TOXICITY OF FOUR PESTICIDES ON EOBANIA VERMICULATA AND MONACHA OBSTRUCTA LAND SNAILS USING LEAF DIPPING AND POISON BAIT TECHNIQUE UNDER LABORATORY CONDITIONS

G. H. Rady(1), A. A. Asran(2), H.M. Abdelnabby(1) and M. A. Elsawaf(2)

(1) Plant Protection Department, Faculty of Agriculture, Benha University
(2) Plant Protection Research Institute, Dokki, Giza, Egypt

Received: Aug. 6, 2017 Accepted: Jan. 8, 2018

ABSTRACT: The toxicity effect of four pesticides (Neomyl, Gastrotox, Round up and Topsin) were evaluated against the brown garden snail, Eobania vermiculata and the glassy clover snail, Monacha obstructa land snails using leaf dipping and poison bait technique under laboratory conditions.

The toxicological studies on Eobania vermiculata snail by poison bait technique revealed that Gastrotox exhibited the highest toxic effect followed by Neomyl and Round up. While, Topsin gave the least effect in this respect. Their LC50 values were (0.16, 0.31, 1.25 and 2.03%), respectively. The relative potency of Gastrotox was 0.19, 0.56 and 0.59 times than of Topsin, Neomyl and Round up and the slope values were 1.97, 1.69, 1.64 and 2.4, respectively.

On the other hand, the activity of the same tested chemicals against Monacha obstructa and the same technique showed that Gastrotox was the most potent one followed by Neomyl, Round up and Topsin. Their LC50 values were (0.18, 0.33, 1.48 and 2.48%), respectively. Also, it noticed that the relative potency of Gastrotox was 0.37, 0.56 and 0.81 times than of Topsin, Neomyl and Round up and the slope values were 1.7, 1.72, 1.59 and 1.86, respectively.

The molluscicidal activity of Neomyl, Topsin and Round up using dipping technique against Eobania vermiculata illustrated that Neomyl exhibited the highest toxic effect followed by Round up. While, Topsin gave the least effect in this respect. Their LC50 values were 0.24, 0.98 and 1.71 and the relative potency of Neomyl was 0.98 and 1.71 times than of Round up and Topsin. Also, the slope values were 0.58, 0.42 and 0.056, respectively.

Concerning the activity of the previous tested chemicals against Monacha obstructa results indicated that Round up was the most potent one followed by Neomyl. But, Topsin gave the least effect and their LC50 values were 0.23, 0.26 and 2.23, respectively. The relative potency of Round up was 0.52 and 0.20 times than of Neomyl and Topsin. Also, the slope values were 1.71, 1.87 and 1.83, respectively.

Key words: Brown garden snail, glassy clover snail, molluscicide, control

INTRODUCTION
Nowadays, the terrestrial snails have become a destructive agricultural pests because it attacking many plants at their different growth stages and feed on leaves, roots, flowers and fruits causing a great economic damage to a wide varieties of field crops, vegetables, horticultural plants and fruit trees in the most areas of Egypt and reduce the yield and its marketing value.

Most molluscicides against terrestrial gastropods more usually deployed in baits Barker (2002). Bait technique is more suitable for reducing environmental pollution as well as the simplicity for use and usually low costly.
The present work aims to evaluate the molluscicidal activity of four pesticides against two land snails species, the brown garden snail, *Eobania vermiculata* and the glassy clover snail, *Monacha obstructa* using two methods of application.

**MATERIALS AND METHODS**

Experiments were designed to study the control measures which can be used effectively to diminish population density and consequently damage caused by common land snails, *E. vermiculata* and *M. obstructa*.

- **Tested snails:**
  The tested snails were adult individuals of glassy clover snails, *M. obstructa* (muller) and brown garden snails, *E. vermiculata* (muller) were collected from infested horticulture, vegetables and field crops at Ashmoon district, menufiya governorate.

  The snails transferred in closed bags to the laboratory and were kept separately each species-at room temperature in glassy terrariums (40*25*20cm) containing moist soil and provided with fresh green lettuce leaves for two weeks for acclimatization before testing (Godan, 1983). Ten healthy individuals were selected for each replicate and starved for 24 hours before starting the testes.

- **Tested materials:**
  Four pesticides belonging to different chemical groups were tested, common name, trade name and chemical name of these compounds were as follows:
  - Methomyl (Neomyl 90% WP) insecticide, molluscicide.
    Chemical name: S-methyl-N-[(methyl carbamoy)oxy] thio acetimidate.
  - Methaldyde (Gastrotox 5% RB) molluscicide.
  - Round up 48% WSC Herbicide
    Chemical name: N-(phosphono methyl) glycine, iso propyl ammonium.
  - Topsin 70% WP Fungicide, Nematicide.
    Chemical name: Dimethyl [(1,2-phenylene) bis-(iminocarbonothioyl)] bis [carbamate].

