Evaluation of Certain Botanical Extracts and Synthetic Insecticides against Whitefly, *Bemisia tabaci* (Gennadius) and Cotton Aphid, *Aphis gossypii* L. on Cucumber (*Cucumis sativus* L.) under Field Condition

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ABSTRACT

Screening extracts of wild plant species for insecticidal properties might lead to the discovery of new agents of pests management. The aim of this study was to evaluate insecticidal efficiency of five plant extracts in comparing with three synthetic insecticides against white fly, *Bemisia tabaci* and cotton aphid, *Aphis gossypii* infesting cucumber plants. The study was conducted at Nobaria district, Beheira Governorate, Egypt during two successive summer seasons of 2020 and 2021 under the open field conditions. The tested botanical extracts included aloe, *Aloe barbadensis*; oleander, *Nerium oleander*; ginger, *Zingiber officinale*; garlic, *Allium sativum* and chinaberry, *Melia azedarach.* The results showed that these extracts had potential effects in reducing the population density of *B. tabaci* and *A. gossypii* on cucumber plants. The descending order of plant extracts efficacy against *B. tabaci* nymphs treated with 10 % (w/v) was chinaberry followed by oleander, garlic, aloe and ginger. On the other hand, the efficiency of the tested plant extracts on the cotton aphids could be arranged according to their percentages of reduction in infestation as following: chinaberry, oleander, aloe, garlic and Ginger. According the provided data we can conclude that the tested aqueous extracts have an insecticidal effect against *B. tabaci* and *A. gossypii* and can be integrated into their management strategies. However, this inference needs thorough testing before generalization.

Key words: *Bemisia tabaci*, *Aphis gossypii*, cucumber, insecticides, plant extracts.

INTRODUCTION

In recent decades, to cope with the sustainable agriculture needs attention has been directed toward expansion in organic farming. Organic farming is the production extension system that completely or largely avoids the use of pesticides, synthetic fertilizers and growth regulators (Behera *et al*., 2012). One of the plant defense mechanisms against insects and pathogens is the produce chemical substances and secondary metabolites. To decrease the harmful impacts of the chemical insecticides on the environment and human health, there is insistent need for new effective substrates in the programs of integrated pest management (IPM) (Rodríguez-González *et al*., 2019). Botanical extracts are less harmful to the environment, less toxic to humans and lower in cost than the use of insecticides (Dougoud *et al.,* 2019). The botanical insecticides can reduce the viability of insect eggs, slowing the growth of insect and can cause insect mortality (Da Silva *et al.,* 2017; Bedini *et al.,* 2020; Tawfeek and Eldesouky, 2021). Recently, surveys of plant families have discovered different botanical insecticides that could be able to meet some of the desired demands (Lydon and Duke 1989; MacKinnon *et al.,* 1997). Worldwide, cucumber (*Cucumis sativus* L.) is one of the most important fresh consumed cucurbitaceous vegetables. In Egypt, cucumber is used to produce under open field conditions and recently is considered as one of the main greenhouse cultivated vegetables (Diab, 2016). The whitefly, *Bemisia tabaci* is a polyphagous insect pest with a wide host range (Oliveira *et al*., 2001; Bayhan *et al*., 2006; Stansly and Natwick, 2010). It causes economic losses in its hosts due to both direct damage (feeding through phloem and honeydew excretions) and indirect damage (transmit plant viruses) (Brown, 2010). The same is true for the cotton aphids, *Aphis gossypii* Glover which is considered as one of the most damaging insect pest because it has a broad host range, and transmits many important plant viruses (Ebert and Cartwright, 1997; Darwish and Eid, 2021). Keeping in view the above mention information, the present work aims to evaluate the efficacy of five botanical extracts in comparing with three insecticides on the population density of *B. tabaci* and *A. gosypii* on cucumber plants.

MATERIALS AND METHODS

Field experiment was carried out at a cucumber private farm (*var.* Beit alpha) at Nobaria district, Beheira Governorate, Egypt throughout two successive seasons 2020 and 2021. The sowing date was during the second week of March in the two successive seasons. During the period of this study no insecticides were applied and all the agriculture practices were performed as usual. The experiment laid out in Randomized

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Complete Block Design (RCBD) with five replications and 9 treatments including the control plots. The experiment contained of 5 blocks and 45 plots, each with area of 16 m^2. Small ridges (1 m) were established between blocks and plots as a barrier. The tested botanical extracts and the insecticides were evaluated and compared to the control.

