DETERMINATION OF FIPRONIL LD$_{50}$ FOR THE BRAZILIAN BEE *MELIPONA SCUTELLARIS*

LOURENÇO, Clara T.; CARVALHO, Stephan M.; MALASPINA, Osmar; NOCELLI, Roberta C. F.
Melipona scutellaris (Latreille 1811)

- Stingless bees of eusocial habits;
- Same size and weight of *Apis mellifera*;
- Do not build queen cells;
- Easy domestication and high honey production;
- Endemic to Northeastern Brazil;

Melipona scutellaris colony

Food pots

Brood comb
Fipronil

- Phenylpyrazole;
- Broad-spectrum;
- Noncompetitive blocker receptor GABA;
- Completely blocks receptor GluCl;
- Causes hyperarousal, paralysis and death.

Methodology

- Bees foragers;
- Packed in disposable plastic cages of 250 mL;
- Kept in incubator at 29\(^\circ\)C±1\(^\circ\)C and R.H. of 70\%±5\%;
- Sucrose solution (50\% w/w) was offered for all groups;
- Fipronil was dissolved in acetone.
Methodology
Methodology

Each treatment group consisted of three cages with ten bees each:

Colony 1  Colony 2  Colony 3

- Control
- Acetone control
  - 0.5 ng/bee
  - 1.0 ng/bee
  - 1.5 ng/bee
  - 2.0 ng/bee
  - 2.5 ng/bee
  - 5.0 ng/bee
Methodology

- Bees were anesthetized with CO$_2$ and 1.0 µL of solution was applied with an automatic micropipette on pronotum of each bee.

- Mortality was assessed every 24 hours for 72 hours.
Results

• LD\textsubscript{50} for 48 hours: 0.41ng/bee or 4.1ng/g bee (average weight of foragers of \textit{M. scutellaris} 0.1g);

<table>
<thead>
<tr>
<th>Exposure mode</th>
<th>LD\textsubscript{50}</th>
<th>CI\textsubscript{95%}</th>
<th>(\chi^2)</th>
<th>D.F.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Topic (ng a.i./bee)</td>
<td>0.41</td>
<td>0.23 – 0.58</td>
<td>9.8238</td>
<td>16</td>
</tr>
</tbody>
</table>

• Acetone was not toxic.
Results

• After 24 hours of contamination, surviving bees in the groups treated with higher doses of insecticide (2.0, 2.5 and 5.0 ng/bee) had tremors followed by paralysis and death.
Discussion and Conclusion

• Fipronil is highly toxic to foragers of *M. scutellaris*;
• Seem to be more sensitive to fipronil:

<table>
<thead>
<tr>
<th>Bee</th>
<th>LD$_{50}$ of Fipronil</th>
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<tbody>
<tr>
<td><em>Apis mellifera</em></td>
<td>1.06 - 6 ng/bee (Tingle, 2003; Decourtye et al., 2005;</td>
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<td></td>
<td>Roat, 2010; Pereira, 2011)</td>
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<tr>
<td><em>Megachili rotundata</em></td>
<td>4 ng/bee (Mayer; Lunden, 1999)</td>
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<tr>
<td><em>Melipona scutellaris</em></td>
<td>0.41 ng/bee</td>
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<tr>
<td><em>Nomia melanderi</em></td>
<td>113 ng/bee (Mayer; Lunden, 1999)</td>
</tr>
<tr>
<td><em>Scaptotrigona postica</em></td>
<td>0.54 ng/bee (Jacob, 2011)</td>
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Final Considerations

• This result will be used to evaluate the behavioral changes (PER and locomotor activity);
• And to develop semi-field tests.
THANK YOU FOR YOUR ATTENTION!