EFFICACY OF CERTAIN CHEMICAL AND SAFE ALTERNATIVE COMPOUNDS ON THE CABBAGE APHID BREVICORYNE BRASSICAE (LINNAEUS) AND ITS ASSOCIATED PARASITOID DIAERETIELLA RAPAE (MCLINTOCH) INHABITING CABBAGE PLANTATIONS

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ABSTRACT:

The study was conducted to evaluate the efficacy of two newly introduced European safe alternative compounds (Evure® and Karate® Zeon) versus two biocide compounds (Biosad 22% SC and Abamectin 1.8% EC), and the chemical compound (Melody 24% SC) against the cabbage aphid Brevicoryne brassicae (Linnaeus) inhabiting cabbage plantations during 2017/18 and 2018/19 cabbage growing seasons in Assiut, northern upper Egypt. Impact of the tested compounds on the infestation levels and the yield income was evaluated. Also, their side effect against the emergence of the aphid parasitoid Diaeretiella rapae (Mclntoch) was taken in consideration. Data revealed that the newly introduced compound (Karate® Zeon) was the most effective compound on the population density of B. brassicae during the entire period of study with 98.98% reduction in the pest numbers. The other newly introduced compound (Evure®) reduced the pest numbers by less reduction percentage (94.20%), and ranked the second. The chemical compound (Melody 24% SC) reduced the pest populations by 93.40% (less than both of the two newly introduced safe alternative compounds). The biocide compounds (Abamectin 1.8% EC and Biosad 22% SC) presented 78.99 and 59.08% reduction in the pest populations and appeared as the least effective compounds. Efficacy on the infestation levels and damaged (unmarketable) plants showed slight variation between the tested compounds (ranged between 47.46 - 55.34 and 46.78 - 49.10%, respectively). So, use of these compounds led to an increase in the marketable cabbage plants (yield income) by more than 50%. Unfortunately the highest effective compound (Karate® Zeon) against cabbage aphid reduced the emerged parasitoid D. rapae by 91.64%, and consequently could be has cautions as aphids control agent. According to their acceptable effectiveness against B. brassicae populations, infestation levels, unmarketable plants and low effectiveness against D. rapae, it can be recommended to use the biocide compounds (Abamectin 1.8% EC and Biosad 22% SC) to manage the population density of cabbage aphids in the field by more than one application throughout one season.

Key words: Cabbage aphid, parasitoids, chemical control, safe alternative compounds.
INTRODUCTION

The cabbage aphid Brevicoryne brassicae (Linnaeus) causes serious losses of yield in Brassica crops and reduces its marketable value (Liu et al., 1994; Costello and Altieri, 1995). This insect pest is one of the most common pests of cabbage crop in Egypt (El-Fakharany and Hendawy, 2010). Aphid's associated parasitoids are very important control agents in a variety of agricultural and horticultural crops. The hymenopterous parasitoid Diaeretiella rapae (McIntosh) is a highly polyphagous parasitic wasp parasitizing exclusively aphids throughout the world infesting hundreds of plant species, both cultivated and wild (Singh and Singh, 2015). Several decades ago, D. rapae was reported as the most effective natural enemy against the cabbage aphid, B. brassicae (George, 1957) and it has been observed to cause as high as 72% parasitism in the Netherlands (Hafez, 1961) and 76% parasitism in Kenya (Bahana and Karuhize, 1986). Continuous usage of broad-spectrum insecticides for aphid control was an occasion to its resurgence, secondary pest outbreaks, and increasing levels of resistance to insecticides. So, predominant pest control strategy has led to intensification of research on alternative control techniques and to the use of selective insecticides. Among the products that are recommended for aphid control, Pymetrozine has reported highest selectivity, systematic insecticide that harmless to natural enemies and can be used in integrated pest management (IPM) programs (Rimaz and Valizadegan, 2013). Spinosyns compounds being of biological origin, and are considered to have a low environmental impact and they are not much aggressive against non-target species. Also, these compounds had broad range of action against many insect pests belonging to different orders, noxious to a wide variety of agricultural crops. For all these reasons, these compounds are considered one of the most interesting products to be used in fighting against agricultural pests (Bacci et al., 2016). Bio-pesticides such as abamectin has been reported as broad-spectrum pesticides with high biological activity with dosage as low as 1-3 g active ingredient per hectare. With such a low rate, such pesticides not only provide protection to the environment but also are safe to human beings (UNIDO, 2008). Therefore, this work has been conducted to evaluate the efficacy of certain chemical and safe alternative compounds such as Bio-pesticides in reducing the cabbage aphid, B. brassicae populations in the field. Also, their potency to reduce the infestation levels and yield loss (unmarketable plants) has been evaluated. The side effect of these compounds on the aphid parasitoid D. rapae was also taken in consideration.

