2017 UVM Research Update

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Pest Fluctuations by Date Over 6 Years

![Graph showing pest fluctuations](image-url)
Average Pests Over 6 Years

![Graph showing mean number of arthropods per leaf across different years and conditions. The conditions are hot, hot + dry, average, cool, warm + moist, and hot + dry. The years are 2011 to 2016. The graph indicates that the highest number of arthropods occurs in 2012 under hot + dry conditions.]
Beneficial Insects

Lacewing Adult (Above) and Egg (Below)

Minute Pirate Bug

Parasitoid Wasps

Lady Beetle Larvae and Adults
More Beneficial Insects!

- Spiders
- Hover Fly
- Spider Mite Destroyer
- Long Legged Fly
- Spined Soldier Bug Eggs, Larvae, and Adult
Hop Natural Enemy Trial

- Measure the impact of physical barriers on populations of HA, TSSM, PLH in hop yards.

- Three farms selected for experiment:

- Results were recorded in a one week period to include pre and post treatment measurements during three sampling periods:
  - June, July, August
Two bines per hill from 10 hills were chosen for both Nugget and Cascade varieties.

- Each hill having one open string and one excluded string.
  - Open: twist tie and cotton around petiole
  - Excluded: mesh bag and cotton around petiole

Counts taken for TSSM, HA, PLH, and MD for selected open and excluded leaves at the start of the week prior to treatments, and after the week with treatments.
Potato Leafhopper

The diagram shows the average increase of PLH (Potato Leafhopper) with different natural enemy treatments. The treatments are categorized as 'Excluded' and 'Open'.

- **Excluded** treatments:
  - Cascade (dark gray) shows a significantly higher increase in PLH compared to the other treatments.
  - Nugget (light gray) also shows an increase, but it is lower than the Cascade treatment.

- **Open** treatments:
  - Cascade (dark gray) shows a much lower increase in PLH compared to the 'Excluded' treatments.
  - Nugget (light gray) shows a moderate increase in PLH.

This graph likely represents experimental data comparing the effectiveness of different natural enemy exclusion methods on potato leafhopper populations.
Hop Aphid

Average increase in Hop Aphid

Excluded

Open

Cascade
Nugget

Natural Enemy Treatment

UNIVERSITY OF VERMONT EXTENSION
CULTIVATING HEALTHY COMMUNITIES
Downy Mildew
Degree Days and Training Timing
Harvest Date: Oil Content

- Centennial
- Cascade

Concentration (ml/100g hops)

Harvest Time:
- Early
- Typical
- Late
Harvest Date: Alpha Acid

![Bar chart showing alpha acid levels for Centennial and Cascade hop varieties at different harvest times.](chart.png)
<table>
<thead>
<tr>
<th>Compound Name</th>
<th>Odor Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>β-pinene</td>
<td>piney, woody</td>
</tr>
<tr>
<td>Myrcene</td>
<td>floral, citrus, piney, herbal</td>
</tr>
<tr>
<td>Linalool</td>
<td>floral, spicy, floral</td>
</tr>
<tr>
<td>Caryophyllene</td>
<td>woody, herbal, clove, spicy</td>
</tr>
<tr>
<td>Farnesene</td>
<td>woody, herbal, citrus</td>
</tr>
<tr>
<td>Humulene</td>
<td>woody, herbal</td>
</tr>
<tr>
<td>Geraniol</td>
<td>floral, citrus, fruity</td>
</tr>
</tbody>
</table>
Cascade: Oil Content

![Bar chart showing oil content for Early, Typical, and Late stages. The chart indicates the percentage of geraniol, humulene, farnesene, caryophyllene, linalool, linalool, myrcene, and b-pinene in each stage.](chart.png)
# Cascade Hops

## Total Oil

<table>
<thead>
<tr>
<th>Compound</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alpha Acid</td>
<td>5.5 - 9%</td>
</tr>
<tr>
<td>Beta Acid</td>
<td>6 - 7.5%</td>
</tr>
<tr>
<td>Co-humulone</td>
<td>30 - 35%</td>
</tr>
<tr>
<td>Total Oil</td>
<td>0.8 - 2.5 mL/100g</td>
</tr>
<tr>
<td>B-Pinene</td>
<td>0.5 - 0.8% of total oil</td>
</tr>
<tr>
<td>Myrcene</td>
<td>45 - 60% of total oil</td>
</tr>
<tr>
<td>Linalool</td>
<td>0.3 - 0.6% of total oil</td>
</tr>
<tr>
<td>Caryophyllene</td>
<td>5 - 9% of total oil</td>
</tr>
<tr>
<td>Farnesene</td>
<td>6 - 9% of total oil</td>
</tr>
<tr>
<td>Humulene</td>
<td>14 - 20% of total oil</td>
</tr>
<tr>
<td>Geraniol</td>
<td>0.2 - 0.2% of total oil</td>
</tr>
</tbody>
</table>

https://ychhops.com/varieties/cascade
Centennial: Oil Content

![Graph showing oil content for early, typical, and late stages of Centennial plant]

- Early
- Typical
- Late

Legend:
- Geraniol
- Humulene
- Farnesene
- Caryophyllene
- Linalool
- Myrcene
- B-pinene

[Graph showing oil concentration by stage]
# Centennial Hops

<table>
<thead>
<tr>
<th>Compound</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alpha Acid</td>
<td>7 - 12%</td>
</tr>
<tr>
<td>Beta Acid</td>
<td>3.5 - 5.5%</td>
</tr>
<tr>
<td>Co-humulone</td>
<td>23 - 27%</td>
</tr>
<tr>
<td>Total Oil</td>
<td>1 - 3 mL/100g</td>
</tr>
<tr>
<td>B-Pinene</td>
<td>0.8 - 1% of total oil</td>
</tr>
<tr>
<td>Myrcene</td>
<td>55 - 65% of total oil</td>
</tr>
<tr>
<td>Linalool</td>
<td>0.6 - 0.9% of total oil</td>
</tr>
<tr>
<td>Caryophyllene</td>
<td>5 - 7% of total oil</td>
</tr>
<tr>
<td>Farnesene</td>
<td>&lt; 1.0% of total oil</td>
</tr>
<tr>
<td>Humulene</td>
<td>10 - 20% of total oil</td>
</tr>
<tr>
<td>Geraniol</td>
<td>1.2 - 1.8% of total oil</td>
</tr>
</tbody>
</table>

https://ychhops.com/varieties/centennial
Nugget: Dry Matter and Oil

- Chart showing the percent dry matter and percent oil over different harvest dates.
- The x-axis represents the harvest date from 8/13 to 10/2.
- The y-axis represents percent dry matter and percent oil.
- Different markers represent dry matter and oil.

Harvest Date
- 8/13
- 8/23
- 9/2
- 9/12
- 9/22
- 10/2
Nugget: Oil Content

22.2%
Sensory Analysis

Descriptive Analysis: 2010 Cascade

Sharp et al., 2014