

Field Drydown of Mature Corn Grain

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- Weather conditions are the major influence on in-field grain drydown.
- Plant characteristics can also influence in-field grain drydown.
- Early grain maturation usually means faster in-field grain drydown.
- Later grain maturation usually means slower in-field grain drydown.

As Indiana's corn crop heads into the last half of the grain filling period, growers' thoughts begin to focus on the upcoming harvest season. As of 14 August, Indiana's corn crop is developing at roughly an average pace with approximately 76% of the state's crop at or beyond the dough stage of kernel development (USDA-NASS, 15 Aug 2005). If this pace continues, half of the state's crop should be mature by mid-September; again about an average date.

Grain moisture content at harvest obviously influences growers' cost of artificially drying the grain after harvest. An early drydown of the crop also facilitates early or at least timely harvest of the crop prior to the colder and, often, wetter conditions of late fall.

Kernel moisture content decreases as the kernel develops through the blister stage (~ 85% moisture), milk stage (~ 80% moisture), dough stage (~ 70% moisture), dent stage (~ 55% moisture), and finally physiological maturity (~ 30% moisture). Prior to physiological maturity, decreases in kernel moisture occur from a combination of actual water loss (evaporation) from the kernel plus the continued accumulation of kernel dry matter via the grain filling process. After physiological maturity, percent kernel moisture continues to decrease primarily due to water loss from the kernel.

Weather & Timing of Grain Maturation

Grain moisture loss in the field occurs at a fairly linear rate within a range of grain moisture content from about 40 percent down to 15 to 20 percent, and then tapers off to little or no additional moisture loss after that. Figure 1 illustrates changes in grain moisture content over time for an adapted medium maturity hybrid grown in Indiana in 1992 (unusually cool fall) and 1994 (more typical fall temperatures).

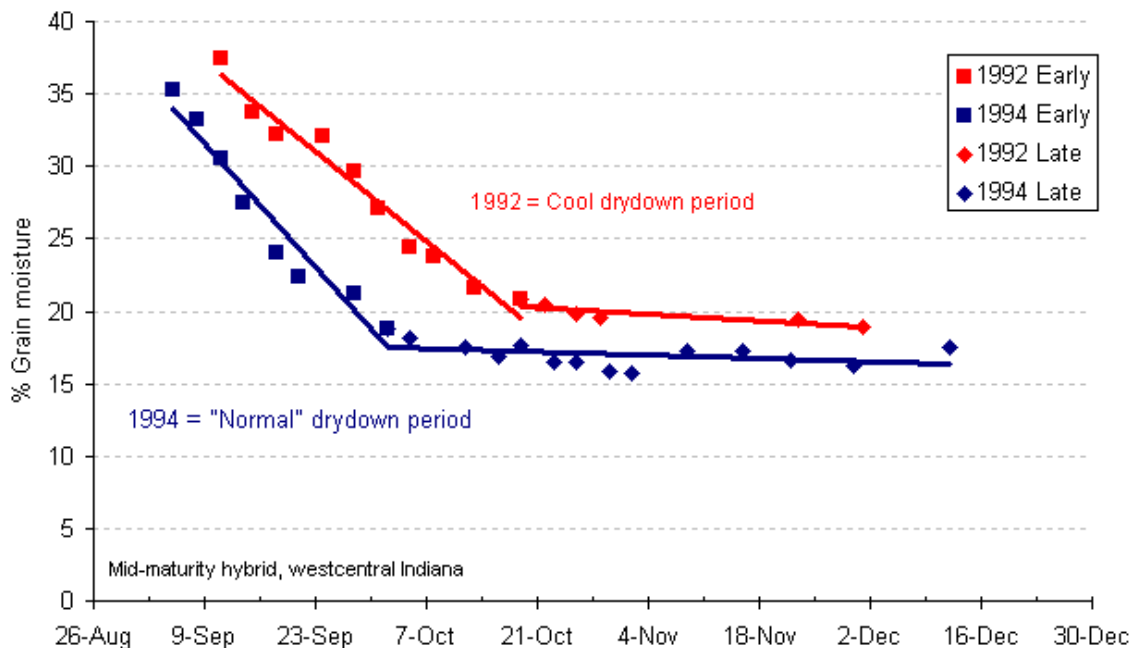


Fig. 1. Decrease in grain moisture content of a mid-maturity corn hybrid over time (westcentral Indiana).

