Getting the Season Off to a Great Start

Dr. Heather Darby, Agronomist
John Bruce, Research Specialist
University of Vermont
Crop Rotation

- Hemp is susceptible to many diseases.

- Hemp should be rotated ideally to a new spot every 1 to 2 years.

- To minimize disease build-up would recommend a 4 to 6 year rotation.
**Sclerotinia White Mold**

*Sclerotinia sclerotiorum* on hemp. Alburgh, VT.

**Lifecycle of White Mold (Sclerotinia)**
(provided by the American Phytopathological Society (APS) 2012)
Soil Limitations

• Grows best on sandy loams.

• 40% or more clay not generally good.

• Does not tolerate water logged soils.

• Adequate pH – over 6.0 (requires calcium).
Fertility Requirements

Nitrogen (3.0 to 4.0%)

Potassium (2.0 to 3.0%)
65 – 70 lbs per acre

Phosphorus (0.5 – 0.6%)
50 to 70 lbs per acre
Prepared For: Tim Magnant
Bridgeman Farm
4826 Hanna Rd
Franklin, VT 05457
tmagnant@franklinvt.net

Consultant: Lindsey Ruhl
UVM Extension
Middlebury, 05753
lruhl@uvm.edu
802-881-5563

Sample Information:
Order #: 4513
Lab ID: S17-02002
Heath's
Received: 6/26/2017
Reported: 7/10/2017
VT County: Franklin

Results

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Low</th>
<th>Medium</th>
<th>Optimum</th>
<th>High or Excessive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phosphorus (P):</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Potassium (K):</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Magnesium (Mg):</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Analysis</th>
<th>Value Found</th>
<th>Optimum Range (or Average *)</th>
<th>Analysis</th>
<th>Value Found</th>
<th>Optimum Range (or Average *)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil pH (2:1, water)</td>
<td>5.8</td>
<td></td>
<td>Boron (B)</td>
<td>0.2</td>
<td>0.3*</td>
</tr>
<tr>
<td>Modified Morgan extractable, ppm</td>
<td></td>
<td></td>
<td>Copper (Cu)</td>
<td>0.2</td>
<td>0.3*</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Zinc (Zn)</td>
<td>0.8</td>
<td>2.0*</td>
</tr>
<tr>
<td>Macronutrients</td>
<td></td>
<td></td>
<td>Sodium (Na)</td>
<td>52.0</td>
<td>20*</td>
</tr>
<tr>
<td>Phosphorus (P)</td>
<td>0.7</td>
<td>4-10</td>
<td>Aluminum (Al)</td>
<td>51</td>
<td>35*</td>
</tr>
<tr>
<td>Potassium (K)</td>
<td>34</td>
<td>100-160</td>
<td>Soil Organic Matter %</td>
<td>5.8</td>
<td>**</td>
</tr>
<tr>
<td>Calcium (Ca)</td>
<td>1630</td>
<td>**</td>
<td>Effective CEC, meq/100g</td>
<td>8.7</td>
<td>**</td>
</tr>
<tr>
<td>Magnesium (Mg)</td>
<td>58</td>
<td>50-120</td>
<td>Base Saturation, %</td>
<td>69.2</td>
<td>40-80</td>
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<tr>
<td>Sulfur (S)</td>
<td>6.0</td>
<td>11*</td>
<td>Calcium Saturation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Micronutrients</td>
<td></td>
<td></td>
<td>Potassium Saturation</td>
<td>0.7</td>
<td>2.0-7.0</td>
</tr>
<tr>
<td>Iron (Fe)</td>
<td>13.1</td>
<td>7.0*</td>
<td>Magnesium Saturation</td>
<td>4.1</td>
<td>10-30</td>
</tr>
<tr>
<td>Manganese (Mn)</td>
<td>12.2</td>
<td>8.0*</td>
<td></td>
<td></td>
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</tbody>
</table>

* Micronutrient S deficiencies are rare in Vermont and optimum ranges are not defined; thus average values in Vermont soils are shown instead.
** Ranges for Calcium, Organic Matter, and Effective CEC vary with soil type and crop.

