

# **CHAPTER 1**

## **INTRODUCTION**

# 1. INTRODUCTION

Tomato (*Solanum lycopersicum* L., syn. *Lycopersicon esculentum* Mill.) is a major contributor to the fruit vegetable diet of humans. It is cultivated in essentially all countries either in fields or in protected culture. It is one of the most important vegetable crops in Egypt either for local consumption and exportation. Tomato is considered as one of the highest nutritional crops because of its high contents of vitamin C as well as many chemical compounds and elements which are not found in the other solanaceous crops. It plays an important role in human health as it is a rich source of lycopene, which helps counteract the harmful effects of radical effects which are thought to contribute to age-related process and a number of types of cancer (**Khan *et al.*, 2006**), especially the prostate cancer (**Giovannucci, 1999**). Peoples who consume large amount of tomato products significantly decrease risk of prostate, lung and stomach cancer. In Egypt, it is used for food and industrial purpose, in 2012; the cultivated area reached to about 515236 feddans, with production quantity 8625219 ton of fruits (**FAO, 2014**).

Under Egyptian conditions tomato plants are vulnerable to infect by bacterial, fungal and viral diseases (**Abdel-Sayed, 2006 and Abada *et al.*, 2008b**), in addition to physiological disorders and nematode infections.

However, fungal diseases, especially early blight caused by *Alternaria solani* (Ellis and Martin) Jones and Grout, is the most threatening one (**Abdel-Sayed, 2006 and Abada *et al.*, 2008b**), which causes great reduction in the quantity and quality of fruit yield. In addition, the disease is favored by warm temperature and extended periods of leaf wetness from dew, rain fall and crowded plantation.

*Alternaria solani* is the causal agent of early blight disease of commercially produced tomato, potato, and eggplant. Early blight may affect the foliage, stems, and fruits of infected plants. Early blight is responsible for a large proportion of total monetary losses sustained by tomato producers every growing season. If disease incidence is high, the fungus can cause extensive defoliation, leading to a reduction of economic fruit yield (**Jones *et al.*, 1991**). Early blight is a three phase disease, which produces leaf spots, stem canker and fruit rot.

*Fusarium solani* is the most important soil borne fungalpathogens, which develop in both cultured and non-cultured soils, causing the symptoms of root rot disease to wide range of vegetable and crop plants including tomato (**Abu-Taleb *et al.*, 2011**).

Root rot of tomato plants caused by *Fusarium solani* is a serious disease leading to delayed growth and subsequent death of severely infected plants (**El-Mohamedy *et al.*, 2014**).

Controlling such diseases mainly depend on fungicides treatments (**El-Mougy *et al.*, 2004**). It is well known that tomato fruits are mostly consumed freshly, thereby spraying fungicides just before harvesting resulted in high fungicide residue in the fruits, which cause great hazard to the human health. However, widespread of fungicidal applications leads to development of pathogen resistance and increase environmental pollution and increase the accumulated toxic substances in human food chain. On the other hand, using alternative disease management, *e.g.* biological control, plant extracts, antioxidants and agricultural practices, are not enough to obtain efficient results (**Hilall, 2004; Muhanna, 2006 and Abada *et al.*, 2008a**). Therefore, alternatives, eco-friendly

approach treatments for control of plant diseases are needed (**Abd-El-Kareem, 2007; Rojo et al., 2007 and Mandal et al., 2009**).

Acetic, citric, succinic, malic, tartaric, benzoic and sorbic acids are the major organic acids that occur naturally in many fruits and vegetables (**Foegeding and Busta, 1991**). Some organic acids naturally found in or applied to fruits and vegetables behave primarily as fungistats, while others are more effective as inhibiting bacterial growth tools.

Systemic acquired resistance (SAR) or induction of resistance to pathogen is a promising approach for controlling plant diseases. Exogenous or endogenous factors could substantially affect host physiology, leading to rapid and coordinated defense-gene activation in plants normally expressing susceptibility to pathogen infection (**Mandal et al., 2009**). This phenomenon, that resistance of plant to pathogens can be enhanced by the application of various biotic and abiotic agent, called induce systemic resistance in plants (**Sarwar et al., 2005 and Abd-El-Kareem, 2007**).

**The objectives of the present study were:**

- 1- To evaluate the inhibitory effect of different concentrations of some antioxidants, a biocide and chemical fungicides on the growth of *Alternaria solani* and *Fusarium solani* (the causative pathogenic fungi of tomato early blight and root rot diseases, respectively) *in vitro*.
- 2- To test a management program model for controlling these two fungal disease under greenhouse conditions using certain antioxidants, a biocide, certain chemical fungicides and/or their sequential treatment minimize the fungicides rate of application and their residues.
- 3- To test the induction of tomato plants defense through the biochemical changes (enzymes activity) in the plants.
- 4- To detect the residues of certain fungicides on tomato fruits.