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Persuade of *Trichoderma* spp against *Phytophthora colocasiae* inciting blight of *Colocasia esculanta* L.

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ABSTRACT

Blight of Colocasia (Colocasia esculanta L.) is caused by phytophthora colocasiae. This paper describes the efficacy of Trichoderma spp against sensitive and resistant isolates of Phytophthora colocasiae by dual culture method under in laboratory conditions. Trichoderma viride T. harzianum, T. virens, T. koningii and T. pseudokoningii species were used for antagonistic study. Results indicated that all Trichoderma species showed antagonistic combat, but among them, T. viride and T. harzianum showed 77.77% antagonism than others. The inhibition percentage of Trichoderma viride and T. harzianum was considerably affected and differed significantly ($p<0.05$). Resistant isolate of pathogen was restricting the antagonism in some degree.

Keywords: *Colocasia esculanta, Phytophthora colocasiae, Trichoderma species dual culture.*

INTRODUCTION

Vegetables are the most important component of a balanced diet and we can now, grow varieties of different vegetables round the year. India is the world's second largest producer of vegetables next to China. Colocasia (*Colocasia esculanta L.)* of family Araceae is an important crop worldwide but is of particular significance in many pacific Island countries where it forms part of the staple diet and serves as an export commodity. *Colocasia esculenta* is a tropical plant grown primarily for its edible corms the leaf and root vegetables whose many names include Taro and Eddoe. It is believed to be one of the earliest cultivated plants. It suffers severely by wilt disease incited by *Phytophthora colocasiae* Rac.

Trichoderma received the most attention as fungal antagonists not only of soil-borne pathogens[2] but also of foliage pathogens because of the ability of some of its species to produce enzymes which inhibit other fungi[13,14]. In *vitro* screening with our arbitrary system of bio-antagonists effective against soil borne pathogens is a simplistic approach to understand a small sector of biological system in disease control. Therefore, biological control of plant pathogens has been considered as a potential control strategy in recent years and search for these biological agents is increasing. *Trichoderma* is the most commonly used fungal biological control agent and have long been known as effective antagonists against plant pathogenic fungi[5]. During the last decade, species of *Trichoderma* have emerged as the most powerful bioprotectants for the management of a wide variety of plant diseases by virtue of their broad spectrum action against a number of plant diseases caused by fungi, bacteria, viruses and even nematodes[16]. Thus the present study was aimed to evaluate the antagonistic activity of *Trichoderma* spp in laboratory conditions.

MATERIAL AND METHODS

Isolation and identification of test pathogen

leaf blight diseased materials were collected and cut into small pieces (2mm) by sterilized blade then surface sterilized with mercuric chloride (1% $HgCl_2$) for 1 min. The pieces were then washed with sterilized distilled water thrice and dried by sterilized blotting paper. In each case, surface disinfested tissue plated on potato dextrose agar (PDA) medium & produced a *Phytophthora colocasiae*[7,19,21].

Dual culture experiment

Trichoderma. viride, T. harzianum, T. virens, T. *koningii* and *T. pseudokoningii* were tested against the sensitive and resistant test fungus by dual culture experiment[15]. *Trichoderma* spp. and test fungus was inoculated at 6 cm apart. Three replicates were maintained for each treatment and incubated at 28 ± 2° C for 7 days. Monoculture plates of both served as control. Seven days after incubation (DAI), radial growth of test fungus and *Trichoderma* isolates were measured. Colony diameter of test fungus in dual culture plate was observed and compared with control. The growth inhibition was calculated by using the formula: 100 x X - Y / X, Where X = growth in control and Y = growth in treatment suggested[22].

Statistical Analysis

Statistical analyses of the experiments were performed by using the book[17].

RESULTS

Isolation and identification of test pathogen

Diseased leaf blight was found as a typical reddish yellow or brown on leaves it shows total leaf blight process *Phytophthora colocasiae.* Colonies on (PDA) agar medium was colonies whitish yellow concentric rings are formed and oil (gel) like secretion texture. Soil inhabitant, saprophytic or facultative parasite, mycelium branched and coenocytic, sporangia on specialized hyphal sporangiophores which are branched and with indeterminate growth. Zoospores reniform, laterally biflagelated. Sporangia were ovoid, hyaline, papillate, caducous, 30 to 60 × 17 to 28 µm, and pedicels were 3.5 to 10 µm long. Such symptoms were collected from different locations of Marathwada region of Maharashtra and five isolates of *phytophthora colocasiae* were isolated. The culture was deposited at Department of Botany, Arts, Science and Commerce College, Naldurg.