MATERIALS AND METHODS

The present investigations were conducted at the Experimental Farm of Assiut University during 2017-2018 and 2018-2019 cabbage growing seasons by using Ganzory cabbage cultivar at (Ca.1/4 fed.) and divided into plots (1/400 fed. / plot). Plants were transplanted in 50 cm intervals at 3rd October during both seasons. Insecticides application was initiated as aphid populations reached to moderate density (two months post transplantation). To evaluate the reduction
percentage of B. brassicae (all forms), 4 cabbage leaves were randomly picked up from 4 cabbage plants (1 leaf / plant) / each replicate (4 replicates) in addition to the control replicates and transferred to the laboratory to later examination. Mean numbers of B. brassicae (all forms) were counted / 5 inches / leaf, before spray by the selected compounds (Table 1) and consequently after 3, 7 and 14 days post application. Reduction percentage of the targeted insect pest numbers, were calculated according to Henderson and Tilton (1955) equation. Reduction percentage of the infested and unmarketable plants (Figure 1), were also calculated in the field. One hundred mummified aphids were isolated in test tubes (4 replicates / each compound and the control replicate) before spray and after 3, 7 and 14 days post application. Reduction percentage of the emerged parasitoid (D. rapae), were calculated according to the same equation. Data were statistically analyzed by using F-test and means were compared according to Duncan's multiple range tests as described by Steel and Torrie (1982).

Table 1. Trade name, common name and application rate of the tested compounds against B. brassicae and its parasitoid D. rapae.

<table>
<thead>
<tr>
<th>Trade name</th>
<th>Common name</th>
<th>Application rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evure®</td>
<td>Tau-fluvalinate 21,4% (240 g/l)</td>
<td>10 ml/100 Litter water</td>
</tr>
<tr>
<td>Karate® Zeon</td>
<td>Lambda cyhalothrin Sc 9.4%</td>
<td>31.2 ml/100 Litter water</td>
</tr>
<tr>
<td>Biosad 22% SC</td>
<td>Spinosad</td>
<td>10 ml /100 Litter water</td>
</tr>
<tr>
<td>Abamectin 1.8%EC</td>
<td>Bermectin</td>
<td>40 ml /100 Litter water</td>
</tr>
<tr>
<td>Melody 24%SC</td>
<td>Metoxyfenozide</td>
<td>25 ml/100 Litter water</td>
</tr>
</tbody>
</table>

Figure 1. Cabbage aphid Brevicoryne brassicae damage symptoms on cabbage plants (A: Healthy plant, B: Infested plant, C: Unmarketable plant)

RESULTS AND DISCUSSION

Effectiveness of two newly introduced European safe alternative compounds (Evure® and Karate® Zeon) versus two biocide compounds (Biosad 22% SC and Abamectin 1.8% EC), and the chemical compound (Melody 24%SC) were evaluated in the field against the cabbage aphid B. brassicae inhabiting cabbage plantations during 2017-2018 and 2018-2019 growing seasons in Assiut governorate, northern Upper Egypt. Impact of the tested compounds on the infestation levels and the yield income was evaluated. Also, their side effect against the emergence of the aphid parasitoid D. rapae was taken in consideration. The obtained results in Table (2) revealed that the newly introduced compound (Karate® Zeon) was the most effective compound on the population density of B. brassicae during the first season of study with 99.53% reduction in
the pest numbers throughout 14 days post application. The other newly introduced compound (Evure®) reduced the pest numbers by less reduction percentage (93.47%), and ranked the second. The chemical compound (Melody 24% SC) ranked the third and reduced the pest numbers by 92.80% (Less than both of the two newly introduced safe alternative compounds). The least effective compounds against this insect pest were the biocide compounds (Abamectin 1.8% EC and Biosad 22% SC) which reduced the pest numbers by 78.20 and 55.35%, respectively. Highly significant variations ($f = 41.068^{**}$) were recorded between the tested compounds. Data presented in Table (3) showed the effectiveness of the tested compounds to reduce the pest infestation levels. Variation between the most effective compound (Karate® Zeon) and the least effective one (Biosad 22% SC) was not high (ranged between 50.33 and 43.08%). Consequently non-significant variations ($f = 1.495$) were recorded between the tested compounds. Effectiveness of the tested compounds on the damaged (unmarketable) plants (Table 4) showed similar trend with non-significant variations ($f = 0.092$).

