Cotton Comments

OSU Southwest Oklahoma Research and Extension Center
Altus, OK

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Crop update

The 2011 summer heat wave finally broke on September 4th, but has returned with temperatures over 100 once again. It appears Altus may yet get to 100 days of 100 degrees, but unfortunately the Grandfield area has already hit that milestone. Based on an Associated Press article, apparently Oklahoma set an all-time record for U.S. for the highest statewide average monthly temperature during the month of July with 89.1 degrees. We do have a rain chance forecast for later in the week. It has been a difficult year to say the least.

After looking at numerous fields over the last two weeks, it is evident that a considerable amount of irrigated cotton will yield less than desired. It appears to me that the "make or break" situation that occurred was whether or not there was sufficient irrigation capacity/quality to enable the crop to "canopy over" and set up a micro-climate of higher humidity during the treacherous run of July and August temperatures. There are still a few pivots running in some late planted/replanted fields. Attempting to make harvestable bolls from blooms set after September 1 in southwest Oklahoma is risky. Nearly all irrigated fields have some open cotton at this time.

Crop Insurance Boll Count Adjustment Date Passes

A significant number of surviving dryland fields with little or no yield as well as some very low yield potential irrigated fields are eligible for crop insurance adjustment. The accepted date for moving from the stand count adjustment method to the boll count method is September 15. Producers who have fought a hard battle with the elements this year should be lining up crop insurance adjusters to obtain a yield determination based on the boll count method. A large number of irrigated fields may also be lost due to low yield potential.

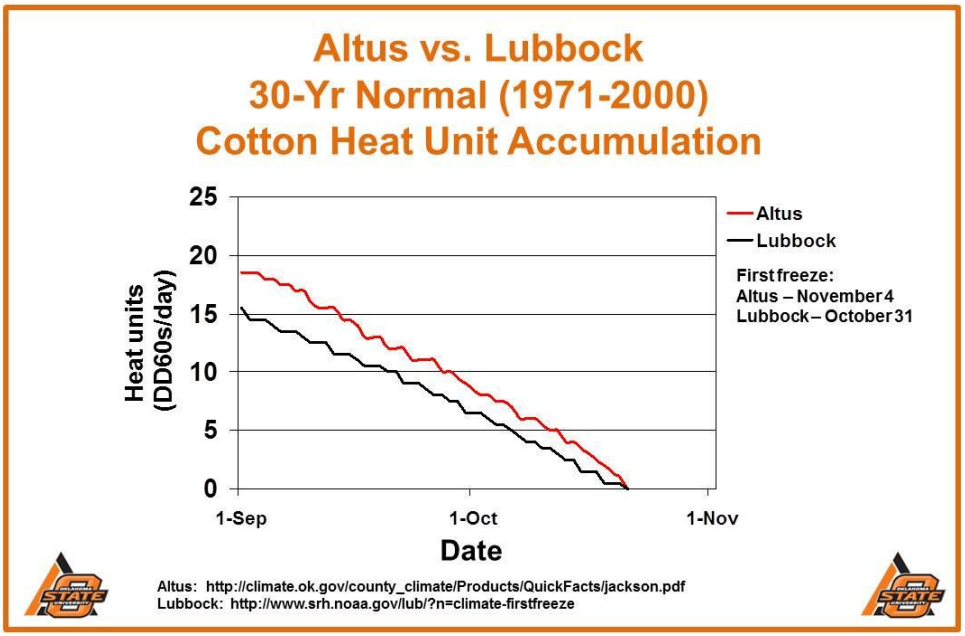
The main thing to remember from a soil stewardship perspective is to leave an acceptable amount of crop residue in the field. What this may mean is that for fields which have been released due to low yield potential, it would be a good idea to terminate this cotton with a high dose rate of paraquat or even shredding rather than running a disk for crop destruction. Any cover left will provide potential to reduce wind erosion. Hopefully it will rain soon and a cover crop can be planted.