Dual culture experiment

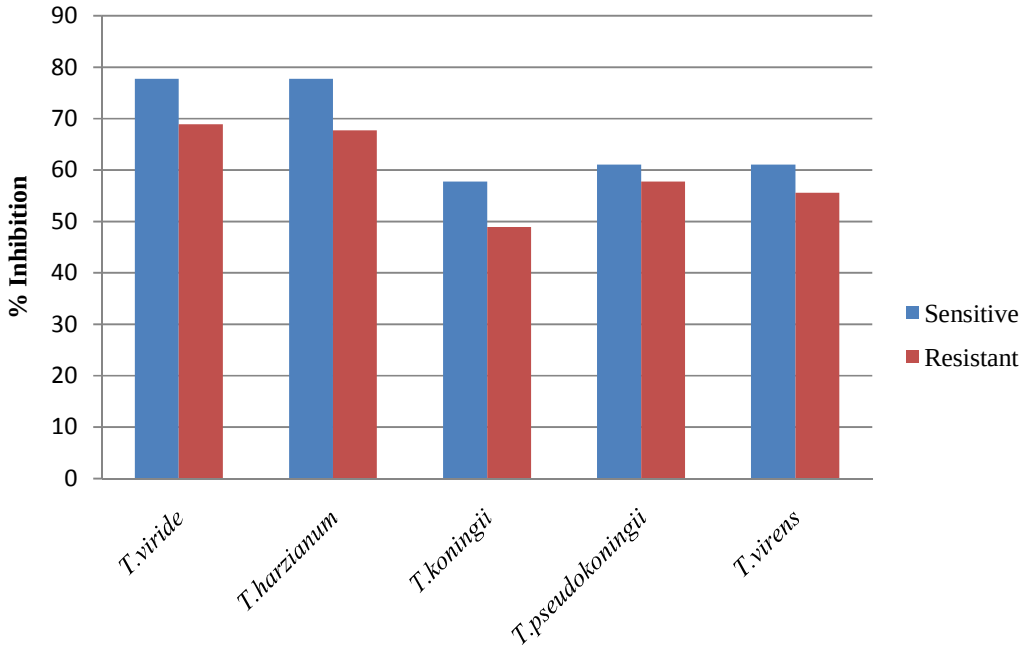
Results indicated that all *Trichoderma* species showed antagonistic activity. But among them *T. viride* and *T. harzianum* (77.77%) against *phytophthora colocasiae* found effective followed by *T. pseudokoningii* (61.11%) antagonistic activity than others in case of sensitive isolate of test fungus. Resistant isolate of pathogen was restricting the antagonism in some extent. Overall, all *Trichoderma* species were found more than 50% antagonistic nature (Table1; Fig 1).

Table 1: Influence of *Trichoderma* species against *Phytophthora colocasiae*

Trichoderma species	Isolates	Radial growth of *Phytophthora colocasiae*	Radial growth of *Trichoderma* species	% Inhibition
T.viride	S	20	70	77.77
	R	28	62	68.88
T.harzianum	S	20	70	77.77
	R	29	61	67.77
T.koningii	S	38	52	57.77
	R	46	44	48.88
T.pseudokoningii	S	35	55	61.11
	R	38	52	57.77
T.virens	S	35	55	61.11
	R	40	50	55.55
CD (p=0.05)	6.77			

S=Sensitive, R=Resistant

Fig1: Influence of *Trichoderma* species against *Phytophthora colocasiae*



DISCUSSION AND CONCLUSION

Several workers have been reported that the use of *Trichoderma* species against number of plant pathogenic fungi[6, 8,10]. The in *vitro* culture of *Phytophthora nicotianae* and *T. harzianum* together led to a variety of interactions. *P. nicotiana* growth was generally inhibited, the hyphae lysed on dual culture media and hyphae were intensely parasitized by *T. harzianum*[20]. It was reported *T.viride*-I and *T.hamatum*-IV&V isolates showed strong antagonism against *Alternaria alternata* causing blight of sesame[1]. High inhibitory effect of volatile toxic substances emitted by *Trichoderma* spp. on the radial growth of *Fusarium* spp. has also been reported[8]. The inhibition was high with the direct use of *Trichoderma* spp. in dual culture against *Fusarium oxysporum f sp psidii* (61-69%) & *F.solani* (58-68%)[9,12]. Tested three species of *Trichoderma* i.e. *T.virens, T. viride* & *T. harzianum* against *F.moniliforum var subglutinas* and found them effective. Among the *Trichoderma* species *T. viride* showed the best performance *in vitro* biological control of *Fusarium oxysporum* followed by others[11]. *Trichoderma viride* reached the confluence of the Petri dish four days after sowing, so that different fungal isolates occupy a surface of 29% to *Fusarium roseum*[3]. Recently reported efficacy of *Trichoderma* species against *Fusarium oxysporum* f. sp. *carthami* causing wilt of safflower and isolates no. 29 and 33 were found to minimum growth of the pathogen as compared to others[23]. The species of *Trichoderma* significantly inhibited the mycelial growth of plant pathogenic fungi[18].

Trichoderma species play an important role in controlling fungal plant pathogens. The use of *Trichoderma*-based products is not only safe for the farmers and consumers but it is also good for the environment. However, much more work needs to be done to develop stable, cost effective, easy to produce and easy to apply formulations. Our results concluded that the tested *Trichoderma viride* and *T. harzianum* was superior against pathogen.

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