The effect biosynthesis of silver nanoparticles by Oxymatrine Botanical Insecticide against *Aphis gossypii* on cucumber and their predator *Chrysoperla carnea*

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Abstract

The study was conducted to know the effect of nano silver prepared with the pesticide Oxymatrine and to test its effect against the cotton aphid A.gossypii and the predator C.carnea aphid on cucumber plants in the greenhouses and laboratories of the Plant Protection Department / Abu Ghraib. The results of the study showed the formation of nanosilver AgNPs with the pesticide Oxymatrin at the concentrations of 1.5 and 0.5 ml/L of water by testing and diagnosing them with chromatography indicators, SEM scanning electron microscope, and UV and visible absorption spectrometers. The formed nanoparticles were also tested and diagnosed using an infrared spectrometer Equipped with an ATR-FTIR Fourier transformer.The results of the study showed that the highest killing percentages was in the treatment Oxymatrine 1.5 ml/L + AgNPs without or with the release of the predator Chrysopidae and it reached (76,44) on the treatments Oxymatrine 1.5 ml/L and Oxymatrine concentration 0.5 ml/L and nanosilver AgNPs solution The killing percentages was (58.33, 79.17, 91.96%), (16.66, 36.36, 49.24%) and (25.00, 52.08, 33.33%) after 3, 7 and 14 days of treatment, respectively. As for the effect of the treatment of introducing the predator, the Chrysopidae alone, with 2 larvae/plant on cotton insects, the killing percentages was (52.08, 77.08 and 87.49%), compared with a killing percentages of 0.0% in the control treatment after 14, 3.7 days of treatment. respectively.With regard to the relative efficiency of the treatments in affecting the cotton aphid and the predator aphid, it was found that the treatment of Oxymatrine at the recommended and below recommended concentrations was excelled on AgNPs. Where the Oxymatrine treatment with a concentration of 1.5 ml / L + AgNPs had the highest relative efficiency of 85.78%, which was excelled on the Oxymatrine treatment with a concentration of 0.5 ml / L + AgNPs 52.42% after three days, but after a week and two weeks of treatment, the efficiency of the treatments used was (97.88 and 99.62%).) and (91.38 and 94.53%) for treatments, respectively.

Key words: nano silver, oxymatrine, Aphis gossypii, Chrysoperla carnea.

تأثير جسيمات الفضة النانوية المحضرة حيويا بواسطة المبيد النباتي الاصل **Oxymatrine** في حشرة من القطن ***Aphis gossypii*** والمفترس ***Chrysoperla carnea*** على محصول الخيار

مسلم صكبان التميمي صفاء زكريا بكر جاسم خلف محمد
وزارة الزراعة كلية الزراعة وزارة الزراعة
دائرة الارشاد والتدريب الزراعي جامعة تكريت دائرة وقاية المزروعات

المستخلص

نفذت الدراسة لمعرفة تأثير جسيمات الفضة النانوية المحضرة مع المبيد Oxymatrine واختبار تأثيرها ضد حشرة من القطن *A.gossypii* والمفترس أسد المن *C.carnea* على نبات الخيار في البيوت المحمية والمختبرات التابعة لدائرة وقاية المزروعات/ابو غريب. اظهرت نتائج الدراسة تكوين جسيمات الفضة النانوية AgNPs مع المبيدOxymatrin بالتركيزين 1.5و0.5 مل/لتر ماء من خلال فحصها وتشخيصها بمؤشرات التغاير اللوني وجهاز المجهر الالكتروني الماسح SEM وجهاز طيف الامتصاصية للأشعة فوق البنفسجية والمرئية وكذلك تم فحص وتشخيص الجسيمات النانوية المتكونة بجهاز مطياف الاشعة تحت الحمراء المزود بمحول فوريه ATR-FTIR. بينت نتائج الدراسة ان اعلى نسبة قتل كانت في المعاملة Oxymatrine 1.5 مل/لتر+ AgNPs بدون او مع اطلاق

