

**EFFICIENCY OF SOME INSECTICIDES FOR CONTROL
PULVINARIA TENUIVALVATA (NEWSTEAD) (HOMOPTERA :
COCCIDAE) ON SUGARCANE IN NAGA-HAMMADI
DISTRICT, QENA GOVERNORATE**

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(Manuscript received 13 December 2004)

Abstract

Pulvinaria tenuivalvata (Newstead) is an economic important insect pest on sugarcane in Upper Egypt governorates. The severe infestation causes economic loss in sugarcane quantity and quality, it can destroy the crop entirely and increases the loss of sugar production causing a shortage of sugar supply in Egypt.

The present work was conducted in Naga-Hammadi district for two years (Sep. 4th 2002 & Sep. 15th 2003) to evaluate the efficiency of six organophosphorus insecticides for control the insect and protect the sugarcane crop from the insect damage.

The obtained results showed that, the tested insecticides were highly effective on the insect populations in the both years (2002/2003). The statistical analysis of the tested organophosphorus insecticides combined over the two years showed that, Actellic was the highest effective compound (99.1%) on the nymphal populations followed by Sumithion in the 2nd order (98.4%). Dursban came in the 3rd order (96.9%). Dimethoate, Malatox and Malathion came in the last order (96.1%, 96% and 95.7%).

The same trend of the experiments compounds was observed with the adult populations, the highest effective compound was Actellic (96.9%) followed by Sumithion and Dursban in the 2nd order (95.8% & 95.2%). Malatox, Dimethoate and Malathion came in the last order (93.3%, 93.2% and 93%).

On the other hand, the efficiency of the tested insecticides on the insect populations (nymphs and adults) combined over the two years indicated that, Actellic was the highest effective compound (98.7%) followed by Sumithion in the 2nd order (98.2%) and Dursban in the 3rd order (96.4%). Dimethoate, Malatox and Malathion came in the last order (95.8%, 95.4% and 95.3%).

INTRODUCTION

Sugarcane, *Saccharum officinarum* L. is an economic important field crop and the main source of sugar production in Egypt. It cultivate with large scale in Upper Egypt, especially in Qena and Aswan governorates (75% of total sugarcane plantation in Egypt). In the last few years, soft scale insect observed on sugarcane plantation cultivated in Attfeh district, Giza governorate during 1995, the insect identified as *Saccharolecanium krugeri* (Zehnter) (Ali *et al.*, 1997) and re-identified as *Pulvinaria*

tenuivalvata (Newstead) (Watson & Foldi, 2001/2002). In the following years, the infestation spread greatly in sugarcane fields in Upper Egypt governorates and the insect become a main pest on sugarcane plantation.

The pest suck the cell sap of the leaves and excrete a large amount of honeydew that cover plant leaves and encourages the growth of sooty mould fungus which give the infested plants dirty black appearance that affect on photosynthesis and respiration processes of sugarcane plants. The pest has a wide range of host plants (Ali *et al*, 2000) and has many generations per year, three generations (Shalaby, 2002) and four generations (Tohamy *et al*, 2002). The maximum period of insect activity occurred during autumn season due to the highly increases of temperature and relative humidity as well as the dense plantations of sugarcane, which are suitable for insect activity in Upper Egypt.

Under severe attack, the pest causes economic loss in both sugarcane quantity and quality, it reduces the stalk weight, juice extraction percentage, brix (total soluble solid) cane, juice sugar percentage, juice purity percentage and sugar yield (Besheit *et al*, 2002). The highly spread of *P. tenuivalvata* and its outbreak in sugarcane fields in Upper Egypt, especially during the grand period of sugarcane growth in autumn can destroy the crop entirely and increases the loss of sugar production, causing a shortage of sugar supply in Egypt. So, the present work was conducted in Naga-Hammadi district for two years (Sep. 4th 2002 & Sep.15th 2003) to evaluate the efficiency of some organophosphorus insecticides for control the pest and to be available in hand for using when it necessary to save the sugarcane fields from the insect damage.

MATERIALS AND METHODS

Qena governorate is a main district for sugarcane plantation, it cultivated about 50% of total sugarcane plantation in Egypt. In the last few years (2000 to 2003), the cultivated areas severely attacked with *P. tenuivalvata* especially in Naga-Hammadi where the present work was done for two years in September 4th 2002 and in September 15th 2003 at Najm El-Temma village, Naga-Hammadi district to evaluate the efficiency of 6 organophosphorus insecticides for control the pest as mentioned in Table 1.

