

Growing Hemp in the Northeast

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Cannabis Sativa

Hemp used for industrial purposes

- Grain
- Fiber
- CBD (phytocannabinoids)



Temperature, Water, Light

- Adapt to region – fairly cold tolerant.
- Tolerant of hot and arid conditions provided roots can reach water.
- Does not tolerate water logged soils.
- Thrive in full sun.





Soil Limitations

- Grows best on sandy loams.
- 40% or more clay not generally good.
- Adequate pH – over 6.0 (requires calcium).
- Nutrient loving especially N-P-K.



Results

Nutrient	Low	Medium	Optimum	High or Excessive
Phosphorus (P):				
Potassium (K):				
Magnesium (Mg):				

<i>Analysis</i>	<i>Value Found</i>	<i>Optimum Range or Average</i>	<i>Analysis</i>	<i>Value Found</i>	<i>Optimum Range or Average</i>
Soil pH (2:1, water)	6.4		Copper (Cu)	0.3	0.5
Modified Morgan extractable, ppm			Zinc (Zn)	0.5	10
<i>Macronutrients</i>			Sodium (Na)	14.0	20.0
Phosphorus (P)	2.0	4-10	Aluminum (Al)	47	
Potassium (K)	54	100-160	Soil Organic Matter %	5.3	
Calcium (Ca)	1664		Effective CEC, meq/100g	9.6	
Magnesium (Mg)	134	50-120	Base Saturation, %		
Sulfur (S)	8.0		Calcium Saturation	77.4	40-80
<i>Micronutrients</i>			Potassium Saturation	1.3	2.0-7.0
Iron (Fe)	13.5	7.0	Magnesium Saturation	10.4	10-30
Manganese (Mn)	4.9	14.0			
Boron (B)	0.3	0.3			

Recommendations for Pasture, Grass (< 30% legume) - Maintenance (2AM)

Limestone (Target pH of 6.2)	Nitrogen, N	Phosphate, P ₂ O ₅	Potash, K ₂ O
tons / Acre	lbs / Acre	lbs / Acre	lbs / Acre
0	50	60	80





Hemp Fibers



Photo courtesy of <http://www.hemptrade.ca/eguide/>

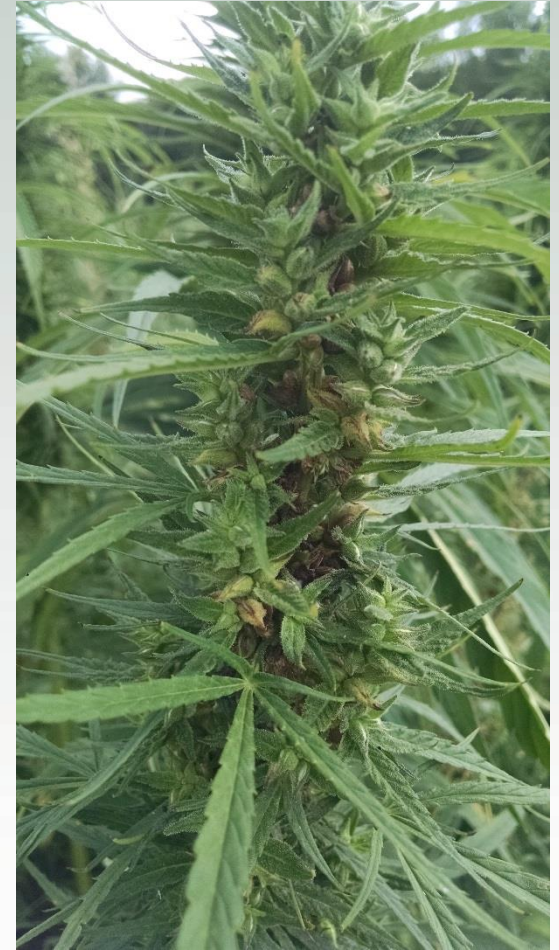
Growth stages



Staminate, male flower



Pistillate, female flower



Seed development

Growing information

- Seeding depth: 2-3cm
- Seeding rate: 20-25 lbs acre⁻¹
for grain, 40-50 lbs acre⁻¹ for fiber
- Fertility needs:
 - N 60-100 lbs acre⁻¹
 - P 40-70 lbs acre⁻¹
 - K 40-80 lbs acre⁻¹
- Avg grain yield: 0.25-0.6 tons acre⁻¹
- Oil content: 30-35%
- Allowable THC content: 0.3%









