Purdue Cooperative Extension Service
USDA-NIFA Extension IPM Grant

August 23, 2013 - Issue 21

In This Issue

Insects, Mites, And Nematodes

Spider Mites Appearing in Dry Soybean Fields - (*Christian Krupke and John Obermeyer*)

- Spider mites can now be found in some dry soybean fields.
- Stressed areas of fields (edges, dry ground) will show damage first.
- Consider many factors before treating spider mites.

According to the U.S. Drought Monitor (<http:drought.unl.edu/>), Indiana is not experiencing abnormally dry or drought conditions. Windshield surveys of some areas of the state, tell a different story, as some crops look parched. It should come as no surprise that two-spotted spider mites have begun to move into and colonize these very thirsty soybeans. Foliage damage from spider mite feeding is expressed initially as subtle stippling, which may progress to a bronzing and necrosis should dry conditions persist and mites are left unchecked. Bronzed foliage is irreversible, meaning the damage is done!

Could this yellowing be spider mite damage? Only one way to find out!

Before considering control, it is very important that spider mites are identified as the source of yellowish or bronzed plants in a field. Many readers are familiar with the process from 2012, when mites were a problem in many, if not most, soybean fields in the state. There are many other diseases, pathogens and nutrient deficiencies that can cause similar appearance in foliage. To confirm the presence of mites, shake some discolored soybean leaves over a white piece of paper. Watch for small dark specks moving about on the paper. Also look for very tiny, fine webbing on the undersides of the discolored leaves. Once spider mites have been positively identified in the damaged areas of the field, it is essential that the portions of the entire field be scouted to determine the range of infestation – spider mites are very patchy in colonizing fields and are often restricted to borders.

Sample in at least five different areas of the field and determine how far the spider mites have moved into the field from the grassy borders by using the "leaf-shake" method. If extensive leaf discoloration is apparent, spider mites are positively identified as the culprit, and hot, dry conditions are expected to persist, it is recommended that a control be considered. Remember, a good rain will "cure" soybean fields by increasing plant vigor and making the plant much less hospitable to these little arachnids!

If a control is warranted, refer to Soybean Insect Control Recommendations – 2013 at <http://extension.entm.purdue.edu/publications/E-77.pdf>.

Black Light Trap Catch Report - (*John Obermeyer*)												
	8/6/13 - 8/12/13						8/13/13 - 8/19/13					
County/Cooperator	VC	BCW	ECB	WBC	FAW	AW	VC	BCW	ECB	WBC	FAW	AW
Dubois/SIPAC Ag Center	0	1	0	0	0	0	0	0	0	0	0	0
Jennings/SEPAC Ag Center	0	0	0	0	0	0	0	0	0	0	0	1
Knox/SWPAC Ag Center	0	0	0	0	0	0	0	0	0	0	0	0
LaPorte/Pinney Ag Center	0	0	0	0	0	0						
Lawrence/Feldun Ag Center	0	1	0	0	0	0	0	2	0	0	0	4
Randolph/Davis Ag Center	0	1	0	0	0	0	0	3	0	2	0	2
Tippecanoe/TPAC Ag Center	0	0	0	2	0	0	0	0	0	0	0	9
Whitley/NEPAC Ag Center	0	0	1	0	0	2	0	0	0	0	0	0

VC = Variegated Cutworm, BCW = Black Cutworm, ECB = European Corn Borer, WBC = Western Bean Cutworm, FAW = Fall Armyworm, AW = Armyworm

Plant Diseases

Are Late-planted Soybeans at Risk for Soybean Rust? – (*Kiersten Wise*) -

Soybean rust is active in the southern U.S. this year, and spores of the fungus that causes the disease (*Phakopsora pachyrhizi*) are moving northward. The disease has developed in southern states due to favorable weather conditions, including frequent rainfall and mild temperatures. Producers may be concerned that late-planted soybeans in Indiana are at greater risk for yield loss should this disease reach Indiana. However, the likelihood that disease will establish and cause yield loss in Indiana in 2013 depends on many factors, including continued disease development in the south, and favorable conditions for disease to develop if the fungus should reach Indiana. Indiana is still in a "wait and see" area for disease development based on the most recent risk prediction from the ipmPIPE center (Figure 1).