Countdown to Harvest Aid Application

Thoughts concerning end of season management inspire me to encourage producers to consider the following. I really like to track nodes above white flower (NAWF) and the date where we reach "hard cutout." I define that as the date the crop reaches less than 4-5 followed by "blooming out the top." The COTMAN program assumes that 850 cotton heat units past blooming are necessary to produce a reasonably mature boll. This is not necessarily defined as a boll that will just open. In many years we may be able to take early September blooms and produce “open cotton” but the probability of this being “mature cotton” is severely reduced. Heat unit accumulation of 750 DD60s past bloom will probably make an "acceptable boll" that may not have "normal" lint production and may be lower quality (low micronaire). With the high value of cotton lint and seed this year, later blooms may be chased, but depending upon the weather in late September and October, these may not open, exert, or fluff properly.

The COTMAN latest possible cutout date is defined as the last date on which 850 heat units can be obtained before daily heat units diminish to zero because of cool temperatures. Long-term weather data are used to compute this and two probabilities or risk levels are provided. The first is the date at which in 85% of the years, in the long-term weather data set submitted, that 850 heat units past bloom could be obtained. The second is the date at which 850 heat units past bloom could be obtained in 50% of the years. The COTMAN team at the University of Arkansas computed the 50% probability date to be August 20th for the 1948-2007 time period. The 85% probability date for Altus was August 13th.

I can’t predict the weather, but I can look at 30-year “normals” (1971-2000). It is interesting to note that when one compares Altus to Lubbock, TX, the daily heat units beginning September 1 are lower for Lubbock (about 18.5 vs. 15.5) due to elevation differences, but both locations approach zero at about the same time around October 21. What this means is that Altus obtains more heat units/day in September and October, but both locations converge to zero on about the same date. Average first fall freeze dates are in early November, with Lubbock October 31st and Altus November 4th. With this year’s record-breaking hot weather, we may not get a freeze until after Thanksgiving. For a graph of these September and October daily heat units see below.



We have generated a table that indicates where we were as of September 12 (Table 1). It is based on actual Altus 2011 heat units from August 10, August 20, August 30, and September 7 cutout dates (possible dates on which NAWF=5 encountered) and from September 12 forward, it uses "temperature normals" (1971-2000, 30-year normal) as projections for each day.

For example, the table shows that for a field that reached cutout on August 10, that bloom should have been able to obtain 850 heat units and should have been a reasonably mature boll on September 11. Based on some irrigation termination studies funded by the COTMAN project, the possible irrigation termination date could have been around August 26. For an August 20 cutout date, September 6 could be a targeted irrigation termination date and this boll would be near harvest aid ready by October 6 if “normal” temperatures are obtained from September 12 forward. One can tell that unless we have an outstanding fall, the cotton blooms on August 30th at Altus will encounter difficulty in making a "fully mature boll" based on temperature normal. Bolls set in early September will only obtain 405 heat units through October 31, and will likely not be productive based on “normal” temperatures after September 12. Many earlier planted fields are exhibiting significant percentages of open bolls at this time, and some lower yielding cotton is being targeted for harvest aid application soon.

Table 1. DD60 heat unit events based on date of cutout (5 NAWF on a steep decline) and actual Altus August 10-September 12, 2011 temperatures with long-term average values for the remainder of the season.

DD60 heat unit accumulation	Date when crop achieved cutout (NAWF = 5)			
	August 10	August 20	August 30	September 7
+ 500? (terminate irrigation if no rainfall?)	Aug. 26?	Sept. 6	Oct. 1	N/A
+ 850 HU (mature boll)	Sept. 11	Oct. 6	N/A	N/A
Total HU through Oct. 15	1187	898	582	394
Total HU through Oct. 31	1198	909	594	405

