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EFFECT OF FOUR NEW DEVELOPED COMPOUNDS UPON APHID SPECIES IN SUMMER CULTIVATION OF CANTALOUPE PLANTS, IN NOBARIEA REGION, BEHAIRA-GOVERNORATE, EGYPT

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ABSTRACT: ***The present field study was conducted at the Agriculture Experimental Farm of El-Nobaria Research Satation, El-Beheira Governorate, during the subsequent growing seasons of 2005 and 2006. Two chemical compounds were evaluated to be involved in the IPM program for managing and controlling the main aphid species of cantaloupe plants Aphis gossypii (Glov.) and Myzus percicae (sulz.) (Homoptera: Aphididae), i.e, thiamethoxam (Actara)®; and pymetrozine (Chess)®; and two plant natural products Azadirachtin (Achook)® and soyabean oil (Natural oil®). The obtained results showed that thiamethoxam (Actara)® was proved to be the highly efficient tested chemical against aphids and gave a high average rate of reduction comprised 78.29% & 81.38 after 30 days post-application of 1st &2nd sprays during the summer season of 2005, followed by soyabean oil (Natural oil®) 63.74% &76.00%, respectively. Pymetrozine (69.37%) and azadirachtin (53.45%)were less efficient. Similary in summer season of 2006, the high toxic efficiency on aphids was also detected for thiamethoxam (Actara)® and soyabean (Natural oil)® after the 1st application and gave a merely similar high average rate of reduction comprised 76.74% and 76.40%, respectively. But, following the 2nd application of same tested chemicals, pymetrozine (Chess)® showed comparative and significant efficiency against the retreated aphids, followed by thiamethoxam (Actara)®, soyabean oil (Natural oil)® and the least efficient azadirachtin (Achook).® Whereas, the significant residual value of pymetrozine (Chess)® after 10 days post treatment was 74.36%, compared to each of the tested compounds, thiamethoxam (Actara)® (71.99%), soyabean oil (Natural oil)® (62.51%) and azddirachtin (Achook)® (53.94%).***

Key Words*: Aphids, thiamethoxam (Actara), pymetrozine (Chess), azadirachtin (Achook), soyabean oil (Natural oil), control.*

INTRODUCTION

Cantaloupe, *Cucumis melo* Family, Cucurbitaceae is one of the most important economic cucurbitaceaous vegetables cultivated in Egypt, in both the open field and greenhouses agro-ecosystem. Therefore, in recent time, the cultivated area with cantaloupe is increased especially in the new reclaimed areas. Cantaloupe plants are liable to infestation by many phytophagous pests of which the sap-sucking aphids, mainly *Aphis gossypii* (Glover) and *Myzus percicae* (Sulz.)… etc., are considered the most injurious economic insect pests that cause serious damage to the growing plants and great reduction in the final yield. Moreover, these aphid species are also virulent and diseases transmitter of several viral diseases (Yamamoto, 1986; Fujisawa, Iizuka, 1985, Hegab and Ola, and Hegab (2008).

During the second half of the last century, the extensive and unwise use of chemical pesticides led to plenty of environmental pollution problems related to the ecosystem, mainly to fish, domestic animals, welfare and human. In recent times the production of insecticide free vegetables and fruits is a main target to avoid human health problems.

So, intensive search works is devoted to attain a new line of developed pesticides, bio-pesticides and naturally occurring phytochemicals which can be safety used to control such pests without causing any drastic side effects upon the beneficial insects (Stepnens, 1997).

Amongst, thiamethoxam (Actara)® has been used for controlling many sucking insects; lepidopterous, cleopterous and dipterous insect-pests, at application rates from 10 to 200g/ha. Major crops for foliar and soil treatments are: leafy and fruity vegetables, deciduous fruit tress, citrus and most of field crops. Also, thiamethoxam is being used for controlling numerous veterinarian and medicinal files.

Pymetrozine (Chess®) is an insecticide with a new mode of action, representing a novel type of chemistry (pyridine azomethines). It is highly active against susceptible and resistant aphids and whiteflies in vegetables and other crops.

