COMPARATIVE STUDIES FOR USING CERTAIN BAITS AS NATURAL CONTROL AGENT AGAINST *AGROTIS YPSILON*, (LEPIDOPTERA) UNDER LABORATORY AND FIELD CONDITIONS

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Abstract

Quick lime and two other biological control agents: *Bacillus thuringiensis*, *Metarhisium anisopliae* and hostathion [triazophos] were used as poisonous pelleted semi-hard cake baits formulations contains of insecticide, sugar cane molasses and wheat brain (2: 1: 4) against the fourth instar larvae of *Agrotis ypsilon.* in the laboratory and the field. Quick lime was used at 1, 1.2and 1.3 kg, *B. thuringiensis* at $1x10^3$, $1.5x10^3$ and $1.75x10^3$ spores/ ml and *Metarhisium anisopliae* at $1x10^7$, $1.5x10^7$ and $1.75x10^7$ spores/ ml and hostathion insecticide at1, 1.5and1.75L. Double concentrations of one of the tested materials, the quick lime, bacterium, fungus and hostathion were used under field conditions. Fourth instar larvae of cut worm insect were allowed to feed on the plants treated with mixture of one of each of quick lime, microbium fungus, and hesitation and in the freely consumption (persistency) with Lc_{50} of one of each material without plants in the laboratory in the field for 2, 4 and 6 days. Lower amout of hostathion and quick lime semi-hard cake were consumed compared with the other biological control agents and achieved higher mortality. *B. thuringiensis* and *M. anisopliae* semi-hard cake achieved moderate mortality within plants or in the freely consumptions.

INTRODUCTION

Cut-worms, *Agrotis ypsilon*, is well known as dangerous pest against many crops all over the world (Mishra, and Singh 2006). The insect pest often difficult to control, especially when populations are epidemic in proportion, (Hill, 1983). In Fayoum governorate, Egypt. 2009 these trials were executed to estimate and evaluate the effect of Calcium Oxide, *Bacillus. thuringiensis*,(Bt) and *Metarhizium anisopliae* as mixture in semi hard cake against the fourth instar larvae of the cut-worms compared with the chemical insecticide Hostathion [triazophos] in protecting our crops from it's severing damage. Efficiency of several pathogenic organisms, and natural and chemical materials were previously investigated against this insect (Schwarz *et al* 2002). The present work was concerned the evaluation the efficiency of quick lime, the pathogens bacterium, fungus and the recommended insecticide Hostathion against each of the cut-worm insect in the laboratory and field. Quick lime was one of the cheapest natural materials in the Egyptian desert. It was known that Ca0 reacted with water to produce Ca (OH) 2, oxygen and high energy .Quick lime used as an Eco-farming substance.

MATERIALS AND METHODS

I- Laboratory studies

I-I .Stock cultures

Stock cultures of the greasy cut worms *A ypsilon*, additional to the entomopathogenic organisms *B. thuringiensis,* and *Metarhizium anisopliae* were prepared in the laboratory as fellow:

a- *A. ypsilon*:

Larvae of this insect were collected from the heavily infested crops of tomatoes, transferred to the laboratory and reared on tomato seedlings of 30 days old in pots of 10 cm for three generations (Harris *et. al.* 1958).

b- Entomopathogenic fungi and bacterium:

The entomopathogenic bacterium *B. thuringiensis,* and the fungus *Metarhizium anisopliae* were isolated from collected dead larvae of *A. ypsilon,* (Sabbour and Sahab 2007). Serial dilutions of the three pathogenic organisms detected and were prepared at 1x 10^3, 1.5 x 10^3 and 1.75 x 10^3 for *B. thuringiensis,* and 1x10^7, 1.5 x 10^7 and 1.75 x 10^7 for *Metarhizium anisopliae*. A pelleted Semi- hard cake baits formulation consisted of quick lime, sugar cane molasses and wheat bran with the rates of (2 L:1L:and 4kg) was prepared. The same procedures were followed for preparing the cakes mixed with any of each other materials and organisms. The experiments were carried out on tomato seedlings cultivated in plastic pots of 10 cm. for *A. ypsilon.*

1-2. Experimental studies:

1-2-1. Effect of quick lime:

Ten of the fourth instars Larvae of *A. ypsilon* were introduced per plastic pot of tomato for 24 hours while the other 10 of the same age were introduced for 48 hours and 10 first instars larvae for 72 hours in cages. Each pot has one of (25gr) from the quick lime cakes individually. Quick lime was used at (1. 1.5 and 1.75kg).

1-2-2. Effect of entomopathogenic fungi and bacterium:

Ten of fourth instars larvae of *A. ypsilon* were introduced per plastic pots of tomato for 24 hours while the other 10 of the same age were introduced for 48 hours and 10 first instars larvae for 72 hours in cages. Each pot has (25gr.) of each of the previous cakes individually. The researchers quantified the effects of sub lethal concentration(Lc_{50}) of quick lime and other sub lethal rates of the microbial organisms and hostathion on a number of *A. ypsilon* fitness parameters. A new cakes of the bacterium and fungi were prepared for estimating the freely consumption of the fourth instar larvae of *A. ypsilon* by mixing the sub lethal by the same abovementioned ratio and introduced in Petri dishes, each has five of the fourth instar larvae of *A.ypsilon*. Avoiding cannibalism, each two Petri dishes represent one replicate. Daily consumption of the insect was calculated.

