Nitrogen Management Tools for Wheat

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How to Grow a Wheat Crop

• Soil
• Seed
• Water
• Fertilizer
• Weed control
• Sunshine
Fertilizer: How much and when?

- Recipe based on past experience
- Yield goal
- Appearance of crop
- N management tools
## N management tools

<table>
<thead>
<tr>
<th>Brand</th>
<th>N management tool</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>N/A</td>
<td>Lower stem nitrate</td>
<td>Nitrate concentration</td>
</tr>
<tr>
<td>Minolta</td>
<td>Chlorophyll meter</td>
<td>SPAD (Soil-Plant Analysis Development) unit ~ chlorophyll</td>
</tr>
<tr>
<td>Greenseeker</td>
<td>Hand held crop sensor</td>
<td>NDVI (Normalized difference vegetation index)</td>
</tr>
<tr>
<td>CropScan</td>
<td>Multispectral radiometer</td>
<td>Reflectance measurements for 16 wavelengths</td>
</tr>
</tbody>
</table>
Lower stem nitrate
Handheld crop sensor
Multispectral radiometer
Yuma N management tools studies

• Locations: UA Yuma Valley and Mesa Ag Centers
• Planting date: January 4, 2019
• Seeding rate: 175 lb/acre
• Durum varieties: Powell and Tiburon
• N rates: 0, 50, 100, 150, 200, 250, 300, and 350 lb N/acre
• N application dates: planting, tillering, jointing, boot, heading
• N management tool measurement dates: same as above except planting
### Vegetation indices

<table>
<thead>
<tr>
<th>Vegetation index*</th>
<th>Algorithm (wavelength, nm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NDVI</td>
<td>(690-810)/(690+810)</td>
</tr>
<tr>
<td>Green NDVI</td>
<td>(550-810)/(550+810)</td>
</tr>
<tr>
<td>Red edge NDVI</td>
<td>(720-750)/(720+750)</td>
</tr>
<tr>
<td>Green VI</td>
<td>(690-550)/(690+550)</td>
</tr>
<tr>
<td>Difference VI</td>
<td>810-690</td>
</tr>
<tr>
<td>CI green</td>
<td>(810/550)-1</td>
</tr>
<tr>
<td>CI red edge</td>
<td>(750/720)-1</td>
</tr>
</tbody>
</table>

*NDVI = normalized difference vegetation index, VI = vegetation index, CI = chlorophyll index.
Grain yield (lb/acre)

Stem nitrate (ppm NO3-N)

\[ y = 837.01 \ln(x) + 1441 \]

\[ R^2 = 0.4602 \]
Grain yield (lb/acre)

Chlorophyll meter

\[ y = 288.58x - 7176.7 \]

\[ R^2 = 0.3884 \]
NDVI (Greenseeker Crop Sensor)

Grain yield (lb/acre)

y = 408.13e^{3.1886x}

R² = 0.8818
Grain yield (lb/acre) vs. Red edge NDVI

\[ y = 16807x - 1360.5 \]

\[ R^2 = 0.873 \]
Conclusion

- Vegetation indices are promising nitrogen management tools for wheat