Since soybean rust was first discovered in the U.S. in 2004, Indiana has been spared from soybean rust outbreaks that could result in yield loss due to the late northward movement and development of the disease. However, producers that are concerned about soybean rust have options on how to stay informed of the risk of soybean rust in Indiana:

1. Soybean rust development can be tracked using the ipmPIPE web site (<http://www.sbrusa.net>). However, not all areas with confirmed soybean rust are visible on this site.

2. Updated commentary on the risk of soybean rust and other soybean diseases will be released in the Pest and Crop newsletter as the season progresses.

Indiana no longer has a formal soybean rust monitoring system in place due to funding constraints, but we will monitor selected fields in the coming weeks. Many foliar diseases can be confused with soybean rust, including brown spot, bacterial blight, and bacterial pustule. Herbicide injury and insect feeding are two other issues that have been confused with soybean rust symptoms in the past. If you suspect that you have soybean rust, please send a sample to the Purdue Plant and Pest Diagnostic Lab for diagnosis: <http://www.ppdl.purdue.edu/PPDL/samples.html>.

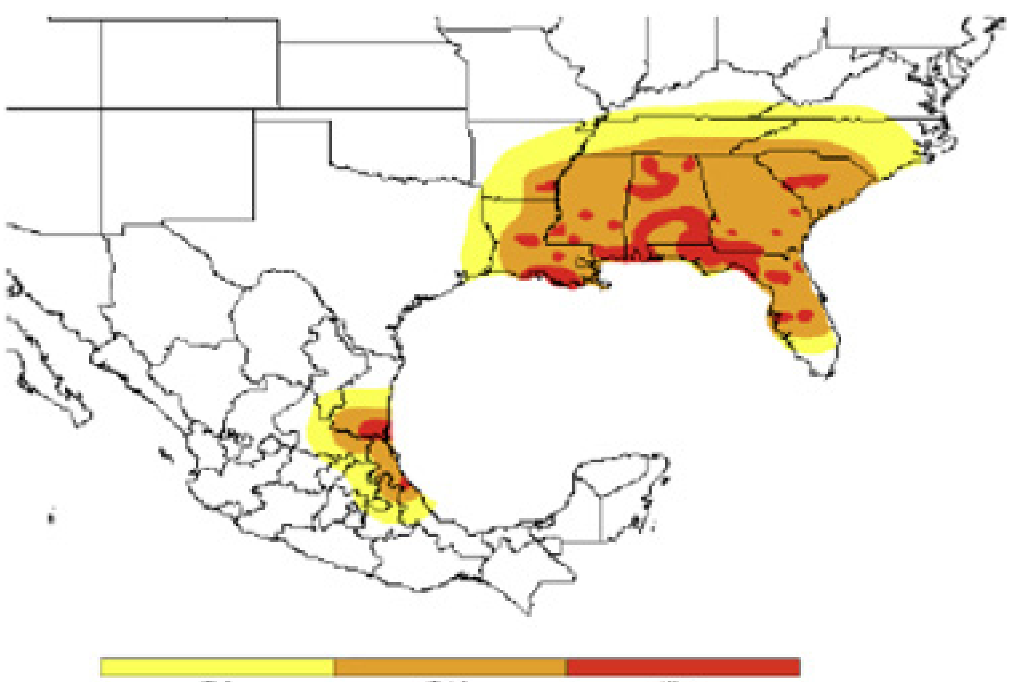


Figure 1. Risk areas for soybean rust based on predicted spore transport from infected areas. Red areas indicate that warnings are in place for soybean rust, orange areas indicate that fields should be monitored for soybean rust, and yellow areas are at potential risk for disease development in coming weeks. Indiana is not yet in a "wait" or "watch" mode, but may be in the coming weeks. (*Forecast courtesy Jeremy Zidek and ipmPIPE*).

Agronomy Tips

Grain Fill Stages in Corn – (*Bob Nielsen*) -

The grain fill period begins with successful pollination and initiation of kernel development, and ends approximately 60 days later when the kernels are physiologically mature. During grain fill, the developing kernels will be the primary sink for concurrent photosynthate produced by the corn plant. What this means is that the photosynthate demands of the developing kernels will take precedence over that of much of the rest of the plant. In essence, the plant will do all it can to "pump" dry matter into the kernels, sometimes at the expense of the health and maintenance of other plant parts including the roots and lower stalk.

