh ha with production of 4.20 lakh tones having average productivity of 632 kg/ha⁻¹ (Anon., 2017b). India is a major Pearl millet producing country with 43.3% of the world area and 42% of world production. The crop is cultivated in almost all the districts of Maharashtra state, except Konkan area, however, the major pearl millet growing districts are Nashik, Dhule, Ahmednagar, Pune, Satara, Sangali, Aurangabad and Solapur.

Pearl millet (*Pennisetum glaucum* L.) is being affected by several fungal diseases. The Pearl millet crop grown extensively with a limiting factor that invariably attacked by fungal diseases like Downey Mildew (*Sclerospora graminicola*), Smut (*Moesziomyces penicillariae*), Ergot (*Claviceps fusiformis*), Blast (*Pyricularia grisea*), Rust (*Puccinia striata*), Leaf spot (*Bipolaris*, *Cercospora*, *Curvularia*, *Drechslera*, *Exserohilum*, *Pyricularia*) etc. Among these, leaf spot is gaining importance in recent years by causing considerable losses in high yielding varieties and hybrids, than the native cultivars. *Curvularia* is a hyphomycete (mold) fungus which is a facultative pathogen of many plant species and of the soil. Most *Curvularia* are found in tropical regions, though a few are found in temperate zones.

Curvularia leaf spot of pearl millet is becoming increasingly important in India. It lessens grain as well as fodder yield and deteriorate the fodder quality. The disease severity observed more during *kharif* season with severe commercial losses and it lessens the yield of pearl millet and became a key limiting factor in pearl millet cultivation. Therefore, present study on *in vivo* efficacy of fungicides against *Curvularia hawaiiensis*, initiating pearl millet leaf spot was planned and conducted at the Department of Plant Pathology, College of Agriculture, Dhule, during 2018-19.

Materials and Methods

In vivo evaluation of fungicides

A field experiment was conducted at Bajra Research Scheme, College of Agriculture, Dhule during *Kharif* 2018 to evaluate the efficacy of six fungicides against *Curvularia hawaiiensis*. Six fungicides found effective in *in vitro* experiment, were tested in field trial to evaluate the efficacy of fungicides against *Curvularia hawaiiensis*.

Leaf spot susceptible pearl millet variety sown in field during July 2018. Field experiment was planned in Randomized Block Design (RBD) with seven treatments and each was replicate thrice. The details of treatment are as follows. The three spraying were taken at interval of 10 days.

Table: Name of treatments and its concentration

Tr. No.	Treatment	Concentration
T ₁	Mancozeb	@ 0.3%
T ₂	Hexaconazole	@ 0.1%
T ₃	Copper oxychloride	@ 0.2%
T ₄	Azoxystrobin	@ 0.05%
T ₅	Carbendazim	@ 0.1%
T ₆	Captan	@ 0.2%
T ₇	Control	(Untreated)

Observation on foliage leaf spot disease was recorded before and after 10 days of each spraying. Five plants per treatment in each replication were selected randomly and tagged for recording the observation. Three leaves at bottom, middle and

top from main branch on each plant were selected for recording observations. Per cent leaf spot disease intensity was worked out by using following scale and formula.

The leaf spot disease intensity was recorded by following 0-9 scale.

Category	Description
0	No symptoms on leaves
1	Small pin-head size lesions covering 1% or less leaf area
3	Small pin-head size lesion covering 1-10% of leaf area
5	Lesions big but not coalescing, covering 11-25% of leaf area
7	Lesions on leaves covering 26-50% of leaf area
9	Lesions on leaves covering 51% or more of leaf area

$$PDI = \frac{\text{Sum of all numerical rating}}{\text{Total number of leaves examined} \times \text{Maximum disease rating}} \times 100$$

Statistical analysis

The data obtained in all experiment was statistically analyzed. The standard error (SE) and critical difference (CD) at level $P=0.05$ was worked out and result obtained were compared statistically by using standard statistical method (Panse and Sukhatme, 1978) for statistical analysis.

