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# *In vitro* Effect of Culture Filtrates of *Chaetomium Globosum* on Growth of Soil Borne Pathogens

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**A B S T R A C T**

In *in vitro* evaluation of cultural extract of *Chaetomium globosum* against *Fusarium*, *Sclerotium* and *Rhizoctonia*, it was observed that inhibition of pathogen was increased with increase in concentration of metabolite indicating the antifungal properties against pathogen. *Chaetomium globosum* showed maximum antagonistic effect to *Fusarium* (51.50%) at 100% concentration. Significantly minimum inhibition zone (20%) was observed at 25% for *Fusarium spp*. Effect of culture filtrate did not show any inhibition effect against soil borne pathogens *Sclerotium* and *Rhizoctonia.*

## Introduction

Biological control of plant pathogens is currently accepted as a key practice in sustainable agriculture because it is based on the management of natural resources, *i.e*. certain rhizosphere organisms, common components of ecosystems, known to develope antagonistic activities against harmful organisms. Soil borne disease organisms are widely found in soil. As a group, they can affect a wide range of plants, including fruits and vegetables, ornamental plants, trees, and shrubs. Common names for plant disease often reflect the visual damage to the plant but do not necessarily indicate the pathogen responsible for the disease.

For example, seedling damping-off, the condition when seedlings die or fall over can occur in most vegetables and can be caused by *Pythium, Phytophthora, Rhizoctonia, Fusarium, Sclerotium,* or any combination of these. Identification of symptoms of root

diseases include wilting, dieback, browning or rotting of tissues, and cankering. *Chaetomium* is a genus belonging to the class Pyrenomycetes (Ascomycotina), order Sordariales and family *Chaetomiaceae.* It is a dematiaceous (dark-walled) mold normally found in soil, air, and plant debris.

There are about 95 species in the widespread genus (Kirk *et al.,* 2008). Members of this genus typically have superficial, ostiolar perithecia, covered in hairs. Asci are often clavate and evanescent, bearing eight spores.

*Chaetomium globosum* strains are saprobic organisms and their ability to suppress plant pathogens resulted to induced growth, and high yield of the plant (Sibounnayong *et al.*, 2005). *Chaetomium* species can be found in leguminous plants like peanuts and mungbean and also on graminous plants like rice.

A gene of *Chaetomium globosum,* 46-kDa codes for an endokinase (chi46) that degrades cell walls of plant pathogens *Rhizoctonia solani, Fusarium oxysporum, Sclerotinia sclerotiorum, Valsa sordida, S. tritici* and *Phytophthora sojae* (Liu *et al.,* 2008).

Growers need to know which treatments are most effective for their specific problems and growing conditions in order to prevent needless expenses, ineffective treatments, and crop losses. In 2009, soil borne pathogens were responsible for an estimated 10% of losses in vegetable crops.

Because fungicide use is not consistently effective, economical, ecologically desirable (due to environmental and worker exposure concerns), or commercially desirable while production of pesticide-free or organic crops can increase crop value by 30%, biological control and plant growth promoting agents should be considered key management components (Anonymous 2012).

## Materials and Methods

### Effect of culture filtrates / metabolites of *Chaetomium globosum* on growth of soil borne pathogens by filter paper disc method

The effect of culture filtrates of *Chaetomium globosum* was studied under *in vitro* conditions. The basic view was to evaluate the metabolites of *Chaetomium* for the control of soil borne pathogens. The fresh culture of *Chaetomium* was prepared and inoculated in 100 ml PD broth. These inoculated broth containing conical flasks were incubated for 15 days at room temperature.

After 15 days of incubation the culture extracts were filtered through G4 filter paper. Then these extracts were stored in sterile conical flask for further use. Antifungal activity of the culture extracts was evaluated using paper disc method. Half litre of PDA medium was prepared in one litre Borocil flask, and equally distributed in five 100 ml capacity flask and autoclaved. Further it was allow to cool to 48-50$^0$C and fungus suspension of *Fusarium, Sclerotium and Rhizoctonia* respectively were added to each flask containing warm media and was quickly poured into petriplates and allowed to solidify.