A stress-free grain fill period can maximize the yield potential of a crop, while severe stress during grain fill can cause kernel abortion or lightweight grain and encourage the development of stalk rot. The health of the upper leaf canopy is particularly important for achieving maximum grain filling capacity.

Kernel development proceeds through several relatively distinct stages that were originally described by Hanway (1971) and most recently by Abendroth et. al., (2011). As with leaf staging protocols, the kernel growth stage for an entire field is defined when at least 50% of the plants in a field have reached that stage.

Silking Stage (Growth Stage R1)

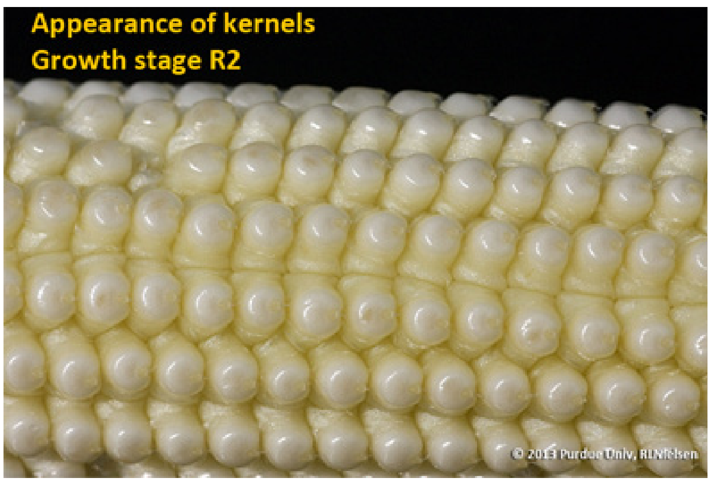
Some may argue whether silking should be labeled as a kernel growth stage, but nonetheless silk emergence is technically the first recognized stage of the reproductive period. Every ovule (potential kernel) on the ear develops its own silk (the functional stigma of the female flower). Silks begin to elongate soon after the V12 leaf stage (12 leaves with visible leaf collars), beginning with the ovules nearer the base of the cob and then sequentially up the cob, with the tip ovules silking last. Consequently, the silks from the base half of the ear are typically the first to emerge from the husk leaves. Turgor pressure "fuels" the elongation of the silks and so severe drought stress usually results in delayed silk elongation and emergence from the husk leaves. Silks elongate about 1.5 inches per day during the first few days after they emerge from the husk leaves. Silks continue to elongate until pollen grains are captured and germinate or until they simply deteriorate with age.

Silks remain receptive to pollen grain germination up to 10 days after silk emergence (Nielsen, 2010a), but deteriorate quickly after about the first 5 days of emergence. Natural senescence of silk tissue over time results in collapsed tissue that restricts continued growth of the pollen tube. Silk emergence usually occurs in close synchrony with pollen shed (Nielsen, 2010b), so that duration of silk receptivity is normally not a concern. Failure of silks to emerge in the first place (for example, in response to silkballing or severe drought stress) does not bode well for successful pollination.

Pollen grains "captured" by silks quickly germinate and develop pollen tubes that penetrate the silk tissue and elongate to the ovule within about 24 hours. The pollen tubes contain the male gametes that eventually fertilize the ovules. Within about 24 hours or so after successfully fertilizing an ovule, the attached silk deteriorates at the base, collapses, and drops away. This fact can be used to determine fertilization success before visible kernel development occurs (Nielsen, 2012).

Kernel Blister Stage (Growth Stage R2)

About 10 to 14 days after silking, the developing kernels are whitish "blisters" on the cob and contain abundant clear fluid. The ear silks are mostly brown and drying rapidly. Some starch is beginning to accumulate in the endosperm. The radicle root, coleoptile, and first embryonic leaf have formed in the embryo by the blister stage. Severe stress can easily abort kernels at pre-blister and blister stages. Kernel moisture content is approximately 85 percent. For late April to early May plantings in Indiana, the thermal time from blister stage to physiological maturity is approximately 960 GDDs (Brown, 1999).