Side effect of the tested compounds on the emergence percentage of the aphid parasitoid D. rapae was presented in Table (5). Karate® Zeon was the most effective compound against the parasitoid and ranked the first with (91.47%) reduction. The remaining compounds efficacy can be arranged as descending as follows: Melody 24% SC by 50.35 > Evure® by 42.89 > Abamectin 1.8% EC by 19.63 > Biosad 22% SC by 10.22%. Highly significant variations ($f = 173.703^{**}$) were recorded between the tested compounds. With few exceptions, similar results (Tables 6-9) were obtained during the second season of study.

Data presented in Table (10) and illustrated in Figure (2) expressed about the mean reduction percentages on all of the tested measurements during both experimental seasons. Data revealed that, the newly introduced compound (Karate® Zeon) was the most effective compound on the population density of B. brassicae during the entire period of study with 98.98% reduction in the pest numbers. It followed by the other newly introduced safe alternative compound (Evure®) with average reduction 94.20%. The chemical compound (Melody 24% SC) reduced the pest populations by 93.40%. However, the biocide compounds (Abamectin 1.8% EC and Biosad 22% SC) reduced the pest populations by 78.99 and 59.08% and appeared as the least effective compounds. Effectiveness on the infestation levels and damaged (unmarketable) plants showed slight variation between the tested compounds (ranged between 47.46 -55.34 and 46.78-49.10 %, for the above-mentioned measurements, respectively). In general, potency of the tested compounds to reduce the pest populations was highly synchronized with their potency to reduce the pest infestation levels. Also, use of these compounds increased the marketable cabbage plants (yield income) by more than 50%. Unfortunately, the side effect of the most effective compounds (Karate® Zeon) against B. brassicae was so high against its parasitoid D. rapae. It reduced its
emergence by 91.64 %. On the other hand, moderately reduction percentages on the emerged parasitoid numbers were obtained by using both of (Melody 24%SC and Evure®) by 53.40 and 46.27 %, respectively. The least effective compounds against D. rapae emergence (Abamectin 1.8% EC and Biosad 22% SC) showed 23.76 and 12.01 % reduction, respectively.

In general it can be note that, the highest effective compound (Karate® Zeon) against B. brassicae populations can reduce the effectiveness of the aphid parasitoid D. rapae by 91.64 %. So, its application could have cautions as aphids control agent. The remaining compounds showed moderately effect on the emerged parasitoid numbers. According to their acceptable effectiveness against B. brassicae populations, infestation levels, unmarketable plants and low effectiveness against D. rapae, it can be recommended to use the biocide compounds (Abamectin 1.8% EC and Biosad 22% SC) to manage the population density of cabbage aphids in the field by more than one application during the cabbage growing season.

Successful use of Abamectin (Bermectine) 1.8% EC at 40 ml/100L water against the cabbage aphid B. brassicae in the field was applied in Northern Egypt by El-Fakharany and Hendawy (2010). They reported that, this compound reduced B. brassicae populations by 91.54 and 92.08 % during 2008/09 and 2009/10 cabbage growing seasons, respectively. Also, they reported that, this compound had slight effects on the aphid's associated natural enemies (Predators, true spiders and parasitoids). Efficacy of Abamectin against various stages of the red palm weevil Rhynchophorus ferrugineus (Olivier) (Coleoptera: Curculionidae) under laboratory conditions was evaluated in Saudi Arabia by (Albutairi et al., 2016). Their bioassay test showed that, Abamectin at 600 ppm (μg/ml) caused 60% mortality against females and males after 24 h. By increasing the concentration to 1000 ppm, the mortality reached 100% for adults. In other applications by some derivatives of the tested products, (Amro and Abdel-Galil, 2012) used Radiant 12% SC (Spinotoram) in the same area of study and reduced onion thrips, Thrips tabaci Lindeman infesting onion heads by 89.75 %. On the other hand, El-Wakeil and Volkmar (2013) proved that Karate caused the highest percent mortality to wheat insect pests and reduced natural enemy diversities. However, Salem et al. (2018) reported that, Karate and Tracer 24% SC (Spinosad) reduced cereal aphid complex infesting wheat by 99.31 and 97.05 %, respectively.

