



International Journal Of Scientific And University Research Publication

ISSN No **2364/2018**

Listed & Index with
ISSN Directory, Paris



Multi-Subject Journal



ANTAGONISTIC POTENTIALITY OF FUNGAL PATHOGENS AGAINST TRICHODERMA VIRIDE AND TRICHODERMA HARZIANUM

KARTHIKEYAN P || Department of Microbiology

St. Joseph University College of Agricultural Science and Technology

Songea

Tanzania.

In the present study, five plant pathogens obtained from St. Joseph University College of Agricultural Science and Technology, Songea, Tanzania. The biocontrol agents were tested

against active plant pathogenic fungi. Bio control agents namely *T. viride* and *T. harzianum* and plant pathogens namely *Aspergillus niger*, *A. fumigatus*, *A. luchensis*, *Humicola* and *Bipolaris oryzae* were tested. *T. viride* and *T. harzianum* were effective bio control agents against all tested plant pathogens. *Trichoderma viride* had good antagonistic active against all pathogenic fungi. *T. viride* showed maximum percentage inhibition activity against *Humicola* sp.(82.8%).

Antagonistic activity, *Trichoderma viride*, *Trichoderma harzianum*

مقدمة

121oC for 20 minutes at 15 lbs pressure. The medium was incorporated with 50 mg/ml streptomycin sulphate solution and mixed well to prevent the bacterial contamination.

onitaversbo

The colonies growing on plates with different morphology were counted separately. The fungal cultures were then transferred, subcultured and the pure cultures were maintained on PDA medium. A portion of mycelium of the representative colonies were picked up with the help of a pair of needles and semi permanent slides were -prepared using lactophenol cotton blue (20g -Phe- nol crystals; 20g lactic acid (SG1 21); 40g-Glycerine; 20ml - wa- ter; Cotton blue - a few drops). The slide was observed under a compound microscope. Morphology of the individual fungal spe- cies was also recorded using Nikon phase contrast microscope (Nikon, Japan).

al culture experiments (Fokkema, 1978)uD

The sterilized potato dextrose agar medium was poured into the petriplates and allowed to solidify. After solidification, the fungal *Aspergillus niger*, *A.fumigatus*, *A. luchuensis*, plant pathogen viz., were grown separately on PDA *Bipolaris oryzae* and *Humicola* medium.

Then agar blocks cut from the actively growing margin of the individual species of plant fungi and test organism were inocu- lated just opposite to each other approximately 3cm apart on potato dextrose agar medium in petriplates. Three replicates for each set were maintained. Controls were set in single and dual inoculated culture of the fungus. The position of the colony margin on the back of the disc was recorded daily. The measurement was taken on the fifth day.

Assessments were made when the fungi had achieved an equilibrium after which there was no further alteration in the growth. Since both of the organisms were mutually inhibited, the assessment was made for both organisms. The percentage inhibition of growth was calculated as follows.

r = Growth of the fungus was measured from the centre of the colony towards the of the plate in the absence of antagonistic fungus.

r_1 = Growth of the fungus was measured from the centre of the colony towards the antagonistic fungus.

orphological characterization of Plant fungal pathogensM illus nigergrepsA

IJSR - INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH 205

The biocontrol means control of pests, pathogens or weeds by using their antagonists. The antagonists may be pathogenic bacteria, fungus, or a virus and in some cases plant extract. Biocontrol is a nonhazardous, ecofriendly approach. Biocontrol means for reducing sp. are *Trichoderma* the use of chemical biocides in agriculture. effective biological control agents against several plant pathogens 1989).,(Govindasamy and Balasubramanian

Plant pathogens include fungi are the most visible threats to sustainable food production to plant. The decreasing efficacy of the fungicides as well as risks associated with fungicide residues on the leaves and fruit, have highlighted the need for a more effective and safer alternative control measures. In recent years, biological control of plant pathogens has received increasing attention as a promising supplement or alternative to chemi- cal control. Biological control of plant diseases is defined as "The involvement of the use of beneficial microorganisms, such as specialized fungi or bacteria at attack and control the plant pathogens (Fravel, 2005).

