A Preliminary report of experiment for controlling Rice weevil, *(Sitophilus oryzae)* in stored wheat by compounds of synergist Ms-8* and pesticides

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**Abstract**

Wheat were treated respectively with 0.1% Liangchongjing, 0.05% malathion, 0.03% deltamethrin, 0.03% cypermethrin, 0.03% Ms-8 + malathion, 0.03% Ms-8 + deltamethrin, 0.03% Ms-8 + cypermethrin and 0.03% Ms-8 + alphacypermethrin to compare the control and protection effect of them. Results indicated that the control effects after 7 days on rice weevil were 90.24%, 100%, 99.32%, 88.36%, 96.84%, 74.51%, 93.72% and 56.37% respectively. Among them, the control effect of Ms-8 + cypermethrin was 16.49% higher than that of cypermethrin. The protection effects after 11 months on wheat were 68.76%, 78.47%, 82.63%, 65.08%, 79.55%, 68.11%, 74.14% and 71.92% Among them, the protection effect of Ms-8 + cypermethrin was 15.45% higher than that of cypermethrin. The mentioned results indicate that synergism of cypermethrin + synergist Ms-8 was good and there was an utmost significant positive correlation between the loss rate \((Y)\) of stored wheat and the rate \((X)\) of damaged wheat by rice weevil. Its correlation coefficient is \(r = 0.982\), regression equation was \(Y = 1.449 + 1.593X\)

**Introduction**

The damage of stored grain insects is increasing along with the increase of the number of stored grain in farmer family. It has brought great loss to stored grain. Ms-8 is a new synergist that has synergism effect on organophosphor, pyrethroid and amino-formate insecticides. A large number of mixed compounds such as fenvalerate + malathion, strengthened methomyl, cypermethrin + phoxim etc. have been produced. The control effect of these compounds on Lepidoptera insects can be raised to 4 - 13 times in the fields, so that the quantities of applied insecticide could be decreased. But we have not seen any reports on the effect on control of rice weevil *(Sitophilus oryzae)*. This experiment used different insecticides and added quantititative synergist Ms-8 to control rice weevil and to pick out economic and effective compounds. The relation between the loss rate of stored wheat and rate of damaged wheat by rice weevil is also analyzed.

**Materials and Methods**

**Insecticides**

- Liangchongjing WP 0.1 %
- malathion EC 0.05 %
- deltamethrin EC 0.03 %
- cypermethrin EC 0.03 %
- 15% Ms-8 + malathion EC 0.03 %
- 15% Ms-8 + deltamethrin EC 0.03 %
- 15% Ms-8 + cypermethrin EC 0.03 %
- 15% Ms-8 + alphacypermethrin EC 0.03 %

**Insects**

- Rice weevil, *Sitophilus oryzae* (L.).

**Experiment method**

**Determination of control effect**

Insecticides were sprayed respectively on the wheat bran as a carrier with a micro-sprayer and then were mixed with materials that carry rice weevil. Treated materials were put into Petri dish. All treatment was in three duplicates. The control effect on rice weevil was observed after 7 days of treatment. The death identification of rice weevil is that they cannot move normally and can not come back to life anymore.

**Determination of grain protection effect**

Insecticides were sprayed respectively on the carrier. The carrier was put into shadow place to dry and then was mixed with wheat in different proportion. All treatment was done in three duplicates. Each treatment used 100g wheat. Treated wheat was put into paper bags respectively and stored for 11 months at the normal room temperature. The loss rate was assessed after 11 months of treatment and the
effect of grain protection was determined. The different significance was tested with the experiment data according to the method of D. B. Dunean.

Results and Analysis

Control effect of different insecticides on rice weevil

The control effect on weevil after 7 days is listed in Table 1.

Data in Table 1 indicate that when control effect of 0.05% malathion reaches up to 100% after 7 days, control effects of deltamethrin and Ms-8 + malathion are nearly equal to the effect of Langchongjung. The control effect of Ms-8 + cypermethrin is 93.72%, which is 5.63% higher than that of cypermethrin. The synergism of Ms-8 to cypermethrin is 16.49%. The control effect of Ms-8 + malathion is almost equal to that of malathion. The synergism of Ms-8 to malathion is zero.

Table 1. Controlling effect of different insecticides on rice weevil after 7 days in room.