- **Procedure conducted:**
  Sixty plastic boxes of 13 cm diameter and 15cm depth were prepared to conduct the experiments by putting 10 snail in it to treat it with different pesticides. Twenty boxes, 4 replicates for each treatment, two methods were used for test these pesticides.

- **Method of pesticide applications:**
  1- **Leaf dipping technique:**
     Neomyl 90%, Gastrotox 5%, Topsin 70 % WP and Round up 48% WSC were tested at different concentrations, similar pieces of green lettuce leaves were dipped in glass jar containing 100ml of tested pesticide for 5 seconds, then left to dry before being offered to the tested animals. Ten adult individuals with the same shell diameter were exposed to each treated leaves in plastic box and the boxes were covered with muslin cloth held by rubber band to prevent animals from escaping, (Baker and Hawake., 1991). Each concentration was included 4 replicates and 4 replicates were kept without treatment as control. All boxes were examined after 3, 6, 9 and 11 days to recorded the mortality percentage.

  2- **Poisonous baits technique:**
     Neomyl 90%, Gastrotox 5%, Topsin 70 % WP and Round up 48% WSC were tested as poisonous baits at different concentrations, the poisonous baits were
Toxicity of four pesticides on eobania vermiculata and monacha 

Prepared by mixing a known of each compound with 5 parts of black sugarcane syrup, then the mixture was incorporated with wheat bran to be finally 100 parts and the bait was moistened with appropriate amount of water.

Ten adult individuals were exposed to 20 grams bait in plastic box and a small piece of sponge saturated with water was kept in the bottom of each box as source of humidity to keep animals active. Boxes were covered with tiny holes muslin for ventilation and to prevent snails from escaping, 4 replicates were used for each concentration of bait and 4 replicates were prepared using wheat brain bait mixed with black sugarcane syrup only without pesticide as control. Finally, all boxes were examined after 3, 6, 9 and 11 days, the mortality percentage was calculated and recorded.

- Toxicity of the tested compounds:

  Mortality percentages were calculated and corrected according to abbott’s formula (1925) as follows:

  Corrected mortality =

  \[
  \frac{\text{Observed M. %} - \text{control M. %}}{100 - \text{control mortality}%} \times 100
  \]

  The toxicity lines were statistically analyzed according to Litchfield and Wilcoxon (1949) as follows:

  \[ Y = a + b x \]

  where \( Y = \) Probit unit, \( a = \) constant value, \( b = \) slope of line and \( x = \) log concentration.

  LC50, confidential limits, and slope for the tested pesticides were calculated according to Finny (1952).

RESULTS AND DISCUSSION

A serial of experiments had been conducted to evaluate the efficiency of certain pesticides and molluscicides against adults of Monacha obstructa and Eobania vermiculata land snails using leaf dipping and poison bait technique under laboratory conditions.

1- Poison bait technique:

Neomyl, Gastrotox, Tospin and Round up were tested as poisonous bait against E. vermiculata in Table (1) and Figures (1,2,3,4).

The results revealed that Gastrotox exhibited the highest toxic effect followed by Neomyl and Round up. While, Tospin gave the least effect in this respect. Their LC50 values were (0.16, 0.31, 1.25 and 2.03%), respectively. The relative potency of Gastrotox was 0.19, 0.56 and 0.59 times than of Tospin, Neomyl and Round up and the slope values were 1.97, 1.69, 1.64 and 2.4, respectively.

On the other hand, the activity of the same tested chemicals against M. obstructa in Table (2) and Figures (1,2,3,4) showed that Gastrotox was the most potent one followed by Neomyl, Round up and Tospin. Their LC50 values were (0.18, 0.33, 1.48 and 2.48%), respectively. Also, it noticed that the relative potency of Gastrotox was 0.37, 0.56 and 0.81 times than of Tospin, Neomyl and Round up and the slope values were 1.7, 1.72, 1.59 and 1.86, respectively.

2-Leaf dipping technique:

Data in Table (3) and Figures (1,3,4) show molluscicidal activity of Neomyl, Tospin and Round up using dipping technique against E. vermiculata. It is clear that Neomyl exhibited the highest toxic effect followed by Round up while Tospin gave the least effect in this respect. Their LC50 values were 0.24, 0.98 and 1.71 and the relative potency of Neomyl was 0.98 and 1.71 times than of Round up and Tospin. Also, the slope values were 0.58, 0.42 and 0.056, respectively.
Table (1). Molluscicidal activity of certain tested pesticides against adults of *Eobania vermiculata* land snail using poisonous bait technique under laboratory conditions.