Field drying of mature corn grain is influenced primarily by weather factors (especially temperature and humidity) and, to a somewhat lesser degree, by ear and husk characteristics of hybrids. Simply put, warmer temperatures and lower humidity encourage rapid field drying of corn grain (Fig. 2).

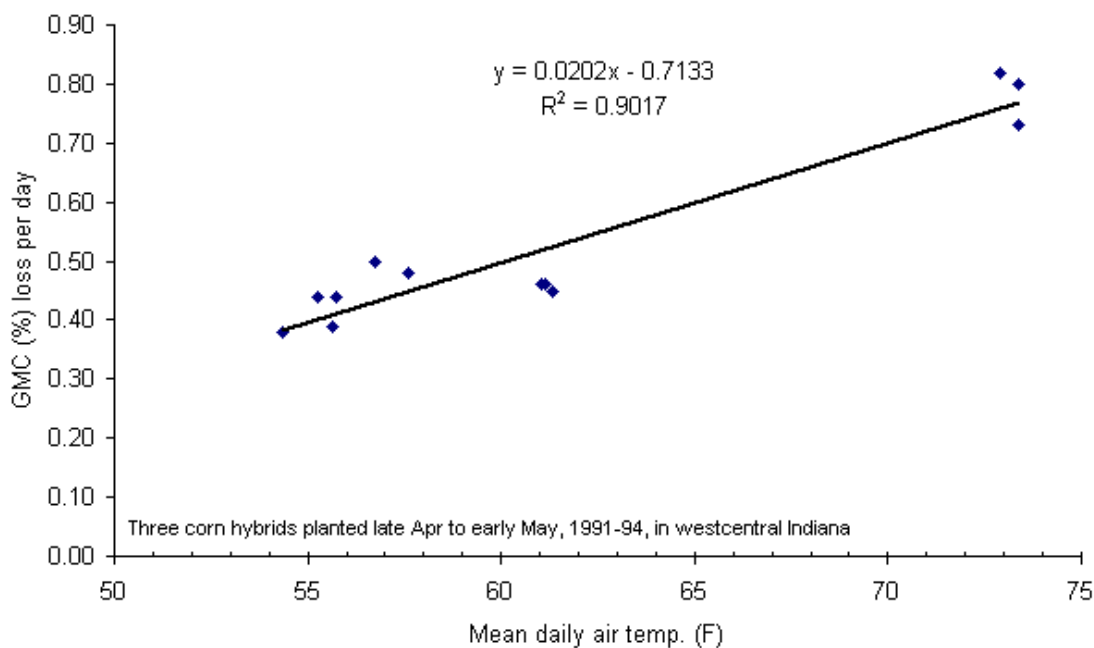


Fig. 2. Average daily grain moisture loss (percentage points/day) relative to average daily air temperature during the drydown period for three corn hybrids planted late April to early May, 1991-1994, westcentral Indiana.

Because grain drydown rates are greater when the drydown period is warmer, it stands to reason that a corn crop that matures in late August will dry down faster than one that matures in mid-September. In fact, there is a close relationship between the date when the grain nears physiological maturity (half-milkline or 2-3 weeks prior to kernel blacklayer) and the subsequent average daily drydown rate. Average daily drydown rates will range from about 0.8 percentage point per day for grain that nears maturity in late August to about 0.4 percentage point per day for grain that nears maturity in mid- to late September (Fig 3).

