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EFFECTS OF SOME PLANT EXTRACTS ON THE EUROPEAN CORN BORERS *OSTRINIA NUBILALIS*

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ABSTRACT: *Results revealed that 2nd and 4th instars larvae of Ostrinia nubilalis treated with different botanical extracts of Buxus chinensis , Amaranthus viridis and abamectin against 2nd and 4th instars larvae of Ostrinia nubilalis. Generally ethanol extracts Buxus chinensis leaves were more effective than other botanical extracts, in causing larval and pupal mortality and larval. These extracts also reduced fecundity and fertility of females and that survived from 2nd and 4th larval instar of Ostrinia nubilalis treated with Buxus chinensis and Amaranthus viridis leaves extracts .*

Key Words: Plant extracts, *Ostrinia nubilalis*.

INTRODUCTION

First found in North America near Boston, Massachusetts in 1917. European corn borer, *Ostrinia nubilalis* (Hübner), now has spread as far west as the Rocky Mountains in both Canada and the United States, and south to the Gulf Coast states. European corn borer is thought to have originated in Europe, where it is widespread. It also occurs in northern Africa. The North American European corn borer population is thought to have resulted from multiple introductions from more than one area of Europe. Thus, there are at least two, and possibly more, strains present. This species occurs infrequently in Florida. Abo El-Ghar (1993) : Amal (1989): Antonious and Rizk (1994) ; Chanda and Chakravorty (1993) : Corbitt *et al* (1989) ; El – Bermawy *et al* (1992) : Ismail *et al* (1996) ; Ismail *et al* (1999) ; Khalaf (1999) ; Nakanishi (1977) ; Naqvi. (1990): Radwan *et al* (1986) ; Salama, and Ahmed (1997) ; Salem *et al* (1995) :Sharaby Aziza (1994) and Schmid *et al* (1997) .

The aim of this work is to assess the use of two plant extracts of *Buxus chinensis* and *Amaranthus viridis* against 2nd and 4th instars larvae of *Ostrinia nubilalis*.

MATERIALS AND METHODS

Insect culture :

Ostrinia nubilalis was obtained from Plant Protection Research Institute in Dokki, Giza, Egypt which reared according to the methods described by El-Defrawi *et el.* (1964).The culture was maintained at 30° + 1 and 60- 70 % RH.

The Botanical extracts :

1-Plant samples :

Two plant species from two different families, were used in this study. Plant samples were collected from Ismailia during summer of 2007-2008. Specialists from Botany Department, Faculty of Science, Cairo University, carried out identification of plants as follows

Buxus chinensis (Common name Jojoba); Buxaceae obtained from Agriculture Research Center.

Amaranthus viridis; Amaranthaceae; Caryophyllales and moncotyledons.

Preparation of plant extracts :

Buxus chinensis and *Amaranthus viridis* leaves were left to dry at room temperature (28±2 °C) for one week. The dried leaves were grounded to fine powder and extracted consecutively in a Soxhlet apparatus using ethanol solvent. Crude extracts were dried and filtered over anhydrous sodium sulphate and were subjected to remove the solvent used in the extraction. All the crude extracts obtained were kept in the freezer until bioassay.

Bioassay of tested extracts against *Ostrinia nubilalis* larvae :

Oral administration was under taken by feeding technique 2nd and 4th instars larvae of *Ostrinia nubilalis* on leaves, by using different concentrations of different plant extracts and. Each crude extract was dissolved in seven concentrations (4 ,2 , 1, 0.5 , 0.25, 0.125 and 0.0625 ppm) were used. The fresh leaves was dipped in different concentrations of each extract and abamectin for five seconds (leave were dipped completely in 10 ml of each concentration). The treated were used as food for the 2nd and 4th instars larvae of *Ostrinia nubilalis* according to method of (Nakanishi, 1977) with modification. Three sets of experiments have been undertaken of above method. In the first set the toxicity was determined according to POLO-PC (Leora Software, 1994). Then data were subjected to the probit analysis Finney (1971). When necessary control mortality was adjusted across concentrations within the probit procedure by Abbott's formula (Abbott, 1925). Untreted leaves were provided daily until pupation, Four groups of 2nd and 4th instars larvae of *Ostrinia nubilalis*; (100 each) were treated. Following 24-hrs treatment, the insects were examined daily to record all biological parameters of the survivors (Mortalities as larvae, pupae and adult) were counted in percentage relative to the total number of insects of the preceding stage. The biological efficiency of the different plant extracts and abamectin used was calculated according to Vagras and Sehnal (1973) for calculating the developmental rates. In the third set larval, pupal malformations were recorded and photographed.

