

**EFFICIENCY OF ACETAMIPRID AGAINST CITRUS
LEAF MINER, *Phyllocnistis citrella* (ST.)
(LEPIDOPTERA, PHYLLOCNISTIDAE)**

**Mosallam, A.M.Z., Anas A. Ahmed, Aida M. El-Hakim,
and Salwa K. Hanna**

Plant Protection Research Institute, Dokki, Giza, Egypt

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ABSTRACT: Citrus seedlings of 6,12 and 18 months old were treated with acetamiprid against *Phyllocnistis citrella* (St.) as stem-paint. The efficiency of the compound, treated as coverage foliar spray on fruiting trees, was also tested. The infestation degree assessed as average of serpentine mines / leaf was reduced by 47.16,56.12,53.40 and 53.83,47.69,54.20% for seedlings of 6,12,18 months after 7 and 5 weeks of both first and second treatments, respectively. The averages of reduction percentages of alive individuals (larvae and pupae) were 79.56,85.66; 94.31,77.82 and 90.31,88.55 after the first and second applications for seedlings of 6,12 and 18 months, consecutively. The averages of mortality percentages of larvae and pupae ranged between 76.73- 84.85 and 84.86-88.13 after the two applications. The corresponding ranges of parasitism by *Baryscapus* sp. and *Cirrospilus* spp. were 0.46-2.35 and 2.48-2.88%. Also, the obtained data indicated that acetamiprid was more effective on fruiting trees than dimethoate and Kz oil, where it reduced both infestation level and alive individuals that averaged by 60.26, 78.33 and 82.94, 88.66% after the first and second treatments, successively. The averages of mortality percentages of the three tested compounds were 68.03, 47.65, 50.32 and 74.23, 61.86, 58.52 after 4 and 5 weeks of both first and second applications, respectively. Parasitism percentages for the tested toxicants ranged between 2.01-4.18 and 2.82-6.72 after the first and second treatments, consecutively.

Key words: acetamiprid, *Phyllocnistis citrella*, Lepidoptera, Phyllocnistidae, dimethoate, mineral oil, insecticides.

INTRODUCTION

Citrus leaf miner (CLM), *Phyllocnistis citrella* (St.) considers one of the major destroying insects of citrus trees reducing the quantity of fruits because larvae make serious damage in the newly vegetative leaves during the different periods of flushes of citrus trees. Also the pest attacks citrus seedlings in nursery causing high degree of distortion. This harmful insect was accidentally recorded as a serious pest on citrus trees and seedlings in Egypt in 1994 (Korashy, 1998).

Many researchers all over the world tried to control this dangerous insect pest with different pesticides such as mineral oils, organophosphorus or carbamate compounds as well as insect growth regulators (Bullock & Pelosi, 1994; Pena & Duncan, 1994; Benfatto, 1996; Boulahia *et al.*, 1996; Nucifora, 1996; Rezk *et al.*, 1996; Saleh *et al.*, 1996; Salas *et al.*, 1997a&b; Korashy, 1998; Mustafa & Ateyyat, 1998; Raga *et al.*, 1998a; BeiXuFang *et al.*, 1999; Mansanet *et al.*, 1999; Moraes *et al.*, 1999; Vargas *et al.*, 1999 and Pizza & Moleas, 2002).

Acetamiprid was examined as a new insecticide against *P. citrella* in Tunisia (Jerraya *et al.*, 1997), Cyprus (Iordanou & Charalambous, 1998), Brazil (Raga *et al.*, 1998b and Yamamoto *et al.*, 2000), China (CaiZiJian, 1999 and Zhang QuanBing *et al.*, 2001) and in Japan (Miyata & Okazaki, 2002).

The aim of the present work is to evaluate the efficiency of acetamiprid against the citrus leaf miner, *P. citrella* on both seedlings and fruiting trees of citrus in Egypt.

