

# Pest&Crop newsletter

**Purdue Cooperative Extension Service and USDA-NIFA Extension IPM Grant**

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# Discolored and Shriveled Soybean Seeds; Who Done It?

**Authors: John Obermeyer and Christian Krupke**

Combines are rolling and wagons of grain are heading for dryers and storage. Already, questions have been received about soybean seed observed to be shrunken and/or discolored. Too, we typically get samples through the [Purdue Plant and Pest Diagnostic Lab](#) during harvest of seeds and asked to determine, which, if any, insect pest caused the damage. Bottom line...we need unharvested, **damaged pods** with the sample.

For the last couple of years, there has been a noticeable population of green stink bug in some Indiana soybean fields. Both green stink bug adults and nymphs feed using their piercing-sucking mouthparts. They cause injury to soybean by puncturing pods and sucking fluid from the developing beans. This feeding also introduces bacteria, fungi and yeasts that may cause further damage. Seeds that do develop despite stink bug pod feeding may be smaller, shriveled, and/or discolored. This damage may lower quality, and ultimately reduce yields. Green stink bug may appear in soybean fields from mid July through harvest time. Although stink bugs are a key pest of soybeans in the southern US and South America, i.e., redbanded stink bug, we don't generally have treatable infestations in Indiana.

Bean leaf beetle is a pest that producers have contended with since legume crops were first introduced into Indiana. This pest has multiple generations per year, feeding on vegetative portions of soybean, then switching to green pods as the foliage senesces. Bean leaf beetle scar the surface of pods with their chewing mouthparts, but only occasionally feed through the pod to the developing seed. During pod maturation, the remaining protective membrane cracks leaving an entry hole for moisture and airborne plant pathogens that may cause discolored, moldy, shriveled, or diseased beans. Too, this damage may lower quality, and ultimately reduce yields.

If you would like suspected stink bug or bean leaf beetle damage to be inspected after senescence, that is after the insects are gone, please enclose whole pods, not just the seed with samples. To submit a sample to Purdue's Plant and Pest Diagnostic Laboratory, click [HERE](#). Consider, that pod splitting and/or diseases may also be causing, or contributing, to damaged seed found during harvest. Again, including pods with your samples will help the multiple specialists that will inspect these!



Bean leaf beetle foliage and pod feeding.



Stink bug damage to pod.



Mature pod showing stink bug seed damage (left) and bean leaf beetle seed damage (right two).



# Cover Crops Vulnerable to Late-Season “Worms”

**Author: John Obermeyer**

Armyworm has been an occasional, yet unpleasant, surprise throughout this summer to those with grass crops, e.g. corn, orchardgrass, etc. One instance of late planted corn was documented in *Pest&Crop* 2018.17 (July 27). In previous late summers, we have received reports of established cover crops being denuded, in some cases from fall armyworm (different species than armyworm). Both species can consume large amounts of foliage as they “march” through a field. One major difference, armyworm feed only on grasses, while fall armyworm feeds on both grasses and broadleaves.

Those with late season crops (ANYTHING GREEN) should be inspecting for feeding damage. This is very important for newly seeded forages and cover crops. Below is listing of high-risk situations until a killing freeze occurs:

- Newly seeded grasses of any kind, including but not limited to grass and mixed grass / alfalfa hay fields, and early planted small grains.
- Established mixed grass and alfalfa hay, grass forages, lawns, parks and playing fields, etc. This insect really likes Bermuda grass, but fescue as well.
- Cover crops of ALL types, including small grains, legumes, and crucifers.

Happy Scouting!



Fall armyworm on denuded alfalfa in September.

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# Field Drydown of Mature Corn Grain

**Author: Bob Nielsen**

- Weather conditions strongly influence 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.

# D

elayed maturity of corn due to late planting or simply cool growing seasons often translates into delayed or slow drydown of mature corn grain prior to harvest and, consequently, higher than desired grain moisture contents at harvest. Wetter grain at harvest increases the need for artificially drying the grain after harvest which, in turn, increases the growers' production costs and can delay the progress of harvest itself. Conversely, an early or rapid drydown of the crop decreases growers' costs and facilitates early or at least timely harvest of the crop prior to the colder and, often, wetter conditions of late fall. At the moment, the 2018 end of season is shaping up to look like the latter situation, with earlier than normal grain maturation and warmer than normal temperatures from late August through mid-September. Kernel moisture content decreases as the kernels develop through the [blister stage](#) (~ 85% moisture), [milk stage](#) (~ 80% moisture), [dough stage](#) (~ 70% moisture), [dent stage](#) (~ 60% 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 (identified by presence of the [kernel black layer](#)), 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. The exact rate of field drying varies among hybrids and years. Figure 1 illustrates changes in grain moisture content over time for an adapted medium maturity hybrid in two years with different temperature patterns following physiological maturity.

