IMPACT OF CERTAIN BAITS FOR CONTROLLING *ANACRIDIUM AEGYPTIUM* (L.)**, UNDER LABORATORY AND FIELD CONDITIONS.**

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ABSTRACT

Quick lime, *Beauveria bassinet*, *Metarhisium anisopliae* and Hostathion [triazophos] were used as poisonous baits mixed with molasses and wheat brain (2: 1: 4) against *Anacridium aegypt**i**u*m adults under laboratory and field conditions. Quick lime was the most efficient material against *A. aegypt**i**um* after 72 hr. when used at the quantity of 1.75 kg and achieved 90% mortality, followed by both *M. anisopliae* at the concentration of 1.75 $x10^7$ spores /ml., Hostathion at the concentration of 1.75 ml/l and *B. bassinet* at the concentration of 1.75 $x10^7$spores /ml .compared to the control. Starved adults were exposed to the concentrations of LC_{50} without plants in the laboratory for 24, 48 and 72 hr. Quick lime also achieved higher mortality (54%) after 72 hrs. compared with any entomopathogen and Hostathion. In the field trails, *A. aegyptium* were exposed to double concentrations of the quick lime, fungal entomopathogen, and Hostathion for 2, 4 and 6 days. Fewer grams of quick lime and Hostathion insecticide semi-hard cake were consumed and achieved higher mortality after 6 days compared with the two other biological agents and the control.

Key words: *Beauveria bassinet, Metarhisium anisopliae*, Hostation, [triazophos], *Anacridium aegypt**i**u*m.

INTRODUCTION

*Anacridium aegypt**i**um*; is well known as dangerous pest against many crops all over the world **(Roditakis *et al* 2002).** This insect is capable of forming large swarms, which invade many countries and causes catastrophic damage to cultivated vegetations, which is difficult to control, especially when populations are epidemic in proportion, **(Anjum *et al* 2001).** This insect pest feeds on the leaves, but its occurrence on the plant is rare **(Goeden 1976)**. In Fayoum Governorate, Egypt. The present study was made 2009 to evaluate the effect of quick lime (calcium oxide), the fungus *Beauveria bassiana* the fungus *Metarhizium anisopliae A. aegypt**i**um* and the chemical insecticide Hostathion [triazophos] to protect our crops from damage. Baits of each in molasses and wheat bran were evaluated against the adult of *A. aegypt**i**um* under laboratory and field conditions.

MATERIALS AND METHODS

I- Laboratory studies

A. Stock cultures

1- *A. aegyptium*:

Adults of the *A. aegypt**i**um* were collected from heavily invested tomato crops and reared in the laboratory on tomato seedlings, 30 days old, in pots of 10 cm for three generations according to **(Maud *et al* 1965).**

2- Entomopathogenic fungi:

The entomopathogenic fungi, *Beauveria bassiana,* and *Metarhizium anisopliae* were isolated from collected dead adults of *Anacridium aegyptium*, **(Rosa and Alain 2004).** Serial dilutions were prepared to obtain the desired

concentrations. of 10^5, 10^6 and 10^7 conidia /ml for *B. bassiana,* and $1x10^5$, $1.5x10^6$ and $1.75x10^7$ spores / ml for *M. anisopliae*.

A pelleted semi- hard cake baits consisted of quick lime, sugar can molasses and wheat bran at the rates of 2 L:1L:and 4kg) was prepared.

The laboratory experiments were carried out on tomato seedlings in 10 cm plastic pots kept at room conditions.

B. Treatments:

Quick lime bait was used at 1.0, 1.5 and 1.75 kg, each was mixed with sugar can molasses and wheat bran at the rates of (2 L:1L:and 4kg).

B. bassiana and *M. anisopliae*. Were used at $1x10^5$, $1.5x10^6$ and $1.75x10^7$ spores / ml. each was mixed with sugar can molasses and wheat bran at the rates of (2 L:1L:and 4kg).

Hostathion was used at 1.0, 1.5 and 1.75l. each was mixed with sugar can molasses and wheat bran at the rates of (2 L:1L:and 4 kg).