MATERIALS AND METHODS

Seedlings Treatment

Citrus seedlings of 6, 12 and 18 months (*Citrus volkamariana*) cultivated in loamy soil in polyethylene black bags in the nursery of Horticulture Research Institute at Giza were chosen. This variety was characterized with more and continuous flushes. The seedlings of each age were arranged in two blocks. Each block contained 25 seedlings that were divided to 5 rows (as replicates) where each row included 5 seedlings. Stems of the treated seedlings were painted, around them by 2 cm over the soil, with

undiluted acetamiprid; (E)- N- [(6-chloro- 3- pyridyl) methyl]- N- cyano- N- methylacetamidine (Beticol 20%SL); as follows:

a- 0.1 ml/seedling of 6 months old.

b- 0.5 ml/seedling of 12 months old.

c- 1 ml/seedling of 18 months old.

This compound have good systemic properties with translaminar activity and with contact and stomach action. The toxicant was painted with fine drawing brushes of 0, 1 and 3 for seedlings of 6, 12 and 18 months old, respectively. The control seedlings were left without treatment. The seedlings were treated twice at the ultimate week of July and the second week of September during the year of 2004. Samples of 25 newly vegetative leaves (a leaf per seedling) were randomly collected every week from both treated and untreated seedlings till the end of period of flushes.

Fruiting Trees Treatment

Navel orange trees of 25 years old; in an orchard of 4 feddans located in Meniat El-Kamh district, Sharkia Governorate; were foliar sprayed with the tested compound (acetamiprid) at the rate of 0.005% (5ml/100 litre of water)

compared with both dimethoate 40% EC and the mineral oil Kz 95% EC at the rate of 0.083 and 1.50% for each, respectively, using a large sprayer of 600 litre capacity. Forty trees (5 rows as replicates x 8 trees for each row) were applied with each toxicant. An equal number of trees were chosen for check. The trees were twice sprayed at 12/8 and 9/9/2004 throughout both summer and autumn flushes. Samples of 10 tender twigs (10-15cm length for each) of each replicate were randomly gathered every week after treatment till the mid of October.

Samples of both seedlings and fruiting trees were kept in polyethylene bags and transferred to laboratory for stereoscopic inspection at the same day. Both leaves of young trees and 5 leaves/each twig of old trees were examined for serpentine mines as well as both alive and dead larvae and pupae. Also the number of parasitized larvae and pupae with *Baryscapus* sp. and *Cirrospilus* spp. was recorded. The reduction percentage of infestation and alive individuals was calculated according to Hindrson and Tilton (1995). The significance variations between treatments were

calculated according to t-test (in case of seedling treatments) and F-test (in case of fruiting trees) (Snedecor and Cochran, 1981).

RESULTS AND DISCUSSION

Seedlings Treatment

Reduction in infestation

Data compiled in Table 1 indicate the effect of acetamiprid on infestation of leaves (represented as serpentine mines) of citrus seedlings of 6, 12 and 18 months with *P. citrella*. Respecting the first application, the reduction in infestation for seedlings of 6 months painted with 0.1 ml/seedling increased from 30.69 to 63.59% through four weeks after treatment. After that it decreased to 47.07, 32.98 and 31.30% after 5, 6 and 7 weeks of treatment. The average of % reduction in mines in seedlings of 6 months throughout 7 successive weeks was 47.16. The infestation in seedlings of 12 months painted with 0.5 ml/seedling reduced by 23.01, 49.08, 30.44, 88.45, 73.91, 60.70 and 67.24% (averaged by 56.12%) after 1, 2, 3, 4, 5, 6 and 7 weeks of treatment. In case of seedlings of

