Nutrient Management for Cannabis Gets Real

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Legal Preamble

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I am solely responsible for this content
Disclaimer

• I am NOT a cannabis nutrition expert!
• “Real” experts won’t speak in public.
• Nutrien briefly considered selling into the fertilizer market.
• I was tasked with developing a fertilizer program for hydroponic production of cannabis.
Introduction

- Hydroponic dealers have supplied custom fertilizer management for cannabis for years. This will continue for hobby growers.
- As production scales up in a regulated market, it is time to treat cannabis like any other crop.
Mystical Fertility

- Cannabis is (apparently) a mystical plant.
- Growing must require mystical fertilizer!
- Hobby growers have little knowledge of chemistry nor access to the technical grade fertilizers needed to create their own hydro programs.
Hydro Programs

• Current programs are all effective at producing quality cannabis, if used as directed.
• Most programs have multiple products that make it easier to follow plant needs for nutrients as it grows.
• Products are very expensive!
Myth Busting

• Cannabis needs the same essential nutrients as any other crop.
• Cannabis has nutrient requirements very similar to determinant greenhouse tomato.
• Successful production can take place with just two different fertilizer blends by varying injection rates over time.
Plant Essential Nutrients

• These are the elements a plant MUST have available to complete a life cycle from seed to flower to fruit to viable seed.
• Determined in nutrient culture by growing the plant with all nutrients except one.
• Currently, there are 17 essential nutrients: C H O P K N S Ca Fe Mg B Mn Cu Zn Mo Ni Cl
N Nitrogen

• In hydroponics, nitrate should dominate with a ratio of around 70:30 NO$_3$:NH$_4$
• Urea not acceptable for media.
• Most important during vegetative growth.
• Reduce N during flowering.
• Ammonium, potassium, calcium and magnesium nitrates
P Phosphorus

• Helps with root development and flower formation.
• Solution concentrations increase sharply with the onset of flowering.
• Mono potassium phosphates
K Potassium

- Similar to tomato, cannabis has a very large requirement for K.
- Moving sugars from leaves to flowers, water relations, etc.
- Concentrations increase substantially beginning at flowering.
- Do not use thiosulfates in media. Potassium nitrate and phosphates are main sources.
Ca Calcium

• Calcium is included in media as gypsum and lime, but need supplementation in liquid feed.
• Calcium nitrate is common fertilizer, supplying both nitrate-N and Ca.
• Used most during vegetative stage.
Mg Magnesium

• Important for chlorophyll.
• Found in dolomite lime (media) and Epsom salts, magnesium nitrate (liquids).
• Important throughout cycle but required in low amounts.
S Sulfur

• Critical for several essential amino acids.
• Should be in a ratio of 5:1 as N:S.
• Sulfates are main source, found in micronutrients, ammonium and potassium sulfate, gypsum, etc.
• Elemental sulfur is not acceptable in media!
Micronutrients

- Metals (Fe, Mn, Zn, Cu, Ni)
  - Important for chlorophyll, reactions, stress management, etc.
  - Fe and Mn concentrations higher than Zn
    - Want compact plant with no seeds; low auxin
  - Chelates or sulfate forms
- B, Mo, Cl
  - trace amounts required
Some growers believe that boosting silicon will stimulate trichome formation, leading to increased terpenes (flavor compounds). This seems to be incorrect. Silicon may make stronger trichomes but is not linked to terpene formation. Plenty of silicon in water naturally.
Hydroponic Fertility Program

- Need all essential nutrients.
- Some fertilizers incompatible.
- Can’t mix everything together in a concentrated form.
- We can inject incompatible products at low rates enough for plant growth, without precipitation.
Reverse Engineering

• Access to a “premium” hydro program
  – 13 different products, all way under analysis
  – One 2.5 gal jug had a $589 price sticker
  – Between 4 – 7 different products per week

• Nutrient solution analysis of the program at four or more growing stages.

• Used tomato “model” to develop a program that fit the points.
Fertility Program

• Typical hydroponic programs can have two blends:
  – Grow Formula
    • High in Nitrate-N, Ca, Mg. Contain B and Mo
    • Higher rates during vegetative development.
  – Flower Formula
    • Low N, high P, K, S, Fe, with Mn, Zn, Cu
    • Higher rates during flowering.

• The two are run simultaneously at varying rates.
Program: Fe Mn B Zn

Weeks

Veg

Flower

ppm

Fe
Mn
B
Zn
Discussion

• This program apparently works.
• Is it the “best” fertility program?
  – Need independent fertility research to determine best practices.
• The same approach should be taken for field grown hemp (CBD) and cannabis.
• Growers need to be trained in nutrient management and BMP’s.
Conclusion

• Increased production of cannabis will lower the retail price of the final product.
• Have to lower input costs.
• Scaling up will result in more bulk sales.
• Learning more about fertilizer and nutrient requirements of cannabis will allow for input cost savings and more control over the final product.