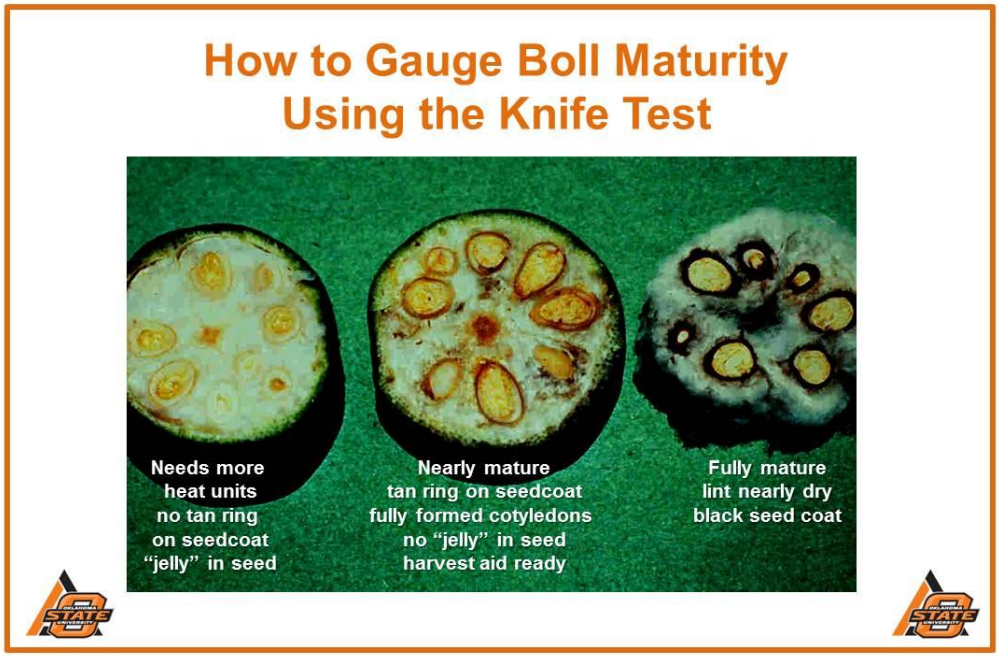
Crop Maturity Determination

Crop maturity determination is critical for a successful harvest-aid program. Premature crop termination has been shown to reduce lint yield, seed quality, micronaire, and fiber strength. Harvest-aid chemicals cannot increase the rate of fiber development. Only additional good growing weather including open skies and adequate heat units combined with functional leaves can mature cotton bolls.

3 Methods of Determining Crop Maturity:

1) Maturity can be determined by using a sharp knife to cut into the bolls. If the boll is watery or jelly like on the inside, then it is immature and needs more heat units. If boll development is such that the knife cannot slice through the lint, then the boll is nearly mature. Close inspection of the seed will give further indication of

boll maturity. If the seed coat is turning tan and the seed leaves (or cotyledons) are fully developed, the boll is mature. For an example of this, see below.



2) Percent open boll is another method that can be used to determine crop maturity. This method is fairly easily accomplished, but can have limitations. One just needs to measure off a known number of row-feet in multiple areas of the field, then begin counting open bolls and unopened or "green bolls." Track these separately. Once both types have been counted, simply add the green boll count and the open boll count to obtain the total number of bolls. After that, divide the open boll total by the total bolls and multiply times 100. This allows for a reasonable observation of percent open bolls. The limitation that occurs with this method arises when a "fruiting gap" exists in the plant. We have seen many fields that exhibit this problem this year. If bolls are present at the bottom of the plant, none in the middle, and more bolls at the top, this can give a skewed representation of the maturity of the field.

3) Nodes above cracked boll (NACB) is a tool that can be used to time harvest aid application (Figure 1). A Beltwide cotton harvest aid timing project was conducted over multiple sites and years by a team of extension personnel across the Cotton Belt (Tom Kerby, James Supak, J.C. Banks, and C.E. Snipes). It was determined that if the uppermost first position-cracked boll is within three nodes of the uppermost harvestable first position boll then no lint weight will be lost if a defoliant-type harvest aid is applied at that time (Figures 1 and 2). However, if the uppermost harvestable first position boll is four or more nodes above the uppermost first position cracked boll, then potential for some lint loss exists. The lint loss potential increases as the NACB increases. Micronaire reduction

generally follows a similar pattern when using the nodes above cracked boll criterion. When defoliant type chemicals are applied, some slight subsequent fiber development may occur before defoliation. If applying desiccants, more bolls must be mature in order to reduce the risk of fiber weight loss or reduction of micronaire, thus two to three NACB would be a better target.

Figure 1. Determining nodes above cracked boll.