1-2-3. Effect of hostathion [**triazophos**] **insecticide:**

Ten of fourth instars larvae of *A._ypsilon* were introduced per plastic pots of tomato for 24 hours while the other 10 of the same age were introduced for 48 hours and 10 first instars larvae for 72 hours in cages. Each pot has one of the studied poisonous cakes individually. Sub Lethal concentration (Lc_{50}) of hostathion were calculated. A new pelleted poisonous semi-hard cakes of hostathion were prepared by mixing the sub lethal by the same mentioned ratio. and introduced in Petri dishes, each has 5 of the fourth instar larvae of *A .ypsilon*. For avoiding cannibalism every two dishes represent one replicate Daily consumption of the insect pest was calculated.

2-Field trials

Under the field conditions the area was divided into four replicates each has four beds (1x3m). Double concentrations were used as follow: pelleted quick lime semi-hard cakes (2, 3 and 3.4 kg), *B. thuringiensis* and *M. anisopliaee* were used at ($2x10^3$, $3x10^3$ and 3.5×10^3) and hostathion (2, 3 and 3.5 L) per each plot and control distributed randomly. The plot bedes were transplanted by Castle rock tomato from Peto Seed Co. Each bed was planted from both sides at distances of 10 cm and covered by black shade netting. 10 of the fourth instar larvae of *A. ypsilon* were introduced per bed. Semi-hard cake of the mixture of the quick lime and molasses were applied on the beds at distances of 25cm beside plants. Each of other mixtures of the pathogenic fungus, bacterium and the hostathion were added on beds. The field of the trial was inspected every 2, 4 and 6 days. Dead larvae of *A. ypsilon* were collected in paper pages and transferred to the laboratory.

3- Statistical analysis:

The data were analyzed using probit analysis (Finny, 1952) and LC_{50} values were estimated for each of tested material, bioagentsand chemical insecticide. Statistical calculator was don through SPSS 11 for windows computer program to determine the Correlation and Regression Co-Efficient (r).

RESULTS AND DISCUSSION

As shown in table (1) and Figs (1, 2 and 3)the obtained results indicated that the dead counts of *A. ypsilon* after 24, hr were 6.3, 7.3 and 8.6 from 10 fourth instar larvae introduced and fed on the pelleted semi-hard cake bait at of 1, 1.5, and 1.75 kg of the quick lime, respectively. Larvae were consumed on 2.5. 2.3 and 1.8 gr., other dead counts of *A. ypsilon* fourth instar larvae after 48, hr were 7.0, 7.5 and 8.7 were fed on the semi-hard cake of the quick lime. Calculated grams of the semi-hard cake of the quick lime were 2.6, 2.1 and 1.8, resp. Dead larvae after 72 hr. Were 7.5, 8.0 and 9.0 fed on the semi-hard cake of the quick lime of 1, 1.5 and 1.7.5 kg. were 2.6, 2.0 and 1.8 grams, respectively. Dead counts of the fourth instar larvae were 0.0 in the control and calculated grams that were consumed were 5.0, 7.5 and 10.5 resp. Calculated Lc_{50} were 0.890, 0.760 and 0.720 after 24, 48 and 72hr.

Table (1) and Figs (1,2 and 3): shows that the dead fourth instar larvae with the concentrations of $1x10^3$,$1.5x10^3$ and $1.75x 10^3$ of *B. thuringiensis* under the laboratory conditions after 24, 48 and 72 hr were 6.1, 6.4 and6.8 and 6.5, 6.6 and 7.5 and 6.8, 7.0 and 8.5 and the control 0.0 resp. However, (Atalla *et al* 2001) reported that the total mortality of the aforementioned insect pest were 27 – 80 on the 2^{nd} and 4^{th} insrar larvae after spraying Agrin, *Bacillus thuringiensis* the bioinsecticide on the tomato plants. Calculated Lc_{50} for the abovementioned concentrations were $4.2x10^2$, $4.1x10^2$ and $4.0x10^2$. (Mansour *et al* 2005*)* tested a biocide containing 20% delta endotoxin of *Bacillus thuringiensis* var. kurstaki at 100, 200, 400, 800 and 1600 ppm against 4^{th} instar larvae of *A. ipsilon* fed on toxicant bait. Calculated LC_{50} values 72 h post treatment with MVP were 480.2 ppm for 4^{th} instar larvae.

Table (1) and Figs (1,2 and 3): shown that the consumption of the abovementioned poisonous semi-hard cake of *B. Thuringiensis* after 24, 48 and 72 hr. were 3.9,4.1and 4.1and 4.5, 4.6 and 4.4 and 5.1, 5.2 and 5.0 grams while consumed grams by the fourth instar larvae in the control were 5.1, 7.8 and 10.0. Table (1) and Figs (1,2 and 3): shows that dead fourth instar larvae with the concentrations of *M. anisopliae* ($1x10^7$, $1.5x10^7$ and $1.75x10^7$) semi-hard cake after 24, 48 and 72hr were 6.0, 6.4 and 6.5 and 6.3, 6.5 and 6.7 and 6.5, 6.8 and 8.0 resp. The dead Counts of the fourth instar larvae in the control were 0.0. Calculated Lc_{50} were $3.5x10^6$, $1.6x10^6$ and $1.5x10^6$. Table (1) and Figs (1,2 and 3), shows that the consumption of the fourth instar larvae after the same abovementioned period (24, 48 and 72 hr) were 4.0, 4.1 and 4.2 and 4.6, 4.8 and 4.7 and 5.6, 5.7 and 5.5gr.Table (1): shows that calculated consumption of the fourth instar larvae in the control were 5.2, 8.0 and 10.8gr. The dead larvae with poisonous semi-hard cake of hostathion pesticide with the concentrations of 1, 1.5 and 1.75 L after (24, 48 and72) were 6.2, 6.5 and 7.3 and 7.0, 7.5 and 7.8 and 7.5, 8.3 and 9.0 and 0.0 in the control. Calculated Lc_{50} was