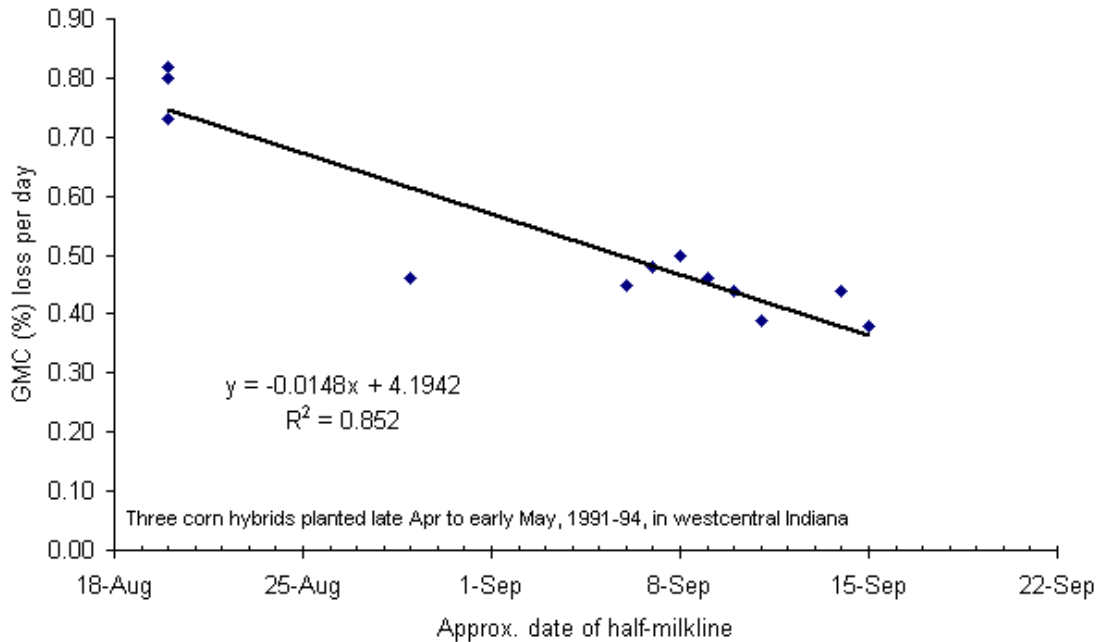


Fig. 3. Relationship between daily grain moisture loss (drydown) and the date at which the grain nears maturity (half-milkline) for three corn hybrids planted late April to early May, 1991-1994, westcentral Indiana.

Bear 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.

Hybrid Variability for Field Drying

Hybrid variability for the rate of grain moisture loss during post-maturity drydown and the eventual grain moisture content at harvest are of great interest to grower and seed industry alike. Growers desire hybrids with superior yielding ability (maximum gross income) that also dry very quickly in the fall (minimum drying or grain shrinkage costs).

The seed industry uses grain moisture content data to assign relative hybrid maturity ratings on the basis of relative moisture differences among hybrids at harvest. Two hybrids that differ in one “day” of relative maturity will typically vary by about one half percentage point of grain moisture content (an average daily loss of moisture) if planted

and harvested on the same days. Recognize that relative hybrid maturity ratings are most consistent within, not among, seed companies.

When weather conditions are not favorable for rapid grain drydown, then hybrid characteristics that influence the rate of grain drying become more important. Researchers have identified the following traits or characteristics as ones most likely to influence grain drying in the field. 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. In fact, modern hybrids have fewer husk leaves than those commonly grown years ago.
- **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 after grain maturation to a downward position, the more rapid the grain moisture loss. In particular, husks of upright ears can “capture” rainfall.
- **Kernel Pericarp Characteristics.** The pericarp is the outermost layer of a corn kernel (botanically; the ovary wall). Thinner or simply more permeable pericarp layers have been associated with faster drying rates in the field.

Final Trivia For Coffeshop Conversations

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 (Kiesselbach and Walker, 1952). As those tissues cease to function (associated with the onset of physiological maturity), the moisture and nutritional connection between kernel and cob is essentially broken.

Related References

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Don't forget, this and other timely information about corn can be viewed at the Chat 'n Chew Café on the Web at <http://www.kingcorn.org/cafe>. For other information about corn, take a look at the Corn Growers' Guidebook on the Web at <http://www.kingcorn.org>.

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