Recommendations for Corn for Silage (3A)

<table>
<thead>
<tr>
<th>Limestone (Target pH of 6.2)</th>
<th>Nitrogen, N</th>
<th>Phosphate, P₂O₅</th>
<th>Potash, K₂O</th>
</tr>
</thead>
<tbody>
<tr>
<td>tons / Acre</td>
<td>lbs / Acre</td>
<td>lbs / Acre</td>
<td>lbs / Acre</td>
</tr>
<tr>
<td>1.5</td>
<td>120</td>
<td>95</td>
<td>140</td>
</tr>
</tbody>
</table>

Comments:
Estimate nutrients supplied by manure - consult UVM Extension or Nutrient Recommendations for Field Crops in Vermont.
Add 10-20 lb/acre extra N in excessively drained (droughtly) soils OR in somewhat poorly to poorly drained soils. Consult Extension Agronomists or References to estimate N credits from a grass or legume crop plowed down within the past 2 years.
Band most if not all phosphorus at planting. Do not band more than 60-80 lbs per acre combined N plus K2O.
See the 2016 Addendum to Nutrient Recommendations for updated information on nitrogen recommendations.

Default Yield Goal: 20. tons / Acre

References:
http://pss.uvm.edu/vtcrops/articles/2016_Soil_Test_addendum_UVMExt.pdf
6 Addendum to Nutrient Recommendations
Hemp Nitrogen Fertility

- High N can stimulate the formation of male flowers.

- Split applications of N are best to minimize over feeding at any one single stage.

- A deficiency of N causes the entire hemp plant to turn yellow (chlorosis).

- With deficiency growth and flowering are slowed, and the plants will be mostly male.
# Whole Plant Analysis

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Nitrogen</th>
<th>Calcium</th>
<th>Phosphorus</th>
<th>Magnesium</th>
<th>Potassium</th>
</tr>
</thead>
<tbody>
<tr>
<td>lbs N ac⁻¹</td>
<td>%</td>
<td>%</td>
<td>%</td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td>0</td>
<td>2.47 b</td>
<td>2.35 bc</td>
<td>0.625</td>
<td>0.238 c</td>
<td>2.21</td>
</tr>
<tr>
<td>75</td>
<td>2.63 b</td>
<td>2.10 c</td>
<td>0.540</td>
<td>0.258 bc</td>
<td>1.96</td>
</tr>
<tr>
<td>100</td>
<td>2.66 b</td>
<td>2.38 bc</td>
<td>0.610</td>
<td>0.283 ab</td>
<td>1.93</td>
</tr>
<tr>
<td>125</td>
<td>3.25 a</td>
<td>2.83 a</td>
<td>0.620</td>
<td>0.303 a</td>
<td>2.09</td>
</tr>
<tr>
<td>150</td>
<td>3.04 a</td>
<td>2.67 ab</td>
<td>0.548</td>
<td>0.308 a</td>
<td>2.10</td>
</tr>
<tr>
<td>LSD (&lt;0.10) ‡</td>
<td>0.378</td>
<td>0.355</td>
<td>NS ¥</td>
<td>0.044</td>
<td>NS</td>
</tr>
<tr>
<td>Trial mean</td>
<td>2.81</td>
<td>2.47</td>
<td>0.589</td>
<td>0.278</td>
<td>2.06</td>
</tr>
</tbody>
</table>

†Within a column treatments marked with the same letter were statistically similar (p=0.10). Top performers are in **bold**.
‡LSD – Least significant difference at p=0.10.
¥NS – No significant difference between treatments.
CBD Nitrogen Fertility - Yields

<table>
<thead>
<tr>
<th>Nitrogen application rate (lbs/ac)</th>
<th>Flower yield (lbs/ac)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 lbs ac-1</td>
<td>3152</td>
</tr>
<tr>
<td>75 lbs ac-1</td>
<td>3830</td>
</tr>
<tr>
<td>100 lbs ac-1</td>
<td>3067</td>
</tr>
<tr>
<td>125 lbs ac-1</td>
<td>3949</td>
</tr>
<tr>
<td>150 lbs ac-1</td>
<td>4016</td>
</tr>
</tbody>
</table>
CBD Nitrogen Fertility – Total CBD & Total THC

