High Bionutrient Crop Production 2011-12

Dan Kittredge Presenter,

Dan@realfoodcampaign.org

978 257 2627

Day 2

Course outline

- Preventing limiting factors - planting/transplanting solution, drenches and foliar sprays.
- Crop and soil management - Conductivity, Brix, and pH
- What do we do with these results? How do we manage accordingly?

Outline continued

Review of experience and results so far

- Integrating whole system understanding.
- Visual plant guides of growth and status
- Using plant and soil monitoring to trouble shoot problems.

Outline continued

- Hands on Soil Conductivity testing
  - Plant sap Brix testing
  - Plant sap pH testing

When Saturated Paste and Tissue Testing?

Review of Experience so far

- Updates and questions?
- Difficulties?
- Successes?
- Trouble Shooting

Cover crop - Crop process

- Address mineral deficiencies based on soil test results and recommendations.
- Always apply minerals with a carbon source like humates/compost/biochar.
- Apply fertilizer
- Till under cover crop
- Prepare bed

Continued

- Make row or hole
- Test conductivity
- Apply plant/transplant drench (fungal and bacterial inoculant, enzymes, sea minerals, micronized calcium/phosphorus/traces
- Plant/Transplant

Limiting factors

- As with bio-inoculants, soil mineral balancing, planting/transplanting drench, regular drench and foliar are designed to address/prevent limitations as they are experienced in the plant.
- Less than ideal mineral and biological levels will show up as deficiencies in crops.

Assessing plant status

- Start with overview of patch. General glance across field.
- Questioning attitude. Ask. Listen. Throughout the day, when working in the crop. What comes to you?
- Sentience, Intuition, Spirit, Devas, Kinesthetic, Gut feeling.

Questions

- Are new growth tips standing erect?
- Do honeybees work the flowers vigorously?
- Is the plant growing rapidly?
- Are stems solid or hollow?
- What weed families are dominant?
- How many flowers are setting per bunch

Questions

- How thick are the stems?
- How thick are the calix’s
- How thick are the leaves?
- What color are the leaves?
- What color is the sap?
- What is the spacing between nodes?
- How many petals are on each flower?

General Parameters

- Stem size - Bigger is better
- Stem Strength - Should be able to bend between the fingers. See how much a stem will bend before breaking. Greater flexibility is a sign of improved quality.
- Stem hairs - More and longer is better.

General Parameters

- Solid stems in grains and brassicas especially. Hollow connotes functional Ca deficiency.
- Stem shape - round is preferred. Oblong connotes Ca deficiency.

General Parameters

- Internode Points - Shorter internodes build stockier plants which can build higher yields. In tomatoes and vine crops 4-6 inches between nodes should be the max. Try for shorter.

General Parameters

- Leaf Thickness - Thicker is better. Facilitates greater photosynthesis and nutrient transport. Fe, Mg and K associated with this.
- Leaf shape. Shorter wider leaves correlate with higher production potential and stockier plants. Ex tomato plant. 1X5.5 inches or 2.5X4 inches

General Parameters

- Leaf Density - plants highly loaded with leaves have higher productive capacity.
- Leaf sap color - darker color more chlorophyll. Mg and B+K associated with this. More photosynthetic potential. N will make plant look greener, but not sap darker.

General Parameters

- Number of flowers per cluster - greater number of flowers greater number of fruit. Mn often limiting factor in flower number and fruit set. 4-6 flowers to 12-15.
- Size and strength of flowers critical. Size of calix.

General Parameters

- Check pH and Brix of crops and weeds next to them. As the soil becomes strengthened, the brix rises and balances in the crops, and drops and imbalances in the weeds.
- What weed families are present? Not individual weeds, but general trends.

Biochemical process of plant nutrition

- Boron activates Silicon which carries all other nutrients starting with Calcium which binds Nitrogen to form amino acids, DNA and cell division. Amino acids form proteins and tag trace minerals especially Magnesium to form chlorophyll which transfers energy via Phosphorus to Carbon to form sugars which go where Potassium carries them

Calcium

- Often Ca shortages show up in tandem with other shortages. Most common, B and Si.
- Stem and leaf strength and ability to flex and bend back are correlated to Ca.
- Strong cell walls which correlate to fungal resistance.
- Roundness of stems sign of good Ca presence.