المفترس اسد المن وبلغت(76,44) على المعاملات Oxymatrine 1.5 مل/لتر و Oxymatrineتركيز0.5 مل/لتر ومحلول جسيمات الفضة النانوية AgNPs وبلغت نسبة القتل (58.33 ,79.17 ,91.96%)و(16.66 ,36.36 ,49.24%)و(25.00,52.08 ,33.33%) بعد 3 و7و14 يوم من المعاملة على التوالي,اما تأثير معاملة أدخال المفترس أسد المن لوحده بعدد 2 يرقة / نبات على حشرات القطن فقد بلغت نسبة القتل (52.08 و77.08 و87.49 %) قياسا مع نسبة قتل بلغت 0.0 % في معاملة المقارنة بعد 3,7 ,14 يوم من المعاملة على التوالي. اما فيما يخص الكفاءة النسبية للمعاملات في التأثير في حشرة من القطن والمفترس أسد المن فقد تبين تفوق معاملة المبيد Oxymatrine بالتركيزين الموصي به وتحت الموصي به مخلوطا مع AgNPs حيث كانت المعاملة Oxymatrine بتركيز 1.5 مل/ لتر+AgNPs اعلى كفاءة نسبية 85.78 % التي تفوقت على معاملة Oxymatrine تركيز 0.5 مل/لتر +AgNPs 52.42 % بعد ثلاثة ايام اما بعد اسبوع واسبوعين من المعاملة فقد بلغت كفاءة المعاملات المستعملة (97.88 و99.62%) و(91.38و94.53%) للمعاملات على التوالي.

الكلمات المفتاحية:جسيمات الفضة النانوية, **Oxymatrine , *Aphis gossypii,Chrysoperla carnea* .**

Introduction

Cucumber crop in protected and open cultivation is affected by many agricultural pests such as cotton Aphis gossypii, whitefly Bemisia tabaci, Thrips tabaci, tunnel-makers Liriomyza spp and mites. 2007; Saleh et al., 2017).The cotton Aphid A. gossypii is one of the economically important insects on the cucumber crop in tropical, semi-tropical and temperate regions, which is characterized by its high ability to reproduce, and the number of its generations reaches about 60 generations per year, as well as its transmission of many dangerous viral diseases, which leads to a decrease in the marketing and economic value for the crop (Kishaba et al., 1992; Pinto et al., 2008). The intense and repeated use of traditional pesticides has led to the emergence of many health and environmental problems and their negative side effects in non-targeted neighborhoods, such as predators and parasites, and their danger to human health through their residuals in the fruits of cucumbers that are consumed fresh. It is worth noting that 75% of the chemical pesticides produced in the world are carcinogenic, and therefore the world has moved towards sustainable agricultural practices, taking into account the protection of the environment and the safety of humans and animals by finding safe and alternative control methods for chemical pesticides or integrated with them within the integrated pest management programs. Biocontrol has emerged as an alternative and environmentally friendly strategy for managing stubborn insect pests in greenhouses and even open fields (Shaker, 2015Mohamed; et al., 2018). One of the modern technologies and alternatives to chemical pesticides is the use of nanoparticles technology in combating agricultural pests, where the methods of producing nanoparticles varied, including physical, chemical and biological methods (Das et al., 2013) and one of the safest methods is the bio-manufacturing of metallic nanoparticles using microorganisms such as fungi, bacteria, yeasts and plant extracts with metal ions such as silver, gold, cadmium et al.The fungi are among the most important bio-reducing agents for metals, which have been widely used for the manufacture of metal nanoparticles, such as Fusarium oxysporium, Verticillium lecani and Beauveria bassiana, and the insect pathogenic fungus Beauveria bassiana is one of the most important biological resistance factors that has been widely used in the production of nanosilver . (AgNPs) that have been introduced into IPM programs for their efficacy due to their large surface area relative to volume and their distinctive chemical and physical properties that increase insect body contact and cell penetration ability (Soni and Prakash, 2012; Banu and Balasubramanian, 2014; Kamil et al., 2017). ; et al., 2017 b; Pavitra et al., 2018)The application of nanotechnology in the protection of agricultural crops is a great promise in the management of insects and plant pathogens through diagnostic tools for early detection. Nagrare et al., (2009).

This study aimed to shed light on the effect of nanosilver prepared by some plant extracts on the cotton Aphis gossypii (Glover) and the predator Chrysoperla Carnea on cucumber.

Materials and methods:

laboratory study

A. aphids were collected. gossypii (Glover) from cucumber fields in Baghdad - Abu Ghraib and it was grown on cucumber plants grown in 1 kg pot in the central incubator at a temperature of 25 ± 2 °C, relative humidity of 65 ± 5% and a photoperiod of 14 light: 10 dark. Kaeda, Fadel. (2002).The predator, the aphid C. carnea, was obtained from the laboratory for the quantitative propagation of parasitoids and predators - the Department of Plant Protection - Abu Ghraib from the laboratory farm for breeding the different roles of the predator,Where two adults were placed in a cylindrical plastic tube measuring (10 x 15) cm, open on both sides, the lower side was covered with a white grout and the upper side was covered with a black grout. The adults were fed a food consisting of honey in the ratio (10: 7: 4), respectively. Tassan et al (1979).After obtaining the eggs of the predator, each egg was placed individually in test tubes of 10 cm in length and 2.5 cm in diameter, plastic until they hatched. On predator larvae in the incubator at a temperature of 25 ± 2 °C and a relative humidity of 65 ± 5% until the emergence of adults.

