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## Population Density of Some Pests and Evaluation of Some Different Control Methods on Cucumber Plants Under Greenhouse Conditions

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Garlic oil, Actara and Lemon oil

### ABSTRACT

Population density of some pests were studied on winter plantation of cucumber plant *Cucumis sativus* L. of 2019 & 2020 seasons under greenhouse condition at Giza governorate, Egypt. Showed that significant difference between the weekly mean number of the pests under investigation. *Bemisia tabaci* (Genn.) was the most pests found in cucumber plants in two seasons. Evaluating the efficacy of some chemical insecticides and botanical oils were sprayed against sap-sucking pest, the whitefly, *B. tabaci*, on Cucumber plant in the greenhouse. The results revealed that there were significant differences between using three systemic insecticides and three botanical oils on the population density of *B. tabaci* cucumber plants were received two sprays of each tested treatment during the experimental period. Statistically, the percentage of reduction in *B. tabaci* counts between mentioned treatments was significant, whereas F value = 7.00\*\* and L.S.D. = 1.96 during first spray and F value = 5.97\*\* and L.S.D. = 2.33 for the second spray. Also the general means of reduction of two sprays, it is clear that Mospilan 20 SP (96%) appeared as the high mortality one in reducing rate of *B. tabaci* members followed significantly by Rosemarie oil (94.67%), Confidor 20% SL (93%), Garlic oil (92%), Actara (86%) and the lowest one Lemon oil (81.33%), respectively.

### INTRODUCTION

The Cucurbitaceae family is the most food used for human consumption. cucurbits represent an important part of vegetable production and are considered very important in agricultural crops in Egypt. The cucumber plant, *Cucumis sativus* L. (Cucurbitaceae) is one of the most important vegetables, it is widely distributed all over the world. In Egypt, the cucumber plantation is progressing at a relatively fast rate especially in the newly reclaimed area in the open field and greenhouse, fruit cucumber used for local consumption and exportation to the foreign markets. However, cucumber plants in Egypt are subjected to infestation by many pests such as whitefly; *Bemisia tabaci* (Genn.) and two-spotted spider mite *Tetranychus urticae* Koch were economically important pest on cucumber (*Cucumis sativus* L.) in different parts of the world (Baiomy, 2008). This polyphagous pest can attack more than 600 different species of plants that occur in both open fields and greenhouse environments (Gelman *et al.*, 2007). *B. tabaci* causes directly damage by sucking the sap from the plant foliage, while indirectly damage due to the transmitting plant pathogenic

viruses and the excretion of honeydew that is considered as a good media for sooty mold growth (Henneberry *et al.*, 2000; Stansly *et al.*, 2004, Hanafy *et al.*, 2014 and Ismail *et al.*, 2020). The induced sooty mold also interferes with light transmission to chloroplasts and therefore reduces the efficiency of plant photosynthesis (Gelman *et al.*, 2002). In recent years the use of synthetic insecticides in crop protection programmers around the world has resulted in environmental hazards, pest resurgences, pest resistance to pesticides and lethal effect to non-target organisms in the agro-ecosystems in addition to direct toxicity to users Therefore, it was necessary to search for safe alternative materials for pest control, which can minimize the use of synthetic pesticides. Botanical pesticides may be one of the important alternatives to reduce synthetic pesticide usage. They possess an array of properties including toxicity to the pest, repellency, antifeedants, insect growth regulatory activities against pests of agricultural importance (Prakash *et al.*, 1990). In recent years, plant extracts and botanical pesticides have shown great importance in agricultural fields due to their cheap and low expenses, with no residual effects, environmentally friendly, and highly toxic against major pests such as thrips, aphids, jassids, whitefly, and mites (Stumpf and Nauen 2001). The present work aimed to study the Population density of some pests and evaluation of certain different treatments on cucumber plants under greenhouse conditions.

