

Efficacy appraisal of fungicides against *Fusarium oxysporum* f. *lini* in linseed for better management strategy

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ABSTRACT

Out of the seven fungicides tested *in vitro* against *Fusarium oxysporum* f. *lini*, carbendazim 50WP and benlate 50WP were found most effective in checking the colony growth to 00 mm (completely check) followed by thiram75WP (10.52 mm), captafol 80WP (14.21 mm) and captan 50WP (15.24 mm). In field trial studies, seedling emergence and mortality inhibition were maximum in case of the seeds treated with *Trichoderma viride* (92.35% and 5.63%) followed by carbendazim 50WP (84.60% and 6.96%). Maximum linseed yield (7.93q/ha) was obtained when seeds treated with *Trichoderma viride* (10⁷ spores/g).

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INTRODUCTION

Linseed (*Linum usitatissimum* L.) commonly known as “Tisi” is one of the popular crop for its seed and fibre. The yield of the crop gets affected by incidence of a large number of diseases, which plays limiting factor with linseed cultivation. One of them is wilt, caused by *Fusarium oxysporum* f. *lini* (Bolley) Snyder and Hansen. There is an urgent need to increase the yield of oil seed in general and also linseed in particular to meet the shortage of oil requirements of the country. Considering the economic importance of oil seed, it is desirable to develop an effective management strategy by exploring more of the biology of the pathogen. Keeping in view, the importance of the crop in oil production and the pathogen playing havoc with its yield, the present study was under taken to test the efficacy of different chemicals against this pathogen to cushion the crop form yield decline.

MATERIAL AND METHODS

For evaluation of the fungicides *in vitro* against *Fusarium oxysporum* f. *lini*, food poison technique develop by Schmitz (1930) was followed. Seven different fungicides viz., mancozeb 72WP, carbendazim 50WP, benlate 50WP, captan 50WP, captafol 80WP, thiram 75WP and mancozeb 72WP + thiram 75WP had been used against the fungus to see the inhibitory effect on the radial growth.

The concentration of the fungicides were made and requisite quantity of fungicides were incorporated in to the sterilized unsolidified potato dextrose agar medium and shaken well to make it homogenous. The medium was then poured in 100mm sterilized Petriplates with three replications of each treatment and allowed to solidify. These Petriplates were then inoculated with 5 mm circular disc of inoculum from 7 days old culture. The disc was placed in the center of each Petriplates in inverted position so that the mycelium of the fungus may

come in direct contact with the medium. The medium without any fungicides were poured and inoculated similarly to serve as the control. The Petriplates were then incubated at $28 \pm 1^\circ\text{C}$. The efficacy of various fungicides were assessed by measuring the radial growth of the fungus (Table A).

Concentrations of suspension desired	ppm	Volume required for mixing	
		% stock solution	% sterile water
0.1	1000	10	90

The growth of the fungus on the media incorporated with various fungicides were measured and average diameter of the fungal colony on each fungicide was recorded along with the control.

The inhibition percentage of *Fusarium oxysporum f. lini* was calculated by using the equation :

$$I = \frac{(C - T)}{C} \times 100$$

where,

I = Per cent growth inhibition

C = Colony diameter in check (mm)

T = Colony diameter in the treatment (mm) in fungicide amended media.

To know the effects of seed treatment on the incidence of the disease, an experiment was laid out in the field. The recommended dose of different fungicides tested *in vitro* was applied at the time of sowing as seed dressing. Talc based formulation of *Trichoderma viride* (TNAU isolates) was also used for bio assay and comparisons with chemicals.

About 7 days old culture, raised on PDA, were homogenized to make suspension with distilled water and stained through muslin cloth. The spore suspension thus, obtained was sprayed in the field with the help of fine sprayer uniformly at the time of last ploughing. The control plots were kept inoculums free.