Results and Discussion

In vivo efficacy of fungicides against *Curvularia hawaiiensis*

The result in Table 1 revealed that Mancozeb @ 0.3% recorded maximum percent disease control 88.30% and was found expressively superior over rest of fungicidal treatments. The second best treatment was Hexaconazole @ 0.1% with 70.76% percent disease control and was followed by the treatment Copper oxychloride @ 0.2% with 53.22% percent disease control. Among these all treatment the other fungicides such as Azoxystrobin @ 0.05%, Carbendazim @ 0.1% and Captan @ 0.2% recorded 41.93%, 38.69% and 35.96% percent disease control respectively (Fig.1).

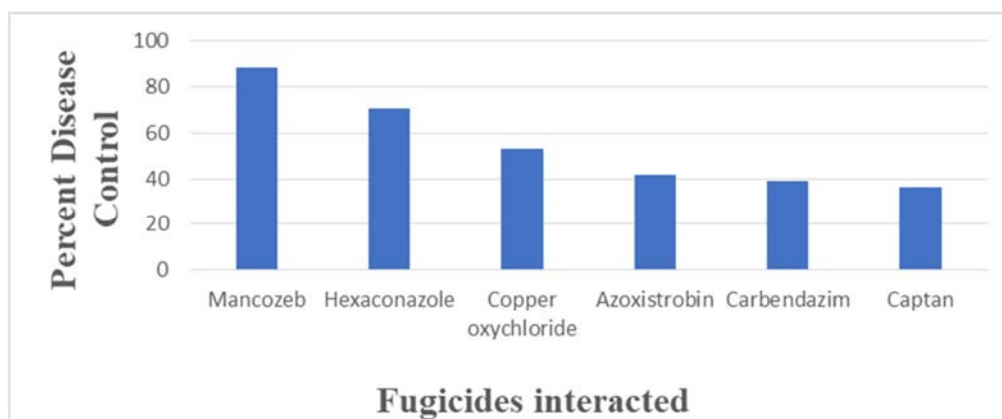


Fig 1: *In vivo* efficacy of different fungicides against *Curvularia hawaiiensis*

It is concluded from the result, the fungicides Mancozeb @ 0.3% was supreme effective to manage leaf spot of pearl millet under field condition, with respect to that the fungicide Captan @ 0.2% was less effective for controlling leaf spot of pearl millet.

Similar result regarding effectiveness of Mancozeb for reducing leaf spot of pearl millet was also reported by Kumar and Tomar (2005) they reported that, Mancozeb (M-45) was most effective to control the disease under field condition.

Grain yield

Grain yield obtained in Table 1 revealed that, the fungicide Mancozeb @ 0.3% treated plot gave maximum grain yield 35.12 q/ha and found significantly superior over rest of the fungicidal treatment. The next best treatment was Hexaconazole @ 0.1% which gave 33.66 q/ha grain yield this was followed by Copper oxychloride @ 0.2%, Azoxystrobin @ 0.05%, Carbendazim @ 0.1% and Captan @ 0.2% which were recorded grain yield 30.44 q/ha, 29.66 q/ha, 29.36 q/ha and 28.60 q/ha respectively (Fig.2).

