Trace Mineral Takeaways – Jan 12 2019 NOFA Mass Winter Conference – Derek Christianson

1 Acre Furrowslice = 2,000,000 (aka 2 Million) pounds… a target for calcium depending on CEC may be 3,000 pounds…

Total trace mineral needs are significantly lower, quite often uptake is influenced by pH and crop needs

Boron – Anion - Logan Labs Mehlich 3 target 1-3 PPM * however the best Boron soil tests are still being debated…

- Helps to create sap pressure and therefore works to improve calcium uptake

Solubor (21% B)

QB-10 or other dry granular boron products (or even Mule Team Borax for the home gardener)

- Soil Applications – if broadcasting 1-2# actual B per acre
- Field Sprays (Soluble Soil Applications) > at Brix we employ Field Sprays with carbon)
- Foliar Applications - 1/10th # to ¼ # actual B per acre
- Mule Team Borax Website for B information - https://agriculture.borax.com/

B for Raised Bed / Home Gardener

B for Homesteader (1/4 acre +)

B for Small Scale (up to 10 acres) – Soluble Field Sprays to build soil B levels (using a backpack, atv, or tractor mounted sprayer) – we spray in the late winter/early spring. Use a base amount (at Brix Bounty we apply 10# solubor per acre, which is approx. 2# actual boron), for crops with high B needs (beets) we may spread additional dry granular B before planting.

B for Large Scale Commercial Grower (10 acres +) – the easiest approach is to determine your B needs (soil tests, past production insights, future crop needs) and have a dry granular B mixed into a custom blend

Molybdenum – Anion – LL M3 target - .2 - .5 PPM

- Cofactor in the Nitrate Reductase Enzyme
- More "Available" at higher pH… liming will improve availability
- Impacts copper uptake… careful on pastures to avoid Mo toxicity with livestock

Sodium Molybdate (39% Mo)

- Foliar Application of 2 oz. Sodium Molybdate per acre to remedy Mo deficiency
- Soil Applications of 4-8 oz Sodium Molybdate per acre are recommended when building Mo levels… Aim to apply with a humic acid to reduce leaching losses

As a general rule the cation trace minerals are not mobile in soils – readily fixed…

Copper (Cu) – Cation - LL M3 target – 2-6 PPM

- Lignin Formation
- Protein Development
- Higher N requires adequate Copper
- Can be "complexed" by Organic Matter in soils…

Copper Sulfate (25% Cu) Pentahydrate

- Application Rates > typically start with 10# per acre Copper Sulfate (up to 20# per acre maximum applications if deemed appropriate).

Iron (Fe) – Cation – LL M3 target – maintain 2x Manganese

- Chlorophyll… and Photosynthesis!
- Along with molybdenum – nitrate reductase enzyme and therefore N fixation
- Typically only worry about Iron if we are applying heavy applications of calcium and/or phosphorous which might antagonize Iron uptate and availability

Iron Sulfate (20% Fe) –

Iron Sulfate (30% Fe)

Manganese (Mn) – Cation – LL M3 target 25-50-75-90 PPM - depending on soil type and crop needs – often best addressed with foliar applications

- Strong Fruiting Energy!
- Mn & Fe balance… generally like to see Fe:Mn levels of 2:1 on a Mehlich-3 test
- Manganese is "difficult" to keep available in soils, as it's easily fixed and becomes "unavailable" especially in well aerated soils with near neutral or alkaline pH … traditional approach is to use an acid forming conventional fertilizer to lower pH around the root zone and boost Mn uptake… saturated soils which create "reducing" conditions also increase Mn availability.
- Foliar applications are considered most efficient across soil types … Advancing Eco Ag Insights > Using Plant Sap Analysis shows Foliar Chelated Manganese is most effective at boosting Mn levels in crops.

Manganese Sulfate (32% Mn)

- Broadcast (less effective) at 10 – 20# Mn Sulfate per acre annually to slowly build Mn soil levels…
- Foliar application rate of 1.5# - 3# Mn Sulfate per acre

Chelated Manganese – OMRI approved Mn Chelates ~5% Mn – widely available online, Arbico or FEDCO OGS for home gardeners, etc. (look for Baicor Chelated Mn or JH Biotech – Biomin Mn

- Follow label Instructions, application rates range 1-4 pints per acre, expect to pay ~$20 per gallon, so per acre application rates would range from $2.50 - $10 for the Mn.

*AEA > https://www.growingproduce.com/production/debunking-the-myth-of-calcium-and-fruit-quality/

*Spectrum Analytic - https://www.spectrumanalytic.com/support/library/ff/Mn_Basics.htm

Cornell Manganese > http://nmsp.cals.cornell.edu/publications/factsheets/factsheet49.pdf

Purdue > https://www.agry.purdue.edu/ext/pubs/AY-276-W.pdf

U of Wisc Manganese Fact Sheet > http://corn.agronomy.wisc.edu/Management/pdfs/a2526.pdf

Zinc (Zn) – Cation - Cation – LL M3 target 4-12 PPM, higher in soils with high P

- Auxin Formation (growth hormone)
- Water Use Efficiency
- Needs to be available **early** in the growing cycle – often used in conventional ag starters

Zinc Sulfate (35% Zn) Monohydrate - broadcast 10-20# per acre to build up Zn levels

Foliar applications also an option – ¼ - 1# actual Zn per acre for remedial application