ALABAMA COOPERATIVE Extension SYSTEM
Your Experts for Life

Corn Barn

Alabama Corn Production - Extension Newsletter

July 23 – 2009 Edited by: Brenda Ortiz

In this Corn Barn:

Guidelines for determining when to terminate irrigation in corn

Brenda Ortiz
Grain Crops/Precision Ag. Extension Specialist

Some corn fields throughout the state "seem" ready for harvest, then producers ask: "When should I stop irrigating my corn fields?". There is not a unique and statewide answer because it depends on the maturity stage, soil moisture and weather conditions especially rainfall (amount and distribution) and ambient temperature. Here are some guidelines:

1. Stop irrigation only when corn has reached "Physiological maturity".
2. Soil moisture, supplied by rainfall or irrigation, is necessary for the corn kernels to reach the full size and maximum weight.
3. Corn maturity can be visually monitored by the progression of the "milkline" from the top to the botton of the grain (Figure 1). This line indicates the progression of starch accumulation in the grain.

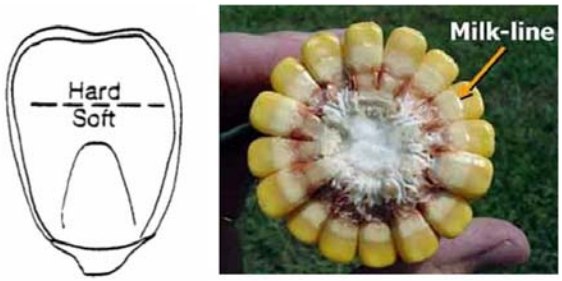


Figure 1. Checking for the Milk line (Photo: Mississippi State University)

4. Because physiological maturity is the cut-off indicator for irrigation, it can be determined when "the black layer" or "brown abscission layer" forms a few days after the milk line has reached the kernel base (Figure 2). At this time, hard starch accumulation is complete.

Figure 2. Black layer-Physiological maturity (Photo: Clemson University)

5. Research from Mississippi State University has shown that at dent stage, corn kernels have reached only 75% of potential weight. If irrigation is terminated at this stage, losses up to 20% can be expected if hot**,** dry weather conditions predominate.
6. Even though the corn water demand declines towards maturity, research conducted by the University of Georgia shows that at early dent, dent, beginning of black layer, and black layer; the plant uses 0.3, 0.27, 0.24, and 0.21 inches of water per day respectively.

Is your corn field ready for harvest?

Brenda Ortiz
Grain Crops/Precision Ag. Extension Specialist

The degree of maturity determines the order in which farms or fields are harvested. It is also related to potential yield losses associated with kernel breakage or loss, and contamination. Harvesting corn at the right moisture content can also reduce attack by insects and mold fungi. Studies from Purdue University have shown that if mature corn grain is allowed to dry down 10 % points in the field (e.g. from 28% to 18% grain moisture content), the potential yield loss would be 10%. If you have drying and storage facilities, harvest should begin when the moisture content is 28-30%. However, studies indicate that the optimum is 25% moisture content. If you want to avoid drying costs and the grain is going directly from the field to the local buying points, the moisture content should be around 15%.

The corn plant accumulates growing degree-days (GDD) or heat units every day during the growing cycle. Changes in the minimum and maximum ambient temperatures through the growing season are directly related to the accumulation of GGD, hence delaying or accelerating the date of physiological maturity. For example, if ambient temperatures are above average; physiological maturity will occur sooner than usual.

Harvest date is influenced by hybrid maturity rate (early or late), ambient temperature, and geographic location. Then, real time accumulation of GDD at your farm or at a location nearby can provide a good indication of the days to physiological maturity. In addition, cumulative GDD calculated from historic weather data can also provide good insights to the harvest time frame.

The Southeast Climate Consortium (SECC) has developed a web-based GDD tool, as part of Agroclimate (www.agroclimate.org), that allows you to predict GDD accumulation for the current season (In the case of Alabama, this accumulation is based on historic weather data). Using this tool, you can estimate the cumulative GDD for a corn field planted in a particular county and date. If you want to learn more about how to use this tool, consult the publication:

"Degree Days: Heating, Cooling, and Growing" from the University of Florida http://edis.ifas.ufl.edu/pdffiles/AE/AE42800.pdf

Appendix A shows examples of the type of information provided by the GDD tool in Agroclimate. For the examples, different planting dates and maturity rates were assumed.

