August 2008

Mississippi State University Extension Service

Agronomy Notes

Corn

by Dr. Erick Larson

Root Lodging - Severe thunderstorms passing through localized areas in the state recently caused substantial corn root lodging in some fields. Root lodging occurs when environmental forces exceed the ability of the root system to provide lateral support to the corn plant. This causes the entire corn stalk to lean or fall from ground level, usually dislodging part of the root system from the soil. Root lodging often results in sizable portions of a field where all plants lodge from the weight of adjacent stalks falling onto others – essentially a “domino effect”. Root lodging often occurs as plants approach physiological maturity (when plant is still green), because the mass of the plant is more than any other time during the season (maximum ear weight and the stalk is full of water). Thus, less force, usually in the form of wind, is required to push stalks over. Because of these factors, there is also little opportunity for plants to reright themselves.

Figure 1. Large tracts often root lodge when storms or high winds occur when the corn is nearly mature. Green, tall, high yielding fields are quite vulnerable because plants are very heavy and prone to fall. (Photo courtesy Jimbo Burkhalter, MSU Extension Service, Tallahatchie Co.).

Of course, exposure to strong winds, coupled with soggy soils, primarily determine the degree of root lodging. However, many types of stress or pest damage, including excessive plant population, inadequate fertility, rootless corn syndrome, excessively wet or dry soil, insect damage can restrict root development and/or encourage late-season root rot and thus, promote root lodging. This growing season, excessive rainfall during the early season might have limited root development in many fields. Corn hybrids also differ considerably in their characteristics and ability to resist root lodging. Poor brace root development, tall plant height and high ear placement all increase the likelihood of root lodging. Thus, many seed companies rate root and stalk lodging separately from stalk lodging. I encourage you to evaluate hybrids in strip trials or side-by-side comparisons, since root-lodging differences are often quite apparent in many trials.

Although corn appears flattened, growers can usually salvage the crop relatively well, but you should expect to make some considerable harvest adjustments. You should generally begin harvest as quickly as practical, if you have had considerable lodging. Harvest progress of lodged corn may be up to five times slower than normal, so you should aggressively harvest lodged fields, particularly if a large acreage is damaged. You should take this action because the likelihood of grain quality deterioration and harvest losses are much higher than normal, and may increase substantially if wet weather is prevalent. Field drying rates of severely lodged fields will likely be much slower, compared to normal (0.6% moisture per day), because aeration is reduced. Furthermore, as average daily temperatures begin to drop, field drying may slow even more. You must usually slow combine speed to a crawl in order to pick up and feed the tangled, fallen corn into the machine. Combine harvest is generally more efficient when traveling opposite the predominant direction the corn stalks are laying. For example, if the stalks are lying towards the west, drive the combine in the east direction. Soybean platform headers may actually work more efficiently than corn heads on nearly flattened corn (less than six inches above ground level). Several types of aftermarket attachments are manufactured to assist corn headers gather fallen corn. These devices are generally designed to help pull lodged stalks along the snouts into the feeder mechanism. These attachments are most helpful when roots are not anchored well in the soil and/or stalk quality is badly deteriorated. These conditions cause stalks to be pulled loose into the header, potentially obstructing flow. Pre-harvest herbicide application may be necessary to kill weeds which could hamper harvest considerably. Herbicides applied as a harvest aid should be applied after corn grain is physiologically mature (black layer), and several days to weeks prior to grain harvest (check product labels for specific restrictions).

Corn continued...

by Dr. Erick Larson

When do you start corn harvest? – This is a common question that deserves a lot more consideration when both market prices and acreage are high. The answer may vary considerably depending upon the interaction of many factors, which I will try to address this month. The primary factors you need to consider are the number of acres relative to combine/ trucking/storage capacity. These factors determine the potential harvest duration and the relative risk associated with harvest delays or complications. Those potential risks include severe lodging and/or grain quality deterioration, which can result from inclimate weather, insect pest damage, and late-season weed growth.

Figure 2. Optimum harvest timing varies depending upon your acreage, crop condition, and harvest capacity. However, you should generally strive to finish before corn grain moisture falls substantially below 15%.