Table 1. Evaluated insecticides in Naga-Hammadi district, Qena governorate per each year (2002 & 2003).

Trade name	Common name	Rate of application
1- Actellic 50 % EC	Pirimiphos-methyle	150 ml /100 liter of water.
2- Sumithion 50 % EC	Fenitrothion	150 ml /100 liter of water
3- Malathion 57% EC	Malathion	250 ml /100 liter of water
4- Malatox 50 % WP	Malathion	300 g /100 liter of water.
5- Dimethoate 40% EC	Dimethoate	150 ml /100 liter of water
6- Dursban 48% EC	Chlorpyrifos	150 ml /100 liter of water

The selected sugarcane fields were cultivated with G.T.54-9 variety and receive all the recommended agricultural practices, homogeneous in plant growth, severely attack with *P. tenuivalvata* and don't receive any control measures for the pest before and after applications.

The experimental area was arranged in Randomized Complete Block Design and each pesticide treatment (700 m²) divided into four replicates, each 175 m². The samples were picked up at random with rate of 10 leaves/ replicate (40 leaves / treatment) before spraying, then after 2, 4 and 6 weeks of spraying. The collected samples transferred to the laboratory in paper pages where the upper and lower surfaces of sugarcane leaves were inspected, nymphs and adults were counted and recorded.

Percent of reduction in the insect populations was estimated using Henderson and Tilton equation (1955) to determine the initial effect after 2 weeks and the residual effect after 4 and 6 weeks intervals. Reduction percentages of the insect populations were transferred to arc sine before conducting analyses of variance (F test) and LSD values were used for separation the means. Reduction percentages in the both tested years (2002 & 2003) were statistically analyzed combined over the two years to determine the final effect of the tested insecticides on the insect populations. The statistical analyses of the present work were conducted using MSTATC computer Program.

RESULTS AND DISCUSSION

A- 1st year (2002):

Data presented in Table 2 showed the initial effect of the evaluated insecticides after 2 weeks of application and the residual effect after 4 and 6 weeks intervals during the 1st year (2002). The obtained results revealed that, the initial effect of the tested organophosphorus insecticides was highly effective on the nymphal populations after 2 weeks of application. The most effective insecticides were Actellic (98.9%), Sumithion (97.3%),

Malatox, (96.7%) and Malathion (96%), respectively, whereas Dursban and Dimethoate reduced the nymphal populations to 95.7% and 94.7%. The initial effect of the tested insecticides on the adult populations was varied after 2 weeks of application, the most effective compounds were Sumithion (96.5%), Actellic (95.7%) and Dursban (95.2%) respectively, while Malatox, Malathion and Dimethoate were lower effect, they reduced the adult populations to 94.5%, 93.3% and 91.4%, respectively.

Highly residual effect of the tested organophosphorus insecticides was observed on the nymphal populations after 4 weeks of applications. The highly residual effective insecticides were Actellic (99.4%), Sumithion (98.7%), Dursban (97.1%) and Dimethoate (96.2%). Malatox and Malathion showed moderate residual effect on the nymphal populations, they reduced the populations to 95.7% and 94.9%, respectively. The residual effect on the adult populations after 4 weeks of application revealed that, the highly effective compounds were Actellic (97.4%), Sumithion (96.8%) and Dursban (95.6%), respectively. Dimethoate, Malatox and Malathion showed varied residual effect on the adult populations, they reduced the population to 93.6% and 92.8%, respectively.

The residual effect of the tested insecticides after 6 weeks of application was highly effective on the nymphal populations, the most effective compounds were Actellic (99.7%) Sumithion (99.5%), Dursban (98.4%) and Dimethoate (97.4%), whereas residual effect of Malatox and Malathion were relatively lower (95.8% and 94.3%).

Table2. Efficiency of some organophosphorus insecticides on sugarcane soft scale insect, *P. tenuivalvata* infesting sugarcane in Najm El-Temma village at Naga-Hammadi district, Qena Governorate in the 1st year (2002).

