The evaluation of efficiency of some bio-fungi to avoid Fusarium oxysporum F. sp.Lycopersici

Samira Mohamed Ebraik, Awad Farh Faraj, and Eltaher Ahmed Abuhligha

***Abstract*—**The biological control for plant diseases especially caused by fungi is one of the important research directions, which use instead of chemical control during these century. The importance of tomato plants, decrease of its production, and the decrease in the studies related to fungi diseases, so the control method is important, this study aimed to the play roll of biological control fungi for incourage systemic control in tomato plant.

***Keywords*—** evaluation of efficiency Fusarium oxysporum F. sp.Lycopersici.

I. Introduction

ACTIVITY of plant pathogenic fungi and non-pathogenic affected with many environmental factors, The resistance of some plant varieties to pathogens which cause diseases back to the formation of different chemical compounds operating as inhibitor to the growth and evolution of pathogens, The compounds were composed during stimulate host plant with some biotic and non-biotic factors (Kloepper, 1992), and these compounds are known Phytoalexin , Phenolic compounds, and protein compounds or enzymes with privacy toxic such as Protease B-1-3glucanacs Peroxidase, which their concentrations increase in the sites of infection.

Several researchers were pointed to the ability of different types of biotics to stimulate systemic resistance of plant against various causal agents,(Yedidia al., 1998) stressed that the Trichoderma fungus led to increase effective of enzyme Chtinase, Peroxidase causing stimulation of plant resistance and thus led to increased fresh weight and Dry shoot and root, (Decal al. ,2000), pointed that the treatment of tomato plants with the suspention of fungi P. oxcaslicum spores (10)7 spore / ml) led to a change physiology of the plant as well as the effect of reducing the density of fungus colonies . F. o. l inside the vascular tissues of tomato plant ranged between 35 - 99%.

In multiple experiments conducted on strain (47 of F. o.) found that when tomato plants inoculate with this strain leads to increased plant enzymes such as enzyme Chitinase in the stem, which has risen to 126% and, in the leaf was 137%, and in the cell fluids leaf was 155%, and also led to the increased enzyme B, 1.3 glucanase by 315% and enzyme B, 1.4 glucosidase by 168% and this is mean that something confirms the ability of this strain to cause resistance in tomato plants (Abu Argub, 2000).

The study of (Ramamoorthy al. , 2002), that bacteria P. flaerescences incourage the tomato plant for produce compound of Phenyl alanine , ammonia lyase (PAL) and Peroxidase (PERO) and Polyphenoloxidase (PPO) to control the tomato wilting of fusarium disease.

(EL.Rafai al.,2003) Found that the treatment of the seeds of tomato plants with fungus Trichoderma harzianum led to an increase in chlorophyll (Chlorophyll a, b) and some phenolic compounds in the leaves of the tomato plant.

And also (Attitalla ,2004) found that the use of non pathogenic isolate of 1386351 F . oxysporum IMI caused stimulation of systemic resistance in tomato plant to produce many chemical compounds that have had an active role in the inhibition of the growth and activity of pathogenic fungus F. o; l , (Hamdani , 2006) pointed that When the tomato plants treated with biotic fungal T. harzianum and non pathogenic isolate of F. oxysporum and Chaetomium giobosum , led to stimulate the systemic resistance of plant which led to increased in weights of soft and dry shoot and root, and a difference of moral treatment from the comparison (f) of the plant as average fresh weight were 4.37 , 3.63 and 3.86 g, respectively, of shoots , and dry weight were 0.58, 0.53, 0.55 respectively for the shoot, also averaged fresh weight of root were 1.46 , 1.32 and 1031 g, respectively, while the average dry weight were 0.15 , 0.12 and 0.12 g. respectively of the total radical compared to the treatment of the comparison and the height of the average fresh weight of shoot and root were 1.63 and 0.74 g . respectively, while the rate of the dry weight of shoot and root were 0.25 , 0.07 g, respectively.