The experiments were carried out on Castle Rock tomato seedlings cultivated in plastic pots of 10 cm.

C. Efficiency tests:

1. Effect of quick lime:

Thirty adults of *Anacridium aegyptium* in three equal groups were exposed to 24, 48, and 72hrs. Insects were kept in cages on potted tomato plants provided each with 25 gr. quick lime at the quantity of (1. 1.5 and 1.75 kg).

2. Effect of chosen fungi:

Thirty adults of *Anacridium aegyptium* in three equal groups were exposed for 24, 48, and 72hrs. Insects were kept as above and provided each with 25 gr. of one of the previous semi-hard cakes of *M. anisoplea* and *B. basiana* individually.

3. Effect of Hostathion [triazophos] insecticide:

Thirty adults of *Anacridium aegyptium* in three equal groups were exposed for 24, 48, and 72hrs. Insects were kept as above were provided each with 25 gr. Hostathion semi-hard cakes.

New pelleted poisonous semi-hard cakes of Hostathion were prepared by mixing the sub lethal concentration at the ratio of (2: 1: 4) to which *A. aegyptium* starved adults were exposed in cages. Daily consumption of these adults was calculated.

The researcher quantified the effects of sub lethal concentration (LC_{50}) of quick lime and other sub lethal concentrations of the microbial organisms and Hostathion insecticide by (EPA) Probit Analysis Program was used for calculating LC/EC values Version 1.5 on a number of *A. egypticum* fitness parameters. New cakes of each of the quick lime, entomopathogenic fungi, and hostation were prepared for estimating the freely consumption of the starved adults of *A. egypticum* for 24, 48 and 72hr, by mixing the sub lethal concentration at (2: 1: 4) and placed in the cages, each with ten adults of ***A. aegypticum*** as a replicate. Daily consumption of these cakes was calculated.

II-Field trials:

In the field, an area of $175m^2$ in Fayoum district was equally divided into three replicates as control for each treatment. Each has four beds (1x1m). Three doubled concentrations of each tested material were used as follows; quick lime pelleted semi-hard cakes (2, 3 and 3.5 kg), *Metarhisium anisopliaee* and *B*eauveria. *bassiana* ($2x10^5$, $3x10^6$ and 3.5×10^7) and Hostathion 2, 3 and 3.5/L. The control was untreated and distributed

randomly. The beds were transplanted by castle rock tomato from Peto Seed Co. Each bed was planted on both sides at distances of 10 cm and covered by black shade netting. Ten adults of *A. aegyptium* were exposed per bed. Semi-hard cake of the mixture of the quick lime and molasses were applied on the beds at distances of ten cm. Each of the other mixtures; entomopathogenic fungi and the Hostathion pesticide, were applied on beds. The field of this trial was inspected after 2, 4 and 6 days of treatment. Dead adults of *A. aegyptium* were collected in paper bags and counted.

III- Statistical analysis:

The data were analyzed using Probit analysis **(Finny, 1952).** LC_{50} values were estimated for treatments. Analysis of variance (ANOVA) and LSD values were obtained at 0.05 level, using SAS program **(SAS Institute, 1988)**. Statistical calculation was done through SPSS 11 for windows computer program to determine the Correlation and Regression Co-Efficient (r).

RESULTS AND DISCUSSION

A- Efficiency of quick lime baits:

As shown in table (1) and figs (1,2 and 3), death rate of *A. aegyptium* adults after 24, hr were 65, 67 and 68% upon exposure to bait at the concentrations of 1, 1.5, and 1.75 kg. of the quick lime, respectively, with the consumption of 6.0. 5.5 and 4.5 gr. After 48, hr .the death rates were 70, 76 and 82%.with reductive consumption of 6.3, 6.0 and 5.1 gr. After 72 hr., these rates increased to 80, 85 and 90% with the consumption of 6.6, 6.3 and 5.6 grams of the bait. Adults consumed 8.5, 8.9 and 9.5 grams of the bait in 24, 48 and 72 hr, respectively, with 0 % death rates in the control. Calculated LC_{50} was 54.5, 113.1 and 0.449.2 after 24, 48 and 72hr, respectively.

