Egyptian Journal of Biological Pest Control, 19(2), 2009, 169-175

Susceptibility of the Peach Fruit Fly, *Bactrocera zonata* (Saunders), (Diptera: Tephritidae) to Three Entomopathogenic Fungi

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(Received: November 15, 2009 and Accepted: December 12, 2009)

ABSTRACT

The peach fruit fly, *Bactrocera zonata* (Saunders) (Diptera: Tephritidae) is one of the most serious polyphagous insect pests in Egypt. Its control depends upon chemical sprays with organophosphate pesticides, especially Malathion mixed with protein baits. Their environmental impacts and development of resistance have justified the need to find sustainable control alternatives. Therefore, susceptibility of *B. zonata* to three entomopathogenic fungi was studied. Laboratory experiments to determine the virulence of the fungi; *Beauveria bassiana*, *Metarhizium anisopliae* and *Lecanicillium muscarium* (formerly *Verticillium lecanii*) on 2nd and 3rd instars' larvae, 1 and 6-day old pupae, newly emerged males and females of the pest were conducted at the recommended dose 5 g/ liter of water (5×10^8 conidia/l) and when each ml was containing 5×10^5 conidia. Obtained results showed that the susceptibility of males to the fungi was higher than that of females in both bioassay treatments. The virulence of fungi was also higher in oral bioassay than contact one in both sexes. Moreover, *M. anisopliae* gave higher mortality than *B. bassiana* and *L. muscarium*, reaching 94.4% in males and 76.8% in females in contact bioassay test. Meanwhile, *M. anisopliae* gave a mortality level of 100 and 95.2% for males and females, respectively in the oral bioassay. In case of *M. anisopliae*, median lethal times (LT_{50s}) were rather short for males (6.23, 8.93 days) than (7.49, 10.89 days) for females, followed by *B. bassiana*, 10.83, 12.69 d. for males and 10.17, 14.39 d. for females. *L. muscarium* showed much longer LT_{50s}; 15.32, 18.05 d. for males and 17.02, 22.36 d. for females. Data revealed that both 2nd instar larvae and 1-day old pupae were more susceptible than 3rd instar larvae and 6-day old pupae to all the tested fungi. Based on the obtained results, 2nd instar larvae, 1-day old pupae and male adults were used to determine the interactions among the three fungi on mortality response. Results also showed some potential effect when *M. anisopliae* was mixed with either *B. bassiana* or *L. muscarium*.

Key words: *Bactrocera zonata*, *Beauveria bassiana*, *Metarhizium anisopliae*, *Lecanicillium muscarium*, virulence, susceptibility.

INTRODUCTION

The peach fruit fly, *Bactrocera zonata* (Saunders) (Diptera: Tephritidae) is one of the serious polyphagous insect pests in the world, particularly several countries in the Near East and Egypt due to its wide host range, high reproductive potential, high mobility and adaptability to climate. It attacks many fruit species (more than 50 host plants), including mango, peach, guava, citrus, fig, apple and tomato. (White and Elson-Harris, 1992).

In Egypt, the pest control depends largely on insecticidal applications, especially Malathion, mixed with protein baits. Intensity of insecticidal treatments against *B. zonata* has resulted in development of resistant populations (Ortego *et al.*, 2005). Their environmental impacts and development of resistance have justified the need to find sustainable control alternatives. Therefore, entomopathogenic fungi were tested. Several reports focused on the potential of bacteria and nematodes as biological control agents against fruit flies (Toledo *et al.*, 2005, Mahmoud 2007 and Mahmoud and Osman 2007). Several species of fungi have the potential as viable biocontrol agents to insects. The most commonly used Deuteromycetes fungi include the genera *Beauveria*, *Metarhizium* and *Lecanicillium*. Entomopathogenic fungi based-biocides are currently commercialized. The viability of the fungus should be evaluated since it is an important component of the quality of the product. Reports concerning the use of entomopathogenic fungi against fruit flies, especially the peach fruit fly are meager (Quesada *et al.*, 2006 and Aemprapa 2007).

Objective of the present study focused on determination of the susceptibility of *B. zonata* to three entomopathogenic fungi namely; *Beauveria bassiana*, *Metarhizium anisopliae* and *Lecanicillium muscarium* under laboratory conditions.

MATERIALS AND METHODS

Entomopathogenic fungi used

Commercial formulations of the bio-pesticides; Bio-Power (*Beauveria bassiana*), Bio-Magic (*Metarhizium anisopliae*) and Bio-Catch (*Lecanicillium muscarium*) (1.15% WP), talc based biological insecticides containing spores and mycelias fragments of 1×10^8 conidia/g were tested. The biocides were obtained from T. Stanes and Company LTD, Tamil Nadu, India. All formulations were used at the recommended dose of 5 g/liter of water. Viability of conidia was determined for each bio-pesticide by spreading conidial suspension in Petri dishes containing thin layers of yeast extract