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In vitro evaluation of root, leaf and seed extracts of *Ricinus communis* and bio-control agents against Fusariumwilt of brinjal

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Brinjal or eggplant (*Solanum melongena* L.) is an important vegetable crop grown in Assam. *Fusarium* wilt disease of brinjal caused by *Fusarium oxysporum* is an important disease of all brinjal growing field which cause heavy losses to the farmers. The present investigation has been carried out with the antifungal activity of *Ricinus communis* viz. (root, leaf and seed) extracts and two species of *Trichoderma* inhabiting the pathogen *in vitro*. Result showed seed extracts of *R.communis* at 15% concentration 68% inhibition followed by root extracts 66.5% and leaf extract 56.4%. Among the two species of *Trichoderma* tested, *T.viride* was found to be most effective with 83% inhibition followed by *T.harzianum* 70.33% inhibition respectively over control after 7th days of incubation.

Key words: Antifungal, eggplant, extract, *Fusarium oxysporum, Ricinus communis*

INTRODUCTION

Brinjal is one of the most popular vegetables crop grown in India and other parts of the world. It can be grown in all season. It is cultivated as a food crop which has also many medicinal value (Daunay and Janick, 2007).The crop is suffers from more than 20 different diseases of which *Fusarium* wilt is the most destructive one throughout the world (Dwivedi and Enespa, 2013). It is caused by *Fusarium oxysporum* f.sp. *melongenae* which decreases the level of quality and quantity of eggplant's fruit.

Fusarium species are ubiquitous, soil-borne pathogens of a wide range of horticultural and food crops that damage vascular wilts, rots, and damping off diseases (Bodah, 2017).Symptoms initially appeared as leaf chlorosis, yellowing of foliage which later wilting and drooping of leaves. The xylem became brown in colour of the stemdue to blockage of the vessel and finally sudden death of the above ground parts (Pietro *et al.* 2003).There are report from farmer that due to attack of Fusarium wilt the eggplant losses yield 20%-30% Begum (2007).Wilt problems are especially severe in the humid tropics and it can cause upto 70% yield losses in Pakistan (Ashfaq *et al.* 2014).In view of the high cost of chemical pesticides and their hazardous to environment use of biodegradable different naturally occurring substances plant extracts which were less toxic, safe to use and eco-friendlygained importance of plant disease control (Duru *et al.* 2003; Saxena *et al*. 2005; Lee *et al*. 2007; Sitara *et al.* 2008).

Plant extracts of many higher plants have seen reported to exhibit antibacterial, antifungal and insecticidal properties under laboratories trials (Okigbo and Ogbonnaya, 2006; Mohana and Raveesha, 2006; Satish, 2007). Effective and efficient management of crop disease is generally achieved by the use of synthetic pesticides (Kiran *et al.* 2006). Biological control through the use of antagonistic microorganism for the development of integrated management strategy against the disease has emerged as a viable option (Alvindia and Natsuaki, 2009). Useof *Trichoderma* as a bio-control agent for control of soil borne plant pathogens has been described by (Morsy*et al*., 2009; Sabalpara *et al*. 2009). Now different species of *Trichoderma* are used successfully to control

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different plant pathogens (Shafiquzzaman *et al.* 2009).

Therefore the present study has been taken to evaluate the botanical extracts and a bio-agent for management of the pathogen under laboratory.

MATERIALS AND METHODS

The fungus *Fusarium oxysporum* was isolated from the infected brinjal plants collected from different fields of Dhubri district (Assam) following tissue segmentation method. The pure culture was maintained on Potato Dextrose Agar slants at 4±1°C.

In vitro bio assay of plant extracts

Aqueous extracts of roots, leaves and seed of *Ricinus communis* plant was tested for their antifungal property against *Fusarium oxysporum* by 'Poisoned Food Technique' in *in vitro* condition. Fresh materialof the test plant was taken for preparing crude extracts. They were thoroughly washed with water and fine slurry was prepared by taking 100g with 100 ml of distilled water. The resultant slurry was filtered through muslin cloth and then through what man No.1 filter paper and the extracts were used as stock solution. From the stock solution different concentrations of aqueous extracts like 5 ml, 10 ml and 15 ml was added with 95 ml, 90 ml and 85 ml of PDA medium to make 5%, 10% and 15% concentrations respectively. The medium was thoroughly shaken for uniform mixing of extract. Twenty ml of medium was poured into sterile petriplates. Mycelium of five mm size discs from periphery of actively growing culture were cut out by sterile cork borer and one such disc was placed at the centre of each agar plate. Control was also maintained by growing the pathogen on PDA plates. The plates were then incubated at 28±1°C for 7 days and the radial growth was measured. The efficacy of plant products or botanicals was expressed as percent of radial growth over control, which was calculated by using the formula (Vincent, 1947).

$$I = \frac{C-T}{C} \times 100$$

where, I=Percent inhibition over control, C=Radial growth in control, T=Radial growth in treatment

In vitro assay of bioagents

The antagonistic activity of *T. harzianum* and *T.viride* were tested against *F. oxysporum* by dual culture technique (Dhingra and Sinclair, 1985). Both the biocontrol agents and test fungi were cultured on Potato Dextrose Agar in order to get fresh and active growth of the fungus. To study the antagonistic activity, mycelial discs (5 mm) of the test fungus was inoculated at one end of the petriplates and the potential antagonistic fungus to be screened was placed opposite to it on the other end. Each treatment was replicated three times.

