Zagazig J. Agric. Res., Vol. 44 No. (1) 2017 273-280

Plant Protection Research

http:/www.journals.zu.edu.eg/journalDisplay.aspx?Journalld=1&queryType=Master

EFFECT OF SOME CHEMICAL AND BIOLOGICAL METHODS IN CONTROLLING *Ommatissus lybicus* BERG. IN THE FIELD

Mohammed Y.S. Ghani[1*], R.O. Mhmod[2] and B.A. Issa[2]

1. Plant Prot. Dept., Agric. and Forestry Coll., Mosul Univ., Iraq

2. Hort. And Landscaping Dept., Agric. Coll., Diyala Univ., Iraq

Received: 08/11/2016 ; Accepted: 08/12/2016

ABSTRACT: Experiments were conducted at date palm orchard, Diyala Governorate, Iraq, during spring and autumn seasons, 2014. The objectives were to evaluate the efficiency of some chemical and biological pesticides with different applying methods (injection, irrigation and spraying) to control *Ommatissus lybicus* Berg on date palm in the field, minimizing environmental pollution and chosen suitable applying date and technique for controlling the pest during palm fruits formation, especially at chmiry and rutab stages. Chemical pesticide commercially known salut 50% EC (effective chemical material, dimetheate 22.2% + chlorpyrifos 27.8%) and Actara 25% wg (effective chemical material, thiamthoxam). Foliar fertilizer known Poly Sulfide and Biocont, different methods (injection, irrigation and spraying) were applied. Results showed significant differences among treatments. Salut had highest efficiency in reducing pest's number (100% after two weeks) when using injection method whereas Actara efficiency was 87% in spring method. Moreover, injection of Salut had positive effect in reducing viable eggs number and increasing dead ones, which amounted 350,00 dead eggs and 109,00 viable eggs, while injection of Actara resulted in increasing dead eggs (344,68) and viable eggs was 120,71. In autumn season, and due to premature phase locally called Rutab stage of date palm fruit, biological pesticides Biocont and Poly Sulfide used to avoid chemical pollution in environment. Biocont had superiority in efficiency (91%) during second and third weeks in reducing viable eggs and increasing dead eggs. The average of dead and viable eggs number were 245.00 at 230.00 eggs, respectively. In Biocont treatments foliar spraying had less efficiency as compared with injection method.

Key words: Dubas bug, *Ommatissus lybicus* Berg, date palm, chemical control, biological control.

INTRODUCTION

Date palm usually affected by different diseases and pests. *Ommatissus lybicus* Bergevin (Homoptera: Tropiduchidae) is one of the most important and nationally widespread. Date palm trees grown near river banks are mostly affected by *O. lybicus* Berg. (Abdul-Husein, 1974). In order to reduce negative effects, 400-500 tons of chemical pesticides yearly applied to control aforementioned pest in Iraq (Al-Jboory *et al.,* 2001).

Biologically and economically, the diversifying of control methods such as injection, irrigation and spraying, also applying more than one kind of chemical pesticide and biological materials have been proving high efficiency in controlling pests especially *O. lybicus* Berg in date palm orchards.

MATERIALS AND METHODS

Two experiments were conducted in an orchard, Diyala Governorate, Iraq, to evaluate the efficiency of some chemical and biological pesticides with different applying methods (injection, irrigation and spraying) to control *Ommatissus lybicus* Berg on date palm in the field, minimizing environmental pollution and

* **Corresponding author: Tel.:** 009647710423560
E-mail address: ree4ee@yahoo.com

chosen suitable applying date and technique for controlling the pest during date palm fruits formation, Zahdi cultivar, especially at chmiry and rutab stages during spring generation, where premature fruits called chimry .

Concentrated and emulsion pesticide Salut 50% EC (chlorpyrifos 27.8% + dimetheate 22.2%) are the effective chemical materials. Salut is dual-effectiveness material act as systematic and contact. Salut efficiency compared to well-known pesticide Actara (Al-Jboory *et al.,* 2001).

Biological pesticide used to control *O. lybicus* Berg during rutab stage, autumn generation as alternative of chemical pesticide to reduce pollution. Commercial pesticide, Actara (*Trichoderma* fungi) applied and compared to foliar fertilizer known Poly Sulfide which was very active to control *O. lybicus* Berg (Mishal and Habis, 2012). Control treatments were free of both kind of pesticide (biological and chemical), only pure water used.