The insecticidal effects of agents naturally produced by plants has been conducted for many years. Such botanical insecticides may be readily biodegraded. Therefore, they are less likely to contaminate the environment and less toxic to mammals. One of these mentioned plant materials containing naturally active ingredients is the neem seeds, *Azadirachta indica*, A. juss, (Mansour and Ascher 1983; Meisner et al., 1986 and 1987; Dreyer, 1991; Harbant and Korpraditskul, 1999; Madanlar et al., 2002; Kumar and Singh, 2004 and Goncalves and Bleicher, 2006).

Neem has deterrent, anti-ovipositional, antifeedant, growth disrupting (growth regulating), fecundity-and fitness – reducing properties on insect

(Mordue and Blackwell. 1993). In this study, the compound "Achook"® which is the principal insecticidal ingredient of neem seed exracts has been used. Neem seed extracts also contain a variety of lemonoids, such as nimbolide, nimbin and salannin.

Moreover, there are few researches used the soyabean oil " Natural oil ®" for controlling the piercing and sucking insect – pests (Butler and Henneberry, 1991; El-Sebae et al., 1997; Amer et al., 2001; Paula and Bleicher, 2003).

Therefore, the present work has been conducted to evaluate four new developed compounds to be possible new approaches in the Integrated Pest Management (IPM) to control and prevent the probably occurring injurious damage of aphids on growing cantaloupe plants under the prevailing conditions in open field and protected cultivations; hoping the attainment of new promisable results that can add a new beam of light towords the Integrated pest management of occurring aphids on cantaloupe plants.

MATERIALS AND METHODS

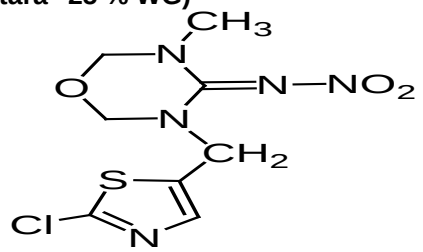
Field experiments of summer seasons of 2005 and 2006

Field trials were conducted for studying the occurring aphids on growing cantaloupe plants, (*Cucumis melo* L., var. *Ananas dokki*) during the consequent summer seasons of 2005 and 2006 at the Agricultural Experimental Farm of Nubaria Station, El-Behaira Governorate.

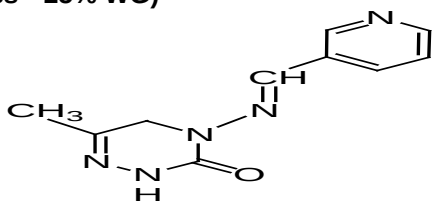
For carried out the summer field experiments, an area of about 300 m^2 was chosen, at Nubaria Experimental Farm, which has been divided into plots each of about 24 m^2 (6 x 4 m). Seeds were sown at a distance of 40-50 cm between hills in beds 1 m in width; 60 cm apart in between. The germinated plants were arranged in one row along the bed. Thereafter, the growing plants were kept under low tunnels. The experimental procedure and treatmental schedules were carried out according to the usual and recommended normal agriculture practices.

- Chemicalcals used

Thiamethoxam (Actara® 25 % WG)

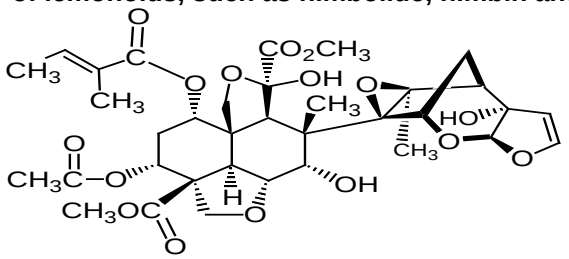


Chemical group: Neonicotinoids
IRAC: 4A
IUPAC name: 3-(2-chloro-1,3-thiazol-5-ylmethyl)-5-methyl-1, 3, 5-oxadiazinan-4-ylidene (nitro) amine.
Biochemistry: Agonist of the nicotinic acetylcholine receptor, affecting the synapses in the insect central nervous system.
Pymetrozine (Chess® 25% WG)



Chemical group: Triazines
IRAC: 9B; selective feeding blocker
IUPAC name: *E*)-4, 5-dihydro-6-methyl-4-(3-pyridylmethyleneamino) -1,2,4-triazin-3(2*H*)-one
Biochemistry: Novel, unidentified biochemistry.