## MATERIALS AND METHODS

### Greenhouse Experiments:

Experiments were conducted in the greenhouse experimental area, Dokki, Giza Governorate during two successive seasons (2019 and 2020). Cucumber seedlings were transplanted on September 10, 2019, and September 10, 2020, in the greenhouse. The area of the greenhouse was 9×40 m<sup>2</sup>. The inspection was started on 23<sup>rd</sup> Sept., after sowing for 15 days. A sample of 10 leaves / replicate and take three replicates for the greenhouse was collected randomly in the early morning each week until the harvest. Beginning control process when appeared the pest on cucumber plants, the insecticides were sprayed by A knapsack sprayer (10 liters) each treatment was replicated three times. The insecticides were sprayed two times on Oct., 14 and Nov., 11, (2019&2020), respectively. Control was sprayed only by water. The efficiency of the tested products was estimated by counting the target alive pests (*Bemisia tabaci* (Genn.)) on the lower surface of twenty cucumber leaves per plot. Pretreatment counts were done just before application while post-treatment counts were made on days 1, 3, 7 and 10 days after treatment. Counts were done in the early morning when flight activity.

### Control Agents:

In the present study, three insecticides and three natural oil were tested for their efficacy against *B. tabaci*. Table (1) illustrate trade and common names and rate of application of the studied chemicals.

**Table 1.** insecticides and botanical oils with their trade name, active ingredient and rate of application.

Trade Name	Common Name	Rate / L Water
Actara	Thiamethoxam	100 cm / 100L
Confidor 20% SL	Imidacloprid	30 cm / 100L
Mospilan 20 SP	Acetamiprid	25gm./100 L
Lemon oil	lemon oil	5cm/ 1 L.
Garlic Oil extraction	Garlic Oil extraction	Garlic Oil extraction
Rosemarie oil	rosemarie oil	5cm/ 1 L.

### Statistical Analysis

Reduction percentages were calculated according to Henderson and Tilton equation (1955). The treatments were compared with each other using one-way ANOVA with LSD 0.05 (SAS Statistical Software, 2000).

## RESULTS AND DISCUSSION

### Population Density of Pests Infesting Cucumber Plant *Cucumis sativus* L.:

Statistical analysis of the data in Table (2) showed a significant difference between the weekly mean number of the pests under investigation, whereas the F values were 18.52\*\*\* & 22.15\*\*\* and L.S.D. = 21.16 & 18.00 individuals for two successive years, respectively. *Bemisia tabaci* (Genn.) was the most pests found in cucumber plants in two seasons

#### *Bemisia tabaci*:

Data in figure (1) revealed that the total mean of *B. tabaci* (nymph) was higher during 2020 (215.08) than 2019 (276.33), respectively.

In the first season 2019, the mean number of *B. tabaci* nymph was high from the first week of inspection after that fluctuated to increase gradually and recorded four peaks on 7<sup>th</sup> of October, 28<sup>th</sup> of Oct., 18<sup>th</sup> of November and 9<sup>th</sup> of December and with mean numbers 189, 350, 390 and 392 nymphs /10 leaves, respectively.

In the second season **2020**, the population density of *B. tabaci* nymph started also appear from the first week and recorded three peaks on 14<sup>th</sup> of October, 28<sup>th</sup> of October and 9<sup>th</sup> of December with mean numbers 377, 379 and 421 nymph/ 10 leaves, respectively.

#### *Liriomyza bryonae*:

Data in figure (1) that the total mean of *L. bryonae* (larvae) was higher during 2019 (22.17) than 2020 (21.58), respectively.

In the first season 2019, the mean number of *L. bryonae* started also appear from the first week recorded three peaks on 21<sup>st</sup> of October, 4<sup>th</sup> of November and 25<sup>th</sup> of December and with mean numbers 32, 36 and 45 larvae /10 leaves, respectively.

In the second season 2020, the population density of *L. bryonae* was found also appear from the first week and recorded three peaks on 7<sup>th</sup> of October, 28<sup>th</sup> of October and 2<sup>nd</sup> of December and with mean numbers 31, 44 and 22 larvae /10 leaves, respectively.

#### *Dacus ciliates*:

Data revealed that the total mean of *Dacus ciliates* (larvae) was higher during 2020 (9.00) than 2019 (3.25), respectively Fig. (1).

The pest found on fruits indicated a rare number in the first season but in the second season, it increases the number to record two peaks on 18<sup>th</sup> of October and 2<sup>nd</sup> of December with mean numbers 22 and 47 larvae /10 leaves, respectively.

#### *Tetranychus urticae*:

Data revealed that the total mean of *T. urticae* (movable stage) was higher during 2019 (30.58) than 2020 (25.83), respectively Fig. (1).

