Often, our early-planted tomatoes have to endure some cool weather. This year, our mid-season tomatoes are experiencing a chill, too. Here's a bit of a review of the effects of low temperatures on tomato transplants.

Tomatoes stop growing, and are susceptible to chilling injury, at temperatures between 0 and 10°C (32-50°F). Chilling injury can show up after short periods of the lower temperatures or long periods of the higher temperatures and can cause:

- stunted growth
- wilting, surface pitting or necrosis of foliage
- increased susceptibility to disease

Low soil temperatures also stunt plant growth and prevent root development.

In addition, plants that are not actively growing would be expected to have a tougher time metabolizing herbicides. Cool soil temperatures mean that slow root growth also limit the plant's access to soil nutrients, such as phosphorus. Using a starter fertilizer with high phosphorus and a bit of nitrogen can help get the plants off to a better start in these conditions.

The combination of cool weather impacts can result in some poor looking plants, but the crop should recover when warm temperatures return. Plants that have been severely stressed, however, may be slow to resume growth and may have lost some yield potential.

Not all cool-temperature effects show up right away. Low temperatures experienced by the plant 4-5 weeks (!) before flower buds are visible, can affect flowering and fruit set.

In tomato, freezing damage occurs at -1 to -2°C (28-30°F). It may be difficult, initially, to determine whether the growing point has been killed and damage may become more evident on the day after the frost.

Besides cool temperatures, young, early-planted transplants may also experience wind whipping, wind desiccation, and possibly sandblasting. Strategies to combat this include:

- setting the plugs sufficiently deep under the best planting conditions that you can possibly achieve
- using wind protection systems (cereal crop wind strips, cover crops, crop residue)
The price of nitrogen fertilizers is going up. So, in trying to get the biggest bang for the nitrogen fertilizer dollar, the following two questions have been asked:

1. Can an apple orchard’s nitrogen requirements be managed by only using foliar urea?
2. What would it cost relative to other inorganic nitrogen sources?

Researchers at Agriculture & Agri-Food Canada Pacific Agri-Food Research Centre in Summerland compared foliar and soil applied urea as way to reduce soil nitrate-nitrogen leaching¹. While their results showed that foliar applied urea reduced soil nitrate-nitrogen leaching, the results can also help answer these two questions.

Using an established apple orchard (6 year-old Gala/M9 orchard, 1250 trees/ha) each tree received a total of 50 g N/tree/yr (62.5 kg N/ha/yr). The total rate was divided between 7 applications between mid-May to mid-August. The soil was loamy sand.

Can an apple orchard’s nitrogen requirements be managed only using foliar urea?

The soil and foliar applied urea had the following effects:

- **Average current shoot growth** was greater for trees receiving soil applied urea.
- **Nitrogen concentration in 1-year old wood** had no significant differences between urea applications, but was significantly higher than the zero nitrogen control.
- **Leaf nitrogen and leaf colour** were not significantly different between soil and foliar applied urea treatments, but were significantly greater than the zero nitrogen control.
- **Yields** were not significantly different between trees receiving soil or foliar applied urea treatments, but were greater than the zero nitrogen control.

For their BC growing conditions, they were able to manage nitrogen using foliar applied urea.

What would it cost, relative to other inorganic nitrogen sources?

Based on an application rate of 50 g N/tree/year (62.5 kg N/ha/yr) the chart below outlines product costs. Nitrogen applied as ammonium nitrate or fertigated was not included in the project but is listed here for comparison.

<table>
<thead>
<tr>
<th>Application</th>
<th>Product</th>
<th>$/ kg N</th>
<th>$/100 kg product</th>
<th>$ product/ha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foliar</td>
<td>urea 46-0-0</td>
<td>2.47</td>
<td>114.00</td>
<td>155</td>
</tr>
<tr>
<td>Soil applied</td>
<td>urea 46-0-0</td>
<td>1.46</td>
<td>67.30</td>
<td>91</td>
</tr>
<tr>
<td></td>
<td>ammonium nitrate 34-0-0</td>
<td>1.77</td>
<td>60.20</td>
<td>111</td>
</tr>
<tr>
<td>Fertilization</td>
<td>potassium nitrate 12-0-44</td>
<td>13.83</td>
<td>166.00</td>
<td>864</td>
</tr>
<tr>
<td></td>
<td>calcium nitrate 15-0-0</td>
<td>4.73</td>
<td>71.00</td>
<td>296</td>
</tr>
</tbody>
</table>

Both foliar and soil applied urea applications could be used to manage an apple tree’s nitrogen nutrition. But the foliar applied urea would cost about twice as much as soil applied to achieve the same results.