Preparation of nano silver AgNPs

Preparation of nano silver from AgNo3 by dissolving 0.11 g of silver nitrate salts in 600 ml of ion-free water and to prepare 1000 ml of an aqueous solution of silver AgNps particles is added 0.18 g of nitrate salts. Asadi et al. (2018).

Preparation of plant extract Oxymatrine 2.4 SL

The plant extract was obtained from the production of the Australian Agri Chem Company, which is registered in the Iraqi Ministry of Agriculture under the trade name Oxymatrine 2.4 SL, naturally extracted from the Suphora plant, with a spraying average of 100-200 ml / 100 liters of water, and a medium was used. The recommended dose is 150 ml / 100 liters of water. At a an average of 1.5 ml/1 liter for use in the biosynthesis of nano silver To prepare the nano plant extract, the recommended average concentration of the extract was used: 1.5 ml / 1000 ml water.It is mixed with the aqueous solution of silver nitrate dissolved in the amount of 0.18 g in 998.5 ml of deionized water in a glass beaker of 2000 ml capacity at room temperature and in a dark atmosphere, and then added 1.5 ml of plant extract Oxymatrine to complete the volume to 1000 ml, then the flask is placed in a device Shaker at a temperature of 25 ° C ± 2 and the number of cycles 150 revolutions / min for a period ranging between 48 - 72 hours .Where the color change to yellow is observed as a result of the formation of nano silver . To prepare the nano plant extract in the recommended concentration, the same method of work is followed, but by adding 999.5 ml of aqueous silver nitrate solution with 0.5 ml of the plant extract to complete the volume to 1000 ml of the nano plant extract and the mixture is placed In a glass beaker with a capacity of 2000 ml and then placed in a shaker device at a temperature of 25 ° C ± 2 and the number of cycles of 150 revolutions / min for a period ranging between 48 - 72 hours. Where the color change of the formed solution is observed in pale yellow as a result of the reductive ability of nano silver the plant extract and the formation of nanoparticles of the original plant pesticide Oxymatrine. Asadi et al., (2018).

Methods for diagnosis and testes of the formation of nanosilver

Samples were taken from the prepared solutions of each of the plant extract nano solution and the solution of the fungal filtrate with silver nanoparticles and from both concentrations of the recommended and sub-recommended solutions and placed in 10 ml glass bottles separately.Where the diagnosis and tested of the formation of nanoparticles for these solutions was conducted using a number of methods used in the field of diagnosing and testes the formation of nanoparticles in nanotechnology, as follows:

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color contrast

nano Silver prepared by the plant extract oxymatrine were detected by changing the color status of the solution and after 72 hours of incubation at a temperature of 25-26°C, by changing the color of the solution to which silver nitrate was added from colorless or aqueous white to pale yellow or brown According to the type of extract or fungus(Al-Nuaimi, 2018).

Using a Scanning Electron Microscoopy (SEM)

The sample is prepared for diagnosis using a scanning electron microscope (SEM) by converting it to a powder by drying using a hot air oven at 60°C (Ganesh et al., 2009).After incubating the fungus filtrate with silver nitrate solution for 96 hours, the solution was placed in sterile plastic tubes with a volume of 10 ml and placed in a centrifuge at 6000 rpm for 15 minutes. In a small earthenware jar and placed in the oven with hot air for 15-20 minutes, observing it constantly. Then, the dried precipitate was collected and ground into a fine powder, and testing was conducted at the Nano-Research Center/University of Technology/Baghdad in order to know the shape and size of the constituent nanoparticles (Talbia et al., 2010; Vanmathi selvi and Sivakumar, 2012).

Ultra-Violet spectrophotometer:

The samples for the plant extract were prepared and placed in glass bottles of 10 ml each separately. The samples were testes in the Ibn Al-Bitar Center / Research and Development Department of the Ministry of Industry and Minerals, where 1 ml of the clear solution was withdrawn for both solutions with different concentrations recommended and under recommended, and the absorbance was measured At the wavelength within the range (360-430).Double Beam UV Visible Spectrophotometer, made in England, CECL-CE 7200. This method is considered one of the most important methods used to confirm the formation of nanoparticles in aqueous solutions.Fourier transform infrared spectrometer

Attenuated Total Reflection Fourier Transform Infrared Spectroscopy (ATR-FTIR)

Samples were taken in the same previous methods and placed in 1 ml glass bottles and tested at Ibn Al-Bitar Center with an infrared spectrometer equipped with a Fourier transformer, which contains the TR system and a calculator program that controls the device.The origin of the German device produced by Bruker Tensor 27 IR. Where the nanoparticles formed from the biosynthesis of silver particles were diagnosed with the plant extract at the recommended concentration and the sub-recommended concentration.

field study:

Preparation and preparation of the experiment field (plastic house)

The study was carried out in the greenhouses of the Plant Protection Department / Abu Ghraib. In a multi-space plastic house with an area of 350 m², and on 15/1/2020, the greenhouse was prepared by plowing and preparing the meadows for the cultivation of the cucumber crop in the form of terraces. 1996).

