

## Antagonistic interaction between *Fusarium oxysporum* var. *cumini* and *Aspergillus niger*

**Authors:**  
Sameer Sharma

**Institution:**  
Microbiology, Plant  
pathology and Mycology  
Laboratory,  
Department of Botany,  
J.N.V. University, Jodhpur  
(Raj.)

**Corresponding author:**  
Sameer Sharma

**Email:**  
sam23112@gmail.com

**Phone No:**  
09460649016

**Web Address:**  
[http://jresearchbiology.com/  
Documents/RA0159.pdf](http://jresearchbiology.com/Documents/RA0159.pdf)

### ABSTRACT:

Antagonists are microorganisms that adversely affect another pathogen growing in association with it. *Aspergillus niger* have long been known as effective antagonists against plant pathogenic fungi and are the focus of much recent research. The antagonism between *Aspergillus niger* and *Fusarium oxysporum* var. *cumini* and the possible mechanism (s) of antagonism employed by *Aspergillus niger* when isolated from *Capsicum annuum* rhizosphere were investigated. *Aspergillus niger* was most effective, in causing significant suppression of growth and spore formation of *Fusarium oxysporum* var. *cumini* in plates and pots. *Aspergillus niger* was mycoparasitic on *Fusarium oxysporum* var. *cumini* and their hyphae grew over the hyphae of *Fusarium oxysporum* var. *cumini*. There was evidence that the mechanism of antagonism employed by *Aspergillus niger* were competition, lysis, penetration and hyperparasitism.

### Keywords:

Antagonism, *Aspergillus niger*, *Fusarium oxysporum* var. *cumini*.

### Article Citation:

Sameer Sharma  
Antagonistic interaction between *Fusarium Oxysporum* var. *cumini* and  
*Aspergillus niger*  
Journal of research in Biology (2012) 1: 032-034

### Dates:

**Received:** 01 Dec 2011 / **Accepted:** 07 Dec 2011 / **Published:** 23 Jan 2012

© Ficus Publishers.

This Open Access article is governed by the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/2.0>), which gives permission for unrestricted use, non-commercial, distribution, and reproduction in all medium, provided the original work is properly cited.

### Body of the Article

Antagonistic interaction is a natural phenomenon present in any habitat which is governed by biological balance present in the community. Any inhibitory effect of an organism created by any means to the other organism is known as antagonistic interaction. Such type of interaction is used in biological control of plant pathogen. Antagonism is the balancing wheel of the nature and through this mechanism some shorts of biological balance or equilibrium is maintained (Dubey and Maheshwari 1999).

*Cumin cyminum* (Jera) is an important cash crop of Rajasthan but it is often attacked by fungus *Fusarium oxysporum* var. *cumini* causing wilt of cumin. Large number of fungicides has been developed to control the fungus but use of synthetic fungicides causes residual toxicities. Therefore, there is an urgent need to develop new and effective means for controlling the fungus that posses less risk to human health and the environment. Antagonistic interaction through biocontrol is a new system of controlling various diseases. Now a days various biocontrol agents are identified like *Trichoderma* (Durrel 1968, Mukhopadhyay and Mukherjee 1996), *Aspergillus niger* (Sen 2000).

In present work *Aspergillus niger* was isolated from *Capsicum annum* rhizosphere which was evaluated *in vitro* and *in vivo* to assess their mode of antagonistic against Cumin wilt pathogen *Fusarium oxysporum* var. *cumini*.

### MATERIALS AND METHODS

For *in vitro* experiment dual culture method described by Dennis and Webster (1971) was used to test the antagonistic ability of *Aspergillus niger* against *Fusarium oxysporum* var. *cumini*, using the PDA medium. Both the fungus was grown on PDA media for seven days at  $28 \pm 2^{\circ}$  C. After that 10 mm. discs were cut by cork borer from both the fungal petriplates and placed on fresh PDA plate on the two different poles. It was termed as antagonistic dual culture (Plate no. 1 a). Further, disc petriplate were allowed to grow both fungi for seven days. Three replicates were maintained for this experiment. For microscopic examination of the mycelium small cut was given at the zone of interaction and then mycelium was stained by cotton blue & mounted in lacto phenol. For *in vivo* experiment pot experiment was conducted.

