EFFICIENCY OF SOME BIO PESTICIDES IN CONTROL OF PLANT DISEASES COMPARING WITH CHEMICAL PESTICIDES

By

ZIENAB HASSAN WAHBA
B.Sc. Agric. Sci. (Biotechnology), Fac. Agric., Cairo Univ., 2005

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DEDICATION

This work is dedicated to the present absent soul, ***Abdel-Rahman Hassan Wahba "BODA"*** *Allah's mercy on him, my sweetheart brother and my soul mate.*

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ABSTRACT

A variety of fungal diseases (rot and wilt) affects tomato plants which causes economic damages. Therefore the present study aimed to identify the pathogenic fungi, evaluate biological and chemical methods controlling different tomato plant diseases. As well as obtaining new isolates that can be used in biocontrol. Therefore pathogenic fungi were isolated from diseased tomato plants and identified as *Fusarium oxysporum, Fusarium solani, Fusarium semitectum* (soil-borne pathogens) and *Alternaria alternata* (as a foliage pathogen). Also, *Chaetomium globosum* and *Trichoderma harzianum* were isolated from healthy tomato plants at the rhizospheric area. All plant sampls came from soil in Alexandria and Giza Governorates. These isolates were evaluated as potential bio-agents in control of the soil-borne fungi. The antagonistic effect of *T. harzianum* and *C. globosum* as controlling bioagents was tested under laboratory conditions on each pathogen, *T. harzianum* showed remarkable superiority over the other one. *T. harzianum* was the most effective bio-agent against *Fusarium* spp. reducing their growth. The maximum growth reduction of 100% with *F. semitectum.* The three tested biocides; Bio Zeid, Bio Ark and Plant guard were evaluated in vitro in comparison with chemical fungicide (Uniform 390 SE and Antracol WP 70%) and *T. harzianum* on growth of pathogenic isolates. The obtained results indicated the superiority of biocides and *T. harzianum* over the chemical fungicides. Quantitative determination of protein content to tested pathogens revealed that bio-ark was the most effective one either by decreasing or increasing fungal protein content. A greenhouse experiment was established for the application of bio-Ark as a model of bacterial bio-pesticide and the fungal isolate *T. harzianum,* comparing them with the chemical pesticide uniform 390 SE. *T. harzianum* recorded the highest disease reduction percentage ranged between 81 - 100% followed by the biocide bio-Ark fom zero - 100% and then uniform 390 SE from 6 - 75%.

Key words: Tomato, *Fusarium* spp., *Alternaria alternata*, biocides, fungicides.

INTRODUCTION

Tomato (*Solanum lycopersicum* L.) is arguably the world′s most important vegetable crop. In the vegetable world market, it is ranked not only in the second place, next to potato, in world total production but also in the first position in international commodity prices (**FAOSTAT, 2012**). According to **FAOSTAT (2017)**, Tomato is grown worldwide for local use or as an export crop. In 2014, the global area cultivated with tomato was 5 million hectares with a production of 171 million tonnes. Egypt is among the top five worldwide producers of tomato with about 8.6 millions ton (**FAOSTAT, 2012**). Tomato, a side from being tasty, it is very healthy because of its high nutritive value as it provides important nutrients such as vitamin C, beta-carotene, lycopene, and flavonoids. Furthermore, antioxidant substances available in tomato may actually represent a modern-day "fountain of youth". Recent evidences suggested that lycopene has a strong anti-oxidative activities and anti-cancer functions (**Wu *et al.* 2011; Park *et al.* 2014**). It is noteworthy that tomato is not only sold fresh, but also processed and canned as soups, sauces, juices, ketchup and other products. Therefore, the production and consumption of this nutritious, health-promoting vegetable is constantly increasing. However, this crop is attacked by many pathogens causing a considerable reduction in yield quantity and quality (**De Curtis *et al.*, 2010**). Among these diseases was two symptomologically distinct forms of the pathogen can cause either a vascular wilt *Fusarium oxysporum f. sp. lycopersici* **(Snyder and Hansen, 1940)** or a crown

and root rot (*F.oxysporum f. sp. radicis-lycopersici* **(Benhamou *et al.*, 1997)**. The Crown root rot disease is caused by *F. oxysporum* which reduce yield to 50%; this fungus causes severe root rot and finally plant death (**De Araujo *et al.*, 2009; Nihorimbere *et al.*, 2010**). The Interaction between *F. oxysporum* and *F. solani* causes a root-rot disease complex that severely damages this important crop **(Klotz, 1973)**.

Diseases are known to limit worldwide production of tomato Controlling such diseases mainly depend on fungicides treatments (**Rauf, 2000**). However, fungicidal applications cause hazards to human health and increase environmental pollution. Biological control had attracted the interest because of increasing regulation and restriction of chemical pesticides or unsuccessful control attempts by other means. Biological control for pathogens by antagonistic microorganisms is potential especially for soil-borne diseases because these pathogens are difficult to be controlled with specific fungicides (**Moussa *et al.*, 2007**). Potential agents for bio-control activity are rhizosphere competent fungi and bacteria, which in addition to their antagonistic activity are capable of inducing growth responses by either controlling minor pathogens or by producing growth stimulating factors (**Akrami *et al.*, 2011**). It has been suggested that microorganisms isolated from the root or rhizosp here of a specific crop may be better adapted to that crop and may provide better control of diseases than organisms originally isolated from other plant species (**Cook, 1993**). Breeding of *Trichoderma* is directed to achieve effective mycoparasitic

strains for bio-control against plant fungal pathogens under a wide range of adverse environmental conditions (**Manczinger *et al.*, 2002**), *Chaetomium globosum* has been reported effective in reducing damage caused by seed rot and damping off of several seed- and soil-borne plant pathogens (**Aggarwal *et al.*, 2004**).

Our study aimed to 1) Isolate pathogenic fungi that cause severe loses in tomato plants in Egypt. 2) Limit the excessive misuse of the chemical pesticides by using alternative methods. 2) Evaluate bio-control methods by either bioagents or bio-pesticides to control and limit the negative effect on the yield quality and quantity caused by these diseases.