

Potential for Frost Damage on Strawberry Fields and Saskatoon Orchards

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There are predictions of frost tonight in the -1°C -5°C range. Most saskatoon orchards are at balloon or full flower phase so they may be at the greatest risk of frost damage. While strawberries are emerging from winter dormancy and still in tight flower bud stage, so can tolerate a mild frost.

The amount of damage to the flower tissue depends on many factors such as length of frost event, lowest temperature achieved, soil temperature/ moisture levels (heat release from the soil by conductivity) and precipitation (snow/ rain) occurring during frost event (may help protect plant similar to irrigation method).

Keep on mind that temperatures can be two to three degrees cooler than temperatures reported by weather stations, which are taken at shoulder level. Therefore, thermometers or electronic temperature alarms should be located in low spots where frost would usually occur first.

Saskatoons Frost Tolerance and Injury Symptoms

Saskatoon flowers and newly-set fruit are susceptible to damage with frosts at -2.2°C or lower. Below this temperature actively growing plant tissues (e.g. flower buds) could be killed or damaged. This damage may be visible within one hour to couple days after the frost. Symptoms of frost damage are not always visible, but look for slight browning of internal flower tissue and slight browning of flower petals.

Saskatoon flower buds however can tolerate lower frost temperatures depending on its stage of development. Detailed frost tolerance research on apples, which is in the same family, indicate the following: tight bud flower stage can tolerate -8°C, first pink -6°C, full pink -4.6°C, first bloom - 4 °C, full bloom -4.7 °C and post bloom -3°C. Note: These temperatures would have to be present for 30 minutes with an expected kill rate of 90%.

Photos of frost damaged saskatoon flowers see: <http://www.prairie-elements.ca/saskatoon/12.1-weather.pdf>



Photo 1: Cross section of frost damage saskatoon flower buds, photo credit: Richard St.Pierre

Strawberries Frost Tolerance

Fortunately it is still quite early in the strawberry growing season and damage to strawberry plants and flower buds should be minimal. It is possible that only slight damage to leaf margins could occur (see photo 2), which the plant will recover from.

Strawberry flower buds can tolerate lower frost temperatures depending on its stage of development. For example **tight bud flower stage can tolerate -5°C**, tight with white petals - 2.2°C, full bloom -1°C, past full bloom and immature fruit can tolerate -2.2°C. Note: These temperatures would have to be present for 30 minutes with an expected kill rate of 90%. **Most strawberry plants would still be in tight bud flower stage.**

Strawberries More Susceptible to Frost Damage at Flowering/ Fruit Development Stages

Frost injury rarely causes complete crop loss because the strawberry plant produces flowers over a two to three week period. The first flowers to open are the largest and face the greatest risk of frost injury. Frost losses can range from 20 to 80% depending on the temperature and the duration of the frost, the cultivar, vigor, stage of development and the weather preceding the frost. Strawberry flower buds and fruit are susceptible to frost injury any time after bud break (-1°C or lower). Frost damages the center of the flower with the center turning black while the petals and

leaves appear uninjured. The blackening occurs within a few hours to one day after the frost. Frost can also damage the developing fruit, deforming the berries.



Photo 2: Strawberry leaf frost damaged, with black curled leaf edges.

Impact of Fruit Bud Damage on Berry Yield

Information from OMAFRA on evaluating tree fruit bud damage, discussed the impact of fruit bud mortality on overall fruit crop yield. It states:

"A general rule of thumb is that sweet cherries need about 50 percent of the buds produced the previous summer in order to have a full crop; all the other tree fruits (apple, pear, apricot, peach, nectarine, and plum) need only about 10 percent for a full crop. Uniform distribution throughout the tree is also important for full crop potential."

www.omafra.gov.on.ca/english/crops/hort/news/hortmatt/2012/

With saskatoons and other prairie bush fruit we can deduce that the percent of fruit buds needed for a full crop would be within those two percentages. This is to say that a loss of some fruit buds is not an indication that the fruit yield will be below average.

Frost Protection via Management Practices

Mild frost damage can be controlled by management practices such as not tilling the soil during the frost risk period in early spring. Untilled soil acts as a heat sink during the day and this heat is released during the night to protect the plants. Irrigation prior to a frost will provide an increased heat release from the soil by conductivity. The use of polyethylene covers will reduce damage to flowers caused by light frosts and cold winds. Long term measures include thinning out

shelterbelts surrounding the orchard to allow for more air flow and reduce the problem of frost pockets on the site.

Saskatoon orchards may have to consider using frost control measures practiced by other tree fruit orchards in Canada in order to protect their yield and investment. Such measures include use of wind machines, outdoor heaters/ fires and artificial fogs. These measures more effective with radiation frost than advection frosts (see frost type definitions below). However the cost of setting up such systems must be balanced with value of the crop. In vineyards where crops are very valuable, costly measures to protect a crop can be justified.

Definitions:

Radiation Frost - Clear; calm; inversion; temperature greater than 0 °C during day

Advection Frost- Windy; no inversion; temperature can be less than 0 °C during day

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