Experimental unit design and plant cultivation in the greenhouse:

Three main terraces representing sectors were planted, and a factorial experiment was applied to them by Randomized complete block design .As each replicate was divided into two pieces of the same line, aphids and predators were distributed to it, and each piece arranged biological control treatments were distributed on it. It includes 6 treatments in each replicate. The results were analyzed using the SAS Sattistical Analysis System program. The Cucumber Sif produced by nunhems company Bayer was used in the study, and it is one of the varieties specialized for climbing cultivation in

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the greenhouses of the autumn and spring arrows. Al-Shammari and Saud, 2013).

Preparation of bio control treatments for field experiment:

1- Oxymatrine 2.4 SL is a plant extract at the recommended concentration of 1.5 ml/liter of water.

2- Oxymatrine 2.4 SL is a plant extract at the recommended concentration of 1.5 ml/L of water + nano silver.

3- The pesticide Oxymatrine 2.4 SL is a plant extract at a concentration below the recommended 0.5 ml/liter of water.

4- Oxymatrine 2.4 SL is a plant extract at a concentration below the recommended 0.5ml/L water + nano silver.

5- A solution of nano silver alone.

6- From cotton + predator Chrysopidae.

Determine the relative efficiency

After completing the treatments and introducing the predator larvae to the field experiment plants, the readings were taken after three days, seven days and fourteen days, by calculating the number of dead and live insects remaining on the plants in the field for all treatment replicates of the experiment. (1955):

% Relative Efficiency = 1- (Cb×Ta)/(Ca×Tb) x 100

whereas:

Ta = average number of live pest members after treatment.

Tb = average number of live pest members before treatment.

Ca = the average number of live pest members in the control after treatment.

Cb = average number of live pest members in the control before treatment

Results and discussion

Diagnosis and testing of the formation of nanosilver by plant extract:

The diagnosis and testing of the formation of nanosilver prepared by the plant extract Oxymatrine through several indicators, including:

1- Color change visual observation

The results shown in Figure (1) showed the formation of nano silver AgNPs nano using the plant extract Oxymatrine by observing the color change from yellow to gray and this indicates the formation of nano silver resulting from the reduction of silver nitrate AgNO3 by the plant extract. solution comparison. As this color change is caused by the excitation of the plasmon surface (the basis of this vibration is the electron conduction groups) in nano silver (Verma et al., 2010).

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Figure (1) Production of nanosilver with plant extract Oxymatrine

A = plant extract solution B = plant extract solution with silver nitrate solution

C = silver nitrate solution

2- UV Absorption Visible Light spectroscopy

The results showed that the absorption spectrum of UV rays showed that the highest absorption was at the wavelength of 373.5 nm for the average recommended concentration of 1.5 ml / liter of nanoparticles water and at the wavelength of 426.5 nm for the concentration under the recommended 0.5 ml / liter of water. This indicates that the plant extract Oxymatrine has the potential to Production of nanoparticles at concentrations of 1.5 and 0.5 ml / liter of water, as shown in Figure (2-A,B), which indicates the occurrence of a biological reduction process of AgNo3 silver nitrate solution dissolved in deionized water and converted into nanoparticles.