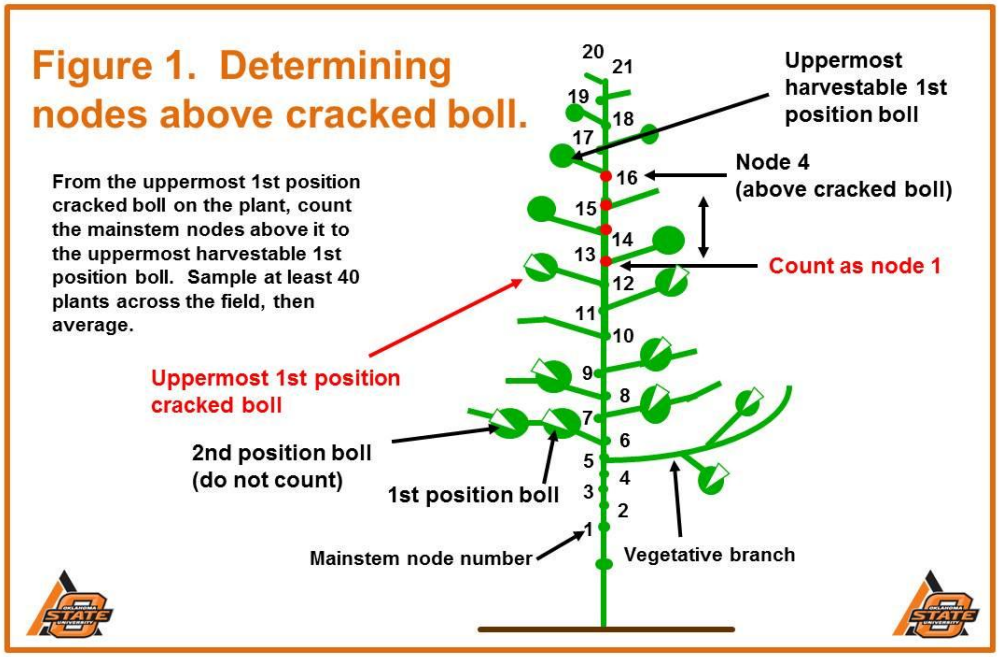
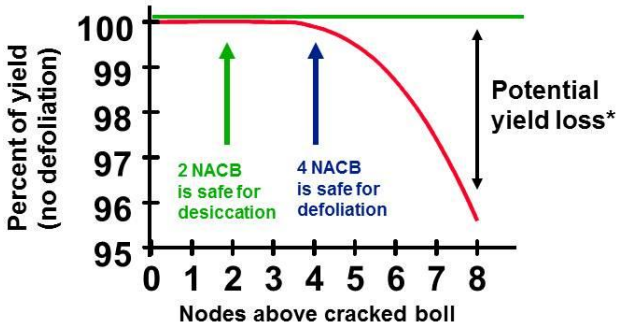


Figure 2. Potential yield loss based on NACB method.



* when desiccating, add 2 to value for NACB to determine the effect on yield (desiccation at 2 NACB=percent of yield at 4 NACB for defoliation)

When determining boll maturity of adjacent fruit, one can consider the following. When moving up the plant from a first position boll that has just cracked to a first position unopened boll on the next fruiting branch, about 60 additional heat units (DD60s) are

required to obtain similar boll maturity. If moving out from a first position boll to a second position boll on the same fruiting branch, about 120 heat units will be required to reach the same level of maturity. For an individual boll, a total of about 800-850 heat units are required after pollination to produce normal size and quality. However, bolls obtaining fewer heat units may still make productive lint of lower micronaire that may contribute to final yield.

Conditions Affecting Harvest Aid Performance

Proper harvest-aid product selection, tank-mix partners, and rates vary with environmental and crop conditions. What works best in one year is not necessarily the best for the next season. Effectiveness of harvest-aid chemicals is always a concern. Several factors affect the performance or lack of performance of harvest-aid chemicals.