Insecticide	Pre-spraying count			Post-spraying counts and % of reduction												Average percent of reduction in the 1 st year (2002)		
	4/9/2002			Initial effect				Residual effect				6 weeks				Nymph	Adult	Total
	Nymph	Adult	Total	2 weeks		4 weeks		6 weeks		2/10/2002		16/10/2002		Nymph	Adult			
				18/9/2002	2/10/2002	16/10/2002	18/9/2002	2/10/2002	16/10/2002									
1- Actellic 50 % EC	4665.5	256.5	4922.0	41.0	10.8	51.8	21.8	7.0	28.8	12.3	3.8	16.1	25.0	7.2	32.2	99.4% a	97.4% a	99.3% a
2- Sumithion 50 % EC	4287.5	374.3	4661.8	94.3	12.8	107.1	45.5	12.3	57.8	19.0	11.3	30.3	52.9	12.1	65.0	99.4% a	97.4% a	99.3% a
3- Malathion 57% EC	6548.5	443.3	6991.8	215.3	29.3	244.6	263.0	33.3	296.3	366.8	44.8	411.6	281.7	35.8	317.5	98.7% b	96.8% a	98.4% b
4- Malatox 50 % WP	4343.3	447.5	4790.8	117.8	24.3	142.1	148.3	31.5	179.8	178.8	31.5	210.3	148.3	29.1	177.4	95.0% e	92.2% d	94.9% e
5- Dimethoate 40% EC	4008.5	379.8	4388.3	173.0	32.0	205.0	120.0	25.3	145.3	103.3	16.0	119.3	132.1	24.4	156.5	93.2% c	93.7% c	95.8% d
6- Dursban 48% EC	3869.5	374.8	4244.3	134.8	17.8	152.6	89.0	17.3	106.3	62.0	16.5	78.5	98.4	17.1	115.5	97.4% d	95.9% c	95.9% d
Control	4700.3	395.0	5095.3	3838.3	388.0	4226.3	3704.3	409.0	4113.3	4599.5	407.8	5007.3	4047.3	401.6	4448.9	95.7% c	95.0% b	96.9% c
F value :	117.4**																	
LSD at 0.05 level :	0.84																	

Note :

Percent of reduction were transferred to arc sine value before conducting analysis of variance.

Means in the sam column not followed by the same letter is significantly different (P < 0.05) using LSD test in MSTATC computer Program

The residual effect of the tested compounds was varied on the adult populations after 6 weeks of spraying. The most effective compounds were Actellic (98.6%), Sumithion (97.1%), Dimethoate (95.9%) and Dursban (95.7%) respectively. The residual effect of Malatox and Malathion were lower on the adult populations, they reduced the populations to 93.2% and 90.2%, respectively.

Data presented in Table 2 revealed the average percent of reduction in the nymph and adult populations during the 1st year (2002). The statistical analyses showed that, Actellic was the highest effective compound on the nymphal populations (99.4%) followed by Sumithion in the 2nd order (98.7%) and Dursban in the 3rd order (97%). Dimethoate and Malatox came in the 4th order (96.2% & 96.1%) whereas Malathion came in the last order (95 %).

Data presented in the same table showed that, Actellic and Sumithion were highly effective compounds on the adult populations (97.4% & 96.8%) followed by Dursban in the 2nd order (95%). Dimethoate and Malatox came in the 3rd order (93.9% & 93.7%), whereas Malathion came in the last order (92.2%).

B- 2nd year (2003):

Experiments were repeated for another year (September 15th 2003) at the same place to ensure the efficiency of the tested insecticides as control measures for the pest. Table 3 showed the initial effect after 2 weeks of spraying and the residual effect after 4 and 6 weeks of spraying.

The obtained results in Table, 3 revealed that, the initial effect of the tested insecticides on the nymphal populations was highly effective after 2 weeks of application, the most effective compounds were Actellic (98.7%), Sumithion (97.9%) and Dursban (96.2%) whereas the other insecticides decreased the nymphal populations to 95.9% (Dimethoate), 95.6% (Malatox) and 95.5% (Malathion), respectively. The initial effect on the adult populations after 2 weeks of application showed that, Actellic (97.2%) was the most effective insecticide on the adult populations, whereas the other tested insecticides were relatively lower, their reduction percentages ranged 95.4% - 93.4%.

