RESEARCH ARTICLE

Potential of biocontrol agents against basal rot of onion caused by *Fusarium oxysporumf. sp. Cepae*

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ABSTRACT

Onion (*Allium cepa* L.) is an important vegetable crop in India and as well in Maharashtra. There are various pathogens attacking on onion and basal rot caused by *Fusarium oxysporum f. sp. cepae.* Schlecht. Emend. Snyder & Hansen is dominant in Nasik district. The disease management is equally important using biocontrol agents to increase productivity of this crop. Therefore, evaluated the ability of biocontrol agents viz. *Aspergillus niger, A. flavus, Trichoderma viride, T. harzianum, T. koningii*, *Curvularia lunata, Penicillium expansum, Alternaria alternata, Xanthomonos axonopodis, Bacillus subtilis,* and *Pseudomonas fluorescens* against *Fusarium oxysporum*. All these biocontrol agents observed significantly reduction in the growth of the pathogens. *Trichoderma viride* was more fruitful PCE value (78.88) against *Fusarium oxysporum* followed by *A. niger*, *T. harzianum*, *A. flavus*, *T. koningii*, *Curvularia lunata*, *Alternaria alternata, Penicillium expansum*, *Xanthomonas axonopodis*, *Bacillus subtilis* and *Pseudomonas fluorescens* (12.85) by dual culture technique *in vitro.* In the nature microbial interactions involve competition, hyper parasitism and these phenomena play vital role in striking ecological balance and keeping several plant pathogens in check. In recent times biological control of plant pathogenic fungi has received a considerable attention, as it has several advantages such as possibility of multiple pathogen suppression, low cost and promotion of soil fertility.

Key words: Basal rot, onion, biocontrol agents, *Fusarium oxysporum*.

INTRODUCTION

Onion (*Allium cepa*L.*)* is an important vegetable crop grown in almost all part of country. It is popularly due to condiment and spices value and diversified use soups, meat dishes, salads and nutritional significance as a source of and is also vital role in traditional medicine

as a diuretic for the treatment of chicken pox, common cold measles and rheumatism (Schwartz and Mohan, 1995). The antimicrobial characters of the onions are likely the result of the effect of sulphur compounds. (Schwartz and Mohan, 1995). It is affected by several diseases, reflecting negatively on plant growth and the produced yield.Among, pathogenic fungi especially, the basal rot of onion caused by *Fusarium oxysporum f. sp. cepae* remain to be challenging task in terms of management. *F.oxysporum f.sp.cepae* is a highly destructive pathogen that causes basal rot disease in onion resulting in significant yield losses of the crop growing areas of the world (Ozer and Koycu, 2004). The pathogen infects the basal stem plate of the onion bulb and degrades it, ultimately kills the whole plant (Crammer, 2000). The main sources of inoculums are contaminated seeds and soil (Ozer and Koycu, 1997).

Under field conditions, early disease symptoms are yellowing of leaves and tip dieback, and the whole plant may collapse with the development of the disease. Disease development is optimized when soil temperature ranges from 25^0 to 28^0C (Sumner, 1995). If pathogen attacks the host plant late in the season, the symptoms may not appear until onion bulbs are in storage (Ozer *et al*., 2003). Control of plant diseases by the use of antagonistic microorganisms can be effective means (Cook and Baker, 1983). Interaction between biocontrol agents and plant pathogens has been studied extensively and application of biocontrol agents to protect some commercially important crops is promising (Vesseur *et al*., 1990). A large number of plant diseases have been successfully controlled through fungal and bacterial antagonists (Cook and Baker, 1983; Federico *et al*., 2007; Sahebani and Hadavi, 2008). Phytopathogens play major role in causing diseases to many agriculturally important crops, resulting in loss of plant yield. Fungicides and other pesticides accumulate hazardous toxic compounds which posses threat to human life and the surrounding environment. Pathogens are also found to develop resistance against several pesticides. Biological control was introduced that uses microorganisms, which interferes with pathogens and pests of various crops to overcome the problems caused by chemical means of plant protection (Anand and Reddy, 2009).

Present study found that biological agents inhibit the growth of *F. oxysporum*. Biological control can limit the instances of basal rot of onion caused by *F. oxysporum* and have specific advantages over synthetic fungicides, including fewer non-target and environmental effects, efficacy against fungicide-resistant pathogens and reduced probability of resistance development.

