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# SENSITIVITY OF *TRICHODERMA* AND *SCLEROTIUM ROLFSII* TO FUNGICIDES *IN VITRO*

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## INTRODUCTION

Chickpea (*Cicer arietinum* L.) is one of the major pulse crops grown throughout the world. More than 50 pathogens have been reported so far to infect chickpea in different parts of the world. Diseases pose a serious threat to chickpea production potential especially those caused by soil borne plant pathogenic fungi *viz*., *Fusarium solani*, *Macrophominaphaseolina*, *Sclerotium rolfsii*, *Rhizoctonia solani* and *Pythium* spp. Among them collar rot caused by *Sclerotium rolfsii* is an important disease capable of causing serious economic losses (Nene, 1985). *Sclerotium rolfsii* is a non-specialized soil borne fungal pathogen of worldwide importance and has a host range of over 500 species. Biological control is proved to be a promising disease management technology against soil borne plant pathogens, when applied either alone or in combination with other management practices (Papavizas, 1985). Species of *Trichoderma* are very effective biological control agents against soil borne plant pathogens such as *S. rolfsii*. However, variation existed in different isolates of *Trichoderma* in their biocontrol efficacy.

## METHODOLOGY

In the present investigation two isolates of *Trichoderma, viz.*, isolate $Th_4$ of *T. harzianum* and isolate $Tv_5$ of *T. virens*were chosen that differed in their *in vitro* antagonistic potential against *Sclerotium rolfsii*.

### Effect of fungicides on radial growth of *S.rolfsii*

The fungicides *viz.*, carbendazim, mancozeb, carboxin, propiconazole, captan and tridemorph were tested at 100, 500, 1000, 1500 and 2000 ppm concentrations. Inhibitory effect of these test fungicides was assessed by poisoned food technique.

Sterilized PDA was melted, cooled and the required quantity of individual fungicide was added in to it (from the stock solution) so as to get the desired concentrations. After thorough mixing the poisoned media was poured into sterilized Petri dishes. Three replications were maintained for each treatment. Test fungus inoculated on fungicide unamended medium was used as control.

Two mm mycelial discs from three day old culture of *S. rolfsii* were cut using sterile cork borer and placed at the centre of plate containing poisoned food and incubated at $29\pm1^0$c. Observations were recorded on the radial growth of *S. rolfsii*.Efficacy of fungicides was expressed as per cent growth inhibition over control and calculated using the formula given by Nene and Thapliyal (1982).

$$I (\%) = (C-T)/ C \times 100$$

I = Percent growth inhibition
C= Growth in control (monoculture)
T= Growth in treatment (dual culture)

**Effect of fungicides on radial growth of selected *Trichoderma* spp.**

The fungicides *viz.,* carbendazim, carboxin and propiconazole were tested at 100, 500, 1000, 1500 and 2000 ppm concentrations for their effect on the radial growth of test *Trichoderma* isolates by following poisoned food technique and the above procedure holds good.

## RESULTS

**Evaluation of different fungicides on the radial growth of *Sclerotium rolfsii in vitro***

Six different fungicides, *viz.,* Carbendazim, Carboxin, Propiconazole and Tridemorph (systemic) and Captan and Mancozeb (non systemic) were evaluated for their inhibitory effect on the growth of *S. rolfsii* using poisoned food technique *in vitro, i.e.,* 100, 500, 1000, 1500 and 2000 ppm. Five concentrations of each fungicide were tested against *S. rolfsii* to choose the effective fungicide to be used for further studies (Table 1).

In comparison with check plate (8.8 cm), Carboxin at all the test concentrations, *i.e.,* 100, 500, 1000, 1500 and 2000 ppm significantly inhibited the growth of *S. rolfsii* from the first day of incubation with no growth equivalent to 100 per cent inhibition.

Further, Tridemorph at 2000 ppm (0.0 cm), Captan at 1500 and 2000 ppm (0.0 cm) and Propiconazole at 1000, 1500 and 2000 ppm (0.0 cm) completely inhibited the growth of *S. rolfsii* which is equivalent to 100 % inhibition.

Results indicated that though all the fungicides were significantly effective in reducing the mycelial growth of *S. rolfsii*, Carbendazim and Mancozeb were comparatively less effective in inhibiting the growth of *S. rolfsii* with mean growth of 1.2 cm and 1.6 cm at 2000 ppm and are equal to 86.6 and 81 per cent inhibition respectively.

**Evaluation of different fungicides on the radial growth of *Trichoderma* isolates *in vitro***

Experiment was conducted with three fungicides *viz.,* Carbendazim (commonly used seed dressing chemical), Carboxin and Propiconazole which were selected from the sensitivity of *S. rolfsii* to fungicides at 100, 500, 1000, 1500 and 2000 ppm concentrations to test their effect on mycelial growth of $Tv_5$ and $Th_4$ isolates in fungicide amended medium.

Both the isolates of *Trichoderma*, *i.e.,* $Th_4$ and $Tv_5$ were found to be highly sensitive to carbendazim with 100% inhibition in radial growth at all the concentrations tested (Table 2) Propiconazole was found highly toxic to both the

*Trichoderma* isolates with complete (100%) inhibition above 1000 ppm concentration and 81.8 to 94.2% between 100 to 500 ppm concentration.

Carboxin was found to be comparatively less toxic to *Trichoderma* isolates among the three fungicides under study. The sensitivity expressed as per cent growth inhibition varied from 92.3% at 2000 ppm to 56.85 at 100 ppm with $Tv_5$ to 87.7% at 2000 ppm to 45.4% at 100 ppm with $Th_4$.