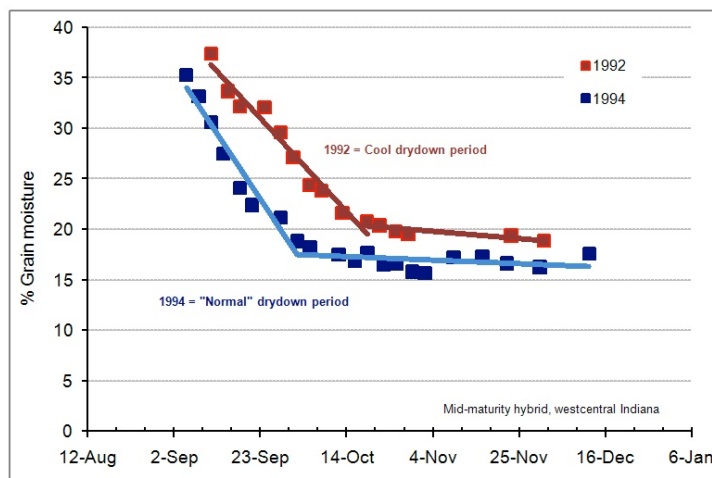


Fig. 1. Example of field drying progress for a medium maturity corn hybrid in 2 years experiencing different temperature patterns.

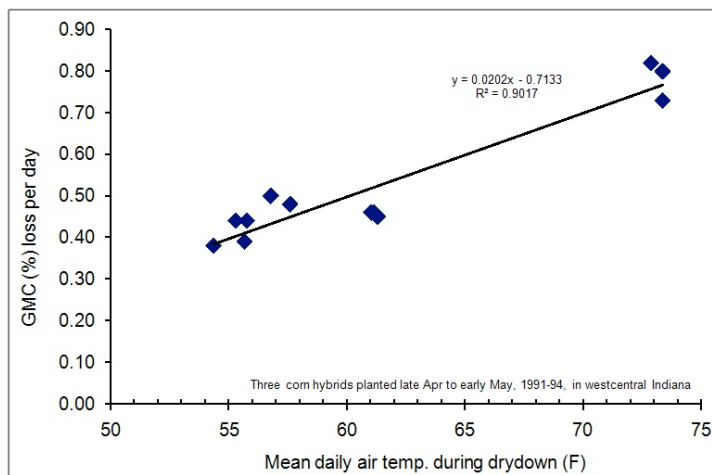


Fig. 2. Average daily grain moisture loss (percentage points/day) relative to average daily air temperature during the drydown period for three corn hybrids planted late April to early May, 1991-1994, westcentral Indiana.

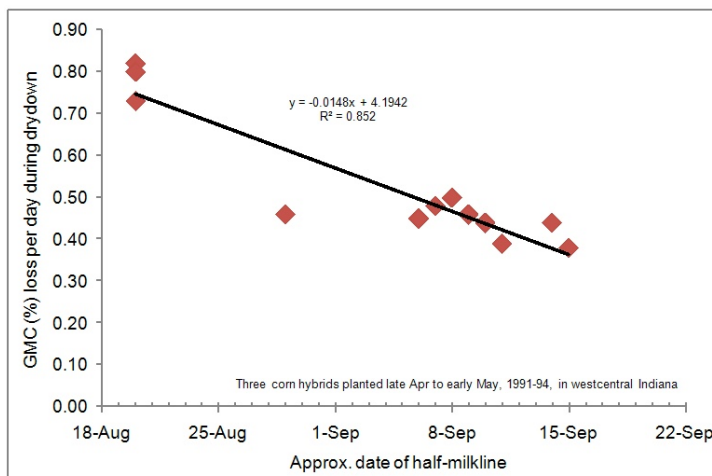


Fig. 3. Relationship between field drying rate and the date at which the grain nears maturity (half-milkline) for three corn hybrids planted late April to early May, 1991-1994, westcentral Indiana.

Field drying of mature corn grain is influenced primarily by weather factors, especially temperature, humidity, and rainfall. Simply put, warmer temperatures and lower humidity encourage rapid field drying of corn grain. Figure 2 illustrates the positive relationship between the average daily temperature and the average daily rate of field drying OVER THE ENTIRE DRYDOWN PERIOD.

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 to 3 weeks prior to kernel blacklayer) and the subsequent average daily drydown rate. Daily drydown rates AVERAGED OVER THE ENTIRE DRYDOWN PERIOD 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).