Azadirachtin (Achook® 0.15% EC)
Azadirachtin is the principal insecticidal ingredient of neem seed extracts (extracted from the neem tree, *Azadirachta indica*.); these extracts also contain a variety of lemonoids, such as nimbolide, nimbin and salannin.



Chemical group: Terpenoids
IRAC: 26
IUPAC name: dimethyl (3*S*,3a*R*,4*S*,5*S*,5a*R*,5a^{1}*R*,7a*S*,8*R*,10*S*,10a*S*)-8-acetoxy-3,3a,4,5,5a,5a^{1},7a,8,9,10-decahydro-3,5-dihydroxy-4-{(1*S*,3*S*,7*S*,8*R*,9*S*,11*R*)-7-hydroxy-9-methyl-2,4,10 trioxatetracyclo[6.3.1.0^{3,7}.0^{9,11}]dodec-5-en-11-yl}-4-methyl-10[(*E*)-2-methylbut-2-enoyloxy]-1*H*,7*H*-naphtho[1,8a,8-*bc*:4,4a-*c'*]difuran-3,7a-dicarboxylate
Biochemistry: Ecdysone agonist / antagonist.

Natural oil® (Soybean oils 93% L): Natural soyabean oil is a soyabean oil (Mixture of fatty acids triglycerides). Soyabean oil is a light yellow liquid with abundant nutritional elements.

Soyabean oil was first registered for use as an insecticide and miticide (a pesticide used to kill mites) in 1959 (U.S.E.PA, 1993) soyabean oil pesticides are now exempt from registration requirements as "minimum risk pesticides," the label of the product is required to identify all ingredients. (U.S.EPA, 2000).

Field trails

In both summer cultivations of cantaloupe plants, the evaluated four chemical compounds and used rates/fed. during the growing seasons of 2005 & 2006 are exhibited in Table (1). Field applications of each tested chemical were performed for measuring their efficiency against aphid species, mainly *A. gossypii* and *M. percicae* (cnymph+adults). Plants received two applications of each tested compound to determine their effect on the insecticides of infestation by aphids populations, and to assess what extent they might be included in the IPM program for cantaloupe plants. All the tested four compounds were recommended and supplied by Ministry of Agriculture and Cairo Chemical Compony to be applied against these target insect pest. Treatments were applied in a complete randomized block design with three replicates for each; and the untreated control. Spraying was made using knapsack sprayer (20 l.); Concentrations were calculated at the rate of the use of 400 litre water per feddan. In the different conducted treatments control plants were those ones faraway from the tested plants, to avoid any contamination or interference of spray drift.

Sampling technique and insects inspection

As an indicator to the effectiveness of each of the involved compounds in the test. The occurring aphid individuals on treated cantaloupe plants were inspected, counted and recorded throughout the adopted intervals of inspection.

Inspections of treated plants were carried out before and after 0,1,3,5,7,10,17,24 and 30 days post spraying; on ten randomizely chosen plants per replicate; 30 leaves were picked at random from the canopy (lower, medium and upper) of each plant.

The sampled leaves were put in plastic sacs, transferred to laboratory, and examined under stereoscopic binocular microscope. The same treatmental inspection steps were followed during the performance of second spray against the occurring aphids,. except a slight modification in sampling intervals, i.e., 0,1,3,5,7 and 10 days post spraying.

Table (1): Pesticides and their used doses in the summer seasons of 2005. 2006.