RESULTS AND DESCASSIOM

Effect of ethanolic *Buxus chinensis* leaves extracts on the 2nd instar of *Ostrinia nubilalis* :

Results represented in Table (1) show the effect of ethanolic Buxus chinensis leaves extracts on the 2nd instars larvae of *Ostrinia nubilalis* fed on castor oil leaves, Where the ethanolic Jojoba leaves extracts were effecting on all developmental aspects of 2nd instar larvae of *Ostrinia nubilalis.* Percentage of larval mortality recorded 70, 80, 84, 90. 92 and 98% at concentrations of 0.125, 0.25, 0.5. 1, 2 and 4 ppm respectively, compared to no mortality for control larvae. On the other hand the results obtained ,also were revealed deformed larvae as 16, 10. 8 and 2% at concentrations of 0.5, 1, 2 and 4 ppm respectively, compared to no deformed larvae for control. From the data represented in Table (1) it was observed that a significant decreasing effect on the duration of 2nd instar larvae after treatment with ethanolic *Buxus chinensis* leaves extracts. At the concentrations of 4, 2. 1, 0.5, 0.25 and 0.125 ppm, the larval durations were 3, 12.4, 12.51, 12.62, 12.73 and 12 .84 days respectively, compared to 16 days for without tretment larvae .In case of pupal stage, which resulted from treated 2nd instar larvae of *Ostrinia nubilalis*, the ethanolic leaves extracts had drastic effect on the percentage of pupation, mortality, deformation and the pupal duration. Data in Table (1) showed that the percentage of pupation was reduced to 20 and 30% at concentration of 0.25 and 0.125 ppm. respectively, compared to 100 % pupation for control. At the same previous concentrations, the percentage of pupal mortality was 4 and 10 % respectively. as compared to no mortality for the control. While the percentage of deformed pupae was reduced to 4 % at concentration of 0.125 ppm respectively, compared to no deformed pupae for the control larvae. According to data in Table (1), show non significant effect on the duration (7 and 8 days compared to 9.8 days of control), of the pupae produced from treated 2nd instar larvae with 0.25 and 0.125 ppm of ethanolic leaves extracts. In case of adult stage, resulted from treated 2nd instar larvae of *Ostrinia nubilalis*, the percentage of emerged moths, deformed moths, fecundity and hatchability were greatly affected Table (1). Emerged moths was obtained only at concentrations 0.25 and 0.125 ppm (8 and 10 % respectively) of ethanolic leaves extracts, compared to 100 % emerged moths for control. Also, at the same previous concentrations, caused 8 and 6 % of moth deformation respectively, compared to no deformed moths in the control larvae. The fecundity and hatchability of adult females were affected, due to treatments of 2nd instar larvae with ethanolic extracts. From the data in Table (1), it was observed that ethanolic highly effect on adult longevity of *Ostrinia nubilalis* from treatmented of 2nd instar larvae. The adult longevity of both sexes were significantly decreased.

Table (1): Effect of Ethanolic *Buxus chinensis*leaves extracts on 2nd instar larvae of *Ostrinia nubilalis*.

Treatments (ppm)	* % Larval Mortality	% Deformed Larvae	Larval Duration (days) mean±S.E.	% Pupation	% Pupal Mortality	% Deformed pupae	Pupal Duration (days) mean±S.E.	% Emerged moths	% Deformed moths
4	98 a	2	3.0 (± 0.19)	–	–	–	–	–	–
2	92 b	8	12.4 (± 0.01)	–	–	–	–	–	–
1	90 b	10	12.51 (± 0.02)	–	–	–	–	–	–
0.5	84 c	16	12.62 (± 0.05)	–	–	–	–	–	–
0.25	80 c	–	12.73 (± 0.07)	20	4	–	7 (± 0.47)	8	8
0.125	70 d	–	12.84 (± 0.1)	30	10	4	8 (± 0.50)	10	6
Treated with ethyl	–	–	12.95 (± 0.15)	100	–	0.5	8 (± 0.81)	99	0.5
Untreated	–	–	16.0 (± 0.21)	100	–	–	9.8 (± 0.22)	100	–

At 30 ± 1 °c and 60-70% R.H.
Mean of each Column Followed by The same letter are not significantly different (P < 0.05).
Larval treatment as 2nd instar.

