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Parasitism Efficacy of Two Isolates of the Fungus *Beauveria bassianato* Control Larvae and Pupae of Melon fly *Dacus frontalis*

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A B S T R A C T

A study was initiated to test the parasitism efficacy of *Beauveria bassiana* against larvae and pupae of melon fly *Dacus frontalis* for the pest bio-control. The melon fly larvae and pupae collected, in the period between 1/10/2013 to 1/6/2014, were transferred to lab. Results revealed the mortality percentages caused by the fungus *B. bassiana* were higher in larvae than pupae. In addition the isolate BjH53 was better than the 5A-1isolate when mortality percentages were (1, 27.77 and 52.1) respectively for day treatments. Whereas, the mortality percentages were (29.9 ، 27.7and23.2) respectively for concentration treatments. The larvae mortality percentages were (1 ،21 and 32.1) and (18.8 ،16.6and18.8) for day and concentration treatments, respectively. No significant differences in mortality percentages for the same fungus and the OAC isolate between larvae and pupae. The pupal mortality percentages were (8.14،28.14 and 26.66) and (22.96 ، 20.73and19.25) for concentration and day treatments, respectively. While, the mortality percentages for larvae were (5.18 ،17.03 and 29.62) and (15.55 ، 9.25and17.3) for concentration and day treatments, respectively days, respectively.

Introduction

Cucumber (*Cucumis sativus* L.) is one of the most important cucurbitaceous crops in Iraq and worldwide, within the family Cucurbitaceae. The possible origins of cucumber are India an d Africa (Al.Sahaf *et al.,* 2011). Cucumber is attacked by several pests including sweet potato white fly *Bemisiata baci*, thrips (*Thripsta baci*, *T. palmi*) (Al.Sahaf *et al.*, 2011; Hamodi and mohammad, 2012; Mahdi, 2000), aphids *Aphis* spp.andred pumpkin beetle (*Rhaphidopalpa foveicollis*). It can be infested by arthropods including the two spotted spider mite *Tetrany chusurtica* in Spring and Autumn seasons. Melon fly *Dacus frontalis* is one of the most important pest that limits cucumber production in Iraq. The damage caused by this insect depends on host plant and environmental conditions. The damage caused by melon fly on its hosts, mainly cucurbitaceous hosts, may reduce fruit quality like holes made due to oviposition, resulting fruit wrinkling or distortion. More damage occurs due to

larvae feeding on fruit flesh and seeds causing fruit decaying (Azab and Kira, 1954). Many approaches, including microbial control, were used to control melon fly. (Sinha and Sexena, 1999) concluded the application of *Trichoderma viridae* Pers., *Rhizoctonia solani* Kuhn and *Gliocladium virens* Origen filtrates reduced the oviposition development of *Bactrocera cucurbitae* adults. The effectiveness and efficacy of biological control agents infields are not clear, therefore, they are required further assessment before field and IPM applications. (Sookar *et al.*,2008) revealed that the pathogenicity of 5 local isolates of *Beauveria bassiana* pathogenicity applied through surface treatment of were highly efficient to control *Bactrocera cucurbitae* adults within five days when mortality percent ranged between (2-94%).

Materials and Methods

Infected fruit collected from vegetable field at Plant Protection Department/College of agriculture-Abu Ghraib were sliced to $1cm^2$ pieces then placed with larvae and pupae in 9 cm Petri-dishes containing filter papers. *Beauveria bassiana* BjH53 and 5A-1isolates were suspended on potato dextrose agar (PDA) (Himedia Laboratories Limited) (prepared by adding 39 g per l liter distilled water then autoclaved for 40 mint. At 121 Cº and 1.5 bar). The PDA was poured in9 cm Petri-dishes then kept inverted at 4Cº up to use. The fungus isolates were grown on PDA by picking 3 mm pieces from fungal culture using cork borer then placing each piece in the middle of the PDA containing plates. Plates were incubated for 5 days at ±22Cº (Jassim, 2007). To test the pathogenicity of fungal isolates on the melon fly *D. frontalis* larvae an pupae at laboratory conditions, three concentrations (1×10^4, 1×10^6 and 1×10^8spore/ml) were tested against melon fly larvae and pupae. Insects were placed in glass plates containing filter papers, then sprayed with 300 ml fungal suspension for each concentration using a hand sprayer. Insects were sprayed by distilled water for control treatment. Plates containing treated insects were incubated in a growth chamber at ± 22Cº, 70% relative humidity and 12 h light period. Mortality percent were calculated after 1, 3 and 4 days of treatments using direct examination by light microscopy.