0.735, 0.650 and 0.600. Calculated consumption in grams of the fourth instar larvae after the abovementioned hours (24, 48 and 72) were 1.9, 1.7 and 1.5 and 2.1, 1.7 and 1.5 and 2.2, 1.8 and 1.5 while in the control 5.1, 8.2 and 10.2 grams. Table (2): shows that the dead counts of the *A. ypsilon* freely consumed on semi-hard cake with the concentrations of (Lc_{50}) of the quick lime semi hard cake after 24, 48 and 72 hr were 3.1, 4.2 and 5.1 and 3.4, 4.5and 5.2 and 4.1, 5.4 and 6.4 and the control was 0.0 resp. Registered grams of the semi-hard cake consumed after the above-mentioned times under the laboratory conditions were 4.5, 4.3 and 4.7 and 3.8 and 6.4, 4.1and 3.8 and 4.7, 4.1 and 3.8. Ferthermore, the quantities of the semi-hard cake in the control were 10.5, 12.2 and 15.5 resp. Table (2) and Figs (4,5 and 6): shows that the dead fourth instar larvae freely consumed on the concentrations of (Lc_{50}) of *B.thuringeinsis* semi hard cake after the abovementioned times (24, 48 and 72hr) were 3.1, 3.1 and 3.3 and 3.2, 3.3 and 3.4 and 3.4, 3.4 and 4.2 and 0.0 control under the laboratory conditions resp. Table (2) shows that calculated dead fourth instar larvae in freely consumptions of the poisonous semi hard cakes of *M. anisopliae* in grams after the abovementioned times (24, 48 and 72 hr) were 3.0, 3.0 and 3.2 and 3.1, 3.2 and 3.5 and5.2, 3.3 and 4.0 while in the control 10.1, 14.3 and 15.5 resp. Table (2) shows that calculated freely consumptions of the fourth instar larvae on *M. anisopliae* semi hard cakes after (24, 48 and 72hr) were 5.2, 5.3 and 6.2 and 5.7, 5.8 and 8.7 and 5.8, 6.7 and 8.4 and 10.2, 12.1 and 15.2 grams in the control. Table (2) shows that dead fourth instar larvae in the freely consumptions fed on the hostathion semi hard cake after (24, 48 and 72 hr) were 3.1, 3.3 and 4.3 and 3.3, 3.5 and 4.0 and 3.4, 4.1 and 4.5 and 10.1, 12.1 and 15.2 grams in the control resp. Calculated grams after the previous mentioned times (24, 48 and 72 hr) were 2.8, 2.5 and 2.5 and 4.2, 2.6 and 2.6 and 4.3, 2.6 and 2.6. Table (3) and figs (4,5 and 5): shows that dead fourth instar larvae fed on the quick lime semi hard cake after (2, 4 and 6 days) were 4.5, 5.0 and 5.0 and 6.0, 6.0 and 6.0 and 6.3, 7.3 and 7.5 and 0.0 control under the field conditions. (Aditi Badiyala and Sharma, D. C 2007) found that *B. thuringiensis* at the concentration of 3.96×10^7 IU/ ha was superior in suppressing the aforementioned pest over the untreated control. Under the field conditions, Table(3): shows that the dead counts of fourth instar larvae fed on the poisonous *B. thuringiensis* semi hard cake after (2, 4 and 6 days) were 0.0, 0.0 and 0.0 and 3.5, 4.5 and 5.3 and 4.0, 4.8 and 6.5 and 0.0 in the control. (Amitava Konar *et al* 2003) reported that *M. anisopliae* by the concentration of 1×10^8 spores / ml was the most effective on the fourth instar larvae. Other fourth instar larvae fed on the poisonous semi hard cake with *M. anisopliae* after the previous days (2, 4 and 6 days) were 0.0 with the three concentrations and 3.0, 4.4 and 5.0 and 3.5, 4.8 and 6.3 and 0.0 in the control . The counts of the dead larvae fed on the poisonous semi hard cake with the chemical insecticide hostathion at (2, 4 and 6 days) were 3.0, 4.5 and 5.5 and 4.0, 5.5