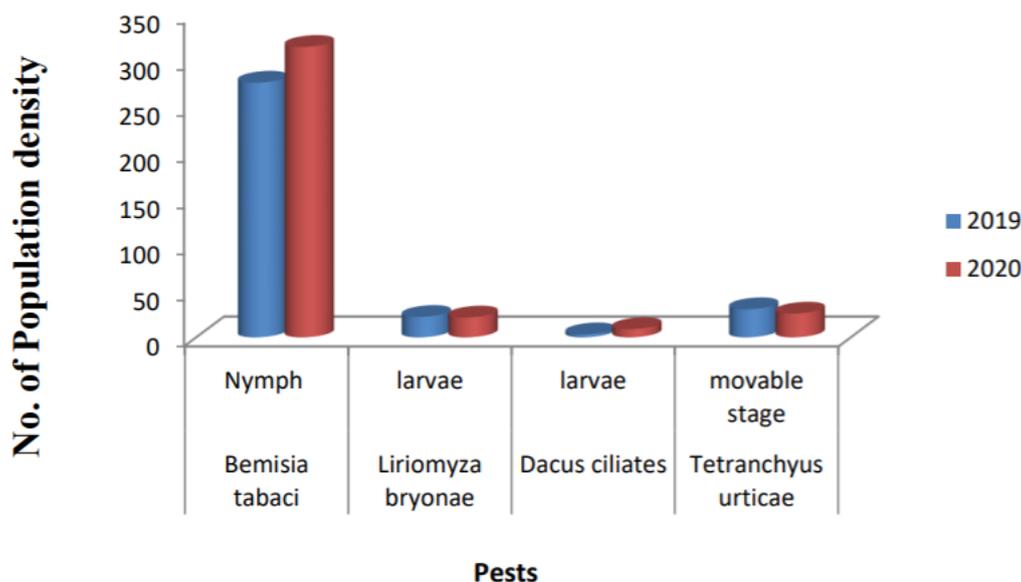
In the first season 2019, the mean number of *T. urticae* started also appear from the third week recorded three peaks on 21<sup>st</sup> of October, 18<sup>th</sup> of November and 9<sup>th</sup> of December and with mean numbers 41, 98 and 21 larvae /10 leaves, respectively.

In the second season 2020, the population density of *T. urticae* found also appear from the second week and recorded two peaks on 14<sup>th</sup> of October and 18<sup>th</sup> of October and with mean numbers 41 and 93 movable stage /10 leaves, respectively.

**Table 2:** Population density of some pests infesting cucumber plant on the greenhouse at Giza governorate during winter plantation 2019/2020.

Investigation Date	2019				2020			
	<i>Bemisia tabaci</i>	<i>Liriomyza bryonae</i>	<i>Dacus ciliates</i>	<i>Tetranychus urticae</i>	<i>Bemisia tabaci</i>	<i>Liriomyza bryonae</i>	<i>Dacus ciliates</i>	<i>Tetranychus urticae</i>
	Nymph	Larvae	Larvae	movable stage	Nymph	Larvae	Larvae	movable stage
23/9/	120	6	0	0	187	21	0	0
30/9	144	12	0	0	222	28	0	12
7/10/	189	17	0	5	345	31	0	17
14/10/	188	19	0	22	377	20	0	41
21/10/	241	32	0	41	210	29	0	23
28/10/	350	20	0	12	376	44	0	10
4/11/	345	36	0	18	310	32	0	11
11/11/	304	17	0	55	296	0	0	43
18/11/	390	20	0	98	310	0	22	90
25/11/	343	45	9	87	347	15	17	53
2/12/	310	32	12	8	380	22	47	10
9/12/	392	10	18	21	421	17	22	0
<b>Total</b>	<b>3316</b>	<b>266</b>	<b>39</b>	<b>367</b>	<b>3781</b>	<b>259</b>	<b>108</b>	<b>310</b>
<b>Mean</b>	<b>276.33 A</b>	<b>22.17 B</b>	<b>3.25 C</b>	<b>30.58 B</b>	<b>315.08 A</b>	<b>21.58</b>	<b>9.00 C</b>	<b>25.83B B</b>

