Nitrogen Availability and Your Crops

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Key Factors for Healthy Soils

- pH
- Soil organic matter
- Management effects on soil tilth and nutrient release

pH and Nutrient Availability

Target is usually 6.0 to 6.5 (near neutral)
At these pHs phosphorus and micronutrients most available
Low pH (<5.5) – aluminum toxicity
At high pH also decreased availability
Exception molybdenum – important for legumes
Effect of Fertilizer Quality

- C to N ratio - N mineralization or immobilization by soil microbes
  - < 25 net mineralization
  - > 25 net immobilization
- Feedstock
  - Bloodmeal – undigested cells
- Processing
  - Compost – decomposed or digested organic matter
  - Raw

Rate of N Release

Putting it Together

- Compost
  - Already stabilized, does not contribute much N
  - Useful to build stable soil organic matter and add microbial life
Putting It Together

- Blood meal
  - Mineralizes very quickly and has large amount of inorganic N
  - Useful in cooler soils and high N demanding plants
  - Fall broccoli transplants
  - Might not want to use with slow growing direct seeded crops

Putting It All Together

- Feather meal
  - Mineralizes quickly under good conditions but doesn’t have inorganic N
  - Useful in spring and summer when soil temperatures are high
  - Most useful for transplants

Putting It Together - Manures

- Similar approach to fertilizers
- Remember waiting periods before harvest
  - 90 days if crop doesn’t touch soil
  - 120 days if it does
- Maybe best use with cover crops
- Watch phosphorus overload
Nitrogen in Cover Crop Residues

<table>
<thead>
<tr>
<th>Winter Legumes</th>
<th>Lbs Total N / Acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alfalfa</td>
<td>100-250</td>
</tr>
<tr>
<td>Crimson Clover</td>
<td>50-160</td>
</tr>
<tr>
<td>Austrian Winter Pea</td>
<td>40-175</td>
</tr>
<tr>
<td>White Clover</td>
<td>75-140</td>
</tr>
<tr>
<td>Hairy Vetch</td>
<td>45-200</td>
</tr>
<tr>
<td>Summer Legumes</td>
<td></td>
</tr>
<tr>
<td>Cowpea</td>
<td>40-100</td>
</tr>
<tr>
<td>Soybean</td>
<td>35-80</td>
</tr>
<tr>
<td>Sunn Hemp</td>
<td>20-280</td>
</tr>
</tbody>
</table>

Notes: UGA, Minnesota et al, 2007; Schomberg et al, 2007; unpublished data

Effect of Cover Crop Quality

- C:N ratio
  - < 25 net mineralization
  - > 25 net immobilization
- Carbohydrates increase rate of decomposition
- Lignin, tannins and polyphenols slow the rate of decomposition
- On surface or incorporated

Grain/Legume Mixtures

- Grain is tall; legume spreads underneath for weed suppression
- Slow N release
- Recommended rates
  - 2/3 legume to 1/3 grain
  - 1/2 legume to 1/2 grain

Growing conditions influence which species dominate:
- High N favors grains
- Low N favors legumes
Putting It Together – Cover Crops

- If using cover crops for N source
  - Legumes fix N
    - Most N released within a month of termination
    - Transplant can take better advantage of this
  - Grains and brassicas good N scavengers
  - Note: Winterkilled radishes release N very rapidly
  - Brassicas - Think about crop rotation and disease bridges
  - Grain legume mixtures slow N release

Putting It Together – Cover Crops

- For maximum N,
  - Maximize legume biomass
  - Timely planting (Asheville probably 1st of Sept)
  - Fresh, correct inoculant
  - Legume kill mid-bloom
  - Grains before boot
- Don’t incorporate too deeply (top 6 inches)
Take Home Messages

• MANY factors affect N
• Mineralization much slower at low soil temperatures or very dry soils
  – N may be in soil but not plant available
• Rely more on manure based fertilizers when building soil, move to cover crops when maintaining
• Think about synchronizing N mineralization with plant need
• Use a variety of N sources

A Couple of References

• Building Soils for Better Crops – free pdf at SARE Learning Center
• Sustainable Ag Webpage at UGA – www.sustainagga.org
• NCSU Extension