18 months painted with 1 ml/seedling, the reduction in serpentine mines increased from 0.38% to 94.11% during the first successive five weeks of treatment but it decreased to 66.23 and 54.97% after 6 and 7 weeks of treatment, respectively, recording average in % reduction in infestation of 53.40. With regard to the second application, the same trend was noticed where the reduction in infestation during successive five weeks after treatment ranged between 38.48-59.84, 38.07-60.26 and 30.92-74.40% (averaged by 53.83, 47.69 and 54.20%) for seedling of 6, 12 and 18 months, consecutively. As shown in Table 1, the differences in average numbers of mines between the treated and untreated seedlings of the tested ages were highly significant in the second application. But, they were insignificant with seedlings of 6 and 12 months old and significant with seedlings of 18 months old in the first application. Iordanou and Charalambous (1998) reported that a single application of acetamiprid SL with the stem paint method at about 1 cc f.p./year of tree age,

Table 1. Mean number of serpentine mines of *P. citrella* in citrus seedlings of different ages treated with acetamidrid by stem- paint application during 2004.

Treatment	Mean no. of mines/ leaf														Average		
	Before treatment	After 1 week	% Reduction	After 2 weeks	% Reduction	After 3 weeks	% Reduction	After 4 weeks	% Reduction	After 5 weeks	% Reduction	After 6 weeks	% Reduction	After 7 weeks	% Reduction	No. of mines	% Reduction
1st application at 22/7/2004																	
Seedlings of 6 months painted with 0.1 ml/ seedling																	
Treatment	3.00	1.64	30.69	0.80	61.36	0.92	63.10	1.60	63.59	4.16	47.07	6.40	32.98	10.16	31.30	3.67	47.16
Control	2.84	2.24	-	1.96	-	2.36	-	4.16	-	7.44	-	9.04	-	14.00	-	5.89	-
Seedlings of 12 months painted with 0.5 ml/ seedling																	
Treatment	2.44	1.48	23.01	0.96	49.08	1.08	30.44	0.70	88.45	2.72	73.91	6.16	60.70	5.28	67.24	2.63	56.12
Control	2.64	2.08	-	2.04	-	1.68	-	6.56	-	11.28	-	16.96	-	17.44	-	8.29	-
Seedlings of 18 months painted with 1 ml/ seedling																	
Treatment	1.72	1.24	0.38	1.00	28.73	0.60	44.77	0.32	84.63	0.32	94.11	2.40	66.23	3.20	54.97	1.30	53.40
Control	3.04	2.20	-	2.48	-	1.92	-	3.68	-	9.60	-	12.56	-	12.56	-	6.43	-
2nd application at 8/9/2004																	
Seedlings of 6 months painted with 0.1 ml/ seedling																	
Treatment	10.16	4.08	59.84	4.16	54.65	3.84	56.63	3.36	59.53	4.00	38.48	-	-	-	-	3.89	53.83
Control	14.00	14.00	-	12.64	-	12.20	-	11.44	-	8.96	-	-	-	-	-	11.85	-
Seedlings of 12 months painted with 0.5 ml/ seedling																	
Treatment	5.28	2.36	40.59	2.88	42.28	2.88	38.07	1.88	57.23	1.92	60.26	-	-	-	-	2.38	47.69
Control	17.44	13.12	-	16.48	-	15.36	-	14.52	-	15.96	-	-	-	-	-	15.09	-
Seedlings of 18 months painted with 1 ml/ seedling																	
Treatment	3.20	1.44	34.58	0.80	67.83	0.88	30.92	0.64	63.27	0.48	74.40	-	-	-	-	0.85	54.20
Control	12.56	8.64	-	9.76	-	5.00	-	6.84	-	7.36	-	-	-	-	-	7.62	-
**																	

provided effective protection for more than 3 months. Also, Miyata and Okazaki (2002) stated that acetamiprid was more effective in controlling citrus leafminer when it was sprayed on trunk.