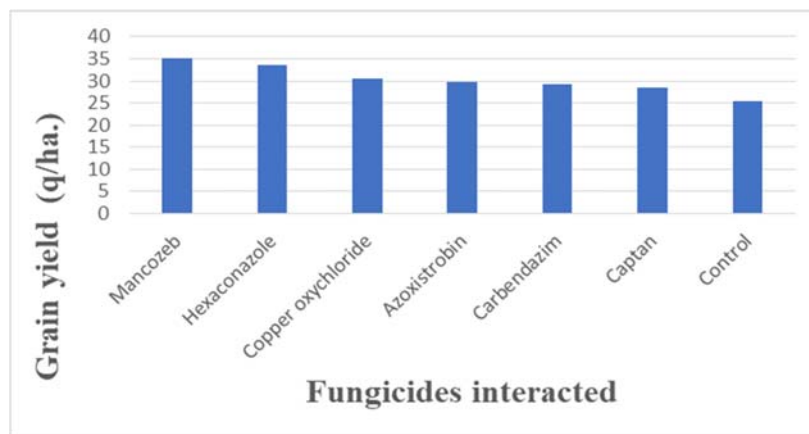


Fig 2: *In vivo* effect of different fungicides on grain yield of bajra against *Curvularia hawaiiensis*

Fodder yield

Fodder yield recorded in Table 1 were revealed that, among all the fungicides, Mancozeb @ 0.3% were produced maximum fodder yield 52.67 q/ha and was found significantly superior over all other treatments. The next best treatment was found

Hexaconazole @ 0.1% produced 52.27 q/ha fodder yield, it was followed by Copper oxychloride @ 0.2%, Azoxystrobin @ 0.05%, Carbendazim @ 0.1% and Captan @ 0.2% which were recorded 49.60 q/ha, 46.00 q/ha, 39.50 q/ha and 38.86 q/ha respectively (Fig.3).

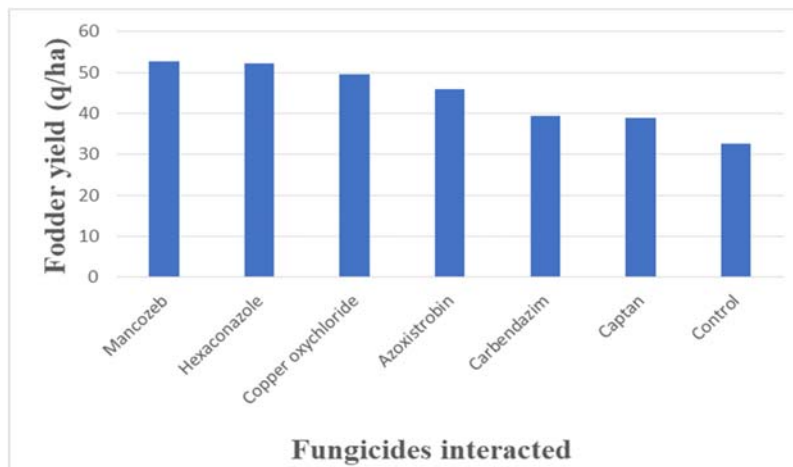


Fig 3: *In vivo* effect of different fungicides on fodder yield of bajra against *Curvularia hawaiiensis*

Table 1: Effect of fungicides on leaf spot of Pearl millet caused by *Curvularia hawaiiensis* (*in vivo*)

Sr. No.	Fungicides	Conc. %	PDI*	PDC	Grain Yield (q/ha)	Fodder Yield (q/ha)
1	Mancozeb	0.3	16.16 (23.70)	88.30	35.12	52.67
2	Hexaconazole	0.1	17.82 (24.97)	70.76	33.66	52.27
3	Copper oxychloride	0.2	19.86 (26.46)	53.22	30.44	49.60
4	Azoxystrobin	0.05	21.44 (27.58)	41.93	29.66	46.00
5	Carbendazim	0.1	21.94 (27.93)	38.69	29.36	39.50
6	Captan	0.2	22.38 (28.23)	35.96	28.60	38.86
7	Control		30.43 (33.48)		25.34	32.57
	S.E. ±		1.09		0.88	1.60
	C.D. at 5%		3.37		2.72	4.94

*Mean of three replication

Figures in parenthesis indicate Arc sin transformed value.

Conclusion

Hence, from ongoing results and discussion, it is concluded that *in vivo* testing of fungicides against *C. hawaiiensis* causing leaf spot of pearl millet was most found controlled by the fungicide Mancozeb @ 0.3% field condition, which produces high grain as well as fodder yield also.

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