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The authors were grateful to Prof. Dr. Abdellah Said Hussein Abdel-Moniem, Head of Plant Protection Department, Faculty of Agricultural, Beni-Suef University, for supplying with the newly used safe alternative compounds. Especial thank to the staff members of Plant Protection Department, Faculty of Agriculture, Assiut University and staff members of Insect Research Laboratory in Assiut, Plant Protection Research Institute for supporting and encouragement during the study.
REFERENCES


Amro, M. A. and Abdel-Galil, F. A. 2012. Can safe alternative compounds used as a promising tool for suppressing Thrips tabaci (Lind.) inhabiting onion seed plantations? The 6rd. Int. Conf. for Develop. and the Env. in the Arab world, March, 24-26:167-175.


Table 2. Potency of the tested compounds in reducing numbers of cabbage aphids Brevicoryne brassicae infesting cabbage plants during 2017-2018 cabbage growing season in Assiut region

<table>
<thead>
<tr>
<th>Compound</th>
<th>Mean numbers of B. brassicae / 4 leaves (5 inches² / leaf) / plot and reduction %</th>
<th>GR%</th>
<th>RO</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Before spraying</td>
<td>After 3 days</td>
<td>After 7 days</td>
</tr>
<tr>
<td></td>
<td>MN</td>
<td>R%</td>
<td>MN</td>
</tr>
<tr>
<td>Evure ®</td>
<td>865.0</td>
<td>148.8</td>
<td>87.76</td>
</tr>
<tr>
<td>Karate® Zeon</td>
<td>882.5</td>
<td>3.50</td>
<td>99.71</td>
</tr>
<tr>
<td>Biosad 22% SC</td>
<td>873.8</td>
<td>440.0</td>
<td>64.00</td>
</tr>
<tr>
<td>Abamectin 1.8%EC</td>
<td>882.5</td>
<td>370.0</td>
<td>69.76</td>
</tr>
<tr>
<td>Melody 24%SC</td>
<td>886.3</td>
<td>91.25</td>
<td>92.80</td>
</tr>
<tr>
<td>Control</td>
<td>872.5</td>
<td>1220</td>
<td>-----</td>
</tr>
</tbody>
</table>

MN = Mean numbers, R% = Reduction %, GR% = General Reduction %, RO = Ranking order

Table 3. Potency of the tested compounds in reducing percentages of the infested cabbage plants by cabbage aphids Brevicoryne brassicae during 2017-2018 cabbage growing season in Assiut region

<table>
<thead>
<tr>
<th>Compound</th>
<th>Mean percentage of the infested cabbage plants / plot and reduction %</th>
<th>GR%</th>
<th>RO</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Before spraying</td>
<td>After 3 days</td>
<td>After 7 days</td>
</tr>
<tr>
<td></td>
<td>MP</td>
<td>R%</td>
<td>MP</td>
</tr>
<tr>
<td>Evure ®</td>
<td>6.00</td>
<td>6.00</td>
<td>38.00</td>
</tr>
<tr>
<td>Karate® Zeon</td>
<td>5.00</td>
<td>5.00</td>
<td>38.00</td>
</tr>
<tr>
<td>Biosad 22% SC</td>
<td>4.00</td>
<td>4.00</td>
<td>38.00</td>
</tr>
<tr>
<td>Abamectin 1.8%EC</td>
<td>5.00</td>
<td>5.00</td>
<td>38.00</td>
</tr>
<tr>
<td>Melody 24%SC</td>
<td>7.00</td>
<td>7.00</td>
<td>38.00</td>
</tr>
<tr>
<td>Control</td>
<td>8.00</td>
<td>13.00</td>
<td>-----</td>
</tr>
</tbody>
</table>

MP = Mean percentage, R% = Reduction %, GR% = General Reduction %, RO = Ranking order

Table 4. Potency of the tested compounds in reducing percentages of the unmarketable cabbage plants infested by cabbage aphid Brevicoryne brassicae during 2017 -2018 cabbage growing season in Assiut region.