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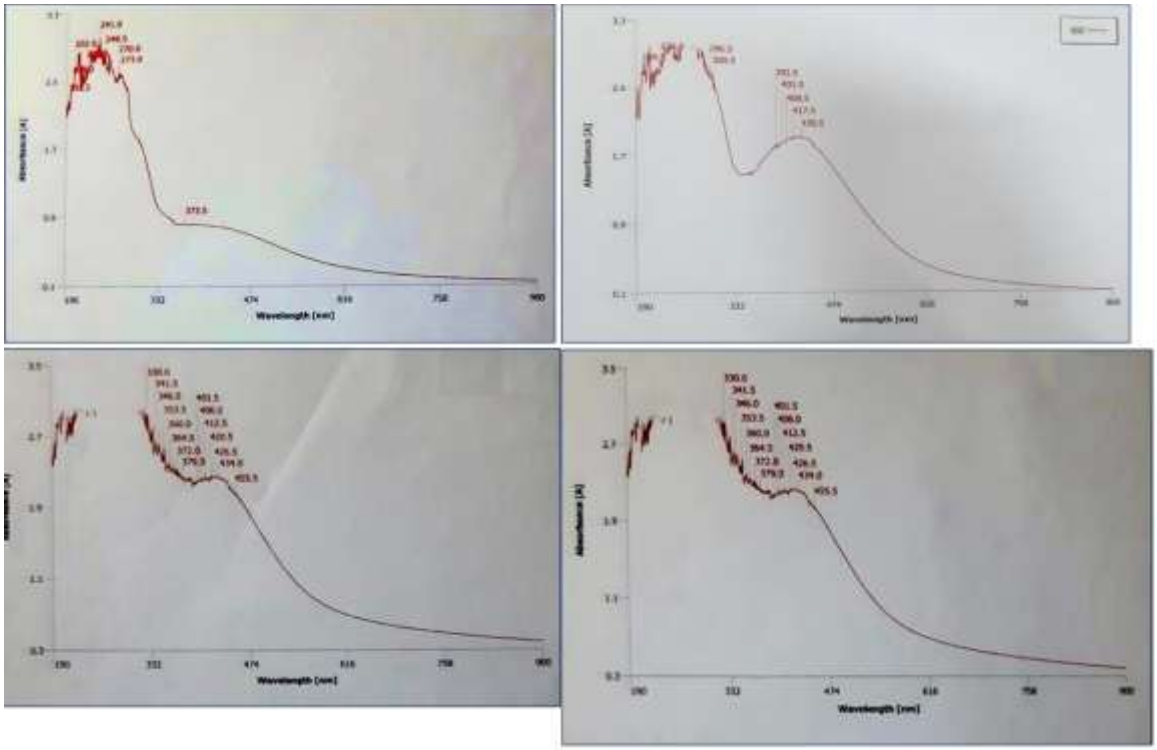

Figure (2) UV-visible absorption spectrum of nanosilver

A = for extract at recommended concentration B = for extract at sub-recommended concentration

3- Scanning electron microscopy (SEM)

By measuring the scanning electron microscope (SEM), it is possible to know the shape, size and distribution of nanoparticles with high accuracy and at different magnifications.The scanning electron microscope (SEM) images of nano silver prepared biologically using the plant extract Oxymatrine show the distribution of silver atoms that are in the form of granules. 2 A,B), the results of scanning electron microscopy for the rate of particle size are in approximate agreement with the results obtained by researchers such as Bhard et al. (2006) as well as Qamandar and Shafeeq (2018).

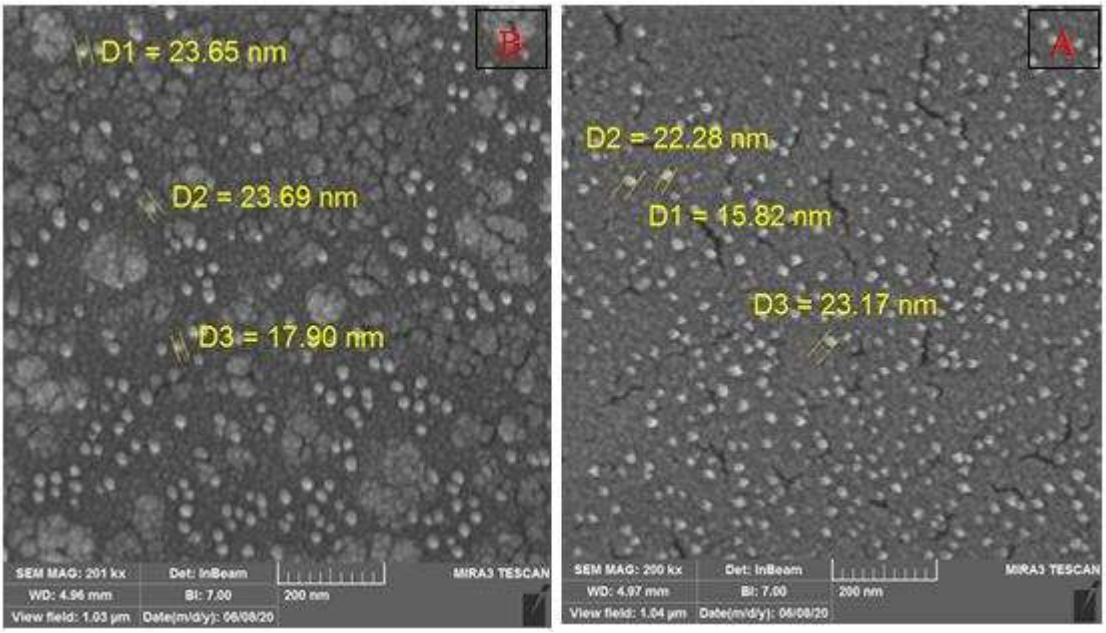

Figure (3) Scanning Electron Microscope (SEM) image of the biosynthesis of nanosilver with Oxymatrine plant extract, A = recommended concentration B = under-recommended concentration

