



CONTROL OF SEED-BORNE FUNGI OF MUSTARD SEEDS

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Abstract:

About 90 percent of all food crops on earth are propagated by seeds and there are substantial losses in quality due to storage fungi. Use of chemical treatment is one of the ways to prevent the damages of stored seeds.

In the present study, to control the seed borne fungi of mustard seeds, fungicides viz. Thiram, Fytolan, Capstan (Captan), Ridomil MZ 72 and Vitavax with different concentration i.e. 0.05%, 0.1% and 0.2% while Contaf 5% EC at 0.025%, 0.05% and 0.1% have been incorporated in the growth medium. Percent inhibition of colony growth has been considered to directly proportional to the effectiveness of the fungicide. *Alternaria alternata*, *Aspergillus flavus*, *A. fumigatus*, *A. niger*, *Curvularia lunata*, *Fusarium moniliforme* and *Penicillium oxalicum* have been used to study the effect of different fungicides on their growth. The radial growths of the colonies after 7 days of incubation were noted.

All six fungicides showed their variable effects on fungal growth. Contaf 5% EC was found to be most effective fungicide tested which showed high inhibition of radial growth of almost all test fungi. Ridomil MZ 72 and Vitavax showed satisfactory results in inhibiting the growth of test fungi.

Key words: Mustard, storage fungi, radial growth, fungicides

Introduction:

Mustard is the most important and widely distributed oilseed crops cultivated in the cooler agriculture regions at higher elevation as well as winter crop in the temperate zones.

About 90 percent of all crops grown on the earth are propagated by seed (Neergaard, 1977) and there is substantial loss in quality due to storage fungi. Seed treatment with chemical is essential because large numbers of disease causing fungi are carried on or in the seed. When seed germinates, these fungi become active and cause both seed and seedling mortality or produce disease at later stage.

The present study deals with storage fungi associated with rapeseed and mustard seeds and their control by chemical fungicides.

Material and Method:

Seed samples of *Brassica juncea* cv. Pusabold (Mustard) was selected for experimental study and collected from different oilseed *Brassica* growers of North India and also from Department of



Botany, RTM Nagpur University, Nagpur. Seed samples of each location were bulked and working samples were stored in small cotton bag under normal room temperature condition for one year and drawn randomly for further investigations.

Isolation of fungi was done by both blotter as well as agar plate method as recommended by ISTA (1966). After every month percentage incidence of fungi were recorded and calculated by using the formula suggested by Sahai and Mahrotra (1982). Altogether 28 storage fungi were isolated throughout the year from the seeds of mustard. After collecting the data of percentage of fungal incidence, most frequent or dominant fungi were selected as 'Test fungi'. *Alternaria alternata*, *Aspergillus flavus*, *A. fumigatus*, *A. niger*, *Curvularia lunata*, *Fusarium moniliforme* and *Penicillium oxalicum* were found most frequently throughout the year and were used as test fungi for studying the effect of different fungicides on their growth. To study control the seed-borne fungi, different fungicides were tested against isolated fungi. Thiram, Fytolan, Capstan (Captan), Ridomil MZ 72 and Vitavax were incorporated in the Czapek's agar medium at the rate of 0.05%, 0.1% and 0.2%. Contaf 5% EC was incorporated at the rate of 0.025%, 0.05% and 0.1%. After that Czapek's agar medium was sterilized at 15 lb, 121⁰ C for 20 minutes. The sterilized petriplates were poured with these media.

The discs of the test fungi were cut with the help of cork borer (8 mm diameter) from the growing margins and these discs were inoculated in the center of petriplates poured with fungicide mixed Czapek's agar medium. These plates were incubated for 7 days at 28 ± 1⁰ C. After incubation the radial growth of the colony was measured in mm. Percent inhibition of colony growth was considered to be directly proportional to the effectiveness of the fungicides, and it was calculated as follows (Thakre, 1975).

$$\% \text{ Inhibition} = \frac{GC - GF}{GC} \times 100$$

Where, GC- Growth in control

GF- Growth in fungicide mixed medium

Result and Discussion:

Six fungicides were used to control the seedborne fungi i.e. Thiram, Contaf (5% EC), Fytolan, Capstan, Ridomil MZ-72 and Vitavax by mixing the different concentration of fungicides in nutrient Czepak's medium and inoculated with test fungi. The Radial growth of fungal colony was measured on 7th days of incubation and the effect of fungicides on test fungi are given in **Table 1 to 6**. The inhibition in radial growth of fungi was indicative of effect of fungicides.