No	Trade name	Concentration of A.I.(%)	F	Common name	Application rate
1	Actara®	25.00	WG	Thiamethoxan	80 g/fed
2	Chess®	25.00	WG	Pymetrozine	80 g/fed
3	Achook®	0.18	EC	Azadirachtin	750 ml/fed
4	Natural oil®	93.00	EC	Soyabean oil	625 ml/fed

A.I: Active ingredient
F: Formulation
WG: Granules or tablets, water dispersible.
EC: Emulsifiable concentration

Calculation of infestation reduction

Post treatmental applications, the percentages of infestation reduction were calculated according to Handerson and Tilton's equation (1955) as follows:

$$\text{Reduction \%} = \left[1 - \frac{a}{b} \times \frac{c}{d}\right] \times 100$$

Where:
a : population in treatment after spraying
b : population in treatment before spraying
c : population in check untreated (control) before spraying
d : population in check untreated (control) after spraying

Statistical analysis

Data were subjected to the analysis of variance ANOVA test and complete Randomized Block Design (F-test), the least significant differences (LSD) at the 5% level were determined according to computer program-Costat and Duncan's Multiple Range Testes modified by Steel and Torrie (1981); and used to compare the average numbers of different inspected pests.

RESULTS AND DISCUSSION

Effect of tested chemical and / or phytocompounds against occurring aphids on the growing cantaloupe plants under low tunnels

In this work, each of the chemical compounds: thiamethoxam (Actara)® and pymetrozine (Chess)® and two essential oils: azadirachtin (Achook)® and soyabean oil (Natural oil)® were evaluated to be involved in IPM for the control of the main prevalent aphids species, *A.gossypii* & *M.percicae* that severely attack cantaloupe plants under protected and open field cultivations. Evaluation of both the tested chemical and / or

phytocompounds was run through two field sprays on the growing plants after 30 and 60 days from sowing date.

The exhibited results in Tables 2-5 and Figurs 1 and 2 elucidate the calculated percentages of reduced aphid numbers after the performance of sequential 1st and 2nd spray of the tested chemicals on cantaloupe plants during the summer seasons of 2005 and 2006.

From Table 2, it could be showed that the applied chemicals treatments gave variable reduction percentages of inspected aphids on the treated cantaloupe plants. Most of the evaluated chemicals were found to have more or less effect on aphids. For the all tested chemicals, the relative highest efficiency of each was detected from the 1st day post spraying till the 5th day; and indicated the period of efficient reduction of existing aphids numbers on the treated plants; from 93.27% to 83.12% in case of thiamethoxam (Actara®); 77.16 to 78.58% and 48.83 to 67.02% for pymetrozine (Chess®) and azadirachtin (Achook®), respectively. For the plant oil soyabean oil (Natural oil®) that efficient period extended up to the 7th day from application and indicated a reduction percentages ranged from 70.99 to 87.51% (Table 2). Thereafter, these calculated percentages of reduction more or less decreased up to 68.45, 1.13, 5.38, and 28.44% on the 30th day from treatment for thiamethoxam, pymetrozine, azadirachtin and soyabean oil, in respect.

Herein, thiamethoxam proved to be the highly efficient chemical against aphids population and gave high average rate of reduction comprised 78.29% after 30 days post-application, followed by soyabean oil (63.77%), pymetrozine (53.95%) and the least efficient compound was azadriachtin (36.74%). (Figure 1)

Similar trend of results was also detected after the 2nd application of same chemicals. From Table 3, the highest efficiency of tested chemicals was inspected during the elapsing period from 1st day up to 5th day post - application, showing highest rates of aphids reduction amounted to 84.44% for thiamethoxam (Actara®), 84.21% for soyabean oil (Natural oil®), 75.54% for pymetrozine (Chess®) and (72.43%) for azadirachtin (Achook®). The superiority of thiamethoxam was also proved and resembled by a general mean of reduction comprised (81.38%); followed by soyabean oil (76.00%), pymetrozine (69.37%) and the least efficient one azadirachtin (Achook®) (53.45%) after the 10th day from re-treatment. (Figure 1).

