# 2021 Hemp Flower Nitrogen Fertility Trial

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Pre-harvest, measurements for plant height and plant width were taken from middle three plants in each plot. For harvest measurements, two plants were cut at the base approximately 10 cm above the ground with loppers and the plant weight was recorded. An a

# RESULTS

Seasonal precipitation and temperature were recorded with a Davis Instrument Vantage Pro2 weather station, equipped with a WeatherLink data logger at Borderview Research Farm in Alburgh, VT (Table 3). The growing season saw hot and dry periods through initial plant establishment. July was much cooler than normal. Overall dry conditions persisted throughout the summer months resulting in below average precipitation for the season. Average temperatures during the growing period were 5.97 degrees higher than the 30-year average for the season with a 4.69% higher growing degree day accumulation for the year.

**Table 3. Seasonal weather data collected in Alburgh, VT, 2021.**

| **Alburgh, VT** | June | July | August | Sept | Oct |
|---|---|---|---|---|---|
| Average temperature (°F) | 70.3 | 68.1 | 74.0 | 62.8 | 54.4 |
| Departure from normal | 2.81 | -4.31 | 3.25 | 0.14 | 4.07 |
| | | | | | |
| Precipitation (inches) | 3.06 | 2.92 | 2.29 | 4.09 | 6.23 |

no significant differences observed in stem weight, bud weight, or leaf weight. When looking at the component in terms of percentage of total plant weight or proportions in relation to one another, some differences emerged in stem weight and leaf weight percentages. This highest total percentage of stem was seen in the 200 lbs N $ac^{-1}$ treatment at 36.9% and was statistically similar to all but the 50 lbs N $ac^{-1}$ treatment. Conversely, the 200 lbs N $ac^{-1}$ treatment had the lowest percentage of leaf material at 26.5%. highest leaf proportions were seen in the 100 lbs N $ac^{-1}$ treatment at 33.9%. The amount of total leaf or stem material can influence a number of factors such as harvest time to remove excess leaf material for trimmed flower or harvestable plant material in a biomass production system. Amount of time required to harvest plants could vary drastically depending on desired end-product and intricacy of trimming, influenced largely by overall plant size and proportions of bud, leaf, and stem material. While not statistically significant, the average bud weight for the control treatments were lower than all other treatments at 6.37 lbs $plant^{-1}$ with other treatments ranging from 7.06-8.17 lbs $plant^{-1}$.

**Table 5. Hemp plant growth metrics, Alburgh, VT, 2021.**

| Treatment | Stem weight | Stem weight | Bud weight | Bud weight | Leaf weight | Leaf weight | Bud:stem | Leaf:stem |
|---|---|---|---|---|---|---|---|---|
| lbs N $ac^{-1}$ | lbs $plant^{-1}$ | % total | lbs $plant^{-1}$ | % total | lbs $plant^{-1}$ | % total | | |
| 0 | 6.28 | 33.8ab | 6.37 | 35.6 | 5.67 | 30.7ab | 1.09 | 0.910ab |

Whole plants were chipped and analyzed for primary and secondary plant nutrients (Table 7). There were significant differences across treatments for concentrations of nitrogen, phosphorus, calcium, sulfur, carbon, iron, and zinc. Highest values for nitrogen, calcium and sulfur were observed in the 150 lbs N $ac^{-1}$ treatment at 2.96%, 2.19%, and 0.280% respectively. Lowest concentrations for many of these nutrients were observed in the 50 lbs N $ac^{-1}$ treatment with the exception of iron which showed the highest concentrations for the treatment at 831 ppm.

Cannabinoid concentrations in this year of study did not appear to be impacted by nitrogen application rate. In past years of studies there were similar responses, or lack thereof, for several cannabinoids however some differences were observed in other years with different hemp varieties. In past years, increased nitrogen application rates have led to depressions in cannabinoid concentrations with a nearly 4% difference between 150 lbs N $ac^{-1}$ rates and control rates receiving no additional nitrogen. From this past data, it did not appear that higher rates of nitrogen increased CBD or THC concentration and may in fact depress overall potential cannabinoid concentration with higher nitrogen rates. Under current regulations, there are major concerns for producing compliant crops. With such wide scale variations in growth habits, yield, and quality of various cultivars, it will be increasingly important to continue research and evaluation not only of available cultivars but also fertility practices to provide region specific information to optimize farmer yields within the Northeast. It is also important to note that only one variety and one fertility source was tested within this trial and other macronutrients or micronutrients could potentially impact cannabinoid profiles or expression under different growing conditions. Upon completion of cannabinoid analysis, this report will be updated to include 2021 season results.

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