Evaluation of Some Natural Insecticides Against Some Insects Infesting Cucumber and Their Predatory Insect (*Syrphus Corollae* F.) in The Field

Salwa,A.Shehata; Mona,A.Abd El-Latief and Hamdy K. Abou-Taleb

Plant Protection Research Institute, Sabahia, Alexandria, Egypt

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ABSTRACT

Field experiments were carried out during 2007 and 2008 fall seasons to evaluate the efficiency of some natural control agents against some insect pests infesting cucumber plants at Alexandria University Experimental Station. The side effects of these control agents against the predatory insect, Syrphus corollae F. were also investigated. In both seasons Confidor, Achook and Runner were the most effective in reducing aphid (Aphis gossypii ,Glov) and whitefly(*Bemisia tabaci* (Genn.)) numbers .Chema oil, Botany guard and Breef recorded the least reduction percentages. Runner revealed the highest leaf miners control in both seasons. On the other hand, in both seasons, Confidor proved to be the most toxic against *S, corollae* followed by Runner, Achook and Chema oil. Botany guard and Breef had the least side effects against *S. corollae* in both seasons.

Key words: control, natural insecticides, whitefly, aphids, beafminers, syrphid fly and cucumber.

INTRODUCTION

Cucumber (*Cucumis sativus* L.) is considered one of the most infested horticultural crops by insect pests. Whitefly, *Bemisia tabaci* (Genn.), aphid, *Aphis gosypii*(Glov.), and leaf miners such as *Liriomyza trifolii* Burgess are the most common insects attacking cucumber leaves. The infestation by these insects causes either direct damage by sucking the plant sap or indirect damage by transmitting virus diseases (Hammad and Abd EL-Salam,1967;Hill,1983;Omer *et al.*, 1992).

Prevention of economic losses requires knowledge of the most effective and safe compounds that can be used for pest control. Intensive researches have been carried out in recent years for evaluating novel insecticides that have new modes of action. Insect growth regulators and Chloronicotinyl insecticides were used successfully to control several homopterous insects (De Cock *et al.*, 1990; Leicht, 1993; Elbert *et al.*, 1998). Some plant oil extracts such as neem oil (Warthern, 1979) and the aromatic compounds in some fruit trees such as citrus (Moussa, 2005) have a repellent action to insects. On the other hand, biopesticides based on microbial agents such as fungus are generally capable of penetrating the insect cuticle directly and infect the insects (Oudejans, 1991).

All the previous insecticide categories have a wide array of modes of action and have selectivity to target insects, they represent an exiting opportunity for the effective control of many insect pests. The present study was initiated to evaluate six of these novel insecticides against some insects on cucumber plants in the field (whitefly, aphid, leafminers and the predatory insect, *Syrphus corollae*,F.).

MATERIALS AND METHODS

Field experiment:

This experiment was carried out during the two successive fall seasons of 2007 and 2008 at the Experimental Station Farm (Abies) of the Faculty of Agriculture, Alexandria University, Alex. , Egypt.

Seeds of "Beta Alpha" cultivar of cucumber were sown in 7 and 13 of August 2007 and 2008, respectively. In each experiment, a randomized complete blocks design (R.C.B.D.), with three replicates (42 m^2 each), was used. Each plot consisted of 6 rows;5m long and 100cm wide; and the plants were allowed to grow at 50cm spacings area. The insecticides were sprayed by Knapsack sprayer equipment (CP_3) at a rate of 100 liters per faddan in 4 and 12 of September, at 2007 and 2008 seasons, respectively. Control plots were sprayed only by tap water.

The different evaluated insecticides; trade names, common names and rates used in this study are presented in Table (1) .

The efficiency of tested products was recorded by counting numbers of target insects (Aphid individuals, Whitefly larvae and pupae and Leaf miner larvae) on the lower surface of ten cucumber leaves per each replicate. Pre-and post-treatment counts were done in early morning. Cucumber leaves were collected in paper bags and transmitted to the laboratory for insect counting. The insects were counted using a stereoscopic microscope. Inspections were done before and after 1,3,5 and 7 days from application. Reduction percentages were calculated according to Henderson and Tilton equation (1955).

Table 1: Trade ,common names and rates of the tested insecticides

Trade name	Common name	Rate / 100 liter water
Runner 24%SC	Methoxyfenozide	200 ml
Confidor 35%SC	Imidacloprid	300 ml
Achook 0.15%EC	Neem oil	200 ml
Botany guard 100%SC	*Baeuveria bassiana*	250 ml
Chema oil 95%EC	Mineral oil	1500 ml
Breef	Orange oil	500 ml

The statistical analyses of all the recorded data were conducted by the standard method of the randomized complete blocks design as illustrated by Steel and Torrie (1980), using Co-Stat Statistical Software (1990), computer program for statistics. The least significant difference test (L.S.D.) was used to test the significance of the differences between means. Treatments were compared with each other using one way ANOVA with $LSD_{0.05}$.

