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Cotton Insights Newsletter

A service provided by Windstar, Inc. affiliated gins.

September 16, 2024

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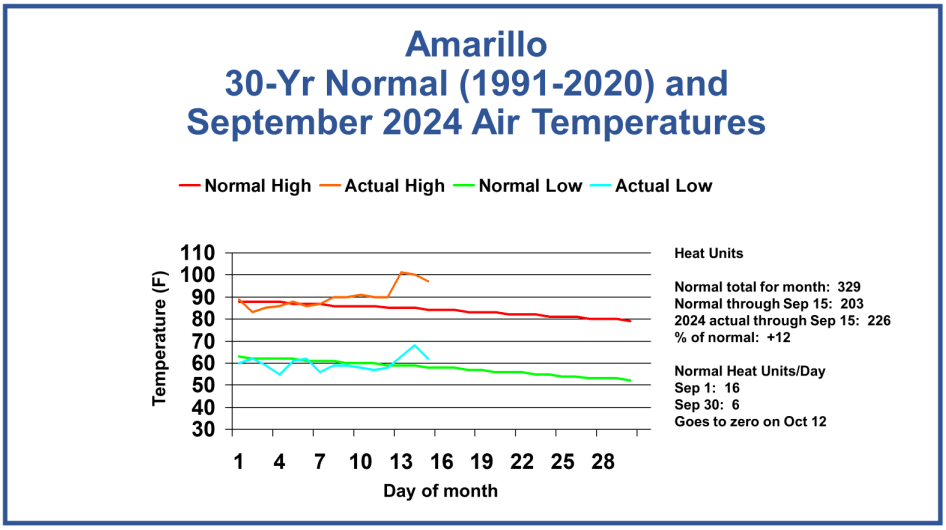
Crop Update

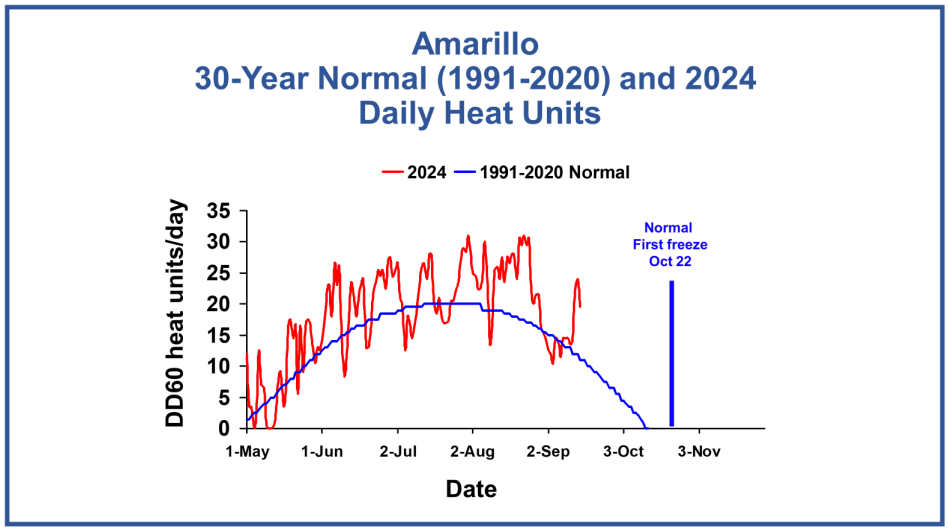
The months of July and August ended with above normal heat unit accumulation at Amarillo and generally low precipitation across the region. Thus far in September, the first 15 days were well above normal for heat unit accumulation. High temperatures around mid-month in September were above normal and low temperatures have been in the near normal range.

Current forecasts are indicating both high and low temperatures returning to near normal for the remainder of September. It appears some dryland and perhaps low capacity irrigated acres will likely fall to the boll count crop loss adjustment procedure.