Grain moisture dockage - Corn may be harvested any time after grain reaches physiological maturity, which occurs at around 30% moisture. However, corn may not be safely stored until considerable moisture loss occurs. Thus, grain elevators discount wet corn to account for drying expenses and moisture weight loss during drying. Moisture dockage schedules between elevators may vary significantly, so thoroughly compare rates. Most schedules discount about 2.5-3.0% per each percent moisture above the standard, and may increase as moisture content rises. Water evaporated during drying (shrinkage) accounts for 1.18% of the dockage per each percent moisture. The producer loses this weight regardless of whether they sell wet grain to the elevator, dry it mechanically or let the grain field dry. Thus, a producer should subtract this value from the dockage rate to show their realized or "actual" dockage.

Harvest timing and expected losses - Harvest losses are just as important as moisture dockage rate in evaluating your harvest timing decision. The longer corn stays in the field, the greater the likelihood of substantial field losses. Factors such as stormy weather and southwestern corn borer damage can cause considerable lodging in unharvested fields. Late summer rainfall can also promote morningglory growth, which can greatly inhibit harvest efficiency. Each of these factors may cause substantial field loss, which would considerably outweigh moisture savings. Producers should also consider their harvest capability -- the longer it takes to complete harvest, the earlier you should start harvest. Besides harvesting drought-stricken fields promptly, growers should also harvest non-Bt hybrids infested with corn borers, early maturing hybrids or fields, and those possessing below average stalk quality as quickly as possible. Producers should closely check for loss while the combine is harvesting and make adjustments accordingly. Two corn kernels per square foot or one dropped ear per 100 feet of row equals about 1 bushel per acre yield loss. Research generally indicates combine efficiency is best (harvest losses are lowest) when corn grain moisture is about 20-22%. <u>Thus, growers seeking maximum profitability should always strive to finish harvest before grain moisture falls below 15%.</u>

Figure 3. Harvesting severely lodged corn is a slow, tedious process with significant harvest loss and inefficiency.

Don't Give Away Corn - If you deliver corn at less than 15% moisture, you are giving away profit. If you harvest 200 Bu./A. corn and deliver at 14% moisture, you lose $11.80 per acre or $23.60 per acre at 13% moisture (at $5.00/Bu.). This loss is solely from reduced grain weight due to lower moisture content. This moisture weight loss closely approximates the "actual" dockage most elevators charge for high moisture corn. Since corn loses approximately 0.6% per day during the harvest season, begin harvest early enough to guarantee all corn is harvested before it reaches 15%.

Forages
by Dr. Rocky Lemus

Switchgrass (SG) is a tall-growing, warm-season, perennial grass that is native to much of the United States including Mississippi. It is adapted to hot, summer conditions with peak growth occurring from May through September. Over the last few years, due to increase in oil prices, switchgrass has received interest as a renewable fuel source, since it produces large amounts of cellulose that can be digested and converted to ethanol. Switchgrass can produce high-quality forage with yields ranging from 2 to 5 tons per acre depending on variety, rainfall, soil type, as well as other environmental conditions. The nutrient content of this forage can be as high as 16 percent crude protein, if harvested correctly.

There is the possibility of having switchgrass as a "dual purpose" crop: biofuel and forage crop. While switchgrass is planted primarily for biofuels production, there is potential to harvest the early growth through haying or grazing, then managing the remainder of the season's growth for biofuels. The summer growth of switchgrass also makes switchgrass excellent forage for grazing. Switchgrass can provide good quality forage for grazing animals and provide the opportunity to rest tall fescue pastures during a stressful time of the year or when establishing new warm-season pastures such as bermudagrass.

Establishment

Switchgrass germinates and develops more slowly than other perennial warm-season grasses due to a high proportion of dormant seed. What may appear to be an unsatisfactory stand may actually be a good stand. Wait until the following summer before abandoning the seeding with poor germination. Seed should always be purchased and planted on a pure live seed basis (PLS). Switchgrass germinates very slowly when soil temperature is below 60 °F. Planting switchgrass should occur from mid-April to mid-June. Switchgrass should be planted at 10 lb of pure live seed per acre for conventional tillage. For no-till or drill seedings, 8 lb per acre might be adequate. Pounds of bulk seed needed can be calculated [lb. needed = recommended lb per acre divided by (germination x purity)] where germination and purity are expressed as decimal values instead of total percentages. Seed should be placed no deeper than 1/4 to 1/2 inch. Consider cultipacking after drill planting in order to obtain good seed-soil contact.