Avoid Post-harvest Aflatoxin contamination

Brenda Ortiz
Grain Crops/Precision Ag. Extension Specialist

Aflatoxin is a carcinogenic toxin produced by the fungi *Aspergillus flavus* and *Aspergillus parasiticus*.
Contaminated corn is especially toxic to young animals and poultry. Therefore, if the corn is intended to feed young livestock, young cattle or humans, it cannot exceed the level of 20 ppb for aflatoxin. Corn grain exceeding these levels cannot enter interstate commerce and can only be used for livestock feed. The fungus can be visually recognized by a yellow-green or gray-green mold growing on corn kernels (Figure 3).

Figure 3. Visual symptoms of *Aspergillus flavus* contamination on a corn ear. (Photo: Alison Robertson – Iowa State)

Pre- and/or Post-harvest Aflatoxin contamination of corn kernel is possible. Pre-harvest contamination usually occurs due to drought and heat stress during kernel filling. However, many other factors favoring plant stress (e.g. fertilization, lack or irrigation, insect pressure, plant population and planting date) can be conducive to contamination. Post-harvest contamination may occur when harvesting, drying, and/or storing the corn. Here are some recommendations to avoid Post-harvest Aflatoxin contamination:

1. CLEAN bins before storing: sweep down the sides of the bin and use an insecticide to treat the bin before filling.
2. Begin harvesting at grain moisture of 28 to 30%. If moisture < = 15%, kernel breakage during harvest is possible which may favor contamination during storage.
3. Threshing – use plenty of air when harvesting to remove foreign matter, weed seed and light chaffy grain.
4. If possible, harvest and store non-irrigated areas (outside of the pivot) separately.
5. Stored moist grain will be highly susceptible to contamination, then it must be dried immediately before it can be placed in storage.
6. After drying, grain should be cooled. Storage temp. should be maintained between 34^{o}F–39^{o}F degrees.
7. If you use a Batch-in-drying (wet grain is dried and cooled in a bin and then

transferred to storage), dry to an average moisture content of 12%.

8. During summer time, stored grain should be maintained between 50°F–59°F degrees.
9. Aeration is key to maintain uniform temperature within the bin and reduce moisture migration, especially on the top of the bin which may favor aflatoxin contamination.

Tips for Successfully Storing Corn on the Farm

Kathy Flanders
Extension Entomologist

The Southeast's warm, moist climate makes southern grain bins especially vulnerable to insects and molds. This is because insects and molds grow faster in warm weather than in cool weather. Stored grains can fall victim to a variety of insect pests. There are primary pests, which attack healthy, intact kernels; and secondary pests, which feed on particles and grain dust thus reducing the stored grain's quality.

Grain quality does not improve during storage. The best that can happen is that the grain is the same quality coming out of the bin as when it goes in. A good insect pest management program will also minimize mold problems, since insects and molds have similar growing requirements.

Grain bins are designed for easy loading and unloading of grain as well as for protecting it from rain, birds and rodents. They are not well equipped to keep out small insect pests. There are a lot of holes, by design or otherwise, that are going to let in bugs. Seal unnecessary openings with caulk or expandable foam. Duct tape and plastic may also be used.

The first line of defense is to eliminate any insects that are left over from the previous batch of grain. While some of these insect species may be brought in with the grain at harvest, most have been in and around the bin for a long time. Some insects that attack stored grain live as long as 3 years.

Therefore, before you start harvesting your corn, take the time to clean the bins thoroughly to eliminate starter colonies of insects or molds that could threaten the stored corn. This includes a thorough vacuuming or sweeping to remove insect debris and remaining grain. Crop residue and dust will reduce the efficacy of empty bin insecticide treatments, another reason to do a thorough cleaning.

Next, apply an EPA-approved insecticide to treat the grain bin floor, inside and outside walls and the concrete pad around the grain bin. This empty bin treatment will kill insects that remain in the bin, even after cleaning. It will provide some protection against future invasion. See "Stored Grains Insect Control for 2009" (http://www.aces.edu/pubs/docs/A/ANR-0500-A/VOL1-2009/stgrain.pdf).