### RESULTS AND DISCUSSION

After seven days incubation, antagonistic

interaction was observed. It was observed that the growth of *Fusarium oxysporum* var. *cumini* was reduced and *Aspergillus niger* grown well and mycelium has captured the *Fusarium oxysporum* var. *cumini* from all the side (Plate no. 1 ab). Different types of observations were observed in the fugal interaction. Plate no. 1 photograph **b<sub>1</sub>** showed chlamyospore formation in the *Fusarium oxysporum* var. *cumini* hyphae. Chlamyospore are formed when any fungus comes under stress. They are asexual spores and can survive for longer time and to save from the antagonist fungus, host cell produces chlamyospore. This was clearly observed in the present investigation.

The another type of antagonist interaction was observed (Plate no. 1, **b<sub>2</sub>**) where host mycelium showed lysis as well as chlamyospore formation. It was clearly observed that at certain places, it showed constriction of hyphae ultimately break down from this place. It was observed by various workers Siven & Chet (1982), Liu & Baker (1986) that metabolites are secreted by antagonist. The secretion of enzymes is the important factor.

Observations from microphotograph (plate no. 1, **b<sub>3</sub>**) showed that two phenomenon are clearly visible that is lysis of host mycelium as well as

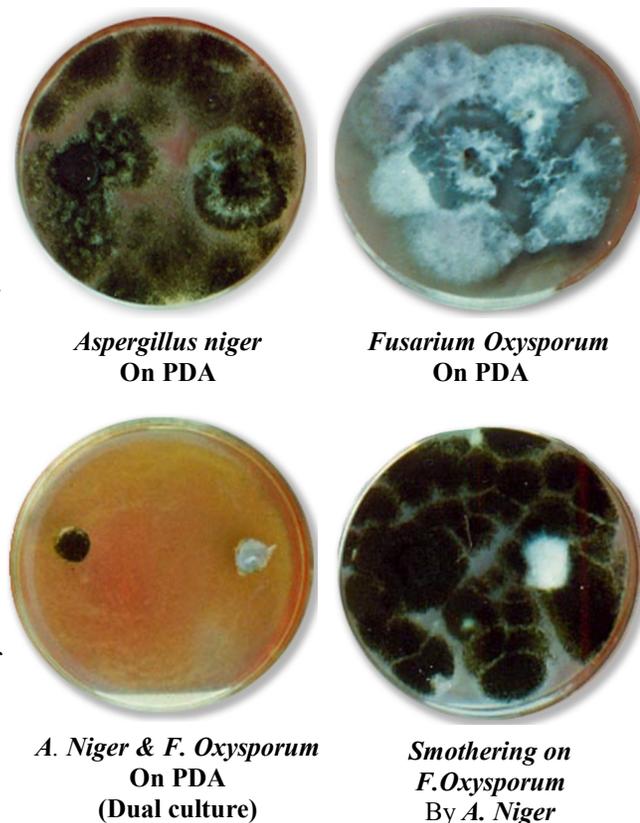
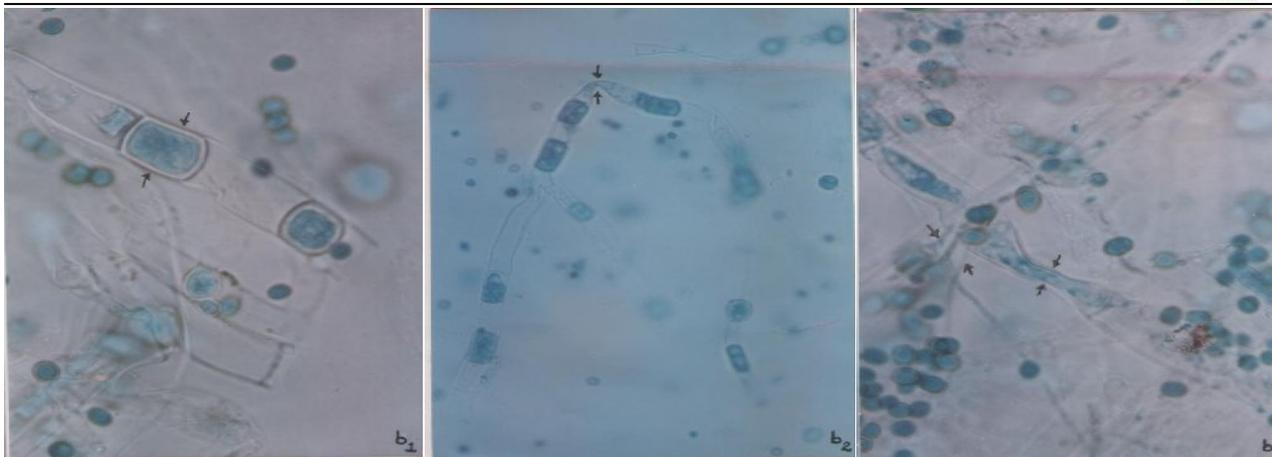


