JOURNAL OF PURE AND APPLIED MICROBIOLOGY, April 2009. Vol. **3**(1), p. 285-287

Biocontrol Agents of White Rot Fungi *Phanerochaete chrysosporium*

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(Received: 21 October 2008; accepted: 05 December 2008)

Phanerochaete chrysosporium **degrade both cellulose and lignin and to cause separation of cells into fibers. This biocontrol method is carried out by dual culture method. The antagonistic effect of fungi such as *Trichoderma viridae* and *Aspergillus niger* against *P. chrysosporium* were analysed. In this study *T. viridae* highest control the pathogen, while *A. niger* moderately control the pathogen. The bacterial antagonist such as *Bacillus subtilis, Pseudomonas fluorescens, Enterobacter aerogenes* and mixed culture of bacteria were effectively control the pathogen. So these organisms were used as biocontrol agents against wood degrading basidiomycete *P. chrysosporium***

Keywords: Biocontrol agents, white rot fungi, *Phanerochaete chrysosporium*.

The biological and biochemical control systems are needed for the preservation of wood decay. The term biological control has been applied in a sense to cover the use of any organism to control the pathogen. This definition includes host plant resistance as a natural and highly effective form of biological control. White rot fungi (WRF) degrade both cellulose and lignin by secretion of cellulolytic and lignolytic enzymes. They decompose lignin of middle lamella sufficiently to cause separation of cells into fibers. *P. chrysosporium a* WRF under nitrogen limiting condition secretes at least six extra cellular lignin peroxidase and four manganese dependent peroxidase (MNP) enzymes (Kirk and Shimida, 1985).

These processes of biocontrol have been used by dual culture method. Colony interaction between the test pathogen and soil fungi were studied *in vitro* dual culture method (Skidmore and Dickinson, 1976). The test organism namely *P. chrysosporium* and the individual sp. of bacteria such as *B. subtilis, P. fluoresencs, E. aerogens* and mixed culture of bacteria were used.

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MATERIAL AND METHODS

The PDA medium and Rose Bengal medium were used for isolating fungal antagonists and Trypticase soy agar and nutrient agar were used for isolating bacterial antagonists. Microorganisms were obtained from (MTCC) Institute of Microbial Technology, Chandigarh, India.

Antagonistic properties of bacteria strains such as *P. fluorescens*. *B. subtilis E.aerogens* and mixed culture of bacteria were tested against *P. chrysosporium* on TSA and nutrient agar plates. Agar blocks (6 mm) of bacterial strains were placed at 2 cm just opposite side of the pathogen. These plates were incubated at 37ºC for one day.

Antagonistic properties of fungal strain such as *T. viridae* and *A. niger* were tested against *P. chrysosporium* and PDA and Rose Bengal medium plates using a dual culture technique. Agar blocks (6 mm) containing 5 days old mycelium of *P. chrysosporium* were placed at the centre of PDA plates and the agar blocks of

T. viridae were placed on PDA plates at 2 cm just opposite to the pathogen. Similarly *A. niger* was placed on PDA plates at 1 cm just opposite to the pathogen. These plates were incubated at 25ºC for 5 days.

RESULTS AND DISCUSSION

Bacterial and fungal antagonism is usually characterized as the mechanism that enables early consists of substrates to successfully gain to inhibit the invasion of other fungi.

Table 1. Antagonistic effect of bacteria and fungi against *P. chrysosporium* in different mediums

S. No.	Organisms	Zone of Inhibition (mm)			
		NA	TSA	RBM	PDA
1.	*P. fluorescens*	29.5±0.25	21.5±0.57	-	-
2.	*B. Subtilis*	28±0.72	27.5±0.95	-	-
3.	*E. aerogenes*	30±0.93	30±6.25	-	-
4.	Mixed bacterial culture	35±1.5	33±0.25	-	-
5.	*T. Viridae*	-	-	36±0.5	37±0.79
6.	*A. niger*	-	-	20±0.79	19±1.25

Values are mean ± indicates *S.E* ; NA= Nutrient Agar; TSA= Trypticase Soy Agar; RBM= Rose Bengal Medium; PDA= Potato Dextrose Agar.

The toxic metabolites produced by initial fungal and bacterial colonies of natural substrates may act to slow (or) present invasion by other sp. (Biswas 1999; Biswas and Das ,1999). *Rhizobacterium* strains such as *Pseudomonas, Burkholderia* and *Bacillus* sp. have been used to reduce the diseases caused by a variety of pathogens (Weller and Cook, 1983; Weller, 1988; Hebber *et al*., 1992).

Trichoderma sp. produce toxins and enzymes such as viridine or gliotoxin and chitinase enzyme, which said to be antagonistic to several pathogenic fungi. In this present study *T. viridae* highest inhibit the *P. chrysosporium*. *A. niger* moderately inhibit the growth of *P. chrysosporium.* These species produce certain alcohol and toxins. *P. fluorescens,*

B. subtilis, E. aerogenes and mixed culture were degrading the fungal cell wall by secreting or producing enzymes like chitinase and ß 1, 3-glucanase. These enzymes are responsible for the maximum inhibition of *P. chrysosporium*. Several strains of *P. fluorescens* have been tested in plot and field trails for the control of soil born fungal pathogens (Singh *et al.,* 1999).

Enterobacter sp. was showed high chitinase production. It is used as antifungal biocontrol agents for the control of fungal plant pathogens (Vyas, 2004). In this present investigation *B. subtils, P.fluorescens. E. aerogens* and mixed culture of bacteria

T. viridae were effectively control the *P. chrysosporium.* But *A. niger* moderately controls the pathogen *i.e. P. chrysosporium* (Table 1).

ACKNOWLEDGMENTS

We acknowledge Dr.V. Dhivaharan, Secretary, STET Women's College, Mannargudi for his support and encouragement during the study. We sincerely express our thanks to the Chief Editor and an anonymous referee for their valuable comments on the manuscript.

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