



Factsheet #5: Blooms and Frost
updated June 2020

Context

Your apple tree has made it through the winter and is beginning to wake up: the fat fruit buds are showing signs of swelling and then growth, with the tips of the leaves that surround the flower cluster emerging from the tip of the bud. Finally you can make out individual flowers, still curled up tight, and then pink petals start to show. It's all good until Environment Canada tells you to expect hard frost. May can require some tricks to get our northern fruit trees over the hump of fruit set and we hope this guide will help.

Frost Tolerance

Tree dormancy is an amazing thing. By shuttling reserves and drawing water into different tissues apple trees can survive -40°C. Once they begin to wake up, however, that tolerance begins to change dramatically. In apples, blooms come out before vegetative shoots and it is these we must protect in order to have fruit come fall. By the time fruit buds have reached the silver tip stage (silvery tips of nascent leaves are visible at the top of the bud) a -10°C night will kill 10% of the buds and a -17°C will take out 90%¹. Next is the green tip stage, followed by 1/4" green then 1/2" green, measured by the length of the leaves that surround the cluster of flower buds. By the time half an inch of green is visible -5°C is sufficient to kill 10% of buds and -9°C will do in 90%. Tolerance continues to drop by a couple of degrees as tight clusters of blooms become evident (sometimes simultaneous with 1/2" green; development differs among varieties), levelling out once the closed blooms show pink and remaining at -2°C/-4°C for 10% and 90% kill rates respectively throughout the bloom period. To tell if blooms have been damaged by cold, look to the form of the pistil and anthers within the flower. Once fruit is set, tolerance increases again a little, however hard frost will damage developing fruit making it more susceptible to rot and less suitable for sale or keeping.

Frost Protection

Use your creativity to protect emerging and blooming trees on a frosty night: quick poles can be stabbed in the ground around a tree to support a sheet, floating row cover, tarp or piece of poly. Coldframes can be covered with tarps and even a candle or two left burning (safely) overnight can help ward off damaging cold. Newly emerging buds are tender so avoid draping heavier materials directly over trees if you can – in a pinch tossing a sheet over at the last minute may save blooms.

On a larger scale, overhead sprinklers can save a crop if the water is supplied throughout the freeze cycle. Another option is to use smudge pots: smouldering fires safely contained. They provide a light haze of smoke in an orchard on calm clear nights, the smoke trapping some heat as it radiates up from the ground.

¹ Phillips, Michael. *The Apple Grower* (1998) Chelsea Green Publishing Company



Damage

Freeze damage can take many forms and is not always immediately apparent. Cultivars differ in their response: some show damage to petals with the functionality of the bloom unaffected while others may look fine but on closer inspection the pistils are shrivelled or completely absent. It can be helpful to learn to recognize the different parts of the flower to know what is likely to be able to set fruit. In extreme cases damage to growing cambium (inner bark) can slow or stop bud development above the hurt area. Look for blistered bark – if found, nick to see if tissues beneath are healthy and green or brown and watery. If damage is found on branches, prune back to healthy green cambium. If on the trunk, carve away damaged tissue and allow to dry. Trees have an amazing ability to recover given time and assistance!

Phases of Fruit Bud Development



Silver tip



Green tip



1/4" green



1/2" green



Tight cluster



Tight cluster



Open cluster



Pink

Take-aways

- ✓ Once green leaves are visible in flower buds, protect blooms from hard freezes;
- ✓ Once apples are blooming, be even more vigilant and keep off all frost if possible.