Reduction in alive individuals

The effect of acetamiprid on mean number of alive larvae and pupae of *P. citrella* on seedlings of citrus was shown in Table 2. The mean number of alive individuals of citrus leaf miner / leaf was reduced by 79.56 and 85.66% for seedlings of 6 months painted with 0.1 ml per seedling after both first and second treatments, respectively. The reduction percentages of alive individuals in seedlings of 6 months ranged between 48.52-100.00 and 49.10-100.00 during 7 and 5 weeks of first and second applications, consecutively. Also, seedlings of 12 months invaded by *P. citrella* when painted by 0.5 ml of acetamiprid per seedling recorded % reduction of 100.00, 100.00, 97.51, 96.55, 96.19, 86.22, 87.14 (averaged by 94.80) and 100.00, 86.61, 82.09, 62.61, 57.97 (averaged by 77.82) during the successive seven and five weeks of both 1st and 2nd treatments, respectively. With respect to

seedlings of 18 months painted with 1 ml acetamiprid per seedling, the treatment reduced alive individuals by 94.84, 89.09, 95.85, 88.43, 98.11, 89.85 and 75.97% after 1, 2, 3, 4, 5, 6 and 7 weeks of the first application, successively. The reduction for the second treatment was 91.27, 100.00, 88.14, 75.37 and 87.96% during the successive five weeks of application, consecutively. The averages of % reduction in alive larvae and pupae for both first and second applications were 90.31 and 88.55, respectively. The statistical analysis revealed that the differences in averages of alive individuals of both treated and untreated seedlings of the tested ages were significant and high significant in both 1st and 2nd applications, consecutively. Raga *et al.* (1998b) found that acetamiprid (5g a.i./100L of water) + mineral oil (190 g a.i./100L of water) had lowest number of CLM larvae up to 7 days after application. Also, CaiZiJian (1999) reported that acetamiprid was quite effective against *P. citrella*.

Mortality and parasitism percentages

Data in Table 3 show mortality percent of both larvae and pupae of *P. citrella* on citrus seedlings

Table 2. Mean number of alive larvae and pupae of *P. citrella* in citrus seedlings of different ages treated with acetamiprid by stem-paint application during 2004.

Treatment	Mean no. of alive individuals/ leaf														Average		
	Before treatment	After 1 week	% Red.	After 2 weeks	% Red.	After 3 weeks	% Red.	After 4 weeks	% Red.	After 5 weeks	% Red.	After 6 weeks	% Red.	After 7 weeks	% Red.	No. of Individ.	% Red.
1 st application at 22/7/2004																	
Seedlings of 6 months painted with 0.1 ml/ seedling																	
Treatment	2.00	0.04	97.72	0.00	100	0.08	95.70	0.32	83.71	1.36	73.81	2.00	57.46	4.48	48.52	1.18	79.56
Control	2.28	2.00	-	1.88	-	2.12	-	2.24	-	5.92	-	5.36	-	9.92	-	4.21	-
Seedlings of 12 months painted with 0.5 ml/ seedling																	
Treatment	1.92	0.00	100	0.00	100	0.04	97.51	0.16	96.55	0.32	96.19	1.60	86.22	2.24	87.14	0.62	94.80
Control	1.72	1.92	-	2.00	-	1.44	-	4.16	-	7.52	-	10.40	-	15.60	-	6.15	-
Seedlings of 18 months painted with 1 ml/ seedling																	
Treatment	1.32	0.04	94.84	0.08	89.09	0.04	95.85	0.16	88.43	0.08	98.11	0.60	89.86	1.44	75.97	0.36	90.31
Control	2.52	1.48	-	1.40	-	1.84	-	2.64	-	8.08	-	11.28	-	11.44	-	5.45	-
2 nd application at 8/9/2004																	
Seedlings of 6 months painted with 0.1 ml/ seedling																	
Treatment	4.48	0.00	100	0.00	100	0.24	92.82	0.44	86.39	1.60	49.10	-	-	-	-	0.46	85.66
Control	9.92	1.04	-	6.88	-	7.40	-	7.16	-	6.96	-	-	-	-	-	5.89	-
Seedlings of 12 months painted with 0.5 ml/ seedling																	
Treatment	2.24	0.00	100	0.16	86.61	0.32	82.09	0.64	62.61	0.48	57.79	-	-	-	-	0.32	77.82
Control	15.60	11.28	-	8.32	-	12.44	-	11.92	-	7.92	-	-	-	-	-	10.38	-
Seedlings of 18 months painted with 1 ml/ seedling																	
Treatment	1.44	0.08	91.27	0.00	100	0.12	88.14	0.16	75.37	0.08	87.96	-	-	-	-	0.09	88.55
Control	11.44	7.28	-	8.80	-	8.04	-	5.16	-	5.28	-	-	-	-	-	6.31	-
**																	