and 6.5 and 5.0, 5.5 and 7.5 and 0.0 in the control. Tables (1, 2, and 3) shown that the quick lime and the pesticide hostation achieved higher mortality within tomato plants and freely consumption than other bacterium *B. thuringiensis*, the fungus *M. anisopliae* after 24, 48 and 72 hr by the abovementioned concentrations. However, Insecticides were used in wide range against *A. ypsilon* in the field allover the world however, the hazards of using the insecticides were recorded in several researches (Badenes-Perez *et al* 2006). In (2002) (Muhammad Shakur *et al*) reported that using baits of (Dipterex [trichlorfon] + sugar + rice husk) on permanent plots of potato crop for controlling the above-mentioned insect pest were effective and more persistent for giving healthy products. (Salama *et al* 1999) studied the possiblility of using *B. thuringiensis* (B.t) preparation (Dipel 2X) as a substitute for chemical insecticides (Lannate [methomyl] and Hostathion [triazophos]) was evaluated against *A. ypsilon* the major pest of potato, and reported that both biopesticide and chemical insecticides were effective against the target insect and reported that one spray or bait application of Dipel 2X at the rate of 750 gm/ feddan provided a satisfactory protection of the potato crop against infestation with *A. ipsilon*. The same auther *et al* (1995) add that When B.t. baits were used, the percentage mortality of *A.ypsilon* reached 96.1-96.4 compared with 97.4-98.0 when using hostathion [triazophos] baits in soybean. And in (1990 *et al* the same other) studied the effective threshold rate of application of Dipel 2X (*Bacillus thuringiensis* subsp. kurstaki) against *Agrotis ipsilon* on vegetable crops and reported that the incorporation of some chemical additives such as calcium sulfate or calcium oxide significantly potentated the effectiveness of the microbial pesticide on larval populations. Therefore, the quick lime was used for the first time is an efficient bait for controlling the the fourth instar larvae of *A. ypsilon*. (Youssef, 1997), tested common alum, aluminum potassium sulfate (solid) and aluminium oxide (liquid) as poison baits in laboratory experiments against *A. ipsilon* one-day-old sixth-instar larvae, however the solid and liquid were also tested as synergists of recommended insecticides (Hostathion [triazophos]therefore, all cases mortality was more than 80%. Hostathion insecticide was used in bait for controlling *A. ypsilon*, an additional problem for control is the soil dwelling habits of the larvae, often beneath heavy foliage, making it difficult for insecticides to reach their targets (Hill 1983). But its persistency polluted the soil for long time after spraying. Therefore, Quick lime and Hostathion *B. thuringiensis*, *M. anisopliae* achieved higher mortality after 72hr in the laboratory and 6 days in the field Respectively. Furthermore, quick lime was safety and cheap to the farmers in controlling the abovementioned insect pest. Statistical analysis shows that the correlation and regression co-efficient were (r =0.5)

Table 1. Efficiency of poisonous cakes of the quick lime, *B.thuringiensis*, *M.anisopliae* and hostathion insecticide semi- hard cake and Quantities (in grams) consumed per 10 fourth instar larvae on tomato plants after24, 48 and 72h. in the laboratory.

Conc. / Pest	Quick lime															
A. yapsilon		1kg			1.2			1.3kg			Control			Lc_{50}		
	Time	24h	48h	72h	24h	48h	72h	24h	48h	72h	24h	48h	72h	24h	48h	72h
	Consmp.	2.5	2.6	2.6	2.3	2.1	2.0	1.8	1.8	1.8	5.0	7.5	10.5	0.890	0.760	0.720
	dead	6.3	7.0	7.5	7.3	7.5	8.0	8.0	8.7	9.0	0.0	0.0	0.0			
	B.thuringiensis															
		$1x10^{3}$			$1.5x10^{3}$			$1.75X10^{3}$			control			Lc_{50}		
	Time	24h	48h	72h	24h	48h	72h	24h	48h	72h	24h	48h	72h	24h	48h	72h
	Consmp.	3.9	4.5	5.1	4.1	4.6	5.2	4.1	4.4	5.0	5.1	7.8	10.0	$4.2x10^{2}$	$4.1x10^{2}$	$4.0x10^{2}$
	dead	6.1	6.5	6.8	6.4	6.6	7.0	6.8	7.5	8.5	0.0	0.0	0.0			
	M.anisopliae															
		$1X10^{7}$			$1.5X10^{7}$			$1.75X10^{7}$			Control			Lc_{50}		
	Time	24h	48h	72h	24h	48h	72h	24h	48h	72h	24h	48h	72h	24h	48h	72h
	Consmp.	4.0	4.6	5.6	4.1	4.8	5.7	4.2	4.7	5.5	5.2	8.0	10.8	$3.5x10^{6}$	$1.6x10^{6}$	$1.5x10^{6}$0
	dead	6.0	6.3	6.5	6.4	6.5	6.8	6.5	6.7	8.0	0.0	0.0	0.0			
	Hostathion															
		1L			1.5L			1.75L			Control			Lc_{50}		
	Time	24h	48h	72h	24h	48h	72h	24h	48h	72h	24h	48h	72h	24h	48h	72h
	Consmp.	1.9	2.1	2.2	1.7	1.7	1.8	1.5	1.5	1.5	5.1	8.2	10.2	735.0	0.650	0.600
	dead	6.2	7.0	7.5	6.5	7.5	8.3	7.3	7.8	9.0	0.0	0.0	0.0			

N.B: Quantities consumed per 10 fourth instar larvae exposed
Consmp. .: consumption

Table 2. Efficiency of the poisonous semi-hard cake of quick lime, *B.thuringiensis*, *M.anisopliae* and hostathion insecticide (in grams) at (Lc_{50}) Freely consumption per 10 fourth instar larvae after 24, 48 and 72hr. in the laboratory.