<table>
<thead>
<tr>
<th>Compound</th>
<th>Mean percentage of the unmarketable cabbage plants / plot and reduction %</th>
<th>GR%</th>
<th>RO</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Before spraying</td>
<td>After 3 days</td>
<td>After 7 days</td>
</tr>
<tr>
<td></td>
<td>MP</td>
<td>R%</td>
<td>MP</td>
</tr>
<tr>
<td>Evure ®</td>
<td>5.00</td>
<td>5.00</td>
<td>29.00</td>
</tr>
<tr>
<td>Karate® Zeon</td>
<td>5.00</td>
<td>5.00</td>
<td>29.00</td>
</tr>
<tr>
<td>Biosad 22% SC</td>
<td>5.00</td>
<td>5.50</td>
<td>21.90</td>
</tr>
<tr>
<td>Abamectin 1.8%EC</td>
<td>4.00</td>
<td>4.00</td>
<td>29.00</td>
</tr>
<tr>
<td>Melody 24%SC</td>
<td>6.00</td>
<td>6.00</td>
<td>29.00</td>
</tr>
<tr>
<td>Control</td>
<td>5.00</td>
<td>7.00</td>
<td>-----</td>
</tr>
</tbody>
</table>

MP = Mean percentage, R% = Reduction %, GR% = General Reduction %, RO = Ranking order

F value between treatments= 0.092
Table 5. Potency of the tested compounds in reducing percentages of the aphid emerged parasitoid (Diaeretiella rapae) inhabiting cabbage during 2017-2018 cabbage growing season in Assiut region

<table>
<thead>
<tr>
<th>Compound</th>
<th>Mean percentage of emerged parasitoids / 100 mummified aphid and reduction %</th>
<th>GR%</th>
<th>RO</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Before spraying</td>
<td>After 3 days</td>
<td>After 7 days</td>
</tr>
<tr>
<td></td>
<td>MP</td>
<td>R%</td>
<td>MP</td>
</tr>
<tr>
<td>Evure ®</td>
<td>88.75</td>
<td>38.25</td>
<td>57.43</td>
</tr>
<tr>
<td>Karate® Zeon</td>
<td>86.25</td>
<td>5.25</td>
<td>94.06</td>
</tr>
<tr>
<td>Biosad 22% SC</td>
<td>88.75</td>
<td>75.50</td>
<td>15.85</td>
</tr>
<tr>
<td>Abamectin 1.8%EC</td>
<td>83.75</td>
<td>57.00</td>
<td>32.68</td>
</tr>
<tr>
<td>Melody 24% SC</td>
<td>90.50</td>
<td>43.50</td>
<td>52.48</td>
</tr>
<tr>
<td>Control</td>
<td>90.75</td>
<td>92.00</td>
<td>-----</td>
</tr>
</tbody>
</table>

MP = Mean percentage, R% = Reduction %, GR% = General Reduction %, RO = Ranking order

F value between treatments= 173.703**

Table 6. Potency of the tested compounds in reducing numbers of cabbage aphids Brevicoryne brassicae infesting cabbage plants during 2018-2019 cabbage growing season in Assiut region

<table>
<thead>
<tr>
<th>Compound</th>
<th>Mean numbers of B. brassicae / 4 leaves (5 inches2 / leaf) / plot and reduction %</th>
<th>GR%</th>
<th>RO</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Before spraying</td>
<td>After 3 days</td>
<td>After 7 days</td>
</tr>
<tr>
<td></td>
<td>MN</td>
<td>R%</td>
<td>MN</td>
</tr>
<tr>
<td>Evure ®</td>
<td>795.5</td>
<td>80.00</td>
<td>93.30</td>
</tr>
<tr>
<td>Karate® Zeon</td>
<td>805.5</td>
<td>15.50</td>
<td>98.66</td>
</tr>
<tr>
<td>Biosad 22% SC</td>
<td>855.0</td>
<td>480.5</td>
<td>62.48</td>
</tr>
<tr>
<td>Abamectin 1.8%EC</td>
<td>799.5</td>
<td>320.0</td>
<td>73.20</td>
</tr>
<tr>
<td>Melody 24% SC</td>
<td>840.5</td>
<td>85.50</td>
<td>93.30</td>
</tr>
<tr>
<td>Control</td>
<td>835.0</td>
<td>1250</td>
<td>-----</td>
</tr>
</tbody>
</table>

MN = Mean numbers, R% = Reduction %, GR% = General Reduction %, RO = Ranking order

F value between treatments= 73.206**

Table 7. Potency of the tested compounds in reducing percentages of the infested cabbage plants by cabbage aphids Brevicoryne brassicae during 2018-2019 cabbage growing season in Assiut region