Calcium

- Deficiencies -
- Dark green vein in mid rib of leaf, yellowish in between
- Leaves have wrinkled appearance, may defoliate
- Poorly developed root hairs
- Young leaves die back at tips

Calcium

- Adequate Ca correlates to same leaf size across the plant. Consistency.
- Adequate Ca will help plant vibrate at a higher frequency increasing the plants ability to pull nutrients to it.
- Leaves will curl upward in Ca shortage in cucurbits and will also become brittle. This will correlate with B also.

Silicon

- Vine crops will become resistant to powdery mildew with sufficient Si. Synergist with Ca. Sufficient Si will make very strong cell walls.
- Grasses and cucurbits especially need Si. Si supplementation will cause leaf hairs to increase in size and vibrancy. Micro transmitters.

Boron

- Boron facilitates Carbohydrate transport down to roots and nutrients up to leaves. Insufficient B will correlate with stagnant brix readings in crops, not fluctuating the day.
- Adequate levels of Ca in the soil and bottom of the plant but not in the top of the plant will correlate with B deficiency.

Boron

- B pushes nutrients upward and outward in the plant. Catalytic effect in moving nutrients.
- Close attention to inside and outside brix and pH in a leaf. If inside of leaf is in better shape than outside probably a B deficiency.
- Death of terminal bud/deformed flowers - deficiency

Sulfur

- Deficiency -
- Reduced growth
- Delayed maturity
- Young leaves light green
- Old leaves turn yellow and don’t drop

Phosphorus

- Deficiency -
- Dull blue green
- Poor root growth
- Poor flowering and fruit set
- Low Brix

Nitrogen

- Deficiency
- Yellowing or orange or purple bottom to top
- Low Conductivity
- Stunted growth

Potassium

- Potassium is a transport element, and catalyst in plant sizing. K deficiency will show up in leaf, fruit, and stem if size is not there. Lack of K is obvious in size and shape of fruit.
- Delicious apple shape shows insufficent K. Should not be oblong, should be as round on flower end as stem end.

Potassium

- K shortage will be obvious in thin stems, calix’s and leaves. Small fruit.
- K shortage in vine crops will show as a light or yellow band on the outside rim of the leaf.
- Yellow spots on lower leaves/dull blue green
- In tomatoes, bottom leaves curling up that turns into early blight is a sign of K deficiency.

Magnesium

- Mg produces chlorophyll and has enzyme cofactors that turn plant sap a deep true green. High levels of Mg will cause a very dark sap which shows a very healthy plant.
- Discoloration in color on veins light and dark to white perhaps lower leaves first then across plant is Mg deficiency.

Magnesium

- Deficiency -
- Yellow leaves
- Yellow between veins
- Brown and dying (bottom to top)
- Low brix and vigor

Cobalt

- Deficiency -
- Poor legume Nitrogen fixation
- Low bacterial activity

Copper

- Deficiency -
- Dieback of young leaf tips
- Stunted growth

Iron

- Deficiency -
- Yellowing of newer leaves

Manganese

- Deficiency -
- Similar to magnesium except chlorosis starts at top

Molybdenum

- Deficiency -
- Yellow between veins, bottom to top
- Leaf curl and tip dieback

Zinc

- Deficiency -
- Yellow mottled spots
- Short internodes
- Small crinkled leaves

Phases of nutritional need

- First phase - up to first blossoming - microbial needs. Plant needs highly functioning soil bacterial system to best establish itself. Soil life needs water and sugar for starters. Dry soil or low brix plants will short circuit this process.

Subsequently

- Blossoming and setting fruit - nutrient demands begin to increase as plant goes through hormonal and reproductive shifts
- Fruit fill - nutritional demands increase even more - B, Ca, Mn, S, P, Mg, Co all needed

Root/Top Balance

- Stocky plants objective
- Cytokinin - root
- Auxin - Top
- Hold each other in check. Brains in roots, roots should always be bigger than top. If top growth starts to get leggy, root growth has fallen behind.

How to Discern Imbalance?

- Conductivity - soil energy levels need to be sufficient for crops to have access to the nutrition needed for optimal growth.
- Conductivity - corresponds to electrical energy flow in soil. Looking for minimum of 200 in spring. 600-800 at fruit fill.
- Biological activity releases minerals into soil solution which increases conductive reading.
- Dropping conductivity reading corresponds to insufficient nutrition for crops.

