MANAGEMENT OF ROOT ROT DISEASE IN ORNAMENTAL NURSERIES

By

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B.Sc.Agric.Sc.(Plant Pathology), Ain Shams Univ. (2009)

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ABSTRACT

Kirolos Magdy Adolf Saied: Management of Root Rot Disease in Ornamental Nurseries. Unpublished M.Sc. Thesis, Department of Plant Pathology, Faculty of Agriculture, Ain Shams University, 2016.

Root rot disease affects a wide range of ornamentals in home and commercial landscapes, nurseries, and greenhouses. The present study identified major fungal pathogens causing root rot disease in six ornamental plants, *i.e.* Carnation, Geranium, Hollyhock, Hopbush, Orange Jessamine, and Pothos, collected from nurseries in five different locations in Egypt during 2012-2013. The most frequently isolated fungi were identified as *Fusarium* spp. (94%). These include: *F. semitectum, F. solani, F. equiseti, F. chlamydosporum, F. subglutinans, F. scirpi, F. oxysporum, F. anthophilum, F. verticiloides* and *F. proliferatum.* In addition, three isolates of *Phytophthora* spp. and an isolate of *Pythium ultiumum* were also isolated. Variation in pathogenicity of these isolates on Geranium and African marigold plants were established. *In vitro* assays, 16 bacterial and fungal isolates, have shown antagonistic activity against five tested fungal pathogens isolates. The most antagonistic were *Pseudomonas fluorescens* (strain3339) and *Trichoderma harzianum* **(**TCNu 1**)** which greatly reduced pathogens mycelial growth. In greenhouse experiments with Geranium and marigold, *P. fluorescens* (strain3339) was superior to *T. harzianum* (TCNu 1) in reducing root rot severity and improving plant growth characters. Solarization of pathogen-infested potting soil and the addition of bio-agent or organic amendments had positive effects on plant growth of marigold plants and significantly suppressed root rot severity. Growth and infection of marigold plants by root rot disease. No significant effect of soil solarization on total chlorophyll content of marigold plants. However, plants grown in soil amended with garlic powder or compost showed high chlorophyll content. Activity of polyphenol oxidase enzyme of marigold plants were high in plants grown in un-solarized soil, while there was no

significant effect between treatments or solarization on activity of peroxidase enzyme. In conclusion, solarization of potting soil for 8-10 weeks, during summer in Egypt, in plastic bag, has prove high potential to be considered as a useful soil disinfectant, and is an inexpensive, fast, and effective technique for recycling pathogen infested soil. Combining solarization with either bio-agents or compost or vermicompost for ornamental nurseries and greenhouses production will have higher horticultural value besides being an environmentally safe and an inexpensive alternative for soil disinfestations.

Keywords:

Ornamentals, Root-rot, *Fusarium* spp., *Phytophthora* sp., *Pythium ultimum*, Pathogenicity, Bio-control, Soil Solarization, Compost, Vermicompost, Soil amendments and Disease management.

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INTRODUCTION

The production of ornamental plants is a thriving and expanding industry, which is economically important in the United States of America, Canada, South America, Australia, and Europe as well as in many developing countries **(Gullino and Garibaldi, 2007).** Like developed countries, demand of flowers is now even discernible in developing countries, where the cultivation of different types of flowers hold a promise of increasing economic return **(Manzoor, *et al.*, 2001).** The ornamental plant industry thrives in Egypt because of the temperate, environment that makes Egypt a compatible location to mass produce numerous plant species. Recently, Egypt has become one of the largest producers of flowers in the Arab region, because of the high demand in internal and external markets **(Annon., 2014).** The value of medicinal, aromatic and ornamental plant crops are estimated at about 0.7% of the total crop production value **(El-Nahrawy, 2011).** The cultivated area with ornamental plants in Egypt reached about 3.5 thousand feddans and produces annually around 4000 tons of flowers, as amounted of Egypt's exports for the year 2010 was 600 million Egyptian pounds **(Annon., 2010).**

Diseases are a major limitation for sustained production of ornamental crops due to demand for unblemished plants and plant organs **(Daughtrey and Benson, 2005; Gullino *et al.*, 2012).** The ornamental plants in Egypt are liable to attack by a wide variety of plant pathogens **(Hilal, *et al.*, 2000; Helmy, *et al.*, 2001; Zaher, *et al.*, 2005 and El-Wakeel, 2010),** and are responsible for serious losses. However, root rot and wilt diseases in nurseries and greenhouses are major constrains for ornamental production **(Daughtrey and Benson, 2005; Gullino and Garibaldi, 2005; Gullino, *et al.*, 2012; Abd Latif, *et al.*, 2016).** Soil-borne diseases include the species *Pythium*, *Phytophthora*, *Rhizoctonia*, *Thielaviopsis* and *Fusarium* **(Newman, 2008; Armengol, *et al.*, 2005, Gullino and Garibaldi, 2007)** which collectively include the majority of the fungi that infect roots and crowns of

plants and most ornamental crops are susceptible to one or more of these causal organisms. Once diseases develop and become established in a crop, more frequent and expensive management actions often are required; in addition, repeated chemical control measures may lead to other problems such as phytotoxicity, outbreaks of secondary diseases, or fungicide resistance **(Dreistadt, 2001).** Most pesticide labels have a list of plants on which the product has been tested and determined safe to treat, as well as plants not tolerant of the product and pesticide performance is sometimes altered by the development of pathogen resistance **(Harmon and Bledsoe, 2012).** Frequent use of pesticides often hardens, marks, or stunts some, if not all, cultivars of a species **(Gullino, *et al.*, 2015).** Also, the heavy use of chemical pesticides often leads to deterioration of the agro ecosystems, in addition to its hazardous to the health of humans and animals **(Pimentel, 2005).**

Propagation of ornamental plant materials is the basis for production of healthy plants to provide consumers with safe and sustainably produced products. Continual introduction of new crops and new production technologies creates new opportunities for pathogens to exploit, such that new disease management tactics must be discovered and old ones rediscovered to achieve optimum health management for ornamentals **(Daughtrey and Benson, 2005).** However, growing concerns over the protection of the environment is now widespread, especially in the field of agriculture. Consumers are progressively seeking quality produce grown under systems respecting the increasingly restrictive environmental guidelines. In this context, ornamental plant growers should also aspire to achieve a more sustainable production system **(Gravel, *et al.*, 2009).** These challenges require growers to develop the most efficient production plans possible, incorporating as many tactics as they can to maximize plant health and minimize opportunities for pest and disease outbreaks a concept known as integrated pest management (IPM). Management tactics are outlined under the following key components of an IPM program: prevention, cultural