Carboxin, found to be effective fungicide against *S. rolfsii* and found to be less efficacious against *Trichoderma*.

## References

1. Nene, Y. L. 1985. Oppurtunities for research on diseases of pulse crops. *IndianPhytopathology*. 38: 1-10.
2. Papavizas, G. C. 1985.*Trichoderma* and *Gliocladium*: Biology, ecology and potential for biocontrol. *Annual Review of Phytopathology*. 23: 23-54.
3. Nene, Y, L and Thapliyal, P. N. 1982. *Fungicide in Plant Diseases Control*. Oxford and IBH Publishing Co. Pvt. Ltd. New Delhi; 325pp.

**Table 1: Effect of fungicides on the radial growth of *Sclerotium rolfsii* Fungicides x Replication**

| Fungicides | Concentration (ppm) | | | | | mean |
|---|---|---|---|---|---|---|
| | 100 | 500 | 1000 | 1500 | 2000 | |
| **Carbendazim** | 7.0 (2.7)$^{a}$ | 3.6 (2.0)$^{a}$ | 3.2 (1.9)$^{a}$ | 2.4 (1.7)$^{a}$ | 1.2 (1.2)$^{b}$ | **3.5 (1.9)** |
| **Carboxin** | 0.0 (0.7)$^{e}$ | 0.0 (0.7)$^{d}$ | 0.0 (0.7)$^{d}$ | 0.0 (0.7)$^{c}$ | 0.0 (0.7)$^{c}$ | **0.0 (0.7)** |
| **Mancozeb** | 5.5 (2.4)$^{b}$ | 3.7 (2.0)$^{a}$ | 2.9 (1.8)$^{a}$ | 2.6 (1.7)$^{a}$ | 1.6 (1.4)$^{a}$ | **3.3 (1.9)** |
| **Propiconazole** | 0.4 (0.9)$^{e}$ | 0.1 (0.8)$^{d}$ | 0.0 (0.7)$^{d}$ | 0.0 (0.7)$^{c}$ | 0.0 (0.7)$^{c}$ | **0.1 (0.8)** |
| **Tridemorph** | 2.6 (1.8)$^{c}$ | 1.2 (1.3)$^{c}$ | 0.5 (1.0)$^{c}$ | 0.0 (0.7)$^{b}$ | 0.0 (0.7)$^{c}$ | **0.8 (1.1)** |
| **Captan** | 5.8 (2.5)$^{b}$ | 2.9 (1.8)$^{b}$ | 1.9 (1.5)$^{b}$ | 0.0 (0.7)$^{c}$ | 0.0 (0.7)$^{c}$ | **2.1 (1.4)** |
| **Mean** | 3.5 (1.8) | 1.9 (1.4) | 1.4 (1.2) | 0.8 (1.0) | 0.5 (0.9) | |
| SEm ± | 0.03 | | | | | |
| CV (%) | 4.8 | | | | | |
| CD (0.01) | 0.1 | | | | | |

Each treatment replicated four times.
Figures with similar alphabets do not differ significantly
Values in parenthesis are arc sine transformed values
Check was maintained with a growth of 8.8 cm (3.04).

**Table 2: Effect of fungicides on the radial growth and inhibition (%) on $Th_4$& $Tv_5$**

| Fungicide (Concentration) (ppm) | $Tv_5$ | | $Th_4$ | |
|---|---|---|---|---|
| | **Radial growth** | **Inhibition (%)** | **Radial growth** | **Inhibition (%)** |
| **Carbendazim** | | | | |
| **100** | 0.0 (0.7) | 100 (90) | 0.0 (0.7) | 100 (90) |
| **500** | 0.0 (0.7) | 100 (90) | 0.0 (0.7) | 100 (90) |
| **1000** | 0.0 (0.7) | 100 (90) | 0.0 (0.7) | 100 (90) |
| **1500** | 0.0 (0.7) | 100 (90) | 0.0 (0.7) | 100 (90) |
| **2000** | 0.0 (0.7) | 100 (90) | 0.0 (0.7) | 100 (90) |
| **Carboxin** | | | | |
| **100** | 3.7 (2.0) | 56.8 (48.9) | 4.5 (2.3) | 45.4 (42.3) |
| **500** | 3.1 (1.9) | 61.4 (51.6) | 2.6 (1.9) | 62.6 (52.3) |
| **1000** | 2.1 (1.6) | 75.3 (60.2) | 2.0 (1.6) | 76.1 (60.7) |
| **1500** | 1.3 (1.3) | 84.6 (66.9) | 1.9 (1.6) | 77.3 (61.6) |
| **2000** | 0.6 (1.0) | 92.3 (74.1) | 1.1 (1.3) | 87.7 (69.5) |
| **Propicanazole** | | | | |
| **100** | 1.5 (1.4) | 81.8 (64.8) | 0.5 (1.0) | 84.2 (76.1) |
| **500** | 0.5 (1.0) | 94.2 (76.1) | 0.5 (1.0) | 84.2 (76.1) |
| **1000** | 0.0 (0.7) | 100 (90) | 0.0 (0.7) | 100 (90) |
| **1500** | 0.0 (0.7) | 100 (90) | 0.0 (0.7) | 100 (90) |
| **2000** | 0.0 (0.7) | 100 (90) | 0.0 (0.7) | 100 (90) |
| **Check** | 8.3 (3.02) | 8.3 (3.02) | 8.3 (3.02) | 8.3 (3.02) |
| SEm $\pm$ | **0.03** | **0.8** | **0.04** | **0.5** |
| CV(%) | **4.5** | **1.8** | **6.5** | **1.1** |
| CD (0.01) | **0.1** | **2.3** | **0.1** | **1.4** |