RESULTS AND DISCUSSION

The occurrence of different insects after applications were recorded in Tables from 2 to 9 as reduction percentages for both seasons of 2007 and 2008.

Aphid (*Aphis gossypii* (Glov.)):

Data presented in Tables (2 and 3) show the reduction percentages recorded with different tested insecticides in 2007 and 2008 seasons. The data revealed that the reduction percentages for the most insecticides increased gradually after applications till 7-days post-treatment. Confidor, Achook and Runner were the most effective in reducing aphid numbers with means of reduction percentages 97.1, 97.5 & 97.4 in 2007 and 97.3, 95.9 & 97.1 in 2008, respectively. The mineral oil Chema oil achieved 83.7 and 83.9% reduction of aphid numbers in 2007 and 2008, respectively. Botany guard and Breef achieved the least aphid reduction percentages of 73.2 and 70.5% in 2007 and 76.6 and 73% in 2008, respectively.

Kraus *et al.* (1981) and Lee *et al.* (1991) reported that neem oil contains effective compounds against insect pests either as antifeedant or as insect growth regulator that lead gradually to the death of treated insects. The same gradual increasing in reduction percentages of aphid numbers was recorded with the nicotinic acetylcholine receptor agonist Confidor, which was slightly potent on days 7 and 14 after application as recorded by Motohiro and Casida (2003) and Horowitz *et al.*, (1998). Beside the direct lethal effects of Chema oil, it seemed to interfere with the feeding activity as it coats the leaf surface of the treated plants and after aphid feeding behavior (Bell, 1980). Results obtained in this study were disagreed with the data recorded by Abd EL-Salam (2000). He recorded a gradual effect of KZ oil (mineral oil), but in a decreasing manner started from 2-days till 14-days post-treatment. The inhibitory effect of Runner was previously recorded as it acts as an insect growth regulator or chitin inhibitor when it was used against several homopteran insects specially aphids (De Cock *et al.*, 1990). Results obtained with Runner reflect its long term effects. Botany guard is known to be a formulation contains *Beauveria bassiana* spores which germinate on the insect integument and penetrate into the body cavity then multiply inside the insect producing lethal metabolites and the mortality occur 5-10 days after exposure (Kadir and Barlow, 1992). The orange fruit oil Breef is a repellent volatile oil which leads to insect starvation and then the death of pest (Moussa, 2005).

Table 2: Reduction percentages of aphid numbers on cucumber after treatment with different control agents (2007)

Treatments	%Reduction				Mean
	1-day	3-days	5-days	7-days	
Botany guard	66.2	68.3	76.6	81.6	73.2 c
Breef	53.8	64.3	83.5	80.2	70.5 c
Chema oil	72.4	84.5	90.5	87.3	83.7 b
Confidor	94.8	95.4	98.3	99.8	97.1 a
Achook	97.9	98.7	98.1	95.4	97.5 a
Runner	99.7	95.7	99.5	94.7	97.4 a

Means followed by the same alphabetical letter(s) do not significantly differ, using LSD test at 0.05 level of probability.

Table 3: Reduction percentages of aphid numbers on cucumber after treatment with different control agents (2008)

Treatments	%Reduction				Mean
	1-day	3-days	5-days	7-days	
Botany guard	70.2	75.7	77.4	83.2	76.6 c
Breef	60.7	69.8	78.5	83.1	73.0 c
Chema oil	75.3	81.2	88.7	90.4	83.9 b
Confidor	95.4	98.2	98.5	97.2	97.3 a
Achook	92.2	95.1	98.4	97.8	95.9 a
Runner	94.3	96.1	98.2	99.8	97.1 a

Means followed by the same alphabetical letter(s) do not significantly differ, using LSD test at 0.05 level of probability.

Whiteflies (*Bemisia tabaci* Genn.):

Gradual reduction percentages of whitefly numbers as a result of treatment by different insecticides were recorded in both seasons 2007 and 2008 (Tables 4 and 5). Confidor, Achook and Runner recorded the highest reduction percentages of whitefly numbers. Chema oil, Botany guard and Breef recorded the least reduction percentages. In 2007 season, the mean reduction in percentages of whiteflies were 90.2, 88.2, 84.1, 80.9, 78.5 and 61.1 for Confidor®, Runner, Achook, Chema oil, Botany guard and Breef, respectively. Whereas reduction percentages of whiteflies were 95.2, 90.4, 86.0, 83.0, 78.1 and 68.3 for Confidor, Runner, Achook, Chema oil, Botany guard and Breef, respectively, in 2008 season .These results are comparable with the results of many authors. El Bessomy (2003) reported that Confidor gave good reduction percentages against whitefly larvae after 84 hrs of application. Also, the results obtained with Chema oil in the present study are in agreement with that obtained by El Bessomy (2003), when using KZ mineral oil. On the other hand, Al Rubeai *et al.* (2004) and Nousseir (2001) recorded that neem oil effectively controlled whiteflies infesting tomato plants . In respect with *B. bassiana*, Yousri *et al.* (1995) recorded a gradual reduction of whitefly population in tomato fields from 1-day to the 7-day after application of Naturalis® (*B. bassiana*) which in accordance with the recorded results in the present study.