Fertilization

For establishing switchgrass, soil pH should be 5.0 or above, although a pH of 6.0 is highly recommended. If soil test indicates medium or higher phosphate (P_2O_5) and potash (K_2O), then no fertilizer is needed at planting. No nitrogen should be applied at planting since switchgrass is good scavenger of nutrients. Nitrogen is seldom needed in the establishment year. During the grazing season, nitrogen should only be applied if soil moisture is not limiting. For hay, actual nitrogen applications should be 45 to 60 lb per acre in both early summer and mid-summer. Under grazing conditions, nitrogen applications of 45 to 60 lb per acre can be applied in early summer and up 60 lb per acre in mid-summer if extra forage growth is needed.

Weed Control

Weed management can be very difficult while establishing switchgrass. Sites with extensive perennial weed infestations should be avoided as they are difficult to manage while establishing switchgrass. It is important to reduce the weedy grass populations as much as possible before planting. If not controlled properly, summer annuals such as barnyard grass, crabgrass, and foxtail could be a major obstacle. This can be done with repeated cultivations and/or burndown herbicide applications before planting switchgrass. Herbicide application, usually glyphosate (Roundup) or paraquat (Gramoxone), may be needed in early April to obtain a weed control. About 4 to 6 weeks later or as close to the day of planting as possible, spray again. One year prior to SG planting, a field should be tilled as needed to bury excess trash, increase infiltration, or smooth the land for planting. Annual broadleaf weeds emerging after planting can be controlled with mowing and/or the use of labeled broadleaf selective herbicides such as Grazon P+D or Weedmaster. If a broadleaf herbicide is used as a post-emergence herbicide, wait until switchgrass plants have at least 3 to 4 leaves (or are 3 to 4 inches tall) before application to avoid injury.

Grazing Management

Since switchgrass is a tall-growing grass, the management must differ from that used for cool-season or other warm-season grasses. Although there are several SG varieties available, Cave-in-rock is the preferred variety where grazing or hay will be the intended usage. Cave-in-Rock is ready to graze in late May and has little growth in September. Other varieties such as Alamo and Kanlow are both best suited for wildlife, soil conservation, and biofuel because of the late growth in the season.

Switchgrass breaks winter dormancy in late April and can provide some grazing in late May, but makes the most of its growth in June, July, and August. In the south, approximately 60% of annual biomass accumulation it obtained by late June. Switchgrass becomes very stemmy and unpalatable as it matures (**Figure 1**), but during the target grazing period forage quality is high and palatability is good (**Table 1**). When harvesting switchgrass for hay, the first cutting occurs at the late boot stage (around mid-June). This should allow for a second cutting in mid-August, leaving enough re-growth to survive the winter. Early-season production, late April to late May, produces the highest quality forage and can be easily diverted for hay. Crude protein levels could easily range from 14 to 16% from early May to late June.

Forages continued...
by Dr. Rocky Lemus

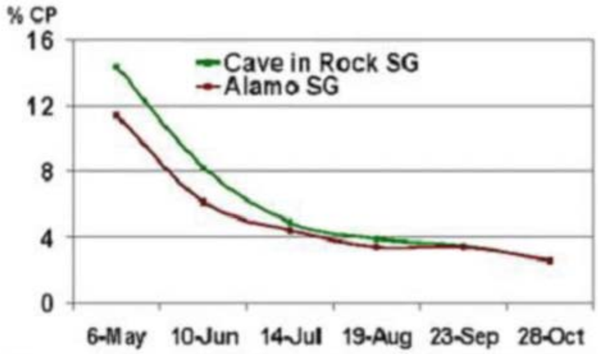


Figure 1. Changes in crude protein of two switchgrass cultivars. Source: Sladen et al., 1994.