F value between pests first seasons = 18.52\*\*\* sig. at 0.0001 L.S.D. = 21.16 individuals/ 240 leaves  
 F value between pests second season = 22.15\*\*\* sig. at 0.0001 L.S.D. = 18.00 individuals/ 240 leaves

**Fig. 1:** Population density of some pests infesting cucumber plant at the greenhouse on Giza governorate during winter plantation 2019/2020

These results agreed with others obtained by Rizk *et al.* (1990), Abou El-Saad (1998), Kamel *et al.* (2000), Gamieh & El-Basouny (2001), Ibrahim *et al.* (2001), El-Duweini *et al.* (2003), Abou-Attia *et al.* (2004), Omar *et al.* (2004), Taha *et al.* (2004) and Hegab *et al.* (2005).

#### The Efficiency of Some Treatments for The Population Density on *B. tabaci*:

Evaluating the efficacy of some chemical insecticides and botanical oils that were sprayed against sap-sucking pests, the whitefly, *Bemisia tabaci*, on Cucumber (*Cucumis sativus L*) in the greenhouse. The results revealed that there were significant differences between using three systemic insecticides and three botanical oils on the population density of *B. tabaci*, cucumber plants were received two sprays of each tested treatment during the experimental period.

Statistically, the percentage of reduction in *B. tabaci* counts between mentioned treatments was significant, whereas F value = 7.00\*\* and L.S.D. = 1.96 during first spray and F value = 5.97\*\* and L.S.D. = 2.33 for the second spray. Also the general means of reduction of two sprays, it is clear that Mospilan 20 SP (96%) appeared as the highly mortality one in reducing rate of *B. tabaci* members followed significantly by Rosemarie oil (94.67%), Confidor 20% SL (93%), Garlic oil (92%), Actara (86%) and the lowest one Lemon oil (81.33%), respectively (Fig. 2).

Data in Table (3) in the First spray of tested indicated that the gradual reduction percentages of whitefly *Bemisia tabaci* numbers as a result highly significant differences between the six treatments tested these treatments could be divided into five groups. it is clear that the six treatments can be arranged in descending orders as follows: Mospilan 20 SP, showing highly mortality with a mean reduction of 100%, The second, third and fourth groups contained Actara, Confidor 20% SL, Garlic oil, and Rosemarie oil 95.67%, 94.67%, 90.0% and 87.33, respectively. The fifth group was lemon oil showing a lower effect of 77.33%.

As the same results in the second spray, the six treatments tested these treatments could be divided into four groups. it is clear that the six treatments can be arranged in descending orders as follows: Mospilan 20 SP, showing highly mortality with a mean reduction of 96%, The second and third groups contained Rosemarie oil, Confidor 20% SL, Garlic oil, and Actara 94.67%, 93.00%, 92.00% and 86.00, respectively. The fourth group was lemon oil showing a lower effect of 81.33%.

**Table. 3:** Corrected mortality % of *Bemisia tabaci* members treated with tested control agents at first and second spray of cucumber plant on the greenhouse at Giza Governorate during 2019/2020.