Addressing deficient conductivity

- Planting/transplanting solution - Should supply sufficient nutrition for crop to have generous availability of nutrition needed to establish large strong root systems which are predictive factors in yield potential. Calcium and Phosphorus critical at this time.
- Often cold soils, or denuded will not be sufficient in energy and nutrition to establish this first key phase in field to optimal levels.
- Conductivity monitoring will proactively show general nutrient availability to crops. If this begins to drop a drench should be applied.

Discerning deficiency Brix

- Ideally, brix readings in plant leaf sap should not drop below 12. Early morning testing is best to show minimum levels. If 12 is not attained in mid afternoon of a sunny day, the plant is definitely stressed.
- Regular weekly monitoring is ideal for discerning movement in brix levels.
- Same point in plant is necessary for significant readings. I.e. fourth newest leaf.
- Same time in day as well.
- Brix below 12 shows the need for other monitoring activities if the desire is to address the problem.

Plant sap pH

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pH Imbalance Troubleshooting

- Low pH most common
- Potassium and Calcium deficiency most common
- Calcium is fixed in the plant, and Potassium mobile
- Calcium will be deficient in top of plant, and Potassium in the bottom.

pH Troubleshooting Continued

- Potassium increases brix where it is present.
- Higher brix at top of plant than bottom with low pH will be probable Potassium deficiency.
- Greater pH deficit at top of plant than bottom with low brix will be probable Calcium deficiency.

pH Troubleshooting Continued

- High plant sap pH is most often a shortage of Phosphates.
- For all deficiencies, solution predicted, apply test foliar spray consisting of predicted deficient nutrient and test plant brix after 2 hours.
- If you have addressed the deficiency, the brix should be up at least 1-2 points in the test plants.
- pH as well should begin to moderate.

In general

- Once a plant shows deficiency symptoms, you have limited the genetic potential of that crop in that year. Epigenetics.
- Why guess when you can test. In high value crops it is very affordable to make changes and test regularly.

Plant Framing and Fruiting

- A plant will generally start seriously building its frame 4-6 weeks after it has been transplanted.
- Saturated paste test 3-4 weeks after transplant = 1-2 weeks before framing and fruiting = time to adjust for deficiencies. Proactive monitoring.

Framing and Yield Potential

- 3-4 weeks after bulking point it becomes difficult to significantly impact yield potential.
- Getting past bulking point with healthy form, healthy root system, and sufficient mineral availability Significantly Increases Potential For Yield.

Lab test

Saturated Paste test.

- See what nutritional components are available for your plants in real time.

Saturated Paste Test

- Soluble Salt - 300-750 ppm
- Chlorides - 25-50
- Bicarbonate - 50-100
- Phosphorus - .5 ppm
- Calcium as % should be greater than Mg and K. As a % the Ca:Mg ratio 3:1 or a ppm ratio of 5:1. Ideal range 30-50 ppm, 60%

Saturated Paste Test

- Magnesium - 6-10 ppm, 18-20%
- Potassium 15-25 ppm, 15%
- Sodium 5 ppm, <5%
- Sulfer 5 ppm
- Boron .1 ppm
- Iron .3 ppm
- Manganese .15 ppm
- Copper .05 ppm
- Zinc .1 ppm
- On traces +- .02 ppm variability from ideal ok

Simple Solutions

- For those who do not want to bother with plant sap monitoring, soil conductivity testing, recipe building and effectiveness testing,
- Simple comprehensive planting/transplanting drench
- Regular weekly/biweekly drench
- Regular weekly/biweekly foliar

Regular application guidelines

- In drip
- Sea mineral concentrate 1 pt/acre
- Ca/P/traces 2 qt/acre
- P 1 pt/acre
- K 1qt/acre

Continued

- As a foliar
- Sea mineral concentrate 1 pt/acre
- P 1 pt/acre
- K 1 qt/acre
- Kelp 5 oz/acre
- Bio-inoculant

Deviations from the mean by crop

- Tomatoes - at fruit sizing more K
- Greens - generally heavier doses
- Berries - more P in foliar
- Tree Fruit - more P in foliar
- Cucurbits - more P throughout - 1-2 qt/acre silicon in regular foliar

Biological process

- Complete Carbs
- Complete proteins
- Essential Oils and Lipids
- Plant secondary metabolites. Anti-Oxidants, phytonutrients etc

Biology

- Assumtions are roughly 1.5 million species of soil fungi and 3 million species of soil bacteria exist.
- We have “identified” perhaps 3-5% of them
- Plants evolved with a digestive tract composed of bacteria and fungi similar to animals. Our practices must integrate this understanding
- Inoculation of the gut is still extremely important

Chemistry

- Each Mineral Has an atomic radius, bonding geometry, layer of orbitals.
- Each enzyme has at its core a specific mineral
- Enzymes are tools the facilitate biological processes.
- These essential components must be present for life to function well.