4- Fourier-transform infrared spectrometer

Attenuated total reflection Fourier-transform infrared (ATR-FTIR) spectroscopy

The active chemical aggregates were determined by a Fourier transform infrared spectrometer containing the ATR system. nano Silver were analyzed by the presence of biomolecules associated with them in the FTIR device. The results showed that the spectrum of nano silver appeared in bands at 3345.13, 2116.71 and 1638.04 CM-1 with the extract at a concentration below recommended. With the recommended concentration of the extract, the beams were 3330.48, 2115.35 and 1638.06cm^{-1}.The FTIR spectrum showed the appearance of different groups of acids, aldehydes and aromatic compounds in addition to hydroxyl groups in nano silver

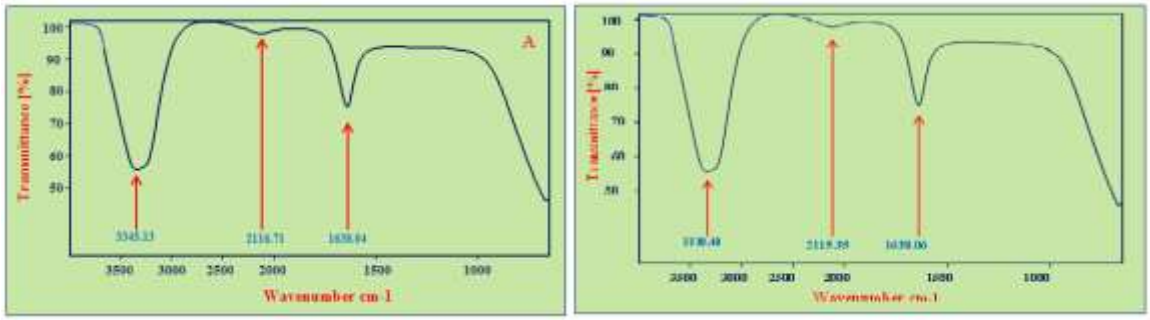

Figure (4) Fourier transform infrared spectrophotometer showing the biosynthesis of nano silver with plant extract Oxymatrine, A = sub-recommended concentration B = recommended concentration

Study of the effect and effectiveness of the plant extract Oxymatrine and AgNPs and

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their mixtures on the percentage killing of A.gossypii melon insect on cucumber plant in the greenhouse (without predator release).

The results in Table (1) showed that the percentage of killing in different treatments with the presence and absence of the predator Chrysopidae showed a clear effect in reducing the average of aphid infection compared to the comparison. The pesticide Oxymatrine concentration of 1.5 ml/L was excelled on the treatments Oxymatrine concentration of 0.5 ml/L and the solution of silver AgNPs nanoparticles. The murder rate was (58.33, 79.16, 91.98%), (16.66, 36.36, 49.23) and (25.00, 52.08, 33.33%) after 3, 7 and 14 days of treatment, respectively. As for the treatment of the pesticide Oxymatrine used in the above two concentrations mixed with AgNPs, The Oxymatrine treatment with a concentration of 1.5 ml / L + AgNPs was the most effective in affecting the cotton aphid , and the killing percentages was (77.08, 87.08 and 97.91%), which excelled on the Oxymatrine treatments with a concentration of 0.5 ml / L + AgNPs, which gave killing percentages of (25.00, 52.08, 70.83%) after 3, 7 and 14 days of treatment, respectively.As for the effect of the treatment of introducing the predator Chrysopidae alone with 2 larvae/plant on cotton insects, the killing percentages was 52.08, 77.08 and 87.49% compared with a killing percentages of 0.0% in the comparison treatment after 3, 7 and 14 days of treatment, respectively. The results also showed that the different treatments with the addition of the predator Chrysopidae aphid showed a clear effect in reducing the rate of aphid infestation. The pesticide Oxymatrine concentration of 1.5 ml/L was excelled on the treatment's Oxymatrine concentration of 0.5 ml/L and the solution of nanosilver AgNPs . The murder rate was (75.36, 85.41, 93.75%), (41.57, 65.00, 65.77%) and (41.62, 58.18, 66.48%) after 3, 7 and 14 days of treatment, respectively.As for the treatment of the pesticide Oxymatrine used in the above two concentrations mixed with AgNPs. The Oxymatrine treatment with a concentration of 1.5 ml / L + AgNPs was the most effective in affecting the cotton aphid , and the killing percentages was (83.56, 89.87, 98.07%), which outperformed the Oxymatrine treatments with a concentration of 0.5 ml / L + AgNPs, which gave a killing percentages of (59.59). , 72.47, 82.57%) after 3, 7 and 14 days of treatment, respectively. As for the effect of the treatment of introducing the predator, the Chrysopidae alone, with 2 larvae/plant on cotton insects, the killing percentages was (52.08, 77.08 and 87.49%), compared with a killing percentages of 0.0% in the comparison treatment after 3, 7 and 14 days of treatment, respectively.