Sickle Bar Mower



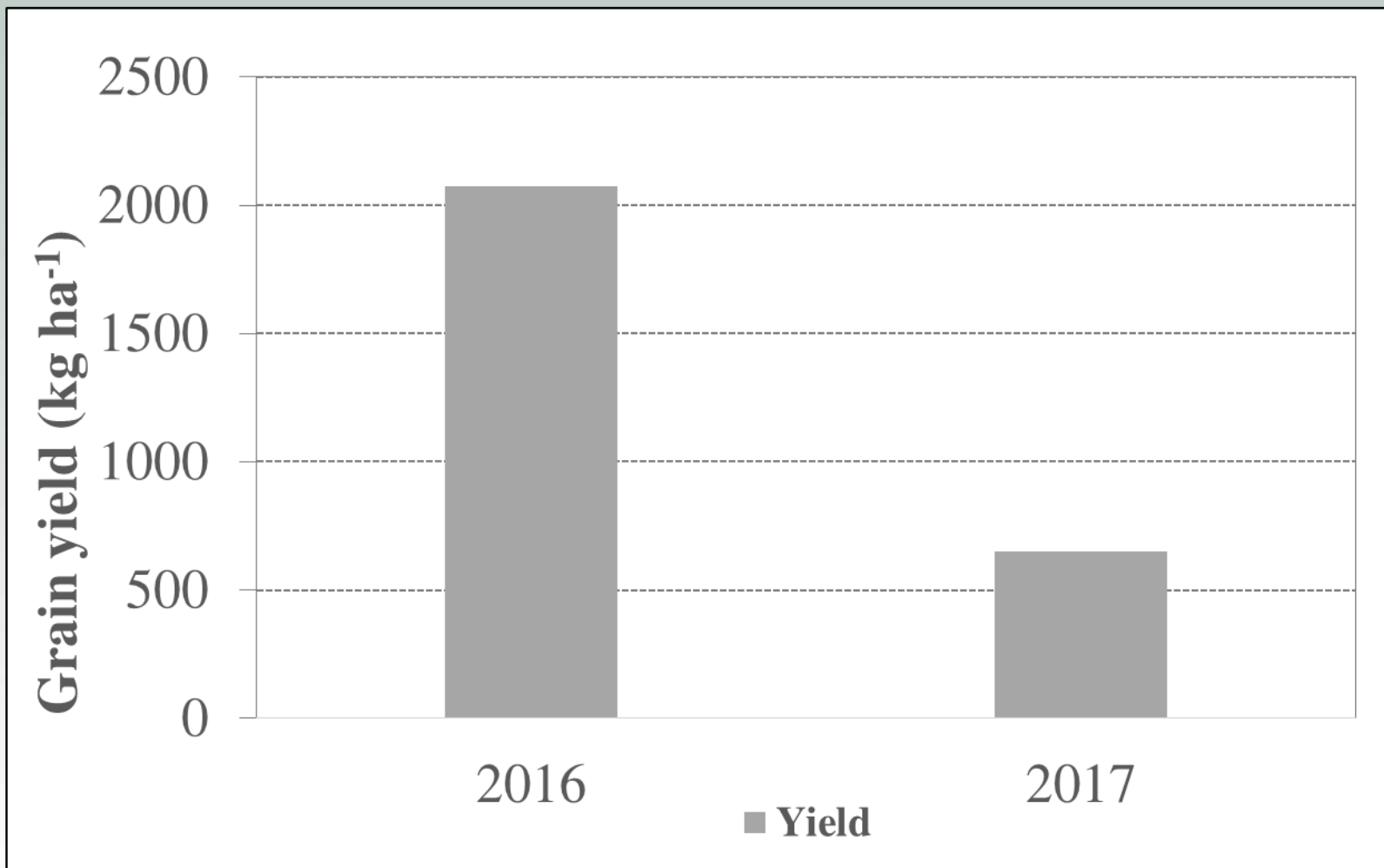


Figure 1. Average hemp grain yield comparisons of the 2016 and 2017 variety trials.