MATERIAL AND MATERIALS

Onion showed typical symptoms of basal rot caused by *Fusarium oxysporum* was collected from Nasik district of Maharashtra and brought to the K.V.P.C. Research Laboratory. *Fusarium oxysporum* was isolated using PDA media and identified on the basis of pure culture, mycelial growth with conidiophores and conidia (micro and macro) using literature. Pure culture of biocontrol agents was collected from our research laboratory and effect of biocontrol agents *viz; Aspergillus niger, Aspergillus flavus, Trichoderma viride, Trichoderma harzianum, Trichoderma koningii*, *Curvularia lunata, Penicillium expansum, Alternaria alternata, Xanthomonos axonopodis, Bacillus subtilis, Pseudomonas fluorescens,* against *Fusarium oxysporumf. sp. cepae* by dual culture method (Dennis and Webster, 1971). A mycelial disc of 5 mm diameter of the *Fusarium oxysporumf. sp. cepae* was placed at one end of the agar plate with PDA and opposite to biocontrol agent was placed. In case of bacteria, a loopful of bacteria was streaked at one end of the agar plate and 5 mm diameter mycelial disc of *Fusarium oxysporumf. sp. cepae* was placed on the opposite end. Replicate three times and radial growth of *Fusarium oxysporumf. sp. Cepae* was measured as served as control. PCE was determined using formula.

$$\text{Percentage Control Efficacy} = \frac{C-T}{C} \times 100$$

Where, C- control growth of *Foc*
T- Treatment

RESULTS AND DISCUSSION

There are various pathogens isolates from onion and basal rot of onion was dominant caused by *Fusarium oxysporumf. sp. cepae.* Similarly 30 isolates were tested their sensitivity against thiophanate methyl. *Foc*-25 was sensitive while iasolate *Foc*-23 was resistant. For further studies Foc-23 was used to control using biocontrol agents. Results are presented in the (Table.1 and Plate 1-2)reveals that eleven biocontrol agent more or less significantly, inhibited the mycelial growth of *Fusarium oxysporumf. sp. cepae.* causingbasal rot in onion. Out of eleven microorganisms tested *Trichoderma viride*was most effective against *Fusarium oxysporumf .sp. cepae.* reduced the radial growth of *Fusarium oxysporumf. sp. cepae.* by (78.88) followed by *Aspergillus niger* and *Trichoderma harzianum* (73.33), *Aspergillus flavus* (67.77), *Trichoderma koningii* (61.47), *Curvularia lunata* (45.55), *Alternaria alternata* (40.00), *Penicillium expansum* (30.00), *Xanthomonas axonopodis* (26.17), *Bacillus subtilis* (23.75), *Pseudomonas fluorescens* (12.85) was observed.Similar results was also reported and correlated with present investigation. Sivan and Chet (1987) reported that *Trichoderma spp*. successfully controlled *Fusarium* spp. on cotton, wheat and muskmelon. Sesame seeds treated with three isolates of *T.viride* reduced the pre-and post–emergence damping off caused by *R.solani* and *F. oxysporumf. sp. sesami* under pot culture and field conditions. Rauf and Javaid (2013) noticed that antifungal activity of different plant extracts of *Chenopodium album* against *Fusarium oxysporumf. sp. cepae.*, the cause of onion basal rot. Farooq and Nasreen (2014) observed that the evaluation of biocontrol agents in vitro against *Fusarium oxysporum* causing *Fusarial*rot of *Pleurotus* spp. all the biocontrol agents more or less inhibit the growth of *Fusarium oxysporum*. The *Bacillus subtilis* more efficient antagonistic activity against *Fusarium oxysporum* and followed by *Pseudomonas fluorescens*.

Table 1:- Evaluation of biocontrol agents against *Fusarium oxysporumf. sp. cepaein vitro*.

Sr. No.	Biocontrol Agents	PCE*
1.	*Aspergillus niger* van Tieghem.	73.33
2.	*Aspergillus flavus* Link.	67.77
3.	*Trichoderma viride* Pers.	78.88
4.	*Trichoderma harzianum* Rifai.	73.33
5.	*Trichodermakoningii*Oudem.	61.47
6.	*Curvularia lunata* (Wakker) Boed.	45.55
7.	*Penicillium expansum* Link.	30.00
8.	*Alternaria alternata* (Fr.) Keissl.	40.00
9.	*Xanthomonos axonopodis* Hasse.	26.17
10.	*Bacillus subtilis* Cohn.	23.75
11.	*Pseudomonas fluorescens* Migula.	12.85
12.	Control	80.00
	SE	16.896
	CD at (0.05)	35.449
	(0.01)	39.321

* Values are mean of three replicates.

