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Evaluation of fungicides on *Sclerotium oryzae*, incitant of rice stem rot disease

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Abstract
Stem rot caused by *Sclerotium oryzae* is one of the major diseases of rice and aserious threat to rice production in in India. Stem rot of rice is difficult to manage due to its soil borne nature. Hence, in the present study efficacy of 15 fungicides were screened at three different concentrations. Against *S. oryzae in vitro*. Among them, Carbendazim, Propiconazole, Hexaconazole, Difenoconazole, Tebuconazole, Trifloxystrobin + Tebuconazole, Azoxystrobin, Isoprothiolane, Mancozeb + Carbendazim, Benomyl and Thiophanate-methyl completely (100%) inhibited the growth of *S. oryzae* at all concentrations. Chlorothalonil, Validamycin and thifluzamide varied in their inhibitory effect on *S. oryzae* at different concentrations. In present investigation, among all the chemicals tested, thifluzamide (0.04%) recorded least per cent inhibition.

Keywords: fungicides, *S. oryzae*, rice, stem rot

1. Introduction
Rice is an important cereal food crop grown under wide ecological conditions including less rain fall situation to inundated condition and submerged conditions. The crop is prone to be affected by a number of fungal, bacterial and viral diseases. Among these, stem rot of rice, caused by *Sclerotium oryzae* is a serious threat to rice production in India. The pathogen has been reported to cause substantial losses in grain yield ranging from 5-80 per cent (Kumar *et al*. 2003). Continuous cultivation of rice during different seasons under high dosages of nitrogenous fertilizers and prevalence of many graminaceous weed flora (Chen, 1971 and 1973) [1, 2] and lack of proper irrigation and drainage facilities progressively aggravated the stem rot disease in recent years. Rice diseases can be managed by cultivating resistant cultivars, cultural practices and chemical application. Of all these, the chemical control is being one of the viable proposition to control the disease and to protect the crop (Kumar *et al*. 2003) [6]. Chemical control offers great potential and plays an important role in reducing the losses caused by the diseases (Gill, 1999) [4] the present investigation has been taken up to test the efficacy of fungicides and herbicides against stem rot pathogen under *in vitro* conditions.

2. Material and Methods
2.1 Isolation of the Pathogen
Rice plant infected with stem rot pathogen *S. oryzae* were collected from Agricultural Research Station (ARS), Nellore. The pathogen was isolated from the stem of infected rice plants by tissue segment method on PDA medium (Rangaswamy and Mahadevan, 1999) [10]. Small pieces of about three mm size was taken from infected region along with some healthy tissue were cut with sterile scalpel. Then the pieces were surface sterilized with one per cent sodium hypochlorite for one min, followed by three washings in sterile distilled water to eliminate excess sodium hypochlorite on the bits of tissue. These bits were transferred to PDA plated Petri plates. Plates were incubated at 28±2 °C and observed periodically for growth of the fungus. The culture was purified by single hyphal tip method and maintained on PDA by periodical transfer throughout the present investigation.

2.2 Identification of pathogen
The pathogen was identified based on its mycelial and sclerotial characters described by Barnett and Hunter (1972) [3].

2.3 *In Vitro* Evaluation of Fungicides against *S. oryzae*
In vitro efficacy of fungicides against the pathogen was evaluated by poisoned food technique

(Nene and Thapliyal, 1993) [9]. The list of fungicides and their test concentrations used in the present study are given below:

S. No.	Chemical Name	% Concentration		
		1	2	3
1	Carbendazim 50WP	0.05	0.1	0.15
2	Propiconazole 25EC	0.05	0.1	0.15
3	Hexaconazole 5EC	0.1	0.2	0.3
4	Difenoconazole 25% EC	0.1	0.2	0.3
5	Tebuconazole 25.9% (250EC)	.0.075	0.15	0.225
6	Validamycin 3L	0.10	0.20	0.30
7	Trifloxystrobin 50% + Tebuconazole 25% WG	0.04	0.08	0.12
8	Azoxystrobin 23% SC	0.05	0.1	0.15
9	Carboxymethyl 44.3% SC	0.05	0.1	0.15
10	Thifluzamide 24% SC	0.04	0.08	0.12
11	Isoprothiolane 40 EC	0.075	0.15	0.225
12	Mancozeb 63% + Carbendazim 12%	0.1	0.2	0.3
13	Chlorothalonil 75% WP	0.1	0.2	0.3
14	Thiophanate methyl 70 WP	0.05	0.1	0.15
15	Benomyl 50 WP	0.05	0.1	0.15
16	Control	--	--	--