As for the relative efficiency of the treatments in affecting cotton aphid in the presence and absence of the predator aphids, it was shown in Table (2) that the Oxymatrine treatment at a concentration of 1.5 ml/L was excelled on that of the pesticide with a concentration of Oxymatrine at a concentration of 0.5 ml/L and the treatment of silver nanoparticles AgNPs solution The relative efficiency was (73.70,95.25,98.60%) after three consecutive days of treatment. The percentage reached (95.25,98.60%), (86.07,90.13%) and (89.55, 88.88%) after one and two weeks of treatment, respectively.As for the treatment of the pesticide Oxymatrine with the above two concentrations mixed with AgNPs. The Oxymatrine treatment with a concentration of 1.5 ml/L + AgNPs gave the highest relative efficiency of 88.15%, which was excelled on the Oxymatrine treatment with a concentration of 0.5 ml/L + AgNPs 78.60% after three days of treatment. After one and two weeks of treatment, the efficiency of the used pesticides was (97.88,99.62%) and (97.28, 94.68%) for the treatments, respectively. The relative efficiency was (68.58, 94.83, 98.58%) in the treatment of cotton + predator aphid after 3, 7 and 14 days of treatment, respectively. The results of the statistical analysis in Table (2) showed that the treatment Oxymatrine concentration 1.5 ml / L + AgNPs significantly differed from the rest of the treatments. As for

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the treatments Oxymatrine concentration 1.5 ml/L and of cotton + predator, they did not differ significantly among them, but they differed significantly with the rest of the treatments. Oxymatrine treatments 0.5ml/L+AgNPs concentration and silver AgNPs solution did not differ significantly among them, but they differed significantly with the rest of the treatments. As for the relative efficiency of the treatments in affecting a cotton insect, Table (2) showed the excelled of Oxymatrine treatment with a concentration of 1.5 ml/L in the presence of the predator Chrysopidae on the rest of the single treatments: Oxymatrine treatment with a concentration of 0.5 ml/L and treatment with nanosilver AgNPs solution and aphids treatment + Predator The relative efficiency was (84.05, 63.15, 62.73, 68.58 %) after three days of treatment, respectively. The percentage reached (97.80, 99.62%), (96.42, 94.17%), (91.30, 94.40%) and (94.83, 98.58) after one week and two weeks of treatment, respectively.As for the Oxymatrine treatment with the two concentrations mixed with AgNPs, the Oxymatrine treatment gave a concentration of 1.5 ml/L + AgNPs, the highest relative efficiency of 88.15%, which was excelled to the Oxymatrine treatment of 0.5 + AgNPs 78.60% after three days of treatment. After a week and two weeks of treatment, the efficiency was (97.80, 99.62%) and (94.68, 97.28%) for the treatments, respectively.

Table (1) Effect of the plant extract Oxymatrine and AgNPs and their mixtures on the killing percentage of A.gossypii melon insect on cucumber in a field experiment.

Average treatment effect	killing percentages% after treatment (day)			Treatments	
	14	7	3		
76.49	91.96	79.17	58.33	Oxymatrine 1.5 ml/L	
87.36	97.91	87.08	77.08	Oxymatrine 1.5 ml/L + AgNPs	
34.09	49.24	36.36	16.66	Oxymatrine 0.5 ml/L	
49.30	70.83	52.08	25.0	Oxymatrine 0.5 ml/L + AgNPs	
36.80	33.33	52.08	25.0	AgNPs nano silver solution	
84.84	93.75	85.41	75.36	Oxymatrine 1.5ml/L+ Chrysopidae	
90.50	98.07	89.87	83.56	Oxymatrine 1.5 ml/L + AgNPs + Chrysopidae	
57.44	65.77	65.0	41.57	Oxymatrine 0.5ml/L+ Chrysopidae	
71.54	82.57	72.47	59.59	Oxymatrine 0.5 + AgNPs + Chrysopidae	
55.43	66.48	58.18	41.62	nano Silver + AgNPs solution Chrysopidae	
72.22	87.49	77.08	52.08	A.gossypii+ Chrysopidae	
0.00	0.00	0.00	0.00	From A.gossypii cotton only (control)	
	69.78	69.90	46.32	average by exposure times	
exposure times =2.308				Treatments =4.616	L.S.D. 0.05
Treatments × exposure times =8.994					

