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EVALUATION OF ANTAGONISTIC POTENTIAL OF CELLULOLYTIC FUNGI AND THEIR COMPOST AGAINST FUSARIUM OXYSPORUM VAR.LYCOPERSICI (BIOCONTROL)

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ABSTRACT

In the light of sustainable and integrated ways of disease control, to minimize the uses of hazardous chemicals, the most of studies in the field of agricultural microbiology have been centered around been biological control. The biological control of wilt (Fusarium oxysporum) disease of Tomato, a soil-borne disease, through certain cellulolytic fungi notably Aspergillus spp. and Penicilliumspp. etc. has been envisioned in the present study. The invitro study of antagonistic effects of these cellulolytic fungi highlights the positive impact of compost prepared through the fungal cultures over the seed germination, plant growth and vigour with reduced incidences of the disease compared to those treated with chemical fungicides. Such compost can be of significant commercial value in future.

Keywords: *Hazardous Chemicals, Agricultural Microbiology, Chemical Fungicides, Soil-Borne Disease*.

Introduction

Biological control of plant disease, in its widest sense, is any means of controlling disease or reducing the amount or the effect of pathogens that relies on biological mechanisms or organisms other than man. The approach of biological control is always holistic it tries to combine the manipulation of edaphic and microclimatic factors with crop husbandry, plant breeding and direct mention with microbial inoculants to produce maximum plant growth and minimum disease.

Merits of Biocontrol

- Cheap and non-bulky can fulfil the demands of nutritional consumption.
- No ill effect on soil health and environment.
- Reduces the pressure on the non-renewable nutrient sources and thus helps in conservation of renewable nutrient sources.
- Improve soil properties and maintain soil fertility for sustainable agriculture.
- The cost: benefit ratio is always higher.
- Significantly useful for dry land and rainfed farming as well as for irrigated areas, eg.*Azobactor* and *Azospirillum.*

Antagonism is a general term used to denote harmful effect of biotic environment on a living organism.In antagonism one organism is injured by other either through competition for food or other demands or through secretion of toxic substances (antibiosis) or by direct injury (parasitism and predation).There are many ways in which an antagonistic organism can operate (Elad.19860). It can be between plants, two or more members of microflora and fauna and between a plant and micro-organism not necessarily producing symptoms of a disease.

The inoculation prior to planting with avirulent *Fusarium oxysporum* or other non-pathogenic fungi can reduce the amount of wilt at later stage of growth. Multiple studies have been reported antagonistic properties of many cellulolytic fungi such as T*richoderma, Penicillium, Aspergillus, Botrytis, Polyporus, Chaetomium glopsorum, Phoma etc.*

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Material and Method

- **Isolation of cellulolytic fungi from soil**

At first 10-fold serial dilution of soil sample are made 1 ml. quantity of diluted liquid is added into sterile plate. The plate is then poured with Molten Dubo's medium and on solidification the plate are incubated for one week at 30℃ for a few days after which the growth of fungi takes place.

- **Production of compost culture**

After having proper growth of cellulolytic microbes, mixwell with soaked *Zea mays*grains.

- **Pot experiment**

Three types of pots were prepared

- 5-pots were prepared with compost culture mixed with normal soil in ratio 1:3.
- 5-pots were prepared with chemical fungicides mixed with normal soil in ratio 1:3.
- 5-pots were prepared with only normal soil.

Per pot 10 seeds of tomato (*Lycopersicon esculantum)* were sown.

- **Invitro experiment**

For study of seed germination and seedling growth in invitro conditions, seeds were transferred in three types of petridish-

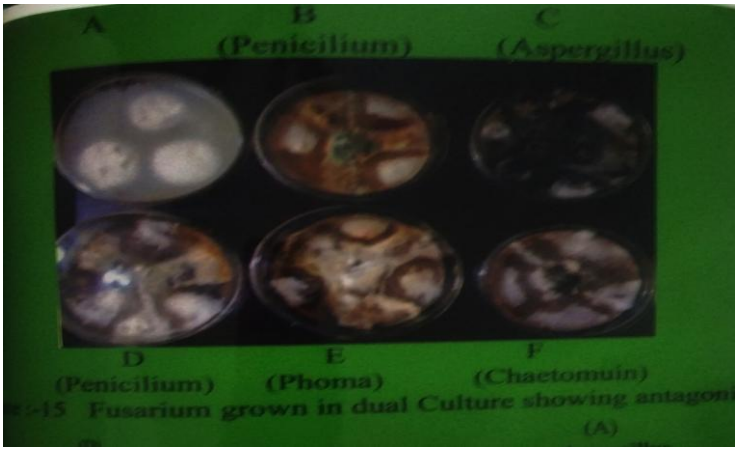
- 10-seeds were transferred in water + compost cultures petridish.
- 10-seeds were transferred in water + chemical fungicides petridish
- 10-seeds were transferred in control water petridish.