<table>
<thead>
<tr>
<th>Nitrogen Application Rate (lbs/ac)</th>
<th>Total CBD</th>
<th>Total THC</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 lbs ac-1</td>
<td>7.34</td>
<td>0.26</td>
</tr>
<tr>
<td>75 lbs ac-1</td>
<td>7.12</td>
<td>0.25</td>
</tr>
<tr>
<td>100 lbs ac-1</td>
<td>8.54</td>
<td>0.30</td>
</tr>
<tr>
<td>125 lbs ac-1</td>
<td>7.36</td>
<td>0.26</td>
</tr>
<tr>
<td>150 lbs ac-1</td>
<td>7.24</td>
<td>0.26</td>
</tr>
</tbody>
</table>
How Many Seeds/Plants

• 5 x 5 = 1,742
• 6 x 6 = 1,260
• 4 x 4 = 2,723
• 2 x 2 = 10,890

Genetics & Planting Stock – Large Expense

$1 to $2 per seed = $1,890/A
$3 to $8 per plant = $5,040/A
$4 to $8 per clone = $7,560/A
Nitrogen Fertility and Grain Hemp

Yield (lb per acre)

Nitrogen rate (lb per acre)

- 0 lb
- 75 lb
- 100 lb
- 125 lb
- 150 lb

Legend:
- b
- ab
- a

The University of Vermont
CBD Plant Spacing x Planting Date Trial (var. Ceiba)

 Marketable and unmarketable flower yields by spacing: per acre basis

![Graph showing yield comparison]

- **Yield (lbs. ac⁻¹)**
- **Marketable yield**
- **Unmarketable yield**

Treatments with the same letter are statistically similar at the 0.10 level.
CBD Plant Spacing x Planting Date Trial (var. Ceiba)

Flower dry matter yields and total potential CBD by plant spacing

Treatments with the same letter are statistically similar at the 0.10 level.
CBD Plant Spacing x Planting Date Trial (var. Ceiba)

Marketable and unmarketable flower yields by spacing: per plant basis

Marketable yield

Treatments with the same letter are statistically similar at the 0.10 level.
CBD Plant Spacing x Planting Date Trial (var. Ceiba)

Biomass percentages by plant spacing

1 x 1:
- Stem: 22%
- Leaf: 55%
- Bud: 23%

3 x 3:
- Stem: 25%
- Leaf: 48%
- Bud: 27%

5 x 5:
- Stem: 27%
- Leaf: 50%
- Bud: 23%
Powdery mildew on a 1 x 1 spacing plant
CBD Plant Spacing x Planting Date Trial (var. Ceiba)

Flower dry matter yields and total potential CBD by planting date

Treatments with the same letter are statistically similar at the 0.10 level.
Figure 3. Yield of hemp planted from 26-May to 17-Jun. Columns with the same letter were not significantly different from each other, p < 0.0001).
Figure 7. Hemp grain yields from four planting dates. Columns with the same letter are not significantly different from each other, LSD (0.10) = 179, p = 0.0075.)
Water Requirements

• Hemp requires at least 20-30 inches of rainfall during the growing period.

• Abundant moisture is needed during the germination period.

• The absorption of water increases until flowering begins. First 6 - 8 weeks of growth.

• Then the uptake of water decreases considerably, with a slight increase at late flowering and during seed formation.
We Should Water Because We Have Irrigation?
Irrigation?