Biological and chemical pesticides were applied on date palm trees by using three different methods to control the pest in the orchard as follows:

Injection

Trees as sample prepared to conduct the experiment, electrical drill hammer used to bore tree trunk. Bore position was 50 cm above soil surface, 20 cm length and 2 cm diameter of plastic tube used to establish hole inside the trunk. Medical syringe was used to inject pesticide solution. Injection with water used only in control treatments. The bores tightly closed by plastic closres (Al-Ali *et al.,* 2007).

Irrigation

Recommended concentration of chemical and biological pesticides which diluted with 20 liters of pure water, irrigation routinely done.

Spraying

Recommended concentration of pesticide applied in common and tradition method (spraying). Leaves of the tree heart covered by perforated cottony cover after equally spraying of the pesticide solution. Randomly, one leaf chosen from each side of sample tree leaves (crown area), then directly covered by perforated cottony cover (1 m length) on mid of the leaf to finally calculate the percentage of pesticide activeness.

Ten leaves per each tree were chosen as sample, totally 40 leaves were represented each treatment. Samples stored in papery bags. Procedures done to calculate alive and dead pests for each treatment before and 48 hours after the spraying. Assessing the duration or lasting of the pesticide effectiveness in the field done after 1, 2, 3 and 4 weeks of the spraying. Effectiveness percentage of pesticide done by using Tilton and Henderson equation (Al-Malah and Abd Al-Razaq, 2011).

Pesticide effectiveness (%) = 100 (1- pests number after treating × pests number before treating)/Pests number after treating ×pest number before treating

Data, statistically analyzed, CRBD (completely randomized block design) design was used with least significant differences LSD under 5% probability.

RESULTS AND DISCUSSION

Effect of different controlling techniques on the relative efficiency of Salut and Actara (chemical insecticide); Biocont (biocide) and polysulfide (foliar fertilizer) against *O. lybicus* infecting date palm was studied. Results obtained are given in Tables 1, 2, 3 and 4.

Data in Table 1 show significant differences among treatments in comparison to control treatment. All chemical treatments result in great consequences, Salut pesticide had superiority during the first two earlier weeks (100%) when injection method used whereas Actara pesticide recorded (95%). Efficiency of used methods came in the following order injection, spraying then irrigation, respectively for the two tested insecticides.

Irrigation method had some obstacles, amount of water is limited factor to facilitate uptaking of pesticide solution into plant through root system, moreover, competition of weeds root result in reducing amount of pesticide solution which uptaken by date palm root system as well as pesticide particles going to be decadent in light alkaline medium.

Table 1. Effect of pesticide type and control method on effectiveness percentage or some chemical pesticides on controlling *Ommatissus lybicus* Berg.

Pesticides	Control method	Percentage of pesticide efficiency after				
		48 hours	1 week	2 weeks	3 weeks	4 weeks
Salut	Spraying	90.00	90.00	91.67	60.00	22.67
	Injection	92.67	100.00	100.00	81.33	50.00
	Irrigation	41.67	75.00	76.67	40.00	10.67
Actara	Spraying	87.00	85.00	81.33	22.67	2.67
	Injection	88.33	95.00	90.00	33.33	5.00
	Irrigation	38.33	70.00	54.33	11.67	0.67
Control treatment	Spraying	0.00	0.00	0.00	0.00	0.00
	Injection	0.00	0.00	0.00	0.00	0.00
	Irrigation	0.00	0.00	0.00	0.00	0.00
LSD 0.05		3.05	0.00	1.82	2.68	1.69

Table 2. Effect of biological pesticide type and control method on the effectiveness percentage in controlling *Ommatissus lybicus* Berg. LSD

Pesticides	Control method	Percentage of pesticide efficiency after				
		48 hours	1 week	2 weeks	3 weeks	4 weeks
Biocont	Spraying	3.67	15.67	42.67	61.67	43.33
	Injection	8.00	25.00	91.00	91.00	74.33
	Irrigation	1.67	10.00	23.33	35.00	20.00
Poly Sulfide	Spraying	6.67	10.33	19.00	25.00	2.00
	Injection	10.00	14.67	21.67	38.33	6.67
	Irrigation	4.33	7.33	9.67	13.33	1.33
Control treatment	Spraying	0.00	0.00	0.00	0.00	0.00
	Injection	0.00	0.00	0.00	0.00	0.00
	Irrigation	0.00	0.00	0.00	0.00	0.00
LSD 0.05		1.73	2.15	2.11	0.84	0.92

Table 3. Effect of pesticide type and control method on live and dead eggs of Dubas Bug *Ommatissus lybicus* Berg.