treated with acetamiprid as well as % parasitism after 7 and 5 weeks of both first and second applications. The mortality percentage ranged between 55.91-100.00, 57.58-100.00 and 50.00-96.77 during seven weeks of the 1st treatment, but the ranges were 60.00-100.00, 65.96-100.00 and 75.00-100.00 during five weeks of the second treatment for seedlings of 6, 12 and 18 months, respectively. The averages of % mortality were 80.12, 84.85, 76.73 and 88.13, 84.86, 87.83 for seedlings of the three tested ages showing high significantly variations with untreated control that recorded 23.06, 20.44, 15.07 and 34.07, 30.17, 17.81% mortality after both first and second applications, consecutively. Jerraya *et al.* (1997) stated that acetamiprid was effective for initial knock-down of *P. citrella* giving mortality of about 78-88%.

Respecting % parasitism with both *Baryscapus* sp. and *Cirrospilus* spp. (as shown in Table, 3), the examined compound had insignificantly little effect against the natural parasites in all treatments except with seedlings of 12 months that showed high significantly differences with untreated control. The average of %

parasitism for the treated seedlings were 1.33, 2.35, 0.46 and 2.88, 2.48, 2.50 compared with 2.85, 2.48, 3.22 and 9.55, 10.52, 11.37 for control after 7 and 5 weeks of the first and second treatments, respectively. Jerraya *et al.* (1997) found an initial deleterious effect for acetamiprid on parasitic insect species (*Pnigalio* sp. and *Cirrospilus* sp.) and this was attributed to mortality of their host (*P. citrella*), but populations recovered by 4 weeks after treatment.

Fruiting Trees Treatment

Acetamiprid was evaluated as coverage spray toxicant against *P. citrella* with the organophosphorus compound dimethoate and the mineral oil Kz on fruiting trees of navel orange. The obtained data were compiled in Tables 4, 5 and 6.

Reduction in infestation

As shown in Table 4, the differences in average numbers of mines between treatments were highly significant in both first and second applications. Acetamiprid reduced the infestation with CLM (assessed as mean number of mines/ leaf) by 85.81, 66.90, 50.98, 37.35 and 77.41, 75.94,

Table 4. Mean number of mines of *P. citrella* in leaves of navel orange treated with different three insecticides at Sharkia Governorate during 2004.

Compound	Mean no. of mines / leaf										Average		
	Before treatment	After 1 week	% Red.	After 2 weeks	% Red.	After 3 weeks	% Red.	After 4 weeks	% Red.	After 5 weeks	% Red.	No. of mines	% Red.
	1 st application at 12/8/2004												
Acetamiprid	0.95	0.36	85.81	1.08	66.90	2.01	50.98	2.96	37.35	-	-	1.60C	60.26
Dimethoate	1.11	1.11	56.26	1.89	42.07	2.39	41.71	4.44	6.03	-	-	2.46AB	36.52
Kz oil	1.25	0.83	67.29	1.31	59.85	2.36	42.44	4.37	7.51	-	-	2.22BC	44.27
Control	0.76	2.03	-	2.61	-	3.28	-	3.78	-	-	-	2.93A	-
	**												
	2 nd application at 9/9/2004												
Acetamiprid	2.96	1.04	77.41	0.88	75.94	0.71	80.33	0.92	80.80	1.64	77.16	1.04C	78.33
Dimethoate	4.44	2.13	53.74	2.93	19.88	1.85	48.75	2.49	48.04	2.79	61.15	2.44BC	46.31
Kz oil	4.37	2.29	50.27	2.59	29.18	1.17	67.59	2.55	46.79	4.56	36.50	2.63B	46.07
Control	3.78	5.88	-	4.67	-	4.61	-	6.12	-	9.17	-	6.09A	-
	**												