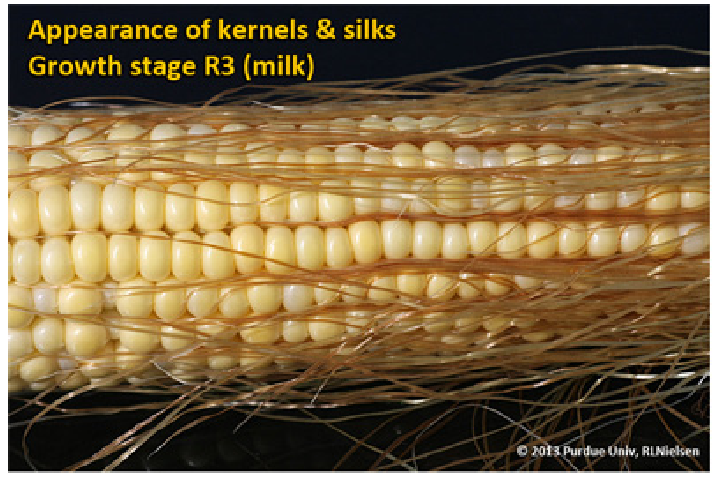


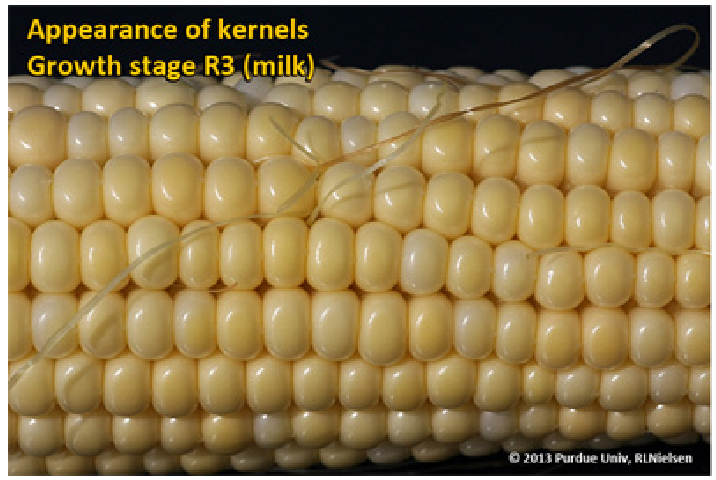
Kernel Milk Stage (R3)

About 18 to 22 days after silking, the kernels are mostly yellow and contain "milky" white fluid. The milk stage of development is the infamous "roasting ear" stage, that stage where you will find die-hard corn aficionados standing out in their field nibbling on these delectable morsels. Starch continues to accumulate in the endosperm. Endosperm cell division is nearly complete and continued growth is mostly due to cell expansion and starch accumulation. Severe stress can still abort kernels, although not as easily as at the blister stage. Kernel moisture content is approximately 80 percent. For late April to early May plantings in Indiana, the thermal time from milk stage to physiological maturity is approximately 880 GDDs (Brown, 1999).

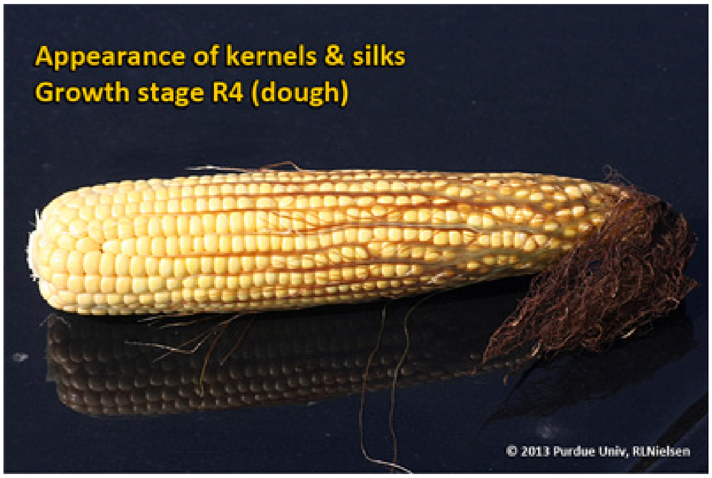
Kernel Dough Stage (R4)