<table>
<thead>
<tr>
<th>Compound</th>
<th>Mean percentage of the infested cabbage plants / plot and reduction %</th>
<th>GR%</th>
<th>RO</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Before spraying</td>
<td>After 3 days</td>
<td>After 7 days</td>
</tr>
<tr>
<td></td>
<td>MP</td>
<td>R%</td>
<td>MP</td>
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<tr>
<td>Evure ®</td>
<td>5.50</td>
<td>5.50</td>
<td>50.00</td>
</tr>
<tr>
<td>Karate® Zeon</td>
<td>6.50</td>
<td>6.50</td>
<td>50.00</td>
</tr>
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<td>Biosad 22% SC</td>
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<td>7.00</td>
<td>41.50</td>
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<tr>
<td>Abamectin 1.8%EC</td>
<td>5.50</td>
<td>6.00</td>
<td>45.50</td>
</tr>
<tr>
<td>Melody 24% SC</td>
<td>6.00</td>
<td>6.00</td>
<td>50.00</td>
</tr>
<tr>
<td>Control</td>
<td>6.00</td>
<td>12.0</td>
<td>-----</td>
</tr>
</tbody>
</table>

MP = Mean percentage, R% = Reduction %, GR% = General Reduction %, RO = Ranking order

F value between treatments= 1.587
Table 8. Potency of the tested compounds in reducing percentages of the unmarketable cabbage plants infested by cabbage aphid *Brevicoryne brassicae* during 2018-2019 cabbage growing season in Assiut region.

<table>
<thead>
<tr>
<th>Compound</th>
<th>Mean percentage of the unmarketable cabbage plants / plot and reduction %</th>
<th>GR%</th>
<th>RO</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Before spraying</td>
<td>After 3 days MP</td>
<td>R%</td>
</tr>
<tr>
<td>Evure®</td>
<td>6.50</td>
<td>6.50</td>
<td>25.00</td>
</tr>
<tr>
<td>Karate® Zeon</td>
<td>6.25</td>
<td>6.25</td>
<td>25.00</td>
</tr>
<tr>
<td>Biosad 22% SC</td>
<td>5.75</td>
<td>6.00</td>
<td>22.00</td>
</tr>
<tr>
<td>Abamectin 1.8%EC</td>
<td>4.75</td>
<td>5.00</td>
<td>21.25</td>
</tr>
<tr>
<td>Melody 24%SC</td>
<td>5.00</td>
<td>5.00</td>
<td>25.00</td>
</tr>
<tr>
<td>Control</td>
<td>6.00</td>
<td>8.00</td>
<td>-----</td>
</tr>
</tbody>
</table>

MP = Mean percentage, R% = Reduction %, GR% = General Reduction %, RO = Ranking order

F value between treatments = 0.039

Table 9. Potency of the tested compounds in reducing percentages of the aphid emerged parasitoid (*Diaeretiella rapae*) inhabiting cabbage during 2018-2019 cabbage growing season in Assiut region.

<table>
<thead>
<tr>
<th>Compound</th>
<th>Mean percentage of emerged parasitoids /100 mummified aphid and reduction %</th>
<th>GR%</th>
<th>RO</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Before spraying</td>
<td>After 3 days MP</td>
<td>R%</td>
</tr>
<tr>
<td>Evure®</td>
<td>87.50</td>
<td>37.50</td>
<td>57.86</td>
</tr>
<tr>
<td>Karate® Zeon</td>
<td>86.50</td>
<td>6.50</td>
<td>92.16</td>
</tr>
<tr>
<td>Biosad 22% SC</td>
<td>88.25</td>
<td>80.00</td>
<td>10.52</td>
</tr>
<tr>
<td>Abamectin 1.8%EC</td>
<td>82.50</td>
<td>62.50</td>
<td>25.52</td>
</tr>
<tr>
<td>Melody 24%SC</td>
<td>88.50</td>
<td>42.50</td>
<td>52.96</td>
</tr>
<tr>
<td>Control</td>
<td>89.50</td>
<td>91.50</td>
<td>-----</td>
</tr>
</tbody>
</table>

MP = Mean percentage, R% = Reduction %, GR% = General Reduction %, RO = Ranking order

F value between treatments = 370.711**

Table 10. Potency of the tested compounds in reducing *Brevicoryne brassicae* populations, percent infestation, unmarketable cabbage plants and emerged parasitoids % during 2017-2018 and 2018-2019 cabbage growing seasons in Assiut region.