Residual effect of the tested insecticides was highly effective on the nymphal populations after 4 weeks of application, the highly residual effective compounds were Actellic (99.1%), Sumithion (98.4%), Dursban (97.3%), Malatox (97.2%) and Dimethoate (96.6%). Malathion came in the last order reducing the nymphal populations to 95.8%. The residual effect on the adult populations was varied after 4

weeks of application, the highest residual effective compounds were Actellic (97.4%) and Sumithion (96.5%) whereas the other tested insecticides showed varied effect on the adult populations (94.2% to 91.1%).

Six weeks of application, the evaluated insecticides showed highly residual effect on the nymphal populations, the highest effective compounds were Actellic (98.5%), Sumithion (97.9%), Malathion (96.8%) and Dursban (96.6%), the lowest ones were Dimethoate and Malatox (95.3% and 93.4%). The residual effect on the adult populations was varied after 6 weeks of application, the most effective insecticides were Dursban (95.5%) and Actellic (94.1%). Sumithion, Malathion and Malatox showed moderate residual effect (93.1% to 92.8%) whereas the lowest one was Dimethoate (89.1%).

Data presented in Table 3 showed the average percent of reduction in the nymph and adult populations during the 2nd year (2003). The statistical analysis for reduction percentages in the insect populations showed that, Actellic was the highest effective insecticide on the nymphal populations (98.8%) followed by Sumithion in the 2nd order (98.1%). Dursban, Malathion, Dimethoate, and Malatox came in the 3rd order (96.8%, 96.2%, 96% and 95.9%).

Data presented in Table 3 showed that, Actellic was the highest effective compound on the adult populations (96.4%) in the 2nd year (2003) followed by Dursban and Sumithion in the 2nd order (94.8% and 94.7%). Malathion came in the 3rd order (93.7%) and Dimethoate & Malatox came in the last order (92.8% and 92.7%).

C- Combined effect of the tested insecticides on the insect populations in the two years:

Reduction percentages in 2002 and 2003 were statistically analyzed combined over the two years to determine the efficiency of the tested insecticides on the insect populations.

The obtained results of the combined effect of the tested insecticides during the both years as mentioned in Table 4 showed that, Actellic was the highest effective compound on the nymphal populations (99.1%) followed by Sumithion in the 2nd order (98.4%). Dursban came in the 3rd order (96.9%). Dimethoate, Malatox and Malathion came in the last order (96.1%, 96% and 95.7%), respectively.

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Table 3. Efficiency of some organophosphorus insecticides on sugarcane soft-scale insect, *P. tenuivalvata* infesting sugarcane in Najim El-Temma village at Naga-Hammadi district, Qena Governorate in the 2nd year (2003).

Insecticide	Pre-spraying count		Post-spraying counts and % of reduction												Average percent of reduction in the 2 nd year (2003)						
	15/9/2003		Initial effect				Residual effect				27/10/2003				Nymph	Adult	Total				
	Nymph	Adult	2 weeks		4 weeks		6 weeks		27/10/2003		4 weeks		6 weeks								
			Nymph	Adult	Total	%	Nymph	Adult	Total	%	Nymph	Adult	Total	%	Nymph	Adult	Total				
- Actellic 50 % EC	4748.5	428.0	67.3	14.5	81.8	96.7%	43.8	9.0	52.8	98.9%	58.0	19.5	77.5	98.5%	56.3	14.3	70.7				
- Sumithion 50 % EC	3886.5	315.0	87.0	20.0	107.0	97.2%	61.0	9.0	70.0	98.9%	67.0	18.5	85.5	98.5%	71.7	15.8	87.5				
- Malathion 57% EC	4393.8	397.3	210.8	22.5	233.3	94.8%	182.3	26.5	208.8	98.3%	115.3	21.0	136.3	97.9%	169.4	23.3	192.7				
- Malatox 50 % WP	4914.0	342.3	183.0	26.0	209.0	95.5%	137.0	24.8	161.8	95.5%	267.5	19.0	286.5	96.8%	195.8	23.3	219.1				
- Dimethoate 40% EC	4277.5	374.5	187.3	30.3	217.6	93.8%	97.2%	91.1%	96.8%	93.4%	165.5	31.3	196.8	93.4%	95.9%	26.3	191.1				
- Dursban 48% EC	3733.8	352.0	153.8	23.5	177.3	93.4%	98.5	17.3	115.8	96.5%	103.8	12.3	116.1	95.3%	118.7	17.7	136.4				
Control	4447.3	443.0	4768.0	543.3	5311.3	96.2%	4384.8	359.0	4743.8	97.1%	3671.5	340.3	4011.8	96.6%	4274.8	414.2	4689.0				
: value :			20.9**															6.4**		25.6**	
SD at 0.05 level :			1.38															2.03		1.20	

note :

Percent of reduction were transferred to arc sine value before conducting analysis of variance.