Table 5. Mean number of alive larvae and pupae of *P. citrella* in leaves of navel orange treated with different three insecticides at Sharkia Governorate during 2004.

Compound	Mean no. of alive individuals / leaf												Average	
	Before treatment	After 1 week	% Red.	After 2 weeks	% Red.	After 3 weeks	% Red.	After 4 weeks	% Red.	After 5 weeks	% Red.	No. of indiv.	% Red.	
1 st application at 12/8/2004														
Acetamiprid	0.82	0.05	97.57	0.25	91.84	0.68	82.89	1.65	59.47	-	-	0.66C	82.94	
Dimethoate	1.05	0.47	82.16	0.92	69.98	1.34	71.58	2.77	46.87	-	-	1.38B	67.65	
Kz oil	1.11	0.23	91.74	0.78	81.20	1.33	73.32	2.45	55.54	-	-	1.20B	75.45	
Control	0.57	1.43	-	2.13	-	2.56	-	2.83	-	-	-	2.24A	-	
**														
2 nd application at 9/9/2004														
Acetamiprid	1.65	0.08	96.74	0.14	90.76	0.10	93.22	0.37	84.93	0.84	77.66	0.31B	88.66	
Dimethoate	2.77	0.93	77.43	1.46	42.63	0.13	94.75	0.83	79.86	1.57	75.13	0.98B	73.96	
Kz oil	2.45	0.93	74.48	0.67	70.23	0.13	94.06	1.57	56.92	3.09	44.66	1.28B	68.07	
Control	2.83	4.21	-	2.60	-	2.53	-	4.21	-	6.45	-	4.00A	-	
**														

Table 6. Mortality percentages of larvae and pupae of *P. citrella* in leaves of navel orange treated with different insecticides and percentages of parasitism with both *Baryscapus* sp. and *Cirrospilus* spp. at Sharkia Governorate during 2004.

Compound	% Mortality after (week)							% Parasitism after (week)						
	Before treatment	1	2	3	4	5	Ave.	Before treatment	1	2	3	4	5	Ave.
1 st application at 12/8/2004														
Acetamiprid	13.38	85.19	76.54	66.23	44.14	-	68.03A	1.40	0	0	7.96	2.48	-	2.61
Dimethoate	6.01	57.66	51.32	44.07	37.54	-	47.65B	1.80	0	0.71	6.42	0.90	-	2.01
Kz oil	11.73	73.09	40.46	43.79	43.94	-	50.32B	1.07	0	2.04	9.04	5.64	-	4.18
Control	25.44	29.28	18.16	21.95	25.22	-	23.65C	0	2.30	3.07	4.07	4.23	-	3.42
							**							NS
2 nd application at 9/9/2004														
Acetamiprid	44.14	92.31	84.09	85.85	60.14	48.78	74.23A	2.48	0	0	4.69	2.90	6.50	2.82
Dimethoate	37.54	56.03	50.28	92.61	66.67	43.73	61.86A	0.90	0.94	5.69	16.58	7.50	2.87	6.72
Kz oil	43.94	59.10	73.87	88.88	38.43	32.31	58.52A	5.64	1.46	7.21	11.97	4.71	4.24	5.92
Control	25.22	28.34	44.29	45.09	31.26	29.60	35.72B	4.23	0.45	9.14	7.09	4.47	3.85	5.00
							**							NS