Corn should be loaded into the bins at the correct moisture content. For aerated grain bins, the recommended moisture content is 14% if the corn will be stored for 6 months or less, 13% if corn is stored for 6-12 months, and 12% if the corn will be stored for more than 1 year.

If the corn will be stored for longer than a month, it should be treated with an EPA-approved insecticide as it is loaded into the bin. If the corn is at the correct moisture content when it comes from the field, the sprayer nozzle can be positioned down by the auger pit. It is important to know that heat breaks down the protectant insecticide. Therefore, if corn is dried at the storage site care should be taken to apply the insecticide when the grain is cool, or at the point where the grain going into the bin is at its coolest point.

Grain should not be loaded above the vertical sides of the bin. The pitched head space is needed to allow access to the grain, to allow effective aeration and, if the need arises, to conduct an effective fumigation. If the bin is not equipped with a grain spreader, the peak of corn remaining after loading should be flattened out. A grain peak harbors moisture, which encourages insects and molds to grow.

As autumn approaches, night temperatures will be low enough to make aeration effective. Running the aeration fans long enough to cool down the grain can pay big dividends. This is because stored grain insects do not grow below 60 degrees Farenheit. It is not necessary to wait until night temperatures dip below 60 degrees before aerating. For example, insects will grow much more slowly at 70 degrees than at 80 degrees. The grain can be cooled down in steps, until the temperature is below 60 degrees. Deciding how long to run the aeration fans can be tricky. If a grain thermometer is available, you can measure the temperature of the grain directly. Otherwise, estimates of the number of cooling hours required can be made based on the power of the aeration fans. It will take at least 12 hours, and sometimes several days, to move the cooling front of air through the bin. For more information on aerating grain bins, see the publication "Grain Storage Guidelines for the Southeast" (http://www.aces.edu/dept/grain/documents/aerationmanual.pdf).

Stored grain should be checked at least once a month to see if insects are present. It is not enough to look in the top hatch to see if anything is crawling around. If you can see an insect infestation using this method, you have a serious insect problem. Push a long brass grain trier down into the corn in order to get a sample of the corn (see Figure 10 in the publication "IPM Tactics for Stored Grain," http://www.aces.edu/pubs/docs/A/ANR-1126/ for a picture of a grain trier). Sift this into a shallow pan through a strainer with holes just small enough to keep the corn from falling through. Vegetable colanders from the discount store work well for this purpose. Look in the sifted material for insects. If more than two weevils (look for the long snouts) are present, or more than 10 other live insects are found, the corn quality is downgraded to "infested" status. Inexpensive pitfall traps can be purchased and used to detect insects in stored grain (see Figure 11 of "IPM Tactics for Stored Grain"). Push the traps down into the grain, and return in a few days to see what insects have fallen into the traps.

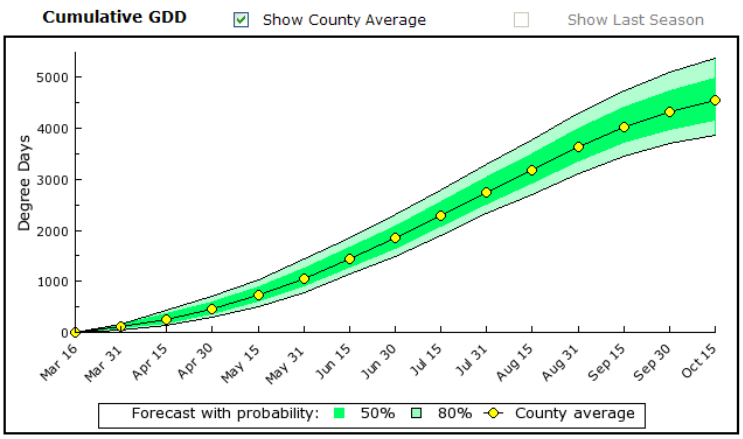
If weevils are found in the stored corn and you are using it for on-farm feed for animals, try to use up the infested corn as soon as possible. If you plan on selling the corn, you will need to eliminate the insect infestation if the population exceeds the tolerance of the buyer. Unfortunately,

the only way to get rid of insects once they are in a grain bin is to fumigate. More information about fumigating grain bins can be found in the publication "Fumigating Agricultural Commodities With Phosphine" (http://www.aces.edu/pubs/docs/A/ANR-1154/). An alternative strategy if you have extra storage capacity is to move the grain from the infested bin to a clean bin, and spray a grain protectant on the grain as it is moved. Be aware that physical damage to corn kernels occurs each time grain is loaded and unloaded.