Means in the same column not followed by the same letter is significantly different (P < 0.05) using LSD test in MSTATC computer Program.

The efficiency of the tested insecticides on the adult populations combined over the two years revealed that, Actellic was the highest effective compound on the adult populations (96.9%) followed by Sumithion and Dursban in the 2nd order (95.8% and 95.2%). Malatox, Dimethoate and Malathion came in the last order, they reduced the adult populations to 93.3% 93.2% and 93%, respectively.

On the other hand, the efficiency of the tested insecticides on the insect populations (nymphs and adults) combined over the two years (Table, 4) indicated that, Actellic was the highest effective compound (98.7%) on the insect population followed by Sumithion in the 2nd order (98.2%) and Dursban in the 3rd order (96.4%). Dimethoate, Malatox and Malathion came in the last order (95.8% 95.7% and 95.4%), respectively.

Literature review showed that, organophosphorus insecticides were highly effective on the scale insects and mealy bugs. El-Borollosy *et al.* (1990) showed that, Actellic 50%EC at rate of 0.3% gave 83.1% reduction for *Chloropulvinaria psidii* (Maskell) on *Aralia papyrifera* at Zohria Botanic Garden, Giza governorate. Abo-Shanab *et al.* (2002) reported that, Actellic 50% EC at rate of 0.15% gave reduction percentage of 91.7% against *Aspidiotus hederae* (Vallot) infesting olive trees at Burg El-Arab, Alexandria district by using thermal fogging machine sprayer under rain-fed conditions. Also, Helmy *et al.* (2002) showed that, Actellic 50% EC (at 0.15%) gave 90.4% reduction for *Ceroplastes floridensis* Comstock and 90.8% reduction in *Aonidiella aurantii* (Maskell) populations on navel orange trees in Qalubiya governorate.

El-Borollosy *et al.* (1990) mentioned that, Sumithion 50% EC at rate of 0.25% gave 95.6% reduction for *Icerya seychellarum* (Westwood) on *Cycas revolute* at Zohria Botanic Garden, Giza governorate. El-Amir (2002) showed that, Sumithion 50% EC at rate of 0.15% gave 81.4% reduction after 4 weeks of application against *Parlatoria oleae* (Colvee) on olive trees in Ismailia governorate.

El-Borollosy *et al.* (1990) revealed that, Malathion 57% EC at rate of 0.25% gave 95.2% reduction for *Chloropulvinaria psidii* on *Aralia papyrifera* at Zohria Botanic Garden, Giza governorate. El-Imery *et al.* (1999) showed that Malathion 57% EC with the same rate gave 74.6% reduction after 6 weeks of application against *Parlatoria oleae* infesting plum trees in Wadi El-Natrun.

Table 4. Efficiency of some organophosphorus insecticides on sugarcane soft scale insect, *P. tenuivalvata* infesting sugarcane in Naga-Hammadi district, Qena Governorate combined over the two years (2002 & 2003)

Insecticide	Average % of reduction / year						% of reduction combined over the two years (2002 & 203)		
	1 st Year (2002)			2 nd Year (2003)			Nymph	Adult	Total
	Nymph	Adult	Total	Nymph	Adult	Total			
1- Actellic 50 % EC	99.4%	97.4%	99.3%	98.8%	96.4%	98.6%	99.1% a	96.9% a	98.7% a
2- Sumithion 50 % EC	98.7%	96.8%	98.4%	98.1%	94.7%	97.9%	98.4% b	95.8% b	98.2% b
3- Malathion 57% EC	95.0%	92.2%	94.9%	96.2%	93.7%	95.8%	95.7% d	93.0% c	95.4% d
4- Malatox 50 % WP	96.1%	93.7%	95.8%	95.9%	92.7%	95.7%	96.0% d	93.3% c	95.7% d
5- Dimethoate 40% EC	96.2%	93.9%	95.9%	96.0%	92.8%	95.7%	96.1% d	93.2% c	95.8% d
6- Dursban 48% EC	97.0%	95.0%	96.9%	96.8%	94.8%	95.8%	96.9% c	95.2% b	96.4% c
F value :							89.7**	23.8**	108.7**
LSD at 0.05 level :							0.80	1.24	0.71

Note :

Percent of reduction were transferred to arc sine value before conducting analysis of variance.