The tested botanical plants included Aloe, *Aloe barbadensis*; Oleander, *Nerium oleander*; Ginger, *Zingiber officinale*; Garlic, *Allium sativum* and Zanzalacht (chinaberry), *Melia azedarach*

The tested insecticides included

- Acetamiprid (Mospilan) 20% SP provided by Nippon Soda Ltd, 25 mg L^{-1}.
- Sulfoxaflor (Closer) 24%, SC provided by DowAgro Sciences Co., Ltd, 0.5mL^{-1}
- Flonicamid (Teppeki 50%WG) was provided by ISK Biosciences, Belgium, 300 mg L^{-1}

Preparation of *M. azedarach* extracts

Mature fruits of *M. azedarach* were collected, washed and cleaned with distilled water. The fruits were shade dried at room temperature (for 2 days). The fruits crushed into small pieces and ground using an electric grinder to a fine powder. The extract by soaking the obtained material in distilled water (at a rate of 100 g per 1liter water) for 24 hours prior to spraying. The soaked material was filtered using filter paper (Whatman No. 1) to get a solution with a concentration of 0.1 gm/ml (10 % w/v).

Preparation of *Allium sativum* aqueous extract

The protective layer of garlic cloves were peeled out, 50 gm of garlic were weighed and rinsed. The garlic cloves were crushed (using electric grinder) and completely blended with 500 ml of distilled water. The homogenate was filtered using filter paper (Whatman No. 1) to get a solution with a concentration of 0.1 gm/ml (10 % w/v).

Preparation of *Zingiber officinale* Extract

The rhizomes *Z. officinale* were washed, peeled and cut into small slices and pulverized with slowly addition of distilled water then boiled for 2 min. The extract was refined by a piece of cotton cloth, squeezed well.

Preparation of *Nerium oleander* L. Extract

Fresh leaves of *Nerium oleander* L. (oleander) were shade dried, ground to a fine powder and then 100 g powder was soaking in one liter of distilled water. To allow the auto influx of plant metabolites to solvent extraction, the extraction was carried out at 25 °C with constant stirring overnight (24 h) in dark (Moosavi, 2012). The homogenate was filtered using filter paper (Whatman No.1) to get the solution (10 % w/v).

Preparation of *Aloe barbadensis* Extract

To collect the 1 kg clear gel of the aloe, leaves washed with tap water and cut into small pieces by using sharp knife then blinded to collect aloe sap.

Data collection

The prepared extracts were sprayed once on April 20th in both seasons with 10 % (w/v) at the rate of 200 liter per feddan. A Knapsack sprayer, Cp^3 was used for spraying. The control plots treated with water only.

The inspection was conducted by picking out randomly five cucumber leaves from each replicate and placed in paper bags then transferred to the laboratory for examination with the help of binocular microscope for counting the individuals of *B. tabaci* (nymphs) and *A. gossypii* (total population). Inspection was done pre, and 1, 3, 7 and 14 days post treatment.

The percentages of population reduction were calculated according the equation of Henderson and Tilton (1955) as following:

$$\% \text{ Reduction} = 100 \times 1 - \frac{Ta \times Cb}{Tb \times Ca}$$

Where:

Cb = mean No. of individuals in control plots before application

Ta = mean No. of individuals in treatment plots after application

Ca = mean No. of individuals in control plots after application

Tb = mean No. of individuals in treatment plots before application

Statistical analysis

The obtained data were statistically analyzed in accordance with Snedecore and Cochran (1967), and the least significant differences (LSD) at 5 % level of significance were computed. The statistical analysis system (SAS) version 9.2 (SAS, 2013) computer program was used to examine the data.