Control of plant diseases provided by composts largely is due to the activities of beneficial microorganisms supported by organic components in composts. These bio control agents, like pathogens and weed seeds, typically do not survive the high temperature phase of the composting process (Boehm, 1999). A great diversity of microorganisms contributes to biological con- trol. Many colonize composts immediately after peak heating during curing of composts as temperatures decline below 40°C. This process continues after utilization in the compost amend- ed substrate until broad spectrum disease suppression finally is achieved.

occur worldwide and can *Trichoderma* Fungal species of the genus be isolated from soil, decaying wood and other forms of plant species are used *Trichoderma* organic material. Mycoparasitic commercially as biological control agents against plant- pathogenic *Rhizoctonia solani*, *Botrytis cinerea*, *Sclerotium rolfsii*, fungi such as spp. in, among *Fusarium* spp., and *Pythium* ,*Sclerotinia sclerotiorum* others, the United States, India, Israel, New Zealand, and Sweden as a promising alternative to chemical pesticides (Barak and Chet, 1986; Chet, 1987; Harman and Bjorkman, 1987; Howell, 2003).

ample collectionSS DHOTMATERIALS AND ME

The fungal species used in the present study which were obtained from the St. Joseph University College of Agricultural Science and Technology, Songea, Tanzania.

Preparation of potato dextrose agar medium (Warcup, 1950)

The potato dextrose agar medium was prepared and autoclaved at

Trichoderma In the present study the antagonistic activity of dual cul- ture *in vitro* tested against plant pathogens by *harzianum* was *harzianum* experiment. Maximum percentage inhibition of *A. fumigatus* (86.84%) following *Bipolaris oryzae* with *iger nA.* (60.5%) and *A. luchuensis* sp (73.6%), *Humicola* (73.68%), 50%) Table 1 and Fig 1.(

is an efficient biocontrol agent that is *richoderma harzianum* *T* commercially produced to prevent development of several soil pathogenic fungi. Different mechanisms have been suggested as being responsible for their biocontrol activity, which include competition for space and nutrients, secretion of chitinolytic enzymes, mycoparasitism and production of inhibitory compounds. Taking advantage of the natural competition between microorganisms for limited biological resources is the basis for sp. are *Trichoderma* biocontrolling plant pathogens. Strains of effective biocontrol agent against several plant pathogens. Ghisal Berti, 1990; Kovach, 2000; Hjeljord and Tronsmo, 2003; Yedidia, 2003; Papavizas, 1985).

Trichoderma In the present study the antagonistic activity of *T.* tested against plant pathogens. The percentage of inhibition *viride* *A.* (62.85%), *A. niger* sp. (82.8%), *Humicola* against *viride* were (48.5%) *A. fumigatus* (57.1%) and *oryzae Bipolaris* (60%) *luchensis* Table 2 and Fig 2.

a biocontrol agent that is highly effective *richoderma asperellum* *T* against rice seed borne disease, forms submerged spores by liquid culture. The cell wall of submerged spores was thinner than that of aerial spores, to the irregular pyramidal warts of aerial 2005). Similar observa- tion have *et al.*, spores (Watanabe followed by *Trichoderma viride*, *T. harzianum* been made on *Aspergillus sydowi*, *A.* antagonistic interactions of soil fungi name- ly *Penicillium citrinum*, *Trichoderma* sp., *sulphureus*, *Gliocladium* was tested in dual culture experiments *Fusarium solani* against *viride* 2002). *et al.*, (Ambikapathy

Trichoderma harzi- able 1. Colony interaction between T and some plant fungi in Dual culture experiments

	<i>Aspergillus niger</i>	<i>Trichoderma viride</i>	<i>Humicola</i>	<i>Bipolaris oryzae</i>	<i>A. fumigatus</i>	<i>A. luchuensis</i>
<i>A. luchuensis</i>	A. B. A. ni or fu ge yz mi r ae gat es					

Volume : 5 | Issue : 4 | April 2016 • ISSN No 2277 - 8179 | IF : 3.508 | IC Value : 69.48

Research Paper

Colonies blackish brown abundant submerged mycelium, aerial hyphae usually scanty produced conidiophores mostly arise directly from the substratum smooth. Septate or nonseptate varying greatly in length and diameter. Vesicles globose phialides typically in two series – thickly covering the vesicle.

