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Evaluation of the Efficacy of Some Biocontrol Agents in Controlling the Lesser Date Moth Batrachedra Amydraula. Meyrick), Cosmoptrygidae: Lepidoptera

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Abstract
This study was carried out in one of the orchards in Al Saqlawiyah region of Anbar governorate to find out the effect of comercial formulation *Bacillus thurengiensis* (BT), botanical pesticide Matrixin plus, the aqueous extract of eucalyptus and the interaction between (Matrixin + aqueous extract of eucalyptus) On the percentage of infestation with the insect of *Batrachedra amydraula* of the Khostawi variety. The results showed that the treatment of B.T bacteria affected the percentage of infection with *B.amydraula,* reaching 7.67%, while other treatments varied in effect and amounted to (8.42, 9.25, and 9.92%), respectively. While it reached 18% in control treatment. The Matrixin plus treatment outperformed the rest of the treatments in its relative effectiveness, reaching 70.5%, while the other treatments varied with their relative efficacy amounting to (58.5, 56, 55.5)%, respectively, for the treatment (bacteria, mixture and aqueous extract of eucalyptus). As for the productive characteristics (weight kg, weight). 10 kg shamrock, average number of fruits per shamrock. The remainder of the transactions fluctuated by decrease. The comparison treatment was (7.8 kg, 0.5 kg, 12.9 fruits / shamrock), respectively, with a significant difference between the treatments.

Key words: date palm, Batrachedra amydraula, Matrixine plus, Bacillus thuringiensis

INTRODUCTION

The date palm *Phoenix Dactylifera* belongs to Arecaceae family, it is considered one of the most important trees for its nutritional benefits and various uses. Iraq is the most important producer of dates in the world, with the number of trees reaching approximately 8935999 palm trees and productivity 404032 tons (The Central Bureau of Statistics 2005). Palm trees are affected by many insect pests.Dubas bug *Ommatissus lybicus* and Lesser Date Moth *Batrachedra amydraula* is one of the most Important pest that causes various economic losses (Al-Ali *et al*.2010). It is controlled by many chemical pesticides and as a result of the negative impact of chemical pesticides from environmental pollution, disturbance of the ecological balance, the emergence of pest resistance, effect on natural enemies and pesticide Residues are harmful to human health. Became of an urgent need to use ecofrendily pesticides, as the bacteria Bacillus thurengiensis kurestaki were used to control many insect pest (Alrubeai et al.2014). It is considered one of the common biological fourmulations used against many insect pests, especially the order of Lepidoptera (Neale

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1997). This bacterium has been used since the 1950s by spraying its spores and crystals protein on plants (Musser and Helton 2003). Through field application, commercial preparations for insect pathogens have been used in Biological or integrated control programs, and it has given positive results in this area (Al-Salty et al .2008). Also the botanical pesticides Oxymatrin are used, a new type of plant compound, an alkaloid found mainly in the Solphora flaverscens plant,

which belongs to the family of Fabaceae. As well as plant extract and other powders such as eucalyptus aqueous extract which has an effective impact in controlling many pests (Oliewi *et al* .2020). Since the pest of *Batrachedra amydraula* causes a great economic damage to the date palm and the importance of using eco friendly methods of controlling the insect based on biological preparations, the study came to evaluate the efficiency of some biological preparations in reducing of population density and improving the dates' specifications in terms of quantity and quality.

MATERIALS AND METHOD

A palm grove of 5 Acres of area planted with the Kestawi, Zuhdhi and Brim variety was chosen in the form of regular lines and medium height in the Saqlawiyah area of Anbar Governorate for the year 2020. 15 palm trees from the orchard identified Khostawi cultivar for being susceptible to *Batrachedra amydraula* infestation (Aziz 1995) three replicates for each treatment (three palms). The random distribution was adopted in each replicates of the bioformulation treatments used in the experiment. It is as follows:

Formulations	**Active ingredient**	**recommendation**	**company**
Antario KAB	*Bacillus thurengiensis* Abamactin+	0.5 gm/ liter	Russel IPm
Matrixin Plus	Oxymatrin 2.4 % +abamactin 5 %	0,4 ml / liter	Russel IPm
Plant extract	Aequeus extract of Eucalyptus	10 ml / liter	Plant protection company
mixture	Eucalyptus+ matrixin	5 ml / liter + 0,2 / Liter	Russel IPm+Plant protection company
control	water		