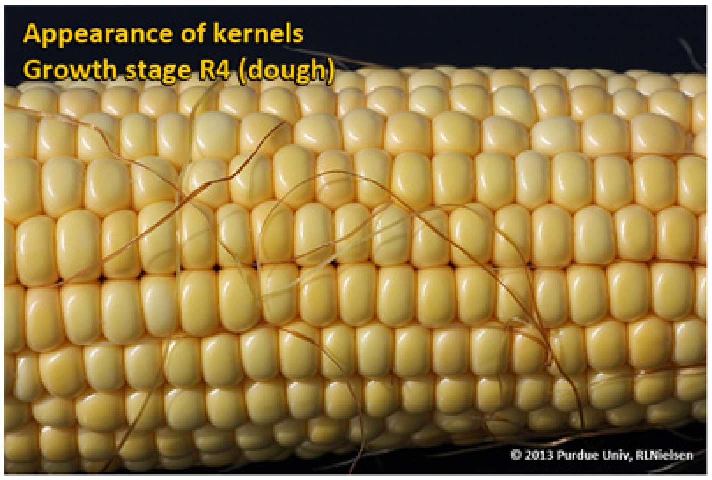
About 24 to 28 days after silking, the kernel's milky inner fluid is changing to a "doughy" consistency as starch accumulation continues in the endosperm. The shelled cob is now light red or pink. By dough stage, four embryonic leaves have formed and the kernels have reached about 50

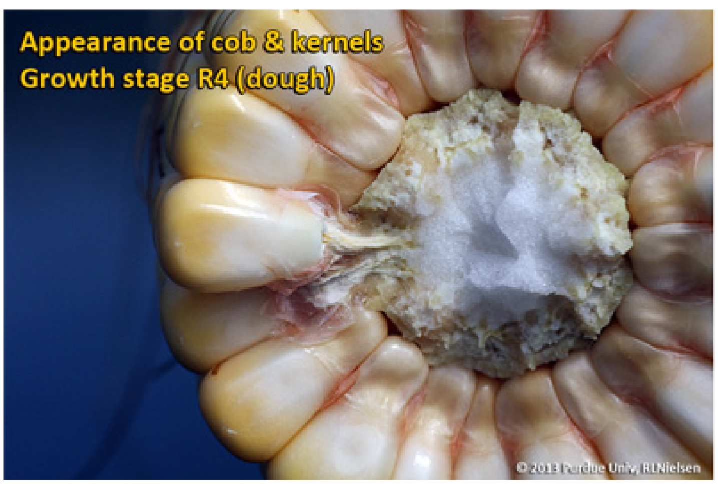




percent of their mature dry weight. Kernel moisture content is approximately 70 percent by R4. Kernel abortion is much less likely to occur once kernels have reached early dough stage, but severe stress can continue to affect eventual yield by reducing kernel weight. For late April to early May plantings in Indiana, the thermal time from dough stage to physiological maturity is approximately 670 GDDs (Brown, 1999).







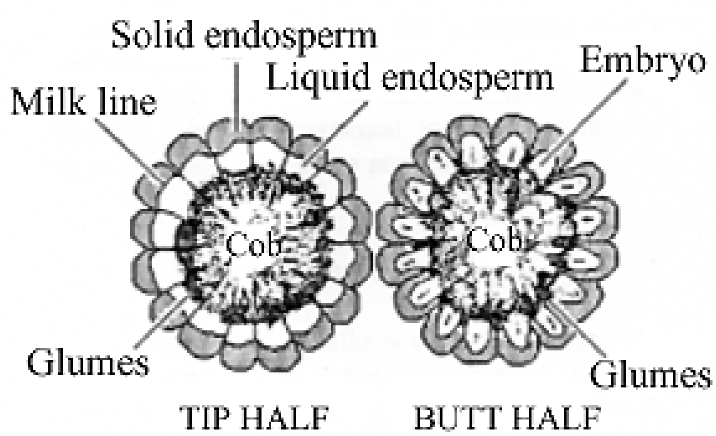
Kernel Dent Stage (R5)