80.33, 80.80, 77.16% after 4 and 5 weeks of the first and second treatments, successively. Reduction percentages for the other two tested insecticides (dimethoate and Kz oil) ranged between 6.03-56.26, 19.88- 61.15 and 7.51-67.29, 29.18- 67.59 during the first and second applications, respectively. Averages of reduction percentages were 60.26 and 78.33 for acetamiprid surpassing the two others that averaged by 36.52, 46.31 and 44.27, 46.07 for dimethoate and Kz oil after both 1st and 2nd treatments, consecutively. Pena and Duncan (1994) conducted field studies to test the efficacy of certain insecticides (Agrimec plus oil, NTN 33893, fenoxycarb, Stalker and RH- 2485) for the control of *P. citrella* that gave satisfactory control. Both Rezk *et al.*, (1996) and Korashy (1998) evaluated several insecticides against citrus leaf miner and they reported that vertimec + mineral oil was the most effective. Also, Pizza and Moleas (2002) stated that imidacloprid at 70ml/hl and abamectin at 3.7ml/hl gave similar levels of control and white oil applied at 10-day intervals failed to control the infestation.

Reduction in alive individuals

Statistical analysis of variance of data in Table 5 revealed that there were high significantly

variations in treatments during the first and second applications. Reduction percentages in alive individuals of citrus leaf miner on navel orange varied according to the used insecticides; acetamiprid recorded the highest average of % reduction (82.94 and 88.66) during both first and second applications, successively. The mineral oil (Kz) occupied the second order giving 75.45% reduction and dimethoate was the third (67.65%) after the first treatment, but during the second application the reverse was true, where dimethoate was the second by 73.96%, whereas Kz oil was the least by 68.07% reduction in alive larvae and pupae of *P. citrella*. The range of % reduction of the three tested toxicants (acetamiprid, dimethoate and Kz oil) was 59.47-97.57, 77.66-96.74; 46.87-82.16, 42.63-94.75 and 55.54-91.74, 44.66-94.06% during four and five weeks of both first and second applications, respectively Table, 5. Pena and Duncan (1994) reported that the insecticides of Agrimek+ oil, NTN 33893, fenoxycarb, Stalker and RH-2485 reduced the number of larvae of *P. citrella* one week after spray, but efficacy reduced 14 days after treatment. On the other hand, Jerraya *et al.* (1997) found

that acetamiprid had a greater residual effect against *P. citrella* than imidacloprid. But, Raga *et al.* (1998a) stated that imidacloprid was the most effective insecticide (up to 97.9% reduction of number of larvae of *P. citrella*) at 14 and 28 days after application.

Mortality and parasitism percentages

Data in Table 6 indicate that acetamiprid was the most effective insecticide than dimethoate and Kz oil, where they gave % mortality in larvae and pupae of *P. citrella* from 44.14 to 85.19 (averaged by 68.03%), from 37.54 to 57.66 (averaged by 47.65%) and from 40.46 to 73.09 (averaged by 50.32%) during the four successive weeks of the first treatment for the three tested compounds, respectively. The mortality percentages for the control ranged between 18.16- 29.28 with an average of 23.65. Also, the averages of mortality percentages were 74.23, 61.86 and 58.52 during five weeks of the second application for acetamiprid, dimethoate and Kz oil, successively. Acetamiprid was the most potent toxicant surpassing the two others (dimethoate and Kz oil), where they gave mortality percentages ranged between 48.78-

92.31, 43.73-92.61 and 32.31-88.88, consecutively. Statistical analysis of data proved that the differences between treatments were highly significant in both first and second applications. Saleh *et al.* (1996) recorded that the most effective compounds in reducing larval population of *P. citrella* were Sevin, Diptrex and Copper oxychloro followed in a descending order by Urea, Sumithion, Cidial, Super Royal oil, Selecron, Vydate, Ammonia, Nuvacron, Dimethoate, Actellic, Malathion and Anthio which resulted in 80.09, 78.2, 77.3, 66.7, 62.2, 57.2, 54.2, 50.1, 38.5, 37.8, 30.7, 26.1, 23.6, 21.8 and 16.9% corrected percentage mortality, respectively.