II. Material and methods

The sterile soils were treated with inoculum of biological fungi Chaetomium globosum and Trichodema harzianum charged or loaded to wheat grains . Distributed in pots at a rate of 200 g / pot , but the sample which using for comparison included only sterile soil without inoculum of fungi, tomato plants ten days old planted in pots and transferred from the paralyzing sterile soil after four weeks of planting, a silt has been made in the plant stems 0.5 cm long and 2.5 cm height from the soil surface by sterile scalpel , and its inoculated by the incision disk of 0.5 cm diameter from the

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center of media (PDA) in the petri dish, in which the colony of pathogenic fungus F.o.l. were growth. and fixed by sterile medical gauze on the stem and then wrapped with the tape of aluminum (Silver) on inoculated stem place, after one week of inoculation the disc was removed from the stalk plant, and after two months of planting the percent of infection was calculated through the following equation:

The percentage of infection =

$$\frac{\text{number of infected plants} \times 100}{\text{The total number of plants examined}}$$

As well as plant height, fresh and dry weights of shoot and root systems. (Decal et al, 1997). All results were statistically analyzing using percentages and Pearson's correlation coefficient and analysis of variance and multiple comparisons method using LSD).

III. Results and discussion

The aim of this experiment is to exclude the role of competition or the secretion of inhibitory metabolites of pathogenic fungi or separation of the direct effect of fungal biological control in the pathogenic fungus F. oxysporum and study the possibility of the ability of these fungi to stimulate systemic resistance in the plant as one of the control mechanisms proposed in the biological control.

The results of table (1) pointed to the low rate of pathogen fungi infection from 100% in the control treatment (F) to 34.32% and 52% respectively compared with fungal treatment T. harzianum and C. globosum, also the biotic fungi which used in this experiment achieved significant superiority in increase the rate of plant height compared to the treatment of the control (F), in which stood the rate of plant height 8.16 cm while the average plant height 25.20 cm and 23.14 cm respectively for fungal biological control as shown in Figure (1).

As noted by the results of this experiment an increase in the weights of soft and dry of shoot and root systems, as the rate of fresh weight of shoots 6.39 g and 5.29 g, respectively, compared to 2.25 g for the treatment of the control (F) as well as the rate of fresh weight of the root system reach to 3.20 grams. and 3.13 g. compared the treatment of the control (f), which weighed 0.82 g. while the rate of the dry weight of shoot 2.60 g. and 1.80 g. respectively, compared to 0.85 g. for the Treatment of comparison, and average dry weight of the root reach to 2.03 g. , 1.98 g., respectively compared to the treatment of the control (F) which the rate of weight 0.04g. .

This result agreed with some results of studies that pointed to the efficiency of some species of biological fungi in stimulating systemic resistance of plant against some different pathogens.(Decal et. al. 2002) found that the inoculation of tomato plants with the suspention of spores of P. Oxalicum may stimulate systemic resistance of plant against pathogenic fungus. F. o l.

The reason where attributed for that to some histological changes in the fertilized plant and the most important of which is the composition of additional secondary phloem in plant and prolong the effectiveness of it cambium. (EL.Rafai et. Al. 2003) pointed that the treatment of tomato seeds with biotic-fungi inoculum of T.harzianum led to an increase in the proportion of chlorophyll (Chlorophy a, b) and some phenolic compounds in the leaves of the plant.

Also (He et. al. 2003 and Attetall ,2004) were pointed that some non-pathogenic isolates of F.oxysporium have prompted systemic resistance in tomato plants in the pathogenic isolates of the fungus F.oxysporium and that attributed the reason to the fact that the host plant responds to some fungal secretions for the manufacture of chemical compounds with toxic or inhibitory effects of pathogens and underlying composition in the areas of infection and surrounding areas leading to impede the growth and development of pathogens, and these compounds: -

1 - chemical compounds or enzymes with different impacts such Peroxidases, Phenoloxidases and Phenyl alanine. ommonia – Lyase

2- Protein or enzyme compounds with privacy toxic such as Protase, Chitinases , B- 1.3-glucanase .

3- Biotic compounds which working to impade the growth and inhibit of pathogen such as Callose , Lignin , rich glycoproteins, hydroxyproline , (Hamdani ,2006) found that when tomato plants inoculated with fungus T.harzianum and with abiotic isolate of F.oxysporium may have stimulated systemic resistance against plant pathogenic fungus F. oxysporium.

This result is consistent with the results of studies (Decal et al, 2002) and (EL.Rafai, et. al. 2003 and He 2003 and Attetall, 2004 and Hamdani, 2006).