Table (2): shows that death rate of *A. aegyptium* adults after 24, hr were 31, 42 and 51% upon expose use to prepared bait at the concentrations of (Lc_{50}) of the quick lime at 1.0, 1.5,1.75kg., respectively, with the consumption of 7.0. 6.8 and 6.5 gr. After 48, hr. the death rates were 34, 45 and 52 %.with reductive consumption of 7.5, 6.8 and 6.6 gr. After72 hr. these rates increased to 41, 46 and 54 % with the consumption of 8.0, 6.3 and 6.1 grams of the bait. Adults death rates were 0 % in the control and consumed 16.5, 20.0 and 23.9 grams of the bait in 24, 48 and 72 hr, respectively.

B-Efficiency of Beauveria bait:

Table (1) and figs (1, 2 and 3): showed that the death rate of *A. aegyptium* adults after 24, hr were 45, 50 and 55% upon exposure use to bait at the concentrations of $1x10^5$, $1.5x10^6$, and $1.75x10^7$ spores/ml. of *Beauveria bassiana*, respectively, with the consumption of 5.6, 6.6 and 6.8 gr. After 48, hr. the death rates were 53, 55 and 57%.with consumption of 6.6, 6.8 and 7.0 gr. After 72 hr. These rates increased to 55, 58 and 60% with the consumption of 6.8, 7.2 and 7.5 grams of the bait, while adults death rates were 0 % in the control and the consumed baits were 8.5, 8.9 and 9.5 grams in 24, 48 and 72 hr, respectively,.Calculated LC_{50} was $1.4x10^4$, $0.6x10^3$and $0.5x10^5$ after 24, 48 and 72hr, respectively.

Death rate of *A. aegyptium* adults after 24, hr were 22, 22 and 35% upon expose use to prepared bait at the concentrations of LC_{50} of $1x10^5$, $1.5x10^6$, and $1.75x10^7$ spores/ml. of *Beauveria bassiana* respectively, with the consumption of 9.5, 9.7 and 9.9 gr. After 48, hr. the death rates were 26, 32 and 39 %.with consumption of 10.0, 10.4 and 10.6 gr. After 72 hr. these rates

Table 1

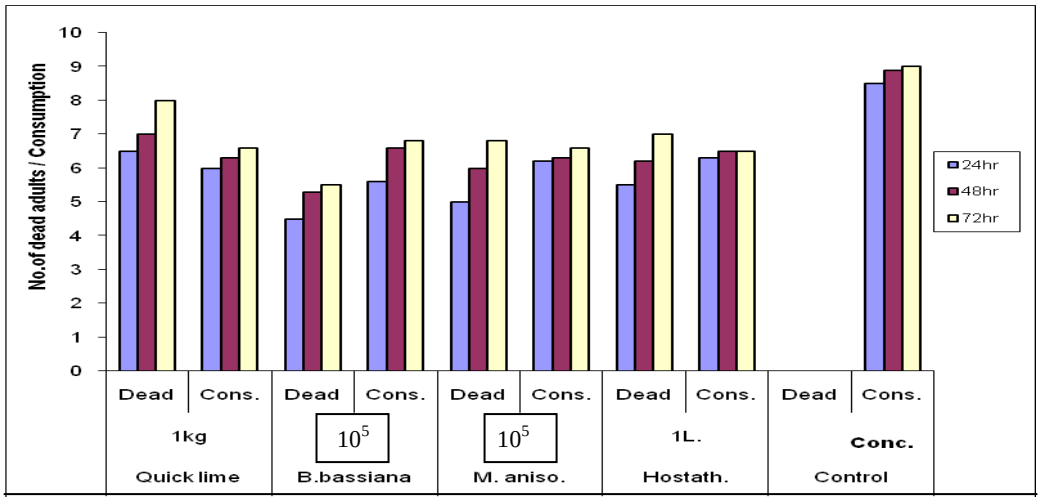

Fig (1): Potency of quick lime, *M. anisopliae*, *B. bassiana* and Hostathion and consumed quantities by the adults of *A. aegyptium,*n the laboratory, at different concentrations.

