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EFFICIENCY OF DIFFERENT TREATMENTS IN CONTROLLING INSECT (*TROGODERMA GRANARIUM)* IN STORAGE OF WHEAT GRAIN

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Abstract

A comparative study was conducted between different treatments, including a lettuce seed powder *Lactuca sativa*, malathion insecticide and bacteria *Bacillus thuringiensis* on control of *Trogoderma granarium* that, causes damage of wheat grain *Triticum aestivum* in stores. Wheat grains were treated directly by mixture with three different concentrations (1, 3 and 5%) of treatment and data were recorded after 24, 48, 72 hours after treatment respectively. The results recorded highest percentage of mortality with treatment 5% at all treatment reached (83.7, 76.3 and 56.2), while the percentage of controlling declined with decreasing concentration of treatment. The lower percentage of mortality rates were reduced by used 1% conc for all treatments with values (21., 26.15, 32.40%) of *Bacillus thuringiensis*, malathion and lettuce powder after 72 hours of treatment respectively. The results of the present study indicate to possibility using *Bacillus thuringiensis* as a one of biological control methods as an alternative to pesticides in the management with more further extensive future studies.
Keywords: controlling insect, *Trogoderma granarium*, wheat grain

Introduction

Trogoderma granarium insect is one of the most important and dangerous insect pests. It is considered one of the most complex of insecticides and most resistant to pesticides. It also has the ability to resist difficult environmental conditions because its larvae have the ability to survive for 23 months without food in the case of long dormancy (FAO, 1995). *Trogoderma granarium* insect is one of the most important and dangerous insect pests. It is considered one of the most complex of insecticides and most resistant to pesticides. It also has the ability to resist difficult environmental conditions because its larvae have the ability to survive for 23 months without food in the case of long dormancy (FAO, 1995).

Parashar (2006) indicated that the larvae of this insect are one of the most dangerous stages of the insect as the larvae start feeding the seed embryo and then, emptied of all content**.** Currently this insect managed by chemical pesticides by fogging or spraying during or after storage. Using such as synthetic pesticides has proved highly and fast in control of insect stores. With the global demand for food increased dramatically as a result of the excessive increase in the world population. There was an urgent need to use chemical pesticides to preserve the products stored during the storage period or until they reached the market. Wrong use, frequent and random for these pesticides outside rules and instructions led to the emergence of many environmental and health problems. In the end years, many researchers have focused on alternatives in the control of insecticides of stored materials, such as heating, radiation, biological control, including microorganisms (Bactria and fungi) and plant extracts (Ibrahim and Nasser, 2009). Previous studies have proved the efficiency of microorganisms and powders of plant extracts natural products in reducing the biological activity of insects or control them completely at different stages of growth, (Iraqi, 2002; Khalaf, and Farhani, 2008). Natural products of plant origin as environmentally friendly compounds, low toxicity, effect and easy to prepare. The effect of plant powders on the insects or / and influencing various life activities may be through many ways than, including reducing number of eggs, losses the number of complete insects and feeding (Mahmood *et al*., 1996; Ghalbi *et al*., 2004). In addition to studies that indicate that, microorganisms do not produce toxic substances, do not have negative effects in the environmental ,and have the ability to parasitic on pathogens (Abound, 2004). The aim of this research is to study the effect powder of *Lactuca sativa* plant and *Bacillus thuringiensis* bactria and their interaction in the control of *Trogoderma granarium* beetle that attack wheat seeds under storage conditions.

Materials and Methods

Insect Collection

The insect was obtained from infected seed taken from commercial stores in Samarra city / Salah al-Din. 250 g of wheat grain was added to clean and sterile bottles capacity 800 ml then, and incubated at 27 ± 2 ° C and humidity 65 ± 5%.

Preparation of Plant Powder

Plant seeds of *Lactuca sativa* L. were collected from local markets in Samarra city. The seeds washed by distilled water to remove dust and plankton. After that the seed dried by oven at 32^{o}C for 2 days. Thy dry seed grinded electric grinder until get to homogeneous powder and then placed in small clean and sterile glass containers to use it for further study.