Switchgrass is suited to rotational grazing systems. Grazing switchgrass calls for watchful management practices to ensure survival of the stand. It is recommended that grazing begins when there are 18 to 24 inches of growth (mid-may) and to stop grazing when there are 8 to 12 inches of stubble left, and to rest the pasture 30 – 45 days between grazing periods. The reason for leaving that amount of residue is due to the elevated growing point in switchgrass (usually > 5" above soils surface). Removing the growing point will in the long run reduce yield, plant vigor, and stand persistence. Single rotations of 2 to 4 weeks of grazing should be planned. Stocking rates of 3 to 5 steers per acre will probably be ideal.
Switchgrass is very slow to establish and no grazing should be planned during the establishment year, unless it a very brief period (2 to 3 days) at a high stocking rate to remove weed competition. During the second year, production of the stand might be 50 to 75% of the potential. If managed correctly, stand longevity of switchgrass could be more than 15 years.

Table 1. Forage quality characteristics of switchgrass.

	Growth Stage	
Quality	**Vegetative to boot**	**Boot to head**
	------------------------ %	------------------------
CP	10 – 14	6 – 10
ADF	35 – 40	40 – 50
NDF	55 – 60	60 – 75
TDN	58 – 62	50 – 58
RFV	90 – 104	62 – 90

CP = Crude Protein; ADF = Acid Detergent Fiber, NDF = Neutral Detergent Fiber, TDN = Total Digestible Nutrients; RFV = Relative Feed Value.
Source: Ball et al., 2002.

Switchgrass is an excellent forage for beef and/or dairy cattle; however, it has shown toxicity in horses, sheep, and goats through chemical compounds known as saponins, which cause photosensitivity and liver damage in these animals. Switchgrass may also cause a phototoxic reaction in horses in which they may lose some hair and suffer sunburns. This is not a common problem, but horse owners should be aware of it. Switchgrass also provides great environmental benefits. It provides excellent erosion control when used as filter strips, grass hedges, or cover for river levee banks. It is also beneficial for wildlife. The upright growth provides wildlife some overhead cover for protection, quality nest sites, and free movement which facilitates food searching.

Soybeans
by Dr. Trey Koger

Week of July 28, 2008: Widespread hot and dry weather along with extreme fuel prices have led to a common question over the past few weeks. When can I stop irrigating these soybeans? This question is going to be even more common over the next several weeks as most of our irrigated April and early May planted soybean crop approaches the end of seed fill and maturity. This is a good opportunity to discuss when it is appropriate to terminate irrigation. We don't want to spend money that will not give us a return on the investment, but we also don't want to leave any yield on the table. In many cases, we have observed significant yield increases with irrigating later than what may be considered the norm. It is important that the plant has sufficient moisture to completely fill out the uppermost youngest pods. Research conducted in Arkansas and field evaluations in Mississippi have consistently shown an 8 to 10 bu/acre yield increase with irrigation applied after the R6 growth stage. Initial stages of the R6 growth stage occurs when the seed in the uppermost fully developed pods are touching one another. Applying irrigation so that ample soil moisture is available through the entire R6 growth stage up to the R7 growth stage contributes to optimal yield potential and accounts for this significant yield increase. Soybean planted in April and May is often going through the seed fill period during the hottest months of the year. The seed fill period is a critical water requirement growth stage. It is imperative that we provide ample soil moisture through the entire seed fill period to obtain maximum yields.

Following are several general rules of thumb to consider when making irrigation termination decisions. These guides should be used to ensure that adequate soil moisture is available through the entire seed fill period.

1) **The decision to terminate irrigation should be made on a field by field basis.** Conditions can change from one field to another. Soil type and existing moisture in the soil profile affect the timing of irrigation termination.

2) Irrigation should be terminated so that adequate soil moisture is available for approximately two weeks after you see the following characteristics:

a. For indeterminate varieties: the leaves on the bottom half of the plant should be yellow and beginning to fall from the plant, and leaves on top of the plant should begin to turn yellow in color. Most group four varieties exhibit an indeterminate growth habit.

