



THE ROLE OF NUTRIENT ANALYSIS IN THE SUCCESSFUL CULTIVATION OF CANNABIS

Adam Floyd & Joshua Cosgrove

WWW.THESOILLABS.COM



INTRODUCTION

Plant tissue analysis has been a staple in commercial agriculture for many years. There has been limited research conducted on the exact nutritional requirements of cannabis and hemp. Maintaining proper nutrient levels in the plant tissue will optimize the production and yield of flower in cannabis cultivation. Mineral nutrient analysis is a powerful tool to identify nutrient deficiencies prior to physical symptoms becoming present.

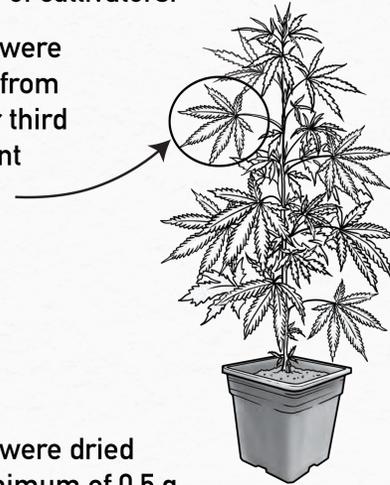
Most often, the physical signs of nutrient toxicities and deficiencies show themselves after the issue has been present for a period. Using plant tissue analysis as a diagnostics tool, early identification of these issues can occur. This allows for the grower to adjust accordingly and not face potential economic damages due to poor yields. Analysis of plant tissue directly indicates deviations from ideal plant nutrient concentrations. Excessive fertilization of specific elements is widely abundant in cannabis cultivation.

Plant tissue analysis provides an in-depth snapshot of the overall nutrient levels at the specific time the sample was taken. Traditionally, nutrient deficiencies and toxicities have been identified by visual cues only.

EXPERIMENTAL

Plant tissue samples were received from a number of cultivators.

Samples were collected from the upper third of the plant canopy.

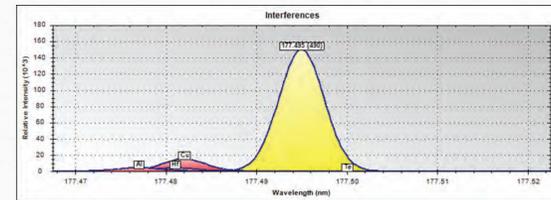


Samples were dried and a minimum of 0.5 g of dried material was digested using 7 mL nitric acid and a Mars6 Microwave Digestion system. The digested plant tissue was diluted with water to 50 mL and analyzed using an iCap 7400 ICP-OES.

RF Power	1150 W
Auxiliary Gas Flow	0.50 L/min
Coolant Gas Flow	12.0 L/min
Nebulizer Gas Flow	0.70L/min
Viewing Height (UV)	12 mm
Viewing Height (Vis)	12 mm
Pump Speed	50 rpm
Exposure Time (UV)	15 s
Exposure Time (Vis)	5 s

Method Acquisition Parameters

The following elements were analyzed using ICP-OES: P, K, Ca, Mg, S, Co, B, Zn, Mn, Mo, Fe, Cu. Sample concentrations were determined from A five-point calibration curve for each of these analyte was prepared using a custom multi-element calibration solution.



Potential Wavelength Interferences

Target wavelengths were optimized for plant tissue testing. The purpose of this was to eliminate interference from other target and non-target analytes

Plant tissue samples were also analyzed for nitrogen content by combustion using a FlashEA 112 Series C/N combustion analyzer.

Identification of potential issues was determined by comparing the analytical values to theoretical target ranges.

RESULTS AND DISCUSSION

Several key nutrient issues were identified for clients. This is particularly important for organic cultivators as the release rate for the plant available nutrients is limited compared to mineral fertilizers. Aggregated averages of the samples are shown below.

N	3.980%	Co	0.03
P	0.724%	B	175.78
K	2.583%	Zn	53.49
Ca	3.187%	Mn	73.14
Mg	0.798%	Mo	0.64
S	0.303%	Fe	86.19
		Cu	7.81

Aggregated average values from several hundred cannabis plant tissue samples

Samples were taken and tested every two weeks. Frequent testing is critical in monitoring plant health and reacting to rectify any potential issues.

CONCLUSION

Comprehensive plant tissue testing is a critical aspect of commercial cultivation which is often overlooked in cannabis cultivation. Visual symptom identification has long been the standard in cannabis cultivation. This often leads to a misdiagnosis and reduced crop yield due to inappropriate action being taken to rectify the issue. The use of mineral nutrient analysis is a useful and critical tool in the identification of nutrient deficiencies and toxicities. Early diagnosis and response can make a significant improvement in crop yield and potentially reduce fertilizer cost and waste.



ThermoFisher iCap 7400 Inductively Coupled Plasma Optical Emission Spectrometer (ICP-OES)