Pesticide	Treatment method	Live (viable) and dead eggs number found on different sides of the date palm tree								Total averages	
		Live eggs (North)	Dead eggs (North)	Live eggs (South)	Dead eggs (South)	Live eggs (East)	Dead eggs (East)	Live eggs (West)	Dead eggs (West)	Live eggs	Dead eggs
	Injection	20.0	80.00	25.0	85.0	30.0	90.0	34.33	95.00	109.33	350.00
Salut	Irrigation	23.0	73.33	37.67	78.33	42.67	83.33	47.67	88.33	151.01	323.32
	Spraying	24.7	77.67	29.67	82.67	34.67	87.67	41.33	92.67	130.37	340.68
	Injection	22.7	78.67	27.67	83.67	32.67	88.67	37.67	93.67	120.71	344.68
Actara	Irrigation	42.0	53.67	47.00	58.67	52.00	63.67	57.00	68.67	198.00	244.68
	Spraying	33.7	69.67	38.67	74.67	43.67	79.67	48.67	84.67	164.71	380.68
	Injection	105.3	2.67	104.33	3.00	114.33	1.67	110.33	2.67	434.29	10.01
Control	Irrigation	110.3	2.33	100.00	2.33	120.00	2.00	100.67	3.00	430.97	9.66
	Injection	115.3	3.67	110.00	1.33	119.33	1.33	101.33	2.67	445.96	9.00
LSD 0.05		10.9	3.28	2.60	3.30	2.79	3.37	3.56	3.26		

Table 4. Effect of biological pesticide type and control method on live and dead eggs of *Ommatissus lybicus* Berg.

Pesticide	Treatment method	Live (viable) and dead eggs number found on different sides of the date palm tree								Total averages	
		Live eggs (North)	Dead eggs (North)	Live eggs (South)	Dead eggs (South)	Live eggs (East)	Dead eggs (East)	Live eggs (West)	Dead eggs (West)	Live eggs	Dead eggs
	Injection	50.00	51.0	55.00	57.00	60.00	68.00	65.00	67.00	230.00	243.00
Biocont	Irrigation	62.67	43.3	67.67	48.33	73.00	53.33	78.00	58.33	281.34	203.29
	Spraying	54.67	47.7	59.67	52.67	64.67	57.67	71.33	62.67	250.34	220.71
	Injection	52.67	48.7	57.67	53.67	62.67	58.67	67.67	63.67	240.68	224.71
Poly Sulfide	Irrigation	72.00	46.0	77.00	28.67	82.00	33.00	87.00	38.67	318.000	146.34
	Spraying	103.33	39.7	68.67	44.67	73.67	49.67	78.67	54.67	288.01	188.71
	Injection	102.00	2.7	100.67	3.00	109.33	1.67	102.00	2.67	415.33	10.04
Control	Irrigation	117.00	2.7	111.33	1.00	100.67	1.33	106.00	2.33	420.00	7.36
	Injection	115.3	1.0	108.33	0.33	120.67	1.33	101.33	1.33	447.33	3.99
LSD 0.05		4.96	10.90	4.30	3.23	2.55	3.44	3.30	3.18		

Percentage of chemical pesticide efficiency reduced based on chemical properties of the pesticide, for example, Salut lasting more than Actara due to date fruits were in chimry stage that would assist to kill more number of the pest might to dual-chemical activeness property, contact and systematic effect, Actara at this point, had least effect in comparison to Salut. Salut in comparison to Actara had high efficiency during first two weeks especially when applying injection and irrigation method, results may interpreted due to rapid move of pesticide solution *via* plant sap toward the leaves with low concentration, This finding agreed with past studies (Al-Jboory *et al.,* 2001). Injecting Actara pesticide solution was more active in reducing the pest number, this agree with (Al-Azaby, 1997) who found that injection of some different kind of pesticide into date palm tree trunk results in killing 100% of red beetles.

