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Isolation and *in vitro* evaluation of bio control agents against anthracnose of sorghum caused by *Colletotrichum graminicola*

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Abstract

Sorghum is subjected to several diseases at all the stages of its development. Sorghum belongs to the family poaceae. It is one of the most important cereal crops in India, it stands fifth most important world cereal crop after wheat, rice, maize and barley. Among all the diseases infecting sorghum, anthracnose caused by *Colletotrichum graminicola* is one of the most destructive foliar diseases in sorghum. According to present investigation under *in vitro* conditions, Three antagonistic fungi of *Trichoderma* species were tested against *Colletotrichum graminicola* under *in vitro* conditions by using the dual culture method the results revealed that *Trichoderma harzianum* has most promising antagonist against *Colletotrichum graminicola*.

Keywords: Sorghum, anthracnose, *Colletotrichum graminicola*, mycelium growth, bio control agents

Introduction

Sorghum is developed in more than 90 nations on the planet, Asia 29% and Africa 52% of 42.8 million of all out world region. In Asia India accounts 84%, china8% and Thailand 1.4% of the complete 12.5million HA territory. The world evaluated sorghum creation is 59 million, with efficiency of 1.4 t ha. The significant states in India where the oat grain is created are Maharashtra, Karnataka, Gujarat, Madhya Pradesh, Andhra Pradesh, Rajasthan Uttar Pradesh. Maharashtra produces most extreme sorghum in India.

Sorghum plants are known to contain cyanogenic glucoside dhurrin, a gathering of nitrogenous auxiliary compound, which during enzymatic hydrolysis discharge hydrocyanic acid glucose.it has been demonstrated that youthful sorghum leaves a mass complex of phenols in light of intrusion by both pathogenic and non-pathogenic growths, and the 5 significant mixes of this complex are 3-deoxyanthocyanidin flavonoids. Different administration approaches towards limiting the effect of anthracnose on sorghum have been attempted with various achievement relying upon the patho systems Synthetic substances are vital at present, yet are not by any means the only answer for crop health. More over the application of the chemicals to manage disease which is an important fodder crop and is fed to the cattle needs to be avoided.

Use of bio agents having bio control and plant growth promoters activities has been consider environmentally alternatives to minimise the use of chemicals. Biological control can be achieved either through introduction of bio control agents directly or by adopting practices which favour build-up of bio control agents under natural agents

Materials and methods.**Isolation of *Colletotrichum graminicola***

In the present investigation the diseases samples were collected from the field. Small tissues from infected stem or roots (5mm) along with the healthy tissue were cut with sterile scalpel. The tissues were surface sterilized with 0.1 % mercury chloride for 30 seconds. The tissues were subsequently washed in three changes of sterile distilled water to eliminate mercury ions. The surface sterilized tissues were transferred on to the PDA and incubated at $25 \pm 2^\circ\text{C}$ in BOD incubator and growth was observed periodically.

***In vitro* screening of *Trichoderma* species**

Three antagonistic fungi of *Trichoderma* species i.e *T.harzianum*, *T.viride* and *T.asperillum* were tested against *Colletotrichum graminicola* under *in-vitro* conditions through dual culture technique.

The data regarding % growth inhibition by the different antagonists of *Trichoderma* species. For this experiment PDA plates were used. Each Petri dish was divided into two halves, the first half was inoculated with disk (0.6 cm in diameter) of the tested antagonist fungus and the second half was inoculated with a similar disk of the pathogenic fungus. Plates inoculated only with the pathogenic fungi acted as a control. Each treatment was replicated ten times. All Petri dishes were incubated at $25 \pm 2^\circ\text{C}$ in the BOD incubator and observed daily. After 5 days of incubation, the pathogenic fungi almost covered the surface of the medium in the control treatment, the percentage of inhibition (I %) was calculated according to Vincent (1947).

Results and Discussion

In-Vitro evaluation of biocontrol agents against *Colletotrichum graminicola* causing anthracnose of sorghum

By following the dual culture technique, three *Trichoderma* sp isolates were used for screening against major soil borne pathogen *C. graminicola* viz. *Trichoderma viride*, *Trichoderma harzianum*, *Trichoderma asperillum* was studied. The result of the experiment are in the given table respectively.

Three antagonistic fungi of *Trichoderma* species were tested against *Colletotrichum graminicola* under *in vitro* conditions through dual culture technique. The data regarding the percent growth inhibition by the different antagonists of *Trichoderma*

species. The study revealed variable inhibition responses of different antagonists against *Colletotrichum graminicola*. An antagonist of *Trichoderma* species were found more inhibitory against the test pathogen. Irrespective of different *Trichoderma* sp. were screened against the growth of *C. graminicola* *Trichoderma harzianum* is most efficacious providing percent growth inhibition followed by *Trichoderma viride* and was recorded minimum in *Trichoderma asperillum*.

Table 3: Sensitivity of *C. graminicola* to different fungal antagonist

Antagonists	Day-1	Day-6
<i>Trichoderma harzium</i>	6.00	44.25
<i>Trichoderma viride</i>	6.00	54.25
<i>Trichoderma asperillum</i>	6.00	59.50
Control	24.00	90.00
C.D.	0.64	1.15
SE(m)	0.20	0.37

Table 4: *In-vitro* evaluation of biocontrol agents of different *Trichoderma* species against anthracnose of sorghum caused by *C. graminicola*

<i>Trichoderma</i> species	% of Inhibition
	Day-6
<i>Trichoderma harzium</i>	50.812
<i>Trichoderma viride</i>	39.715
<i>Trichoderma asperillum</i>	33.874
C.D.	0.026
SE(m)	0.009

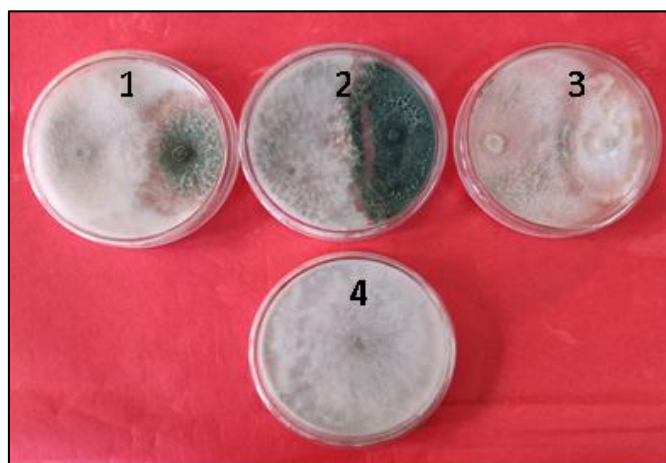


Plate 1: Sensitivity of *Colletotrichum graminicola* to different fungal antagonists.

- 1 – *Trichoderma viride*
 2 – *Trichoderma harzianum*
 3 – *Trichoderma asperillum*
 4 – Control

High efficacies of *Trichoderma harzianum* has been recorded against *Colletotrichum graminicola* by Vijaya N.L, Patel D.S and Maheshwari K.D (2019) [8]. While evaluating different antagonists of *Trichoderma* species, Rekha (2013) [5] also reported *Trichoderma harzianum* as the most promising antagonist against the mycelial growth of *Colletotrichum graminicola* Vijaya N.L et al. (2013), reported *Trichoderma harzianum* is most effective against *Colletotrichum graminicola* followed by *Trichoderma* spp against mycelial growth of *Colletotrichum graminicola* causing anthracnose of sorghum. Chandra Sekhar J, et al, 2020 [1] who also used same fungicides at concentration levels against the pathogen and similar results were observed.

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