These factors improve the performance of harvest-aid chemicals:

- Warm, calm, sunny weather
- Soil moisture relatively low but sufficient to maintain cotton plant in active growth condition without moisture stress
- Soil nitrogen levels relatively low
- Leaves active and uniformly expanded on plants
- Little or no secondary growth evident on plants
- Plants with a high percentage of open bolls that have shed some mature leaves

Conversely, here are some factors that negatively affect harvest-aid chemical performance:

- Applications made under cool (below 60° Fahrenheit), cloudy conditions
- Long periods of wet weather after treatment
- Plants in vegetative growth state with low fruit set
- Plants severely moisture stressed with tough, leathery leaves at time of treatment
- High soil moisture and nitrogen levels, which contribute to rank, dense foliage and delayed maturity
- Plants exhibiting secondary growth (regrowth) after a “cut-out” period
- Improper calibration of application rates and poor spray coverage

Harvest Aid Product Selection

In general, the yield and condition of the cotton crop should determine the choice of harvest-aid product. If the leaves are beginning to shed and are reddish to purple, they will more easily drop off without too much “sticking” (when leaves do not drop and are frozen on the plant). The natural process that causes leaves to drop can be stopped by stress such as a freeze or desiccant application. Also, some cotton varieties do not defoliate properly. **Increased leaf content in the harvested cotton can potentially reduce lint quality by triggering lower quality leaf grades.** Drought-stressed leaves

generally have a much thicker waxy coating, which can reduce harvest-aid performance.

Regrowth

Secondary growth (regrowth) sometimes occurs after the plants have “cut out” or stopped blooming due to drought stress or physiological maturity. If the weather is warm and rainy after an extended period of drought stress and cut out, the growth cycle can start again. You might see regrowth in the terminal and on many of the other nodes on the plant. Plants with unopened bolls or young, developing bolls are less likely to produce secondary growth. Regrowth is difficult to control because young foliage does not shed as older leaves do.

Spray Volume

Proper spray volume and coverage are also critical to the success of a harvest-aid program. Be sure to calibrate the sprayer to deliver the correct volume at the proper nozzle pressure to ensure adequate distribution and foliage penetration. **Read and follow the label directions for product use.** The harvest-aid label contains information based on many years of testing and results. Avoid applying on windy days to reduce the hazard of spray drift to non-target vegetation. Some harvest-aid chemicals are very toxic and should be properly handled and stored, especially around small children and pets.

Harvest Aid Chemical Types

Harvest-aid products are broadly classed in three categories: desiccants, defoliants, and boll openers. Some can be classed as both desiccants and defoliants depending upon the rate used.

Desiccants

Desiccants (paraquat formulations such as Gramoxone Inteon, Firestorm, Parazone and various tank-mixes with other products) dry down the plant by causing the cells to rupture. The old rule of thumb is that desiccants are normally applied when approximately 80% of the productive bolls are open, or at two to three nodes above cracked boll. Do not use paraquat-based desiccants when seedling-stage small grains or other crops are near targeted cotton fields. Paraquat drift can severely damage developing small grains grown for cover or harvest. Gramoxone Inteon, Firestorm, and Parazone are similar products that have paraquat as the active ingredient. Paraquat applications made in the late afternoon before a bright, sunny day seem to boost the effectiveness of desiccation and tend to increase regrowth control. We suggest the use of nonionic surfactant (NIS) with paraquat. Use the NIS at a minimum rate of 0.125% or 0.25% volume/volume (v/v), depending on the percent concentration of surface-active

agent (see individual product labels). You may need to increase the NIS rate to 1% v/v and spray late in the day to effectively desiccate some fields. In some years, protoporphyrinogen oxidase (PPO) inhibitor defoliant/desiccant products applied at **higher rates** work well to desiccate juvenile growth and regrowth, which is often difficult to do with paraquat. PPO inhibitor products include Aim, Blizzard, and ET. Unlike the problem with paraquat, drift from desiccant rates of PPO inhibitors should not injure small grains.