RESULTS AND DISCUSSION

Field evaluation of the plant extract against the whitefly, *B. tabaci*

As shown in Tables (1&2), the most obvious reduction percentages were calculated for chinaberry, (*M. azedarach*) extract with mean values of 55.64±10.06, 61.72±7.72, 73.64±4.815 and 70.76±7.51 after 1, 4, 7 and 14 days post treatment, respectively in the 1st season, 2020. In season 2021, the same trend was noticed with reduction percentages of 50.44±8.04, 62.26±9.58, 76.07±5.31 and 67.44±6.98 after 1, 4, 7 and 14 days post treatment, respectively with general means of 65.44±10.23 and 64.05±11.82 for 2020 and 2021, respectively. In second place came the oleander extract (*N. oleander*) with reduction percentages of 46.04±5.81, 58.46±9.13, 67.47±5.3 and 66.76±8.84 in 2020 and 44.21±10.02, 55.14±7.09, 67.71±6.91 and 63.88±4.24 in 2021 after 1, 4, 7 and 14 days post treatment with general means of 59.68±11.21 and 57.73±11.47 in the 1st and 2nd season, respectively. Also, the plots treated with garlic extract (*A. sativum*) showed reduction in whitefly nymphs reached to 42.62±3.39, 51.3±5.13, 62.28±4.82 and 51.16±9.7 at the previous intervals, respectively in 2020, while in the season 2021 this extract recorded 42.18±4.51, 49.2±6.81, 60.28±4.88 and 57.8±11.87. Aloe, (*A. barbadensis*) comes in the second-to-last rank with reduction percentages of 41.57±1.47, 46.09±9.65, 53.56±9.36 and 51.72±6.82in 2020 season and 38.97±5.19, 47.83±11.15, 57.33±6.69 and 51.45±8.99 in 2021 season at the previous intervals. Ginger extract (*Z. officinale*) was the least effective extract on the whitefly nymphs as it was recorded 37.55±5.32, 41.73±6.79, 45.57±7.88 and 40.47±9.06 with a general mean of 41.33±7.4 in 2020 and 34.3±8.29, 40.25±8.44, 51.2±6.07 and 44±8.83 with general mean of 42.44±9.65 at the previous intervals, respectively.

In our results, the descending order of plant extracts efficacy against *B. tabaci* treated with 10 % (w/v) was *M. azedarach* followed by *N. oleander*, *A. sativum*, *A. barbadensis* and then *Z. officinale*. Hammad *et al*. (2001) studied the effect of *M. azedarach* L. extracts against of *B. tabaci* adults. They found that the extracts of callus and different age classes of *M. azedarach* leaves and fruits have shown significant repellent activity of 58.9–67.7% and significantly decreased the whitefly oviposition rate. Jazzar and Hammad (2003) tested the efficacy of aqueous extracts of *M. azedarach* fruits and leaves against *B. tabaci* nymphs under laboratory conditions and found that the *M. azedarach* extract produced a significant greater mortality of *B. tabaci* than the untreated nymphs. Also the our results are in harmony with the results of Rathi and Al- Zubaidi (2011), who found that the crude phenolic extracts of *N. oleander* had higher effect against both first and third nymphal instars of *B. tabaci* mortality (cumulative mortality reached 100 % at concentration of 1% and 2 %) than second nymphal instar.

Table 1. The Reduction percentages of whitefly, *Bemisia tabaci*, after different treatments by plant extracts and synthetic insecticides in season of 2020.

Insecticides	Pre-spray	Days post treatment				General means
		I Day	4 Days	one weeks	Two weeks	
Control	(89.6)	(108.2)	(106.4)	(115)	(133.2)	
Melia azedarach	(91.2)	(48) 55.64±10.06c	(41.6) 61.72±7.72c	(30.6) 73.64±4.815bc	(38.6) 70.76±7.51c	65.44±10.23c
Allium sativum	(88.6)	(62) 42.62±3.39def	(51.4) 51.3±5.13de	(42.8) 62.28±4.82d	(63.6) 51.16±9.7d	51.84±9.16e
Zingiber officinale	(87.2)	(66.2) 37.55±5.32ef	(60.2) 41.73±6.79f	(60.2) 45.57±7.88f	(76.4) 40.47±9.06e	41.33±7.4f
Nerium oleander	(86.8)	(57) 46.04±5.81de	(42.4) 58.46±9.13cd	(36.4) 67.47±5.3cd	(42.2) 66.76±8.84c	59.68±11.21d
Aloe barbadensis	(91.2)	(65) 41.57±1.47def	(57.6) 46.09±9.65ef	(53.4) 53.56±9.36e	(65.4) 51.72±6.82d	48.24±8.48e
Acetamiprid	(92)	(31.6) 71.33±5.47b	(25) 77.13±2.91b	(23.4) 79.55±6.61b	(26.6) 80.57±3.77b	77.14±5.81b
Flonicamid	(95)	(12.8) 88.72±2.61a	(9.8) 91.2±1.81a	(7.8) 93.49±2.167a	(13) 90.79±3.32a	91.05±2.91a
Sulfoxaflor	(97.2)	(12.4) 89.58±3.06a	(7.2) 93.99±2.33a	(5.8) 95.32±1.76a	(8) 94.48±1.32a	93.34±3.05a
F values		81.549	49.370	45.905	40.025	123.673
L.S.D.		6.801	8.2197	7.5631	8.93075	4.90125