Conc. / Pest		Quick lime											
A. yapsilon		1kg			1.5kg			1.75kg			Control		
	Time	24hr	48hr	72hr	24hr	48hr	72hr	24hr	48hr	72hr	24hr	48hr	72hr
	Consmp..	4.5	4.6	4.7	4.3	4.1	4.0	3.8	3.8	3.8	10.5	12.2	15.5
	Dead	3.1	3.4	4.1	4.2	4.5	4.6	5.1	5.2	5.4	0.0	0.0	0.0
		B.thuringiensis											
		$1x10^3$			$1.5x10^3$			$1.75X10^3$			control		
	Time	24hr	48hr	72hr	24hr	48hr	72hr	24hr	48hr	72hr	24hr	48hr	72hr
	Consmp..	5.0	5.5	6.2	5.3	5.7	6.3	5.3	5.5	7.5	10.1	14.3	15.5
	Dead	3.1	3.2	3.4	3.1	3.3	3.4	3.3	3.4	4.2	0.0	0.0	0.0
		M.anisopliae											
		$1X10^7$			$1.5X10^7$			$1.75X10^7$			Control		
	Time	24hr	48hr	72hr	24hr	48hr	72hr	24hr	48hr	72hr	24hr	48hr	72hr
	Consmp..	5.2	5.7	5.8	5.3	5.8	6.7	6.2	8.7	8.4	10.2	12.1	15.2
	Dead	3.0	3.1	3.2	3.0	3.2	3.3	3.2	3.5	4.0	0.0	0.0	0.0
		Hostathion											
		1L			1.5L			1.75L			Control		
	Time	24hr	48hr	72hr	24hr	48hr	72hr	24hr	48hr	72hr	24hr	48hr	72hr
	Consmp.	2.8	4.2	4.3	2.5	2.6	2.6	2.5	2.6	2.6	10.1	12.1	15.2
	Dead	3.1	3.3	3.4	3.4	3.5	4.1	3.3	4.0	4.5	0.0	0.0	0.0

N.B: Quantities consumed per 10 fourth instar larvae exposed.

Consmp..: consumption

Table 3. Efficiency of the poisonous semi-hard cake of Quick lime, *B.thuringiensis*, *M.anisopliae* and hostathion insecticide on the fourth instar larvae of *A. yapsilon* within tomato after 2,4 and 6 days in the field.

Conc. / Pest	Quick lime											
	2 kg			3 kg			3.4kg			Control		
	2days	4 days	6 days	2days	4 days	6 days	2days	4 days	6 days	2days	4 days	6 days
	4.5	6.0	6.3	5.0	6.0	7.3	5.0	6.0	7.5	0.0	0.0	0.0
	B.thuringiensis											
	2x10^{3}			3x10^{3}			3.5X10^{3}			control		
A. yapsilon	2days	4 days	6 days	2days	4 days	6 days	2days	4 days	6 days	2days	4 days	6 days
	0.0	3.5	4.0	0.0	4.5	4.8	0.0	5.3	6.5	0.0	0.0	0.0
	M.anisopliae											
	2X10^{7}			3X10^{7}			3.5X10^{7}			Control		
	2days	4 days	6 days	2days	4 days	6 days	2days	4 days	6 days	2days	4 days	6 days
	0.0	3.0	3.5	0.0	4.4	4.8	0.0	5.0	6.3	0.0	0.0	0.0
	Hostathion											
	2L			3L			3.5L			Control		
	2days	4 days	6 days	2days	4 days	6 days	2days	4 days	6 days	2days	4 days	6 days
	3.0	4.0	5.0	4.5	5.5	6.5	5.5	6.5	7.5	0.0	0.0	0.0

N.B: Dead counts per 10 fourth instar larvae exposed.

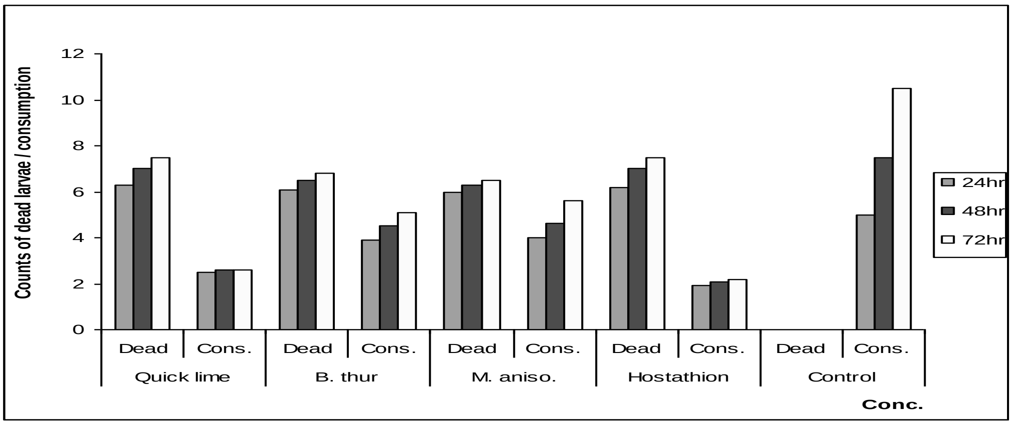

Fig. 1. Efficiency of quick lime, *B. thuringiensis*, *M. anisopliae* and hostathion and consumed quantitis on the fourth instar larvae of *A. ypsilonin* in the loboratory.