Table 2

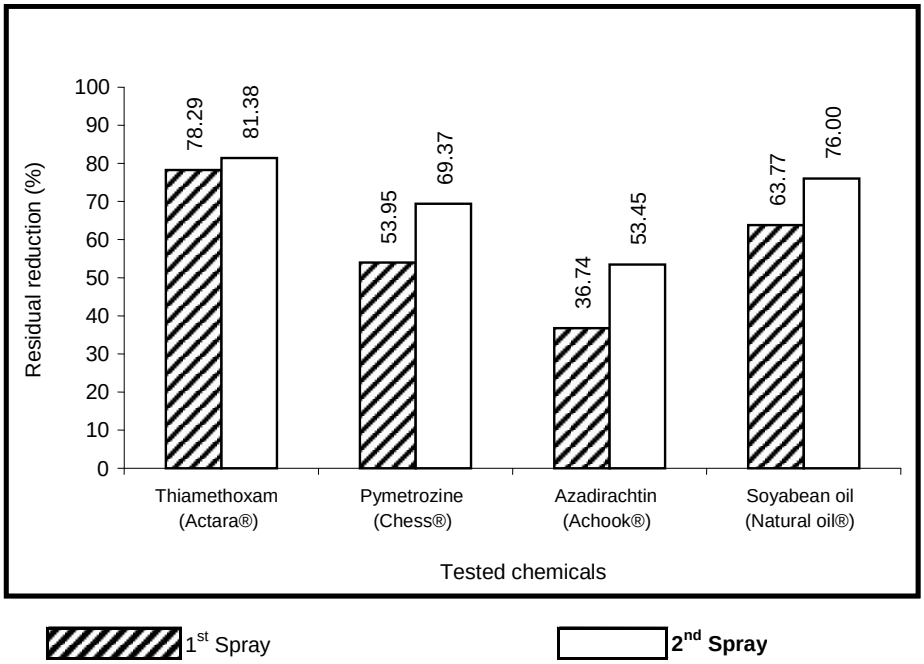


Fig. (1): The calculated general mean value of residual effect for the tested chemicals after 1st and 2nd spray against aphids (season 2005).

Moreover, in contrast to the performed field experiments during the summer season of 2006 the included results in Table 4 also confirmed the effectiveness of the tested chemicals and plant oils, whereas all treatments in a more or a less extent reduced aphids numbers on the treated cantaloupe plants. The highest efficiency of thiamethoxam, pymetrozine and azadirachtin was detected along the 1st day after application till the 5th day with highest reduction percentages in inspected aphids numbers reached to 94.98, 86.32 and 74.49%, respectively. For soyabean oil (Natural oil®), its high efficiency was recorded along 7 days from spraying and reached the maximum in the 5th day (95.97%).

In similar trend as to summer season of 2005, the calculated percentages of reduction showed a more or a less gradual decrease up to the 30th day post-spraying (Table 4). In this respect, soyabean oil, indicated stability in its efficiency that could be explained by the higher stable efficiency from the 1st till the 10th day post spraying, and a moderately stable efficiency from the beginning of the 17th day till the 30th one after spraying.

Table (3): The estimated percentages of occurring aphids reduction after 2nd application of evaluated chemicals on cantaloupe plants (season 2005).

Treatment	% of reduction						
	Inspection period (days)						
	No. of individuals pre-spray	1	3	5	7	10	General Mean
Thiamethoxam (Actara®)	62	94.56	89.12	84.44	75.50	63.26	81.38[a*]
Pymetrozine (Chess®)	71	76.26	79.43	75.54	65.21	47.06	69.37[c]
Azadirachtin (Achook®)	63	42.94	60.77	72.43	59.82	31.30	53.45[d]
Soyabean oil (Natural oil®)	55	69.36	77.53	84.21	77.91	71.01	76.00[b]
Control	82						
General mean		70.78[b]	76.71[a]	79.16[a]	70.44[b]	53.16[c]	
$LSD_{0.05}$			[(B)]3.159				[(A)]2.151**

*** Means followed with same letter (s) are not significantly different.**

**** (A) = $LSD_{0.05}$ between treatments (Pesticides), and (B) = $LSD_{0.05}$ between intervals (time)**

Also, both of thiamethoxam (Actara®) and soyabean oil (Natural oil®) proved to be the more efficient chemicals against aphids infestation and gave a merely similar high average rate of reduction comprised 76.74% and 76.40%, respectively (Table 4 and Figure 2).