Paper discs of 5 mm diameter cut from G4 filter paper get sterilized and loaded with aqueous extract of metabolite. The loaded discs were kept onto the surface of the petriplates containing fungus seeded PDA medium. Paper disc without metabolite served as check. Each treatment was replicated seven times. The plates were incubated at 28 ± 2$^0$C for 48 hrs. The inhibition zone/lysis of fungus pathogen around the paper disc was measured with a millimetre scale. Accordingly, culture extract or metabolites of isolates were evaluated.

## Results and Discussion

Data pertaining to sensitivity of *Fusarium*, *Sclerotium* and *Rhizoctonia* to culture extracts of *Chaetomium globosum* at various concentration *viz*., 25%, 50%, 75% and 100% are presented in Table 1 and Plate no.1 which revealed that inhibition of growth of pathogen was significantly different due to different concentration of metabolites/culture extracts. Out of three test pathogens viz, *Fusarium*, *Sclerotium* and *Rhizoctonia*, *Fusarium* showed maximum inhibition zone (51.50%) at 100% concentration of *Chaetomium* culture extracts. Significantly minimum inhibition zone (20%) was observed at 25% for *Fusarium spp*. only. The inhibition of *Fusarium* was increased with increase in concentrations of culture filtrate. Effect of culture filtrate did not show any inhibition effect against soil borne pathogens *Sclerotium* and *Rhizoctonia* (Fig. 1).

**Table.1** Effect of culture filtrate/metabolites on growth of soil borne pathogens

| Sr. No | Treatment | Effect of culture filtrate of *Chaetomium* | | | | | |
|---|---|---|---|---|---|---|---|
| | | ***Fusarium*** | | ***Sclerotium*** | | ***Rhizoctonia*** | |
| | | Mean Growth (mm) | Inhibition % | Mean Growth (mm) | Inhibition % | Mean Growth (mm) | Inhibition % |
| **1** | *Chaetomium* 25% | 72 | 20 | 90 | 00 | 90 | 00 |
| **2** | *Chaetomium 50%* | 65 | 27 | 90 | 00 | 90 | 00 |
| **3** | *Chaetomium 75%* | 51.3 | 43 | 90 | 00 | 90 | 00 |
| **4** | *Chaetomium 100%* | 43.6 | 51.5 | 90 | 00 | 90 | 00 |
| **5** | Control | 90 | 00 | 90 | 00 | 90 | 00 |
| **7** | SE (±) | 1.34 | 00 | 00 | 00 | 00 | 00 |
| **8** | CD @ 5% | 3.69 | | NS | | NS | |