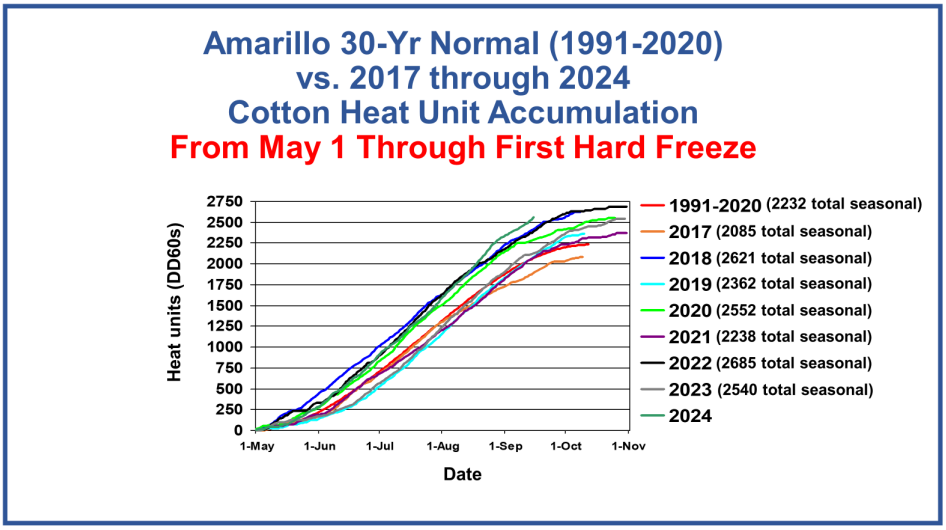


Heat Unit Update

Daily cotton heat units have generally been well above normal for August and slightly above normal for September, which has been good news, especially in well irrigated fields. The graphic below presents the daily cotton DD60 heat units from May 1 through September 15.



Amarillo's 2024 total seasonal heat unit accumulation from May 1 has recently climbed slightly above 2018 (2419) and 2022 (2388), making the 2024 growing season (as of September 15th) one of the hottest in about a decade. The seasonal total from May 1 through September 15 is about 23% above normal (2557 vs 2071). Most fields are exhibiting open bolls due to hot temperatures and lack of moisture. Forecasted temperatures should enable harvest aid products to perform well. The level of maturity is excellent across the region for fields with adequate water. Some highly stressed dryland or marginally irrigated fields may struggle with good micronaire this year. A graphic with data for several previous seasons is presented below.



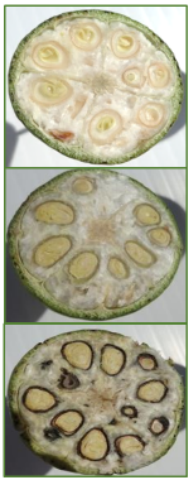
Crop Maturity Considerations

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 conditions and weather including good soil moisture, open skies and adequate heat units combined with healthy plants with functional leaves can mature cotton bolls.

Three Crop Maturity Determination Methods:

1) Knife Test

- Maturity can be determined by using a sharp knife to cut midway through the length of 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 photos of this, see below.



Requires more heat units prior to ethephon application. Ethephon will probably open this boll but it likely will not "fluff." Still has "watery" lint, and "jelly" in seed.

Fully formed seed leaves (cotyledons), no "jelly" in seed, tan seedcoat ring forming, lint stringing out. Ready for ethephon application.

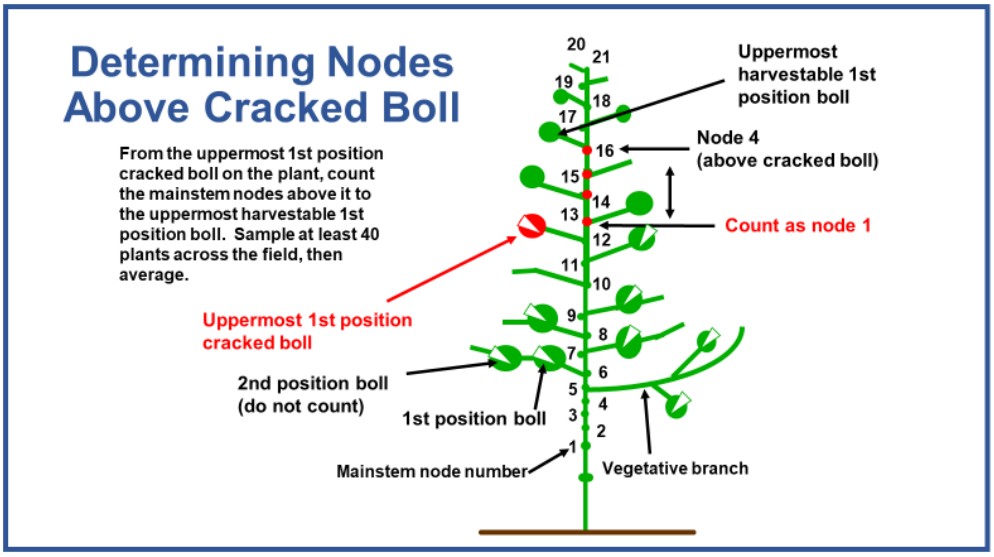
Fully mature, blackened seed coat, should open with paraquat.

2) Open boll percentage

- 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. 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

- It is important when using this method to identify the uppermost first position boll that has a likelihood of contributing to lint yield. This is a judgement call and should be supported by knife-test evaluation.
- Research 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 (see figure below).
- 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 and reduced micronaire exists. This potential increases as the NACB increases.
- If applying desiccants, more bolls must be mature in order to reduce the risk of fiber weight loss or reduction of micronaire, thus two NACB would be a better target.



- 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.

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.

1) Desiccants

- Desiccants generally are paraquat formulations and may contain various tank-mixes with other products. These 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.**
- 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). One 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, ETX, Sharpen, Reviton and others. Unlike the problem with paraquat, drift from desiccant rates of PPO inhibitors should not injure small grains.