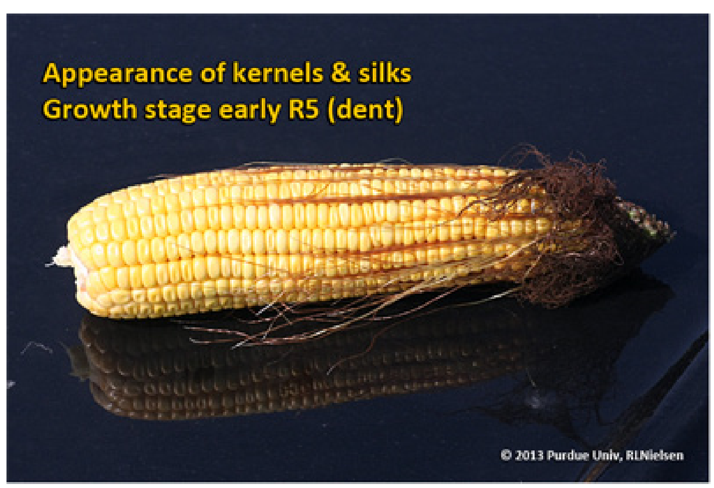
About 35 to 42 days after silking, all or nearly all of the kernels are denting near their crowns. The fifth (and last) embryonic leaf and lateral seminal roots form just prior to the dent stage. Kernel moisture content at the beginning of the dent stage is approximately 55 percent.

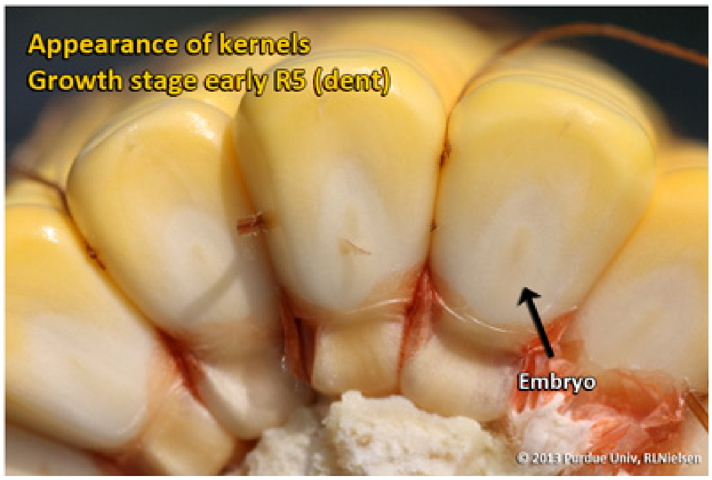
A distinct horizontal line appears near the dent end of the kernel and slowly progresses to the tip end of the kernel over the next 3 weeks or so. This line is called the "milk line" and marks the boundary between the liquid (milky) and solid (starchy) areas of the maturing kernels.

For late April to early May plantings in Indiana, the thermal time from full dent (kernel milk line barely visible) to physiological maturity is approximately 350 GDDs (Brown, 1999). Thermal time from the half-milkline stage to physiological maturity for similar planting dates is approximately 280 GDDs. One of the consequences of delayed planting is that thermal time from the dent stage to physiological maturity is shortened, though this may simply reflect a premature maturation of the grain caused by the cumulative effects of shorter daylengths and cooler days in early fall or by outright death of the plants by a killing fall freeze.

Severe stress can continue to limit kernel dry weight accumulation between the dent stage and physiological maturity. Estimated yield loss due to total plant death at full dent is about 40%, while total plant death at half-milkline would decrease yield by about 12% (Carter & Hesterman, 1990).