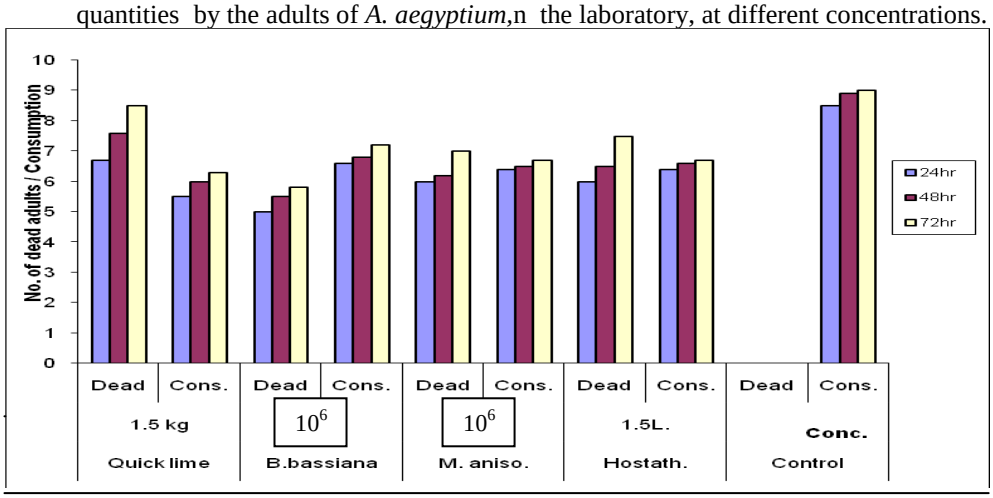

Fig (2): Potency of quick lime, *M. anisopliae*, *B. bassiana* and Hostathion and consumed quantities by the adults of *Anacridium aegyptium*, in the laboratoryat different concentrations.

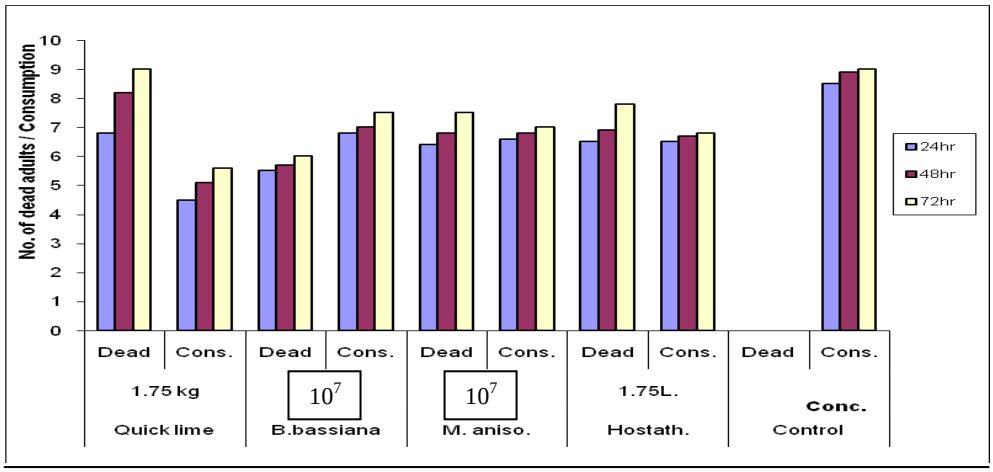

Fig (3): Potency of quick lime, *M. anisopliae*, *B. bassiana* and Hostathion and consumed quantities by the adults of *Anacridium aegyptium* in the laboratory at different concentrations.

Table 2

increased to 35, 44 and 50 % with the consumption of 12.0, 12.3 and 12.5 grams of the bait while the adults death rates were 0 % in the control and the consumed bait were 17.5, 19.0 and 21.4 grams in 24, 48 and 72 hr, Table. 2., respectively.