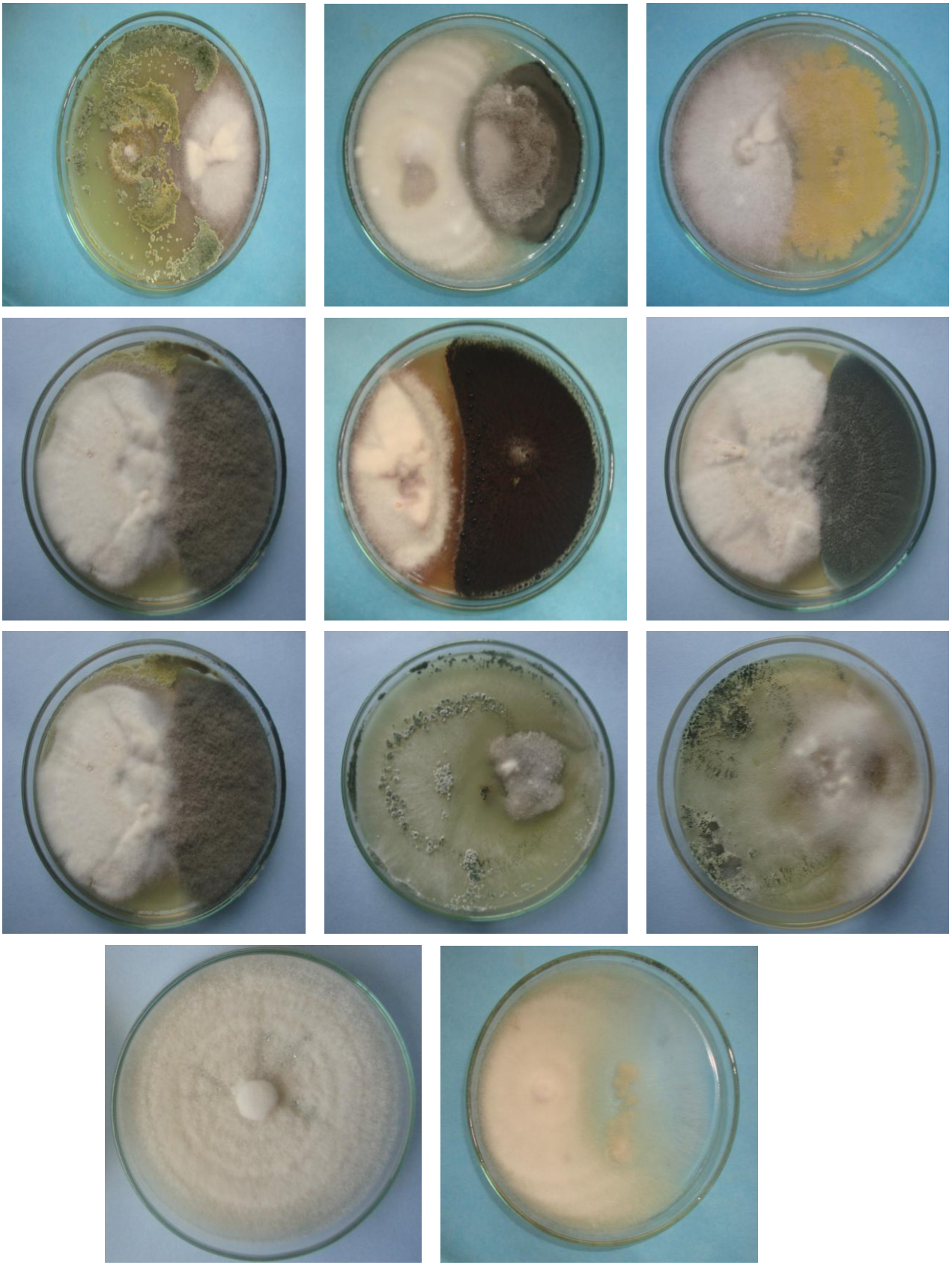

Fig.1: Biological control agents against *Fusarium oxysporum*(*in vitro)*.

CONCLUSION

The present investigation envisions the preliminary results of *in vitro* evaluation of both fungal and bacterial microorganisms are one of the potential bio-control agents against basal rot of onion caused by *Fusarium oxysporumf. sp. cepae.* Further studies are promising enough to reveal and characterize the antagonistic agent responsible for bio-control activity. While use excess amount of biocontrol agent's for the management of pathogens maintained eco-friendly relationship. Therefore the management of plant diseases using fungicides in excess amount was dangerous to host as well as environment. For minimize the usage of pesticides and chemical fungicides use biological origin products.

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