Per pot 10 seeds of tomato (*Lycopersicon esculantum)* were sown..

Observation and Results

Seeds grown on soil with compost culture showed maximum germination with a faster rate. Percentage seed germination *in vitro* was also higher in compost culture. Seedlings grow with faster rate in petri-plate containing compost culture. Plant treated with compost culture showed only mild symptoms of wilt disease in 30 percent of plants while those treated with chemical fungicides showed 60 percent of diseased plants, both mild and highly infected plants were noted.

From the i*nvitro* antagonistic experiment, it is observed that *Aspergillus* showed highest disease inhibition i.e.83 percent, followed by *Penicillium* 73 percent and *Chaetomium* 66 percent against *Fusarium oxysporum. (Slide A)*



Slide A

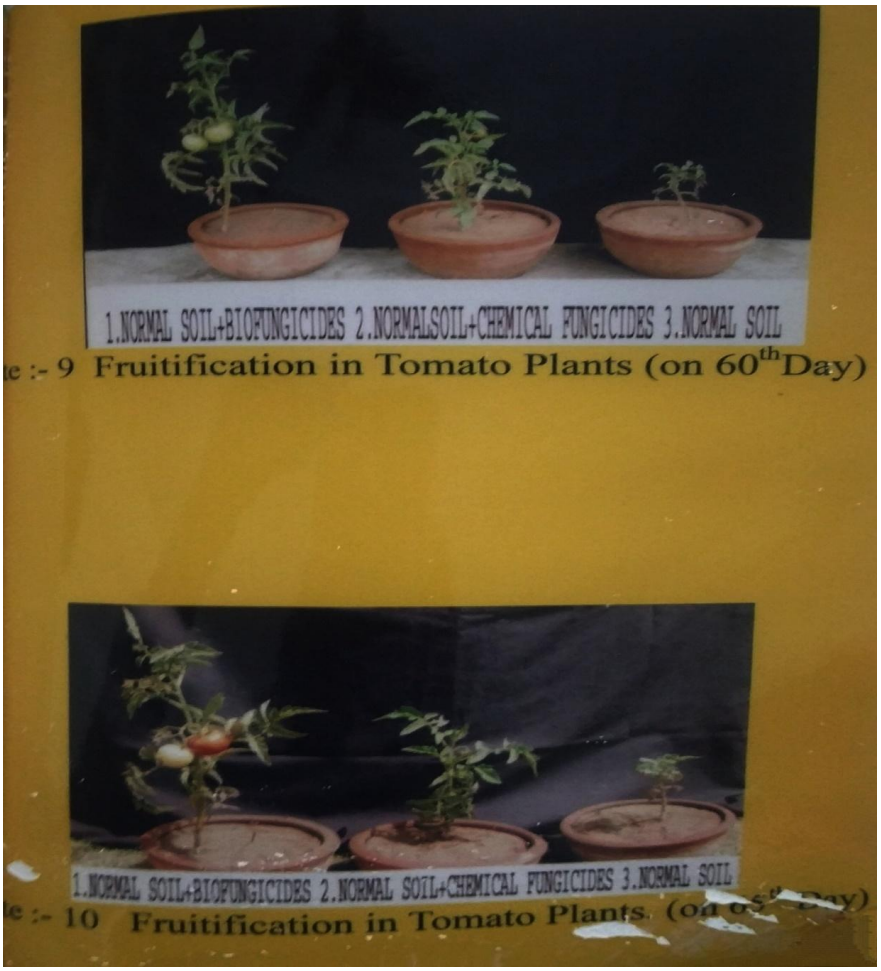
Discussion

An analysis of the data obtained during the present studies on the effect of cellulolytic fungi on disease impact of *Fusarium* wilt of Tomato caused by *Fusarium oxysporum* showed that they not only reduce disease incidence as compare to control but they also increase seed germination and plant growth.

In present study showed in dual culture, *Aspergillus* grew faster and over run *Fusarium oxysporum* and ultimately covered the whole area replacing *Fusarium*.It can be assumed that the entire protoplasmic content of mycelium of the test organism was digested by the antagonist. *Phoma* showed least antagonism and did not appear much effective. *Penicillium* and *Chaetomium* both showed good cellulolytic activity and also expressed antagonism against *Fusarium.* Seedling grown on compost culture show improved health and vigour. Increasing nutrient content of soil due to the addition of cultured compost is responsible for better growth of seedling.