C -Efficiency of Metarhizium bait:

Death rate, of *A. aegyptium* adults after 24, hr were 50, 60 and 64% upon exposure to bait concentrations of $1x10^5$, $1.5x10^6$, and $1.75x10^7$ spores / ml of *Metarhizium anisopliae*, respectively, with the consumption of 6.2. 6.4 and 6.6 gr. After 48, hr. the death rates were 60, 62 and 68%.with reduced consumption of 6.3, 6.5 and 6.8 gr. After 72 hr. these rates increased to 68, 70 and 75% with the consumption of 6.6, 6.7 and 7.0 grams of the bait. Adults death were 0.0 % in the control that consumed 8.5, 8.9 and 9.5 grams of the bait in 24, 48 and 72 hr, respectively, with 0 % death rates in the control. Calculated LC_{50} values (Table 1) were $1x10^3$, $8x10^2$ and $7x10^2$ after 24, 48 and 72hr, respectively.

Death rate of *A. aegyptium* adults after 24, hr were 28, 41 and 42% upon exposure to prepared bait at the concentrations of LC_{50} of $1x10^5$, $1.5x10^6$, and $1.75x10^7$ spores / ml of *Metarhizium anisopliae*, respectively, with the consumption of 10.5. 10.6 and 10.8 gr. After 48, hr. the death rates were 30, 34 and 45%.with increased consumption of 12.1, 13.6 and 14.2 gr. After72 hr. these rates increased to 41, 46 and 54 % with the consumption of 12.5, 13.4 and 14.6 grams of the bait. Adults consumed 18.5, 20. and 22.3 grams of the bait in 24, 48 and 72 hr, with 0 % death rates in the control, table 2, respectively .

In this resdect, **(Shah *et al* 1997)** found that *M. anisopliae* and *B. bassiana* were the most dominant pathogens on *A. aegyptium* and *M. anisopliae* was determined to be highly virulent during screening tests as a part of research program for the development of a microbial insecticide against locusts and grasshoppers in Africa. **(Roditakis *et al* 2002)** also reported that *M. anisopliae* is more virulent than *B. bassiana* at a conidial concentration lower or equal to 10^6 per ml while being similarly virulent on the first stage nymphs at 10^7 conidia per ml. **(Lomer *et al* 2001)** found that the recent development of effective oil formulations of *M. anisopliae* spores opens new possibilities for environmentally safe control operations. *Metarhizium* biopesticide kills 70% - 90% of treated locusts within 14-20 days, with no measurable impact on non-target organisms.

D- Hostathion bait:

Death rate of *A. aegyptium* adults after 24, hr were 55, 60 and 65% upon exposure to bait at the concentrations of 1.0 L, 1.5L, and 1.75L. ml of Hostathion, respectively, with the consumption of 6.2. 6.4 and 6.5 gr. After 48, hr. the death rates were 60, 62 and 69%.with reduced consumption of 6.5, 6.6 and 6.7 gr. After 72 hr. these rates increased to 63, 70 and 75% with the consumption of 6.5, 6.7 and 6.8 grams of the bait. Adults death rates were 0 % in the control and consumed 8.5, 8.9 and 9.5 grams of the bait in 24, 48 and 72 hr, respectively, with 0.0% death in the control. Calculated LC_{50} were 1379.7, 789.8 and 433.0 ml. after 24, 48 and 72hr, respectively, (Table 1).

Death rate of *A. aegyptium* adults after 24, hr were 29, 35 and 45% upon exposure to bait at the concentrations of LC_{50} of 1.0 L, 1.5L, and 1.75L. ml of Hostathion, respectively, with the consumption of 7.0, 6.8 and 6.5 gr. After 48, hr. the death rates were 30, 38 and 52 %.with reductive consumption of 7.5, 6.8 and 6.6 gr. After72 hr. these rates increased to 38, 42 and 45% with

the consumption of 8.0, 6.3 and 6.1 grams of the bait. Adults death rates were 0 % in the control and consumed 18.2, 20.5 and 22.2 grams of the bait in 24, 48 and 72 hr, respectively.

