This Crop Action contains information on:

1. Frost event – 5/1/17
2. Events

1. Frost event - 5/1/17

On 5th January 2017 growers located inland from Ashburton reported a frost event and raised questions about potential impacts on various crops.

How cold was it?

Air temperature records sourced from NIWA show air temperatures consistent with ground frosts for both Lismore and Methven (figure 1.) while Winchmore recorded a ground frost from approx. 11pm on the 4th though until 7am on the 5th January, some 8 hours of temperatures below 0°C. Air temperature are commonly about 2°C warmer than grass minimums, but at Winchmore the difference during this frost event was closer to 4.5°C.

For further information of formation of frost see:

Figure 1. Minimum hourly air temperature for three sites in mid Canterbury from midnight on the 4th January 2017. Data sourced from Cliflo database, https://cliflo.niwa.co.nz/
Influence on crops.

**Grasses**

The effect of frost depends on the intensity and duration of the frost and the growth stage of the crop. In tall fescue, Hare (1993) showed that an air frost of -2°C for 6 hours significantly reduced seed yields and germination, especially when seed heads were between ear emergence and at anthesis, with the damage decreasing as seeds developed (Table 1). For the frost of the morning 5th January, some late flowering ryegrasses (head emergence +20 days after Nui) are still flowering (at anthesis). However grasses do flower over a long period (about 15+ days) and early flowered tillers in the crop will be less damaged than florets still flowering. In our experience frost damage is more severe in lodged areas of a crop, compared with standing areas. Severe frost damage will show as bleached seed heads, typically the upper head.

**Table 1**. Effect of -2°C frost for 6 hours on tall fescue at different growth stages on relative seed yield (no frost = 100) and germination (from Hare, 1993).

<table>
<thead>
<tr>
<th>Growth stage</th>
<th>Relative Seed Yield</th>
<th>Germination</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-2C</td>
<td>No frost</td>
</tr>
<tr>
<td>Ear emergence</td>
<td>36</td>
<td>88</td>
</tr>
<tr>
<td>Anthesis</td>
<td>47</td>
<td>90</td>
</tr>
<tr>
<td>4 days after anthesis</td>
<td>50</td>
<td>93</td>
</tr>
<tr>
<td>6 days after anthesis</td>
<td>76</td>
<td>92</td>
</tr>
<tr>
<td>8 days after anthesis</td>
<td>62</td>
<td>91</td>
</tr>
<tr>
<td>LSD 5%</td>
<td>9</td>
<td>5</td>
</tr>
</tbody>
</table>

Hare, M.D. 1993 Effects of frost and frost protectants on tall fescue seed production

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**Other seed crops**

There is no information on frost effects on crops like carrot and clover that are currently flowering. In previous frost events growers reported damage in brassica crops when developing seed was still at a watery stage. Some spring sown brassica crops and radish maybe affected.

**Maize**

- It can take two days after the frost for the damage to become evident and after three to five days the plant should show signs of recovering.
- Leaf injury or death does not guarantee plant death or yield loss.
- Maize crops in Canterbury are expected to have reached at least the V5 stage. The growing point region of a maize plant remains below ground until about the V5 stage and, thus, is reasonably protected from the effects of frost. Although frost damage may appear as death of above ground plant parts maize can easily recover from this type of damage early in its development and suffer no yield loss. The effect of early defoliation on yield was reported in FAR Maize Update 62. [www.far.org.nz/assets/files/uploads/62Mz_Maize_defoliation.pdf](http://www.far.org.nz/assets/files/uploads/62Mz_Maize_defoliation.pdf)
- After full canopy closure a significant amount of heat can be trapped in the crop and damage may be limited to the crop margins or to upper leaves.
- There is less information on the influence of severe frost damage to maize after the V6 stage. To define the extent of damage split plants vertically and inspect the growing point region for visual damage (mushy, discoloured tissue). If the growing point tissue is obviously damaged, plants will not recover. Sometimes the growing point appears healthy immediately after the frost but plants still may die. Cool weather after the frost can delay visible deterioration of damaged tissue on plants.
- Some work in the US shows yield loss with different percentages of frost damaged leaves at the V7 to 10 stage (figure 3 below).
- Experiments to remove frost damaged leaves after V7 have not resulted in any increased yield.
- Patience is a virtue when waiting for crops to indicate their recovery.

![Yield loss for maize when frost damage occurs at the 7 to 10 leaf collar stage of maturity (Carter, 1995).](image)

Figure 3. Yield loss for maize when frost damage occurs at the 7 to 10 leaf collar stage of maturity (Carter, 1995).

Carter, P.R. 1995. Late spring frost and post-frost clipping effect on corn growth and yield. J. Prod. Agric. 8:203-209.
**Potatoes**

A light frost of 0 to -2 degrees will generally have limited effect on potato production later in the season due to tubers being protected underground. Early season frosts can affect young plants and will result in symptoms of blackened foliage however plants have the ability to re sprout simply delaying plant development. Different cultivars have different frost tolerances. With seed and process potato crops currently all at various stages it’s important to monitor after cold snaps for fungal infection and respond with fungicides accordingly.

### Events

**Save the date**
- Thursday 26 January - South Otago/Southland Field Day

**Potato Field Days**
- Thursday 2 February, Canterbury
- Wednesday 8 February, Manawatu
- Wednesday 15 February, Pukekohe

### Contact us

<table>
<thead>
<tr>
<th>Name</th>
<th>Phone</th>
<th>Email</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nick Poole</td>
<td>021 544 411</td>
<td><a href="mailto:nick.poole@far.org.nz">nick.poole@far.org.nz</a></td>
</tr>
<tr>
<td>Rob Craigie</td>
<td>021 575 303</td>
<td><a href="mailto:rob.craigie@far.org.nz">rob.craigie@far.org.nz</a></td>
</tr>
<tr>
<td>Richard Chynoweth</td>
<td>021 860 246</td>
<td><a href="mailto:richard.chynoweth@far.org.nz">richard.chynoweth@far.org.nz</a></td>
</tr>
<tr>
<td>Elin Arnaudin</td>
<td>027 468 8648</td>
<td><a href="mailto:elin.arnaudin@far.org.nz">elin.arnaudin@far.org.nz</a></td>
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