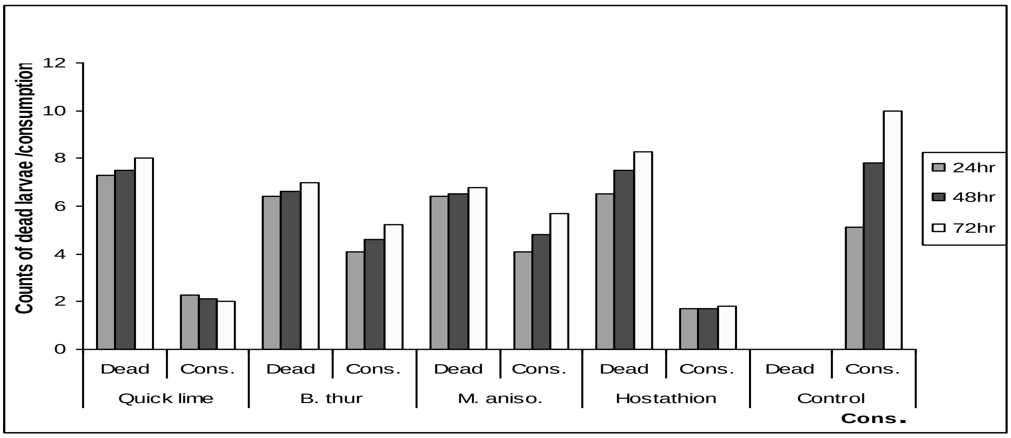

Fig. 2. Efficiency of quick lime, *B. thuringiensis*, *M. anisopliae* and hostathion and consumed quantitis on the fourth instar larvae of *A. ypsilonin* in the loboratory.

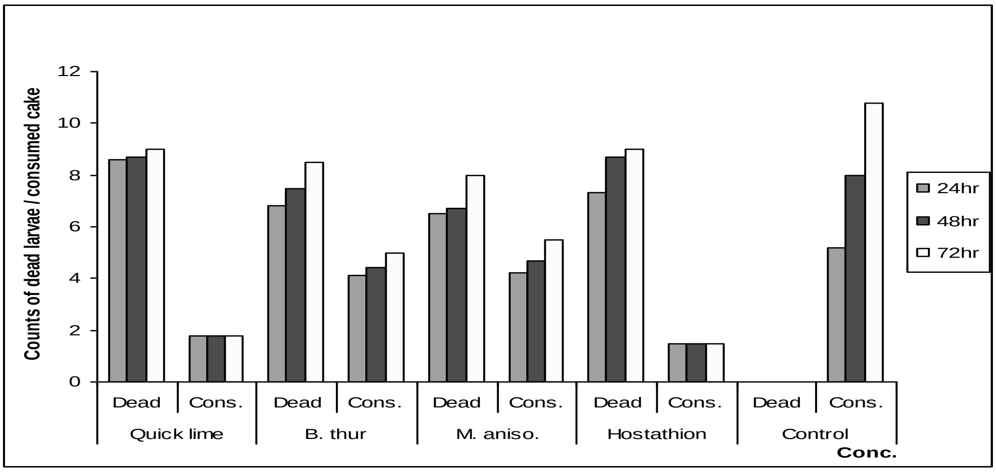

Fig. 3. Efficiency of quick lime, *B. thuringiensis*, *M. anisopliae* and hostathion and consumed quantitis on the fourth instar larvae of *A. ypsilonin* in the loboratory.

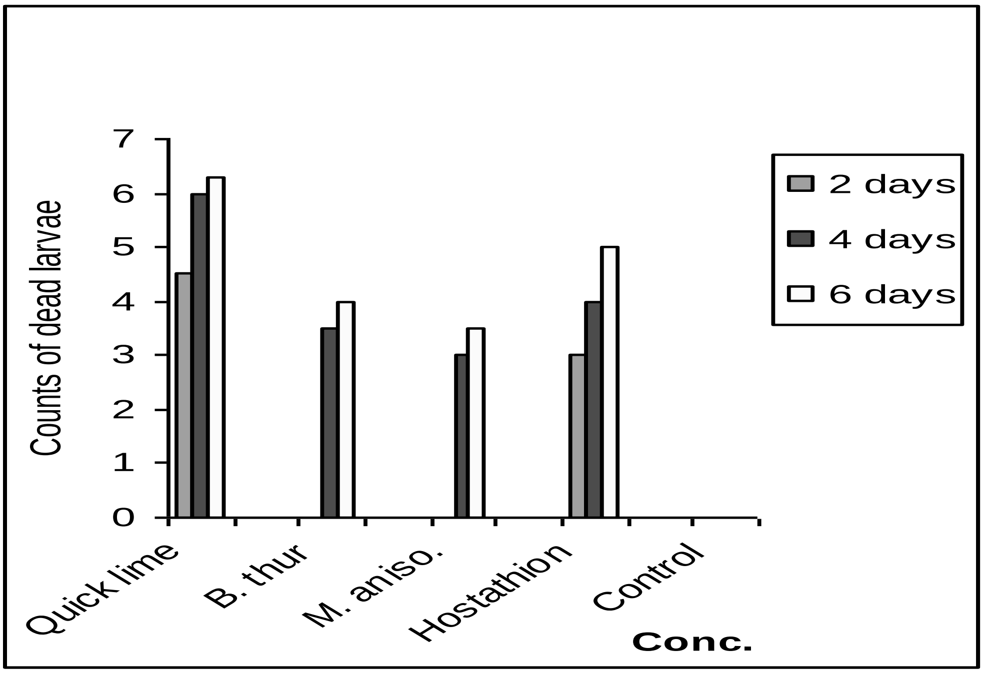

Fig. 4. Efficiency of quick lime *B . thuringiensis*, *M. anisopliae* and Hostathion on the fourth instar larvae of *A. yabsilon,* in the field.

