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PATHOGENICITY EFFECTS OF ENTOMOPATHOGENIC FUNGI IN CONTROL OF HOUSE FLY, *Musca domestica*

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ABSTRACT

The housefly, Musca domestica L. (Diptera: Muscidae) consider one of the most major domestic, medical, and veterinary pest which causes much diseases to human and animal and transmit many medical and veterinary pathogenic organisms. The present study investigated native isolates of two entomopathogenic fungi, *Beauveria bassiana* and *Metarhizum anisopliae*, for housefly larvae control in laboratory bioassays and to identify an optimum conidial dose, which could be further formulated as biopesticide. all fungus formulations showed effects on the mortality percentage of house fly larvae. Data revealed that there were significant differences in the average mortality of house fly larvae among the tested fungus formulations as well as their concentrations. The highest reduction percentages were recorded with *Beauveria bassiana* liquid at 0.5g/kg, 1 g/kg and 1.5 g/kg,which giving 20,20, 25 % mortality,respectively.Followed by the treatments of *Metarhizum anisopilae* powder at 0.5g/kg, 1 g/kg and 1.5 g/kg gives 12.5,17.5and 25%, respectively.

Keywords: Fungus formulations, House fly, *B. bassiana* , *M. anisopliae*

INTRODUCTION

The housefly, *Musca domestica* L. (Diptera: Muscidae) conseder one of the most major domestic, medical, and veterinary pest which causes much diseases to human and animal and transmit many medical and veterinary pathogenic organisms (Forester et al. 2009; Sukontason et al. 2000). It has been found to carry the etiological agents of typhus fever, dysentery, cholera, hematic carbuncle, bovine mastitis, conjunctivitis and poliomyelitis, protozoan cysts, and helminth eggs (Howard 2001; Barin et al. 2010). High population densities of the housefly can cause irritation and annoyance to employees, as well as reduction in egg and milk production in poultry and dairy farms. Housefly management relies heavily on pesticide application. However, houseflies quickly develop resistance to the pesticides (Shono and Scott 2003; Srinivasan et al. 2008; Acevedo et al. 2009).

As an alternative to chemical control or as apart of Integrated Pest Management (IPM) programs, there is a resurgence of interest in the use of microbial insecticides for the biological control of insect pests. Fungal agents belong to the most promising group of biological control agents against insect pests. Particularly, the Deuteromycete fungi are known to cause epizootics in fly populations under laboratory and field conditions (Barson et al. 1994; Watson et al. 1996: Reithinger et al. 1997). *Metarhizum anisopilae* , *Beauveria bassiana* and *Paecilomyces fumosoroseus* (Wize) Brown & Smith have been recognised as some of the most important entomopathogens of dipteran insects (Steinkraus et al. 1990; Kuramoto and Shimaku 1992; Samson et al. 1994; Watson et al. 1995). Use of entomopathogenic fungi for housefly

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control could have a lot of potential due to their low mammalian toxicity and natural prevalence among flies population. However, majority of the studies concerning entomopathogenic fungi deal with agricultural pests (Shah and Pell 2003; Goettel , et al. 2005). many studies indicated absolute mortality of housefly population in 5–15 days period. However, in order to compete with the conventionally used chemical insecticides, it is desirable to investigate native entomopathogenic isolates, adaptable to local environment, and hence, more efficient for the control of pest population of the region. (Steinkrauss, et al. 1990; Geden et al. 1995; Watson , et al. 1995; Lecuona, et al. 2005; Carswell , et al. 1998).

The oral bioassays caused higher mortality after four treatments than the used contact bioassays. Moreover, the virulence of *Lecanicillium lecanii* was higher than the virulence of *B. bassiana* and *M. anisopilae* in both ways of experiment (Mahmoud 2009). The objective of the present study is to investigate native isolates of two entomopathogenic fungi, B. bassiana and M. anisopliae, for housefly larvae control in laboratory bioassays and to identify an optimum conidial dose, which could be further formulated as biopesticide.