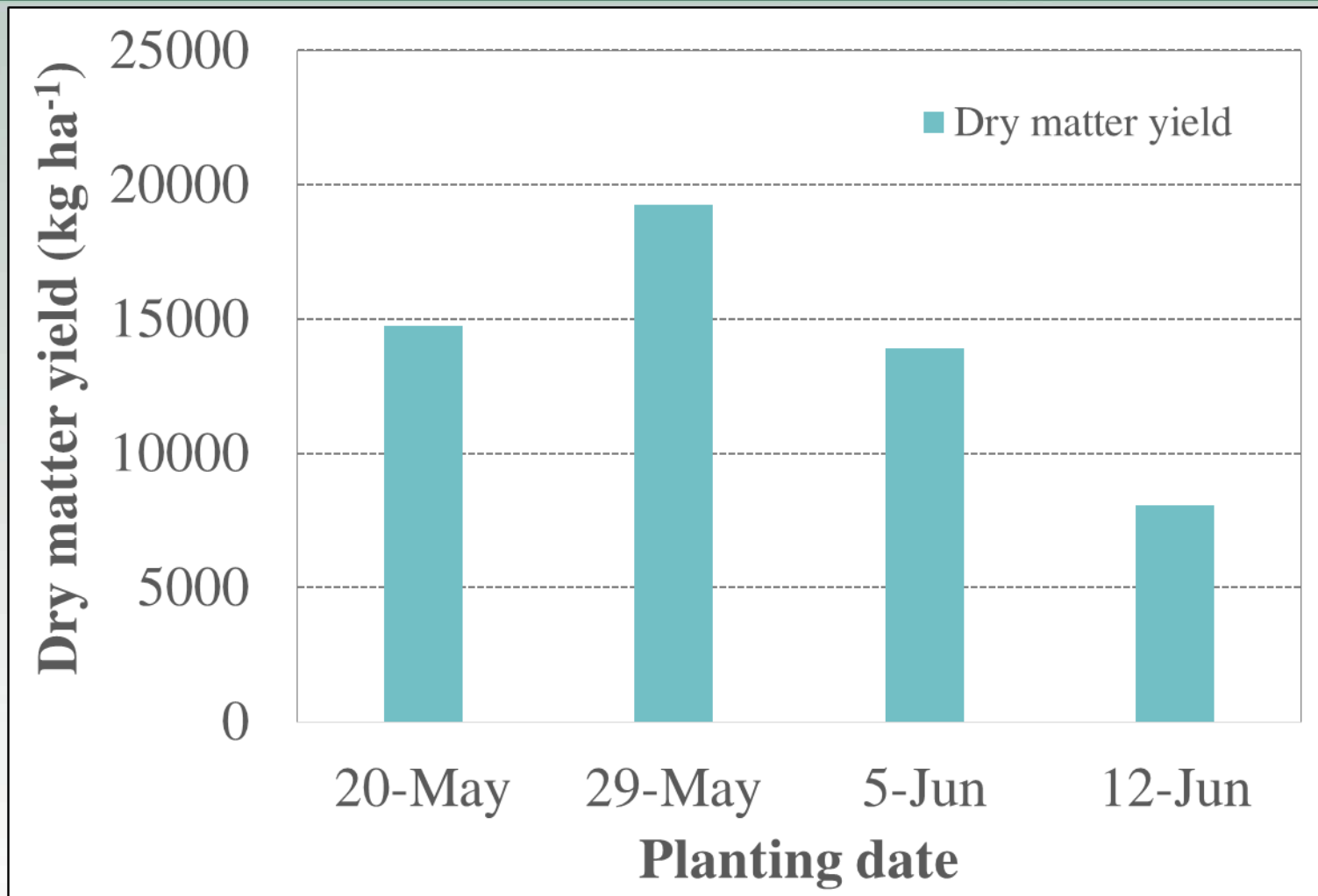


Figure 6. Hemp fiber dry matter yields from four planting dates. No significant difference.

CBD Hemp

- Female plants only
- Clones, seed, feminized seed
- Spacing 5 to 6 feet apart
- Harvesting flower buds only
- Primarily hand labor not too much mechanization.





**Approximately 1 month in greenhouse
Deep 72 or 50 cell trays
Potting mix many successes – Fort-V Lite**



How Many Seeds/Plants

- $5 \times 5 = 1,742$
- $6 \times 6 = 1,260$
- $4 \times 4 = 2,723$
- $2 \times 2 = 10,890$