Leafminers:

Impact of Confidor, Runner, Achook, Botany guard, Chema oil and Breef against leaf miners on cucumber plants is presented in Tables (6 and 7). Runner revealed the highest leaf miner control in both seasons with means of reduction percentages 80.6 and 83.1 in 2007 and 2008 seasons, respectively. At the same time Confidor, Achook, Chema oil and Breef achieved 64.2, 67.9, 63.2 & 57.3% reduction in leaf miner numbers in 2007 season, respectively, and 69.9, 69.2, 69.5 & 60.8% reduction in leaf miner numbers in 2008 season, respectively. Botany guard showed the least effective leaf miner control with means of reduction percentages 30.2 and 32.9 in 2007 and 2008 seasons, respectively.

Being the leaf miner larvae live and feed inside the plant leaves, which may gave them an ability to protect themselves, somehow, from the sprayed insecticides. Botany guard, Chema oil and Achook revealed low action against leaf miners due to the very small chance to reach and contact with the larvae through stomata on the plant leaves. Achook and Breef are known to act through insects chemoreceptors to deter their feeding (Jacobson,

Table 4: Reduction percentages of whitefly numbers on cucumber after treatment with different control agents (2007

Treatments	%Reduction				Mean
	1-day	3-days	5-days	7-days	
Botany guard	70.4	78.3	80.2	84.9	78.5 c
Breef	50.3	55.4	67.2	71.6	61.1 d
Chema oil	73.4	81.5	83.5	85.1	80.9 bc
Confidor	85.1	90.4	92.5	92.7	90.2 a
Achook	80.1	84.3	86.1	85.8	84.1 b
Runner	78.2	88.5	93.4	92.8	88.2 a

Means followed by the same alphabetical letter(s) do not significantly differ, using LSD test at 0.05 level of probability.

Table 5: Reduction percentages of whitefly numbers on cucumber after treatment with different control agents (2008)

Treatments	%Reduction				Mean
	1-day	3-days	5-days	7-days	
Botany guard	68.0	75.3	82.5	86.4	78.1 d
Breef	60.2	66.4	71.6	75.1	68.3 e
Chema oil	78.3	82.4	85.6	85.7	83.0 c
Confidor	92.4	94.3	97.2	96.8	95.2 a
Achook	82.1	85.7	87.4	88.9	86.0 c
Runner	84.3	87.4	94.3	95.7	90.4 b

Means followed by the same alphabetical letter(s) do not significantly differ, using LSD test at 0.05 level of probability.

Table 6: Reduction percentages of leaf miner numbers on cucumber after treatment with different control agents (2007)

Treatments	%Reduction				Mean
	1-day	3-days	5-days	7-days	
Botany guard	15.4	32.8	35.2	37.5	30.2 e
Breef	40.3	55.4	65.3	68.2	57.3 d
Chema oil	51.7	60.5	70.2	74.4	63.2 c
Confidor	45.5	65.8	72.1	73.5	64.2 bc
Achook	40.5	70.1	78.3	82.5	67.9 b
Runner	70.3	78.2	85.3	88.4	80.6 a

Means followed by the same alphabetical letter(s) do not significantly differ, using LSD test at 0.05 level of probability.

Table 7: Reduction percentages of leaf miner numbers on cucumber after treatment with different control agents (2008).

Treatments	%Reduction				Mean
	1-day	3-days	5-days	7-days	
Botany guard	20.3	33.2	38.0	40.1	32.9 d
Breef	50.4	56.1	65.3	71.2	60.8 c
Chema oil	61.3	68.7	74.5	73.4	69.5 b
Confidor	52.4	70.3	78.2	78.5	69.9 b
Achook	48.4	69.1	79.3	80.0	69.2 b
Runner	73.5	82.8	87.9	88.2	83.1 a

Means followed by the same alphabetical letter(s) do not significantly differ, using LSD test at 0.05 level of probability.

1989; Mordue and Blackwell, 1993), therefore, there was a need to contact with the larvae. On the other hand, results obtained with Confidor in this study are in contradiction with the results obtained by Nilima *et al.* (1997). They mentioned that Confidor was highly effective against phloem feeder insects.

