

Efficacy of fungicides against recovery of *Myrothecium roridum* in cotton seed

D. S. Tomar* and P.P. Shastry

Main cotton research station, J.N.K.V.V., B. M. College of Agriculture, KHANDWA (M. P.) INDIA

ABSTRACT

The efficacy of five fungicides viz. Carbendazim (0.1%), Carboxin (0.2%), Chlorothalonil (0.2%), Triademefon (0.2%) and Propineb (0.2%) in suppressing seed-borne *M. roridum* was tested. All the five test fungicides increased the percent germination and reduced the recovery of *M. roridum* from cottonseed. Carbendazim was the most effective fungicide, which decreased the recovery by 100% over the control. Chlorothalonil decreased the recovery by 90.69%. All the fungicidal seed treatments increased the vigour of the cotton seed. Carbendazim exerted the maximum influence in this respect. *Myrothecium roridum* is seed-borne in nature and the preferred site in the seed was found to be the seed coat in cotton. Seed treatment with Carbendazim (0.1%) was the most effective fungicide in controlling seed-borne *M. roridum* and increasing the seedling vigour.

Key words: Recovery, Fungicides, Cottonseed, *Myrothecium roridum*

INTRODUCTION

Cotton is a major cash crop of India. However, the average yield of cotton is much below the world average, particularly in countries like Israel, Egypt, China and USA (Anonymous, 1994). Cotton is primarily valued for its extraordinary strength, fineness and durability of fibers. The seeds of cotton also have a market value due to its high quality of vegetable oil and the seed cake, which is a high source of protein. Among the various factors affecting cotton yield, the foliar diseases have major role (Chattannavar *et al.* 2001). The *Myrothecium* leaf blight caused by *Myrothecium roridum* is one of the major foliar diseases of cotton in East Nimar of Madhya Pradesh.

Seeds are found to be one of the potential sources for the survival, perpetuation and transmission of seed-borne pathogen. In cotton, most of the dangerous diseases are transmitted through seeds (Jeyalakshmi *et al.* 1999). The impact of mycoflora on seed germination and seedling vigour was reported by Lima *et al.* (1984), Solemany *et al.* (1993) and Solunkey and Kore (1993). Fungicides have been successfully employed to control seed-borne mycoflora (Ahmed and Ali, 1990; Kale *et al.* 1992 and Solunkey and Kore, 1993). The present investigation was undertaken to determine the efficacy of fungicides on *Myrothecium roridum* in cotton seed and their effect on seed germination and vigour; and to identify a suitable fungicide for their successful control.

MATERIALS AND METHODS

The efficacy of five fungicides viz. Carbendazim (0.1%), Carboxin (0.2%), Chlorothalonil (0.2%), Triademefon (0.2%) and Propineb (0.2%) in suppressing seed-borne *M. roridum* was tested. The seed samples with high natural infection by *M. roridum* were treated with the fungicides. The treated seeds were tested in Petri dishes by Standard Blotter Method (ISTA, 1976) to assess the recovery of *M. roridum* and Paper Towel Method (ISTA, 1976) for seed germination and vigour index. Four replications were maintained for each treatment. The observations were recorded on germination percentage, hypocotyl length and recovery percentage of *M. roridum* in various treatments. The vigour index of the seed lot for each treatment was established by multiplying percent normal germination with hypocotyl length in millimeters (Anderson and Abdul Baki, 1973). The list of fungicides used in experiment is given in Table 1.

RESULTS AND DISCUSSION

Effect of fungicides on recovery of *M. roridum* in cotton seed:

The results on the efficacy of five fungicides (Carbendazim,

Chlorothalonil, Carboxin, Triademefon, Propineb) in suppressing seed-borne *M. roridum* have been presented in Table 2 and Fig 1. The vigour index for each fungicidal treatment in cotton seed was also determined and has been presented in Table 3 and Fig 2.

The data clearly indicate that all the five test fungicides increased the percent germination over the control. The highest germination was recorded for Carbendazim (94.23%) followed by Chlorothalonil (86.72%). The efficacy of fungicides was in the following descending order - Carbendazim > Chlorothalonil > Carboxin > Triademefon > Propineb. The same trend for fungicidal effect was recorded in reducing the recovery of *M. roridum* from cotton seed. Carbendazim was the most effective fungicide, which decreased the recovery by 100% over the control. Chlorothalonil decreased the recovery by 90.69%. The other three fungicides were moderately effective in reducing the recovery i.e. Carboxin by 79.06%, Propineb by 72.09% and Triademefon by 65.11%.

The data on vigour index (Table 3) indicate that the vigour of seed increased by all the fungicidal treatments. Maximum influence on vigour was recorded for Carbendazim treatment (9046.08), which increased the vigour by 621.37% over the control that was closely followed by Chlorothalonil (7371.20) which increased the vigour by 487.31 % over the control. The other three fungicides namely Carboxin, Propineb and Triademefon increased the vigour by 412.05 %, 363.11 % and 310.16 %, respectively.