Conclusion

In this experiment, observation showed that some diseases specially soil borne diseases caused by micro-organisms can be controlled by increasing the population of non-pathogenic organisms in the rhizosphere of host plant, as in the case of wilt of Tomato. The present study also showed that compost prepared through fungal cultures support plant growth. Not only it increased germination but also enhanced dry weight, and had positive impact over flowering and fruiting.(Slide-B)



Slide B

Nature has provided us a number of control agents, micro-organisms are one of best among them. They are safe and cheap and when prepared in the form of compost culture, they can also act as Bio-fertilizer. Thus, it can be concluded that biocontrol is the need of the hour.

The result of this investigation illustrated that a bio-controlling agents especially the cellulolytic fungi can be used, at a moderate inoculum level, to have significant control over diseases and in near future a cultured compost can be prepared with *Aspergillus Penicillium, Chaetomium (Slide-C).*Itcanbe developed as acommercial product to control soil borne disease e.g. Wilt of Tom

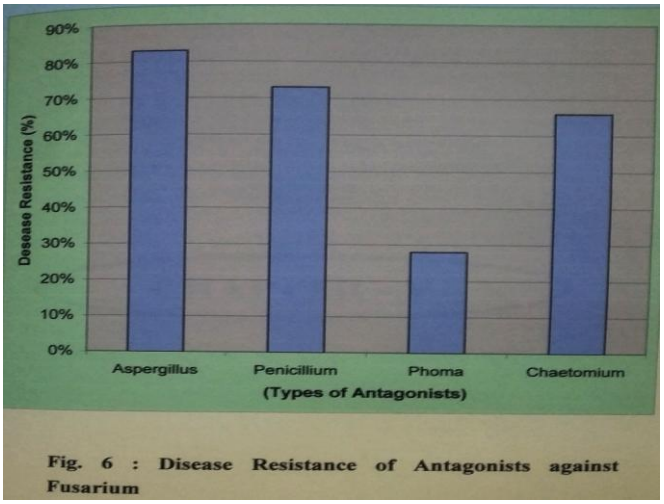


Fig. 6 : Disease Resistance of Antagonists against Fusarium

Slide C

References

1. Adams,M.J.(1991), The potential of mycoparasites for biological control of plant diseases, Annual Rev. Phytopathology. 28:59
2. Anderson, A.J.(1982), Performed resistance mechanisms. Pp. 119-137. In: Ref.No.392, Vol.2
3. Agrios, G.N.(1988), Plant pathology. 3rd. Ed. 1997. 4th. Ed. Academic Press, New York.
4. Ayed Fakher (2006), Potato vascular wilt in Tunisia, Incidence and bio-control by *Trichoderma spp.* Plant Pathology Journal 5 (1) 92-98.
5. Chingkheileima,C. Singh, M.S. and Pandey, R. R. (2007), Invitro antagonistic activities of rhizosphere and rhizoplane fungi of Tomato (*Lycopersicon esculantum (L*.) against Fusarium oxysporum f. Sp.lycopersici (SACC).Synder &
6. Hans Department of life science, Manipur University. All india botanical conference 28th-30thNovember,2007. pp.28.
7. Fakher, A. and et al. (2006) Potato vascular *Fusarium* wilt in Tunisia, Incidence and biocontrol by *Trichoderma spp*. Plant pathology Journal 5(1) pp.92-98.
8. Fravel, D.R. and Lewis, J.N. (2004) Biological control of *Fusarium oxysporum* and other soil borne plant pathogenic fungi. Phytoparasitica, 32. 111-118 (2008).
9. Heydari, Asghar and Pessarakli, Mohammad, A Review on Biological Control of Fungal
10. Plant Pathogens Using Microbial Antagonists. Journal of Biological Sciences Year 2010 |Volume: 10| Issue:4| Page No.273-290.
11. Larkin, R.P. and Fravel, D.R. (2005) Biological control of *Fusarium* wilt diseases by nonpathogenic *Fusarium spp*. Journal of phytopathology.Vol.153,Nov. 2005.
12. Laxmipriya, P. and Pravu, C.L. (2007) “Tomato valuable plant for health”. Agrobios Newsletter Vol VI, No. 5, October, 2007.
13. Mahajan, A. and Sharma, R. (2005) Integrated nutrient management (INM) system concept,need and future strategy. G.H. Toennienssion, pp 259-272.
14. Mitra, Aboutorabi, A Review on the Biological Control of Plant Diseases using Various Microorganisms. Journal of Research in Medical and Dental Science 2018.Volume 6, Issue 4, Page No. 30-35
15. Pal, Kamal Krishna (2011), Biological Control of Plant Pathogens. Biological Control of Plant Health Instructor . Updated 2011.
16. Singh, R.S. (2002) Principles of plant pathology. Fourth ed. (2005). Pp. 329-337.

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