ergillus luchuensis sp A

in showing a single series of phial- *A. niger* This form differs from ides 7-9 x 5µ, with conidia 4-4.5 µ and finely roughened. Conidiophores up to 2.5mm x 10-15µ, smooth, vesicles 30-40µ in diameter, showing spores or marking where phialides fall off. Phialides in one seies, 6-3 µ.

ergillus fumigatus sp A

-Colonies on Czapek's agar in some strains strictly velvires pur- ple red with varying amounts of tufted aerial mycelium. Reverse and substratum colorless to yellow. Conidiophores short, usu- ally densely crowded, branches from aerial hyphae, one septate or nonseptate, gradually enlarged, upward – with apical flask – shaped vesicle up to 20-30µ in diameter.

umicola sp. H

Colonies at first white, passing through shades of grayish, olive, gray reverse and substratum persistently some shade of yellow, colony velvety at margins and floccose towards the centre where conidiophores are borne as short branches of the hyphae.

ipolaris oryzae B

The brown spot fungus produces multiseptate (three or more septae) conidiophore, singly or in bundles (generally 17), up to

600 µm long, and 4-8 µm wide. Conidia are generally curved, boat, or club-shaped, with 6 to 14 transverse septa or cross walls.

Morphological characterization of Biocontrol agents

richoderma viride T

Is a common species the mature mold. It is bright green in col- our, because the balls of green conidia are glued together, and tufts of white hyphae stick up well above the conidiophores.

richoderma harzianum T

showing repeatedly branched conidiophores, *richoderma harzianum* *T* irregularly verticillate, bearing clusters of divergent, of- ten irregularly bent, flask-shaped phialides. Conidia are mostly green, sometimes hyaline, with smooth or rough walls and are formed in slimy conidial heads (glioconidia) clustered at the tips of the phialides.

NOISSISCUDULT AND SER

Trichoderma harzianum In this study was two biocontrol agents . were tested against five plant pathogens such *T. viride* and , *Bipo-* sp *Aspergillus niger*, *A. fumigatus*, *A. luchuensis*, *Humicola* as *larisoryzae*.

Biological control is a potent means of reducing the damage caused by plant pathogens (Jeyarajan and Nakkeeran, 2000) Biological control of plant disease can occur through different mechanisms, which are generally classified as antibiosis, competition, suppression, direct parasitism, induced resistance, hypo virulence and predation. The antagonistic activity has often been associated with production of secondary metabolites the involvement of the use of beneficial microorganisms, such as spe- cialized fungi or yeast or bacteria to attack and control the plant pathogens (Fravel, 2005).

[illegible]

tagonist away from the pathogen.			
21.0	18.4	% of growth in inhibition in the zone of interaction	7.

Trichoderma viride able 2. Colony interactions betweenT and some plant fungi in Dual culture experiments

agoni with r stic fespo ungi nse Test of S.No .	(the a .	Gro ntag onist ic and test f ungu s (m m)	
A. luchensis	A. niger	B. or yzae	A. f umig atus
15	18	Colo ny gr owth of pa thog en to ward s ant agon ist	1.
25	23	Colo ny gr owth of pa thog en away from the a ntag onist	2.
		% of grow	

ion		Co lo ny gr ow th of an tag on ist in co ntr ol (i. e) gr ow th of th e p lat e in th e a bs en ce of th e p at ho ge n.	4.
26	36		
30	31	Co lo ny gr ow th of an tag on ist to ward s t he pa th og en.	5.
18	20	Co lo ny gr ow th of an	6.

In the present investigation mentioned that biological control of fungal plant diseases using *Trichoderma viride* and *T. harzianum* are potential in inhibit the growth of plant pathogens. Fungal diseases in agricultural crops possess a great challenge. *Trichoderma viride*, *T. harzianum* could be effectively used to suppress the plant pathogens, to reduce the environmental pollution to improve the soil fertility and ecofriendly in nature. Hence, this study concluded that *Trichoderma* sp. should be used as effective broad spectrum biocontrol agents to control plant disease.