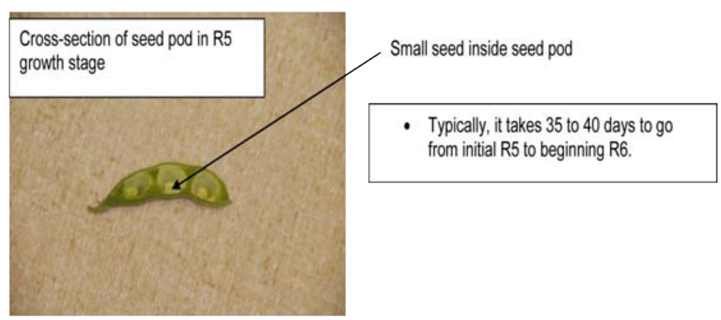
b. For determinate varieties: leaves up and down the main stem should be turning yellow and beginning to fall from the plant.

c. For all maturity groups: Seed in pods of the uppermost (youngest) four nodes have completely filled all available space in the pods.

3) The final irrigation should take place in close proximity to the seed consuming all available space in the pods of the four uppermost (youngest) nodes. This will provide ample soil moisture is available for optimal test weights and yields.

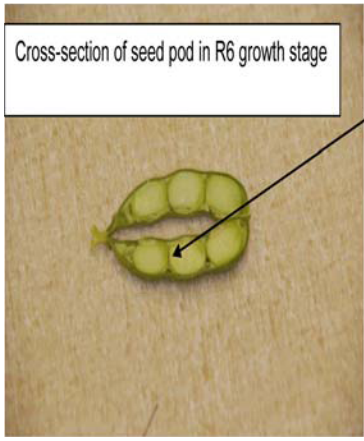
Below are several pictures and descriptions to support the above general rules of thumb and help in making the decision to terminate irrigation easier. Seed still have a significant amount of growth to go once the seed initially touch within the pod. Providing sufficient soil moisture through irrigation is critical until the seed have completely filled all available space within the pod. Soybean plants go through a critical water use period during the pod fill period. It is critical that we provide sufficient soil moisture from the R5 through the full R7 growth stages. See pictures and descriptions below for details on proper timing of irrigation termination.

R5: is beginning seed development within pods of the four uppermost (youngest) nodes. Providing ample soil moisture through the entire seed fill (R5 through R6) and beginning maturity growth stages (R7) is critical.



R6: Initial phase of R6 is when the seed barely touch in the uppermost fully developed pods. Full R6 is when the pods consume all available space within the uppermost fully developed pods. It is critical to provide ample soil moisture through irrigation during this critical water use period. For optimal yields is vital that irrigation is terminated so that ample soil moisture exists for at least 10 days after seed have consumed all available space in uppermost pods.

Soybeans continued...
by Dr. Trey Koger

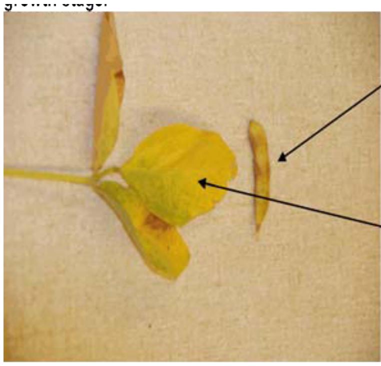


Seed are touching one another inside seed pod and close to consuming all available space within seed pod.

- If adequate soil moisture is not present once the seed consume all available space within the uppermost pods, a final irrigation is likely needed to ensure adequate soil moisture for at least 10 days after complete seed fill.
- It may take two to three weeks for the seed pod to go from initial R6 to complete seed fill when ample soil moisture is present.

For optimal yields, it is crucial that ample soil moisture is provided through entire seed fill period (R5-R6). Irrigation should be implemented to provide ample soil moisture up to the initial R7 growth stage.

R7: Begins when pods on the main stem reach mature color (grey, brown, to tan) and youngest uppermost leaves will be begin to turn color from green to yellow or yellow/ purplish in color. In most cases, bottom leaves will have fallen off plants. Dry matter content in seed peaks at R7. Seed within these pods that have changed color will have lost all their green color and will appear yellow. Stress after this point will have essentially no negative impact on yield. **Ample soil moisture is not required after the plant reaches the initial R7 growth stage.**