D – Field application effects :

Quick lime bait:

The death rates of *A. aegyptium* adults after 2 days were 53, 54 and 54% upon exposure to bait of quick lime at the concentration 2.0, 3.0, and 3.5kg., respectively. After 4 days the death rates were 58, 60 and 61%. After 6 days these rates increased to 60, 63 and 70 % while Adults death rates were 0 % in the control.

Beauveria bait:

The death rate of *A. aegyptium* adults after 2 days were 0 % upon exposure to bait at the concentrations of the *B. bassiana* at the concentration $2x10^5$, $3x10^6$, and $3.5x10^7$ spores / ml., respectively. After 4 days the death rates were 45, 48 and 50 %. After 6 days these rates increased to 46, 50 and 55% while Adults death rates were 0 % in the control.

Metarhizium bait:

Death rate of *A. aegyptium* adults after 2 days were 0 % upon exposure to bait at the concentrations of the *M.anisopliae* at the concentration $2x10^5$, $3x10^6$, and $3.5x10^7$ spores / ml., respectively. After 4 days the death rates were 38, 40 and 43 %. After 6 days these rates increased to 40, 40 and 53% while Adults death rates were 0 % in the control.

Hostahion bait:

Death rate of *A. aegyptium* adults after 2 days were 51, 50 and 53% upon expose use to prepared bait at the concentrations of Hostathion at the concentration 2, 3, and 3.5l. respectively. After 4 days the death rates were 55, 55 and 60 %. After 6 days these rates increased to 58, 60 and 68% while Adults death rates were 0 % in the control.

Statistical analysis of the obtained data showed significant differences in reducing *A. aegyptium* at different concentrations of quick lime, the entomopathogens and the chemical insecticide compared with the untreated control.

Obtained results were in agreement with the findings of **Ishraga and Magzoub (2009)** who reported that the entomopathogenic fungus *Metarhizium anisopliae* in oil-based formulation is used for control of locusts and grasshoppers and acts through direct contact and *Metarhizium* spp. have show effective control of a number of target species under a range of natural field conditions.

On the other hand, **Tandon *et al*., (2007)** reported that pests have developed resistance to insecticides, biological control using microbial pathogens, particularly fungal pathogens like *B.bassiana M. anisopliae* and *Verticillium lecanii* has been explored for a number of pests.

Insecticides were used in wide range against *A. aegyptium* in the field allover the world **(Roditakis *et al* 2002)**. However, the hazards of using the insecticides were recorded in several researches **(Badenes-Perez and Shelton 2006) and (Muhammad Shakur *et al* 2007)** reported that using baits of (Dipterex [trichlorfon] + sugar + rice husk) on permanent plots of potato crop were effective and more persistent for giving healthy products. Hostathion insecticide was used in bait for controlling *A. aegyptium*, an additional problem for control making it difficult for insecticides to reach their targets **(Goeden 1979).** But its persistency polluted the soil for long

Table 3

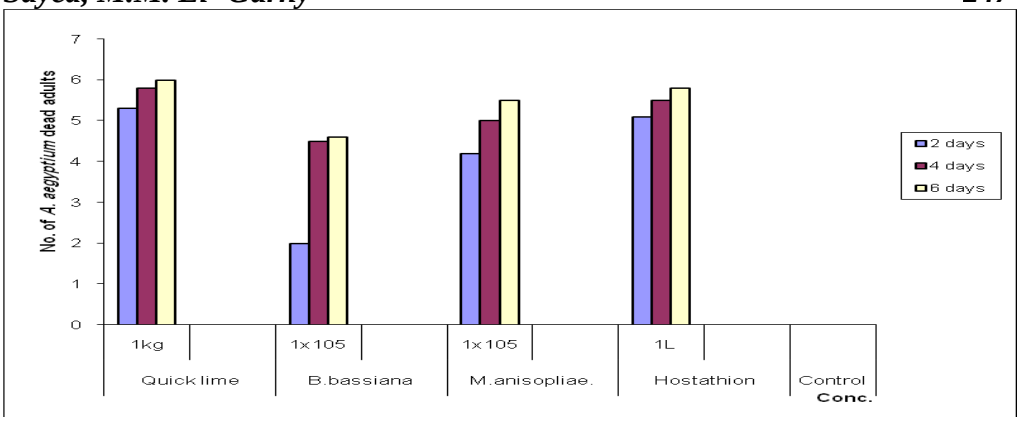

Fig (4): Potency of quick lime *B. bassiana*, *M. anisopliae*, and Hostathion against adult of *Anacridium aegyptium*,in the field at different concentrations.