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



Transplanting Hemp



Transplanting Hemp



Plastic Mulch







3 11 1



Transplanting Hemp



Transplanting Hemp



Hemp and Plasticulture





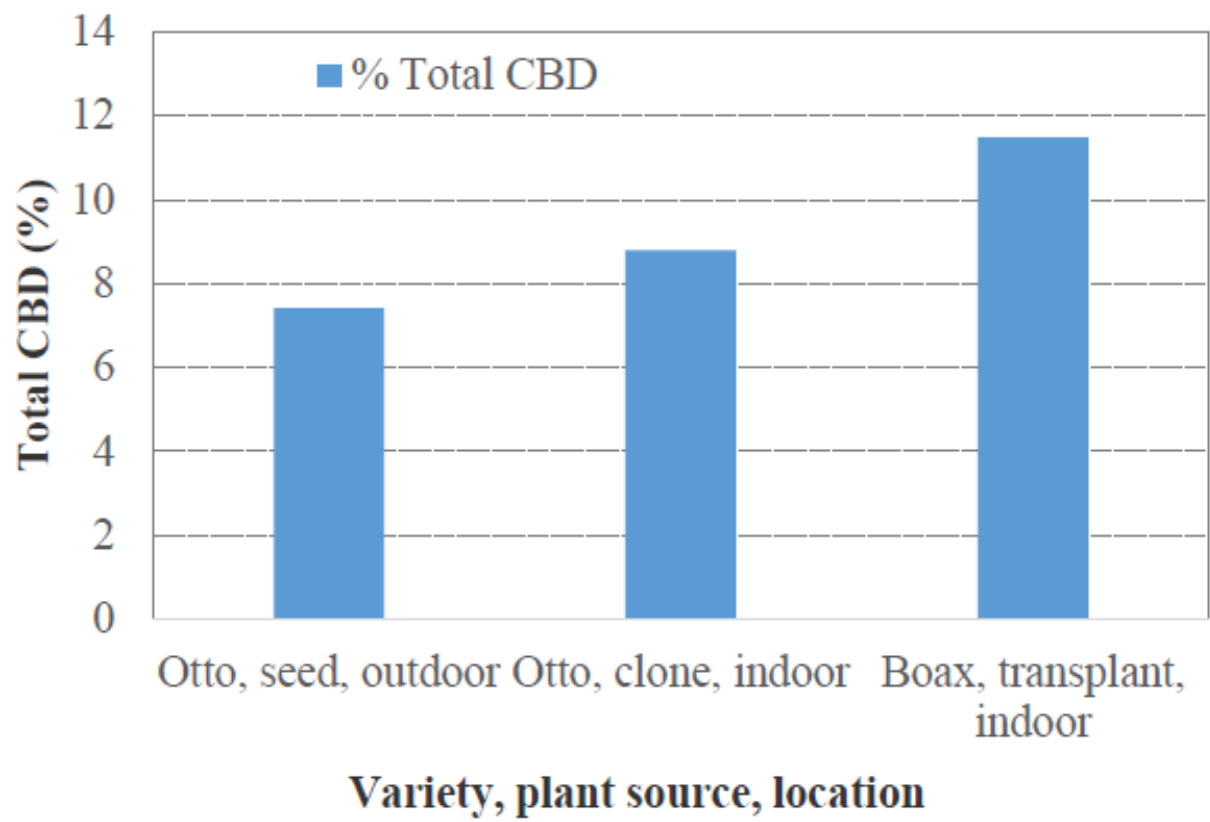
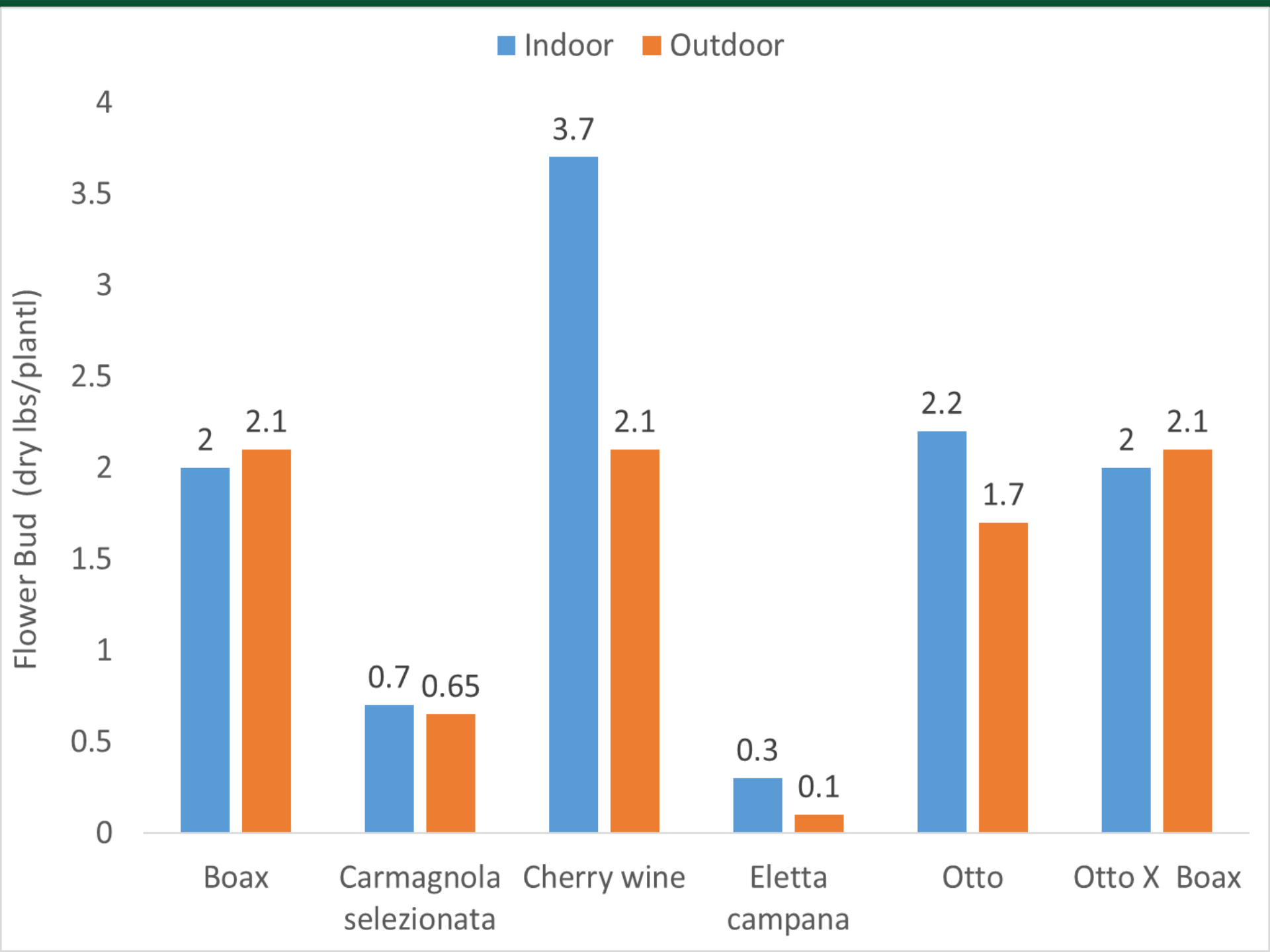


