Edible Hemp Foliar Sampling Project 2018

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Hemp, a multi-use crop that has been cultivated for centuries, is increasingly cultivated in New York. 'Industrial hemp' is a non-intoxicant version of *Cannabis sativa* with potential use as fiber, grain or processed consumer products. Hemp is a controlled substance, regulated by the US Drug Enforcement Agency. The previous Farm Bill allowed states to develop pilot programs to research industrial hemp. New York is one of the states with a sanctioned program to study growth, cultivation and marketing of the crop. In NYS permits to grow hemp are regulated by Ag and Markets under close supervision. Any person interested in growing hemp must become familiar with the pertinent regulations prior to considering growing, and a permit is required. The NYSDAM website is a good place to begin this process: ww.agriculture.ny.gov/PI/PIHome.html

Figure 1. Field crop of industrial hemp.

In 2018 CCE worked with two farms in Central and Northern New York to begin to understand nutrient dynamics in the production of edible hemp. The end product may be a microgreen for salad style consumption, juice or smoothies; or formulated into other edible products. Although we initially began to work with microgreens, farmers have found interest in edible portions of later stages of crop growth too. In both situations the crop was grown inside a greenhouse; one in mineral soil, the other in potting soil.

Foliar sampling is a common crop management tool, particularly for greenhouse and high tunnel vegetables. Coupling a soil test with regular foliar tests, farmers can observe nutrient trends within the crop and make mid-stream adjustments before deficiencies or toxicities become visible and cause a yield loss. The process is simple; leaf tissue samples are sent to a lab for analysis and results are returned, hopefully within 1 week, indicating macro, secondary and micronutrients as % foliar mass or parts per million. These values are plotted within known sufficiency ranges for the crop. In our situation there are no established ranges for hemp, so we are beginning with spinach, another edible greens crop. Farmers and crop advisors can adjust fertilizer or irrigation practices based on these results to keep the crop between upper and lower

Figure 2 Edible Hemp grown in potting media.

limits for each nutrient. We collected soil and foliar samples on these two farms on 5 dates from March through August 2018. Foliar samples were collected between 14 to 18 days after seeding on plants from 4 to 6 inches in height. Leaves were collected randomly throughout the trays or beds. Remaining samples were collected at around 60 days to gain mature leaves (5 leaves) on pre-flower to lowering stage plants. Samples were analyzed by Agro-One Laboratory in Ithaca, NY. The data shared here is an average of foliar nutrient values throughout the growing season. In this initial year of testing we observed the following trends:

- Both farms were near the lower range of sufficiency for nitrogen.
- Hemp grown in potting media tested lower in magnesium and calcium.
- The farm with mineral soil was deficient in foliar levels of phosphorus and potassium, due to low soil phosphors and potassium levels, high soil calcium and lack of fertilization.
- Both farms showed lower levels of the micronutrient manganese; likely due to high water pH/alkalinity and soil calcium levels.

Low foliar nitrogen will decrease hemp yield and leaf tissue quality by decreasing photosynthesis, growth rate, leaf color and size. Phosphorus is particularly critical for root growth, which is tied to uptake of all other nutrients. Low potassium will also decrease total yield, vigor and leaf color. Nitrogen is highly mobile and in most greenhouse situations must be replenished each cropping cycle. Total N rates per acre do not need to be very high for a microgreens crop; 50 lbs/ac may be sufficient. However, if the crop is being grown to maturity this rate could go above 125 lbs/ac. Greenhouses with bench or floor heating may lose nitrogen more rapidly due to volatization. In these cases smaller, soluble doses of N may be most appropriate. Acidfication of irrigation water with acid may help foliar manganese levels. Rarely is manganese fertilization required. Rate of acid to inject will depend on a water test of pH and alkalinity. Both soluble N and acid injection require an injector pump within the irrigation system.

Figure 3. Beneficial insects in a New York hemp planting.

This work is based on spinach sufficiency ranges and is a starting point as we learn how to best grow an edible hemp crop. We also see an increase use of hemp transplants (vs. direct seed) for other target uses. Our continued work will contribute to understanding appropriate fertilization of transplanted hemp crops grown for non-edible purposes. If you need help calculating fertilizer application or injection rates please contact us.