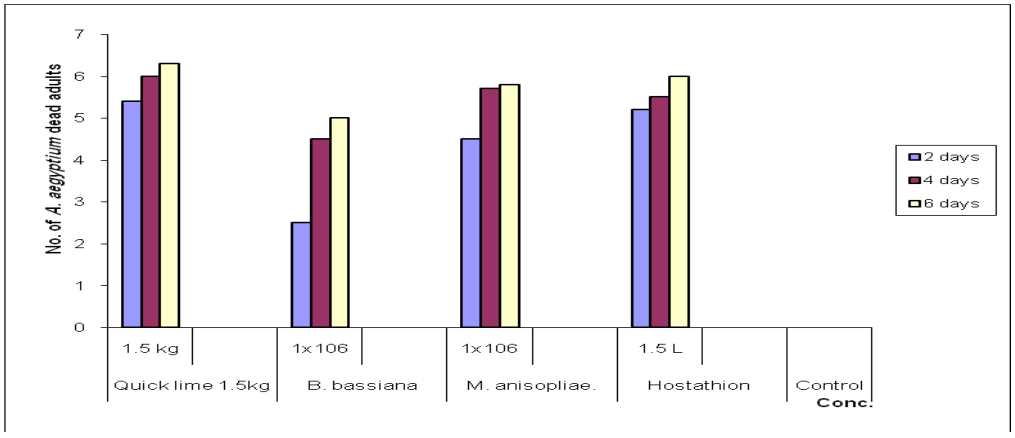

Fig (5): Potency of quick lime *B. bassiana*, *M. anisopliae*, and Hostathion against *Anacridium aegyptium* adults, in the field at different concentrations.

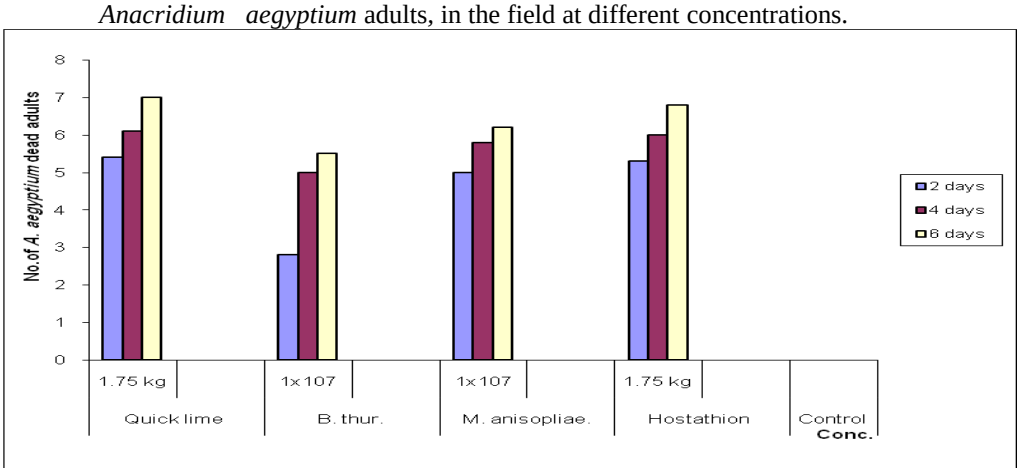

Fig (6): Potency of quick lime *B. bassiana*, *M. anisopliae*, and Hostathion against *Anacridium aegyptiu*m adults in the field at different concentration.

