

EVALUATION OF BIOCONTROL AGENTS AGAINST *COLLETOTRICHUM GOSSYPII* CAUSING AN ANTHRACNOSE OF COTTON

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A total of five isolates of antagonistic fungi viz. *Aspergillus niger*, *A. flavus*, *Trichoderma viride*, *T.harzianum* and *Penicillium oxalicum* were tested for antagonism against *Colletotrichum gossypii* causing anthracnose of cotton by dual culture method. Isolates varied in growth rate and efficacy to inhibit the growth of the pathogen. There was little difference among the isolates in causing inhibition of the pathogen after 3rd day of incubation in dual culture, but significant difference appeared on 5th day of incubation. Fast growing isolates were better than slow growing isolates inhibiting the growth of the pathogen in dual culture. Among the isolates *Trichoderma viride* and *T.harzianum* found to be most promising antagonist inhibiting mycelial growth of the pathogen since 3rd day of incubation.

Keywords : Antagonist; *Colletotrichum gossypii*; Cotton, Rhizosphere; *Trichoderma*.

Cotton (*Gossypium* spp.) is one of the most important cash crop of Vidarbha region of Maharashtra state, India. Cotton is cultivated in more than 70 countries of the world with total area of 34 million hectare. India now produces around 242.50 lack bales of cotton ranging from short staple to extra long staple from an area of 88.17 lack hectares with productivity of 465 kg/ha¹. In Maharashtra, the area under cotton cultivation is 31.33 lack hectares with production of 62.00 lack bales and average productivity of 312 kg/ha while in Vidarbha region cotton is grown on an area of 13.00 lacks hectares with production of 27 lack bales².

However, the production potential of the crop has not been fully exploited due to several environmental factors. The cotton crop suffers from several bacterial, viral and fungal diseases, of which foliar diseases take a heavy toll. Among the fungal diseases Alternaria blight, anthracnose, Cercospora leaf spot, Fusarium wilt, Grey mildew, Myrothecium leaf spot, are important ones. An anthracnose disease of cotton caused by fungal pathogen *Colletotrichum gossypii* reported from most of the varieties in Amravati region of Vidarbha.

Moreover, the widespread use of chemicals has become a subject of public concern mainly due to their potential harmful effects on non-target organisms, the development of resistant races of pathogen and pollution of the environment. Therefore in the present investigation, biological control is used as an alternative strategy for disease management.

a) *Isolation of pathogen*-Infected leaves of cotton were collected from various cotton fields of Amravati region.

Colletotrichum gossypii was isolated from diseased leaves and maintained on PDA slants. PDA was employed to maintain pure culture of isolated fungus. The isolate were identified from available literature. Pathogenecity test was confirmed in laboratory on potted cotton plants by Koch's postulate method.

b) *Isolation of antagonists*- Antagonistic fungi were collected from the rhizosphere of cotton plants during rainy season by serial dilution method³. Only five fungi were selected for antagonistic study viz. *Aspergillus flavus*, *A.niger*, *Trichoderma harzianum*, *T.viride* and *Penicillium oxalicum*.

c) *Antagonistic study* -The dual culture method was adopted to observe the antimycotic effect of different isolates of the test antagonists. Test antagonists were screened against the pathogen *Colletotrichum gossypii* in dual culture on potato dextrose agar in petriplates. Autoclaved PDA medium was poured into petriplates and allowed to solidify. 5 mm disc of antagonist and pathogen were inoculated 4 cm apart on PDA in petriplates in which pathogen was placed in centre. In control only disc of pathogen was inoculated. The petriplates were inoculated at 27±1°C. The radial mycelia growth of the fungi was measured on 3rd, 5th and 7th day of incubation and compared with control. The percent of inhibition was calculated by using formula-

$$\text{Per cent inhibition} = \frac{\text{TFC-TFTr}}{\text{TFC}} \times 100$$

Where, TFC= Test fungus in control

Table 1. Effect of different antagonists on radial mycelial growth of *Colletotrichum gossypii*.

Sr. No.	Antagonistic fungi	Radial mycelial growth (mm)			% growth inhibition		
		3 DAI	5 DAI	7 DAI	3 DAI	5 DAI	7 DAI
1	<i>Aspergillus flavus</i>	11.00	0.00	0.00	63.33	100.00	100.00
2	<i>Aspergillus niger</i>	17.00	8.00	0.00	43.33	80.95	100.00
3	<i>Trichoderma viride</i>	9.00	0.00	0.00	70.00	100.00	100.00
4	<i>T. harzianum</i>	10.00	0.00	0.00	66.66	100.00	100.00
5	<i>Penicillium oxalicum</i>	20.00	11.00	0.00	33.33	73.80	100.00
6	Control	30.00	42.00	52.00	-	-	-

DAI - Days After Incubation.

TFTr= Test fungus in treatment.

The pathogen *Colletotrichum gossypii* showed significant variation in linear growth in the presence of different antagonist in dual culture method. In the beginning both pathogen and antagonists grew with same speed and little difference was observed among the isolates in causing inhibition of *C. gossypii*. But from 3rd day of incubation significant growth inhibition was observed (Table 1). Maximum inhibition was observed in the presence of *Trichoderma viride* (70%) and *T.harzianum* (66.66%) on 3rd day of incubation followed by *Aspergillus flavus* (63.33%). Slow growing isolates *Penicillium oxalicum* (43.33%) and *Aspergillus niger* (33.33%) found to be least effective in reducing the growth of the pathogen. Among the various isolates *Trichoderma viride* and *T. harzianum* showed maximum overlapping of the pathogen. The minimum overlapping of the mycelium was shown by *Aspergillus niger* followed by *Penicillium oxalicum*. Fast growing isolates caused more inhibition of pathogen probably due to lysis, mycoparasitism, antibiosis and competition for food.

Upadhyay and Mukhopadhyay⁴ noted that *Trichoderma* spp. produces extracellular enzymes $\beta(5,3)$ gluconase and chitinase which are capable of degrading cell walls pathogenic fungi. Sonawane and Pawar⁵ reported that *Trichoderma* was highly effective in controlling the vegetative growth of the pathogen.

Jamdade⁶ studied the antagonistic properties of various species of *Trichoderma* against *Colletotrichum capsicii* and pointed that *T.viride* found to be most effective antagonist caused growth inhibition from the beginning.

Arumugam *et al.*⁷ studied the antagonistic effect of *Trichoderma harzianum*, and isolated the enzyme chitosanase. Therefore from these results it is obviously clear that enzyme secreted by the antagonist shows potential antimycotic property which inhibit the growth of pathogen.

The present study indicates that management by potential biocontrol agent like *Trichoderma* is effective against pathogen *Colletotrichum gossypii*. Management of pathogen by using biocontrol method is eco-friendly, non-hazardous and safe to environment.

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