Statistical analysis showed the insignificant difference between thiamethoxam (Actara®) and soyabean oil (Natural oil®), versus the detected significant differences between them and both of the antifeedant pymetrozine (Chess®) and azadirachtin (Achook®) (63.92% and 48.27%), respectively).

Data exhibited in Table 5 also show that after the performance of 2nd application of same tested chemicals, the highest reduction of aphid numbers was detected during the extended period from the 1st till the 5th day post-reapplication; with a highest rate of reduced aphids numbers at the 1st day for thiamethoxam (Actara®) followed by soyabean oil (Natural oil®) amounted to 95.43 and 77.67%, respectively. The efficiency of pymetrozine (Chess®) or/and azadirachtin (Achook®) showed gradual increase from the 1st till the 5th day from spraying with reduction percentages comprising 84.80 and 70.64%, respectively.

Table 4

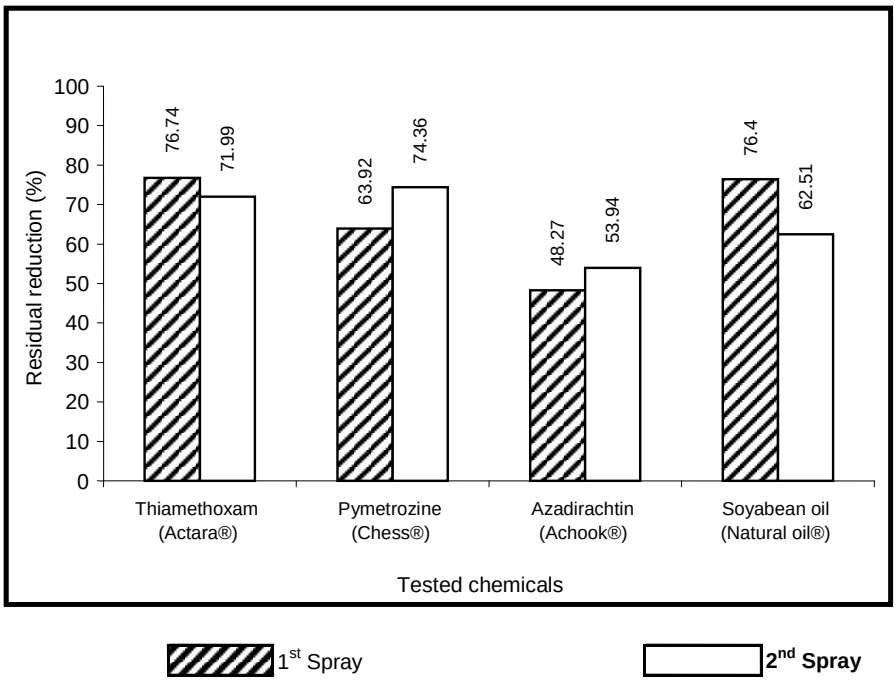


Fig.(2): The calculated general mean value of residual effect for the evaluated chemicals after 1st and 2nd spray against aphids (season 2006).

Approximately, in this summer season of 2006 pymetrozine showed comparative and significant increased efficiency against the retreated aphids, followed by thiamethoxam (Actara®), soyabean oil (Natural oil®) and the least efficient compounds azadirachtin (Achook®), where the calculated significant residual value of pymetrozine (Chess®) after the 10th day of re-treatment was 74.36% in comparison to that calculated for each of tested thiamethoxam (Actara®), soyabean oil (Natural oil®) and azadirachtin (Achook®) (71.99, 62.51 and 53.94%, respectively) (Figure 2).

The aforementioned results pointed out that thiamethoxam (Actara®) compared with the other evaluated compounds was the more efficient tested compound against the treated aphids.

Table (5): The estimated percentages of occurring aphids reduction after 2nd spraying of evaluated chemicals on cantaloupe plants (season 2006).

