FIELD CHECK - *University of California Cooperative Extension*

Preparing the Cotton Crop for Harvest - 2015

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Defoliation

Although it is one of the last management decisions in the cotton production cycle, defoliation timing and application are critical to producing a profitable crop. Improper timing will compromise both cotton yield and quality. In light of the premium and discounts for fiber quality the proper use of harvest aid chemicals is of paramount importance.

Nitrogen Nutrition Effects

- Influence vegetative growth and maturity and extent of natural senescence at time of defoliation
- High nitrogen concentrations in plant tissue delay abscission zone formation in both leaf petioles and sutures in the boll walls

Crop Water Status

- Water stress at the time of defoliation tends to reduce response to harvest aids
- Wilted leaves tend to delay absorption
- Increasing water stress hastens boll opening, but sufficient moisture must remain for defoliants to activate the abscission layer

Importance of Proper Timing

- Reducing potential of sticky cotton
- Economic incentive to defoliate and harvest early
- Better weather & more hours for harvest-early
- Improper timing – reduction of fiber quality and yield
- Decisions have to be made field by field

Influence of Crop Conditions on Harvest-Aid Chemicals

Crop conditions that can impact harvest aid decisions and performance range from:
Fields with uniform and/or heavy boll load with abrupt cutout (conditions that generally make defoliation easier, with lower chemical rates and fewer total applications)
… and at the other extreme …
Late plantings and/or low boll retention, fields with rank growth in Upland and Pima varieties due to excess water and/or nitrogen combined with uneven, reduced fruit retention (in late fields, temperatures at harvest aid application timing are often lower, and the above conditions generally make defoliation more difficult, requiring multiple chemical treatments, sometimes at higher rates).

The following are guidelines based on information from multi-year field research trials:
The effectiveness of defoliation varies each season and often from field to field depending on nitrogen status of the crop, boll load, irrigation termination, temperatures, and soil types. Guidelines were developed to manage two basic scenarios: (SITUATION ONE) cotton fields with a high boll load for the size of plant and amount of leaf area, early vegetative cutout and more advanced and even boll maturation, irrigation termination and nitrogen depletion well-synchronized; and (SITUATION TWO) cotton fields with a later-maturing, more unevenly distributed boll load, large amount of leaf area for the boll load, and even some rank growth problems and more potential for regrowth. Obviously, fields

can be somewhere in between these two situations and that can require other adjustments and considerations based on current and upcoming weather conditions and past experiences with defoliation in the field.

SITUATION ONE - Factors to consider when selecting a defoliation strategy for 2013

1. Most fields we have seen have a heavy boll load, fairly abrupt vegetative cutout, and may be ready for the start of harvest aid applications while temperatures are still warm (highs >80º F).
2. Ginstar/Adios treatments usually give effective defoliation. Lower rates (4-6 oz should be effective for Acala's and 5-8 oz on Pima). Def and Folex in combination with ethephon (such as Prep, Cotton Quick, Finish or others) are effective and can be useful in helping with later-maturing bolls. It is better to start with the lowest rate of Ginstar/Adios to be effective and have to come back than to freeze the leaves due to a high rate which is more likely to occur with 90 F. plus temperatures..

- Standard rates of chlorate plus paraquat, ET, or Shark as secondary treatments are generally effective. ET or Shark should be included as part of the first and second applications for suppression of annual morningglory.

SITUATION TWO - Factors to consider when selecting a defoliation strategy for 2013

This situation described in the prior page for "Situation Two" occurs when you have multiple crop and environmental factors that can make defoliation more difficult and harvest aid chemical performance more uneven, including low bottom boll retention, rank growth in Acala or Pima, cooler temperatures at first harvest aid application, often with vigorous, late-maturing fields with smaller boll loads. In these circumstances, it is often difficult to achieve many of the conditions identified below in the table "Best Conditions for Effective Defoliation", and as the season progresses more into cooler weather periods, becomes more important to consider factors such as "minimum temperatures for optimum performance" of harvest aid chemicals shown below.