<table>
<thead>
<tr>
<th>Treatments</th>
<th>The number of weevil before treatment</th>
<th>Mortality (%)</th>
<th>Mortality Adjusted (%)</th>
<th>Significance Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liangchongjung WP 0.1%</td>
<td>59.33</td>
<td>91.83</td>
<td>90.24</td>
<td>a</td>
</tr>
<tr>
<td>Malathion EC 0.05%</td>
<td>72.30</td>
<td>100.0</td>
<td>100.0</td>
<td>a</td>
</tr>
<tr>
<td>Deltamethrin EC 0.03%</td>
<td>55.00</td>
<td>99.46</td>
<td>99.32</td>
<td>a</td>
</tr>
<tr>
<td>Ms-8 + malathion EC 0.03%</td>
<td>90.67</td>
<td>97.14</td>
<td>96.84</td>
<td>a</td>
</tr>
<tr>
<td>Ms-8 + cypermethrin EC 0.03%</td>
<td>83.33</td>
<td>94.42</td>
<td>93.72</td>
<td>a</td>
</tr>
<tr>
<td>Cypermethrin EC 0.03%</td>
<td>96.00</td>
<td>89.59</td>
<td>88.36</td>
<td>a</td>
</tr>
<tr>
<td>Ms-8 + alphacypermethrin EC 0.03%</td>
<td>82.00</td>
<td>62.24</td>
<td>56.37</td>
<td>b</td>
</tr>
<tr>
<td>Ms-8 + deltamethrin EC 0.03%</td>
<td>61.33</td>
<td>58.92</td>
<td>53.51</td>
<td>b</td>
</tr>
</tbody>
</table>

Note: Data in the table is the average of three repeats.

The protection effect of different insecticides to wheat

After treated wheat was stored for 11 months at the room temperature and then the rate of damaged wheat was counted, and the effect of grain protection was calculated. Result is shown as Table 2.

Table 2. The protection effect of different insecticides to wheat.

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Damaged rate (%)</th>
<th>Loss rate (%)</th>
<th>Protection effect (%)</th>
<th>Significance test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liangchongjung WP 0.1%</td>
<td>2.293</td>
<td>4.467</td>
<td>68.76</td>
<td>cd</td>
</tr>
<tr>
<td>Malathion EC 0.05%</td>
<td>1.580</td>
<td>3.967</td>
<td>78.47</td>
<td>ab</td>
</tr>
<tr>
<td>Deltamethrin EC 0.03%</td>
<td>1.277</td>
<td>2.967</td>
<td>82.63</td>
<td>a</td>
</tr>
<tr>
<td>Ms-8 + malathion EC 0.03%</td>
<td>1.517</td>
<td>4.367</td>
<td>79.55</td>
<td>ab</td>
</tr>
<tr>
<td>Ms-8 + cypermethrin EC 0.03%</td>
<td>1.919</td>
<td>5.300</td>
<td>74.14</td>
<td>abc</td>
</tr>
<tr>
<td>Ms-8 + deltamethrin EC 0.03%</td>
<td>2.387</td>
<td>5.133</td>
<td>68.11</td>
<td>cd</td>
</tr>
<tr>
<td>Ms-8 + alphacypermethrin EC 0.03%</td>
<td>2.076</td>
<td>5.133</td>
<td>71.92</td>
<td>bcd</td>
</tr>
<tr>
<td>Cypermethrin EC 0.03%</td>
<td>2.530</td>
<td>5.600</td>
<td>65.08</td>
<td>d</td>
</tr>
<tr>
<td>Ck</td>
<td>7.387</td>
<td>13.367</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. The data in table are the average of three repeats.

Table 2 shows that the effect of 2.5% deltamethrin is better than that of other treatment, the protection effect on wheat is 82.63%, and it can reduce loss ratio in 10.40%.

The control effect of Ms-8 + cypermethrin is 74.14%, which is 10.06% higher than 65.08 of cypermethrin. The synergism of Ms-8 to cypermethrin is 15.45% which is
nearly equal to the control effect of 16.49% mentioned above. The control effect 82.63% of deltamethrin is
14.52% higher than 68.11% of Ms-8 + deltamethrin, and
Ms-8 to deltamethrin shows antagonism

The correlativity between damaged rate and loss rate
of wheat

Experiment results indicate that there is an utmost
significant positive correlation between the loss rate \(Y\)
and the rate \(X\) of damaged wheat. The correlation
coefficient is \(r = 0.982^{**} (r_{0.01} = 0.725, df = 9)\). The
regression equation is \(Y = 1.449 + 1.593X\). The confidence
interval of 95% probability limit is \(0.8486 \leq \beta \leq 2.3374\).
That is to say, the stored wheat will lose or save loss of
0.8486 – 2.3374, as the average rate of damaged wheat
increases or reduces about 1%.

Conclusion and Discussion

The Ms-8 used in this experiment has very remarkable
synergism in controlling aphids and Lepidoptera insects, and
the synergism is normally 4 - 13 times. The synergism of
Ms-8 to cypermethrin is outstanding. The control and
protection effect of Ms-8 + cypermethrin are 16.49% and
15.45% respectively. But the Ms-8 is no synergism to
malathion. The Ms-8 to deltamethrin shows antagonism.
The synergism of Ms-8 to insecticides for controlling
Sitotroga cerealella and other stored grain pests remains to
be studied.

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