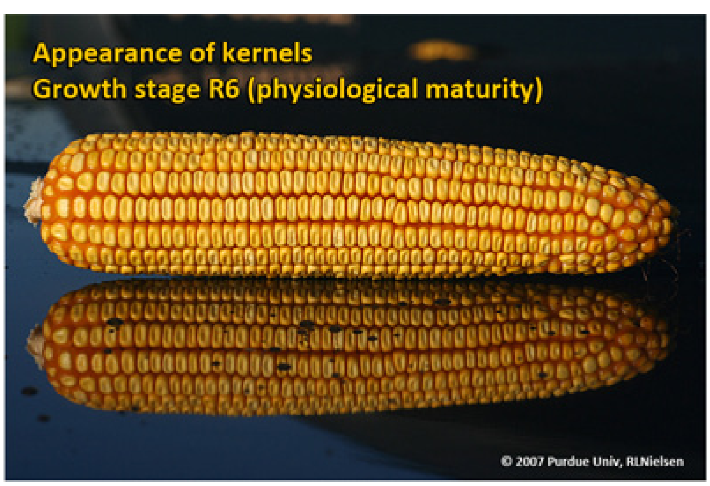


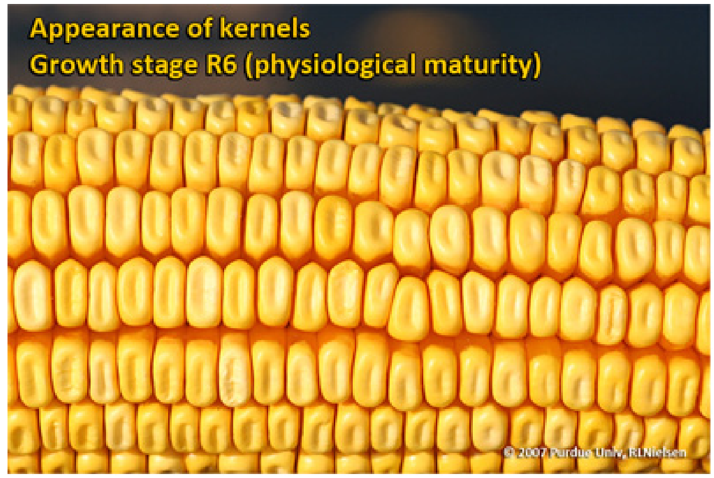


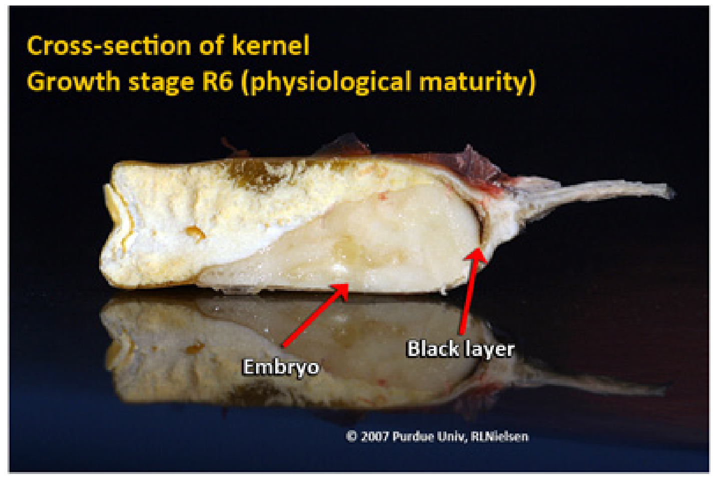


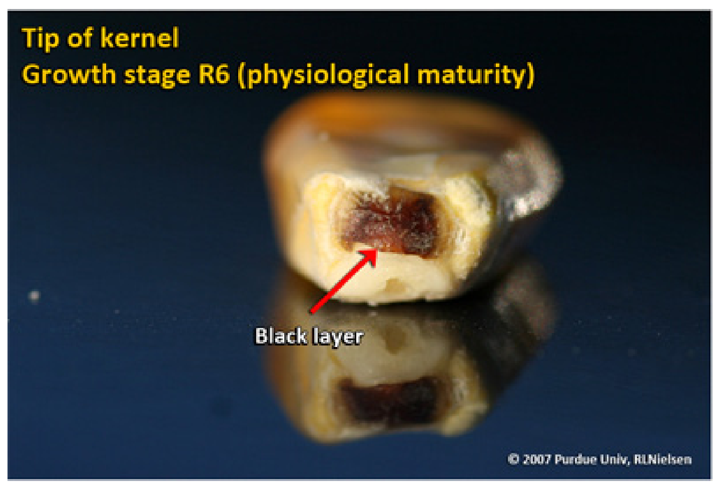
Physiological Maturity (R6)

About 55 to 65 days after silking, kernel dry weight usually reaches its maximum and kernels are said to be physiologically mature and safe from frost. Physiological maturity occurs shortly after the kernel milk line disappears and just before the kernel black layer forms at the tip of the kernels. Severe stress after physiological maturity has little effect on grain yield, unless the integrity of the stalk or ear is compromised (e.g., damage from European corn borer or stalk rots). Kernel moisture content at physiological maturity averages 30 percent, but can vary from 25 to 40 percent grain moisture.