2) 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 and LIVING process, but it is enhanced by the defoliant.
- Herbicidal defoliants include Folex (tribufos) and related products, the PPO inhibitors (e.g. Aim, ETX, Display, Reviton, and Sharpen), 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 include Ginstar (thidiazuron plus diuron and surfactants) 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 assists in opening some mature bolls, 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 thus causing abscission cells at the connection point of the leaf petiole and main stem to release. 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, ethephon, Finish 6 Pro, and various other ethephon-based products.
- It is suggested that crop oil concentrate (COC) be used for the Aim, Display and ETX spray mixtures. Sharpen has special adjuvant needs which includes methylated seed oil (MSO) and ammonium sulfate (AMS). ***See specific product labels for details. Failure to include proper adjuvants with these products will likely result in significantly reduced activity.***
- **Reviton (tiafenacil) is a recently labeled PPO inhibitor product marketed by Helm Agro. Unlike other cotton harvest aid PPO inhibitor products, Reviton has activity on grasses – so beware of direct application or drift to small grains. This product has been labeled as a preplant burndown for grasses and broadleaf weeds in multiple crops, as well as a cotton defoliant (at the 1.0 oz/acre rate) and desiccant (1.0+ oz/acre rate).**
- Current knowledge suggests the use rate is 1 oz/acre in tank mix with ethephon or at 1.5 oz/acre when used as a sequential desiccant. The actual labeled rate is 1.0 to 3.0 oz/acre when used as a cotton harvest aid (see label, page 9), not to exceed 6.0 oz/acre/year. HIGH quality methylated seed oil (MSO) is **REQUIRED** for optimum activity. Reviton has a 10 day pre-harvest interval (PHI) when used as a cotton harvest aid.
- For any questions or for more information, contact Jeremy Hawkins – Helm Agro at (806) 474-6002. To see the Reviton website, click on the following link: https://us.helmcrop.com/crop-protection/herbicides/reviton
- To see the Reviton label, click on this link: https://s3-us-west-1.amazonaws.com/agrian-cg-fs1-production/pdfs/Reviton_Label1.pdf

3) 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.
- Ethephon product labels 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."
- ***These products accelerate 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 in boll sutures between locks. To be most effective, bolls must have ethephon deposition during application.

- My experience indicates that ethephon, when applied under good temperature conditions and when given plenty of time will open nearly all bolls. This includes most immature bolls ("juicy bolls") on the plants. Smaller non-productive bolls are often shed.
- ***Ethephon must be applied to an active plant to be effective, and warm temperatures drive its effectiveness.***
- Ethephon-based products usually reach a level of maximum effect within 14 days. This response is driven by temperatures. The warmer the temperatures, the faster the response.
- 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.
- Many ethephon products are available including Boll'd, Boll Buster, Setup, SuperBoll, and others. Some enhanced boll-opener/defoliant products are available: Finish 6 Pro, which contains ethephon with a synergist called cyclanilide; and CottonQuik, which contains ethephon and urea sulfate.
- The maximum labeled rate for ethephon products is 2 pounds of active ingredient per acre, or about 42 oz/acre of 6-lb/gallon ethephon product. Defoliant chemicals can be tank-mixed with ethephon products to enhance defoliation.
- If one applies boll-opening products when bolls are not mature enough, reduced lint yield and micronaire are possible, so proper maturity determination is important.
- After applying tank mixes of boll opener and defoliant products, a follow-up application of paraquat (or other product with excellent desiccant activity) or a freeze should be obtained to sufficiently condition the cotton for stripper harvest.

When the "Clock Runs Out"

- ***Late maturing cotton*** will be susceptible to potential yield and quality losses if ***a hard freeze*** is encountered. Many times severe lint color degradation is observed after a freeze when prior to that a substantial number of unopened immature bolls remained in the field. Low micronaire is also to be expected.
- Ethephon application will not improve micronaire as it does not increase fiber maturity. It only opens bolls given appropriate temperatures and time after application.
- For late maturing cotton (defined as cotton still needing maturity, but the long-term average heat units have gone to zero) high rates of ethephon can be used as a conditioning treatment to assist with boll opening. ***Low micronaire should be expected from this treatment.***
- An unfortunate but necessary judgment call will have to be made concerning harvest aid application about 7 days before a freeze, not the day before a freeze is forecast.
- Ethephon must have at least 70 degree daytime temperatures for several days in order to provide maximum benefits with respect to boll opening and potential reduction of lint staining of unopened immature bolls which typically occurs after a hard freeze.
- Ethephon application is ineffective AFTER ***a hard killing freeze*** based on the destruction of the required ***active physiological processes*** needed for benefit. ***Ethephon requires a functional plant. If a hard killing freeze is encountered, the plant is dead.***