Review

Basics of Fertility Management for Apples and Peaches

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Optimum nutrient levels

- Developing a nutrient management program
- Differs for perennial crops
  - Consider nutrient demand-supply relationship throughout the season
Nitrogen

- When trees require larger amounts
  - Early season canopy development
- Only a minimum supply
  - Fruit quality development
  - Adequate cold hardiness
- Nitrogen sources
  - Reserve N in the tree from the previous season
    - Readily available for initial growth in the spring
      - Main support for spur leaf development and early fruit development
Nitrogen sources

- **N supply from soil mineralization**
  - when the chemical compounds in organic matter decompose or are oxidized into plant-accessible forms
  - Provides substantial amounts of N to trees grown on soils with high organic matter

- **Nitrogen fertilizers applied to the soil or foliage**
  - Use soil and leaf analysis to help diagnose tree nutrient status and soil nutrient availability
    - Make adjustments on fertilization program
Soil analysis

• Useful to determine
  • Lime requirements
  • Mineral availability in the soil prior to orchard establishment
  • For established orchards...
    • Combine to interpret leaf analysis results
    • Modify fertilization programs
  • Sample separately the topsoil and the subsoil
Preplant soil preparation

- **Liming**
  - Maintain in the range of 6.0 to 6.5 throughout the soil profile
    * pH of topsoil (0-8 inch depth) adjust to 7.0
    * Adjust subsoil (8-16 inch depth) to 6.5
  - Also ensures adequate soil calcium and magnesium
    * Use high-Mag lime if soil magnesium levels are below the desired levels
      * 450-950 lbs Mg/acre topsoil (coarse → fine textured)
        * 250-550 subsoil
    - Harrow thoroughly into the soil surface before plowing down as deeply as possible
      * For large amounts, plow down 2/3 followed by thoroughly harrowing the remainder into the topsoil.
Other preplant nutrients

- **Potassium**
  - 330-520 lbs K₂O/acre topsoil (coarse → fine textured)
    - 200-300 subsoil
  - \([(\text{desired level topsoil} - \text{actual level}) + (\text{desired level subsoil} - \text{actual level subsoil})]\) = lb./acre K₂O per 16” depth

- **Nitrogen**
  - 40 lb./acre for cover crop establishment
  - Another 40 lb./acre when cover crop is plowed down and permanent sod is seeded

- **Boron**
  - If Boron levels are in the low to medium range, apply preplant 2 to 3 lb./acre
    - Low (<0.4 to <0.8 lbs/a), Medium (0.4 to 1.6 lbs/a)
Fertilizing Young Trees

- Immediate supply of water to settle soil around roots
  - Nitrogen fertilizer not recommended at this time
    - Initial growth comes from tree reserves
    - Soil nutrient uptake is delayed due to the damaged root system
      - Applying dry fertilizer at this time may damage roots
  - First nitrogen application at budbreak
    - Soil applied
      - 0.6 to 1.0 ounce of actual N per tree
      - Same rate applied again 4 weeks after budbreak
    - If fertigation is an option
      - 100 ppm N in all water applied through drip for 8 weeks
Fertilizing Young Trees cont...

- **First nitrogen application at budbreak cont...**
  - Foliar sprays to improve early season tree growth
    - 2 to 3 sprays at 10-14-day intervals beginning 3 weeks after bud break
      - 6 lbs urea per 100 gal water
    - 2 additional sprays prior to leaf fall
      - 25 lbs per 100 gal water
- **In the second year when new shoots begin rapid growth**
  - Apply 0.1 to 0.2 lbs of actual N per tree and a similar foliar N spray program as in year 1
    - If fertigating, continue with 100 ppm N
Fertilizing Established Orchards

- Leaf sampling
  - Indicated concentrations of nutrients in the foliage
  - Leaf samples should be collected between 60 and 70 days after petal fall (usually late July to early August)
    - Collect mid-shoot leaves from current season terminal shoots on the periphery of the tree
      - Each sample should consist of about 100 leaves from several trees in the sampling area
        - Don’t mix leaves from different cultivars, soil conditions, tree vigor or crop load
  - Limitation of leaf sampling
    - Fairly late in the season to make corrections
### Maintenance program