Physics

- Vibration of the component pieces of matter sets up the vibration of the whole
- Every mineral and compound has a frequency that effects every other aspect of the system.
- When we can envision the vibrational underpinnings of our experience the modes of effect are more understandable.

Quantum Mechanics

- There is a fundamentally multidimensional nature to nature.
- Only when we can begin to envision and conceive of it can we begin to understand from a logical framework
- Dark matter/energy
- Octaves
- Resonance
- Spin

Seminal Thinker

- Mae Won Ho
- Quantum Jazz
- Institute of Science in Society
- .000000000000001 S is the speed of vibration of the materials inside cells.
- Each vibration effects each other and feedback loops ensue.
- How Foliars and Prayer work

Seminal Thinker

- Phil Callahan
- Identified subtle background force correlated with plant growth vitality called paramagnetism. Correlations with Irish stone towers, pyramids and vital soil. Paramagnetic stone dusts are often locally available. Carbon and Oxygen are paramagnetic materials.
- Insect Antenna

Seminal Thinker

- Louis Kervran
- Biological transmutations
- Life can move protons and neutrons in the manner that chemistry is comfortable with moving electrons.
- Atomic Weight 10 + Atomic Weight 16 = Atomic Weight 26

Seminal Thinker

- Lynn McTaggart
- The Field
- The brain as a field antenna, that attunes to specific underlying frequencies.
- Plant roots and leaves exhibit this wave guide form

Seminal Thinker

- Stephen Herrod Buhner
- Life communication
- Three neural nodes - Brain, Gut, Heart
- Entrainment and attunement
- Dominant organ determines frequencies projected

Seminal Thinker

- Richard Olree
- Human Genome project identified all enzymes critical for full human DNA replication
- Each enzyme has at its core a mineral.
- 86 minerals necessary for complete DNA replication
- Limitations result in breaks called Genetic Markers

Seminal Thinker

- Wilhelm Reich
- Bions and Orgone
- Intelligent self organizing foundational particles
- Look just above the top of a forest at dawn or dusk. Spirals bounce around off snow.

Seminal Thinker

- Rudolf Steiner
- Subtle energy signatures of natural materials, moon and other cosmic influences have profound effect on plant manifestation
- Humans can not hold coherent frequencies because our food does not have strong enough “soul force”

Seminal Thinker

- Mollison/Holmgren
- Permaculture
- Permanent soil life system with multispeciated cover provides environment for greatest flourishing of genetic potential.

Seminal Thinker

- John Jeavons
- Double Digging down two feet, deepening aerobic zone, mixing in minerals and compost/biology and then only broadforking
- Establishes deep biological zone after revitalizing/mineralizing and then minimizes disturbance of the living system

Seminal Thinker

- Carey Reams
- Millhouse Units
- Micronage, Milli-micronage and milli-milli-micronage
- Spin of electron clouds and Male or Female effect of minerals
- Phosphorus, Manganese - Female
- Calcium, Potassium - Male

Seminal Thinker

- Gaston Naessons

Krasilnikof

Somatids foundational biological lines similar to stem cells in animals

These lines are present in background levels but concentrated in sea water.

Through perception of state of somatids, overall health can be predicted.

Seminal Thinker

- Cosmic Pipes
- Galen Heironymus
- Hugh Lovel
- Bruce Tainio
- Tools designed to project different frequencies across the landscape.

Seminal Thinker

- Water
- Emoto
- Christalline Structure, intention and vibration
- Energizers
- Victor Schauberger
- Spin and spiral movement
- Irrigation source and pipes

Local Natural Solutions

- Sea Water
- Naturally occurring material with that largest spectrum of minerals and more biology per unit space than healthy garden soil.
- Great mineral amendment and biological inoculant

Local Natural Solutions

- Local Rock Dust
- Broad spectrum revitalizer containing raw crystalline mineral with broad spectrum element component.