COMPARISON BETWEEN SOME MINERAL OILS AND CIDIAL FOR CONTROLLING MEALYBUG ICERYA SEYCHELLARUM (WESTWOOD) ON MULBERRY TREES BY USING KNAPSACK MOTOR SPRAYER

NEGMA, M.F., SHADIA, M. ASSEM AND A.G. EL-SISI

1 Plant Protection Research Institute, Agricultural Research Centre, Dokki, Giza, Egypt.
2 Central Agricultural Pesticides Laboratory, Agricultural Research Centre, Dokki, Giza, Egypt.

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Abstract

Mealybug ICERYA SEYCHELLARUM is considered one of the most important economic insect of mulberry trees. This insect pest causes serious problems to silk industry in Egypt. So, the present study is an attempt to test two local mineral oils (KZ-oil and CAPL-2) against this insect with Arnilus sprayer compared with one of the recommended insecticides (Cidial), with two application rates 420, 630 lit./ fed. Biological data revealed that, application rate 420 lit./fed. of Cidial insecticide with pneumatic-rotary-atomization induced sufficient control against this insect. Droplet spectrum of deposited spraying with 420 lit./fed. were 158 spots/Cm² having an average diameter (VMD) of 94 micrometer (µm). Next comes KZ-oil at the lower rate of application 420 lit./fed. and droplet spectrum of deposited spraying was 138 spots/Cm² having an average diameter of 103 µm. The lowest biological activity treatment resulted from CAPL-2 at the same rate of application. The droplet spectrum of deposited spray 143 spots/Cm² having VMD of 99 µm.

The best control result (90.8%) was achieved by Cidial insecticide using flow rate 420 lit./fed. higher rate of application (630 lit./fed.) gave the next level of control result (77.2%) followed by KZ-oil which gave 76.5%, 72.1% reduction using lower and higher rates of application (420 lit./fed., 630 lit./fed.), respectively. Similar trend was found with CAPL-2 where 69.6% and 63.8% were achieved by applying 420 lit./fed. and 630 lit./fed. successively.

INTRODUCTION

The mealybug ICERYA SEYCHELLARUM (Westwood) could be considered as one of the main pests attacking mulberry trees Morus alba in Nile Delta which negatively affected sericulture and silk production.

This species is a polyphagous insect. It was first recorded in Egypt by Ezz and Samhan (1965) on five host plants at Suez. Shadia et al. (1991) found that the range
of host plants of this mealybug includes 44 plant species and varieties in five Governorates in Egypt; (Cairo, Giza, Qualubia, Beheira and Suez.), most of those host plants are economic horticultural plants belonging to several plant families. This giant mealybug mainly attacks the foliage, sucks a great amount of plant-sap for its protein requirements and secretes honey-dew. Most mealybug individuals are accumulated along the leaf veins underside especially along the mid-rib (Shadid, 1990).

The most effective treatment for controlling mealybug Maconellicoccus hirsutus on mulberry in Indonesia was cutting back and spraying with Fenitrothion (Anwar, 1991). In India, good control result was achieved by an inorganic oil (Azol) against the same bug on guava (Jalaluddin and Sadakathulla., 1998). On the other hand, spraying with either 0.08% of Chlorpyrifos, Aciphate, Methyl demton, Monocrotofos, Quinalfos, Dimethoate, Phenothoate or 0.02% of Cypermethrin, Fenvalerate and Carbaryl were equally effective against mealybug Drosicha magniferae on guava (Ghule and Dhumal., 1992).

The use of crude diesel emulsion against Icerya seychellarum was recorded in Mauritius by (Jepson, 1983). In Egypt the most effective insecticides against the same bug were Malathion, Cidial and Actellic (Saad, 1980).

The aim of the present study is to evaluate the biological activity of the local, safe and cheap mineral oils: KZ and CAPL-2 compared to Cidial (the recommended insecticide) under two techniques of application.

**MATERIALS AND METHODS**

A. Sprayed chemicals

1. Mineral oils

   a. KZ-oil: Local mineral oil, produced by Kafr El-Zayaat Co. for Pesticides and Chemicals, formulated as emulsifiable concentrate used at a concentration of 1.5% (v/v).

   b. CAPL-2: Local mineral oil, formulated by Central Agricultural Pesticides Laboratory as emulsifiable concentrate contained 95.62% base oil, used at a concentration of 1.5% (v/v).
2. Insecticide used

Cidial (phenthoate) 50%: Organophosphorus pesticide, used at a concentration of 0.15% (v/v).