The movement of pesticide solution into plant or cell sap depend on different chemical and physical factors of pesticide compounds. The speed of water movement, proportionally depend on transpiration rate which facilitate uptaking of pesticide solution.

Applying different types of pesticides and methods show relative activeness for some biological pesticides in controlling *O. lybicus* Berg. Data arranged in Table 1 cleare high effectiveness percentage of Salut and Actara regarding dead numbers of the pests. On other side, effectiveness started to be reduced and the pest again predominant after 30 days from applying the pesticide which led to desperate need to re-applying the pesticide. Clearly, the trace of pesticide remains for 4 weeks (Al-Malah and Mohammed, 2013) which means the possibility to use abovementioned pesticides in integrated control management.

Due to difficulty and unsafely of applying chemical pesticide on date palm fruits especially during khalal and rutab stages ,so biological pesticide well-known as biocont and foliar fertilizer known as polysulphate used as alternative.

Data presented in Table 2, clear the significant differences of applying Biocont pesticide and foliar fertilizer, polysulphate in reducing pest numbers, effectiveness continuously sustained especially with applying Biocont pesticide, where the result was 91% after two weeks when using injection method.

Worthy to mention, digestive kietenes enzymes are components of pesticide as well as melissa, spors and enzymatic fungi excretions on material-bearing (Al-Husseiny *et al.,* 2004). Similar results were found in second and third weeks beauveria bassina, meatarhizin and paeclomyces fungs (Al-Zubaidy, 1992; Salih and Abd-alrazag, 2011). Tricodyrma fungi produces enzymes that could disfiguring the mouth of pests which result in starvation then the death of pest, in addition, there was a direct effect on outer cuticle crest.

Foliar fertilizer result in high percentage of killing (38.33%) after 3 weeks. nothing known regarding polysulphate mechanism, but the role of K as principle element is well-known where absorbing from smooth-body pests (Mickler, 2012). Mechanism of S role is unknown of killing pests (Madany, 2009). Applying polysulphate on trees results in vigorous growth as it is foliar fertilizer as well we could use it as insecticide in organic culture after obtaining courtesy of special agency (Madany, 2009; Mickler, 2012).

Despite of positive results, nymph still represents 30% of total different stages of *O. lybicus* which means desperate needs to establish integrated control management for all stage (Research and Development of date palm commission, 1999).

Results presented in Table 3 show that, injection of the chemical pesticide solution had superiority in reducing eggs hatching percentage, results showed negatively reducing of alive eggs number and positively increasing of dead eggs number. The total averages of dead eggs in Salut and Actara treatments were 350.00 and 344.68 eggs, while the alive values were 109.33 and 120.71 eggs, respectively. The highest total average of dead eggs (380.68) associated with 164.71 alive eggs was recorded in Actara treatment with spraying method.

Efficiency of Salut and Actara in controlling *O. lybicus* by using different methods (injection, spraying and irrigation) explained the speed movement of pesticide solution *via* plant cell sap with vital concentration into date palm leaves

especially injection method, this finding agreed with previous studies (Fernandez- Escobar *et al.,* 1993).

Properties of pesticide movement into plant cell sap depend on chemical and physical factors like partition coefficient of Salut and Actara which is 0, 3 and hydrophilic compound that led to speed the uptaking of pesticide solution (Al-Jboory, 2001). Due to systematic function of both pesticide, some negative effects of Salut and Actara occurred on eggs crest and on embryo. Same results were found by Mian-Lal and Mulla (1982) where they pointed out that treating eggs of three type of Coleoptera storage pests, *Oryzaephilus surinamensis* L., Rust-Red grain beetle (*Ceroplastes ferrugineas,* steph) and Lesser grain borer (*Rhizopertha dominica* fab.) in low concentration of both aforementioned pesticides result in killing 100% of eggs. Due to biological nature of pests, maturing stage of date fruits and to avoid chemical pollution, complementary control done by applying biocont and polysolphide.