Means followed by the same letter(s) in the same column are not significantly different (p≥0.05).

Table 2. The Reduction percentage of whitefly, *Bemisia tabaci*, after different treatments by plant extracts and synthetic insecticides in season of 2021.

Insecticides	Pre-spray	Days post treatment				General means
		I Day	4 Days	one weeks	Two weeks	
Control	(75)	(86.4)	(88)	(98.4)	(102.6)	
Melia azedarach	(75.2)	(42.6) 50.44±8.04^{c}	(33) 62.26±9.58^{c}	(23.2) 76.07±5.31^{bc}	(33) 67.44±6.98^{c}	64.05±11.82^{c}
Allium sativum	(72.8)	(48.8) 42.18±4.51^{d}	(43.2) 49.2±6.81^{de}	(37.8) 60.28±4.88^{cd}	(41.4) 57.8±11.87^{d}	52.37±10.15^{de}
Zingiber officinale	(78.4)	(59.4) 34.3±8.29^{de}	(54.8) 40.25±8.44^{e}	(50) 51.2±6.07^{d}	(59.6) 44±8.83^{e}	42.44±9.65^{f}
Nerium oleander	(79)	(50.4) 44.21±10.02^{cd}	(41.2) 55.14±7.09^{cd}	(33.2) 67.71±6.91^{c}	(38.8) 63.88±4.24^{cd}	57.73±11.47^{d}
Aloe barbadensis	(76.6)	(54.4) 38.97±5.19^{de}	(46.4) 47.83±11.15^{de}	(42.6) 57.33±6.69^{d}	(50.2) 51.45±8.99^{de}	48.89±10.24^{e}
Acetamiprid	(76.6)	(21.6) 75.56±3.46^{b}	(17.2) 80.72±3.45^{b}	(6.4) 81.6±7.49^{b}	(7.2) 83.45±4.22^{b}	80.33±5.44^{b}
Flonicamid	(79.4)	(12.6) 86.15±3.03^{a}	(6.4) 93.1±3.11^{a}	(6.2) 94.1±4.72^{a}	(11.8) 89.16±3.54^{ab}	90.63±4.68^{a}
Sulfoxaflor	(78)	(8.4) 90.52±2.6^{a}	(7.2) 92.01±3.92^{a}	(3.2) 96.74±3.16^{a}	(2.8) 97.09±4.03^{a}	94.09±4.35^{a}
F values		66.199	41.096	42.438	34.477	96.228
L.S.D.		8.0058	9.3459	7.47935	9.25505	5.6002

Means followed by the same letter(s) in the same column are not significantly different ($p \geq 0.05$).

Siam and Othman (2020) evaluated four botanicals extracts for suppressing the mango scale insect, *Aulacaspis tubercularis*. They found that the combination of garlic and aloe was the most effective one in reducing the insect. Also, the present results showed that *A. sativum* was more effective in killing *B. tabaci* than *A. barbadensis*. Meles *et al.* (2012) determined the efficacy of some plants extracts including aloe and garlic against different insects (from different orders) and reported that aloe extract was more effective in repelling than to kill insects. However, the results also clearly show that the used plant extracts were more efficient in suppressing the cotton aphids than the whitefly; this might be attributed for the high ability to movement for aphids than whitefly nymphs. Also, Okonkwo and Ohaeri (2013) tested *Zingiber officinale* on brown plant hopper and found that this plant had insecticidal properties against treated insects.