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Table (2) Relative efficacy of the plant extract Oxymatrine and AgNPs and their mixtures in controlling A.gossypii melon insect on cucumber in a field experiment

Average treatment effect	Relative efficiency % after treatment (day)			Treatments	
	14	7	3		
89.18	98.60	95.25	73.70	Oxymatrine 1.5 ml/L	
94.42	99.62	97.88	85.78	Oxymatrine 1.5 ml/L + AgNPs	
74.38	90.13	86.07	47.0	Oxymatrine 0.5 ml/L	
79.44	94.53	91.38	52.43	Oxymatrine 0.5 ml/L + AgNPs	
77.0	88.88	89.55	52.58	AgNPs nano Silver solution	
93.54	99.68	96.90	84.05	Oxymatrine 1.5ml/L+ Chrysopidae	
95.19	99.62	97.80	88.15	Oxymatrine 1.5 ml/L + AgNPs +Chrysopidae	
84.58	94.17	96.42	63.15	Oxymatrine 0.5ml/L+ Chrysopidae	
90.18	97.28	94.68	78.60	Oxymatrine 0.5 + AgNPs +Chrysopidae-	
82.81	94.40	91.30	62.73	nano Silver + AgNPs +Chrysopidae	
87.33	98.58	94.83	68.58	A.gossypii+ Chrysopidae	
	95.95	93.82	68.79	average by exposure times	
exposure times =0.387				Treatments =0.741	**L.S.D. 0.05**
Treatments × exposure times =1.283					

References

Al-Harbi, Abdul-Aziz Rabih, Abdullah Abdul-Rahman Al-Saadoun, and Safwat Othman Khalil. 1996 . Effect of breeding method and cultivation medium on the growth and productivity of some cucumber cultivars in greenhouses. The Scientific Journal of King Saud University. Alexandria Journal of Agricultural Research 41 (3): 355-365.

Al-Shamry, Aziz Mahdi Abd and Omar Ghazi Yahya Saud (2013) Effect of spraying with some organic nutrients and breeding method on the growth and yield of three cucumber crosses under protected cultivation conditions. Diyala College for Agricultural Sciences, 5 (2): 283 - 294,

Shaker, Amna Nayef. (2015). The effect of compatibility of insect pathogens with some pesticides Modern insecticide in controlling the tomato moth Tuta absoluta (Myrick) (Lepidoptera: Gelechiidae under protected cultivation conditions). Master's thesis. College of Agriculture - University of Tikrit.

Banu,A.N. and Balasubramanian,C.(2014) Myco-synthesis of silver nanoparticles using *Beauveria bassiana* against dengue vector, *Aedes aegypti* (Diptera: Culicidae).Parasitol Research .113(8):2869-2877.

Das, J. ; Das, M.P., and Velusamy ,P. (2013) *Sesbania grandiflora* leaf extract mediated green synthesis of antibacterial silver nanoparticles against selected human pathogens. Spectrochim Acta Part A 104:265–270.

Asadi ,S.; Charati1,F.R.; Akbari1,R. and Razavi,S.A.(2018) Green synthesis of silver nanoparticles using *Taxus baccata* Leaves extract and identify its specifications. J. Mater. Environ. Sci., 9 (10) : 2798-2803.

Kamil,D. ; Prameeladevi1 ,T. ; Ganesh ,S. ; Prabhakaran1 ,N. ; Nareshkumar,R. and Thomas,S.P. (2017) Green synthesis of silver nanoparticles by entomopathogenic fungus *Beauveria bassiana* and their bioefficacy against mustard aphid (*Lipaphis*

 ISSN 2072-3875

erysimi Kalt.). Indian Journal of Experimental Biology. 55: 555-561.

Khan, S.; Taning, N.T.C.; Bonneure, E.; Mangelinckx, S., Smagghe, G. and Shah, M.M.(2017a). Insecticidal activity of plant-derived extracts against different economically important pest insects. Phytoparasitica. 45(1):113–124.

Saleh , A.A.A.; El-Sharkawy, H.M. ; El-Santel, F.S. and Abd El-

Salam,R.A.A.(2017) Seasonal Abundance of Certain Piercing Sucking Pests on Cucumber plants In Egypt. Egypt. Acad. J. Biolog. Sci., 10(7): 65–79.

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