B. thuringiensis Bacteria

Pure and diagnostic isolates of bacteria were obtained from microbial control laboratories / ANAT department / National Research Center / Dokki / Egypt**.**

Bio-assay Activity Test

(i) Plant Powder activity

Three concentration of plant seed powder (1, 3 and 5 g) added to 10g of clean wheat grain mixture well until homogeneity then, placed in glass bottles capacity 100 ml. Ten whole insects added to bottles that covered with a clean cloth and tied with a rubber band. The samples prepared incubated under 27 ± 2 ° C and relative humidity 65 ± 5%**.** The experiment was randomly repeated three times and data were collected based on insect death rate after 24, 48 and 72 hr compared with untreated control follow formula bellow.

$$\%\ death = \frac{\text{No of insect in control treatment} - \text{No of insect in treated treatment}}{\text{No.insect in control treatment}} \times 100$$

(ii) Pesticides activity

Malathion pesticide 45% EC with three concentrates (1, 3 and 5%) were prepared and used as compared treatment. Same steps in section 2.3.1 applied to determined activity of pesticides.

(iii) *B. thuringiensis* bacteria activity

Three concentrations were prepared (1, 3 and 5%) by dissolving 1 g, 3 g and 5 g of bacteria in 100 ml of distilled water respectively. Same steps in section 2.3.1 applied to determined activity of bacteria.

Results and Discussion

Effect of treatments

The results from Table.1 showed a significant increase in percentage of mortality rate by using different treatments.

Table 1 : Efficiency of three deferent treatment s in mortality rate of whole *Trogoderma granarium* insect after 24, 48 and 72 hr of treatment.

Treatment	Cont.(%)	Mortality rate %			Mean of mortality
		24	48	72	
Seed powder	1	7.2	13.55	21	13.9
	3	11.4	27	41.15	26.51
	5	18	33.65	56.2	35.95
Malathion	1	6.2	14.3	26.15	15.55
	3	15.5	31.3	15.5	33.8
	5	22.3	41.44	76.3	46.68
B. thuringiensis	1	12.5	20.9	32.4	21.93
	3	20	35.22	51.15	35.45
	5	31.9	50.10	83.70	55.23

Effect of seed powder of *Lactuca sativa* L. on inhibition insect activity shows in Figure.1 The higher mortality rate reached to 56.20% at concentration 5g after 72 hours of treatment, while the lowest percentage of mortality (21%) recorded with concentration 1% after the same period of exposure. The results also indicate that a positive relationship between the concentration powder and percentage of the mortality rate. Generally there are increased in death of whole insect with increasing concentration of powder. The result may be due to the toxic effect of alkaloids or volatile oils that as second bioactive compound in seed of Lettuce plant. Also the cause of the loss may be due to the effect of powders through contact it with surface of the body or entering through the respiratory openings (Ibrahim and Nasser, 2009; Twig *et al*., 2015). On other hands, may be powder causes damage in body surface or/and led to remove the wax layer body, amount evaporate water and finally increase mortality percentage (Ibrahim and Nasser, 2009).

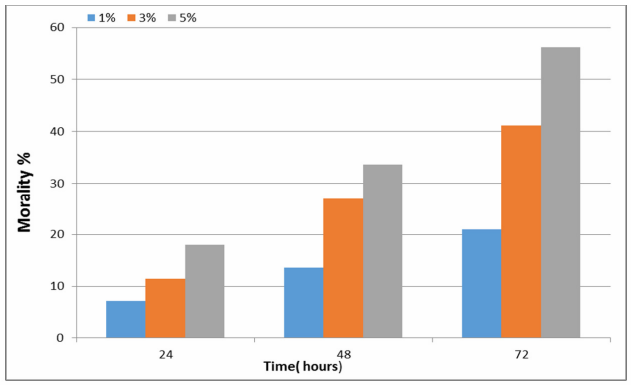

Fig. 1 : Efficiency of seed powder of *Lactuca sativa* L. on inhibition insect activity *Trogoderma granarium* under deferent time (24, 48 and 72 hr) and concentration (1, 3 and 5 %).

