Cover crops with contrasting root systems: plant development and nitrate movement during the winter
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Cover crop yields and nitrogen content 2009-2014

<table>
<thead>
<tr>
<th>Year</th>
<th>Cover crop treatments</th>
<th>Dry weight kg ha⁻¹</th>
<th>N content kg N ha⁻¹</th>
<th>Planting Date</th>
<th>Termination Date</th>
<th>Growing Degree Days (°C)</th>
<th>Water inputs inches</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009-10</td>
<td>Triticale</td>
<td>584 (±148)</td>
<td>14.1 (±3.5)</td>
<td>Nov 18</td>
<td>Feb 18</td>
<td>292</td>
<td>9.6</td>
</tr>
<tr>
<td></td>
<td>Bell beans, vetch, oats</td>
<td>910 (±79)</td>
<td>25.0 (±2.8)</td>
<td>Nov 18</td>
<td>March 25</td>
<td>456</td>
<td>12.4</td>
</tr>
<tr>
<td>2010-11</td>
<td>Triticale</td>
<td>771 (±22)</td>
<td>27.0 (±0.7)</td>
<td>Nov 18</td>
<td>Feb 22</td>
<td>260</td>
<td>10.4</td>
</tr>
<tr>
<td></td>
<td>Bell beans, vetch, oats</td>
<td>1986 (±151)</td>
<td>52.7 (±2.7)</td>
<td>Nov 18</td>
<td>April 5</td>
<td>507</td>
<td>17.0</td>
</tr>
<tr>
<td>2011-12</td>
<td>Triticale</td>
<td>2655 (±248)</td>
<td>61.1 (±5.8)</td>
<td>Nov 4</td>
<td>March 22</td>
<td>567</td>
<td>6.1</td>
</tr>
<tr>
<td></td>
<td>Bell beans, weeds</td>
<td>3224 (±157)</td>
<td>81.7 (±2.2)</td>
<td>Nov 4</td>
<td>March 22</td>
<td>567</td>
<td>6.1</td>
</tr>
<tr>
<td>2012-13</td>
<td>Triticale</td>
<td>3155 (±225)</td>
<td>58.8 (±3.2)</td>
<td>Oct 19</td>
<td>Feb 22</td>
<td>535</td>
<td>12.8*</td>
</tr>
<tr>
<td></td>
<td>Bell beans, weeds</td>
<td>5610 (±40)</td>
<td>182.6 (±4.5)</td>
<td>Oct 19</td>
<td>Feb 22</td>
<td>535</td>
<td>12.8*</td>
</tr>
<tr>
<td>2013-14</td>
<td>Triticale</td>
<td>4611 (±587)</td>
<td>87.3 (±16.4)</td>
<td>Oct 29</td>
<td>March 21</td>
<td>820</td>
<td>7.8**</td>
</tr>
<tr>
<td></td>
<td>Bell beans, weeds</td>
<td>4861 (±145)</td>
<td>123.8 (±8.8)</td>
<td>Oct 29</td>
<td>March 21</td>
<td>820</td>
<td>7.8**</td>
</tr>
</tbody>
</table>

Includes 2.8 inches (*) and 1.9 inches (**) irrigation to establish cover crops

- Starting mid-October exposed the plants to more growing degree days, allowing them to get established before the rainiest months.

- Weeds were a significant proportion of total biomass for the bell bean treatment (84% in 2011-12, 48% in 2012-13, and 90% in 2013-14).
Triticale root systems grew deeper and more dense than bell bean + weed root systems.
Soil nitrate concentration (μg NO₃-N /ml)

**Winter fallow treatment**

- 30 cm
- 60 cm
- 90 cm
- 125 cm
- 210 cm

**Bell bean treatment**

- 30 cm
- 60 cm
- 90 cm
- 150 cm
- 210 cm

**Triticale treatment**

- 30 cm
- 60 cm
- 90 cm
- 125 cm
- 210 cm

**Cover crops**

- Tomato
- Corn
- Cover crop
Growing degree days and long-term weather data

- Calculated the average daily air temperature between 1982 and 2014 for Davis, CA. Used $T_{\text{base}}=5^\circ\text{C}$ in the formula.
- Cumulative GDDs were calculated for three temperatures: average daily temperature, 25th percentile, and 75th percentile.
- Growth during the middle of the winter can be slow.