Means in the sam column not followed by the same letter is significantly different (P < 0.05) using LSD test in MSTATC computer Program

Abo-Shanab *et al.* (2002) showed that, Malathion 57% EC at rate of 0.15 gave 95.6% reduction against *Aspidiotus hederae* infesting olive trees at Burg El-Arab, Alexandria district by using thermal fogging machine sprayer under rain-fed conditions.

Kasim and El-Dash (2002) reported that, Malathion 57% EC at rate of 0.25% was effective against *Parlatoria ziziphus* (Lucas), it reduced the nymphs and adult females populations to 93.9% and 89.2% whereas its reduction percentages in nymphs and adults populations of *Hemiberlesia lataniae* (Signoret) were 94.8% and 90.4% after one month on apple trees in Gharbiya governorate.

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كفاءة بعض المبيدات الحشرية في مكافحة حشرة القصب الرخوة
***Pulvinaria tenuivalvata* (Newstead)** على قصب السكر
 في نجع حمادى - محافظة قنا

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حشرة القصب القشرية الرخوة (*Pulvinaria tenuivalvata* (Newstead) من الآفات الحشرية الهامة اقتصاديا على قصب السكر في محافظات مصر العليا. تسبب الإصابة الشديدة بالحشرة خسارة اقتصادية كبيرة على كمية وجودة محصول قصب السكر ، كما يمكنها تدمير المحصول بالكامل مسببة نقص كبير في إنتاج السكر مما يؤدي إلى عدم توفيره محليا. أجرى البحث الحالي لمدة عامين متتاليين ٢٠٠٢/٢٠٠٣م في مركز نجع حمادى (محافظة قنا) حيث تم تقييم كفاءة ستة مبيدات حشرية فسفورية في مكافحة حشرة القصب الرخوة وحماية المحصول من أضرارها.

اتضح من نتائج الدراسة كفاءة المبيدات المختبرة في مكافحة الحشرة وخفض أعدادها في كلا العامين ، وكان المبيد الفسفوري أكتيلك أكثر المبيدات فعالية في خفض أعداد حوريات الحشرة حيث جاء في المرتبة الأولى (٩٩,١%) ، سومثيون في المرتبة الثانية (٩٨,٤%) ، دورسبان في المرتبة الثالثة (٩٦,٩%) وكان كل من دايمثويت ، ملاتوكس وملاثيون في المرتبة الأخيرة حيث خفضت أعداد الحوريات إلى ٩٦,١% ، ٩٦% ، ٩٥,٧% على التوالي.

تبين من تحليل النتائج أيضا كفاءة تلك المبيدات في خفض أعداد الحشرة الكاملة ، كان أكثر المبيدات فعالية أكتيلك في المرتبة الأولى (٩٦,٩%) ، وكان سومثيون & دورسبان في المرتبة الثانية (٩٥,٨% & ٩٥,٢%) ، وكل من ملاتوكس، دايمثويت وملاثيون في المرتبة الأخيرة حيث خفضت أعداد الحشرة الكاملة إلى ٩٣,٣% ، ٩٣,٢% ، ٩٣% على التوالي.

كما اتضح من النتائج كفاءة المبيدات المستخدمة في خفض أعداد الحشرة بصفة عامة (حوريات وحشرات كاملة) حيث كان أعلاها كفاءة في خفض التعداد الكلى لأطوار الحشرة أكتيلك في المرتبة الأولى (٩٨,٧%) ، سومثيون في المرتبة الثانية (٩٨,٢%) ، دورسبان في المرتبة الثالثة (٩٦,٤%) ، وفي المرتبة الأخيرة كان دايمثويت ، ملاتوكس والملاثيون حيث خفض التعداد الكلى لأطوار الحشرة إلي ٩٥,٨% ، ٩٥,٤% ، ٩٥,٣% على التوالي .