New FIFRA 25(b) Exempt Miticide-Insecticide

Active Ingredients
- Castor oil, 20%
- Rosemary oil, 10%
- Clove oil, 3%
- Peppermint oil, 2%

Target Pests
- Mites, spider mites
- Small, soft-bodied insects such as: aphids, whiteflies, thrips, mealybugs, lygus

Application
- Contact
- Foliar
- Standard spray equipment, high volume sprayers, booms, hydraulic-air assist

Application Sites
- All crops
- Indoors and outdoors
Multiple Modes of Action

**NEUROTOXIC EFFECT**

- **PARALYSIS**
  - The botanical oil active compounds affect the octopamine receptors specific to insects, disrupting its nervous system, causing paralysis followed by its death

**CONTACT EFFECT**

- **SUFFOCATION**
  - The castor oil provides true pest suffocation by blocking air from entering the spiracle, leading to the pest death

- **DESICCATION**
  - The formula degrades/disrupts the waxy cuticle allowing the active ingredients to quickly penetrate and induce water loss in mites, resulting in desiccation and death

**REPELLENT EFFECT**

- **REPELLENCY**
  - The vapor exposure to the botanical oils interferes with the pest’s sensing faculties, inducing hyperactivity and avoidance behavior thus keeping them away and limiting chances of their establishment on crops.

- **✓ Quick knockdown**
- **✓ Slow the chance of pest resistance development**
TSSM Bioassay

- Efficacy against adult *Tetranychus urticae* Koch (two-spotted spider mite, TSSM)
- N = 6, 10 mites/leaf x 6 replicates

**RESULTS:**

- TetraCURB MAX compared similarly to TetraCURB Concentrate & TetraCURB Organic at all rates
  - The standard error bars overlap indicating no significance
- TetraCURB MAX ranged from 79-83% efficacy between 0.5-1.0% application rates
Silverleaf Whitefly Bioassay

- Efficacy of TetraCURB MAX against adult *Bemisia tabaci* (silverleaf whitefly)
- Formulations were diluted to 0.25, 0.5, 1.0, and 2.0% in water.
  - Negative control (no spray - 0%)
- Green bean leaves were cut with ~10-40 whitefly/leaf
  - N = 6 leaves/treatment
- Evaluation 24 hr after application

<table>
<thead>
<tr>
<th>Treatments</th>
<th>% Whitefly Mortality ±SE</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.00%</td>
<td>4%</td>
</tr>
<tr>
<td>0.25%</td>
<td>98%</td>
</tr>
<tr>
<td>0.50%</td>
<td>100%</td>
</tr>
<tr>
<td>1.00%</td>
<td>100%</td>
</tr>
<tr>
<td>2.00%</td>
<td>100%</td>
</tr>
</tbody>
</table>

TCC = 100%, TCO = 90% (@ 0.5% rate)
Green Peach Aphid Bioassay

- Efficacy of TetraCURB MAX against adult *Myzus persicae* Sulzer (green peach aphid)
- Formulations were diluted to in water
  - Negative control (no spray - 0%)
  - Positive Controls
    - TetraCURB Concentrate
    - TetraCURB Organic
- Leaf cut outs from soybean plants were taken with 20-40 adult aphids
  - N = 6 leaves/treatment
- Evaluation 24 hr after application

<table>
<thead>
<tr>
<th>% Green Peach Aphid Mortality ±SE</th>
<th>0.00%</th>
<th>0.25%</th>
<th>0.50%</th>
<th>1.00%</th>
<th>2.00%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Negative Control</td>
<td>2%</td>
<td>18%</td>
<td>81%</td>
<td>73%</td>
<td>92%</td>
</tr>
<tr>
<td>TetraCURB MAX Treatments</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TetraCURB MAX</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Western Flower Thrip (WFT) Bioassay

- Efficacy of TetraCURB MAX on 2nd instar *Frankliniella occidentalis* (western flower thrip, WFT)
- Formulations were diluted to in water
  - Negative control (no spray - 0%)
  - Positive Controls
    - TetraCURB Concentrate
    - TetraCURB Organic
- Leaf cut outs from soybean plants were loaded with 10 2\textsuperscript{nd} instar larvae
  - 3x N = 6 leaves/treatment
- Evaluation 24 hr & 48 hr after application
Application & Testing Needs

Application Information:
• Apply when pest population first appears and before economic threshold is reached
• Complete coverage of the leaf and plant surfaces, apply to run off
• Make 2-3 consecutive applications 5-7 days apart
• Rates:
  • 64 fl oz/100 gal (moderate infestation)
  • 128 fl oz/100 gal (high infestation)
• Apply early in the morning or late afternoon when temperature is under 90 °F

Testing Needs:
• Greenhouse and field **efficacy trials** on all small, soft-bodied insects and mites
• Plant **safety trials** at 256 fl oz/100 gal (highest label rate), 2x, and 4x