To 50 ml of sterilized distilled water, required quantity of fungicide (double the dose) was added and mixed thoroughly. This solution was added to 50 ml of sterilized cool molten double strength PDA medium, mixed thoroughly and poured into Petri plates. Five mm disc of four day old culture of the pathogen was inoculated at the centre of Petri plates containing poisoned food and then incubated at 28±2 °C. Observations were recorded on radial growth of *S. oryzae.* Three replications were maintained for each fungicide. Medium without fungicide was kept as control and per cent growth inhibition was calculated by using the following formula (Vincent, 1947) [8]

$$I = C\text{-}T/C \times 100$$

Where, I = Per cent inhibition, C = Colony diameter of the test fungus in Control and T = Colony diameter of the test fungus in Treatment

3. Results and Discussion

In the present investigation fifteen fungicides that are being used commonly in rice system were evaluated for their bio efficacy against *S. oryzae* using poisoned food technique at three different concentrations (Table 3.1). All the fungicides significantly inhibited the growth of *S. oryzae* compared to control. Carbendazim, Propiconazole, Hexaconazole, Difenoconazole, Tebuconazole, Trifloxystrobin + Tebuconazole, Azoxystrobin, Isoprothiolane, Mancozeb + Carbendazim, Benomyl and Thiophanate-methyl completely (100%) inhibited the growth of *S. oryzae* at all concentrations. The inhibition of *S. oryzae* due to Chlorothalonil treatment was 87.4% at 0.3% concentration, 82.9% at 0.2% concentration and 67.7% at 0.1% concentration of the fungicide. The inhibition of *S. oryzae* due to Validamycin treatment was 80.3% at 0.3% concentration, 77.4% at 0.2% concentration and 74% at 0.1% concentration of the fungicide. Among different concentrations of Thifluzamide, maximum inhibition was at 0.12% (60.3%) followed by 0.08% (54.8%) and least inhibition was observed at 0.04% (3.7%) (Table3.1). in present investigation, among all the chemicals, thifluzamide (0.04%) recorded least per cent inhibition. Results revealed that, irrespective of fungicide, as the concentration increases there was a significant reduction in the mycelial growth of *S. oryzae* when compared with control. Similar results was found when Prakash and Puri (2012) [9] tested the five systemic fungicides, among them Hexaconazole (contaf) was highly effective in reducing mycelial growth of *S. oryzae* at low concentration. Of the four non-systemic (contact) fungicides chlorothalonil was highly effective against the pathogen *in vitro*. The results were in agreement with Gopika and Jagadeeshwar (2017) [5] who evaluated the fungicides against *S. oryzae*. Out of six fungicides tested, Hexaconazole @ 200 ppm and Propiconazole @100 ppm completely inhibited *S. oryzae* in poisoned medium. While azoxystrobin @ 100 ppm (98.6%), Tebuconazole (98.5%), carbendazim (98.4%) @ 100 ppm were on par with each other.

On the basis of present *in vitro* experiment it can be concluded, fungicides which showed 100% inhibition in the growth of *S. oryzae* at all concentrations were most effective against *S. oryzae*.

4. Conclusion

In the present study the effective fungicides *viz.*, Carbendazim Propiconazole, Hexaconazole, Difenoconazole, Tebuconazole, Trifloxystrobin + Tebuconazole, Azoxystrobin, Isoprothiolane, Mancozeb + Carbendazim, Benomyl and Thiophanate-methyl were proved most effective on the stem rot causing fungi *S. oryzae*. They may probably act as antifungal agents and imparts its poisoning effect on metabolic process of pathogen, therefore, the growth of the *S. oryzae* might be adversely affected.