Syrphus corollae F:

When the integration between the natural enemies (such as *S. corollae*) and the chemical control is required, the impact of these chemical insecticides on the natural enemies must be studied. Therefore, the effects of the tested insecticides against the predatory insect, *S. corollae* in 2007 and 2008 seasons were presented in Tables (8and 9). It is clear that, in both seasons, Confidor proved to be the most toxic against *S. corollae* followed by Runner, Achook and Chema oil. Botany guard and Breef had the least effects against *S. corollae* in both seasons. In 2007 season, the means of reduction percentages of *S. corollae* caused by Confidor, Runner, Achook, Chema oil, Botany guard and Breef were 55.3, 46.6, 37.1, 30.4, 10.9 and 13.6%, respectively. These means of reduction percentages were 61.7, 44.2, 36.0, 35.6, 13.4 and 11.1%, respectively, in season 2008.

Results obtained in the present study were comparable in part with the results of many authors

Table 8: Reduction percentages of *S.corollae* numbers on cucumber after treatment with different control agents (2007)

Treatments	%Reduction				Mean
	1-day	3-days	5-days	7-days	
Botany guard	9.7	11.2	11.2	11.5	10.9 e
Breef	13.4	14.2	13.3	13.6	13.6 e
Chema oil	25.0	30.7	32.8	33.1	30.4 d
Confidor	52.4	55.6	55.9	57.4	55.3 a
Achook	33.5	35.4	40.2	39.3	37.1 c
Runner	40.1	44.0	50.7	51.5	46.6 b

Means followed by the same alphabetical letter(s) do not significantly differ, using LSD test at 0.05 level of probability.

Table 9: Reduction percentages of *S. corollae* numbers on cucumber after treatment with different control agents (2008):

Treatments	%Reduction				Mean
	1-day	3-days	5-days	7-days	
Botany guard	12.1	12.7	14.2	14.7	13.4 d
Breef	10.5	10.9	11.3	11.8	11.1 d
Chema oil	32.9	35.0	37.3	37.2	35.6 c
Confidor	55.4	60.3	64.2	66.7	61.7 a
Achook	30.1	35.6	38.3	39.9	36.0 c
Runner	41.0	43.4	44.5	47.8	44.2 b

Means followed by the same alphabetical letter(s) do not significantly differ, using LSD test at 0.05 level of probability.

. While, Schmutterer (1997) stated that larvae of syrphid flies seem to be more sensitive to neem products than other predators, Eisenlohr *et al.* (1992) reported that the numbers of syrphid larvae was not affected in the field after spraying of Neemazal-F on peach trees. In respect with Botany guard (*B. bassiana*) Wright and Knauf (1994) illustrated that this fungus does not affect the natural enemies.

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الملخص العربي

تقييم بعض المبيدات الطبيعية ضد بعض الحشرات التي تصيب الخيار وأعدائها الطبيعية فى الحقل

سلوى احمد شحاتة ــ منى السيد عبد اللطيف ــ حمدي قطب أبو طالب

معهد بحوث وقاية النبات-الصبحية-مركز البحوث الزراعية

أجريت تجربة حقلية خلال موسمين خريفيين لأعوام ٢٠٠٧ و ٢٠٠٨ فى محطة البحوث الزراعية بأبيس و التابعة لكلية الزراعة – جامعة الإسكندرية ، و ذلك لتقييم فاعلية بعض عوامل المكافحة الطبيعية تجاه بعض الآفات الحشرية التي تصيب نباتات الخيار،كما تم دراسة الآثار الجانبية لهذه العوامل ضد الحشرات المفترسة (ذبابة السرفس) .أوضحت النتائج بصفة عامة في كلا الموسمين أن كل من المبيدات كونفيدور ،أشوك و رانر كانت الأكثر فاعلية في خفض تعداد المن ، في حين ان كل من المبيدات كونفيدور و اشوك و رانر سجلوا نسبة خفض عالية في إعداد الذبابة البيضاء ، إما بالنسبة إلى المبيدات كيما اويل و بوتانى جارد و بريف قد سجلت اقل نسبة خفض .و قد أوضحت النتائج أيضا أن مبيد رانر أعطى اعلي إبادة لنفاقات الأوراق خلال الموسمين .ومن ناحية أخرى فقد أظهرت النتائج ان مبيد كونفيدور كان الأعلى سمية ضد المفترس (ذبابة السرفس) تبعه بعد ذلك رانر ثم اشوك و كيما اويل في كلا الموسمين .اما بالنسبة لكل من بوتانى جارد و بريف فقد اظهرا اقل آثارا جانبية على ذبابة السرفس في كلا الموسمين .