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CANOLA ADVANTAGE

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Early Fall Frost! Now What?

If your canola crop has experienced a frost in the mid to late pod fill stage, stay calm and carefully evaluate the extent of the damage.

Canola plants with lower than 20% seed moisture will normally experience minimal damage from frost.

Research at the University of Alberta suggests that the main effect of mild frost is to cause an accelerated desiccation, which forces a premature transition from grain-filling to dry down. After a mild frost, there is a rapid moisture loss from cells in both pod walls and seeds. De-greening enzymes thus are not able to complete pigment degradation. However, if the frost is light, there can still be some curing of damaged seed to minimize yield and grade losses, given enough time and adequate moisture conditions.

Frost in excess of -5˚ C at high seed moisture contents however is generally lethal, resulting in non-viable seed. At such low temperatures, ice crystals physically disrupt structures such as membranes and enzymes. Pods of immature canola crops frozen at lethal temperatures have been observed to turn black, whereas mild frost turns pods white or white-speckled. Lethal frost at seed moisture content greater than about 45% will cause seed shriveling since dry matter accumulation is not complete.

Before any plan of action can be undertaken, a general overall assessment of the field is required to determine the level of damage. Once that has been determined the decision to swath or to leave the crop standing can be made.

The following are some guidelines to help in the decision making process.

Sampling the field should be done in either a “W” pattern or in an “X” pattern, randomly sampling in various spots to ensure a good representation of what has happened. The field should be assessed within 1-3 days after the frost, but it may require more than one assessment. One suggestion would be to inspect the day of the frost then again 1-2 days later to examine seed damage that may not be apparent immediately after the frost.

The following are pictures of frost damage ranging from severe to light.

Figure 1. Severe frost damage causing general whitening of canopy.

Figures 2a and 2b. Severe frost damage causing desiccation of pods – pods have bleached and shrunken appearance.

Figure 2a.

Figure 2b.

Figure 3. Severe frost damage to seeds causes them to shrivel and turn white.

Figures 4a, 4b and 4c. Moderate damage causing white speckling on outside of pods and browning or shriveling of some seeds. However, pods remain reasonably intact and pliable and some seed remains green and turgid.

Figure 4a.

Figure 4b.

Figure 4c.

Figure 5. Light damage may cause some seeds to turn 'shoe polish' brown, but pods and most seeds generally remain intact and turgid.

After the frost – swath or leave the crop standing?

The decision to leave the crop standing and follow through to proper stages for swathing or to start swathing immediately after a frost will have to be based upon the level of damage observed in each field. Ultimately, the decision will boil down to a comparison of the risk of yield loss from shattering versus the potential for further curing and improved grade in the remaining intact seed. Following are some example scenarios and suggested courses of action, but it is important to realize that the weather after the frost event will play a large role in determining how much shattering or curing will take place.

Scenario 1

If 50 % of the field has moderate to severe damage, there's a risk that hardest hit plants will begin to shell out and any seed that can contribute to yield will be lost. However, the yield and quality of the seed in this part of the field has likely already been significantly reduced. If the remaining 50% of the field has light to minimal damage, swathing too early may further reduce yield and grade. Leaving the field standing and following it to the proper stage for swathing can allow the remaining intact seed to clear green and continue filling, improving both grade and yield. This part of the field will likely contribute most to yield anyway, and anything severely damaged will likely shell out or be separated with the chaff or dockage.

Scenario 2

When the field is more than 50-60% severely damaged, the crop will shell so it is best to swath to protect any viable seeds. Quality is likely to be poor anyway, so it is more important to protect as much yield as possible. Once swathed, rainfall with warmer temperatures (>10°C) may allow for some enzyme activity to occur in any remaining intact seeds, which can reduce the percentage of green seed. If the decision to swath is made, the field in question should be one of the last fields to be harvested to allow as much time for green seed clearing as possible. Since yield and grade are likely to be relatively poor, the risk from leaving the crop out will be lower than for other less affected fields.

Scenario 3

The field has light to moderate damage in portions or across the field. It is suggested that this field be left for swathing at the proper stage of maturity, based on remaining healthy seeds in the pods. Any seeds that are damaged will be shriveled and will typically blow out of the combine with the chaff or end up as dockage. In order to maximize economic return, the crop should be left for as long as possible before combining. Areas of moderate damage should be monitored regularly for pods becoming desiccated and prone to shattering. If this occurs, consider swathing either the whole field or just the affected areas, if that is practical.

Scenario 4

The field has some light damage in portions of the field or across the majority of the field. It is recommended to allow the crop to continue to mature and to swath when the crop is at the proper stage based on seed colour change of the remaining healthy seed. Given time and moisture, crop quality and yield can be maximized. Swathing the crop immediately rather than allowing it to mature may result in higher economic and yield losses than if left alone.

For more information call your local Canola Council agronomist.

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