Plate no. 1 a



**b. Mycoparasitism showing post infection events in antagonist & host hyphae.**

**b1 Chlamydospore formation in host hyphae**

**b2 Lysis of host hyphae**

**b3 Penetration of antagonist in host hyphae.**

penetration of antagonist fungus in the host mycelium. These antagonisms also check the growth of the fungus.

When experiment was conducted *in vivo*. *Aspergillus niger* inhibited the *Fusarium oxysporum* var. *cumini* and plant showed no symptoms of wilting. This observation of biocontrol of *Fusarium oxysporum* var. *cumini* by *Aspergillus niger* is first report from Rajasthan (India).

## CONCLUSION

Interaction of fungal form for biological control is a new method for controlling diseases. In the present investigation, attempts have been made by interacting *Aspergillus niger* (potent antagonist) with the *Fusarium oxysporum* var. *cumini*, better suppression of the host was noted by formation of chlamydospore, penetration of antagonist hyphae into host hyphae and lysis of host hyphae are important findings of present investigation.

## ACKNOWLEDGEMENT

I wish to thanks Dr. V.G. Rao and Dr. Alka Pande Scientist in charge, Agharkar research institute, Pune for the identification of many of my research materials.

## REFERENCES

**Dennis C, Webster J. 1971.** Antagonistic properties of species groups of *Trichoderma* 1. Production of non- volatile antibiotics. Trans. Brit. Myco. Soc., 57:25-39.

**Dubey RC, Maheshwari DK. 1999.** A text book of

Microbiology. S. Chand and Co. Ltd. India. 552-560.

**Durrell LM. 1968.** Hyphal invasion by *Trichoderma viride* Mycopath. Mycol. App., 35:138-144.

**Liu S, Baker R. 1986.** Mechanism of biological control in soil suppressive to *Rhizoctonia solani*. Phytopatho., 70:402-412.

**Mukhopadhyay AN, Mukherjee PK. 1996.** Fungi as fungicides. Internati. J Tropi. Pl. Dis., 14(1):1-17.

**Sen B. 2000.** Biological Control: A success story. Ind. Phytopatho., 53(3):243-249.

**Siven A, Chet I. 1982.** Biological control of *Phythium* by *Trichoderma*. Phytopathology 72-118.

**Submit your articles online at Ficuspublishers.com**

### Advantages

- Easy online submission
- Complete Peer review
- Affordable Charges
- Quick processing
- Extensive indexing
- Open Access and Quick spreading
- You retains your copyright

submit@ficuspublishers.com

www.ficuspublishers.com/submit1.aspx.

**FicusPublishers**