Susceptibility of different stages of the Mediterranean fruit fly *Ceratitis capitata* to entomopathogenic fungus *Lecanicillium muscarium*

Ali Ali, Helga Sermann, Carmen Büttner
Humboldt Universität zu Berlin, Institute for Horticultural Sciences, Department of Phytomedicine, Lentzeallee 55-57, 14195 Berlin, Germany
E-mail: aligermany80@yahoo.de

INTRODUCTION

Fruit flies are the most serious pests of fruits and vegetables in the tropical and subtropical regions of the world. The Mediterranean fruit fly *Ceratitis capitata* have many generations per year (up to 8) in Syria and attacks many species of fruits. The damage to crops caused by Mediterranean fruit flies result from 1) oviposition in fruit, 2) feeding by the larvae, and 3) decomposition of plant tissue by invading secondary microorganism (Ronald, 2007). Since several years, the integrated pest management (IPM) is used against *C. capitata* in citrus orchards of Syria. The objective of this study was, to evaluate the pathogenicity of entomopathogenic fungus *Lecanicillium muscarium* on eggs, larvae and adults of Mediterranean fruit fly *C. capitata* under laboratory conditions.

Fig. 1 Adult of Mediterranean fruit fly *C. capitata*

MATERIALS AND METHODS

1- Eggs: 4 ml of suspension (4×10^7 conidia/ml) was applied on sterile filter paper in Petri dishes or water for the control respectively. 10 eggs were placed on the infected filter paper and incubated at 20°C. After 24 h 10 contaminated eggs were transferred on artificial diet and incubated at 25°C and 70% R.H. There were 5 replications.
2- Old larvae: plastic container (3,8 cm diam. × 2,8 cm high) were filled with 10 g dry soil and sprayed with 1 ml suspension on the soil surface (4.3×10^6 spores/cm^2) using a small dash bottle. On each container 10 old larvae were transferred on the treated soil. Container were incubated at 25°C and 70% R.H (5 replicates).
3- Adults: plastic container (5 cm diam. × 3,5 cm high) were filled with 1cm soil and 15 ripe pupae were spread uniformly on the surface. Above it, 2 to 3 cm layer of soil were filled again. Than 3 ml suspension was sprayed on the soil surface (1×10^6conidia/cm^2) (5 replicates). Incubation took place at 25°C and 70% R.H. All emerged adults were transferred daily to cages with water and dry yeast extract-sucrose. All dead flies were disinfected, placed on water agar in Petri dishes and incubated at 20°C. The number of dead and mouldy individuals were counted.

Fig. 2 Treated flies in plastic cage with water and food

RESULTS

1 Eggs:

- *L. muscarium* was low pathogenic to the eggs of *C. capitata* (Fig. 4).
- The emerged larvae from treated eggs were not infected and could develop up to the pupae.

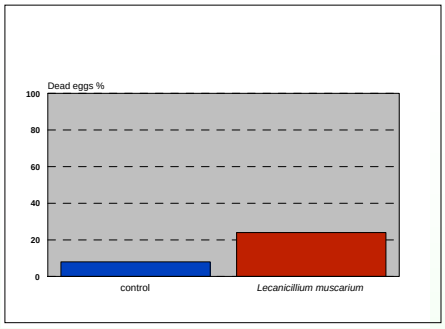

Fig. 4 Mortality of eggs (%) of *C. capitata* after application of *L. muscarium* at 4×10^7 conidia/ml (25°C, 60% RH and 16:8 L:D)

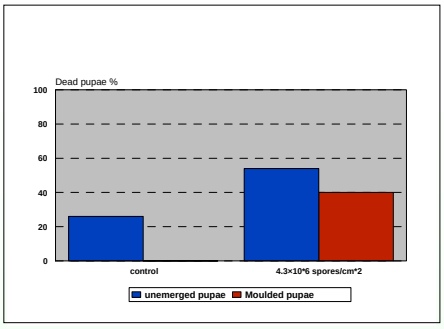

Fig. 5 Dead and moulded pupae (%) of *C. capitata* after application of *L. muscarium at* 4.3×10^6 spores/cm^2 (25°C, 60% RH and 16:8 L:D).

2 Old larvae:

- *L. muscarium* caused a mortality of 54% and there was a significant difference between the control and treatment (Fig.5).
- The Mouldiness of dead pupae was 40% and was very intensive (Fig. 6).

Fig. 6 Moulded pupae of *C. capitata* caused by *L. muscarium*

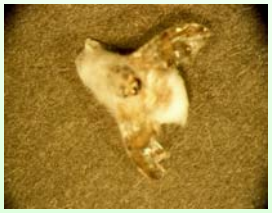

Fig. 7 Moulded fly of *C. capitata* caused by *L. muscarium*

3 Adults:

- The highest mortality of all developmental stages of *C. capitata* was achieved in adults (Fig. 8).
- The adults died between the 5. and 9. day after application of *L. muscarium* (Fig. 8). After 14 days 62,5% of adults were died.
- Infected flies moulded easily and rapidly (40,6%) (Fig. 7).

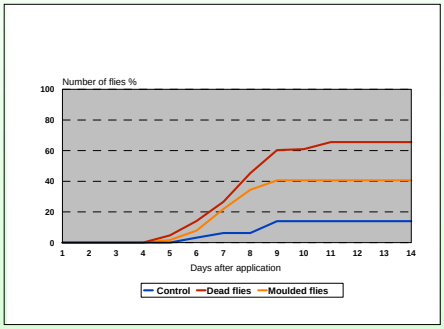

Fig. 8 Dead flies (%) of *C. capitata* adults 14 days after application of *L. muscarium* at 1×10^6 spores/cm^2 (25°C, 60% RH and 16:8 L:D)

CONCLUSION

The entomopathogenic fungus *L muscarium* was pathogen against different stages (egg, old larvae and adult) of *Ceratitis capitata* but with different level. The adults were more susceptible to *L. muscarium*, than the old larvae. The lowest efficacy were obtained in the egg stage.
We suppose, that the high mortality of adults results in the high number of adhered spores on the body of flies. During the time of the emergency there were contacts of the emerging flies and the fungal spores on treated soil. Following the adhered spores on the body resulted in infection.
The old larvae goes into the soil (2.5 cm or more) for pupation. Therefore the contact with spores on the soil is short and only a little number of spores adhered on the larvae. Nevertheless some spores adhered successfully and could penetrate into the larvae body before or during the pupation. The infection process took place and caused mouldy pupae.
The low mortality of the eggs after direct application of fungal spores resulted in the short duration of egg stage. Therefore the first instar of larvae emerged before the spores germinated and penetrated inside the egg.

The efficiency of entomopathogenic fungi seems to be effective only for the adults of *C. capitata*. Therefore the next step is to examine a higher spore density on soil and other fungi species too.