Regarding the effect of the three tested toxicants against the non-target parasites of both *Baryscapus* sp. and *Cirrospilus* spp., the averages of parasitism percentages were 2.61, 2.01, 4.18 and 2.82, 6.72, 5.92 for acetamiprid, dimethoate, Kz oil compared with 3.42 and 5 for the control after the first and second applications, respectively. This means that the three tested compounds had insignificantly low and nearly equal effects against the parasites of citrus leaf miner during the two

applications. Raga *et al.* (1998a) found that the level of parasitism by *Galeopsomya* sp. (Eulophidae) ranged from 4.1% to 34.7% in the control when they experimented 14 different insecticides on citrus leafminer in Brazil.

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فعالية الأسيتامبيريد ضد حشرة صانعة أنفاق أوراق الموالح

أحمد محمود زكي مسلم- أناس عبد العزيز أحمد

عابدة مصطفى الحكيم- سنوي كامل حنا

معهد بحوث وقاية النباتات - مركز البحوث الزراعية - الدقي - الجيزة

تم معاملة شتلات الموالح أعمار ٦، ١٢، ١٨ شهر بدهان الساق إضافة إلى الأشجار المثمرة برش المجموع الخضري بمركب اسيتامبيريد ضد حشرة صانعة أنفاق أوراق الموالح. اختبرت أيضاً فعالية المركب عند معالته برش المجموع الخضري على الأشجار المثمرة. أدت المعاملة إلى خفض درجة الإصابة مقدرة كمتوسط عدد الإنفاق / ورقة بـ ٤٧،١٦، ٥٦،١٢، ٥٣،٤٠ و ٥٣،٨٣، ٤٧،٦٩، ٥٤،٢٠ % للشتلات عمر ٦، ١٢، ١٨ شهراً بعد ٧، ٥ أسابيع من المعاملتين الأولى والثانية، على التوالي. كانت متوسطات % للخفض في عدد الأفراد الحية (يرقات و عذارى) ٧٩،٥٦، ٨٥،٦٦ و ٩٤،٣١، ٧٧،٨٢ و ٩٠،٣١، ٨٨،٥٥ بعد المعاملتين الأولى والثانية للشتلات ٦، ١٢، ١٨ شهراً، على الترتيب. تراوحت متوسطات % للموت في اليرقات والعذارى بين ٧٦،٧٣ - ٨٤،٨٥، ٨٤،٨٦ - ٨٨،١٣ بعد المعاملتين بينما تراوحت % التطفل بين ٤٦،٠٠ - ٢،٣٥، ٢،٤٨ - ٢،٨٨. ودلت النتائج أيضاً أن مركب اسيتامبيريد أكثر فعالية على الأشجار المثمرة من الدايمثويت والزيث المعدني حيث أدى إلى خفض كل من مستوي الإصابة والأفراد الحية بنسبة ٦٠،٢٦، ٧٨،٣٣ و ٨٢،٩٤، ٨٨،٦٦ بعد المعاملتين الأولى والثانية، على التوالي. كانت متوسطات % للموت للمركبات الثلاثة ٦٨،٠٣، ٤٧،٦٥، ٥٠،٣٢ و ٧٤،٢٣، ٦١،٨٦، ٥٨،٥٢ بعد ٤، ٥ أسابيع من المعاملتين الأولى والثانية على التوالي. وكانت % التطفل تتراوح بين ٢٠٠١ - ٤،١٨، ٢،٨٢ - ٦،٧٢ % بعد المعاملتين الأولى والثانية، على الترتيب.