Grain bins, like many locations on the farm, are dangerous places. Use caution in and around grain bins. See the publication "Grain Bin Hazards and Safety Considerations" (http://www.aces.edu/pubs/docs/A/ANR-1332/ANR-1332.pdf)

Apendix A. Cumulative Growing Degree Days for corn growing at a particular location and planting date**.** For each scenario, a maturity date was estimated by the GDD tool based on historic weather data. *Source*: Agroclimate (http://agroclimate.org/tools/GDD/)

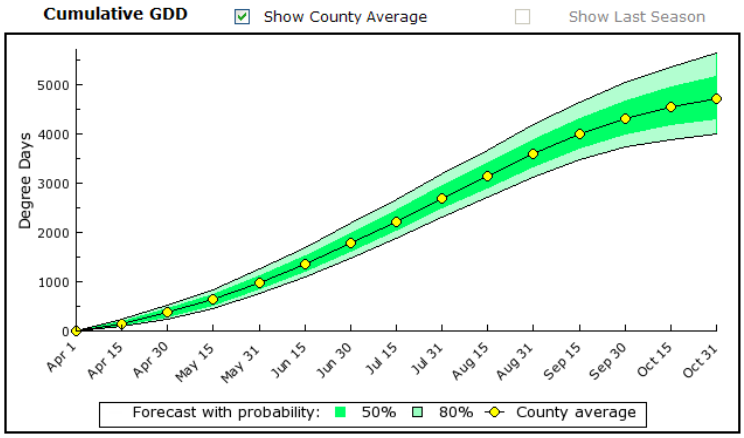
Lawrence (AL) . Planting date: March 16, 2009



If you planted a 2780-2800 GDD hybrid, **maturity will occur around July 31**

If you planted a 2860-3000 GDD hybrid, **maturity will occur around 1 week or 2nd week of August**

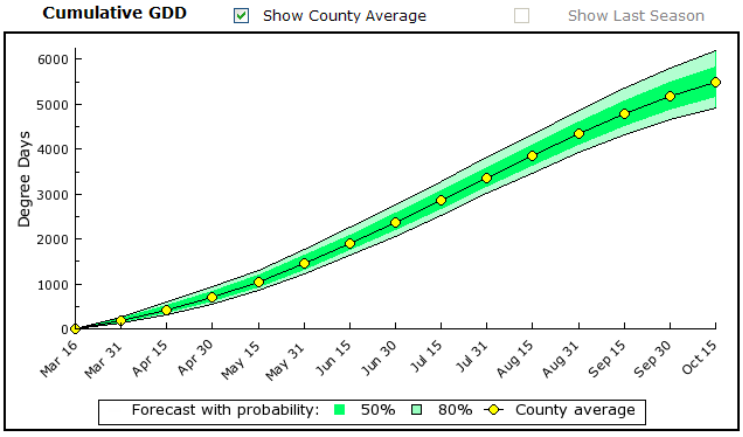
Talladega (AL). Planting date: April 1st, 2009



If you planted a 2780-2800 GDD hybrid, **maturity will occur after July 31**

If you planted a 2860-3000 GDD hybrid, **maturity will occur around 1 week or 2nd week of August**

Mobile (AL)). Planting date: March 16, 2009



If you planted a 2780-2800 GDD hybrid, **maturity will occur around July 15**

If you planted a 2860-3000 GDD hybrid, **maturity will occur around the last week of July**

For more information you can contact:
Brenda Ortiz, Grain Crops/Precision Ag. Specialist (bortiz@auburn.edu)
Visit also: www.alabamacrops.com

*Reference Number: **CB-7-09**, Brenda Ortiz, editor