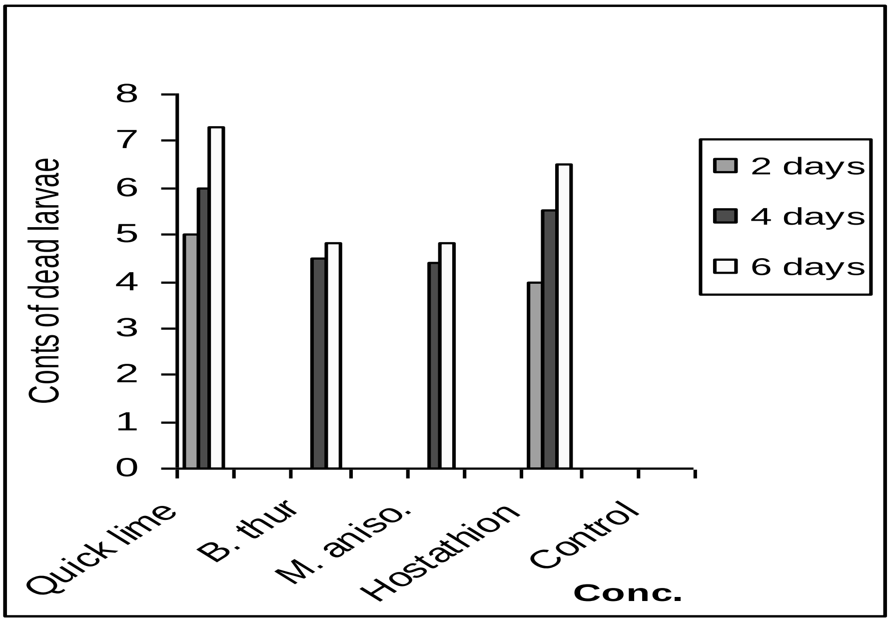

Fig. 5. Efficiency of quick lime *B . thuringiensis*, *M. anisopliae* and Hostathion on the fourth instar larvae of *A. yabsilon* in the field.

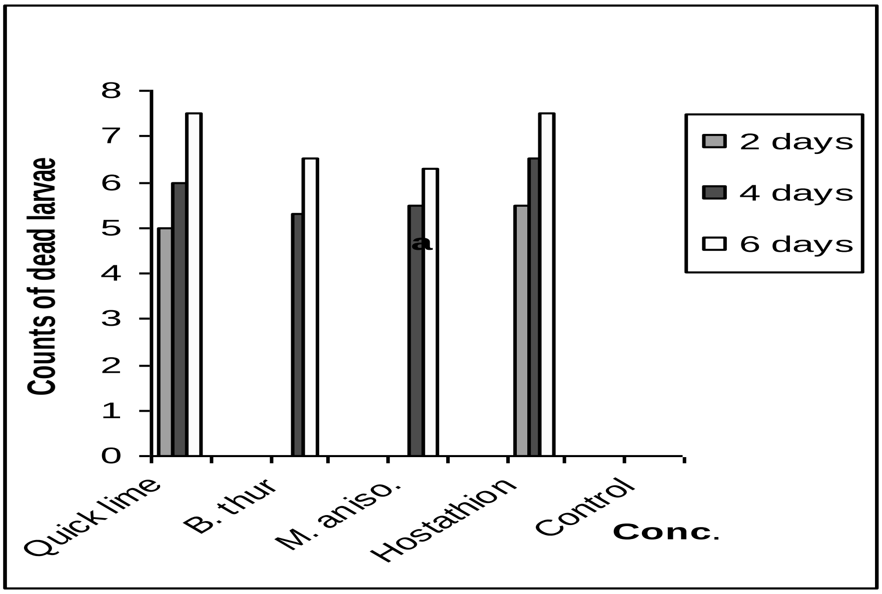

Fig. 6. Efficiency of quick lime *B . thuringiensis*, *M. anisopliae* and Hostathion on the fourth instar larvae of *A. yabsilon* in the field

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دراسات مقارنة لإستخدام بعض الطعوم كمواد طبيعية في مكافحة الطور اليرقي الرابع لحشرة الدودة القارضة *Agrotis ypsilon* (حرشفية الأجنحة) معمليا وحقليا