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 uncommon for grain moisture to decline more than one percentage point per day over a period of days when conditions are warm, sunny, windy and dry. In contrast, there may be zero drydown of grain on cool, cloudy, rainy days.

## Weather-Related Crop Stress and Field Drydown of Grain

Farmers often question whether field drydown will occur “normally” after some severe weather-related stress damages the crop prior to physiological maturity or causes premature death of the plants. Examples of such weather stress include damage caused by severe drought plus heat, late-season hail storms, and frost or killing freeze events prior to physiological maturity.

The answer in all cases to whether grain drydown will occur “normally” is essentially “yes”, but this requires a bit of explanation.

Lingering severe stress such as drought or foliar disease (e.g., gray leaf spot) that occurs during the latter stages of the grain filling period can cause premature death of entire plants, smaller than normal kernels, AND premature formation of kernel black layer. The latter two factors usually result in earlier than expected drydown of the grain and ultimately grain moisture content in severely affected areas of a field much drier at harvest than lesser affected areas. The fact that grain drydown of “prematurely mature” grain begins earlier on the calendar usually means it occurs in relatively warmer time periods and so grain drydown rates per day are higher than would be expected if the grain had matured “normally” at a later date. However, the rate of grain drydown is “normal” for the time period during which the grain is drying.

**NOTE:** When areas of fields die prematurely due to stresses like drought, spatial variability for grain moisture at harvest can be dramatic and often creates challenges with the management of the grain dryer operation. This is especially true early in the harvest season when grain moistures of healthier areas of the field are in the low 20’s. The spatial variability for grain moisture decreases later in the harvest season as grain moistures throughout the field settle to an equilibrium level (15% or less).

The effects of a sudden single stress event like hail or lethal cold temperatures prior to physiological maturity often create an optical illusion of sorts relative to subsequent field drying of the grain. Because

leaf or plant death of an immature crop may occur quite rapidly in response to severe hail damage or lethal frost / freeze events, the moisture content of the yet immature grain will “appear” to be quite high given that the appearance of the now dead plants would seem to suggest the crop was “mature”. In fact, subsequent field drydown of the affected grain will occur fairly normally relative to their immature stage of development (Hicks, 2004). The appearance of the dead plant tissue gives the illusion that field drydown was slowed by the damage from the hail or frost/freeze.

**Corny Trivia:** Grain in fields severely damaged or killed by severe stresses during the grain filling period will always reach physiological maturity (kernel black layer). The significant reduction or complete cessation of photosynthate availability due to damaged or dead plants will eventually lead to the death and collapse of the placental tissue at the tips of kernels that then develops into the so-called “black layer.”

## Hybrid Variability for Field Drydown

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 (Nielsen, 2012). Two hybrids that differ by 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 favorable for rapid grain drydown, hybrids tend to dry at fairly similar rates. When weather conditions are not favorable for rapid 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 collectively, as mentioned earlier, hybrid differences for these traits are most influential when weather conditions are not conducive for rapid grain drying.

- **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.
- **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.

## Final Trivia For Coffeeshop Conversations

Interestingly, there is little, if any, documented evidence that moisture loss occurs through the pedicel (kernel connection to the cob) of the kernel through the cob tissue. 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; Crane et al., 1959). As those tissues cease to function (associated with the onset of kernel black layer and physiological maturity), the moisture and nutritional connection between kernel and cob is essentially broken.

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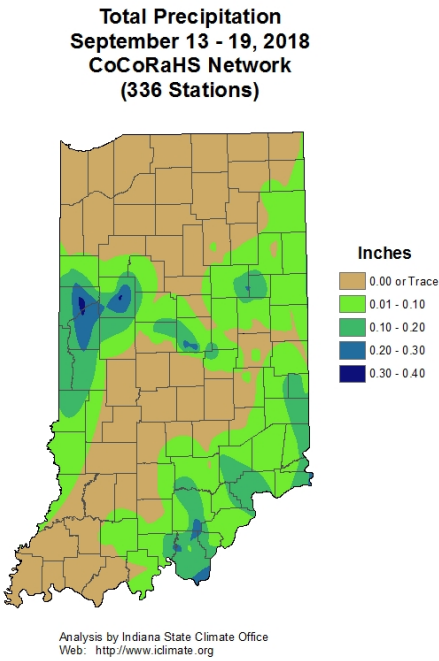
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# Total Precipitation September 13-19, 2018



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# Average Temperature Departure from Mean September 12-18, 2018

Average Temperature (°F): Departure from Mean  
September 12, 2018 to September 18, 2018