The treatments were carried out on the Khistawi palm variety in the Al-Jamri stage on 06/31/2020 due to the delay of infestation by *B. amydraula* insect, due to the unfavorable environmental conditions of the insect developement, especially the low temperatures that affect on the laying of eggs by adults. The eggs may be laid but do not hatch due to the low temperature at night in 5/30/2020, the temperature was (23-34 C) respectively, the minimum and the maximum, and the relative humidity was 26.6% (according to the NASA weather forecast). The treatments were applied. The result record after (3, 7, 14 days). To determine the relative efficacy of the biopesticides, the equation described by (Henderson and Telton

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1955) was followed. Also tested the effect of different treatments on the percentage of ***B. amydraula*** infestation and its reflection on Productive qualities of the date palm in the stage of maturity, as one cluster was taken from each riplecate , i.e. (three) clusters for each treatment, and the weight of the branch was calculated and the weight of 10 branches was then according to the average number of fruits from each branch. a 50 kg portable field scale was used for this purpose.

STATISTICAL ANALYSIS

The experiment was designed according to the randomized completely block design RCBD and the differences between the means of the treatments were compared according to the value of the lowest significant difference LSD at the level of significance 0.05 (Al-Sahuki and Wahib1995) and the results were analyzed by the statistical program Genstat.

RESULTS AND DISCUSSION

The results, Table (1), showed that the total infection rate in the treatments before the treatment process was (19.14%), and that the different treatments showed a clear effect in reducing the total infection rate in B.A insect after two weeks of treatment compared to the Control treatment, and the bio formulation BT. is the most effective to affect on B. *amydraula* insect, as the rate of infestation reached after two weeks in the fallen fruits of bunches (7.67%) as it was in the treatment of Matrixin and the mixture (Matrixin + aqueous extract of eucalyptus) and the treatment of the aqueous extract of eucalyptus (8.42, 9.25, 9.92%, respectively. While the infection rate was 18% throughout the Control treatment. The results of the statistical analysis showed that there were no significant differences between the percentages of infections in all treatments on the one hand, but they differed significantly from the comparison on the other hand, due to the effect of B. *thurengiensis*. Due to the effect of B. *thurengiensis* In insects, it occurs through paralysis of the midgut after 20 minutes from the insect swallows the bacteria, and after 7 hours a general paralysis occurs, accompanied by an increase in blood pH, which causes the flow of the basic contents of the stomach into the blood (Al-Zubaidi 1992) and it bacteria secretion of Phosphatidylinositol which contains the enzyme phospholipase that breaks down the phospholipids present in the basement and cavernous membranes of the stomach tissues, thus stops the stomach functioning (Higgins *et al* .1989). Matrixin plus contains Oxymathrine affects the acetyl choline in the synapse, causing to paralyze insect (Naser 2012). Also, Oxymathrine contains alkaloid compounds and phenols that are effective as toxic to insects (Akdeniz and Ozmen 2011). The effectiveness of the aqueous extract of eucalyptus because it contains phenolic compounds, which are astringents: Pyrocatachin, Catechin, Kinoin-Kino-tannic acid, as well as volatile oils as insect repellent (Oliewi *et al* .2020).

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Table (1) The effect of biological and natural pesticides on the infestation percentage of Batrachedra amydraula

treatment	%infection				mean
	pre treatment	After3day	After7day	After14day	
Matrixine	16.67	7.67	9.33	0	8.42
mixture	18.00	5	14	0	9.25
B.T	17.67	8.33	4.67	0	7.67
Aqueous extract of Eucalyptus	23.67	10.33	5.67	0	9.92
control	19.67	22.33	30	0	18
mean	19.14	10.73	12.73	0	
LSD 0.05	2.38 = time ^{x} treat		1.06 = time	1.19 =treat	

