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How Pesticide Additives Alter Feeding Behavior and Viral Infections in Honey Bees

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Recommended Citation
Honey bees are vital to agriculture; the decline of honey bee populations in Utah and worldwide is concerning. Several factors can reduce honey bee health and when they interact can increase in magnitude (Fig. 1). We are investigating the interactions of a pesticide ingredient, organosilicone surfactant (OSS), and viral pathogens.

**Goals**
- Determine if OSS exposure alters honey bee feeding behavior.
- Determine if OSS synergizes with and increases the negative impact of viruses on honey bees.

**Introduction**
Honey bees are vital to agriculture; the decline of honey bee populations in Utah and worldwide is concerning. Several factors can reduce honey bee health and when they interact can increase in magnitude (Fig. 1). We are investigating the interactions of a pesticide ingredient, organosilicone surfactant (OSS), and viral pathogens.

**Feeding Behavior**
- We analyzed locally collected adult honey bees. (Fig. 4)
- 36 cohorts of 10 bees were given one of 6 treatments (6 reps/treatment).
- Feeding data was collected for 7 days. (Fig. 2)

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Ingredients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>N/A</td>
</tr>
<tr>
<td>OSS Low</td>
<td>OSS (40ppb)</td>
</tr>
<tr>
<td>OSS Medium</td>
<td>OSS (1ppm)</td>
</tr>
<tr>
<td>OSS High</td>
<td>OSS (10ppm)</td>
</tr>
<tr>
<td>Fungicide &amp; Pesticide</td>
<td>Tilt (150 ppb), Altacor (3ppm)</td>
</tr>
<tr>
<td>All (Fungicide, Pesticide &amp; OSS Medium)</td>
<td>Tilt (150ppb), Altacor (3ppm) &amp; OSS (1ppm)</td>
</tr>
</tbody>
</table>

**Viral Detection**
- We extracted RNA from bees (Fig. 4) and converted it into DNA.
- Viruses were detected via PCR (polymerase chain reaction) and subsequent gel electrophoresis. (Fig. 3)

Viruses screened for:
- Deformed Wing Virus*
- Black Queen Cell Virus*
- Israeli Acute Paralysis Virus
- Sacbrood Virus*
- Kashmir Bee Virus
- Chronic Bee Paralysis Virus
- Lake Sinai Virus

*Detected in all treatments.

**Conclusions**
- There is evidence that OSS exposure decreases honey bee feeding. However, this effect was not seen with the “All” treatment.
- Preliminary virus detection yielded no observed differences in viral presence between treatments. Future research will examine the precise quantity of viral activity between treatments.
- Future findings will illustrate the impacts of OSS on honey bee health and the potential need to regulate their usage as mixtures in pesticide applications.