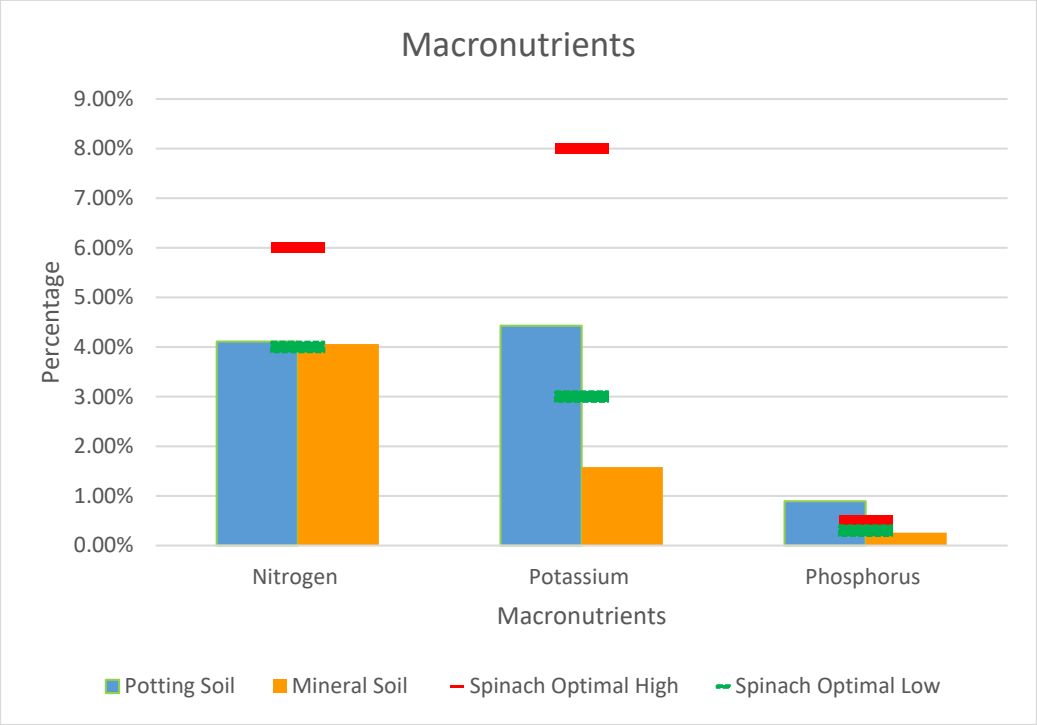

Figure 4. Macronutrients at two farms growing edible hemp crops. Red represents upper levels of sufficiency and green the lower limit, based on spinach data. Both farms border the lower acceptable foliar range of nitrogen.