Data given in Table 4 show that the biological pesticide had great positive effects on *O. lybicus.* When using injection method the effect was approximately 50%, whereas the total number of dead eggs was 243.000 and relatively the same number with alive ones (250.00). The killing rate was low in other techniques. Results when applying foliar fertilizer were 224.71 dead eggs and 240.68 alive ones. Foliar fertilizer consist of KO and S as 40%, solphate S, registered in USA IN 1920 as pesticide and fertilizer, known as inorganic used on wide spectrum of pests, arachnids and diseases (Ascher *et al.,* 1982). K is key mineral element in agriculture soap industry and used widely in integrated control and in organic farming (Madany, 2009). S and K play a great role as foliar fertilizer and pesticide, specially for controlling smooth body pests such as Homoptera. Polysulphide used in this experiment to confirm previous studies on controlling *O. lybicus*. Polysulphide is dual-effectiveness pesticide, used as fertilizer, results shown less efficiency in killing eggs especially in irrigation method. The total average of dead eggs was 136.34 whereas the values of alive was 318.00 ones. Biocont prepared as wettable contactable powder with *Trichogerma harizianum* fungi and its execrations such as Glomaies, Protease and chitinease enzymes (Rincon and Antonio, 2004).

Aforementioned enzymes act as digestive when targeting pests body then fungi enzymes introduce into the body to break down cellular walls (Rincon and Antonio, 2004). More studies are needed to explain above mechanism and the roles of fungi's excretions.

Despite the good result obtained in the field, digestive process by enzyme Glomaies, Protease and kitenease which introduced by pesticide supply company still needs to be evaluated. Biocont effects on the pests and eggs were negligible during the first week, then started to be escalated during the second one, killing rate were 91% on nymphs and 50% on eggs when using injection method. Good results come from gradual biological effect of Biocont pesticide.

REFERENCES

Abdul-Husein, A. (1974). Palm trees, dates and diseases in Iraq, Baghdad Univ., Iraq.

Al-Ali, A.M., A.K. Ali, A.A. Adnan and N.K. Akeel (2007). efficiency of some chemical pesticides used in field in different control methods against dubas bug *ommatissus lybicus* berg eggs in Karbala Governorate. Scien. J. Karbala Univ., 5 - 2.

Al-Azaby, F. (1997). Injection method as technique to control indian red palm weevil. Arabic J. Pl. Prot., 15 (1) : 31-38.

Al-Husseiny, M., A. Al-Zugby and S. Umar (2004). Isolation, propagation and using diseas-causing fungies to control pests on sugar beet. First Arabic Conf. Biol. Cont. Pest., Cairo, Egypt.

Al-Jboory, I.J., A.I. Al-Samaraiy, F.W. Jamal and A.M. Wsam (2001). Evaluation of Actara (thiamethoxan) pesticide in different methods to control dubas bug *ommatissus lybicus* berg. Arab J. Pl. Prot., 19 : 2.

Al-Malah, N.M. and U.J. Abd Al-Razaq (2011). Practical Applications of Pests Pesticides. Al-Yazury House for Scien. Pub., Amman. Jordan.

Al-Malah, N.M. and Y.S. Mohammed (2013). Evaluation efficiency of some chemical and biological pesticide on controlling fig leaves worm in the field, 4 : 1.

Al-Zubaidy, H. (1992). Biological Resistance of Pests. dar-al-kutub house for printing and publications, Mosul Univ., 440.

Ascher, K., M. Eliyahu, N. Nemny and I. Ishaaya (1982). The toxicity of some novel pesticides-synthetic pyrethroids and benzoylphenylurea chitin synthesis inhibitors for eggs of *spodoptera littoralis* (boisd). Z. Angew Entomol., 94: 504-509.

Fernandez-Escobar, R., D. Barranco, M. Benlloch and J.J. Alegria (1993). overcoming lron chlorosis in olive and peach trees using a low -pressure trunk injection method. Hort. Sci., 28 (3): 192– 194.

Madany, M. (2009). Guide of transformation agricultural lands to organic farming, northern-southern consulting commission for sustainable agriculture (kosoby), 38.

Main-Lal, S. and M. Mulla (1982). Biological activity of igrs against four stored product coleopteras. J. Econ. Entomo., 75 : 80-85.

