

# Efficacy of chemical fungicides and bio-agents against major cotton fungal foliar diseases



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## SUMMARY

An investigation was conducted during summer 2008 on the farm of All India Coordinated Cotton Improvement Project, Mahatma Phule Krishi Vidyapeeth, Rahuri on isolation of leaf spot pathogens, pathogenicity to efficacy of chemical fungicides and bioagent in field conditions. The isolated pathogens associated with fungal foliar diseases were *Alternaria macrospora*, *Myrothecium roridum* and *Helminthosporium spiciferum*. The pathogenicity of isolation pathogens was proved on susceptible cotton var. LRA-5166. These pathogens produced symptoms within 8-13 days. The pathogenicity test proved the pathogenic nature of the isolated pathogens. The chemical fungicides Mancozeb (0.3%), Propiconazole (0.1%), Propineb (0.3%), Copper oxychloride (0.25%) and bioagent *Trichoderma viride* (0.5%) recorded the efficacy against *Alternaria* leaf blight, *Myrothecium* and *Helminthosporium* leaf spot diseases of cotton and increasing the seed cotton yield.

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## Key words :

Cotton Leaf spot,  
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Cotton is the most important commercial crop which plays a vital role in the national economy. The area under Maharashtra state during 2007-08 was 31.91 lakh ha with the production of 60.00 l bales and productivity of 320 kg lint / ha (Anonymous, 2008). Cotton plant subjects to infection by various fungi, bacteria and viruses which leads to reduction in gross yield and deterioration in quality causing depreciation of market value. Amongst the diseases *Alternaria* leaf blight, *Myrothecium* leaf spot and *Helminthosporium* leaf spot poses an alarming situation in Maharashtra but very less information is available on these aspects. Hence, systemic studies on isolation, pathogenicity of isolated organisms and testing the efficacy of chemical / bioagents in field condition was carried out.

## MATERIALS AND METHODS

A field experiment was conducted during summer 2008 on the farm of All India Coordinated Cotton Improvement Project, Mahatma Phule Krishi Vidyapeeth, Rahuri. Six fungicides and one bioagent *Trichoderma viride* were evaluated to find out effective control measure against the foliar diseases of

cotton. Three sprays were given at fifteen days interval immediately after the appearance of disease.

To carry out the field experiment, fresh specimen of cotton leaf spots were collected, isolation of fungus associated with leaf blight and leaf spot of cotton was made on Potato dextrose agar. The pathogens were grown on Potato dextrose broth (PDB) to study the pathogenicity. The well developed contamination free fungal growth was transferred to agar slants by hyppal tip method to obtain pure culture. The susceptible var. LRA-5166 of cotton was sown in thirty sterilized earthen pots filled with sterilized soil under controlled conditions in glasshouse. Forty five days old plants were used to test the pathogenicity. The pure cultures of *Alternaria macrospora* Zimm., *Myrothecium roridum* Todex ex Fr. and *Helminthosporium spiciferum* (Bain) Nicot were inoculated separately by leaf injury method on the healthy seedlings of cotton var. LRA-5166 under controlled conditions and Koch's postulates were proved. The control plants sprayed with sterilized water only.

The field experiment was carried out with

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eight treatments replicated thrice in Randomised Block Design with plant spacing of 90 x 60 cm. The observations of disease occurrence, per cent disease intensity at fifteen days after last spray and seed cotton yield per plot were recorded.

## RESULTS AND DISCUSSION

The results obtained from the present investigation as well as relevant discussion have been presented under following heads:

### Isolation :

The microscopic examination of the diseased cotton leaves collected from cotton field of AICCIP, MPKV, Rahuri, revealed the presence of spores of *Alternaria*, *Myrothecium* and *Helminthosporium* spp. The pathogens responsible for the leaf spot and blight were isolated on PDA and taxonomically identified as *Alternaria macrospora*, *Myrothecium roridum* and *Helminthosporium spiciferum*. The pathogens responsible for blight and leaf spots were also isolated and reported by Kurundkar and Mayee (1986) and Sharma and Chauhan (1987).

### Pathogenicity :

The pure cultures of *Alternaria macrospora* Zimm., *Myrothecium roridum* Todex ex. Fr. and

*Helminthosporium spiciferum* (Bain) Nicot were inoculated separately by leaf injury method on the healthy seedlings of cotton var. LRA-5166 under controlled conditions. The leaf spots and leaf blight symptoms developed within 8 to 13 days on susceptible cotton var. LRA-5166 and were identical with symptoms of disease as previously observed in the field. Sharma and Chauhan (1987) isolated *Myrothecium* to prove its pathogenicity and Lambhate *et al.* (2002) isolated and proved the pathogenicity of *Alternaria macrospora*.

### Efficacy of fungicides and bioagent against leaf spot in field:

The results of spray treatments of fungicides and bioagents on the disease intensity of leaf spot under field condition are given in Table 1.

#### *Alternaria* leaf blight:

The leaf spots were observed 66 days after sowing. Among the six fungicides and one bioagent *Trichoderma viride* tested against the fungal foliar diseases of cotton revealed that the fungicides Mancozeb (0.3%), Propiconazole (0.1%) and Propineb (0.3%) were significantly superior in reducing the PDI of *A. macrospora* than other fungicides and *Trichoderma* but were at par with each other.