The fungi associated with seeds play an important role in seed deterioration. Some associated fungi may be actively colonizing in the seed tissues (Vidyasekharan *et al.*, 1966). Dake (1980) reported that cotton seeds failed to germinate when the seeds were treated with the toxin of *M. roridum*. During the early stage of seed imbibition the electrolyte release rate from the seed is very high which is related to the integrity of the cell membrane system (Bewley and Black, 1985). Seed deterioration either due to mechanical damage caused by tissue colonization or production of toxins by the associated fungi and their spores leads to increased leakage of various substances from the seed during imbibitions leading to decrease in vigour (Vidyasekharan *et al.*, 1966; Vidyasekharan, 1977; Wheeler and Hanchy, 1968; Hopper and Hinton, 1987). *Myrothecium roridum* is seed-borne in cotton and the preferred site in the seed was found to be the seed coat. Elimination / reduction in associated fungi by Carbendazim and other tested chemicals observed in the present studies may thus lead to increased seed vigour.

*Author for correspondence

Table 1 : List of fungicides used in the investigations

S. No.	Trade Name	Active ingredient	Chemical Name	Manufacturer's Name
1	Antracol (70% WP)	Propineb	Zinc-propylene bis-dithiocarbamate	Bayer, Mumbai, India
2	Bavistin (50% WP)	Carbendazim	Methyl-2-benzimidazole carbamate	B. A. S. F. India Ltd., Mumbai.
3	Bayleton (25% WP)	Triadimefon	1-(4-chloro-phenoxy)-3,3-dimethyl-1-(1H-1,2,4-triazol-1-y1)-2-butanone	Bayer, Mumbai, India
4	Kavach (75% WP)	Chlorothalonil	Tetrachloroisophthalonitrile	Syngenta India Ltd, Mumbai
5	Vitavax (75% WP)	Carboxin	5,6-dihydro-2-methyl-1-,4-oxathiin-3-carboxanilide	Uniroyal Chemical, USA

Table 2 : Effect of fungicides on recovery of *Myrothecium roridum* associated with cotton seed by standard blotter method (ISTA, 1976)

S. No.	Treatments	Recovery of <i>M. roridum</i> (%)	Percent Decrease in recovery over control
1	Propineb	12	72.09
2	Carbendazim	0	100.00
3	Triademefon	15	65.11
4	Chlorothalonil	4	90.69
5	Carboxin	9	79.06
6	Control	43	-

Table 3 : Effect of fungicides on seed germination, hypocotyl length and vigour of seed by Paper Towel method (ISTA, 1976)

Treatments	Germination (%)	Recovery <i>M. roridum</i>	Radical length (mm)	Hypocotyl length (mm)	Vigour index (VI)	% increase in VI over control
Propineb	78.48	12	34	74	5807.52	363.11
Carbendazim	94.23	0	42	96	9046.08	621.37
Triademefon	79.13	15	30	65	5143.45	310.16
Chlorothalonil	86.72	4	38	85	7371.20	487.81
Carboxin	80.64	9	40	80	6451.20	412.05
Control	31.35	43	24	40	1254.00	-

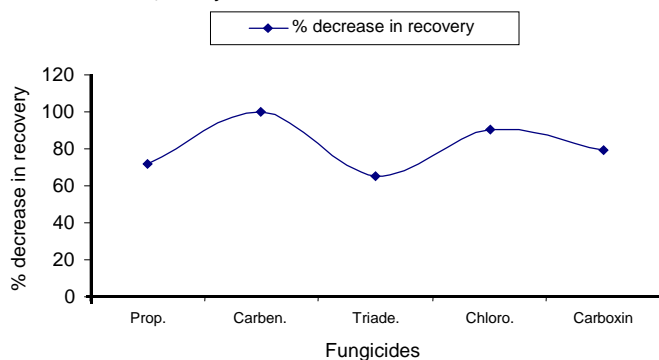
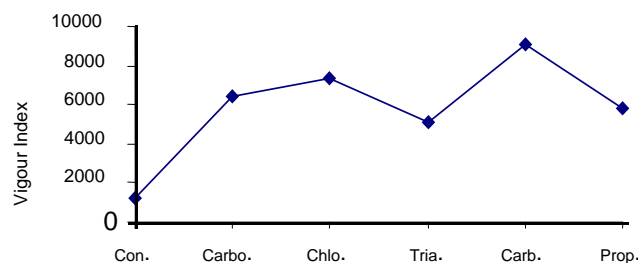
Fig.1. Effect of fungicidal seed treatment on percent decrease in recovery of *Myrothecium roridum* over control

Fig 2. Influence of fungicidal treatment on the Vigour Index of cottonseed



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