Mickler, K. (2012). Soap oil and bt products control mostgarden insects, college of agricultural and environmental sciences *county agent-floyd county*) georgia pest management handbook, online.

Mishal, M. and A. Habis (2012). Evalution of effects of some biological pesticides on dubas bug *ommatissus lybicus* berg.

Researches and Development of Date Palm Commission (1999). Workshop on integrated control for date palm pests and diseases. King Faisal Univ., Jedha, Arabia Sudi., 350.

Rincón, M. and C. Antonio (2004). biocontrol mechanisms of *richoderma* strains-uni. of sevilla., spain, Int. Microbiol., 7 (4): 249-260.

Salih, A. and Abd-alrazaq (2011). Evaluation of some bio-pesticides on controling tomato leaves digger *tuta absoluta*.

تأثير استخدام بعض الطرق الكيميائية والحيوية في مكافحة حشرة دوباس النخيل *Ommatissus lybicus* Berg في الحقل

محمد يوسف سيد غاني[١] – رعد وهيب محمود[٢] – باسم الماس عيسى[٢]

١- قسم وقاية النبات – كلية الزراعة والغابات – جامعة الموصل – العراق

٢- قسم البستنة وهندسة الحدائق – كلية الزراعة – جامعة ديالي - العراق

تم تقييم كفاءة بعض المبيدات الكيمياوية (سالوت (50% EC) ٢٢,٢٤%+ ٢٧,٨% Chlorpyrifos Dimethoate، وأكتارا Thiamethoxam 25% WG) والمبيد الحيوي (بيوكونت) والسماد الورقي بولي سلفايد لمكافحة حشرة دوباس النخيل *Ommatissus lybicus* Berg evin باستخدام طرق معاملة مختلفة (حقن، ري، رش) في موسمي الربيع والخريف لعام ٢٠١٤ في محافظة ديالى . وأكدت النتائج وجود فروقات في التحليل الاحصائي بين المعاملات، في الموسم الربيعي تفوق مبيد سالوت في تحقيق أعلى فاعلية وخفض مستويات الآفة إلى أقل حد ممكن وبنسبة بلغت ١٠٠% في الأسبوع الأول والثاني وبخاصة عند استخدام معاملة الحقن تلاه مبيد أكتارا بالمعاملة آنفة الذكر وبنسبة بلغت ٨٧% في حين تفاوتت النسب في بقية المعاملات، وانعكست المكافحة الكيمياوية إيجابياً في خفض أعداد البيض الحي وزيادة عدد البيض الميت وبخاصة عند استخدام مبيد سالوت واكتارا في معاملة الحقن وبلغ متوسط عدد البيض الميت ٣٥٠,٠٠ بيضة والحي ١٠٩,٣٣ بيضة عند استخدام مبيد سالوت في حين بلغ مجموع البيض الميت ٣٤٤,٦٨ بيضة والحي ١٢٠,٧١ بيضة عند استخدام مبيد أكتارا في معاملة الحقن وتفاوتت النسب في بقية المعاملات، أما في الموسم الخريفي ولكون ثمار التمر في مرحلة النضج (الرطب) فقد تم استخدام المبيد الحيوي (بيوكونت) والسماد الورقي (بولي سلفايد) لتجنب حدوث تلوث بالمبيدات الكيمياوية وعليه فقد حقق مبيد بيوكونت أفضل النتائج في تحقيق أعلى فاعلية بلغت ٩١% في الأسبوع الثاني والثالث وتقليل عدد البيض الحي وزيادة عدد البيض الميت وبمجموع متوسط بلغ ٢٣٠,٠٠ بيضة ، أما السماد الورقي فقد كانت نتائجه جيدة ومرضية لكن أقل كفاءة من مبيد بيوكونت الذي تميز بتحقيق نتائج جيدة في المكافحة الحيوية وبخاصة عند استخدام طريقة الحقن.

المحكمون :

١- أ.د. عطـــا علـــي مرســـي شلبي أستاذ المبيدات المتفرغ – كلية الزراعة – جامعة الزقازيق.

٢- أ.د. كامل عبداللطيف عبدالله حماد أستاذ الحشرات الاقتصادية – كلية الزراعة – جامعة الزقازيق.