MATERIALS AND METHODS

House fly rearing:

The larvae of house fly (local strain), *Musca domestica* L., were collected from manure piles at the poultry farms of the Faculty of Agriculture, Menoufia University, Egypt. The house fly larvae were provided with nutrient compound to fed and complete its life cycle on it. The nutrient compound was introduced in plastic cups, 10 cm diameter and 10 cm deep, the nutrient compound consisted of 9 g powder milk and 5 g yeast dissolved in 100 ml water then added to 100 g fine bran according to (Wilkins and Khalequzzaman 1993). The mixture was then thoroughly stirred and put into the cups leaving 3 cm from the top. The cups were transferred to an entomological glass cages (60 × 35 × 40 cm) which used for rearing house fly under laboratory conditions (25 ± 5˚C& 60 ± 5% RH) , These cages were covered with mesh screen with cloth sleeve opening at top and provided with electric lamps 20 watt to control temperature in cages during winter months. When adult house fly emerged in cages, granulated sugar and milk soaked cotton wool balls were provided in Petri dishes as food to house fly adults. The emerged flies were also fed with full fat fresh milk in Petri dishes. After two days of fly emergency, the beakers containing larval food was placed for egg laying process, then beakers were removed from cages after 2 - 3 days when eggs were visible and attached to food along the sides of beakers. The food was changed after 2 - 4 days depending upon the numbers of larvae per beaker. The beakers were kept in separate cage for fly emergency according to (Ahmed and Irfanullah 2007).

Application of fungal formulations on the second instar larvae of house flies:

Two fungal formulation were used (*Beauveria bassiana, Metarhizum anisopilae*) at different concentration of (32×10^7)and different formulation. The different concentrations of the entomopathogenic fungi in 1ml. distilled water were mixed with the previously described house fly artificial diet in plastic cups, 10 cm diameter and 10 cm deep, each one containing 50g of house fly artificial diet with 10 house fly larvae. in control treatment was 1 ml. distilled water without fungus spores. Each treatment was replicated three times. Mortality percentage was modified by Abbott's formula.

Statistical analysis:

All obtained data were analyzed by SPSS software computer Program.

Results

3-1 Effect of different concentrations of fungus formulations against house fly larvae

Results reported in Table (1) show the effect of different concentrations of fungus formulations on the mortality percentage of house fly larvae.

Statistical analysis of the data in Table (1) revealed that there were significant differences in the average mortality of house fly larvae among the tested fungus formulations as well as their concentrations. The highest reduction percentages were recorded with *B. bassiana* liquid at 0.5g/kg, 1 g/kg and 1.5 g/kg giving 20 , 20, 25 %mortality, followed by the treatments of *M. anisopliae* powder at 0.5g/kg, 1 g/kg and 1.5 g/kg gives 12.5,17.5and 25%, respectively.

It was noticed that all tested fungus formulations at the concentrations of 0.5gr/kg, gave the lowest mortality percentages of house fly larvae.

It could be concluded that fungus formulations of *B. bassiana* powder or liquid recorded the highest reduction percentages of house fly larvae reaching 25% at the concentrations of 1.5 gr/kg without significant differences among them, in addition, *M. anisopliae* powder and liquid resulted satisfactory control of house fly larvae (25%) at 1.5 gr/kg concentrations. These results agreed with (Sharififard *et al* 2012, Sapna *et al* 2011)

3-2 Effect of different concentrations of fungus formulations on the

pupation process of house fly and the weights of pupae.

Data presented in Table (2) reported the effect of the treating house fly larvae by different concentrations of fungus formulations on the pupation process of house fly and the weights of pupae under laboratory condition (25 ±5 C˚& 60±5% RH).

Statistical analysis of the data in Table (2) indicated that there were significant differences among all fungus formulations and their applied concentrations on the numbers of the pupated larvae, as well as the average numbers of the weights of each pupa.

The lowest numbers of pupated larvae were recorded with the treatment of Beauveria bassiana liquid 0.5%, 1%, 1.5%, followed by M. anisopliae powder 0.5%, 1%, 1.5%.

The rest treatments gave unsatisfactory control results, where the percentages of the pupation process were ranged between 65 % to 90 %.