Effect of ethanolic extract of Amaranthuss virridis leaves extracts on the 2nd instar of *Ostrinia nubilalis* :

When 2nd instar larvae of *Ostrinia nubilalis* were fed on castor oil leaves treated with ethanolic *Amaranthus viridis* leaves extracts. The different developmental stages affected .From the data recorded in Table (2) it was observed that the percentage of larval mortality was increased by increasing concentrations. where the lower mortality (30%) was obtained at lower concentration of 0.25 ppm. while the higher mortality (86%) was occurred at higher concentration of 4ppm, compared to no mortality for control larvae. The percentage of deformed larvae was decreased from 10, 8, 6, 4 to 2 % at the concentrations of 0.125, 0.25, 0.5, 1 and 2 ppm respectively, compared to no deformed larvae for control. According to the data obtained in Table (2) indicated that a significant shortened of larval duration at the concentrations of 4, 2, 1, 0.5, 0.25 and 0.125 ppm, it was 12.21 , 12.24 , 12.27 , 12.31, 12.42 and 12 .5 days respectively, compared to 16 days for control larvae . In case of pupal stage, which resulted from treated 2nd instar larvae of *Ostrinia nubilalis*, the ethanolic *A. viriddis* leaves extracts was affected on the percentage of pupation, mortality, deformed pupae and the pupal duration From Table (2). the percentage of pupation period was increased by decreasing of concentrations of ethanolic *A. viridis* extracts. It was 14, 44, 48, 54, 62 and 90% at concentrations 4, 2, 1, 0.5, 0.25 and 0.125 ppm respectively, compared to 100% pupation for control. While the percentage pupal mortality increased by increasing of concentrations. At lower concentrations (0.5, 0.25 and 0.125 ppm) caused 8, 6 and 4% mortality percent and at higher concentrations (4, 2 and 1ppm) caused 10% mortality respectively, compared to no mortality for the control. But the percentage of deformed pupae was reduced to 36, 10 and 8% at concentrations of 0.125, 0.25 and 0.5 ppm and 4% at concentrations of 1 and 2 ppm respectively, compared to no deformed pupae for the control larvae .According to data in Table (2) show a significant effect on the duration of the pupae produced from treated 2nd instar larvae treatment with the concentrations of 0.125, 0.25, 0.5, 1, 2 and 4 ppm . the pupal duration was decreased to 7.5, 7.43, 7.39, 7.37, 7.25 and 7.14 days respectively, compared to 9.8 days for the control larvae . In case of adult stage, resulted from treated 2nd instar larvae of *Ostrinia nubilalis*, the percentage of emerged moths, deformed moths, fecundity and hatchability were greatly effected presented in Table (2). The percentage of emerged moths was decreased to 38, 36, 30, 28, 26 and 4 % at concentrations of 0.125, 0.25, 0.5, 1, 2 and 4 ppm respectively, as compared to 100 % emerged moths for control. While at the concentrations of 0.125, 0.25, 0.5,1 and 2 ppm, the percentage of deformed moths was reduced to 12, 10, 8, 6 and 4 % respectively, compared to no deformed moths in the control.

Table (2): Effect of Ethanolic *Amaranthus viridis* leaves extracts on 2nd instar larvae of *Ostrinia nubilalis*.

Treat. (ppm)	* % Larval Mortality	% Deformed Larvae	Larval Duration (days) mean±S.E.	% Pupation	% Pupal Mortality	% Deformed pupae	Pupal Duration (days) mean±S.E.	% Emerged Moths	% Deformed Moths
4	86 a	–	12.21 (± 0.11)	14	10	–	7.14 (± 0.81)	4	–
2	54 b	2	12.24 (± 0.21)	44	10	4	7.25 (± 0.82)	26	4
1	48 c	4	12.27 (± 0.35)	48	10	4	7.37 (± 0.83)	28	6
0.5	40 d	6	12.31 (± 0.66)	54	8	8	7.39 (± 0.86)	30	8
0.25	30 e	8	12.42 (± 0.72)	62	6	10	7.43 (± 0.88)	36	10
0.125	–	10	12.5 (± 0.84)	90	4	36	7.5 (± 0.92)	38	12
Treated with ethyl	–	–	12.61 (± 0.42)	100	–	0.2	8.11 (± 0.95)	99.8	–
Untreated	–	–	16.0 (± 0.21)	100	–	–	9.8 (± 0.22)	100	–

At 30 ± 1 °c and 60-70% R.H.