Thiram (Tetra-methyl thiram disulphide) - The effect of 0.05%, 0.10% and 0.20% concentration of Thiram on radial growth of test fungi is given in **Table 1**. 0.1% shows effectiveness on *Aspergillus niger*, while radial growth of all test fungi were affected with 0.2% of Thiram. Specially *Aspergillus fumigatus*, *Aspergillus niger*, *Fusarium moniliforme* and *Penicillium oxalicum* affected most with 0.2% showing 8 mm only and the growth of test fungi did not exceeds beyond the cavity. The percent inhibition recorded at 0.2% for *Alternaria alternata*, *Aspergillus flavus*, *Aspergillus fumigatus*, *Aspergillus niger*, *Fusarium moniliforme* and *Penicillium oxalicum* were 80.65%, 83.33%, 89.74%, 89.87%, 87.18%, 91.11% and 73.33% respectively. As a result, there was gradual decrease with the 0.05% and 0.1% and sudden decrease with 0.2% of Thiram fungicide.

Contaf (5% EC) – It is also known as Hexaconazole 5% EC which is protectant and eradicant systemic fungicide belonging to the new class of triazoles. The radial growth of test fungi was checked at 0.025%, 0.05% and 0.10% of Contaf (5%EC) was given in **Table 2**. At 0.025% concentration of fungicide, all test fungi except *Penicillium oxalicum* shows higher inhibition. However, *Penicillium oxalicum* shows somewhat resistances to this fungicide at 0.1% indicating 66.67% inhibition.

Table - 1 : Effect of Thiram on radial growth of test fungi.

S. No.	Name of Organisms	Fungal colony growth (in mm)						
		Control	0.05% [#]	%inhibitio n	0.10%	%inhibitio n	0.20%	%inhibiti on
1	<i>Alternaria alternata</i>	62*	20	67.74	14	77.42	12	80.65
2	<i>Aspergillus flavus</i>	90	29	67.78	20	77.78	15	83.33
3	<i>A.fumigatus</i>	78	23	70.51	13	83.33	8	89.74
4	<i>A.niger</i>	79	18	77.22	9	88.61	8	89.87
5	<i>Curvularia lunata</i>	78	23	70.51	13	83.33	10	87.18
6	<i>Fusarium moniliforme</i>	90	38	57.78	18	80.00	8	91.11
7	<i>Penicillium oxalicum</i>	30	16	46.67	13	56.67	8	73.33

* Radial growth in mm

concentration of fungicide

**Table - 2 : Effect of Contaf (5% EC) on radial growth of test fungi.**

S. No	Name of Organisms	Fungal colony growth (in mm)						
		Contr ol	0.025 % [#]	%inhibiti on	0.05 %	%inhibiti on	0.10 %	%inhibiti on
1	<i>Alternaria alternata</i>	62*	9	85.48	8	87.10	8	87.10
2	<i>Aspergillus flavus</i>	90	12	86.67	12	86.67	9	90.00
3	<i>A.fumigatus</i>	78	8	89.74	8	89.74	8	89.74
4	<i>A.niger</i>	79	10	87.34	9	88.60	8	89.87
5	<i>Curvularia lunata</i>	78	11	85.90	11	85.90	8	89.74
6	<i>Fusarium moniliforme</i>	90	10	88.89	10	88.89	9	90.00
7	<i>Penicillium oxalicum</i>	30	16	46.67	14	53.33	10	66.67

* Radial growth in mm.

concentration of fungicide

Fytolan (Copper oxychloride) – The effect of Fytolan on test fungi is presented in **Table 3**. At 0.05% the radial growth of *Alternaria alternata* and *Aspergillus fumigatus* was checked and shows 51.61% and 51.28% inhibition. *Aspergillus flavus*, *Aspergillus niger* and *Penicillium oxalicum* were less affected by the action of fungicides even at 0.2% concentration. *Aspergillus fumigatus* shows 76.92% inhibition while *Fusarium moniliforme* shows 75.56% inhibition at 0.2% concentration.