The results (Table 2) showed the relative efficacy of bio-pesticides the superiority of the biocide Matrixin Plus spray and gave the highest relative efficiency of 70.5%, then came the BT treatment of aeques extract of Eucalyptus 58.5%, then the relative efficiency of the treatments decreased. The mixture (Matrixin + aqueous extract of eucalyptus) and the treatment of aqueous extract of eucalyptus were (56% and 55.5%), respectively. The variation in the effect of the pesticides might be attributed to the difference in the effect of environmental conditions such as temperature, humidity and wind in the effectiveness of these biological factors, as well as the effectiveness of the biocides. It depends on the level of infestation of the insect, the time of treatment, and the type of biological factor, as most biological agents give a satisfactory result when used at the beginning of the insect's life cycle. When the larvae crawl or move from one fruit to another, they are in direct contact with the biological pesticide because pesticides affect through contact and ingestion (Dhoubi and Elsaadi 2007). Therefore, the treatment should take place when the larva is outside the fruit and before it penetrates the peel. In addition, the chemical biocides vary in the duration of their survival and fade after the treatment according to the influence of environmental factors and the photoperiod. An indication of the statistical analysis that there are significant differences between the Matrixin Plus treatment and the BT treatment, and there are significant differences between the BT treatment and the aqueous extract treatment, and there are no significant differences between the BT treatment and the mixture treatment below the 5% probability level, while there are significant differences between the periods 3 and 7 day in this level of overlap. also There are significant differences between the treatment and the time.

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Table (2) the relative efficacy of biological preparations against the date palm insect Batrachedra amydraula

treatment	%relative efficacy		mean
	After3day	After7day	
Matrixine	58	83	5.67 ± 70.5
mixture	55	62	1.67 ± 58.5
B.T	72	40	7.22 ± 56
Aqueous extract of Eucalyptus	43	68	5.67 ± 55.5
mean	3.16 ± 57	4.70 ± 63.25	
LSD 0.05	Treat =2.709	time =1.915	Treat × time= 3.831

Table (3) shows the effect of different treatments on the infestation rate of B.A insect, which was reflected on the studied productive characteristics of date palm yield compared to palm yield. That was not treated. Whereas, the average number of fruits / branch in the Matrixin Plus treatment and the BT treatment was (24.3, 23.0) fruit / branch respectively, and it differed from the mixture and the aqueous extract treatment of eucalyptus where the average number of fruits in it was (17.9, 15.4) fruit / branch, while it reached (12.9) Fruit / branch in control treatment. As for the weights of 10 branch, they were close in the two treatments of Matrixin Plus and BT bacteria, which amounted to (1.4 and 1.2) kg respectively, and differed from the treatment of the mixture and aqueous extract of eucalyptus, which was (0.96 and 0.86) kg respectively, and compared to the control treatment that reached (0.5) kg. There was a clear significant difference between the treatment and control. As for the fresh weight, the weights were (14.17, 13.0, 10.7, 10.1) kg / cluster for the treatments, respectively, compared with the control treatment, which amounted to 7.8 kg / cluster.

The results of the study indicate that the biological control agents have demonstrated good efficacy against the date palm insect. Therefore, bio-pesticides can be adopted as an effective and environmentally safe alternative, as they have led to better control in the environmental and health aspects of chemical pesticides, as well as the economic implications of increasing the yield. Any of them can be used separately according to their availability and can be used within integrated biological control elements.

Table (3) The effect of some biological formulation on the productive indicators of date palm, variety Kistawi

treatment	No.frut/ branch	branch weight / kg	cluster weight / kg
Matrixine	24.33	1.467	14.17
B.T	23.00	1.267	13.00

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mixture	17.97	0.967	10.77
Aqueous extract of Eucalyptus	15.43	0.867	10.10
control	12.90	0.500	7.83
LSD 0.05	4.169	0.1417	2.005

CONCLUSIONS

1- *Batrachedra amydraula* caused significant economic losses to Khestawi date`` palms.e

2-*Bacillus thurengiensis* is the best treatment which led to a reduction of the percentage of infestation insect.

3- Matrixine plus containing Oxymathrine in influencing the different instar on the palm insect also has an effect on nutrition as an inhibitor of nutrition because it contains alkaloids and phenols, which makes the used pesticide suitable for IPM programs.

4-Since the materials used are natural and relatively ineffective, so we can expand this experience to other regions in order to reach a sound conclusion about its adoption as one of the effective alternatives in combating the important economic pest afflicting the date palm in Iraq.