Mean of each Column Followed by The same letter are not significantly different ($P < 0.05$).

*Larval treatment as 2nd instar.

Effect of ethanolic *Buxus chinensis* leaves extracts 4th instar of *Ostrinia nubilalis* :

Results represented in Table (3) was show the effect of ethanolic *Buxus chinensis* leaves extracts on 4th instar larvae of *Ostrinia nubilalis* fed on castor oil leaves. Where the ethanolic *Buxus chinensis* leaves extracts were affected on 4th instar larvae of *Ostrinia nubilalis*. the percentage of larval mortality was decreased to 25. 20. 15. 15, 10 and 5 % at concentrations of 4. 2.1 0.5. 0.25 and 0.125 ppm of ethanolic *Buxus chinensis* leaves extracts respectively, compared to no mortality for control larvae . On the other hand results. also. showed the percentage of deformed larvae was reduced to 5 % at concentrations 4. 2 and 1 ppm respectively, compared to no deformed larvae for control. From the data in Table (3) it was observed that a significant effect on the duration of 4th instar larvae after treatment with ethanolic *Buxus chinensis* leaves extracts. At concentrations of 4 , 2 , 1, 0.5. 0.25 and 0.125 ppm. it was 3 .53. 3.55. 3.6, 3.67. 3.7 and 3 .8 days respectively, compared to 6 days for control larvae.In case of pupal stage. which resulted from treated 4th instar larvae of *Ostrinia nubilalis*, the ethanolic *Buxus chinensis* leaves extracts was affected on the percentage of pupation, mortality, deformed pupae and the pupal durtion. Data in Table (3) showed that the percentage of pupation increased with decreasing concentrations of ethanolic *Buxus chinensis* leaves extracts. It was 70, 75. 80. 85, 90 and 95 % at concentrations of 4, 2 , 1. 0.5. 0.25 and 0.125 ppm respectively, compared to 100 % pupation for control. At concentrations 4 ppm of ethanolic *Buxus chinensis* leaves extracts, the percentage pupal mortality was reduced to 10 %, as compared to no mortality for the control. While the percentage of deformed pupae was 30. 25, 30, 38, 40 and 42 % at same concentrations respectively. compared to no deformed pupae for the control larvae .According to data in Table (3) show a significant effect on the duration of the pupae produced from treated 4th instar larvae with at concentrations of 4, 2,1, 0.5, 0.25 and 0.125 ppm of ethanolic *Buxus chinensis* leaves extracts. the pupal duration was decreased to 6.63. 6.51. 6.42. 6.37. 6.31 and 6.04 days respectively, as compared to 9.8 days for the control larvae.

Table (3): Effect of Ethanolic *Buxus chinensis*leaves extracts on 4th instar larvae of *Ostrinia nubilalis*.

Treatments (ppm)	* % Larval Mortality	% Deformed Larvae	Larval Duration (days) mean±S.E.	% Pupation	% Pupal Mortality	% Deformed pupae	Pupal Duration (days) mean±S.E.	% Emerged Moths	% Deformed moths
4	25 a	5	3.53 (± 1.07)	70	10	30	6.04 (± 0.21)	30	–
2	20 b	5	3.55 (± 1.07)	75	–	25	6.31 (± 0.25)	40	10
1	15 c	5	3.6 (± 1.11)	80	–	30	6.37 (± 0.33)	45	5
0.5	15 d	–	3.67 (± 1.16)	85	–	38	6.42 (± 0.39)	47	–
0.25	10 e	–	3.7 (± 1.6)	90	–	40	6.51 (± 0.45)	50	–
0.125	5 f	–	3.8 (± 1.14)	95	–	42	6.63 (± 0.48)	53	–
Treated with ethyl	–	–	6 (± 2.16)	99	0.5	0.4	7 (± 0.4)	98.6	0.5
Untreated	–	–	6 (± 0.15)	100	–	–	9.8 (± 0.22)	100	–

At 30 ± 1 °c and 60-70% R.