Capstan (Captan) – It shows moderate effect on radial growth of test fungi and given in **Table 4**. *Alternaria alternata*, *Aspergillus flavus* and *Aspergillus niger* were less affected at 0.05% concentration of capstan showing 19.35%, 15.56% and 20.25% respectively, but growth was checked at 0.1% and 0.2%. *Aspergillus fumigatus* shows 46.15%, 66.67% and 75.64% inhibition at 0.05%, 0.1% and 0.2% concentration of capstan respectively, while at same concentration, *Curvularia lunata* shows 48.72%, 66.67% and 76.92% inhibition. It is clear that the radial growth of test fungi reduced with gradual increase in the concentrations of capstan, but shows moderate effect on growth of test fungi at such concentrations.

**Table - 3: Effect of Fytolan on radial growth of test fungi.**

S. No.	Name of Organisms	Fungal colony growth (in mm)						
		Control	0.05% #	%inhibiti on	0.10 %	%inhibit ion	0.20%	%inhibitio n
1	<i>Alternaria alternata</i>	62*	30	51.61	28	54.84	21	66.13
2	<i>Aspergillus flavus</i>	90	88	2.22	80	11.11	46	48.89
3	<i>A.fumigatus</i>	78	38	51.28	20	74.36	18	76.92
4	<i>A.niger</i>	79	71	10.13	52	34.18	40	49.37
5	<i>Curvularia lunata</i>	78	76	2.56	42	46.15	20	74.36
6	<i>Fusarium</i>	90	60	33.33	31	65.56	22	75.56
7	<i>Penicillium</i>	30	28	6.67	26	13.33	16	46.67

* Radial growth in mm.

concentration of fungicide

Table - 4 : Effect of Capstan (Captan) on radial growth of test fungi.

S. No.	Name of Organisms	Fungal colony growth (in mm)						
		Control	0.05 %#	%inhibiti on	0.10 %	%inhibiti on	0.20 %	%inhibiti on
1	<i>Alternaria alternata</i>	62*	50	19.35	34	45.16	24	61.29
2	<i>Aspergillus flavus</i>	90	76	15.56	62	31.11	38	57.78
3	<i>A.fumigatus</i>	78	42	46.15	26	66.67	19	75.64
4	<i>A.niger</i>	79	63	20.25	42	46.84	36	54.43
5	<i>Curvularia lunata</i>	78	40	48.72	26	66.67	18	76.92
6	<i>Fusarium moniliforme</i>	90	65	27.78	59	34.44	43	52.22
7	<i>Penicillium oxalicum</i>	30	22	26.67	18	40.00	16	46.67

* Radial growth in mm.

concentration of fungicide

Ridomil MZ-72 (Metalaxyl 8% + Macozeb 64%) – **Tables 5** indicates the effect of Ridomil MZ-72 on the percent inhibition of test fungi. At 0.05% *Aspergillus niger* and *Curvularia lunata* shows 82.28% and 84.62% inhibition respectively that means this fungicide was highly effective over these two test fungi followed by *Aspergillus flavus*, *Aspergillus fumigatus* and *Alternaria alternata* showing moderate response to Ridomil MZ-72. But with gradual increase in concentration i.e. 0.1% and 0.2%, it shows more effective over all test fungi. At 0.1% concentration they shows more than



60% inhibition while at 0.2% all test fungi shows more than 70% inhibition.