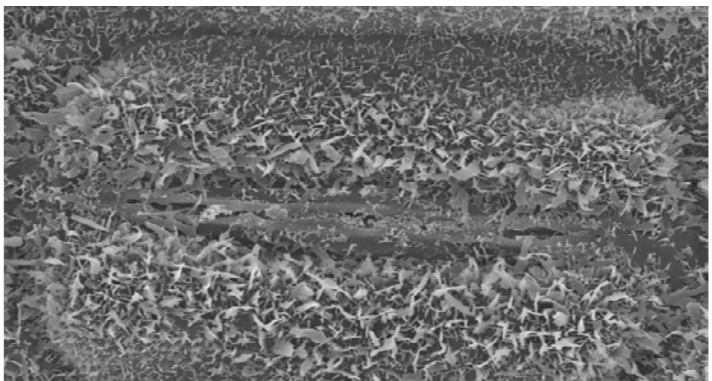
Seed pod in R7 growth stage that has turned to mature color

This is a leaf from the top of the plant. Leaves from bottom of the plant have likely begun to fall off, especially for indeterminate varieties.

R8: Full maturity. Approximately 95% of pods will have reached mature color (grey, brown, to tan). Often only five to ten days of good drying weather after this state are required to have the soybean at 15% or less moisture.

Cotton
by Dr. Darrin Dodds

High Temperature Effects on Cotton: There are several factors that affect how hot cotton plant tissue will actually get including: air temperature, sunlight, soil moisture, relative humidity, and air movement. The optimum range for growth and photosynthesis of a cotton plant is between 74°F and 90°F. Microscopic openings in the leaves called stomata will open when air temperature and sunlight warm the plant. Stomatal opening allows for water to evaporate from the plant providing a cooling effect. Well watered cotton will often be up to 10°F cooler than the air temperature on a hot dry afternoon. Generally speaking, nearly all of the water taken up by a cotton plant will be used to evaporatively cool the plant.



Barnyardgrass stomata at 4000x magnification.

High nighttime temperatures are detrimental to cotton in irrigated and dryland conditions. Nighttime temperatures above 80°F at peak bloom can lead to shed of many small bolls. At peak bloom, carbohydrate demand to fill developing bolls is high. High nighttime temperatures reduce the amount of carbohydrates available to fill developing bolls due to high nighttime respiration. Due to this reduction in carbohydrates, fewer seeds are set per boll and small bolls will be shed. About four to five-days after high temperatures begin, mid- to late-bloom cotton will begin to shed small bolls. If temperature stress continues, larger bolls may be shed. Reduction in overall boll set may also be observed due to high nighttime temperatures.

High daytime temperatures may be good or bad for cotton yield depending on the stage of crop development and the amount of soil moisture that is available. Cotton can tolerate a wide range of daytime temperatures; well watered cotton will produce rapid growth even with daytime air temperatures approaching and/or exceeding 100°F. However, when moisture is lacking, high temperatures can lead to a reduction in photosynthesis and in turn, a shortage of carbohydrates available to fill bolls. This generally results in boll shed, small boll size, and leaf damage. Cotton grown in soils without adequate moisture is most sensitive to high daytime air temperatures during bloom.

Increased air temperatures prior to bloom can be beneficial as the water use is generally low during this time and roots are still expanding into unexplored soil. Additionally, these high temperatures prior to bloom can accelerate the onset of bloom. Increased air temperatures are bloom may decrease the time to boll maturation and boll opening. Cotton subjected to high temperatures may produce fiber that will have increased micronaire. Increased micronaire is due to thicker cellulose rings being deposited in the fiber.

When temperatures are high, it is important to keep the level of soil moisture available to the plant high. Irrigation applications that saturate the soil should be avoided. Soil that is saturated with water will have a lack of oxygen causing the cotton to wilt and die rapidly during warm conditions. Fields that are deprived of water may suffer from boll shed, a reduction in the total number of mainstem nodes, reduced leaf size, and premature leaf senescence. Timing of the final irrigation depends on the type of irrigations system being employed. Pivot irrigation that provides one inch of water per irrigation or less should be terminated about one to two weeks after first open boll. Furrow irrigation generally supplies greater amounts of water to the crop compared to pivot irrigation. As a result, furrow irrigation should be terminated at or just prior to first boll crack. Irrigation applied later than recommended may lead to problems with boll rot and/or delayed harvest depending on weather conditions.

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