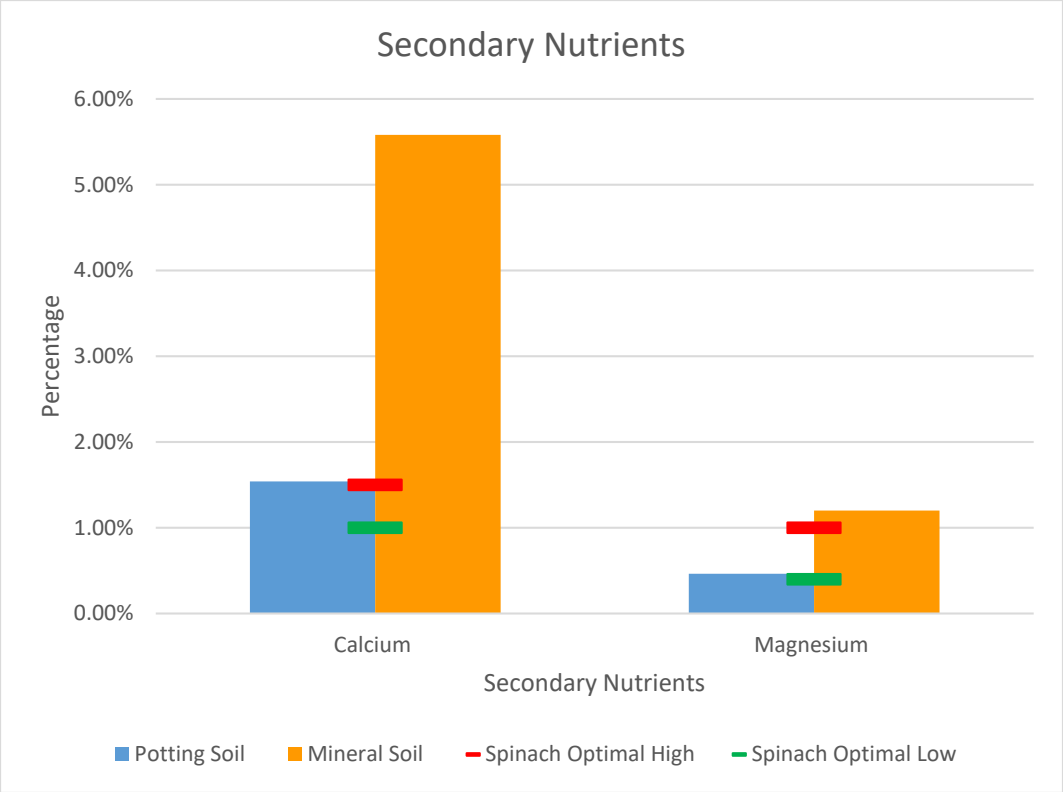

Figure 5. Calcium and magnesium were acceptable at both farms, although the potting media showed lower levels.

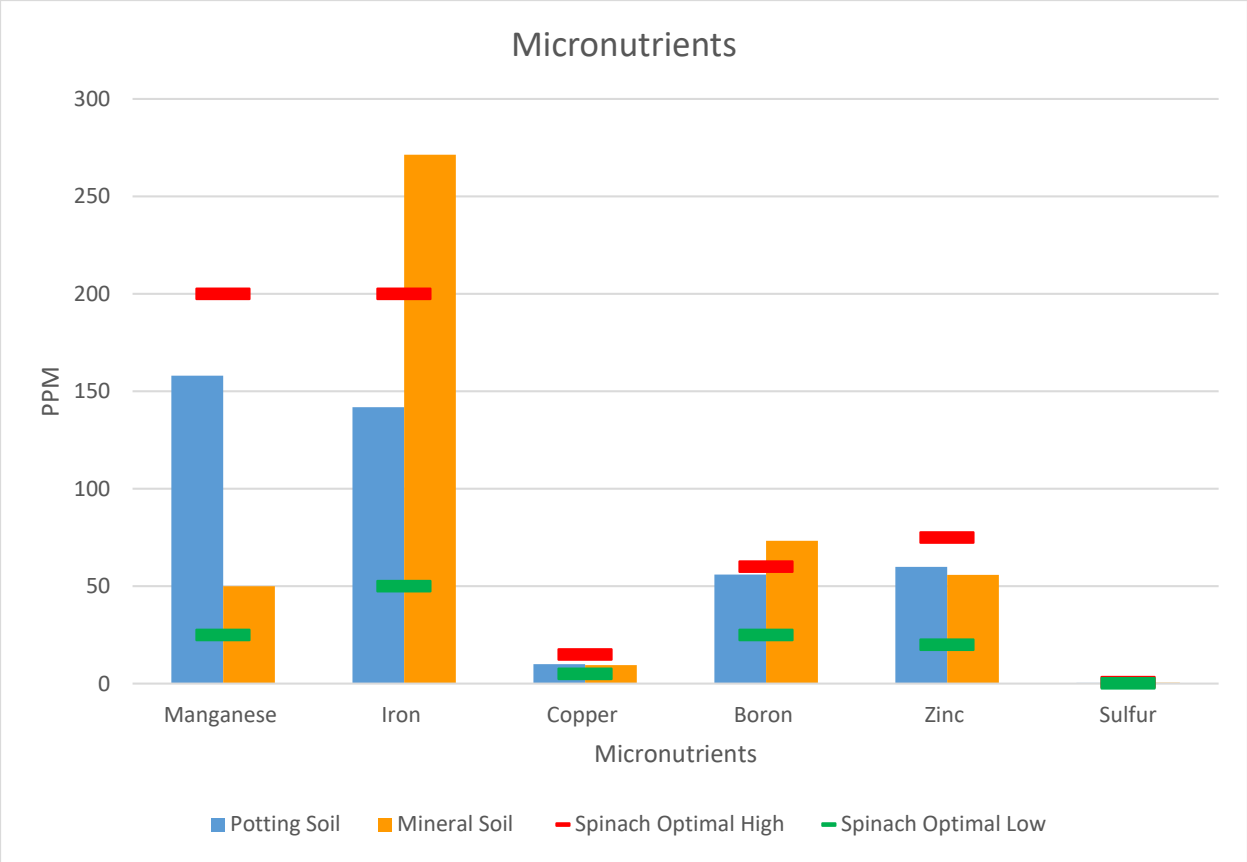

Figure 6. Foliar micronutrient levels at both farms were within acceptable ranges.