<table>
<thead>
<tr>
<th>Toxicant</th>
<th>LC₅₀</th>
<th>Confidence limits</th>
<th>Slope and variance</th>
<th>Relative potency</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Lower</td>
<td>Upper</td>
<td></td>
</tr>
<tr>
<td>Neomyl 90 % W P</td>
<td>0.31</td>
<td>0.267</td>
<td>0.372</td>
<td>1.69 ± 0.156</td>
</tr>
<tr>
<td>Gastrotox 5 % G</td>
<td>0.16</td>
<td>0.086</td>
<td>0.284</td>
<td>1.97 ± 0.165</td>
</tr>
<tr>
<td>Topsin 70 % WP</td>
<td>2.03</td>
<td>1.796</td>
<td>2.381</td>
<td>2.40 ±0.287</td>
</tr>
<tr>
<td>Round up 48 % WSC</td>
<td>1.25</td>
<td>1.051</td>
<td>1.514</td>
<td>1.64 ± 0.156</td>
</tr>
</tbody>
</table>

Table (2). Molluscicidal activity of certain tested pesticides against adults of *Monacha obstructa* land snail using poisonous bait technique under laboratory conditions.

<table>
<thead>
<tr>
<th>Toxicant</th>
<th>LC₅₀</th>
<th>Confidence limits</th>
<th>Slope and variance</th>
<th>Relative potency</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Lower</td>
<td>Upper</td>
<td></td>
</tr>
<tr>
<td>Neomyl 90 % W P</td>
<td>0.33</td>
<td>0.280</td>
<td>0.389</td>
<td>1.72 ±0.157</td>
</tr>
<tr>
<td>Gastrotox 5 % G</td>
<td>0.18</td>
<td>0.157</td>
<td>0.219</td>
<td>1.70 ±0.155</td>
</tr>
<tr>
<td>Topsin 70 % WP</td>
<td>2.48</td>
<td>2.078</td>
<td>3.275</td>
<td>1.86 ±0.273</td>
</tr>
<tr>
<td>Round up 48 % WSC</td>
<td>1.48</td>
<td>1.237</td>
<td>1.845</td>
<td>1.59 ±0.158</td>
</tr>
</tbody>
</table>

Fig. (1): LD-P lines of dipping and baiting treatments of Topsin against *Monacha obstructa* and *Eobania vermiculata*
Fig. (2): LD-P lines of granules treatment of Gastrotox against *Eobania vermiculata* and *Monacha obstructa*

Fig. (3): LD-P lines of dipping and baiting treatments of Round up against *Monacha obstructa* and *Eobania vermiculata.*
Fig. (4): LD-P lines of dipping and baiting treatments of Neomyl against *Monacha obstructa* and *Eobania vermiculata*

Table (3). Molluscicidal activity of certain tested pesticides against adults of *Eobania vermiculata* land snail using dipping technique under laboratory conditions.

<table>
<thead>
<tr>
<th>Toxicant</th>
<th>LC₅₀</th>
<th>Confidence limits</th>
<th>Slope and variance</th>
<th>Relative potency</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Lower</td>
<td>Upper</td>
<td></td>
</tr>
<tr>
<td>Neomyl 90 % WP</td>
<td>0.24</td>
<td>0.208</td>
<td>0.279</td>
<td>1.97 ± 0.167</td>
</tr>
<tr>
<td>Topsin 70 % WP</td>
<td>1.71</td>
<td>1.523</td>
<td>1.967</td>
<td>2.31 ± 0.269</td>
</tr>
<tr>
<td>Round up 48 % WSC</td>
<td>0.98</td>
<td>0.842</td>
<td>1.147</td>
<td>1.87 ± 0.161</td>
</tr>
</tbody>
</table>

Concerning the activity of the previous tested chemicals against *M. obstructa* data in Table (4) and depicted in Figures (1,3,4) results indicated that that Round up was the most potent one followed by Neomyl but Topsin gave the least effect and their LC₅₀ values were 1.71, 1.87 and 1.83, respectively. The relative potency of Round up was 0.52 and 0.20 times than that of Neomyl and Topsin. Also, the slope values were 1.71, 1.87 and 1.83, respectively.

Toxicity of four pesticides on eobania vermiculata and monacha

Table (4). Molluscicidal activity of certain tested pesticides against adults of Monacha obstructa land snail using dipping technique under laboratory conditions.

<table>
<thead>
<tr>
<th>Toxicant</th>
<th>LC₅₀</th>
<th>Confidence limits</th>
<th>Slope and variance</th>
<th>Relative potency</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Lower</td>
<td>Upper</td>
<td></td>
</tr>
<tr>
<td>Neomyl 90 % W P</td>
<td>0.26</td>
<td>0.223</td>
<td>0.304</td>
<td>1.87 ±0.162</td>
</tr>
<tr>
<td>Topsin 70 % WP</td>
<td>2.23</td>
<td>1.890</td>
<td>2.849</td>
<td>1.83 ±0.265</td>
</tr>
<tr>
<td>Round up 48 % WSC</td>
<td>0.23</td>
<td>1.045</td>
<td>1.484</td>
<td>1.71 ±0.159</td>
</tr>
</tbody>
</table>

REFERENCES


Toxicity of four pesticides on eobania vermiculata and monacha

 ppt on to

ppt on to

ppt on to