



## **Efficacy of *Trichoderma viride* isolates against *Aspergillus niger* inciting collar rot in peanut (*Arachis hypogaea* L.)**

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### **ABSTRACT**

*Peanut (Arachis hypogaea L.) commonly known as groundnut, is one of the world's major legume oil seed crop, which is succumbed to many diseases. Among, collar rot caused by Aspergillus niger is one of the economically significant disease that limit groundnut production and productivity. Many cultivars of groundnut are susceptible to this disease and many fungicides were reported to be effective against collar rot of groundnut, but limited work has been done on exploitation successful bio-control agents. So, an in-vitro study was conducted to recognize the efficacy of different isolates of Trichoderma viride against Aspergillus niger. Among the isolates tested, it was observed that, maximum per cent inhibition (71.00%) of mycelial growth was observed in T. viride-3 isolate of chirala followed by Ponnur isolate T. vride-4 with 62.00 per cent inhibition. Isolates of T. vride-1 and T. viride-2 were on par with each other with per cent inhiition of mycelial growth 52.00% and 55.30% respectively. Whereas, least per cent (32.52%) inhibition of mycelial growth was recorded in isolate T. vride-5 of Repalle.*

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### **INTRODUCTION**

Peanut (*Arachis hypogaea* L.) commonly known as groundnut is one of the world's major legume oil seed crop originated from Brazil. Grover (1981) mentioned more than 55 pathogens in groundnut crop. Among, few diseases collar rot (*Aspergillus niger*) is economically significant in India that limit groundnut production and productivity.

The *A. niger* causing collar rot disease on groundnut seedlings was first reported by Jochem (1926). In India, Jain and Nema (1952) first reported the *Aspergillus* blight of groundnut caused by *A. niger* and causes an average 5 to 40 per cent loss. Collar rot is a more serious problem in sandy soil (Gibson 1953). In Punjab of India, the losses of peanut plants due to *A. niger* may amount to 40 to 50 per cent (Aulakh and Sandhu 1970). Joshi (1969) surveyed groundnut growing areas in the state Gujarat of India and found that, as high as 50 per cent seedling blight in some fields.

Many cultivars of groundnut are susceptible to this disease. Many fungicides were reported to be effective against collar rot of groundnut (Gangopadhyay *et al.* 1996). But limited work has been done on exploitation successful bio-control agents, for the management of collar rot disease. *Trichoderma viride* have been used as biological control agents against soil-borne plant pathological fungi (Kucuk and Kivank 2003). The main objective of the present study was to find an, *in-vitro* efficacy of different *Trichoderma viride* isolates collected in and around Guntur district of Andhra Pradesh.

### **MATERIAL AND METHODS**

#### **Isolation of *Aspergillus niger***

Groundnut plants which showed typical symptoms of collar rot, were cut into small bits using a sterilized blade. The pure pathogen culture (*A. niger*) was made by the hyphal tip isolation method (Sinclair and Dhingra 1985) on the PDA medium in petri plates. A typical black mycelium (conidia) growth of *A. niger* was observed after 72 h of incubation, at 28±2°C, in an incubator. This was maintained throughout the study by periodical transfers on (PDA) medium under aseptic conditions, to keep the culture fresh and viable.

#### **Isolation of *Trichoderma viride***

Various isolates of *Trichoderma viride* were isolated from rhizosphere of different regions in and around Guntur district (A.P, India). For isolation of *Trichoderma viride*, a serial dilution technique was followed and a  $10^3$  dilution of each sample was prepared. One millilitre of each solution was pipetted onto a Rose Bengal Agar (RBA) plate and incubated at  $28\pm 2^\circ\text{C}$  for 1 week. The culture plates were examined daily and each colony that appeared was considered to be one colony forming unit (cfu). After enumeration of cfu, individual colonies were isolated from the plates of different regions. Distinct morphological characteristics were observed for identification of *Trichoderma viride* from other *Trichoderma* spp. Two techniques, visual observation on petri dishes and micro-morphological studies in slide culture, were adopted for identification of *Trichoderma* species. For visual observation, the isolates were grown on PDA agar for 3-5 days. The mode of mycelia growth, colour, odour and changes of medium colour for each isolate were examined every day. For micro morphological studies, a slide culture technique was used (Leahy *et al.*, 1990). Examination of the shape, size, arrangement and development of conidiophores or phialides provided a tentative identification of *Trichoderma* spp. and the plates were stored at  $4^\circ\text{C}$ .