Figure 2. Average cannabidiol (CBD) concentration of Boax and Otto, Alburgh, VT, 2017.



Harvest Time Consuming





High-CBD Hemp Harvest 2018! Hemp Handler Prototype Test - July 2018





Weed pressure – only early season



Pest pressure

- What we saw:
 - Aphids
 - Tarnish plant bugs



Hop aphids



Tarnished plant bugs

- What else may be out:
 - Hemp borer
 - Spider mites
 - Bertha armyworm
 - Cutworms



Bertha armyworm



Hemp borer



Cutworms

Corn Borer



Disease

- Sclerotinia
- Botrytis
- Alternaria
- Fusarium



Sclerotinia, 2016

White Mold



Botrytis – Grey Mold

- Limit irrigation during and after bloom.
- In greenhouses, maintain the relative humidity below 50%, temperatures warm, and high light intensity.
- Avoid over-fertilization with nitrogen.
- Canopy management is the best preventive method.



Virtual tour link -

<https://goo.gl/photos/sRNsdFwnhgNmFhk87>

Hemp webpage -

<http://www.uvm.edu/extension/cropsoil/hemp>

The screenshot shows the website for the Northwest Crops & Soils Program at the University of Vermont. The header includes the UVM logo and navigation links such as 'ABOUT UVM', 'ADMISSIONS', 'ACADEMICS', 'STUDENT LIFE', 'RESEARCH', 'ATHLETICS', 'OFFICES', and 'OUTREACH'. A red 'APPLY TO UVM' button is also present. The main content area features a 'Welcome' message and a large banner for the 'NW CROPS & SOILS PROGRAM' with several images: a hay bale, a close-up of a green leaf, a field of crops, a person working in a field, and sunflowers. Below the banner, there is a mission statement: 'The mission of the UVM Extension Northwest Crops and Soils Team is to provide the best and relevant cropping information, both research-based and experiential, delivered in the most practical and understandable ways to Vermont farmers.' A section titled 'OUT CROPPINGS: Important crop news from the field!' includes two articles: 'Northern Corn Leaf Blight' and 'Cereal Grain Testing'. The 'Northern Corn Leaf Blight' article mentions increased pressure in the area and provides a link to download the entire article. The 'Cereal Grain Testing' article mentions the Grain Quality Laboratory and provides a link to download a submission form. The 'Northeast Hop Alliance' article mentions courses on October 9 and 10, 2010. A sidebar on the left contains a table of contents with links to 'UVM Home', 'UVM Extension', 'Northwest Crops and Soils Program', 'About the Northwest Crops and Soils Team', 'Forages', 'Grains', 'Oilseeds', 'Hops', 'Soil Health and Nutrient Management', 'Organic Farming', 'Events and Calendar', 'Videos', 'Out Croppings', and 'What's Happening'. At the bottom left, there is a logo for 'UNIVERSITY OF VERMONT EXTENSION' with the tagline 'CULTIVATING HEALTHY COMMUNITIES'. At the bottom right, there is a speaker icon.

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