Amendment N release

Incubations at optimum moisture and temperature show the amount of N which may become available during the growing season. Amendment types followed five patterns:

- Yard trimmings composts released little to no N. They contribute to long-term fertility but not the current crop demand.
- Poultry manure composts had 10-20% of their N available at application, and then slowly released over time. After 12 weeks, about 30% of their N was available.
- Granular fertilizers had 15-25% of their N available at the time of addition, and mineralized quickly for the first few weeks.
- Liquids and guano mineralized more quickly, and 65-100% N was potentially available.
- Blood and feather meal contained no available N initially, but mineralized very quickly when mixed with soil.

Amendment carbon to nitrogen ratio predicts N availability

Potential N release had a strong relationship to C:N

<table>
<thead>
<tr>
<th>Material</th>
<th>Typical C:N ratio</th>
<th>N available after 12 weeks</th>
<th>Releases in:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Municipal yard trimmings composts</td>
<td>13 - 20</td>
<td>3% - 24%</td>
<td>Years</td>
</tr>
<tr>
<td>Poultry manure composts</td>
<td>6 - 8</td>
<td>30 - 70%</td>
<td>Weeks-months</td>
</tr>
<tr>
<td>Granular fertilizers</td>
<td>5 - 7</td>
<td>38 - 60%</td>
<td>Days-months</td>
</tr>
<tr>
<td>Blood &amp; feather meal</td>
<td>3 - 4</td>
<td>65 - 70%</td>
<td>Days</td>
</tr>
<tr>
<td>Liquid fertilizers</td>
<td>4 - 6</td>
<td>65 - 70%</td>
<td>Days</td>
</tr>
<tr>
<td>Guano</td>
<td>3 - 4</td>
<td>85-90%</td>
<td>Days</td>
</tr>
</tbody>
</table>

Margaret Lloyd is the University of California Cooperative Extension Small Farms Advisor for the Capitol Corridor region. Learn more at http://ccsmallfarms.ucanr.edu/, or check out her blog at https://ucanr.edu/blogs/capitolcorridormallorganicfarm/

Daniel Geisseler is the Associate Cooperative Extension Specialist in Nutrient Management at the UC Davis Department of Land, Air, and Water Resources. Find out about his lab’s work at http://geisseler.ucdavis.edu/index.html

Patricia Lazicki is an Assistant Specialist in the Dept of Land, Air and Water Resources at UC Davis. Email her for more info at palazicki@ucdavis.edu

This project was supported by the U.S. Department of Agriculture’s (USDA) Agricultural Marketing Service through Grant 16-SCBGP-CA-0035. Its contents are solely the responsibility of the authors and do not necessarily represent the official views of the USDA.

More details from this study can be found at https://ucanr.edu/blogs/blogcore/postdetail.cfm?postnum=26596
**Nitrogen uptake rate**
Brandywine tomatoes took up little N before flowering. On average 73% of the crop’s total N was taken up between full bloom and the first harvest. Peak N uptake rates averaged 3-5 lbs N/acre/day.

The N uptake rate slowed during the harvest period.

**Predicting crop uptake**
Given a marketable yield of 15 tons per acre, a cull rate of 45%, and N uptake of 6.5 lbs/ton of fruit produced

Step 1: Use marketable yield to calculate total yield
- Total yield=(marketable yield)/(1-cull rate)
- Total yield=[15 tons marketable fruit]/(1-0.45)=27.3 tons fruit

Step 2: Use an estimate of plant N uptake for each ton of yield to calculate plant uptake
- N uptake=Total yield×cull rate per ton
- N uptake=(27.3 tons fruit)×(6.5 lbs N per ton fruit)=177 tons N/acre taken up by the crop

**Predicting N removed from the field**
Given a marketable yield of 15 tons per acre, a cull rate of 45%, and 2.4 lbs N in each ton of fruit

Step 1: Calculate the N removed with the marketable yield
- N removed=(marketable yield)×(N per ton fruit)
- N removed=(15 tons marketable fruit/acre)×(2.4 lbs N/ton) =36 lbs N/acre

Next, account for culls which may be removed from the field

Step 2: Calculate the weight of the culls leaving the field (estimate about 1/3 of the total culls)
- Culls leaving the field=(( Marketable yield)/(1-cull rate))×cull rate×proportion culls leaving the field
- Culls leaving the field=((15 tons per acre)/(1-0.45))×0.45×0.33=4.1 tons culls/acre

Step 3: Calculate the total N leaving the field
- N removed=N in marketable fruit+N in culls leaving the field
- N removed=N=36 lbs N/acre×(4.1 tons culls/acre×2.4 lbs N/ton) =45.8 lbs N/acre removed from the field

**Nitrogen partitioning at harvest**
In our study, relatively little of the N taken up ended up in the marketable fruit. See next page for calculating N uptake and removal.

**Monitoring soil and plant N**
The most meaningful time to sample the soil for available N is a couple weeks before the period of rapid uptake. Samples taken at this stage will include the N from the soil organic matter, cover crops and amendments which the quickly growing crop will be able to use.

Nitrogen concentration in the most recently matured leaf wasn’t a very sensitive indicator of N status. In this study, it had the best relationship to yield at green fruit stage. Broad ranges are shown below.

**Average and range of yield and N uptake parameters from Yolo county field sites in 2017 and 2018**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Average</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>N uptake (lbs/acre)</td>
<td>202</td>
<td>58</td>
<td>391</td>
</tr>
<tr>
<td>Yields (tons/acre)</td>
<td>31</td>
<td>13</td>
<td>48</td>
</tr>
<tr>
<td>N in fruit (lbs/ton)</td>
<td>2.4</td>
<td>1.6</td>
<td>3.9</td>
</tr>
<tr>
<td>Cull rate (%)</td>
<td>51</td>
<td>23</td>
<td>78</td>
</tr>
<tr>
<td>Plant N uptake (lbs/ton)</td>
<td>6.5</td>
<td>3.4</td>
<td>10.2</td>
</tr>
</tbody>
</table>

Observations were in line with values listed for fresh market tomatoes in the Western Fertilizer Handbook

Find out more about taking and interpreting soil nitrate tests online at: https://apps1.cdfa.ca.gov/FertilizerResearch/docs/Soil_Sampling_Nitrate.pdf and http://catag.ucanr.edu/archive/?article=ca.2016a0027