Field evaluation of the plant extract against cotton aphid, *A. gossypii*:

Results presented in Tables 3 and 4 show that the mean number of *A. gossypii* on cucumber leaves significantly decreased after treatment with all examined plant extracts and insecticides comparing with check control. The highest reduction percentage of cotton aphids (best control level) was recorded for chinaberry, (*M. azedarach*) extract with 56.08±11.15, 62.58±6.44, 78.76±7.97 and 78.84±10.44 in 2020 season, and 58.38±8.43, 64.4±11.05, 80.37±9.71 and 77.03±8.51 in 2021 season after 1, 3, 7 and 14 days, respectively with a general mean of 69.06±13.29 and 70.05±12.68 in 2020 and 2021, respectively. The oleander extract (*N. oleander*) caused the following reduction percentages (51.57±7.42, 63±8.76, 77.89±6.04 and 64.56±11.57 in 2020 and 58.11±13.19, 69.89±7.23, 79.96±7.71 and 68.42±8.11 in 2021 after the previous intervals, respectively). Aloe extract come in the 3rd place with 45.22±19.52, 55.88±6.9, 66.79±5.07 and 59.08±3.23 in 2020 and 50.83±12.71, 59.09±8.91, 65.45±4.84 and 64.59±10.33 in 2021. Garlic extract comes in the second-to-last rank with reduction percentages of 44.41±19.3, 46.72±5.5, 57.47±10.4 and 53.48±8.2 with a general mean of 50.52±12.26 in the 1st season, 2020 and 48.72±9, 52.6±7.39, 63.62±7.48 and 58.21±5.44 with a general mean of 55.79±8.95 in 2021 season. Ginger extract was found to be less effective one with mean values of 40.71±7.38, 43.24±6.67, 55.98±6.15 and 46.95±9.78 reduction percentages at 1, 4, 7 and days intervals with a general mean of 46.72±9.18 in 2020 and 43.62±9.08, 48.69±8.8, 59.39±6.09 and 49.16±7.98 at 1, 4, 7 and 14 days post treatment, respectively. In the current results the *N. oleander* extract came in the 2nd place after *M. azedarach* against *A. gossypii* in agreement with the results of Heikal (2018) who evaluated the efficiency of eight plant extracts against *A. gossypii* under greenhouses conditions on Cucumber plants. The efficacy of the extracts can be arranged in the following descending order: Neemazal, Azadirachta, Eucalyptus, Nerium, Helianthus, Glycine, Citronella and Jojoba extracts.

Results presented in Table 1 and 2 indicate that the mean initial reduction percentages of *B. tabaci* population on cucumber plant (after 24 hr.), caused by Acetamiprid, Flonicamid and Sulfoxaflor were 71.33±5.47, 88.72±2.61 and 89.58±3.06% for the 1st season, 2020, and 75.56±3.46, 86.15±3.03 and 90.52±2.6 for the 2nd season, 2021, respectively. However, the mean reduction percentages of accumulation effect (general mean) were 77.14±5.81, 91.05±2.91 and 93.34±3.05% in 2020 season and 80.33±5.44, 90.63±4.68 and 94.09±4.35 in 2021 for Acetamiprid, Flonicamid and Sulfoxaflor, respectively. Based on the obtained results it is obvious that the reduction percentages of whiteflies nymphs were higher in 2nd season than the 1st season. In similar results, Darwish *et al.* (2021) found that the insecticide Sulfoxaflor was the most effective insecticides against the whitefly in tomato field followed by Thiamethoxam, Acetamiprid, Pyriproxphene, Buprofezin and Dinotefuran. Jahel *et al.* (2017) also, found that the insecticide sulfoxaflor was the most effective insecticide followed by Azadirachtin and *Beauveria bassiana*. Concerning the effect of these insecticides against *A. gossypii*, there are a little differences, whereas the insecticides Flonicamid was the most effective insecticide with reduction percentages of 88.26±3.57, 95.92±4.32, 96.41±3.29 and 87.99±5.41 in 2020 and 88.48±3.15, 91.3±4.16, 94.61±4.39 and 93.37±6.36 at 1, 4, 7 and 14 days post treatment. The insecticide Sulfoxaflor came in the 2nd rank with a general mean of 90.98±5.44 and 90.88±4.94 followed by Acetamiprid with a general mean of 68.76±8.08 and 74.43±8.09 in 2020 and 2021 seasons, respectively. In the same frame, El-Sherbeni *et al.* (2018) found that Flonicamid insecticide was the most effective against the cotton aphid, *A. gossypii* in cotton fields.