Treatment	% of reduction						
		Inspection period (days)					
	No. of indi-viduals pre-spray	1	3	5	7	10	General Mean
Thiamethoxam (Actara®)	172	95.43	91.45	78.36	54.80	39.91	71.99[b*]
Pymetrozine (Chess®)	98	71.52	83.33	84.80	56.88	75.28	74.36[a]
Azadirachtin (Achook®)	192	55.49	69.80	70.64	41.90	31.87	53.94[d]
Soyabean oil (Natural oil®)	125	77.67	74.52	59.16	56.73	44.45	62.51[c]
Control	218	--	--	--	--	--	--
General mean	--	75.03[b]	79.78[a]	73.24[b]	52.58[c]	17.88[d]	--
$LSD_{0.05}$		[(B)]2.809				[(A)]1.998[**]	

*** Means followed with same letter (s) are not significantly different.**

**** (A) = $LSD_{0.05}$ between treatments (Pesticides), and (B) = $LSD_{0.05}$ between intervals (time)**

In similar studies, Senn *et al.* (1998) stated that dose rates between 10 and 200 g a.i./ha of thiamethoxam (Actara®) applied by foliar, soil or seed treatment were sufficient for controlling the aphids, whiteflies and thrips. In Brazil, Franco (1999) mentioned that thiamethoxam (Actara®) gave efficient control of A*. *gossypii* at high infestation for up to 8 days after application. Also, Metwally *et al.* (1999) recorded that imidacloprid (Admire®) gave the highest reduction percentages of *A*. *gossypii* (100 and 97.5% in Qalubeia and Fayoum, respectively) [Moreover, they showed that the other tested Super Mesrona® (mineral oil and natural oil®) gave highest mortality percentages of the treated aphids amounted to 93.70 and 90.48%, in respect after 7 days from treatment].

In Australia, Thackary *et al.* (2000) showed that the aphid, *Myzus persicae* was most effectively controlled by using imidacloprid (Admire®). The same latter compound was recommended by Omar *et al.* (2001), as the most potent insecticide in reducing *A.gossypii* population.

Also, Fallas and Bland (2003), in New-Zealand decleared that the use of the antifeedant compound-pymetrozine (Chess® 25% wp) with three different rates of 50, 75 and 100 g a.i./ha on tomato and 100, 200 and 300 g a.i./ha on cabbage significantly reduced the inspected populations of the apterous aphids-*Myzus persicae*, *Macrosiphum euphoribae* and *Brevicoryna brassicae* up to 80, 85 and 81% on tomato and 98.98% and 97% on cabbage, respectively after 14 days from application.

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تأثير اربع مركبات حديثة علي حشرات المن التي تصيب الزراعات الصيفية لنباتات الكانتالوب في منطقة النوبارية ـ محافظة البحيرة.

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الملخص العربي

في هذه الدراسة تم تقييم كفاءة كل من مركب الثياميزوكسام (الاكتارا)، البايمتروزين (التشس) ومركبين طبيعيين من اصل نباتي وهما الازاديراخيتن او النيم (الاشوك) وزيت فول الصويا (الناتشرل اويل) علي حشرات المن التي تصيب الكانتالوب في ظروف الزراعات الحقلية والمحمية (تحت الانفاق، في مزرعه محطة البحوث الزراعية بالنوبارية ـ محافظة البحيرة، خلال الموسم الصيفي لعامي ٢٠٠٥، ٢٠٠٦.

