

The Corn Cob

A focus on Corn Production

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THE FACTS OF GRAIN CORN DRYDOWN

Corn crop maturity is advancing across southern Manitoba. The warm weather and recent rainfalls (plus no frost events) are helping with grain fill, which will hopefully translate into high yields and good bushel weights. As corn harvest approaches, a quick review of the facts concerning grain drydown (how and when kernel moisture content decreases) would be beneficial. Grain drydown can be separated into two stages: the grain fill period and after physiological maturity.

Drydown During Grain Fill

The grain fill stage begins at flowering and is completed at physiological maturity. Grain filling is characterized by the rapid accumulation of dry matter in the kernel and the rapid movement of water out of the kernel. Decreases in kernel moisture occur from a combination of actual water loss (evaporation) from the kernel surface and the accumulation of dry matter. The corn plant uses internal “plumbing” to move water out of the kernel since water movement out of the kernel is regulated by how much dry matter is being forced into the kernel. The corn plant is much more efficient in removing water from the kernel using internal “plumbing” instead of physical evaporation through the kernel surface.

Drydown After Physiological Maturity

Physiological maturity occurs when kernel moisture is at approximately 30%. At this stage of growth, a layer of cells at the base of the kernel dies and turns black (hence black layer), the “plumbing” is therefore disconnected, and a barrier is formed between the kernel and the corn plant. For this reason, post-maturity grain moisture loss occurs primarily by evaporative loss from the kernel itself. Research many years ago established that post-maturity moisture loss through the kernel connective tissues (placental tissues) back to the cob is essentially non-existent.

As moisture loss after maturity is due to physical evaporation, field drying of mature corn grain is influenced primarily by weather factors (especially temperature and humidity) and, to a lesser degree, by hybrid characteristics. In simple terms, warmer temperatures and lower humidity encourage rapid field drying of corn grain.

Because moisture loss is greatest just after physiological maturity, both because the weather is usually warmer and because wet kernels lose water more easily, it stands to reason that a corn crop that matures earlier in the season will dry down faster than a crop that matures later in the season. However, it is important to keep in mind that grain moisture loss for any particular day may be quite high or low depending on the exact temperature, humidity, sunshine, or rain conditions that day. It is not unheard of for grain moisture to decline more than one percentage point per day for a period of days when conditions are warm, sunny and dry. By the same token, there may be zero drydown on cool, rainy days.

When weather conditions are not favorable for rapid grain drydown, hybrid characteristics that influence the rate of grain drying become more important. The relative importance of each trait

varies throughout the duration of the field drydown process and, as mentioned earlier, is most influential when weather conditions are not conducive for rapid grain drying.

- *Husk Leaf Number.* The fewer the number of husk leaves, the more rapid the grain moisture loss.
- *Husk Leaf Thickness.* The thinner the husk leaves, the more rapid the grain moisture loss.
- *Husk Leaf Senescence.* The sooner the husk leaves senesce (die), the more rapid the grain moisture loss.
- *Husk Coverage of the Ear.* The less the husk covers the tip of the ear, the more rapid the grain moisture loss.
- *Husk Tightness.* The looser the husk covers the ear, the more rapid the grain moisture loss.
- *Ear Declination.* The sooner the ears drop from an upright position to a downward position, the more rapid the grain moisture loss.
- *Cob Diameter.* The narrower the cob diameter, the more rapid the grain moisture loss.
- *Kernel Type.* Flint-dent kernel types tend to dry down slower in comparison to dent kernel types due to the harder nature of the kernel.

Will desiccating corn aid in faster drydown?

In the past, many producers have tried desiccating their grain corn with a glyphosate application to hasten drydown. It is important to note that glyphosate is not registered for preharvest application in corn. More importantly however, when reviewing drydown and how it occurs in corn, applying glyphosate will not make corn dry faster. Prior to physiological maturity (black layer), the corn plant is much more efficient in removing water from the kernel using its internal “plumbing” instead of physical evaporation through the kernel surface. When the crop is basically “killed” by a glyphosate application before grain fill is complete, drydown can actually take longer since the crop is now relying only on evaporation to reduce kernel moisture content.

One more factor to consider if a desiccant is applied prior to physiological maturity is that grain fill will be stopped prematurely, resulting in lighter-weight, less dense (“chaffy”) kernels. Of course this will translate into lower yields. As well, it can also end up increasing drying costs because kernels not filled completely usually have higher than normal sugar content, which makes it more difficult to remove moisture. Such kernels also tend to turn brown as sugars caramelize during drying with heated air.

If the desiccant is applied after physiological maturity, it is important to remember the connection between the corn plant and the developing kernel is broken already by “normal” physiological maturity. Therefore, applying a desiccant to halt plant growth will not hasten drydown rates as the kernel is already mature and the kernel is losing moisture through evaporation only at this stage.

Final Notes:

Normal plant processes and weather conditions are the major influences on grain drydown, although hybrid characteristics can also play a role. Given the late maturation of corn in Manitoba in 2008, it is likely that grain drydown rates will be slower than in normal years.

If you have any questions or comments, don't hesitate to contact me at 745-5676 or email pamela.derocquigny@gov.mb.ca

Until the next issue of **THE CORN COB**, take care!

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