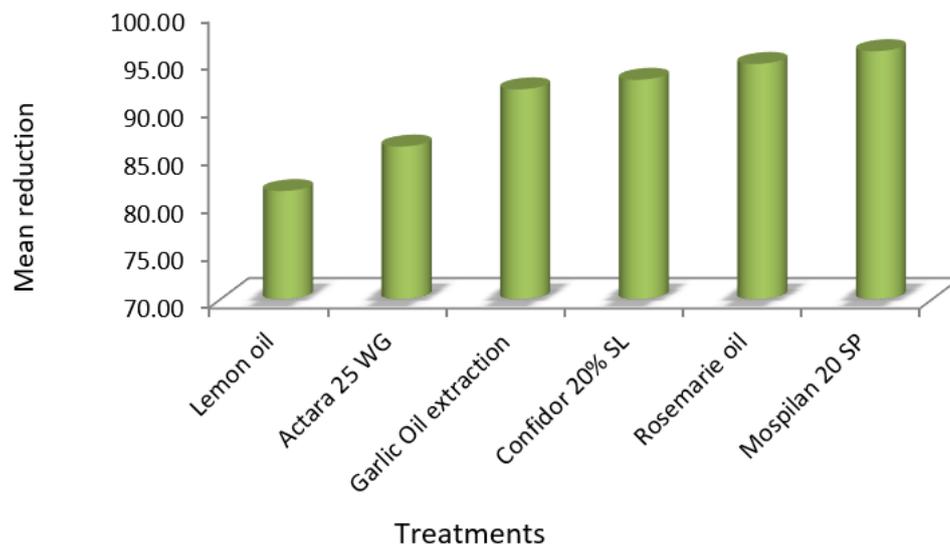
Treatments	Pre-treat.	Initial	Residual effect (reduction % after spraying)			
		After 24 hours	After 3 Days	After 7 Days	After 10 Days	mean
Lemon oil	172	33	52	88	92	77.33 E
Garlic Oil extraction	177	42	79	91	100	90.00 C
Rosemarie oil	189	40	77	90	95	87.33 D
Actara 25 WG	180	50	87	100	100	95.67 B
Confidor 20% SL	174	60	84	100	100	94.67 B
Mospilan 20 SP	191	75	100	100	100	100.00 A
Control	188	--	--	--	--	--
Lemon oil	300	37	55	89	100	81.33 D
Garlic Oil extraction	324	51	81	95	100	92.00 B
Rosemarie oil	289	42	89	95	100	94.67 A
Actara 25 WG	271	58	66	92	100	86.00 C
Confidor 20% SL	295	61	79	100	100	93.00 B
Mospilan 20 SP	288	78	88	100	100	96.00 A
control	294	--	--	--	--	--

F value of first spray = 7.00\*\*

L.S.D. = 1.96

F value of second spray = 5.97\*\*

L.S.D. = 2.33



**Fig.2.** General mean mortality % of *Bemisia tabaci* members treated with tested six treatment of cucumber plant on the greenhouse at Giza Governorate during 2019/2020.

The results are in agreement with those obtained by Vimala *et al.* (1999), Abbassey *et al.* (2009), Shalaby (2004), Akram *et al.* (2010), Maha (2011), Ahmed *et al.* (2014), Qamar *et al.* (2016) and Ismail (2020).

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### ARABIC SUMMARY

الكثافة العددية وتقييم بعض طرق المكافحة المختلفه لبعض آفات الخيار تحت ظروف الصوب

منى إبراهيم عمار وعصام على محمد موسى وجمال محمد محمود عبد اللطيف  
معهد بحوث وقاية النباتات - مركز البحوث الزراعية- الدقي - الجيزة - مصر

تمت دراسة الكثافة العددية لبعض الآفات في الموسم الشتوية لنبات الخيار *Cucumis sativus* L. لموسمي 2019 و 2020 تحت الصوب بمحافظة الجيزة ، مصر. وأظهر اختلافا كبيرا بين متوسط العدد الأسبوعي للآفات محل الدراسة. كانت *Bemisia tabaci* (Genn.) أكثر الآفات تواجداً علي نبات الخيار في موسمين الدراسة. ثم تم تقييم فاعلية بعض المبيدات الحشرية الكيميائية والزيوت النباتية التي تم رشها ضد الذبابة البيضاء *B. tabaci* على نبات الخيار في الصوب الزراعية. أوضحت النتائج وجود فروق معنوية بين استخدام ثلاثة مبيدات حشرية جهازية وثلاثة زيوت نباتية على الكثافة العددية لذبابة البيضاء حيث تم رشتين متتاليتين من كل معاملة مختبرة خلال فترة التجربة. وأظهرت النتائج وجود علاقة معنوية بين المعاملات و اعداد الذبابة البيضاء ، حيث سجلت قيمة  $F = 7.00$  \* و  $L.S.D. = 1.96$  أثناء الرش الأول وقيمة  $F = 5.97$  \* و  $L.S.D. = 2.33$  للرش الثانية. ولقد اعطا مبيد موسيبلان (96 SP) 20% (أعلى كفاءة في خفض لحوريات الذبابة البيضاء *B. tabaci* يليه زيت الروزماري 94.67%) ، يليه مبيد الكنفادور 20% SL 93% ، ثم زيت الثوم (92%) ، يليه مبيد أكتارا (86%) وكان زيت ليمون أقل كفاءة في نسبة خفض (81.33%) على التوالي.