B. Spraying machine and techniques

Knapsack motor sprayer Arimitsu with pneumatic/rotary atomizer working at 6000 r.p.m. and chemical tank capacity 16 liters, was used instead of hydraulic spraying machines to avoid wide range of droplet sizes produced with such technique (Maas, 1971; Gabir and Sawicki, 1978) which is considered as a powerless droplets from the spray quality point of view (Gabir et al., 1991). Two flow discs No. 2 and 3 were tested having a flow rate 0.91 and 1.30 lit./min., producing spraying volumes of 420 and 630 lit./h., respectively, at an average working speed 1.2 Km/h. The swath width obtained by both discs was 1.5 meter, as target spray.

C. Mulberry trees and location

The experimental area was about half feddan of Japanese mulberry trees, infested with the mealybug *Pseudococcus* (Westwood) located in El Kanater El Khairia, Qalyoubia Governorate, containing about 1050 trees with interval spaces of 1 and 2 meters between each other and their average heights were about 3 meters, with a diameter about of 2.5 meter.

This race of mulberry is a light-foliage tree in comparison with the local Egyptian race, its leaf area is about 4-5 times less than the Egyptian one.

D. Experimental design and assessment of data

Each treatment was divided into three random replicates as well as the untreated control treatment. Each replicate contained 50 trees approximately and results were based on counts of living individuals on 30 mulberry leaves on both leaf surfaces, just before spraying and four counts at weak intervals after spraying. Reduction percentages were estimated according to the equation of Henderson and Tilton (1955).

E. Timing of application and climatic conditions

Spraying application was carried out on November 13th, 1998. The average climatic conditions of air temperature, relative humidity and air speed were, 24°C, 60% and 0.5 m/sec., respectively, those conditions were favourable for spraying.
F. Qualitative evaluation of spray coverage

Measurements of size and number of deposited droplets were carried out by means of scaled monocular. All necessary corrections and calculations connected with such technique of measurement were undertaken to determine volume median diameter (VMD) and number of droplets per square centimeter were carried out according to (Anonymous, 1978).

RESULTS AND DISCUSSION

This study was conducted to disclose the effects of two different flow rates of atomizer on the performance of Arimitsu (Knapsack motor sprayer) and the biological activity of the three different chemicals, Cidial, KZ-oil and CAPI-2 against Mealybug, Icerya seychellarum.

Table 1 shows that, the coverage efficiency of this sprayer with two flow rates which produce 420 and 630 lit./fed., was homogeneous in volume median diameter (VMD) and number of droplets per square centimeter (No./Cm²) of the treated leaves with Cidial, KZ-oil and CAPI-2. There is no clear difference in VMD in the three levels on treated trees, but there is a slight increase in the number of droplets per square centimeter in middle and lower levels than the upper one. VMD of the two rates of application, 420 and 630 lit./fed. ranged between 94 and 112 micrometers, while the droplets number per square centimeter was between 107 and 158 drop/Cm².

Generally, VMD and No./Cm² of droplets increased in descending order on the three levels of the treated trees: upper, middle and lower ones as shown in Table 1.

Data in Table 2 indicates the effects of the three chemicals as a result of the obtained good coverage of the produced spectrum specially with flow rate 420 lit./fed. Cidial insecticide was the most potent chemical after one, 2, 3 and 4 weeks of spraying, compared with KZ-oil and CAPI-2. The application of Cidial with flow rate 420 lit./fed. induced 86.2, 95.0, 86.4 and 95.5 reduction percentages after one, 2, 3 and 4 weeks, respectively compared with 80.6, 71.1, 69.1 and 87.8 reduction percentages for the same periods after application with flow rate 630 lit./fed.

The same table also, shows that, application of KZ-oil with flow rate 420 lit./fed. resulted in 66.7, 64.8, 71.0 and 83.6 reduction percentages after one, 2, 3 and 4 weeks, respectively compared with 71.6, 55.9, 71.2 and 89.5 reduction percentages for the same periods after spraying with flow rate 630 lit./fed.
It is clear that the application of CAPL-2 with flow rate 420 ltr./fed. induced 57.9, 53.8, 78.4 and 88.4 reduction percentages after one, 2, 3 and 4 weeks, respectively compared with 51.6, 49.3, 62.6 and 91.6 reduction percentages for the same periods after spraying with flow rate 630 ltr./fed.

From the obtained results it could be concluded that the application of the three tested materials against this insect with 420 ltr./fed. achieved high percentages of reduction in the population densities of this insect in comparison with 630 ltr./fed. This result means that, the reduction percentages could be improved with decreasing the application rate. This result agreed with Womac, et al. (1999).

Also, the results in Table 1 supported this conclusion which indicates that, the droplet spectrum of the low rate of application (420 ltr./fed.) has higher number of droplets per square centimeter and lower VMD, compared with those produced from application rate (630 ltr./fed.). These specifications achieved good coverage of the infested leaves on the treated three levels of the tree in agreement with El-Sayed et al., (1992) who obtained good results against whitefly Bemisia tabaci with homogeneous coverage of spraying solution to inhabitant immature stages. Also, Carlos et al. (1995) stated that, effectiveness of any chemical material not only depends on the material used, but also on other factors such as application technology and rate of application.