Table 3. The Reduction percentage of cotton aphids, *Aphis gossypii*, after different treatments by plant extracts and synthetic insecticides in season of 2020.

Insecticides	Pre-spray	Days post treatment				General means
		I Day	4 Days	one weeks	Two weeks	
Control	(18.6)	(16.4)	(15.6)	(14.8)	(20.6)	
Nerium oleander	(18.6)	(8) 51.57±7.42b^{cd}	(5.6) 63±8.76^{bc}	(3.2) 77.89±6.04^{b}	(7) 65.79±5.44^{cd}	64.56±11.57^{b}
Aloe barbadensis	(17.8)	(8.2) 45.22±19.52^{cd}	(6.6) 55.88±6.9^{c}	(4.8) 66.79±5.07^{cd}	(8) 59.08±3.23^{de}	56.74±12.69^{c}
Allium sativum	(17.2)	(8) 44.41±19.3^{cd}	(8) 46.72±5.5^{d}	(5.6) 57.47±10.4^{de}	(8.8) 53.48±8.2^{ef}	50.52±12.26^{cd}
Melia azedarach	(18)	(6.8) 56.08±11.15^{bc}	(5.8) 62.58±6.44^{bc}	(3) 78.76±7.97^{b}	(4) 78.84±10.44^{b}	69.06±13.29^{b}
Zingiber officinale	(19.4)	(10.4) 40.71±7.38^{d}	(9.4) 43.24±6.67^{d}	(6.6) 55.98±6.15^{e}	(11.4) 46.95±9.78^{f}	46.72±9.18^{d}
Acetamiprid	(20)	(6) 65.22±5.39^{b}	(5.4) 67.25±6.49^{b}	(4.4) 70.08±11.13^{bc}	(6) 72.5±8.75^{bc}	68.76±8.08^{b}
Sulfoxaflor	(20.4)	(2.2) 87.02±4.26^{a}	(0.6) 90.9±3.61^{a}	(0.6) 96.67±4.57^{a}	(2.6) 89.35±5.03^{a}	90.98±5.44^{a}
Flonicamid	(19.2)	(2.2) 88.26±3.57^{a}	(1.4) 95.92±4.32^{a}	(0.4) 96.41±3.29^{a}	(2.2) 87.99±5.41^{a}	92.14±5.67^{a}
F values		13.506	45.952	22.872	22.187	55.089
L.S.D.		14.7407	8.0759	9.41655	9.585	6.3747

Means followed by the same letter(s) in the same column are not significantly different (p≥0.05).

Table 4. The Reduction percentage of cotton aphids, *Aphis gossypii*, after different treatments by five plant extracts and three synthetic insecticides in season of 2021.

Insecticides	Pre-spray	Days post treatment				General means
		I Day	4 Days	one weeks	Two weeks	
Control	(29)	(30.6)	(33)	(36)	(42.8)	
Nerium oleander	(28)	(12) 58.11±13.19[bc]	(9.4) 69.89±7.23[bc]	(6.8) 79.96±7.71[b]	(12.8) 68.42±8.11[cd]	69.1±11.71[b]
Aloe barbadensis	(25.8)	(13) 50.83±12.71[cd]	(11.8) 59.09±8.91[de]	(11.4) 65.45±4.84[c]	(13) 64.59±10.33[d]	59.99±10.67[c]
Allium sativum	(26.2)	(14) 48.72±9[cd]	(14) 52.6±7.39[ef]	(11.6) 63.62±7.48[c]	(16) 58.21±5.44[de]	55.79±8.95[c]
Melia azedarach	(25.2)	(10.8) 58.38±8.43[b]	(9.8) 64.4±11.05[cd]	(6) 80.37±9.71[b]	(8.2) 77.03±8.51[bc]	70.05±12.68[b]
Zingiber officinale	(27.4)	(16.2) 43.62±9.08[d]	(16) 48.69±8.8[f]	(13.8) 59.39±6.09[c]	(20.6) 49.16±7.98[e]	50.22±9.45[c]
Acetamiprid	(25.2)	(9.4) 64.27±5.94[b]	(6.6) 76.54±6.44[b]	(6.8) 77.43±6.93[b]	(7.8) 79.48±2.89[b]	74.43±8.09[b]
Sulfoxaflor	(26.4)	(3.6) 87.01±4.46[a]	(2.2) 92.33±4.95[a]	(3) 90.81±5.47[a]	(2.6) 93.37±3.77[a]	90.88±4.94[a]
Flonicamid	(24.8)	(3) 88.48±3.15[a]	(2.4) 91.3±4.16[a]	(1.8) 94.61±4.39[a]	(2.4) 93.37±6.36[a]	91.94±4.9[a]
F values		17.971	23.129	17.748	25.168	53.599
L.S.D.		11.47905	9.8661	8.73205	9.1229	5.82515