Observation regarding per cent emergence, per cent mortality and yield of the linseed were recorded at 15 days interval from germination stage to harvesting of crop for testing efficacy of fungicide viz., mancozeb 72WP, carbendazim 50WP, benlate 50WP, captan 50WP, captafol 80WP, thiram 75WP, mancozeb 72WP + thiram 75WP and *Trichoderma viride*.

RESULTS AND DISCUSSION

The radial growth of the test fungus on the medium incorporated with various fungicides were measured and average diameter of the fungal colony on each poisoned medium were recorded alongwith the control.

All the fungicides tested, were significantly superior over

Treatments	*Colony diameter(mm) after 7 days	Per cent inhibition over check
Mancozeb 75WP	43.12	46.73
Carbendazim 50WP	00.00	100.00
Benlate 50WP	00.00	100.00
Captan 50WP	15.24	81.17
Captafol 80WP	14.21	82.45
Thiram 75WP	10.52	87.00
Mancozeb 75WP + Thiram 75WP	36.02	55.50
Check	80.95	-
C.D. (P = 0.05)	0.56	

*Average of three replication

Treatments	Dose	Emergence (%)	Mortality (%)	Yield(q/ha)
Mancozeb 75WP	0.2	71.60	10.67	4.33
Carbendazim 50WP	0.1	84.60	6.96	7.80
Benlate 50WP	0.2	78.07	7.10	7.27
Captan 50WP	0.2	73.30	8.14	5.60
Captafol 80WP	0.2	73.47	7.84	6.40
Thiram 75WP	0.3	74.73	7.61	7.00
Mancozeb 75WP+ Thiram 75WP	0.1+0.15	78.93	6.94	7.46
<i>Trichoderma viride</i> (10^7 spores/g)	0.4	92.33	5.63	7.93
Check	-	67.03	16.65	2.67
C.D. (P = 0.05)		7.083	0.431	0.45

the control in inhibiting the growth of the pathogen. Out of the seven fungicides tested carbendazim 50WP and benlate 50WP were found most effective in checking the colony growth (100 %) followed by thiram, difoltan and captaf. All the treatment are statistically significant (Table 1). The colony diameter of the fungus was maximum (80.95 mm) in control. Ondrej (1972) also observed that the systemic fungicides benomyl and thiobendazole inhibited the growth of the fungus in culture.

The experiment on seed treatment resulted in increased germination as compared to the control. Maximum seed germination *i.e.* 92.35 per cent was obtained in case of seed treated with *Trichoderma viride* followed by carbendazim (84.60%), mancozeb + thiram (78.93%) and benlate (78.07%).

All these treatments were found significant over the control. In control plot (untreated seed) the germination was only 67.03 per cent.

It is also revealed that the percentage mortality in seed treated with *Trichoderma viride* was minimum (5.63%) followed by mancozeb 75WP+ thiram 75WP (5.94), carbendazim 50WP (6.96%) benlate 50WP (7.10%), captan 50WP (7.61%), captafol 80WP (7.84%) and mancozeb 75WP (10.67%). All the treatment were found to be significantly superior over the control. Maximum yield were obtained when treatment with *Trichoderma viride* (7.93q/ha) followed by carbendazim (7.80q/ha), mancozeb + thiram (7.46q/ha), benlate (7.27q/ha), thiram (7.00q/ha) difoltan (6.40q/ha), captan (5.60q/ha) and mancozeb (4.33q/ha) over control (2.67q/ha).

Khare and Joshi (1972) reported that captan, thiram and phizoctol significantly decreased the incidence and increased seed germination and ultimately the yield. Srivastava and Qadri (1984) also observed that seedling mortality is severe damage under monsoon condition in Maharashtra. The chief pathogen involved is *Fusarium oxysporum* and different isolates of

which showed wide range of virulence. *In vitro* tests, Captan was the most effective fungicide followed by Thiram and Difoltan (Hanson, 1961; Huffaker and Gutierrez, 1991; Nadarajan and Gunasekaran, 2005; Panse and Sukhatme, 1989; Sharma, 1998 and Srivastava, 1996).

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