CONCLUSION

The highest percentage of reduction of the mealybug Isovia seychellarum infested mulberry trees was 90.8% using Cidial insecticide at an application rate (420 ltr./fed.) using Arimoto’s knapsack motor sprayer.

A medium control (76.5%) was achieved by KZ-oil using application rate (420 ltr./fed.), and followed by CAPL-2 (69.8%) at the same rate. This spraying technique is suitable for use in small farms because of reducing the spraying volume and also reducing total spraying costs. Low volume technique revealed a high reduction amount of the insecticide used rather than in using conventional ground motor as a high volume technique.

Wherever, the conventional ground motor is used a spray volume not less than 2000 ltr./fed. is applied. Thus, the reduction percentages spray volume is about 80%.

In spite of the obtained results, it is recommended to use mineral oils because they are local products, safe and cheap than conventional insecticide, but to be used in low volume spraying techniques with application rate 420 ltr./fed.
Table 1. Spray coverage of tested pesticides on mulberry leaves using two different flow discs of atomizer.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>KZ - oil</th>
<th>Cidial</th>
<th>CAPL-2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tree level</td>
<td>420 l./fed.</td>
<td>530 l./fed.</td>
<td>420 l./fed.</td>
</tr>
<tr>
<td>Upper</td>
<td>VMD N/Cm²</td>
<td>VMD N/Cm²</td>
<td>VMD N/Cm²</td>
</tr>
<tr>
<td>Middle</td>
<td>102</td>
<td>125</td>
<td>111</td>
</tr>
<tr>
<td>Lower</td>
<td>104</td>
<td>148</td>
<td>115</td>
</tr>
<tr>
<td>Mean</td>
<td>103</td>
<td>138</td>
<td>112</td>
</tr>
</tbody>
</table>

Table 2. Effect of tested pesticids on coccide bug Icerya seychellarum (Westwood) infested mulberry trees.

<table>
<thead>
<tr>
<th>Pesticide</th>
<th>No. of alive insects/ treatment* and % reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spray Vol.</td>
<td>420 l./fed.</td>
</tr>
<tr>
<td>Before application</td>
<td>168.7</td>
</tr>
<tr>
<td>After one week</td>
<td>46.0</td>
</tr>
<tr>
<td>After 2 weeks</td>
<td>6.0</td>
</tr>
<tr>
<td>After 3 weeks</td>
<td>9.0</td>
</tr>
<tr>
<td>After 4 weeks</td>
<td>7.0</td>
</tr>
<tr>
<td>Mean (%)</td>
<td>76.5%</td>
</tr>
</tbody>
</table>

* Each treatment = 150 trees.
* No. of alive insects per 30 mulberry leaves.
REFERENCES


مقارنة بين بعض الزيوت المعدنية والسديدار في مقاومة البرق الدقيق

على أشجار النوت باستخدام موتور الرش الظهري

محمد فاروق نعم، شادية محمود عامر، أحمد داود السيسي

1 معهد بحوث وتقنية النباتات - مركز البترول الزراعية - الدقي - جيزة - مصر
2 انخفاض الزاوي للمبيدات - مركز البترول الزراعية - الدقي - جيزة - مصر

أجري هذا البحث بمراكز الأشجار النباتية - محافظة الجيزة، عام 1998 بعرض معرفة تأثير
معدلات الشريقات المنخفضة وذلك باستخدام جمييع من الزوان، حيث: 3 جرذان، 22 لزداد/литر من الرش. 
الإمتصاص الوار dụng كل من سعيد السديدار كمحمية البرق الدقيقية في مدة 1 شهريًاء. لازداد/10 نتر. و]
الزيوت المعدنية ك 1/6 لازداد/10 نتر. و/2 ببعض 1.6 لازداد/10 نتر. ما. كفلاً. 
بدأت الميزان بين الزيوت على أشجار النوت.

وقد أظهرت النتائج الدقيقة الآتية:

1- استخدم السديدار إلى خفض تعداد العشترية بنسبة 80.8% وتم فتح 34٪ في حالة
استخدام جمع الزيوت 4 لازداد/10 نتر.

2- تم استخدام الزوان الكهربائي إلى خفض تعداد العشترية بنسبة 47.5% وتم فتح 31٪ في حالة
استخدام جمع الزيوت 4 لازداد/10 نتر.

3- تم استخدام الزوان الكهربائي إلى خفض تعداد العشترية بنسبة 32.7% وتم فتح 37٪ في حالة
استخدام جمع الزيوت 4 لازداد/10 نتر.

من هذه النتائج يتضح باستخدام الزيوت المعدنية يمكن خرج 20 لازداد/10 نتر فتأثروا
بتلك مركبات اتمنى للنورا وتحتفها على الأعداء الطبيعية.