Means followed by the same letter(s) in the same column are not significantly different ($p \geq 0.05$).

CONCLUSION

Finally we can conclude that the botanical extracts of chinaberry, oleander, garlic, aloe and ginger had different potential effects to control the whitefly and cotton aphid on cucumber plants. These extracts easily prepared and the plants locally available and can be integrated into the integrated pest management strategies of these insect pests.

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الملخص العربي

تقييم كفاءة بعض المستخلصات النباتية وبعض المبيدات الحشرية ضد ذبابة القطن البيضاء *Bemisia tabaci* ومن القطن *Aphis gossypii* علي نباتات الخيار تحت الظروف الحقلية

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الهدف من هذه الدراسة هو تقييم النشاط الإبادي للمستخلص المائي لخمس نباتات وذلك بالمقارنة بالنشاط الإبادي بثلاث مبيدات حشرية ضد كلا من ذبابة القطن البيضاء *Bemisia tabaci* ومن القطن *Aphis gossypii* علي نباتات الخيار تحت الظروف الحقلية. تم اجراء هذه الدراسة خلال الموسم الصيفي للعامين ٢٠٢٠ و٢٠٢١. تشمل المستخلصات المختبرة صبار الالوفيرا *Aloe barbadensis*، الدفلة*Nerium oleander*، الزنجبيل *Zingiber officinale*، الثوم *Allium sativum* والزنزلخت *Melia azedarach*.

تشير النتائج الي أن المستخلصات المختبرة كانت لها كفاءة في خفض تعداد كلا من الذبابة البيضاء ومن القطن علي نباتات الخيار. الترتيب التنازلي للمستخلصات المختبرة حسب كفاءتها في خفض تعداد حوريات الذبابة البيضاء كان كالآتي الزنزلخت، الدفلة، الثوم، صبار الالوفيرا واخيرا الزنجبيل. متوسط النسبة المئوية للخفض التي حققتها المبيدات المختبرة في الموسم الاول ٢٠٢٠ كانت ٧٧,١٤ و٩١,٠٥ و٩٣,٣٤% لمبيدات Acetamiprid وFlonicamid وSulfoxaflor وفي الموسم الثاني ٢٠٢١ حققت هذه المبيدات نسب مئوية للخفض وصلت الي ٨٠,٣٣ و٩٠,٦٣ و٩٤,٠٩%، علي الترتيب. ومن ناحية أخري فإن كفاءة هذه المستخلصات في خفض حشرة من القطن يمكن ترتيبها كالآتي الزنزلخت، الدفلة، صبار الالوفيرا، الثوم واخيرا نبات الزنجبيل. مبيد Flonicamid كان الاكثر فاعلية في خفض تعداد حشرة من القطن عن كل من Sulfoxaflor ومبيد Acetamiprid. طبقا لهذه النتائج يمكن القول بان المستخلصات النباتية المختبرة لها تأثير إبادي ضد كل من الحشرتين ومن الممكن ادراجها في برامج المكافحة المتكاملة لهما.

الكلمات المفتاحية: الذبابة البيضاء، من القطن، الخيار، المبيدات الحشريه، مستخلصات نباتية.