Defoliants

Defoliants cause plants to begin developing an "abscission layer," or zone of cells that eventually break down and cause leaves to separate from the stem and drop. Abscission is a natural process, but it is enhanced by the defoliant. Some defoliants are classified as hormonal, some are herbicidal, and some are mixtures of both. Hormonal defoliants work two ways: (1) they enhance production of "ethylene," a hormone that stimulates leaf abscission; or (2) they inhibit a plant's ability to transport "auxin," a plant growth hormone. Lower temperatures are more likely to reduce the effectiveness of hormonal defoliants than herbicidal defoliants. Hormonal defoliants include Dropp (thidiazuron) and related products. Because of fall temperatures, Dropp is not generally used in Oklahoma and north Texas. Herbicidal defoliants include Folex (tribufos) and related products, the PPO inhibitors (Aim, Blizzard, and ET), and low rates of paraquat or other desiccants (which at lower rates injure but do not kill the leaves). Some products may have mixtures of both hormonal and herbicidal defoliants. These products include Ginstar (thidiazuron plus diuron) and related products. To maximize leaf drop, defoliants require fairly healthy and active leaves that still function properly and are not severely drought stressed (tough and leathery). Warm air temperatures generally enhance a defoliant's effectiveness. According to the commonly used rule of thumb, defoliants can be safely applied when 50-60% of the bolls are open and the remaining bolls are mature enough to obtain a good yield. Defoliation generally causes mature bolls to open, but green, unopened bolls can still remain a challenge. Frequently, a killing freeze or a follow-up application of paraquat or other desiccant product is needed to allow stripper harvest of the crop. Defoliant rates of PPO inhibitors disrupt plant cell membranes, triggering increased ethylene production in leaves and causing abscission. Research trials indicate that the PPO-inhibitor products can be effective defoliants, as well as effective desiccants in some instances when used at higher rates. These products tend to work equally well, but some may work better under certain crop conditions. PPO inhibitors can be tank-mixed with other products such as paraquat, Folex, Ginstar, Prep, Finish 6 Pro, FirstPick, and various other ethephon-based products. We suggest the use of a crop oil concentrate (COC) for the Aim EC, Blizzard, and ET spray mixtures. See specific product labels for details. Failure to include proper adjuvants with these products will likely result in significantly reduced activity.

Boll Openers - Ethephon

Ethephon-based boll-opener products increase the rate of boll opening and defoliation to allow for more rapid harvesting of the crop. Primary ethephon materials include Prep and other related products such as Boll'd, Boll Buster, Setup, and SuperBoll. A few years ago, some enhanced boll-opener/defoliant products were marketed: Finish 6 Pro, which contains ethephon and cyclanilide; and FirstPick, which contains ethephon and urea sulfate. These products affect the natural boll-opening process, but they do not cause bolls or fiber to mature faster. Plants convert ethephon to ethylene, an aging-related hormone that speeds up abscission layer formation. Ethephon-based products usually reach a level of maximum effect within 14 days. Tank mixes of ethephon and defoliants are effective at opening bolls and dropping leaves in higher yielding cotton. Higher rates of ethephon products alone are often very effective for defoliation, but lower rates are generally effective only for boll opening. The maximum labeled rate for ethephon products is 2 pounds of active ingredient per acre. Defoliant chemicals can be tank-mixed with ethephon products to enhance defoliation.

Boll Maturity and Ethephon

Ethephon must be applied to an active plant to be effective, and temperatures generally drive its effectiveness. Ethephon product labels generally state that plants need "sufficient mature unopened bolls present to produce desired crop." Mature bolls are defined as "too hard to be dented when squeezed between the thumb and fingers, too hard to be sliced with a sharp knife, and when the seedcoat becomes light brown in color." If you apply boll-opening products when bolls are not mature enough, you will likely see reduced lint yield and micronaire. Results from several High Plains studies indicate that lint yield and micronaire reductions occurred when applications were made at 25% open bolls but not at 50% open bolls. Lint yields were reduced at least 10%, and micronaire was decreased by about 5%. When you initially apply tank mixes of boll opener and defoliant products, you often need a follow-up application of paraquat (or other product with desiccant activity) to sufficiently condition the cotton for stripper harvest, although this step adds more expense to the overall harvest-aid program. For late maturing cotton (defined as cotton still needing maturity, but the long-term average heat units have gone to zero) ethephon can be used as a conditioning treatment. Late maturing cotton will be susceptible to potential yield and quality losses if a hard freeze is encountered. An unfortunate judgment call will have to be made concerning harvest aid application 7-10 days before a freeze, not the day before a freeze is forecast. Ethephon must have at least 70 degree temperatures for several days in order to provide benefits with respect to boll opening and potential reduction of lint staining. Many times severe lint color degradation is observed after a freeze when prior to that a substantial number of unopened bolls remain in the field. Ethephon is ineffective AFTER a freeze based on the destruction of the physiological processes needed for benefit. Ethephon requires a functional plant. If a hard freeze is obtained the plant is dead. One can apply ethephon at higher rates at least 7 days prior to killing freeze date in order to get some activity, assuming 70 degree temperatures can be obtained. It should be noted that if a freeze

is not encountered, ethephon applied to immature cotton will potentially reduce yield and fiber maturity as measured by micronaire. This is one box we need to stay out of and why we encourage producers to manage for earliness. However, ultimately we are at the mercy of Mother Nature.