Mean of each Column Followed by The same letter are not significantly different (P < 0.05).

*Larval treatment as 4 th instar.

Effect of ethanolic *Amaranthus virridis* leaves extracts on 4th instar of *Ostrinia nubilalis*, :

When 4th larvae of *Ostrinia nubilalis*, were fed on leaves treated with ethanolic *Amaranthus viridis* leaves extracts. The different developmental stages were affected (Table 4) .From the data recorded in Table (4), it observed that the percentage of larval mortality was increased by increasing concentrations. It was 20,40, 60, 80 and 100 % at concentrations of 0.25, 0.5, 1, 2 and 4 ppm of *A. viridis* respectively, compared to no mortality for control larvae. At same previous concentrations, no malformation were occurred According to the data in Table (4) no significant effect was found to the action of ethanolic *A. viridis* developmental durations, it was 6, 6.35, 6, 6, 5and 3 days at the same previous concentrations respectively, compared to 6 days for control larvae .In case of pupal stage, which resulted from treated 4th instar larvae of *Ostrinia nubilalis*, the ethanolic *A. viriddis* leaves extracts was affected on the percentage of pupation, mortality, deformed pupae and the pupal durtion. From Table (4), the percentage of pupation was increased by decreasing of concentrations of ethanolic A. viridis extract was 20, 40, 60, 80 and 100 % at concentrations 2, 1, 0.5, 0.25 and 0.125 ppm respectively, compared to 100 % pupation for control. While the percentage pupal mortality was reduced to 10 % at the concentrations of 0.125, 0.25, 0.5 and 1ppm, compared to no mortality for the control. But the percentage of deformed pupae was decreased to 20 , 40 , 50 and 70, 50, 40 and 20 % at the concentrations of 0.125, 0.25, 0.5 and 1ppm respectively, compared to no deformed pupae for the control larvae .According to data in Table (4) show a significant effect of ethanolic *A. viridis* leaves extracts on the duration of the pupae produced from treated 4th instar larvae treatment . The pupal duration was decreased to 7.5, 7.44, 7.35, 7.21 and 7.06 days, at the concentrations of 0.125, 0.25, 0.5, 1 and 2 ppm respectively, compared to 9.8 days for the control larvae .In case of adult stage, resulted from treated 4th instar larvae of *Ostrinia nubilalis*, the percentage of emerged moths, deformed moths, and hatchability were greatly effected presented in Table (4). The percentage of emerged moths was reduced to 20 % at concentrations 2 and 1ppm , and 10% at concentrations of 0.5, 0.25 and 0.125 ppm respectively, as compared to 100 % emerged moths for control. Where at the concentrations of 0.125, 0.25, 0.5, 1and 4 ppm, caused a complete inhibition of deformed moths respectively, except at concentration 2 ppm, the percentage of deformed moths was reduced to 10 % respectively, compared to no deformed moths in the control. From the data in Table (4) showed that the effect of ethanolic *A. viridis* leaves extracts on adult durations of *Ostrinia nubilalis*, after treatment of 4th instar larvae.

Table (4): Effect of methanolic *Amaaranthus viridis* leaves extracts on 4th instar of *Ostrinia nubilali.*

Treatments (ppm)	* % Larval Mortality	% Deformed Larvae	Larval Duration (days) mean±S.E.	% Pupation	% Pupal Mortality	% Deformed Pupae	Pupal Duration (days) mean±S.E.	% Emerged Moths	% Deformed moths
4	100	–	3 (± 0.81)	–	–	–	–	–	–
2	80	–	5 (± 0.2)	10	–	–	7.06 (± 0.6)	10	10
1	60	–	6 (± 0.27)	40	10	20	7.21 (± 0.3)	10	–
0.5	40	–	6 (± 0.29)	60	10	40	7.35 (± 0.2)	10	–
0.25	20	–	6.35 (± 0.37)	80	10	50	7.44 (± 0.1)	20	–
0.125	–	–	6 (± 0.4)	100	10	70	7.5 (± 0.5)	20	–
Treated with ethyl	–	–	6 (± 1.1)	100	0.2	0.3	7 (± 0.5)	99.5	–
Untreated	–	–	6 (± 0.15)	100	–	–	9.8 (± 0.22)	100	–

At 30 ± 1 °c and 60 – 70 % R.H ..
Mean of each Column Followed by The same letter are not significantly different (P < 0.05).
*Larval treatment as 4 th instar.