RESULTS AND DISCUSSION

In the present investigation revealed that the aqueous extracts of leaves, seeds, and roots of *R.communis* found to be effective in reducing the mycelial growth of the pathogen (Table1).Among them seed extracts showed most effective 68% inhibition followed by roots extracts 66.5% and leaves extracts 56.4% inhibition at the highest level i.e. at 15% concentration (Fig.1).Results from the present study could be correlated with the studies made by Jalander and Gachande (2012) using plant extracts from *Tinospora cordifolia* against *Fusarium oxysporum*. Aquous extracts of *Ricinus communis* leaves was found most effective against *Candida albicans* (Khan and Yadav, 2011).Effectiveness of plant extract in inhibiting the growth of *Fusarium oxysporum* has also been reported previously by earlier workers(Chakraborthy *et al*. 2009; Mandall *et al.* 2009).

Table 1: Effect of root, leaf and seed extracts of *R.communis* at three different concentrations against the mycelial growth of *Fusarium oxysporum*

Plant parts used	Concentration			Mean ± SE
	5%	10%	15%	
Root	55.5	62.9	66.5	61.63 ± 2.14
Leaf	42.3	50.4	56.4	49.70 ± 3.18
Seed	54.5	65.2	68	62.56 ± 3.09

Values shown are the mean ± SE of 3 replicate

The result revealed that the antagonistic activity of *T.viride* was found more effective than *T.harzianum*. Maximum inhibition was observed (83%) by *T.viride* followed by *T.harzianum* (70.33%) (Table2, Fig.2).Similar results were reported that

Table 2. Effect of two species of *Trichoderma* on mycelial growth of *Fusarium oxysporum*

Trichoderma species	Percent inhibition of mycelia growth
T. harzianum	70.33
T.viride	83.00

Treatment means found significantly different at p=.002(d" .05),as per t test

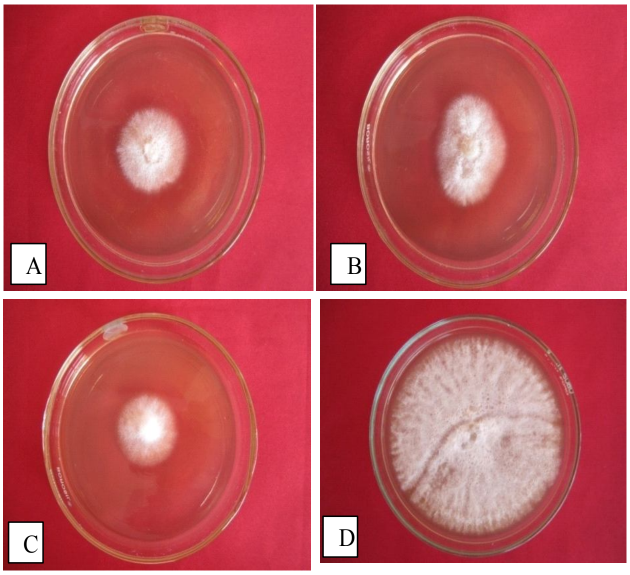
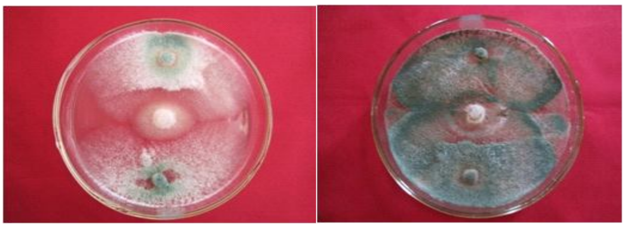


Fig. 1: *In vitro* evaluation of aqueous extracts of *Ricinus communis* at 15% concentration against the mycelial growth of *F. oxysporum*.A- Root extract; B-Leaf extract; C-Seed extract; D-Control



T. harzianum *T. viride*

Fig. 2: *In vitro* evaluation of *Trichoderma harzianum* and *T. viride* against *F. oxysporum.*

*Trichodermaviride*was found most effective against *Fusarium oxysporum* (Bashar and Chakma 2014; John *et al.* 2019).

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