<table>
<thead>
<tr>
<th>Compound</th>
<th>General reduction percentage during 2017-2018 and 2018-2019 cabbage growing seasons</th>
<th>B. brassicae Populations</th>
<th>Infested plants %</th>
<th>Unmarketable plants %</th>
<th>Emerged parasitoids %</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>R %</td>
<td>RO</td>
<td>R %</td>
<td>RO</td>
<td>R%</td>
</tr>
<tr>
<td>Evure®</td>
<td>94.20</td>
<td>2</td>
<td>54.75</td>
<td>2</td>
<td>49.10</td>
</tr>
<tr>
<td>Karate® Zeon</td>
<td>98.98</td>
<td>1</td>
<td>55.34</td>
<td>1</td>
<td>47.96</td>
</tr>
<tr>
<td>Biosad 22% SC</td>
<td>59.08</td>
<td>5</td>
<td>47.46</td>
<td>5</td>
<td>47.88</td>
</tr>
<tr>
<td>Abamectin 1.8%EC</td>
<td>78.99</td>
<td>4</td>
<td>50.33</td>
<td>4</td>
<td>46.78</td>
</tr>
<tr>
<td>Melody 24%SC</td>
<td>93.40</td>
<td>3</td>
<td>52.84</td>
<td>3</td>
<td>48.85</td>
</tr>
</tbody>
</table>

R% = Reduction %, RO = Ranking Order
Figure 2. Potency of the tested compounds in reducing *Brevicoryne brassicae* populations, percent infestation, unmarketable cabbage plants and emerged parasitoids % during 2017-2018 and 2018-2019 cabbage growing seasons in Assiut region.
فعالية بعض المركبات الكيميائية والبدائل الأمنة لل sist قشرة السائل بانامة ومن الكربن والطفيل المصاحب له التي تقلز زراعات الكرنب

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**معهد بحث وقاية النباتات - مركز البحوث الزراعية - الدقى - الجيزة - مصر.

المستند العربي:

Evure® and Karate® (Biosad 22% SC and Abamectin 1.8% EC) مقاومة لمتكين طبيين (Zeon 24%SC) لدورة الكرنب (Melody 24%SC) الذي يقتل زراعات الكرنب خلال موسم نمو الكرنب 10/2017 و 1/2018 بأسيوط شمالي صعيد مصر. تم أيضا تقيم فعالية هذه المركبات على معدل الاصابة وكيفية المحصول. كما أخذ في الاعتبار تأثير هذه المركبات على نسب إعداد المنبلطة من محوريات الكرنب المبطول عليها. أظهرت النتائج أن المركب Diaeretiella rapae (McLoch) كان أكثر المركبات فعالية في حالة مجامع حشرة من الكرنب بمتوسط خفض فاعل 98.98%.

تلاء في ذلك مركب (Evure®) بمتوسط خفض عام 94.40% المركب الديسكي (Abamectin 1.8% EC) خفض معدل الألفة بمقدار 93.60% (أقل من المركبين السابقين). المركبات الطبية (and Biosad 22% SC) أظهرت أقل نسبة خفض في تعداد الألفة بمقدار 78.00% على التوالي.

فعالية المركبات المختارة على خفض نسبة النباتات المصابه والنباتات غير المصابه كليا تراوحت بين 77.46 - 75.64% (65.38% على التوالي. وبهذا فقد ظهر أن استناد هذه المركبات أدى إلى زيادة في المحصول بنسبة تجاوزت ال 75%. نسوا النتائج أن أكثر المركبات فعالة على الألفة كان أكترها فعالية على الطفيل المصاحب حيث أدأ استخدامه أعلى نسبة خفض في أعداد الطفيل المنبلطة من المحوريات مقدارها 74.91%.

بالتالي فإنه يجب أن يكون هناك محايد عند استخدام هذا المركب كعنصير لمكافحة المن. نسبة الخفض المقبولة في المركب (Abamectin 1.8% EC) أعداد الألفة والتي تجبها نسبة خفض قليلة في أعداد الطفيل المنبلطة عند أعداد مركبي (and Biosad 22% SC) الحليب حتى لو أسدقي ذلك تطبيقا أكثر من مرة في المواسم الواحد.

الكلمات المفتاحية: الكرنب ومتكين الصليبيات والطفيليات والكافحة الكيميائية والبدائل الأمنة لل sist قشرة السائل بانامة.