- **Suggested when leaf analysis shows no nutrient deficiency**

<table>
<thead>
<tr>
<th>Timing</th>
<th>Foliar Sprays</th>
<th>Ground Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green tip</td>
<td>1 spray of 2-4 lbs of a fixed copper product per 100 gal</td>
<td></td>
</tr>
<tr>
<td>Tight cluster to pink</td>
<td>1 spray of tank mixed 3 lbs urea and 1 lb Solubor/100 gal</td>
<td>Apply 20-40 lbs actual N/acre to soil</td>
</tr>
</tbody>
</table>
| Petal fall to early cover sprays | 1 spray of Zn-EDTA at label rate at second cover  
**Plus** 1 spray of 3-4 lb of calcium chloride/100 gal at third cover  
**Plus** 2 sprays of 10-15 lb of Epsom salt/100 gal at petal fall, and second cover | Apply 40-60 lbs of K₂O/acre to soil at petal fall |
| End of shoot growth to harvest | 3 to 4 sprays of 3 to 4 lbs of calcium chloride/100 gal at 14-day intervals for bitter pit susceptible varieties |                    |
| After harvest                 |                                                                                 | Apply 40-60 lbs of K₂O/acre to soil  
**Plus** Every 2 to 3 years, apply appropriate amount of lime determined from soil analysis |
## Corrective program

- **Suggested when leaf analysis shows nutrient deficiency**

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<td><strong>Green tip</strong></td>
<td>1 spray of 2-4 lbs of a fixed copper product per 100 gal</td>
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<tr>
<td><strong>Prebloom period</strong></td>
<td>2 sprays of tank mixed 3 lbs urea, 1 lb Solubor and Zn-EDTA at labeled rate per 100 gal; One at ½” green and the other at tight cluster to pink</td>
<td>Apply 40-60 lbs actual N/acre to soil</td>
</tr>
<tr>
<td><strong>Petal fall to early cover sprays</strong></td>
<td>2 sprays of 5 lbs urea/100 gal at petal fall and first cover <strong>Plus</strong> 2 sprays of Zn-EDTA at label rate at petal fall and second cover <strong>Plus</strong> 2 sprays of 1 lb solubor/100 gal at first and third cover <strong>Plus</strong> 3 sprays of 10-15 lb of Epsom salt/100 gal at petal fall, first and second cover <strong>Plus</strong> 1 spray of 3-4 lbs calcium chloride per 100 gal at third cover</td>
<td>Apply 60-150 lbs of K₂O/acre to soil at petal fall</td>
</tr>
<tr>
<td><strong>End of shoot growth to harvest</strong></td>
<td>5 to 6 sprays of 3-4 lbs of calcium chloride/100 gal at 14-day intervals</td>
<td>Apply 60-150 lbs of K₂O/acre to soil at the end of shoot growth</td>
</tr>
<tr>
<td><strong>After harvest</strong></td>
<td>2 sprays of 25 lbs of urea/100 gal at 7 to 10-day interval <strong>Plus</strong> 1 spray of 1 lb of actual copper/acre as copper sulfate</td>
<td>Soil application of 60-150 lbs of potassium/acre as sulfate of potash-magnesia <strong>Plus</strong> Soil application of dolomitic lime to increase calcium and magnesium supply based on soil and leaf analysis</td>
</tr>
</tbody>
</table>
Compatibility

- Generally, urea, Solubor and Zn-EDTA are compatible
  - Urea and Epsom salts has sometimes injured young apple foliage
- Epsom salts and some of the boron products may increase $pH$ of the tank mix
  - Adjust $pH$ before adding $pH$-sensitive pesticide
- Do not tank mix boron product with pesticides contained in water-soluble plastic packages
  - Inhibits dissolution of the plastic
- In general, foliar nutrients should not be mixed with oil
  - Particularly Solubor
- Epsom salts, Solubor and ZN-EDTA are compatible for use in postbloom sprays
  - Not usually sprayed together though; more common to spray two together
Foliar application cont...

- Compatibility cont...
  - Calcium chloride may be physically incompatible with Epsom salts
    - Resulting in plugged nozzles
  - Calcium chloride cannot be tank-mixed with Zn-EDTA
    - Can result in Zn phytotoxicity
    - Always test a new Zn-chelate product on a few trees first to see if any phytotoxicity occurs
Questions?

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