Availability of nitrogen in processing tomato residue

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Northern San Joaquin Valley Processing Tomato Meeting, Modesto
January 29, 2020
N uptake by processing tomatoes

- Results from field trial at UC Davis
- Average yield: 60 t/ac, no treatment effects
- Average values from 2 years (2017 and 2018)

<table>
<thead>
<tr>
<th>Treatment</th>
<th>N application (lbs/acre)</th>
<th>Fruits (lbs N/ton)</th>
<th>Total N uptake (lbs/acre)</th>
<th>N in fruits (lbs/acre)</th>
<th>N in vines (lbs/acre)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low N</td>
<td>150</td>
<td>2.5</td>
<td>227</td>
<td>146</td>
<td>81</td>
</tr>
<tr>
<td>Intermediate N</td>
<td>200</td>
<td>2.8</td>
<td>255</td>
<td>164</td>
<td>91</td>
</tr>
<tr>
<td>High N</td>
<td>250</td>
<td>3.0</td>
<td>314</td>
<td>192</td>
<td>122</td>
</tr>
</tbody>
</table>
Factors affecting decomposition and N mineralization

- Soil temperature
- Soil moisture
- Residue nitrogen content; C to N ratio
- Residue moisture
- Residue management
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Factors affecting N mineralization: Temperature
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Studies: Treatments

Laboratory incubation:
• Treatments included:
  – Different soil moisture contents (FC, PWP)
  – Different residue moisture (fresh, air dry)
• Constant temperature (77 °F) for 12 weeks

Field trial:
• Treatments included:
  – Plots with residue incorporation
  – Plots without aboveground residue
• Soil sampling throughout the winter
Residue properties:
- 1.8% N
- C to N ratio of 22:1

Soil properties:
- Location: west of UC Davis campus
- Yolo silt loam
- pH 7.6
- 1.4% soil organic matter
Nitrogen mineralization

Soil moisture:
- moist
- dry

Fresh residue

N mineralized (mg kg\(^{-1}\))

Weeks
Nitrogen mineralization

Soil moisture:
- moist
- dry
- Fresh residue
- Dry residue

N mineralized (mg kg⁻¹)

Weeks
Nitrogen mineralization

Soil moisture:
- moist
- dry

- Fresh residue
- Dry residue

N mineralized (mg kg⁻¹)

Weeks
Nitrogen mineralization in the field during the winter
Nitrogen mineralization in the field during the winter.
Nitrogen mineralization in the field during the winter

Graph showing mineral N (mg kg\(^{-1}\) soil) over time with two conditions: No residue and With residue.

Soil temperature and precipitation data are also shown.
Conclusions

• Plants adjust N uptake to N availability
  ⇒ Not all of the “excess” N is at risk of being leached

• One third of N in aboveground biomass left in the field as residues

• N mineralization from tomato residue during the winter is slow
  ⇒ C:N ratio of around 20:1
  ⇒ Fall: dry soil
  ⇒ Winter: cool soil
Acknowledgement

• UC Agricultural and Natural Resources (UC ANR)
• CDFA Fertilizer Research and Education Program (FREP)
• California Tomato Research Institute
• Gene Miyao, Brenna Aegerter, Tom Turini, Michael Cahn, Tim Hartz
• Suzette Turner, Kelley Liang, Irfan Ainuddin, Ken Miller