Sl. No.	Name of Isolate	Place
1	<i>Trichoderma viride</i> -1	Agricultural College, Bapatla
2	<i>Trichoderma viride</i> -2	Agricultural College Form, Bapatla
3	<i>Trichoderma viride</i> -3	Chirala
4	<i>Trichoderma viride</i> -4	Ponnur
5	<i>Trichoderma viride</i> -5	Repalle

### ***In vitro* antagonism between isolates of *Trichoderma viride* and pathogen (*A. niger*)**

For this study, the dual culture technique was used to test the antagonistic effect of 5 isolates of *T. viride* against *A. niger* on PDA media. A 5 mm in diameter mycelial disc, from each *T. viride* isolate and test fungus (*A. niger*) were placed on PDA medium in the same petri plate, approximately 7 cm away from each other. The experiment was conducted in four replications for each antagonist. All the inoculated plates were kept for incubation at a temperature of  $28\pm 2^\circ\text{C}$ . After six days, the plates were observed for growth of antagonist and test fungus. Index of antagonism as per cent growth inhibition of *A. niger*, was determined by following the method of Watanabe (1984).

### **RESULTS**

The antagonistic effect of different *T. viride* isolates against *A. niger* were tested *in-vitro* and results were presented in table 1 and figure 2 and plate 1. The interaction data was recorded after full growth mycelia in control plates of both the test and bio-control organisms (*A. niger* and *T. viride*) and analysed statistically.

There was a significant difference observed among all the isolates of *T. viride* against *A. niger*. Among the isolates tested, maximum per cent inhibition (71.00%) of mycelial growth was recorded in *T. viride*-3 isolate of Chirala followed by *T. viride*-4 with 62.00 per cent inhibition. Isolates of *T. viride*-1 and *T. viride*-2 were on par with each other with per cent inhibition of 52.00 and 55.30 respectively. Whereas, least per cent (32.52%) mycelial inhibition of *A. niger* recorded on *T. viride*-5 of Repalle.

Sl. No.	Isolates	Mean per cent growth inhibition of <i>A. niger</i>
1	<i>T. viride</i> -1	52.01 (55.50)*
2	<i>T. viride</i> -2	55.30 (59.00)
3	<i>T. viride</i> -3	71.00 (79.00)
4	<i>T. viride</i> -4	62.00 (66.62)
5	<i>T. viride</i> -5	32.52 (33.33)
<b>C.D. at 1%</b>		<b>3.373</b>
<b>SE(m)±</b>		<b>1.109</b>
<b>C.V. %</b>		<b>3.807</b>