Regarding to the effect of different concentrations of the tested fungus formulations on the weights of the pupae resulted from treated house fly larvae,

It could be concluded that the best control results of the use of fungus formulations against house fly larvae were recorded with the treatment of B. bassiana liquid, followed by M. anisopliae powder. These results agreed with (Sharififard *et al* 2012, Sapna *et al* 2011)

CONCLUSION

It could be concluded that fungus formulations of *B. bassiana* powder or liquid recorded the highest reduction percentages of house fly larvae reaching 25% at the concentrations of 1.5 gr/kg without significant differences among them, in addition, *M. anisopliae* powder and liquid resulted satisfactory control of house fly larvae (25%) at 1.5 gr/kg concentrations.

It could be concluded that the best control results of the use of fungus formulations against house fly larvae were recorded with the treatment of *B. bassiana* liquid, followed by *M. anisopliae* powder.

Table (1): Mortality percentages of house fly larvae, 1, 2, 3 days after application of different concentrations of fungus formulations.

Fungus formulations and concentration		House fly larvae mortality%			
		Day1	Day2	Day3	Average mortality
Beauveria bassiana (powder)	0.5%	0.0	5	15	10d
	1%	0.0	10	20	15c
	1.5%	0.0	20	30	25a
Beauveria bassiana (liquid)	0.5%	0.0	15	25	20b
	1%	0.0	10	30	20b
	1.5%	0.0	15	35	25a
Metarhizum anisopliae (powder)	0.5%	0.0	10	15	12.5
	1%	0.0	15	20	17.5b
	1.5%	0.0	20	30	25a
Metarhizum anisopliae (liquid)	0.5%	0.0	5	10	7.5d
	1%	0.0	25	25	25a
	1.5%	0.0	20	30	25a
Control		0.0	0.0	0.0	0.0

Means in last column followed by the same letter (s) are not significantly different at 5% level.

Table (2): Effect of different concentrations of fungus formulations on the pupation process of house fly and the weights of pupae .

fungus formulations and concentration		No. treated larvae	No. pupated larvae	Weight of pupae /gr.	% pupation
Beauveria bassiana (powder)	0.5%	20	17	0.346	85a
	1%	20	16	0.291	80b
	1.5%	20	14	0.239	70c
Beauveria bassiana (liquid)	0.5%	20	15	0.399	75b
	1%	20	14	0.296	70c
	1.5%	20	13	0.264	65d
Metarhizum anisopliae (powder)	0.5%	20	17	0.353	85a
	1%	20	16	0.329	80b
	1.5%	20	14	0.245	70c
Metarhizum anisopliae (liquid)	0.5%	20	18	0.409	90a
	1%	20	15	0.397	75b
	1.5%	20	14	0.272	70c
Control		20	20	0.417	100a

Means in each column followed by the same letter (s) are not significantly different at 5% level.

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التأثيرات الممرضة للفطريات فى مكافحة الذبابة المنزلية

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الملخص العربى

تعتبر الذبابة المنزلية واحدة من الآفات المنزلية والطبية والبيطرية التي تسبب العديد من الأمراض للإنسان و الحيوان و تنقل المسببات المرضية من الكائنات الحية . تم استخدام نوعين من الفطريات الممرضة للحشرات (فطرى البيوفاريا باسيانا و الميتورزيم انيسوبلى) لمكافحة يرقات الذبابة في اختبارات بيولوجية داخل المعمل وتحديد جرعة التغبير المثلى التي يمكن أن تستخدم من المبيدات الحيوية . وأظهرت كل صور الفطر تأثيرات على نسبة موت يرقات الذباب . واوضحت البيانات أن هناك فروق ذات دلالة إحصائية في متوسط نسبة الموت بين يرقات الذباب لصور الفطريات المختلفة وتركيزاتها المختلفة .وسجلت أعلى نسب خفض مع فطر البيوفاريا السائل ويليها البيوفاريا البودرة ثم الميتريزيم البودر واخيرا الميتارزيم السائل .

الكلمات المفتاحية :المستحضرات الفطرية ، الذبابة المنزلية ، فطر البيوفاريا ، فطر الميتارزيم.