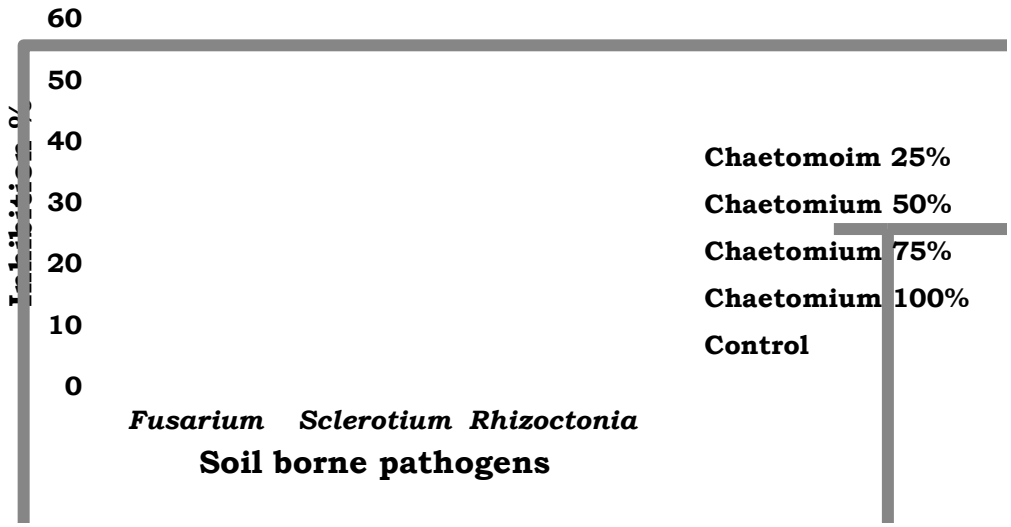
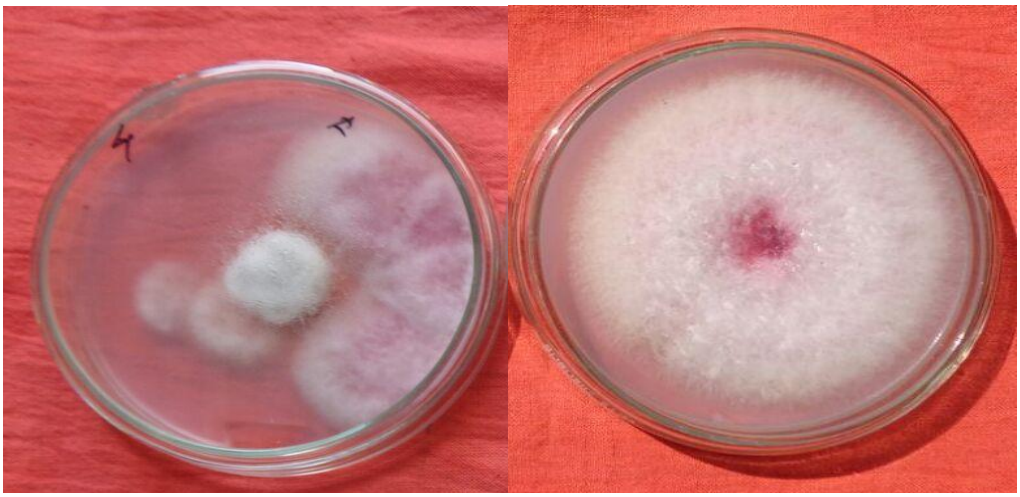
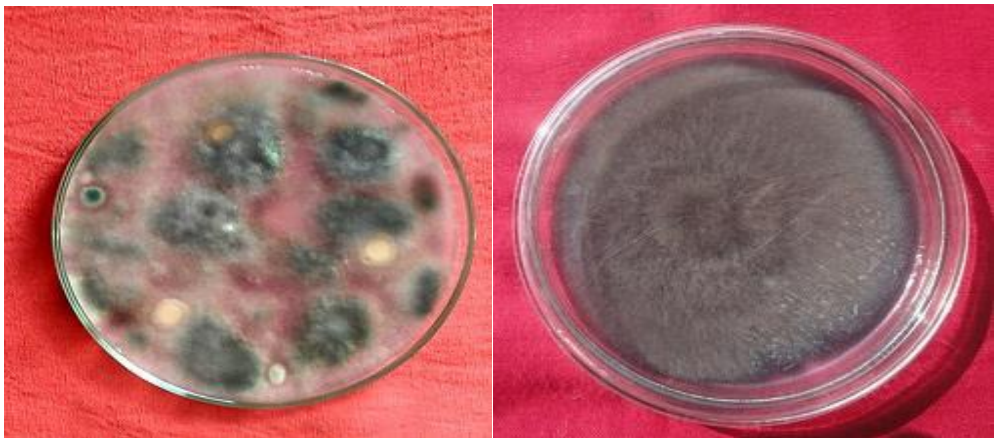



**Fig.1** Effect of culture filtrates /metabolites of *Chaetomium* on growth of soil borne pathogens



Treatment Control

**Plate.1a** Effect of culture filtrates/ metabolites of *Chaetomium* on growth of *Fusarium* spp.



Treatment Control

**Plate.1b** Effect of culture filtrates/ metabolites of *Chaetomium* on growth of *Rhizoctonia* spp.

Treatment Control

**Plate.1c** Effect of culture filtrates/metabolites on growth of *Sclerotium* spp.

**Plate.1** *In vitro* effect of culture filtrate of *Chaetomium globosum* against soil borne pathogens

This concluded that the culture extract of *Chaetomium globosum* contain some unknown chemicals which inhibit the growth of *Fusarium* spp. *Chaetomium globosum* can be used as a biocontrol agent against *Fusarium* spp. in future.

Tomilova *et al.,* (2006) studied the effect of a *Chaetomium* fungi on the growth of phytopathogenic fungi *viz., Rhizoctonia solani* and *Fusarium oxysporum* and observed inhibitory effect of the preparation under study depended on its concentration, duration of storage, and growth characteristics of pure cultures of the phytopathogens.

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