

### **Mineral Holding Capacity**

- Plant cell have a finite mineral holding capacity.
- In soils we call it cation exchange capacity or anion exchange capacity.
- When one cation or anion is excessive another will be displaced to make room for it.

### Synergistic Interactions

- There is a synergistic relationship between the minerals in opposing quarters.
- Cation macronutrients, have a synergistic relationship with anion micronutrients (Ca/Si-B).
- Anion macronutrients have a synergistic relationship with cation micronutrients (P/Zn-Mn).

### **Nutrient Mobility**

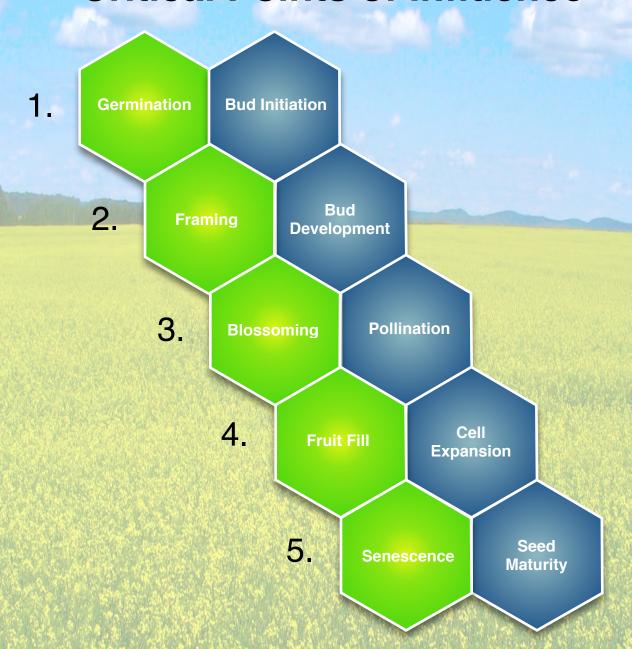
- All macronutrients except calcium are mobile in plants.
- Plants attempt to maintain ideal levels in new growth.
- Comparing old and new leaves can show nutrient movement and early imbalances.

### Cation / Anion Balance

- There is a strong correlation between anion / cation balance and plant immunity.
- Anion and cation balance is regulated by calcium and phosphorus, the heaviest macronutrient cation and anion respectively.



# **Critical Points of Influence**



For many crops there are five distinct Critical Points of Influence, which are connected with both vegetative and reproductive growth stages.





## **Plant Health Pyramid**

We work with different crops on many farms around the world, helping them to achieve functional immunity and higher levels of disease and insect resistance. We have noticed a clear and gradual evolution of plant health as plants become resistant to different pests at different stages of metabolic functionality and nutritional integrity.

PRODUCTION
OF PLANT
SECONDARY
METABOLITES (PSM)

PSMs act as plant protectants to guard against ultraviolet radiation, disease, and insect attack.

4. The production of phytoalexins in stage 4 is based on the lipids produced in stage 3. These aromatic "essential oil" compounds (terpenes, phenolics, bioflavonoids) are natural plant protection compounds that contain pesticidal properties of their own.

Resistance to cucumber beetles,
Colorado potato beetles, and
Japanese beetles; Production of advanced anti-fungal compounds and digestion inhibitors.

3. Resistance to downy and powdery mildew, late blight and others as well as bacterial invaders such as fire blight, scab, rust, bacterial speck, and bacterial spot, just to name a few.

2. Resistant to aphids,
white flies and

larval insects such as cabbage eardrum, alfalfa, weevil, tomato hornworm and many others.

#### STORAGE OF SHIPPLUS ENERGY

Energy is stored in the form of lipids, fats and oils. Lipids build strong cell membranes for increased resistance to al airborne pathogens, parasites, disease and UV radiation.

### PRODUCTION OF COMPLETE PROTEINS

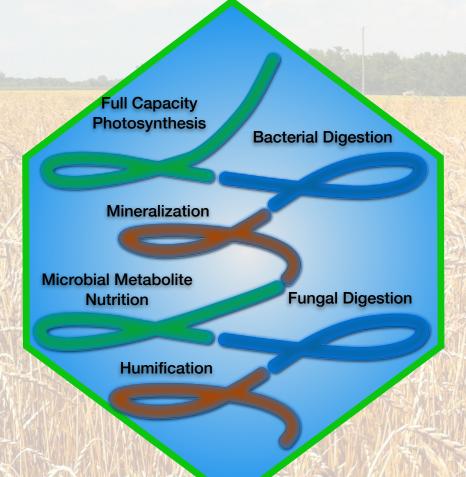
Transfer of sugars through roots to soil microbes who release nutrients in a plant-available form. Increased resistance to insects with simple digestive systems.

### SUCCESSFUL PHOTOSYNTHESIS

Formation of complete complex CARBOHYDRATES such as pectins and other polysaccharides which build resistance to soil-borne fungal pathogens such as fusarium, alternaria, verticillium.

If we wish to grow "food as medicine," this is where the medicine is.

# **Biological Cascade**



- 1. Full Capacity Photosynthesis

  Most crops can produce as much as 3-5 times more photosynthetic energy than 'normal'
- 2. Sugars Are Released as Root Exudates

  Bacterial populations develop rapidly to utilize these sugars
- 3. As Bacterial Populations Develop

  They extract minerals from the soil mineral matrix to build their own cells
- 4. Plants Absorb Microbial Metabolites

  And become exceptionally energy efficient, resulting in the development of elevated lipid levels
- 5. Lipid Root Exudates

  Are digested by soil fungal communities, which begin expanding rapidly
- 6. Fungal Digestion of Lipids

  Results in the formation of stable humic substances, with a half life of hundreds of years