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تهدف هذه الدراسة إلي استخدام مادة طبيعية وهي الجير والذي عند تفاعله مع الماء الموجود بالمعدة لحشرة *Agrotis ypsilon* والذي ينتج عنه طاقة كبيرة تؤدى إلي موت الطور الرابع من حشرة الدودة القارضة حيث تم استخدام كميات(1و 1.2 و 1.3 كج) مقارنة بالممر ضان اللذان تم فصلهما من من الطور السالف الذكر حيث استخدما بتركيزات $1x\ 10^3$ و $1.5\ x^3\ 10$ و $1.75\ x10^3$ جراثيم / مل لميكروب *Bacillus thuringiensis* وتركيز $1=\ 10^7$ و $1=\ 1.5 = 10^7$ و $1.75 = 10^7$ جراثيم / مل لفطر *Metarhisium anisopliae* مقارنة بالمبيد الكيماوي هوستاثيون بتركيزات (1و 1.5 و 1.75 لتر) بالإضافة إلي الكنترول. وقد تم تحضير كعكة من خليط كل من أحد هذه المواد السابقة مع مولاس قصب السكر والردة بنسبة (2 :1: 4) علي الترتيب حيث تم وضعها في أصص بها نباتات الطماطم في المعمل لمدة 24 و 48 و 72 ساعة و تم التعرف علي كمية المادة المستهلكة من خليط كل كعكة علي حدة. ودلت النتائج علي أن المادة المستهلكة من كل من عجينة المبيد و عجينة الجير كانت أقل وأحدثت نسبة عالية في القتل بعد مرور 72 ساعة مقارنة بمخلوط الجراثيم لبكتريا *B. thuringiensis* وفطر *M. anisopliae* .و دلت النتائج ايضأ علي أن الاعداد المقتولة في عجينة الجير بعد تعريض الطور السالف الذكر بعد مرور 72 ساعة هي 7.5 و 8.5 و 9.0 أما في الكنترول0.0 وبحساب الكميات المستهلكة من العجينة وجد أنها 2.6 و2.0 و 1.8 جرامات مقارنة بالكنترول حيث كانت 10.5 جرامات. وبحساب قيم Lc_{50} للثلاثة معاملات وجد أنها 10^2 x 4.2 x و x $4.1x^2 10$ و 4.0 و x 10^2 x 4.0 بعد مرور 24 و 48 و 72 ساعة علي الترتيب. كما أظهرت النتائج أنه عند تعريض الطور السالف الذكر لعجينة جراثيم بكتريا *B .Thuringiensis*أن ألاعداد المقتولة بعد مرور72 ساعة كانت هي 7.5 و 8.0 و 9.0 أما الأعداد المقتولة في الكنترول (00) بكميات مستهلكة قدرها 5.1 و 5.2 و 5.0 جرامات والكمية المستهلكة في الكنترول 10.0 جرامات. وبحساب قيم Lc_{50} للثلاثة معاملات وجد أنها 0.890 و760 و720 بعد مرور 24 و 48 و 72 ساعة علي الترتيب. كما أظهرت النتائج أنه عند تعريض الطور السالف الذكر لعجينة *M. anisopliae* بعد مرور 72 ساعة كانت الأعداد المقتولة هي 7.5 و 8.0 و 9.0 طور والكمية المستهلكة من العجينة 5.6 و 5.7 و 5.5 جرامات بينما كانت الأعداد المقتولة في الكنترول (0.0) والكمية المستهلكة من العجينة 10.8 جرامات. وبحساب قيم Lc_{50} للثلاثة معاملات وجد أنها $3.5\ x\ 10^6$ و $1.6\ x\ 10^6$ و $1.5\ x\ 10^6$ بعد مرور 24 و 48 و 72 ساعة علي الترتيب. ولقد أظهرت النتائج

أن الأعداد المقتولة في عجينة المبيد الكيماوي هوستاثيون بعد مرور 72 ساعة كانت الأعداد المقتولة هي 7.5 و 8.0 و 9.0 طور بإستهلاك قدره 2.2 و 1.8 و 1.5 جرامات 5 بينما كانت الأعداد المقتولة في الكونترول (0.0) طور بإستهلاك قدره 10.2 جرامات . وبحساب قيم Lc_{50} للثلاثة معاملات وجد أنها 0.735 و 0.650 و 0.600 بعد مرور 24 و 48 و 72 ساعة علي الترتيب. بغرض تقدير الأستهلاك اليومي تم عمل مخلوط اخر بنفس النسبة السابقة باستخدام تركيز ال Lc_{50} (من الأربع معاملات (عجينة الجير و جبنة الباسلس و جبنة الجير و عجينة المبيد الكيمبائي هوستاثيون) بتفس النسب السابق ذكرها. أظهرت النتائج أن الكمية المستهلكة من خليط المبيد وخليط الحير عند أستخدامه بكمية 1.75 كج وهي (3.8 جرام بأكبرمعدل للقتل هو 5.4 بعد مرور 72 ساعة) لهما علي الترتيب بينما كانت الكمية المستهلة من خليط *B. thuringiensis* بتركيز 1.75×10^3 هي 7.5 جرام و ومعدل للقتل هو 4.2 يرقات بعد مرور نفس المدة وخليط *M. anisopliae* بتركيز 1.75×10^7 كانت الكمية المستهلكة 8.4 حققمعدل للقتل هو 4.0 يرقات في حين كانت الكمية المستهلكة من كعكة خليط الهوستاثيون بكمية 1.75 لتر هي 2.6 جرامات ومعدل للقتل 4.يرقة بعد مرور 72 ساعة. وتحت الظروف الحقلية دلت النتائج على أن أعلي معدل للقل هو 7.5 يرقات لكل من كعكة مخلوط الجير الحي بتركيز 1.75 كج وخلوط كعكة المبيد الحشري الهوستاثيون بكمية 1.75 لتر بعد مرور 6 أيام يليها مخلوط كعكة *B. thuringiensis* و مخلوط كعكة *M. anisopliae* حيث كانت 6.5 و 6.3 بعد مرور نفس المدة علي الترتيب مقارنة بالكنترول. ومن ذلك يتبين أن كعكة خليط الهوستاثيون وخليط كعكة الجير أدت لأفضل النتائج يليها مخلوط كعكة ميكروب *B.thuringiensis* ثم مخلوط كعكة *M.anisoplia* تحت الظروف المعملية والحقلية.