The lowest PDI (13.50%) was recorded in

**Table 1 : Effect of fungicides and bioagent on the severity of major fungal foliar diseases of cotton**

Sr. No.	Treatments	Concentration (%)	<i>Alternaria macrospora</i>		<i>Myrothecium roridum</i>		<i>Helminthosporium spiciferum</i>	
			PDI	PDC	PDI	PDC	PDI	PDC
1.	Chlorothalonil	0.2	18.50 (25.48**)	38.66	17.50 (24.73)	31.76	11.45 (19.73)	40.25
2.	Carbendazim	0.1	25.00 (30.00)	17.10	20.25 (26.71)	21.35	15.06 (22.79)	21.39
3.	Copper oxychloride	0.25	18.25 (25.25)	39.48	12.50 (20.70)	51.45	9.25 (17.66)	51.72
4.	Mancozeb	0.3	13.50 (21.56)	55.23	14.75 (22.55)	42.71	5.50 (13.56)	71.29
5.	Propineb	0.3	15.00 (22.79)	50.26	15.25 (22.95)	40.77	8.50 (16.95)	55.63
6.	Propiconazole	0.1	14.25 (22.14)	52.75	12.00 (20.27)	53.39	6.75 (15.00)	64.77
7.	<i>Trichoderma viride</i>	0.5	21.00 (27.28)	30.37	16.00 (23.28)	37.86	10.00 (18.44)	47.80
8.	Control	--	30.16 (33.27)	--	25.75 (30.46)	--	19.16 (25.91)	--
	S.E. ±		1.31		1.20		1.38	
	C.D. (P=0.05)		3.97		3.65		4.20	

PDI – Per cent disease intensity

PDC – Per cent disease control

\* Average of three replications

\*\* - Figure in parenthesis indicates angular from formed value

**Table 2 : Effect of fungicides and bioagent on seed cotton yield/ha**

Sr. No.	Treatments	Concentration (%)	Yield / plot (kg)	Yield (q/ha)	Per cent increase over control
1.	Chlorothalonil	0.2	4.70	14.50	7.73
2.	Carbendazim	0.1	4.57	14.13	4.98
3.	Copper oxychloride	0.25	5.02	15.49	15.08
4.	Mancozeb	0.3	5.42	16.73	24.29
5.	Propineb	0.3	5.22	16.11	19.68
6.	Propiconazole	0.1	5.40	16.67	23.84
7.	<i>Trichoderma viride</i>	0.5	4.80	14.81	10.02
8.	Control	--	4.36	13.46	--
	Result		Significant		
	S.E. $\pm$		0.250	0.77	
	C.D. (P=0.05)		0.758	2.34	

Mancozeb treatment followed by Propiconazole (14.75%) and Propineb (15.00%). The plots sprayed with *Trichoderma viride* (0.5%) recorded 30.37 per cent control of Alternaria leaf blight disease of cotton.

#### *Myrothecium leaf spot.*

The *Myrothecium* leaf spots were observed 60 days after sowing.

The PDI in different treatments ranged from 12.00 to 25.75 per cent. The highest per cent disease intensity (25.75%) was observed in untreated control plots. All the fungicides and bioagents were found effective in reducing the disease intensity from 21.39 to 71.29 per cent. The lowest PDI (12.00%) was recorded in the plots sprayed with Propiconazole (0.1%) and was at par with Copper oxychloride (12.50 PDI), Mancozeb (14.75 PDI) and Propineb (15.25 PDI). The bioagent *T. viride* (0.5%) was also found effective in reducing the disease intensity by 37.86 per cent.

#### *Helminthosporium leaf spot:*

The intensity of by Helminthosporium leaf spot was low. From the results of Table 1, it was revealed that the highest per cent disease intensity (19.16%) was observed in control plots. All the fungicides and bioagent (*T. viride*) were found effective in reducing the PDI of Helminthosporium leaf spot. Mancozeb (0.3%) sprays were most effective (5.50 PDI) followed by propiconazole (6.75 PDI), propineb and copper oxychloride. All these fungicides were at par with each other and superior over other treatments in the experiment. The bioagent agent *Trichoderma viride* was also found effective in reducing the Helminthosporium leaf spot by 47.80 per cent.

#### *Seed cotton yield:*

The seed cotton yield obtained is presented in Table

2. From Table 2, it is seen that there were significant differences in seed cotton yield among different treatments and ranging from 13.46 to 16.73 q/ha. The maximum seed cotton yield (16.73q/ha) was recorded in the plots of treatment of Mancozeb (0.3%) and was at par with Propiconazole (16.67 q/ha), Propineb (16.11 q/ha) and Copper oxychloride (15.49 q/ha). The lowest yield (13.46 q/ha) was recorded in control treatment.

The results obtained during the present study were in agreement with the results of Desai *et al.* (1981), Jangra *et al.* (1995), Chattanavar *et al.* (2000), Zanjare *et al.* (2005), Akbari and Parakhia (2007) and Govindappa *et al.* (2008).

#### **Conclusion:**

The efficacy of chemical fungicides and bioagent in field condition revealed that Mancozeb (0.3%), Propiconazole (0.1%), Propineb (0.3%), Copper oxychloride (0.25%) and *Trichoderma viride* were effective in reducing the leaf blight and leaf spot diseases (Alternaria leaf blight, Myrothecium leaf spot and Helminthosporium leaf spot) of cotton thus increasing the seed cotton yield.

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