The results also showed that significant effect on the mortality rate of the beetle within 24, 48 and 72 hours after treatment with pesticides treatment. Higher effect recorded with concentration 5% with values reached to 22.30, 41.44 and 74.50 % respectively (figure 2). From result of current study concluded that, increased concentration leads to an increase in the rate of killing and may be due to the low efficiency of enzymes responsible for removing the toxicity of these pesticides. Also providing an opportunity for the molecules of these pesticides reach their targets directly without being exposed to toxicity reactions, or may be attributed to their conversion into toxic metabolites more than the original material in the activation process . Or this may be due to their conversion to more toxic metabolites than the original substance by activation, although the primary function of these enzymes is to convert toxic compounds into more polar products by detoxification to facilitate their release outside the body (Al-Khazraji, and Mustafa, 1997; Magil, N. 2004). The results of this study are consistent with a study conducted by the (Al-Azzawi *et al*., 1983; Dubey *et al*., 2008) that, larvae of the third age of flour beetle exposed to wheat grains mixed with powder In Vite Liquid Lure pesticide with concentration of 1g / kg was able to complete a life of larvae and whole insect, but at a concentration of 5g/kg the inhalation of larvae reached to 40%. These results also are agreement with finding of that, the percentage of killing depending on different concentration and duration of exposure.

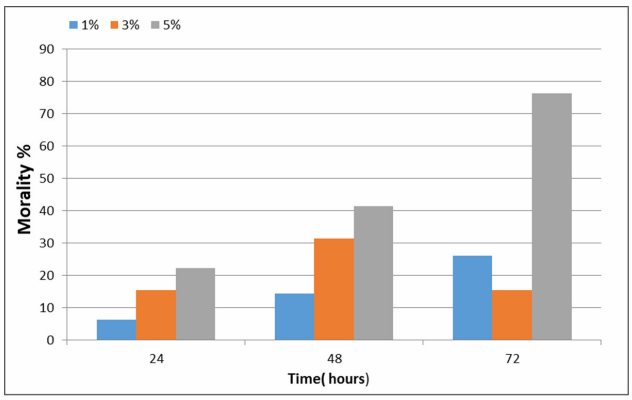

Fig. 2 : Efficiency of Malathion pesticide on inhibition insect activity *Trogoderma granarium* under deferent time (24, 48 and 72hr) and concentration (1, 3 and 5 %).

With regard to control using bacteria the results showed similar effect for both plan powder and insecticide on the mortality of whole grain beetle. Higher percentage recorded with 5% (31.90, 50.10 and 88.70%). While lowest percentages were at 1% with value (12.50, 20.90 and 32.40%) in 24, 48 and 72 hours respectively figure.3. The effect of *B. thuringiensis* bacteria may be due to its ability to produce different kinds of toxins, (Intravenous), intravenous beta-exotoxin (beta-exotoxin), and phosphorus-phosphorus. May be the effect in above will led to increase the permeability of the pesticide during the insecticide or it acts to inhibit the enzymes that harm the pesticides or act as a barrier to prevent the arrival of oxygen and through block the respiratory openings (Mahmoud and Hamid, 1996; Farman, 2009).

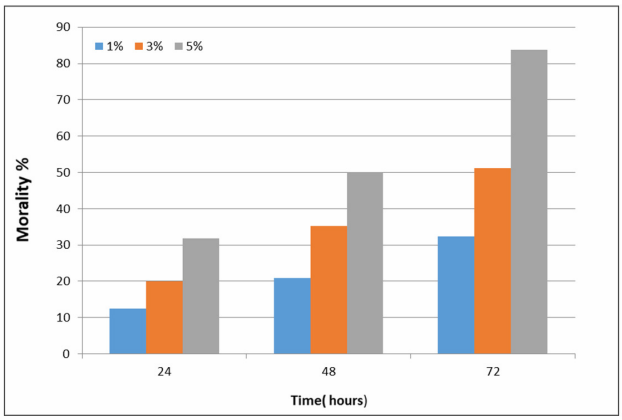

Fig. 3 : Efficiency of Malathion pesticide on inhibition insect activity *B. thuringiensis* under deferent time (24, 48 and 72hr) and concentration (1, 3 and 5 %).

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