Through this study we found that the methods of biological resistance for plant pathogens were too many and through which many could be eliminate pathogens, although Fusarium wilt disease in tomato caused by fungus Fusarium oxysporum f.sp. lycopersici which causes heavy losses in the fields and nurseries can be combated biologically by some biotic fungi and that could secrete several enzymes which analyst for wall cells of pathogenic fungus, as some of these fungi have improved some recipes growth tomato plants as germination and the rise in the lengths of plants and an increase in the fresh and dry weights of the root and shoot systems and stimulate systemic resistance in tomato plants.

TABLE I
SHOWS THE EFFICIENCY OF THE SOME BIOTIC FUNGI IN STIMULATING SYSTEMIC RESISTANCE TO PLANT

Height of plant (cm)	Rtae of infection (%)	Dry weight		Soft weight		Fungus	No.
		Root	shoot	Root	shoot		
25.20	34.32	2.03	2.60	3.20	6.39	*T.harzianum*	1
18.16	100	0.40	0.85	0.82	2.25	Control(F)	2
23.14	52	1.98	1.80	3.13	5.29	*C.globosum*	3
		1.47	1,75	2.38	4.64	The rate	
		0.27	0.14	1.52	1.4	%5 L.S.D	

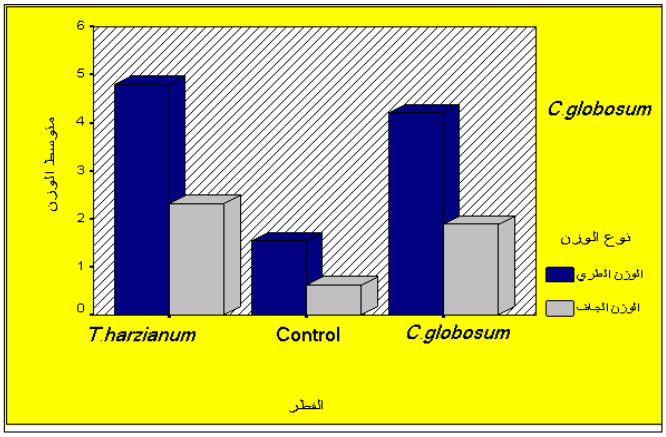

Fig. 1 the efficiency some biotic-fungi in stimulating systemic resistance to plant

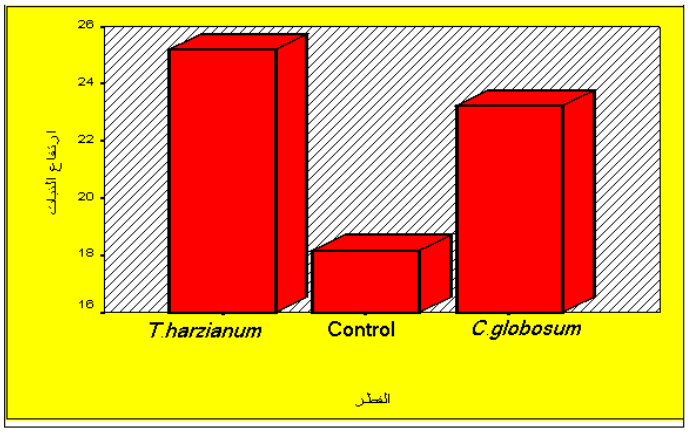

Fig. 2 the efficiency of some biotic-fungi to stimulate systemic resistance in plants

Fig. 3 efficiency biotic-fungi in stimulating systemic resistance in tomato plants against pathogenic fungus .F.o.l

IV. CONCLUSION

The results showed that fungal Biological control has the potential to stimulate systemic resistance to tomato plant where it worked to reduce the rate of infection of pathogen fungi F.o.l. , And also achieved a superior increase in average length of the plant accompanied by a significant increase in the rates of fresh and dry weights of shoot and root systems of the plant compared to the treatment of the control.

V. RECOMMENDATIONS

1 - Further expansion in the study of fungal strains useful in biological control, and the use of modern methods and techniques in the classification.

2 - Conduct studies of fungal strains useful in biological control on other plant species, and different environments.

3 - Follow-up work on the fungal of biological control isolates in terms of breeding and regeneration, and test the efficiency of the different types of plants and also in different environments.

4 - Constant concern to plant seeds and seedlings of tomato plants in agricultural soil pre-treatment with different fungi of biological control and that have proven effective.

5 - Continuation of scientific research in the field of biological control of pathogens in terms of modern developments and its various applications in this area.

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