REFERANCES

1) Al-Ali, Aziz Salih Hammoud, Astifan, Zuhair Aziz, and Awad, Hashem Ibrahim. (2010) Agricultural Pest Control Guide. Al-Azza Press, Baghdad 240 pages.
2) Al-Dulaimi, Khamis Abboud. 2004. Economic and environmental studies on the insect of Batrachedra amydraula. Meyrick (Cosmoptrygidae: lepidobtera) in central Iraq and some methods of controlling it. Master thesis of plant protection - insects. Faculty of Agriculture, University of Baghdad.
3) Alrubeai, H.F.Hamad.B.sh: Abdullatif.A.m: Ali.H.Z.Abd.A. (2014) Efficacy of Trichogramma evanescens and Bacillus thurengiensis Kurstaki to control lesser date moth Batrachedra amydraula. Meyrick. of Agri.sci.tech.B4: p.281-284.
4) Al-Sahuki, Medhat, Karima Muhammad and Wahib, 1995, Applications in Design and Analysis of Experiments, University of Baghdad - House of Wisdom
5) Al-Salty, M.N.J.A. Alhamada and B.L. Abdullah. 2008. Role some elements of biocontrol pollworms in dear El-zor region (Syria). Second arabs comference of applied biological pest control Cairo. Egbt. 7-10April. P.37.
6) Al-Zubaidi, Hamza Kazem (1992), Biological control of Pests, Ministry of Higher Education and Scientific Research, 520 pages
7) Akdeniz, D, Ozmen, A, (2011). Antimotic Effects of biopesticid Oxymatrine.Adnan Menderes Unive.Fen Edebiyat, Turkey.Vol 64 No: 117 - 120
8) Aziz, Fawzia Muhammad, 1995. The sensitivity of some palm varieties to infestation Batrachedra amydraula. Meyrick (Cosmoptrygidae: lepidobtera) Master Thesis.

Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 3, 2021, Pages. 4377 - 4383
Received 16 February 2021; Accepted 08 March 2021.

College of Science / University of Baghdad

9) Dhoubi, M.H. And S.H. Elsaadi. 2007 Biocontrol of the lesser date moth Batrachedra tree.Proceeding of the third internation of date palm Conferenace.Abu-dhabi. 9 - 21.2 / 2006; Acta Horticulture.736; March2007.391 - 397.
10) Henderson, C.F. and E.W.Telton.1955.Tests of Acricides Against the Brown wheat mite.J. Econ.Ectomol. 48 (2): 157--161.
11) Higgins, I.A: Hitchim, B.W: Martin, G.L. (1989) Phosphatidylinositol Specific Phpspholipase of Bacillus thurengiensis As Aprobe of Distribution of phosphofidlino sixal in heputocyte membrane biochem.G.259 - 913 - 916.
12) Musser, F.R. And A.M.Helton. 2003. Bacillus thurengiensis sweet Corn and selective insecticidal: Impacts on pests and predators.J. Econ. Entomolo.96: 71-80.
13) Neale, M.C.1997. Bi-Pesticids harmonization of registrant requirements within Eudriective 91-411 An industry view bullet of Eurpean and miditerrnean. Plant Protection organization 27: 71-80.
14) Naser, H.M. (2012). Toxicological and biochemical effects of Chlorobyrifoso Chlorflua Zuron and Oxymatrine on larvae Bomlyx mori. G. Agri.Res. Kafer el-sheikhuny 37 (1); 209-222.
15) Oliewi, K, A. Hazim, I, Al-shammari; Bassem, H, H, (2020). Efficacy of Eucalyptus sp. And Common Myrtle (Myrtus communis) leaf extract for control of lesser date moth Batrachedra amydraula. Meyrick. Indian Journal of Ecology. 47 Special Issue (12):. 275--280
16) The Central Bureau of Statistics (Ministry of Planning) annual statistical group. 2005. Baghdad, Republic of Iraq, p. 68.
17) Y.Fu.C.W. G: F.Ye. the application of solphora flavescens Ait.Alkolatoids in china. Pesticide science and Administrition 26 (2005) 30-33.
18) Y.Q.Zheug.G.R:. Yaoal.d.H.D.Shoo. (2000) review on the Contituents and Agricultural Application of solphora flavescens A.A. Pesticide science and administration21 ;24-26