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Evaluation of various fungicides against sheath blight under *in vitro* condition

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Abstract

The present studies were undertaken to investigate the effect of various fungicides against sheath blight. Eight fungicides were tested against the rice sheath blight pathogen under lab conditions at various concentrations for analysing the mycelial growth and mycelial dry weight. The results revealed that, among the various fungicides among the eight fungicides, Hexaconazole (Contaf) @ (200 ppm) completely inhibited the mycelial growth and mycelial dry weight of *R. solani*. Propiconazole, Metaminostrobin, carbendazim, Azoxystrobin, copper oxychloride, difenconazole, Tebuconazole @ 400 ppm recorded 0.00mm, 0.00mm, 2.70mm, 5.35mm, 16.84mm and 22.15mm and 26.00mm radial growth of the test pathogen respectively.

Keywords: Rice sheath blight, fungicides, new generation fungicides, mycelial dry weight

Introduction

Rhizoctonia solani kuhn the causal agent of rice sheath blight, is one of the most serious rice diseases worldwide (Shahram naeimi *et al.*, 2010) [8]. First reported in Japan in 1910, the disease became established in many oriental countries and as a result is often referred to as "Oriental leaf and sheath blight", sheath blight, *Pellicularia* sheath blight, sclerotial blight and banded blight of rice (Dath and premalatha, 1990) [1]. Presently, sheath blight disease management is mainly achieved through systemic fungicides (Pal *et al.*, 2005) [6]. The present paper deals about the evaluation of various fungicides against sheath blight disease.

Materials and Methods

Evaluation of fungicides against *R. solani*.

S. No	Chemical name	Concentration (%)	Trade name
1	Carbendazim 50% WP	0.1	Bavistin
2	Azoxystrobin 23% Sc	0.3	Amistar
3	Difenconazole 25% EC	0.1	Score
4	Copper oxy Chloride 50% WP	0.1	Corpus
5	Metaminostrobin 20 SC	0.1	Metaminostrobin
6	Tebuconazole 25% EC	0.1	Tegrol
7	Hexaconazole 5 SC	0.1	Contaf
8	Propiconazole 5 SC	0.1	Spectator

Poisoned food technique (Schmitz, 1930)

Eight fungicides, Hexaconazole 5% SC, Propineb 75% WP, Difenconazole 25% EC, Tricyclazole 75% WP, Benomyl 50% WP, Azoxystrobin 25% SC, Iprodion + Carbendazim 50% WP, Tebuconazole + Trifloxystrobin 75% WG were used for the study. The effect of various fungicides on the radial growth of the pathogen was studied by poisoned food technique. Required quantity of fungicide solutions were mixed with PDA autoclaved and cooled just before pouring into Petri plates, so as to obtain the required concentrations *viz.* 100, 200, 400 ppm. The medium was then dispensed uniformly into 90 mm diameter. Petri plates and inoculated with 9mm mycelial disc of the pathogen from 8 day old culture with their mycelial side down. Pathogen inoculated in unamended medium served as control. The growth of the fungus was monitored by measuring the radial growth in mm every 24 h, till the fungus covers the plate completely in the control plate. The per cent inhibition (PI) of the fungus over control was calculated using the following formula:

$$PI = (A - B)/A \times 100$$

Where, A is colony diameter of the fungus in control plates (mm) and B is colony diameter of the fungus in treated plates (mm).

Results and Discussion

In vitro evaluation of various fungicides against *R. solani*

Mycelial growth

In the present study eight, fungicides were tested against *R. solani* and presented in Table 5. All the tested fungicides registered appreciable inhibition in colony growth and mycelial dry weight. Among the eight fungicides, Hexaconazole (Contaf) @ (200 ppm) completely inhibited the mycelial growth of *R. solani*. Propiconazole, Metaminostrobin, carbendazim, Azoxystrobin, copper oxychloride, difenconazole, Tebuconazole @ 400 ppm recorded 0.00mm, 0.00mm, 2.70mm, 5.35mm, 16.84mm and 22.15mm and 26.00mm radial growth of the test pathogen respectively. Hexaconazole was significantly superior in comparison to the other fungicides inhibiting the mycelial growth.

Mycelial dry weight

Under *in vitro* condition, all the eight fungicides inhibited the growth of mycelial biomass of *R. solani*. Among the fungicides, Hexaconazole showed the highest level of inhibition and recorded 47.3 mg mean mycelial dry weight. It

was followed by Propiconazole which recorded 72.9 mg of mycelial dry weight. In all *in vitro* experiments conducted, the level of efficacy of Hexaconazole was superior to that of other fungicides (Table 1). The result of the experiment revealed the superiority of Hexaconazole. Hence the same was used for further studies.

Evaluation of fungicides against *R. solani*

The results of the present study revealed that, all the eight fungicides tested inhibited the mycelial growth of the pathogen when compared to the control. Of these, hexaconazole exhibited the highest level of inhibition of *R. solani* even at very low concentration (200 ppm). Similarly, Brown *et al.* (1989) reported that hexaconazole was highly effective against *R. Solani* by way of inhibiting mycelial growth and conidial germination at lower concentrations in *in vitro* and *in vivo* conditions. Dubey and Toppo (1997)^[3], Lore *et al.* (2012)^[5] also reported that hexaconazole was most effective in reducing the rice sheath blight disease intensity and increased the yield. There are several works reported on the efficacy of hexaconazole against *R. solani* (Dinakaran *et al.*, 2012; Vishal Gupta *et al.*, 2013; Johnson *et al.*, 2013)^[2, 10, 4]. This may be due to demethylation of C-14 during ergosterol biosynthesis that leads to accumulation of C-14 methyl sterols. The above results lend support to the present findings.

Table 1:

Fungicides	Mycelial growth of <i>R.solani</i> (mm)				Mycelial dry weight (mg/50 ml broth)			
	100 ppm	200 ppm	400 ppm	Mean	100 ppm	200 ppm	400 ppm	Mean
Carbendazim 50% WP	27.20	10.50	2.70	10.13 ^c	260.0	117.0	58.0	89.6 ^b
Azoxystrobin 23% Sc	30.00	13.00	5.35	16.28 ^c	281.0	140.0	107.0	176.0 ^c
Difenconazole 25% EC	58.50	28.00	22.15	33.21 ^d	328.0	178.0	139.0	209.3 ^d
Copper oxy Chloride 50% WP	57.10	27.10	16.84	33.68 ^d	327.0	174.0	137.0	212.6 ^d
Metaminostrobin 20 SC	20.00	8.70	0.00	9.56 ^b	200.0	104.0	55.0	119.6 ^b
Tebuconazole 25% EC	60.10	31.00	26.00	37.03 ^e	330.0	180.0	142.0	214.0 ^d
Hexaconazole 5 SC	6.10	0.00	0.00	2.03 ^a	130.0	7.5	4.5	47.3 ^a
Propiconazole 5 SC	15.20	4.50	0.00	6.56 ^b	145.0	59.84	14.0	72.9 ^b
Control	88.00	88.00	88.00	88.00 ^f	390.0	390.0	390.0	390.0 ^e

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