Cotton Incorporated Harvesting Publications

Last year, several publications were produced by Cotton Incorporated in cooperation with a team of harvest engineers and agronomists. These publications included a publication on stripper harvesting, picker harvesting and seed cotton storage (module building). There is a huge amount of relevant information in these publications and they should not be overlooked.

Click for:

Stripper Harvesting

The Spindle-Type Cotton Harvester

Seed Cotton Handling and Storage

Also, more information concerning cotton harvesting and economics of the two harvester types can be found on the Cotton Incorporated Website at:

Click here for Harvest-Systems

Quick Reference Decision Aid Tables

Many irrigated fields are moving rapidly toward sufficient maturity to allow harvest aid application soon. The question remains what to use to bring down this cotton. I've always said that there is more than one way to get cotton harvest ready. What works this year may not work next year. It is very important to learn the strengths and weaknesses of the various products. Use rates, timing, weather, crop condition, etc. are all important for a successful harvest aid program.

A decision aid-table has been generated for three projected lint yield levels (less than 500 lb/acre, 500+ lb/acre, and 1000+ lb/acre) and four scenarios (dry with temperatures less than 80 degrees 0-3 days after treatment; dry with temperatures greater than 80 degrees 0-3 after treatment; wet with temperatures less than 75 degrees 0-3 days after treatment; and late maturing). Make sure to read the footnotes at the end of the publication, as they contain important information. Some products may be more difficult to obtain in the marketplace than others, but these tables are a worthwhile general guide because so many are available. Click here for Cotton Harvest Aid Suggestion for Oklahoma.

Possible Glyphosate Resistant Palmer Pigweeds Noted in Texas High Plains

There is a possibility that the dreaded glyphosate resistant palmer amaranth (pigweed) has been found in Terry County, located in the Texas High Plains. It is still early in the science involved in the confirmation process, but it is important to raise awareness of this issue. A news release from Plains Cotton Growers, Inc. at Lubbock was distributed a few days ago and is reproduced in its entirety below.

Resistant Pigweed Possibly Found on High Plains

By Mary Jane Buerkle
September 6, 2011

Many producers are aware of the weed resistance problems that have developed across the Mid-South, but now those problems could be in our own backyard.

Dr. Wayne Keeling with Texas AgriLife Research said that their staff first was made aware of potential problems around the first of August, when experts reported a couple of fields in Terry County where Palmer amaranth, more commonly known as pigweed or carelessweed, had survived multiple glyphosate applications, possibly exhibiting resistance.

Dr. Peter Dotray, also with Texas AgriLife Research and the Department of Plant and Soil Science at Texas Tech, said he has received phone calls reporting possible resistance in the past, but other issues such as herbicide rate, carrier volume, spray coverage, weed size, and overall environmental conditions were noted as the likely cause.

Texas AgriLife Research staff collected soil samples from the areas where actively growing weeds were present and cultivated pigweed in their greenhouse. They then made glyphosate applications over a wide rate range. The weeds survived glyphosate rates equal or higher than normal use rates.

"Preliminary greenhouse results indicated that glyphosate-resistant weeds were present in these fields," Keeling said, adding that additional soil and weed seed samples have been collected for further study.

Dotray and Keeling noted that this is disturbing news for area producers, and reiterates the need to implement aggressive weed resistance management strategies, including the use of pre-plant incorporated pre-emergence and post-emergence herbicides with residual weed activity.

Keeling said producers should be proactive and closely monitor fields, destroying suspicious weeds as soon as possible.

"Get rid of what you can," Keeling said. "That will limit the production of additional resistant seed and help prevent the problem from becoming more widespread next year."

Producers who repeatedly have sprayed fields with glyphosate this season and have surviving weeds should contact Keeling or Dotray at the Texas AgriLife Research Center, (806) 746-6101. Plains Cotton Growers also will keep you updated with additional information.

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SEND US A COMMENT BY EMAIL

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