أظهرت النتائج فاعلية المواد الكيميائية والطبيعية التي تم اختبارها علي المن خلال موسمي الزراعة ٢٠٠٦،٢٠٠٥ والتي كان من بينهما مبيد الثياميزوكسام (الاكتارا) الاعلي تأثيراً في خفض تعداد المن بعد الرشه الاولي والثانية وقدرت النسبه المئوية المحسوبه له في خفض تعداد المن بـ ٧٨.٢٩٪ ، ٨١.٣٨٪ بعد شهر، ١٠ أيام من بداية الرشه الاولي والثانية علي الترتيب يليه في ذلك زيت فول الصويا (الناتشرل اويل) (٦٣.٧٧٪ ، ٥٣.٤٥٪). كما أكدت نتائج الرشه الأولي للموسم الصيفي ٢٠٠٦ أيضاً تفوق مركب الثياميزوكسام (الاكتارا) في تأثيره السام علي أفراد المن يلية في ذلك زيت فول الصويا (الناتشرل أويل) حيث أعطيا نسبه خفض في تعداد المن وصلت الي ٧٦.٦٤٪، ٧٦.٤٠٪ علي التوالي بعد شهر من اجراء المعامله مع اختلاف محدود في ترتيب كفاءة تلك المركبات بعد الرشة الثانية في نفس الموسم حيث أظهر مبيد البايمتروزين (التشس) تأثير أبادي أعلي في خفض تعداد حشرات المن تلاه في ذلك علي الترتيب

مبيد الثياميزوكسام (الاكتارا) ثم زيت فول الصويا (الناتشرل أويل) واخيراً مركب الازاديراختين (الاشوك) وحيث أظهر التحليل الاحصائي وجود فروق معنوية بين تلك المركبات المختبره مقارنه بالكنترول وضحت في نسبه الخفض المئوية المحسوبه بعد ١٠ أيام من المعامله لكل منهم والتي بلغت ٧٤.٣٦ ، ٧١.٩٩، ٦٢.٥١، ٥٣.٩٤٪ علي التوالي.

Table (2): The calculated percentages of inspected aphids reduction after 1st application of tested chemicals on cantaloupe plants (season 2005).

Treatment	% of reduction									
	Inspection period (days)									
	No. of indi-viduals pre-spray	1	3	5	7	10	17	24	30	General Mean
Thiamethoxam (Actara®)	410	93.27	90.60	83.12	77.04	73.71	74.06	66.11	68.45	78.29*
Pymetrozine (Chess®)	342	77.16	71.22	78.58	72.70	67.51	51.37	11.89	1.13	53.95c
Azadirachtin (Achook®)	395	48.83	57.75	67.02	46.44	22.64	30.97	14.91	5.38	36.74d
Soyabean oil (Natural oil®)	380	70.99	70.72	80.72	87.51	67.83	58.78	44.18	28.44	63.77b
Control	350	--	--	--	--	--	--	--	--	--
General mean		72.56b	72.57b	77.36a	70.91b	57.92c	53.99d	34.52e	25.85f	
$LSD_{0.05}$					(B)3.762					(A)2.84**

* Means followed with same letter (s) are not significantly different.

** (A) = $LSD_{0.05}$ between treatments (Pesticides), and (B) = $LSD_{0.05}$ between intervals (time)

Table (4): The calculated percentages of inspected aphids reduction after 1st spraying of tested chemicals on cantaloupe plants (season 2006).

Treatment	% of reduction									
	Inspection period (days)									
	No. of indi-viduals pre-spray	1	3	5	7	10	17	24	30	General Mean
Thiamethoxam (Actara®)	203	92.46	94.98	89.88	83.35	81.42	69.57	58.87	44.12	76.74[a]*
Pymetrozine (Chess®)	155	84.64	86.32	69.78	56.41	66.54	56.05	54.24	41.54	63.92[b]
Azadirachtin (Achook®)	176	58.47	71.09	74.49	47.74	47.32	33.42	25.27	28.30	48.27[c]
Soyabean oil (Natural oil®)	205	75.54	83.29	95.97	89.47	83.51	68.54	65.40	62.02	76.40[a]
Control	198									
General mean		77.73[a]	82.29[a]	79.94[a]	69.21[b]	69.63[b]	56.96[c]	50.95[cd]	43.99[d]	
$LSD_{0.05}$					[(B)]6.640*					[(A)]3.710**

* Means followed with same letter (s) are not significantly different.

** (A) = $LSD_{0.05}$ between treatments (Pesticides), and (B) = $LSD_{0.05}$ between intervals (time)