Vitavax (Carboxin 75%) – The radial growth in millimeter (mm) and % inhibition of test fungi by the fungicide Vitavax is given in **Table 6**. From the data, it was clear that Vitavax is more effective at lowest 0.05% concentration and showing more than 66% inhibition. *Penicillium oxalicum* shows 66.67% inhibition, which was lowest while 87.34% inhibition in *Aspergillus niger* which was highest at 0.05%. The growths of test fungi were suppressed with gradual increase in the concentration of fungicides.

Table - 6 : Effect of Vitavax on radial growth of test fungi.

S. No.	Name of Organisms	Fungal colony growth (in mm)						
		Control	0.05 % [#]	%inhibition	0.10 %	%inhibition	0.20 %	%inhibition
1	<i>Alternaria alternata</i>	62*	14	77.42	9	85.48	8	87.10
2	<i>Aspergillus flavus</i>	90	28	68.89	16	82.22	14	84.44
3	<i>A.fumigatus</i>	78	10	87.18	9	88.46	8	89.74
4	<i>A.niger</i>	79	10	87.34	9	88.61	8	89.87
5	<i>Curvularia lunata</i>	78	16	79.49	14	82.05	12	84.61
6	<i>Fusarium moniliforme</i>	90	20	77.78	16	82.22	13	85.56
7	<i>Penicillium oxalicum</i>	30	10	66.67	9	70.00	8	73.33

* Radial growth in mm.

concentration of fungicide

**Table - 5 : Effect of Ridomil MZ-72 on radial growth of test fungi.**

S. No.	Name of Organisms	Fungal colony growth (in mm)						
		Control	0.05 % [#]	%inhibition	0.10 %	%inhibition	0.20 %	%inhibition
1	<i>Alternaria alternata</i>	62*	28	54.84	18	70.97	12	80.65
2	<i>Aspergillus flavus</i>	90	36	60.00	22	75.56	12	86.67
3	<i>A.fumigatus</i>	78	35	55.13	12	84.62	9	88.46
4	<i>A.niger</i>	79	14	82.28	10	87.34	9	88.61
5	<i>Curvularia lunata</i>	78	12	84.62	10	87.18	8	89.74
6	<i>Fusarium moniliforme</i>	90	55	38.89	28	68.89	22	75.56
7	<i>Penicillium oxalicum</i>	30	26	13.33	12	60.00	9	70.00

* Radial growth in mm. # concentration of fungicide

Control of plant diseases aim at preservation or reduction in the incidence or severity of disease and are usually concerned with plant population (crops) rather than individuals. Adjustment of crop management procedures has been an age old practice with farmers for prevention of losses in crops due to disease and other causes. In spite of development of chemical methods and resistant varieties, this approach has excellent promise for further studies. The fungal diseases of economic importance generally have characteristics of rapid rate of multiplication given the appropriate environment condition. Majority of fungi produce spores at some stage in their life cycle and these are generally distributed over large distance by air movement. Since the most of the fungal disease incorporated in plants are seed borne diseases, it is necessary to treat with chemicals to minimize the disease incidence and crop losses.

From the above study of seed borne fungi control by fungicides, it is concluded that there is increase in percent inhibition of radial growth of test fungi with increase in the concentration of the fungicides.

Mehta et al., (1996) shows that the seed treatment with Apron SD-35 (Metalaxyl) along with two foliar application of Ridomil MZ-72 at 30 days interval were effective in reducing the disease incidence and improve the field of mustard. The corresponding increase in field by seed treatment with Ridomil MZ-72 also supported by Kolte (1985) and Saharan (1992). Shah and Jain (1993) showed that Carboxin was found best in controlling all the fungi followed by Zineb, Carbendazim and copper oxychloride. This results also supported by Khandelwal (1968) in controlling seed borne fungi in cucurbitaceous crop.



Conclusion:

In the present study seed treatment with Contaf (5% EC) is recommended. It is a protectant, eradicator and systemic fungicide belonging to the new class of triazoles. Thiram has already been established as a good seed dressing fungicide. Ridomil MZ- 72 and Vitavax also showed promising results as compared to three other fungicides tested.

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