Impact of Irrigation on Bud Yield

Rain-fed

Irrigation
19.79 gallons of water

July - (1.03 inches rain/acre * 27154 gallons of water/inch * 0.00055894918 acre/hemp) = 4.16 gallons of water/hemp plant

Below is the weekly irrigation amount without precipitation in different months:

- September: 10.79 gallons of water/week for one hemp plant
- August: 16.63 gallons of water/week for one hemp plant
- July: 19.79 gallons of water/week for one hemp plant
- June: 18.52 gallons of water/week for one hemp plant
- May: 15.62 gallons of water/week for one hemp plant

### Monthly Average Potential Evapotranspiration (PET) Estimates (inches)

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Boston, MA</td>
<td>0.37</td>
<td>0.57</td>
<td>1.15</td>
<td>1.95</td>
<td>3.09</td>
<td>3.58</td>
<td><strong>4.02</strong></td>
<td>3.49</td>
<td>2.29</td>
<td>1.36</td>
<td>0.63</td>
<td>0.37</td>
</tr>
<tr>
<td>Bridgeport, CT</td>
<td>0.44</td>
<td>0.63</td>
<td>1.31</td>
<td>2.21</td>
<td>3.41</td>
<td>3.90</td>
<td><strong>4.38</strong></td>
<td>3.76</td>
<td>2.52</td>
<td>1.54</td>
<td>0.74</td>
<td>0.44</td>
</tr>
<tr>
<td>Buffalo, NY</td>
<td>0.24</td>
<td>0.40</td>
<td>0.99</td>
<td>1.92</td>
<td>3.26</td>
<td>3.74</td>
<td><strong>4.05</strong></td>
<td>3.43</td>
<td>2.23</td>
<td>1.18</td>
<td>0.47</td>
<td>0.24</td>
</tr>
<tr>
<td>Burlington, VT</td>
<td><strong>0.24</strong></td>
<td>0.42</td>
<td>0.97</td>
<td>1.96</td>
<td>3.26</td>
<td>3.74</td>
<td><strong>4.13</strong></td>
<td>3.47</td>
<td>2.18</td>
<td>1.13</td>
<td>0.45</td>
<td>0.23</td>
</tr>
<tr>
<td>Caribou, ME</td>
<td>0.17</td>
<td>0.30</td>
<td>0.73</td>
<td>1.51</td>
<td>2.88</td>
<td>3.39</td>
<td><strong>3.64</strong></td>
<td>3.07</td>
<td>1.84</td>
<td>0.89</td>
<td>0.31</td>
<td>0.16</td>
</tr>
</tbody>
</table>
Below is the weekly irrigation amount without precipitation in different months:

September: 10.79 gallons of water/week for one hemp plant

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July: 19.79 gallons of water/week for one hemp plant

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19.79 gallons of water July - (1.03 inches rain/acre * 27154 gallons of water/ inch * 0.00055894918 acre/hemp)= 4.16 gallons of water/ hemp plant per week.
Cover Crops
Corn Borer

- 2 flights per year
- June little damage
- July/August more damage

- Traps
  - Pheremone traps
- Beneficial release
  - Trichogramma wasps
- Sprays
Corn Borer

ECB found in hemp; Left- ECB in grain hemp (Photo credit: Marguerite Bolt, Purdue Extension, 8-Aug 2019) Right- ECB in CBD hemp (Alburgh, VT, 2019)

ECB damage in corn
ScenTray Large Plastic Delta Trap

This Work-Horse Trap Will Last & Last!

WRITE A REVIEW

<table>
<thead>
<tr>
<th>Pack of 5</th>
<th>$35.00</th>
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<tbody>
<tr>
<td>SKU: 1230435</td>
<td>1</td>
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<tr>
<td>Pack of 10</td>
<td>$66.50</td>
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<tr>
<td>SKU: 1230436</td>
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<tr>
<td>5 Replacement Liners</td>
<td>$7.00</td>
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<td>SKU: 1230505</td>
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<tr>
<td>10 Replacement Liners</td>
<td>$11.50</td>
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<td>SKU: 1230510</td>
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DESCRIPTION

Designed to last, the Large Plastic Delta Trap (LPD) is the most utilized and dependable insect trap available. Use with pheromone lures to attract, trap and monitor specified species.

These traps help to disrupt the mating cycle of the pest insects and allow you to easily monitor and determine pest populations. They are rugged and highly resistant to weather conditions. Easy to assemble, easy to use, they are re-usable and collapse flat for storage.

Each LPD ships with 2 liners that slide in for use and are easily removed once used. Replace when full of bugs or after dust storms.
Get to the Field!