Results and Discussion

Table 1 shows relative activity of *Beauveria bassaina* against *Dacus frontalis* larvae and pupae. Mortality percentages were higher in pupae (29.9%) than larvae after 24 h exposure time for 1×104 spore/ml treatment. Mortality percentages were 27.7 and 23.2 after 72 and 96h exposure time for 1×106 and 1×108 spore/ml treatments respectively. Significant differences were shown clearly for larvae mortality percentages by fungus based on concentrations and exposing time when the less significant difference was 6.06. Besides, larvae mortality percentages were proportionally correlated to concentrations and exposing time. Mortality percentages were 18.8% for both 1×104 and 1×108and 16.6% for 1×106spore/ml concentrations. LSD value between time and concentration averages was 10.53, whereas it was 6.08 for days. Mortality percentages increased per days after 24 h of treatment and became more obvious by 27 and 86h after of treatment which increased gradually for all days (27.7 and 23.2). The above results suggest the efficacy of *Beauveria bassaina* to kill *Dacus frontalis* larvae despite the chitin layer covering their bodies. Chitin represents an essential barrier to protect the insect against pesticides and microbe invasion (Heinz *et al.*, 2004).

Table.1 Relative activity of *Beauveria bassiana* isolate 1 against *Dacus frontalis* larvae and pupae

Mortality Rate for pupae		**Mortality Rate for fungus *B.bacssiaua, D.frontalis***		**Dead Concentration**
concentration	**rate**	**concention**	**Rate**	
29.9	1	18.8	1.0	**^{4}10x1 / 24H.**
27.7	27.7	16.6	21.0	**^{6}10x1 / 72H.**
23.2	52.1	18.8	32.1	**^{8}10x1 / 96H.**
6.93		6.08		**LSD**
12.01		**10.53**		**LSD for time**

Table.2 Relative activity of *Beauveria bassiana* isolate 2 against *Dacus frontalis* larvae and pupae

Pupae		**Larvae**		**Time Comcentaration**
Concentration	**rate**	**Concention**	**Rate**	
8.14	22.96	5.18	15.55	**10^{4}x1 / 24 hour**
28.14	20.73	17.03	19.25	**10^{6}x1 / 72 hour**
26.66	19.25	29.62	17.03	**10^{8}x1 / 96 hour**
14.9		15.3		**LSD**
13.8		**14.6**		**LSD Avg**

This fungus, when conidia germinate, form germ tubes and excrete chitinase and proteinase which cleave chitin and protein respectively. Beside excreting the mycotoxin Beauvericin, known to be toxic to several insects, affecting the ionic balance necessary for cell activities, the fungus, therefore, is able to invade the insect body (Mazel and Boucias, 1996). Similar results shown when this fungus isolate was applied to different pests infesting other plants when (Ferron and Vincant, 1978) found that apple maggot larvae in the last stage were most sensitive to be infected by this fungus compared to first stage larvae.

Results presented in table 2 revealed mortality rates caused by *Beauveria bassaina* 2ndisolatein 2nd stage larvae raised by concentration increase which were (5.18,17.3 and 26.62) % at (1×104, 1×106 and 1×108) spore/ml concentrations, respectively. Whereas, mortality were (15.55،19.25, 17.03) % after 24, 72 and 96 h treatments, respectively. Pupae mortality percentages were (8.14 ،28.14, 26.66)% for the same concentrations, respectively. Whereas mortality percentages per days up to (22.96 ،20.73, 19.25) % after 24, 72 and 96 h treatments, respectively as statistical analysis showed no significant differences.

As (Charnley *et al.,* 1997) indicated *Beauveria bassaina* mycelium, once penetrating the body wall, excretes the enzyme attacks fatty bodies, as well as the toxin Beauvericin, then the remaining body tissues. Then, the fungus forms the conidiophores containing conidia spores, out of the dead insect body, to spread the infection to new individuals.

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