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

ELWAN, E. A., MOHAMED S. I. SHALABY AND MAHMoud M. KHEWA

Plant Protection Research Institute, Agricultural Research Centre, Dokki, Giza, Egypt

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Abstract

Pulvinaria tenuiivalvata (Newsted) 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 (98.1%). Durban came in the 3rd order (96.9%). Dimethoate, Malathion 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 Sumihion and Durban in the 2nd order (95.8% & 95.2%). Malathion, Dimethoate and Malathion came in the last order (93.9%, 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 Sumihion in the 3rd order (98.3%) and Durban in the 3rd order (96.4%). Dimethoate, Malathion 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 Gena and Aswan governorates (75% of total sugarcane plantation in Egypt). In the last few years, soft scale insect observed on sugarcane plantation cultivated in Attfah district, Giza governorate during 1995, the insect identified as Saccharolecanium krugerai (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 (Tohany 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 Naja El-Emma 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).

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

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. tenuivallata* 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%).
Table 2. Efficiency of some organophosphorus insecticides on sugarcane soft scale insect, *P. tanuki-viata* infesting sugarcane in Najr El-Temima village at Naga Hammadi district, Qena Governorate in the 1st year (2002).

<table>
<thead>
<tr>
<th>Insecticide</th>
<th>Pre-spraying count</th>
<th>Post-spraying counts and % of reduction</th>
<th>Average percent of reduction in the 1st year (2002)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1- Achetile 50 % EC</td>
<td>4665.5</td>
<td>256.5</td>
<td>4922.0</td>
</tr>
<tr>
<td>2- Sumithion 59 % EC</td>
<td>4287.5</td>
<td>374.3</td>
<td>4661.8</td>
</tr>
<tr>
<td>3- Malathion 57% EC</td>
<td>6598.5</td>
<td>433.3</td>
<td>6991.8</td>
</tr>
<tr>
<td>4- Malathion 59 % WP</td>
<td>4343.3</td>
<td>447.5</td>
<td>4790.8</td>
</tr>
<tr>
<td>5- Dimethactate 40% EC</td>
<td>4008.5</td>
<td>379.8</td>
<td>4388.3</td>
</tr>
<tr>
<td>6- Durban 48% EC</td>
<td>3869.5</td>
<td>374.8</td>
<td>4244.3</td>
</tr>
<tr>
<td>Control</td>
<td>4700.3</td>
<td>350.0</td>
<td>5050.3</td>
</tr>
</tbody>
</table>

F value:
- **LSD at 0.01 level:**
  - 0.84
  - 1.49
  - 0.78

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 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 Malathion 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 Malathion 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 Malathox 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% (Malathox) 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 nymph populations after 4 weeks of application, the highly residual effective compounds were Actellic (99.1%), Sumithion (98.4%), Dursban (97.3%), Malathox (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.
The table below illustrates the efficiency of some organophosphorus insecticides on sugarcane soft scale insect, *P. zonata* var. *zonata* infesting sugarcane in Naja El-Terma village at Naga-Hammadi district, Qena Governorate in the 2nd year (2003).

<table>
<thead>
<tr>
<th>Insecticide</th>
<th>Pre-spraying count</th>
<th>Post-spraying counts and % of reduction</th>
<th>Average percent of reduction in the 2nd year (2003)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Nymph</td>
<td>Adult</td>
<td>Total</td>
</tr>
<tr>
<td>Acetillic 50% EC</td>
<td>4748.5</td>
<td>428.0</td>
<td>5176.5</td>
</tr>
<tr>
<td></td>
<td>98.7%</td>
<td>97.2%</td>
<td>98.5%</td>
</tr>
<tr>
<td>Surbitin 50% EC</td>
<td>3886.5</td>
<td>315.0</td>
<td>4201.5</td>
</tr>
<tr>
<td></td>
<td>97.9%</td>
<td>94.8%</td>
<td>97.7%</td>
</tr>
<tr>
<td>Malathion 57% EC</td>
<td>4393.8</td>
<td>397.3</td>
<td>4791.1</td>
</tr>
<tr>
<td></td>
<td>95.5%</td>
<td>95.4%</td>
<td>95.5%</td>
</tr>
<tr>
<td>Malathy 50% WP</td>
<td>4914.0</td>
<td>342.3</td>
<td>5256.3</td>
</tr>
<tr>
<td></td>
<td>95.6%</td>
<td>93.8%</td>
<td>96.3%</td>
</tr>
<tr>
<td>Dimethoate 40% EC</td>
<td>4277.5</td>
<td>374.5</td>
<td>4652.0</td>
</tr>
<tr>
<td></td>
<td>95.4%</td>
<td>93.4%</td>
<td>95.7%</td>
</tr>
<tr>
<td>Durbin 46% EC</td>
<td>3733.6</td>
<td>352.0</td>
<td>4085.6</td>
</tr>
<tr>
<td></td>
<td>96.2%</td>
<td>94.6%</td>
<td>96.0%</td>
</tr>
<tr>
<td>Isonort</td>
<td>4447.3</td>
<td>443.0</td>
<td>4890.3</td>
</tr>
</tbody>
</table>

**Percent of reduction were transferred to arcsine 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%). Malathion, 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, Malathion and Malathion came in the last order (95.8% 95.7% and 95.4%),
respectively.

Literature review showed that, organophosphorous 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 Zohra 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 (Valot) infesting olive trees at Burg
El-Arebi, 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
Zohra 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 (Collvee) 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 Zohra 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. tenuivalva* infesting sugarcane in Nage-Hammodi district, Qena Governorate combined over the two years (2002 & 2003)

<table>
<thead>
<tr>
<th>Insecticide</th>
<th>Average % of reduction / year</th>
<th>% of reduction combined over the two years (2002 &amp; 2003)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1st Year (2002)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Nymph</td>
<td>Adult</td>
</tr>
<tr>
<td>1- Actellic 50 % EC</td>
<td>99.4%</td>
<td>97.4%</td>
</tr>
<tr>
<td>2- Sumithion 50 % EC</td>
<td>98.7%</td>
<td>96.8%</td>
</tr>
<tr>
<td>3- Malathion 57% EC</td>
<td>95.0%</td>
<td>92.2%</td>
</tr>
<tr>
<td>4- Malaox 50 % WP</td>
<td>96.1%</td>
<td>93.7%</td>
</tr>
<tr>
<td>5- Dimethoate 40% EC</td>
<td>96.2%</td>
<td>93.9%</td>
</tr>
<tr>
<td>6- Dursban 48% EC</td>
<td>97.0%</td>
<td>95.0%</td>
</tr>
<tr>
<td>F value :</td>
<td>89.7**</td>
<td>23.8**</td>
</tr>
<tr>
<td>LSD at 0.05 level :</td>
<td>0.80</td>
<td>1.24</td>
</tr>
</tbody>
</table>

Note: Percent of reduction were transferred to arc sine values 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
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 xiphydis* (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 *Hemipectes leitaniae* (Signore) 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) في نجد جمدي – محافظة قنا

السيد عبد الحميد عوفان ، محمد سب سيد إبراهيم شالي ، محروس محمد خيروه

معهد بحث وقاحية الأدوات - مركز البحث الزراعي - الفلاحي – المجايره

ملاحظة: النص المحول من مصادر أخرى في مكتبة معلوم موطنية.