time after spraying. Therefore, Quick lime, Hostathion, *M. anisopliae* and *B. bassiana*, achieved semi-hard cake achieved higher mortality after 72hr. in the laboratory and 6 days in the field. Furthermore, quick lime was safety and cheap material for controlling *A. aegyptium*. Statistical analysis shows that the correlation and regression co-efficient were (r =1.5)

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تأثير بعض الطعوم في مقاومة الطور الكامل للجراد المصري معمليا وحقليا

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معهد بحوث وقاية النبات- مركز البحوث الزراعية – الدقي – جيزة

نهدف هذه الدراسة إلي أستخدام مادة طبيعية وهي الجير الحي والذى عند تفاعله مع الماء الموجود بالمعدة لحشرة*Anacridium aegyptium* والذي ينتج عنه طاقة كبيرة تؤدى إلي موت الطور الكامل للحشرة حيث تم أستخدامة كميات (١و ١.٥ و ١.٧٥ كج) مقارنة بالممرضان الذان تم فصلهما من من الطور السالف الذكر وهما *Beauveria bassiana* و *Metarhizium anisopliae* حيث استخدما بتركيزات١٠^{٥} و ١٠^{٦} و ١٠^{٧} كونيديا / مل وجراثيم / مل علي الترتيب مقارنة بالمبيد الكيماوي هوستاثيون بتركيزات (١و ١.٥ و ١.٧٥ لتر) بالاضافة إلي الكونترول. لقد تم تحضير كعكة من خليط كل من أحد هذه المواد السابقة مع مولاس قصب السكر والردة بنسبة (٢ :١: ٤) علي الترتيب حيث تم وضعها في أصص بها نباتات الطماطم في المعمل لمدة ٢٤ و ٤٨ و ٧٢ ساعة حيث تم التعرف علي كمية المادة المستهلكة من خليط كل كعكة علي حدة.

دلت النتائج علي أن المادة المستهلكة من كل من عجينة الجير الحي و عجينة المبيد كانت أقل وأحدثت نسبة عالية في القتل مقارنة بمخلوط الجراثيم لبكتريا *B. bassiana* وفطر *M. anisopleiae*. دلت النتائج علي أن الاعداد المقتولة في عجينة الجير الحي بعد تعريض الطور السالف الذكر لمدة ٢٤ و ٤٨ و ٧٢ ساعة للثلاثة تركيزات (١.٠ و ١.٥ و١.٧٥ كج) كانت أعلي من كل من الممرضان والمبيد الكيماوي حيث كانت التنسة المؤية للأعداد المقتولة بعد مرور ٧٢ ساعة عند تركيز ١.٧٥ kg هي ٦٨ و ٨٢ و ٨٠ % طور وكانت الكميات المستهلكة من العجينة هي ٤.٥ و١.٥ و٥.٦ جرامات بينما كانت الكميات المستهلكة في الكونترول هي ٨.٥ و٨.٩ و٩.٠ جرامات علي الترتيب بينما كانت التنسة المؤية للأعداد المقتولة الأعداد المقتولة في الكونترول (صفر) طور.

كما أظهرت النتائج أن الأعداد التنسة المؤية للأعداد المقتولة من عجينة مخلوط المبيد والذي أحتل المرتبة الثانية بعد مرور ٧٢ ساعة عند تركيز ١.٧٥ لترهي ٦٥ و ٦٩ و٧٨ % طور وكانت الكميات المستهلكة ٦.٥ و ٦.٧ و ٦.٨ جرامات وكانت التنسة المؤية للأعداد المقتولة في الكونترول هي (صفر) طور والكميات المستهلكة هي ٨.٥ و ٨.٩ و ٩.٠ جرامات.

كما أظهرت النتائج أن الأعداد المقتولة في عجينة *M. anisopliae* بعد مرور ٧٢ ساعة عند تركيز ١٠^{٧} كانت أكبر من نظيرتها في عجينة *B. bassiana* عند نفس التركيز وأيضا في التغذية المطلقة للطور الكامل بعد التجويع لمدة ٢٤ ساعة علي العجينة فقط وكذلك في الدراسات الحقلية مقارنة بالكونترول.