Harvest Maturity

While not strictly a stage of grain development, harvest maturity is often defined as that grain moisture content where harvest can occur with minimal kernel damage and mechanical harvest loss. Harvest maturity is usually considered to be near 25 percent grain moisture.

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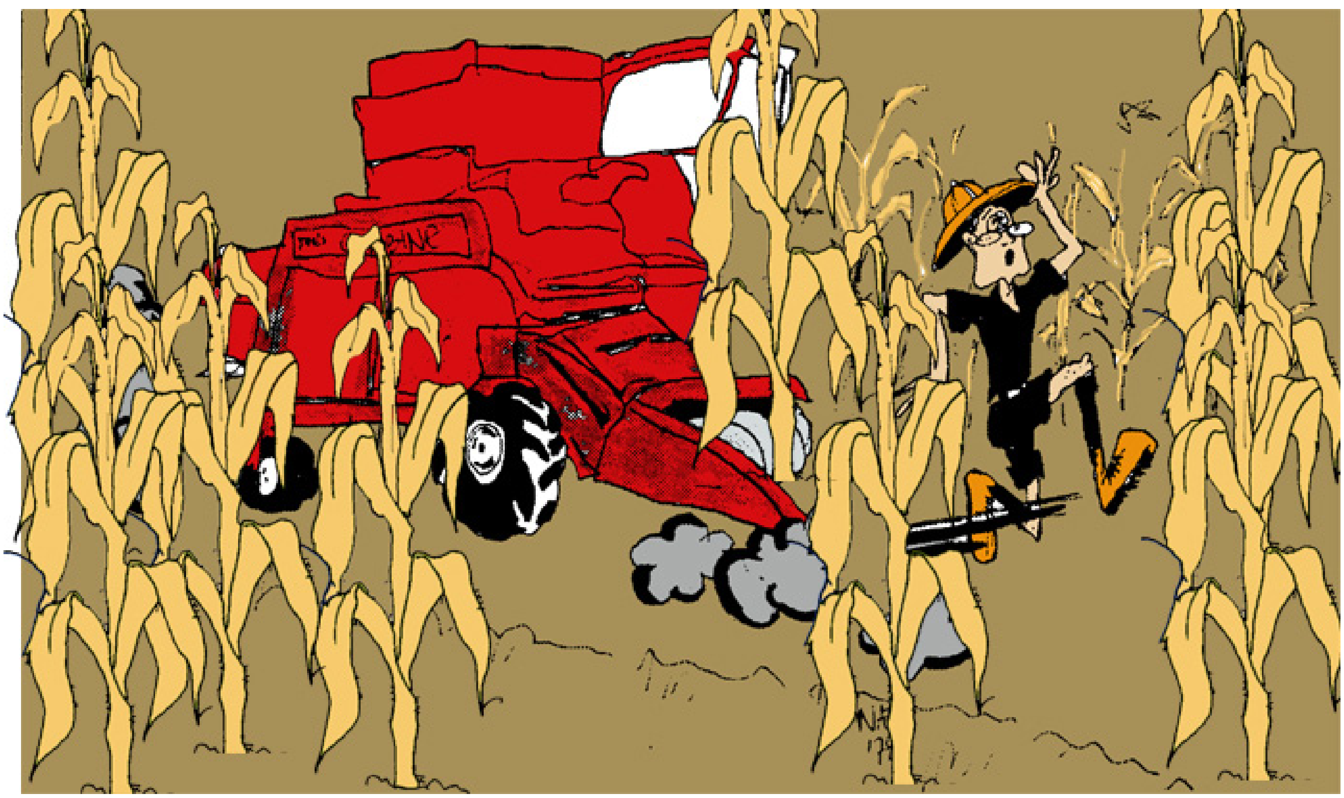
Bug Scout



Doesn't he know the difference between physiological and harvest maturity!?!?

Weather Update