ref_str

- panneerselvam, A., saravanamuthu, R., 2002. **Ambikapathy, V.**, .1
appel and *Fusarium solani* Antagonistic effect of soil fungi to
22(1):14-17. *Agrisci digest* willenweher
and Chet, I. 1986. Determination, by fluorescein diacetate **Barak, R.** .2
Soil Biol. Biochem. staining, of fungal viability during mycoparasitism.
18:315-9.
, Hoitink, H.A., 1999. Biocontrol within the context of **Boehm, M.J.** .3
soil microbial communities: A substrate – dependent
.37: 427-446. *Annu. Rev. Phytopathol* phenomenon.
1987. *Trichoderma*-Application, mode of action, and potential **Chet, I.** .4
as a bio- control agent of soilborne pathogenic fungi. Innovative
Approaches to Plant Disease Control. New York: Wiley and Sons,
137-60.
nn. A 1978. Fungal antagonism in the phyllophere. **Fokkema, N.J.** .5
. 89,115-117. *Appl. Biol*
. 2005. Commercialization and implementation of biocontrol **Fravel, D.** .6
43:337-359. *Phytopathol* P. *Ann. Rev*
Narbey, M.J., Dewan, M.M., Sivaithampatam, K., **Ghisalberti, E.L.**, .7
1990. Properties and biocontrol activity of aerial submerged spores
121: 287-291. *Trichoderma asperellum. Plant and Soil.* in
and Balasubramanian, 1989. Properties and **Govindasamy, V.** .8
Trichoderma biocontrol activity of aerial and submerged spores in
96:337-345. *asperellum. J. Plant Dis. Prot.*
and Bjorkman, T. 1987. Potential and existing uses of. **Harman, G.E.** .9
, plant disease control and plant *Gliocladium* for and *Trichoderma*
growth enhancement. In Harman G.E., Kubicek C.P.,
. Vol. 2. London: Taylor and Francis, *Gliocladium* and *Trichoderma* ed.
229-65.
and Tronsmo, A., 2003. Properties and biocontrol **Hjelijord, L.G.** .10
activities of aerial and submerged spores
. 93:1593-1598. *Trichoderma asperellum. Phytopathology* in
species *Trichoderma* 2003. Mechanisms employed by **Howell, C.R.** .11
in the bio- logical control of plant diseases: The history and evolution
, 87(1):4-10. *Plant Disease* of current concepts.
and Nakkeeran, S. 2000. Exploitation of **Jayarajan, R.** .12
microorganisms and viruses as biocontrol agents for crop disease
. 1:95-116. *and Nematrop Dis. Weeds* management .C
properties and . Petzoldt, R. and Harman, G.E., 2000 **Kovach, J.**, .13
Trichoderma biocontrol ac- tivities of aerial and submerged spores in
. 18: 235-242. *asperellum. Biol. Control*
: Biology, *Gliocladium* and *Trichoderma* 1985. **Papavizas, G.C.** .14
. 23:23-54. *nn. Rev. Phytopathol* Aecology and poten- tial for biocontrol.
, Kumakura, K., Kato, H., Lyozumi, H., Togawa, M. and **Watanabe, S.** .15
. 71: 351-356. *Plant Pathol. Gen.* Nagayama, K., 2005
1950. The soil plate method for isolation of fungi from **Warcup, J.H.** .16
178:1477. *Nature, Lond.* soil.
Shores, K. Kerem, N. Benhamou, Y. Kapulnik & I. **Yedidia, I., M.** .17
Chet. 2003. on-comitant induction of systemic resistance to
Trichoderma Pseudomonas syringae pv. *lachrymans* in cucumber by
pl. Ap (T-203) and the accumulation of phytoalexins. *asperellum*
, 69:7343-53. *Environ. Microbiol*

th inhibition of pathogen in the zone of interaction			
5748.5 3.			
26	36	Colony growth of antagonist in control (i.e) growth of the plate in the absence of the pathogen.	4.
16	19	Colony growth of antagonist towards the pathogen.	5.
28	25	Colony growth of antagonist away from the pathogen.	6.
54.2	45.7	% of growth inhibition in the zone of interaction	7.



IJSURP Publishing Academy

International Journal Of Scientific And University Research Publication
Multi-Subject Journal

Editor.

International Journal Of Scientific And University Research Publication



+965 99549511



+90 5374545296



+961 03236496



+44 (0)203 197 6676

www.ijsurp.com