Table 3.1: Effect of fungicides on the growth of *Sclerotium oryzae in vitro*

S. No.	Fungicide	Concentration (%)	Mycelial growth of pathogen (cm)	Per cent inhibition
1	Carbendazim	0.05	0.00	100.0 (90.0)
		0.1	0.00	100.0 (90.0)
		0.15	0.00	100.0 (90.0)
2	Propiconazole	0.05	0.00	100.0 (90.0)
		0.1	0.00	100.0 (90.0)
		0.15	0.00	100.0 (90.0)
3	Hexaconazole	0.1	0.00	100.0 (90.0)
		0.2	0.00	100.0 (90.0)
		0.3	0.00	100.0 (90.0)
4	Difenoconazole	0.1	0.00	100.0 (90.0)
		0.2	0.00	100.0 (90.0)
		0.3	0.00	100.0 (90.0)
5	Tebuconazole	0.075	0.00	100.0 (90.0)
		0.15	0.00	100.0 (90.0)
		0.225	0.00	100.0 (90.0)
6	Validamycin	0.1	2.33	74.0 (59.3)
		0.2	2.03	77.4 (61.6)
		0.3	1.76	80.3 (63.6)
7	Trifloxystrobin + Tebuconazole	0.04	0.00	100.0 (90.0)

		0.08	0.00	100.0 (90.0)
		0.12	0.00	100.0 (90.0)
8	Azoxystrobin	0.05	0.00	100.0 (90.0)
		0.1	0.00	100.0 (90.0)
		0.15	0.00	100.0 (90.0)
9	Carboxymethyl	0.05	1.16	87.0 (68.8)
		0.1	0.00	100.0 (90.0)
		0.15	0.00	100.0 (90.0)
10	Thifluzamide	0.04	8.66	3.7 (10.89)
		0.08	4.06	54.8 (47.7)
		0.12	3.56	60.3 (50.9)
11	Isoprothiolane	0.075	0.00	100.0 (90.0)
		0.15	0.00	100.0 (90.0)
		0.225	0.00	100.0 (90.0)
12	Mancozeb + Carbendazim	0.1	0.00	100.0 (90.0)
		0.2	0.00	100.0 (90.0)
		0.3	0.00	100.0 (90.0)
13	Chlorothalonil	0.1	2.90	67.7 (55.3)
		0.2	1.53	82.9 (65.6)
		0.3	1.13	87.4 (69.2)
14	Thiophanate methyl	0.05	0.00	100.0 (90.0)
		0.1	0.00	100.0 (90.0)
		0.15	0.00	100.0 (90.0)
15	Benomyl	0.05	0.00	100.0 (90.0)
		0.1	0.00	100.0 (90.0)
		0.15	0.00	100.0 (90.0)
16	Control	0.00	9.00	0.000
	SE(m)			0.395
	C.D.			1.111
	C.V.			0.849

5. References

1. Chen CC. Stem rot of rice. Proceedings Symposium JCRR, Jaipur, Taiwan, 1971, 77-78.
2. Chen CC. The study on host range of rice stem rot fungi. Memoirs of the College of Agriculture, National Taiwan University. 1973; 14:29-45.
3. Barnett HL, Hunter BB. *Illustrated genera of imperfect fungi*. 4th edition APS Press, St. Paul, Minnesota, 2003, 92-94.
4. Gill LS. Ethnomedical uses of plants in Nigeria. Nigeria. University of Benin press, 1992, 24.
5. Gopika K, Jagadeeshwar R. Studies on disease incidence and efficacy of fungicides, herbicides and antagonists micro flora against stem rot of rice (*Sclerotium oryzae*) along with integrated management. Agriculture Update. 2017; 12(7):2077-2087.
6. Kumar A, Ram Singh, Jalali BL. Management of stem rot of rice with resistance inducing chemicals and fungicides. Indian Phytopathology. 2003; 56(3):266-269.
7. Nene YL, Thapliyal PN. Fungicides in plant disease control (3rd edition). Oxford and IBH Publishing Company Private Limited, 1993, 691.
8. Vincent JM. Distortion of fungal hyphae in the presence of certain inhibitor Nature. 1947; 15:850.
9. Prakash N, Puri S. Efficacy of combination of systemic and non-systemic fungicides against stem rot of rice. The Bioscan. 2012; 7(2):291-294.
10. Rangaswami G, Mahadevan A. *Diseases of crop plants in India*, 4th edition, Prentice Hall of India Private Limited, New Delhi, 1999, 536.