Table 1. Mean per cent mycelial growth inhibition of *Aspergillus niger*

\*Values in parenthesis are arcsine transformed

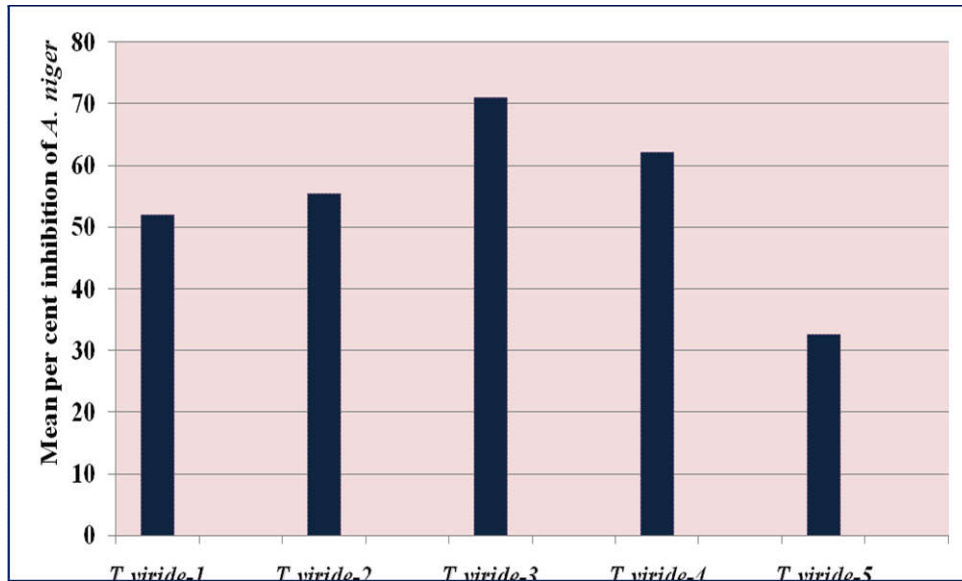


Fig 1. Mean per cent mycelial growth inhibition of *Aspergillus niger*

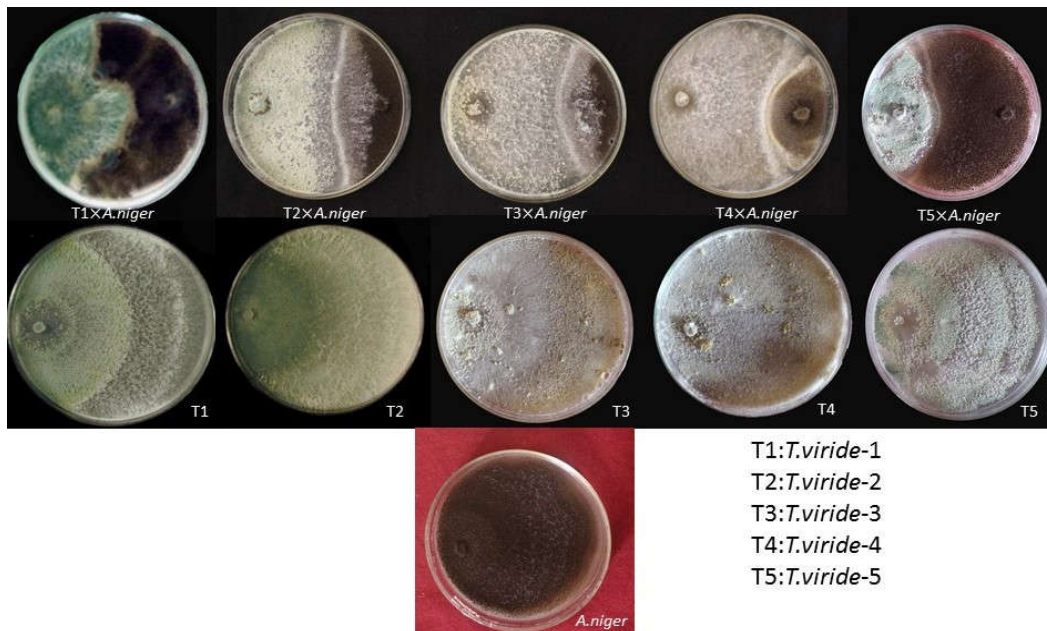


Plate1. *In vitro* evaluation of different isolates of *T. viride* against *A. niger*

## DISCUSSION

Peanut is an economically important crop, but the collar rot disease was affecting its growth and development. Use of bioagents, now a days, is the best and has been more emphasized and widely accepted practice as it is environmentally safe and can overcome the residual problems associated with heavy use of fungicides for management disease. Hence, The present experiment was initiated to study the comparative efficacy of *Trichoderma* isolates against *A. niger*. An antagonistic effect of fungal biocontrol agents against the test pathogen fungus (*A. niger*) was observed. Among the isolates *T. viride-3* showed maximum reduction (71.00%) in growth of test fungus and least (32.52%) was observed in *T. viride-5* isolate. These results are in confirmation with findings of Rao and Sitaramaih (2000) and Prabhu and Urs (1998) also showed that *Trichoderma* isolates significantly inhibited the growth of *A. niger*.

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