Comparative toxicity of botanicacl extracts :

Generally, the LD50 of botanical extracts tested against 2nd instars larvae of *Ostrinia nubilalis*, were 0.045 and 1.87 for *Buxus chinensis and Amaranthus viridis* respecively table (5). It was noticed that the *Buxus chinensis* extract was the most effective against 2nd instar larvae of *Ostrinia nubilalis*, while the *Amaranthus viridis* was the least potent extract. The LD50 were 4.2 and 7.33 when 4th instar larvae of *Ostrinia nubilalis* treated with *A. viridis,* and *Buxus chinensis* respectively table (5). These results also indicate that, the 2nd and 4th instars larvae are more sensitive to botanical extracts. These results are similar to those obtained by many authors using different botanical extracts against different insects. Radwan *et al.*, (1986) stated that extracts of *Hyoscyanus muticus* had high contact toxicity through topical application against *Ostrinia nubilalis* larvae. Ismail et *al.*, (1996)found *D. acris* extracts was more effective than *D. hara*, when the 4th instar larvae of *Ostrinia nubilalis* were offered treated food for one time, 32.5-40 % of the larvae died, the antifeedant activity exceeded 99 % , so that no pupae and adult moths formed from the treated larvae. Farag (1995) and Ismail et al., (1999) who reported that Neem and Melia extracts were toxic to *B. emisia* and unhormful to its natural enemies.

Table (5): Toxicity Effect of plant extracts on 2nd and 4th instar larvae of *Ostrinia nubilali.,*

Extract	LD 50	95%Confidences limits Lower Upper	Slope ± S.E.
2nd instar larvae			
Buxus chinensis	0.045	0.0321 2.67	1.25 ± 0.28
Amaranthus viridis	1.78	0.934 4.51	1.78 ± 0.25
4th instar larvae			
Buxus chinensis	4.20	0.12 1.67	1.33 ± 0.36
Amaranthus viridis	7.33	0.23 2.43	1.64 ± 0.77

At 30 ± 1 °c and 60-70% R.H.

Mean of each Column Followed by The same letter are not significantly different ($P < 0.05$).

* Larval treatment as 1st instar.

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تأثير بعض المستخلصات النباتية لإمكانية مكافحة ثاقبة ساق الذره الاوربية

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٢ - قسم وقاية النبات - كلية الزراعه - جامعة الازهر

الملخص العربي

أجرى هذا البحث لمعرفة تأثير بعض المستخلصات النباتية وإمكانية استخدامها في مكافحة بعض الآفات الحشرية حيث أدت معاملة العمر الثانى والرابع لحشرة ثاقبة ساق الذرة الاوربية بالمستخلصات النباتية لكل من الهوهوبا والامارانسس فردس إلى النتائج التالية :كان لنبات الهوهوبا هو الاكثر تاثيرا على درجة السمية بعد معاملة العمر الثانى والرابع اليرقى، حيث أنة سجل أعلى معدل وفيات بينما كان نبات الامارانسس فردس أقل فاعلية على العمر االثانى والرابع اليرقى أيضا. وكان للسموم النباتية الناتجة من الهوهوبا والامارانسس فردس تأثير معنوى على قصر عمر ونسبة خروج الأطوار اليافعة الناتجة عن معالجة العمر الثانى والرابع اليرقى. كما وجد أن لنباتي الهوهوبا والامارانسس فردس تاثيرا فعالا على عدد البيض.واتبت الدراسة عموما أن مستخلصات الايثانول من الهوهوبا والامارانسس فردس هما الاكثر فاعلية عن باقى المستخلصات المستخدمة فى معدل وفيات اليرقات والعذارى. ونقص عمر اليرقات والعذارى والحشرات البافعة وتعد النتائج التى تم التوصل اليها من الاهمية حيث يمكن الاعتماد عليها فى مكافحة الآفة موضع البحث لترشيد استخدام المركبات الكيمائية.