Best Conditions for Effective Defoliation

- Moderate to high air temperatures (day time - > 80 F.; night time - >60 F.).
- Relatively low plant & soil nitrogen levels.
- Soil water levels moderate (plants can't be water stressed).
- Uniform crop development; crop at cutout.
- Weeds, insect & disease – under control.
- Complete defoliant coverage – good penetration within the canopy.

Minimum temperatures for optimum performance

	Degrees F
• Sodium Chlorate	50
• Paraquat	<50
• Tribufos	55-60
• Dimethipin	55
• Ethephon	60
• Thidiazuron	65

(*Night temperatures above 60ºF are best for defoliation, below 60ºF slower defoliation)

With more vigorous plants with a high proportion of later-maturing bolls, it may be desirable to consider some different practices to improve chances for acceptable defoliation, desiccation, achieve better control of regrowth, and to improve chances of getting later-maturing bolls to open. Growers need to look at the calendar, judge the likelihood that good weather will continue, and decide which bolls they really can afford to wait for.

Under these circumstances, pre-treatments of Ginstar/Adios or ethephon can be very helpful, and typically, sequential applications will be required. The first application of these materials are applied with the goal of opening up the canopy (removing a first wave of leaves). Higher rates are typically required on second applications to defoliate or desiccate remaining leaves (and also often because temperatures have gone down by the time of later applications). A couple of strategies to consider under these conditions include:

Strategy One: UCCE studies demonstrated benefits in defoliation and boll opening by applying a pre-treatment of 4-6 oz of Ginstar/Adios at about 40 percent open boll or 6 (NACB) followed by later treatments (at 4 NACB) of: (1) Ginstar at 6-8 oz; or (2) Ginstar/Adios in combination with a boll opener material (such as Prep, Cotton Quick, Finish or others); or (3) Def/Folex plus a boll opener. Ginstar/Adios rates should be adjusted if changes in air temperatures occur at application or are anticipated in the days following application. In many cases in both Acala and Pima, a final application of sodium chlorate and Paraquat or Shark or ET will also be useful in desiccating remaining leaves and improving opening of last-remaining bolls. Applying ethephon at 6 NACB slightly reduced yield and micronaire compared to 4 NACB but may be necessary to hasten harvest.

Strategy Two: Another approach for vigorous, late-maturing cotton fields, particularly when there are concerns that the fields are just not making progress in opening up bolls, involves use of glyphosate as a pre-treatment in non RR varieties. Results showed some advantages in earlier opening of later-developing bolls with the glyphosate pre-treatments. Glyphosate should not be applied before about 8 NACB for these pre-treatments in Acala varieties, since the research showed yield losses of 5 to 12% with earlier applications at 10 NACB. Ginstar/Adios has been effective on late maturing Pima if it does not appear to be changing in maturity. If and when cotton moves closer to the 6 NACB the start with the pretreatments of Ginstar or Ginstar plus ethephon.

In making decisions regarding approaches to consider and chemicals to use, some factors to think about can be summarized in the table below.

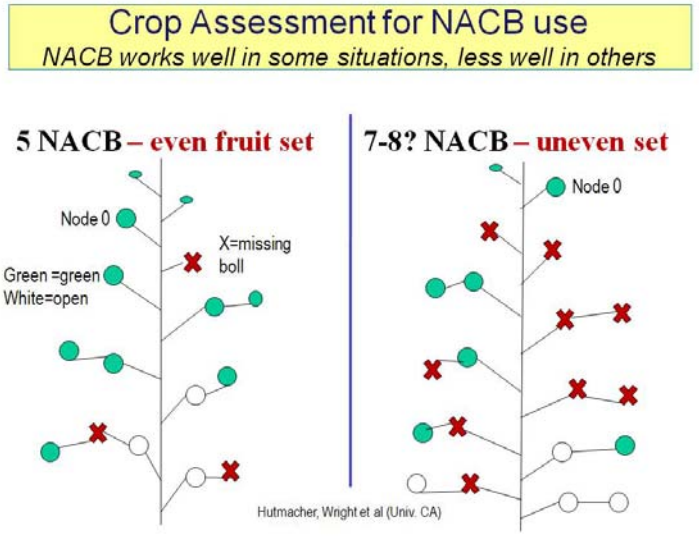
	Advantages	**Disadvantages**
Ginstar, Adios	Very effective, no odor, regrowth control	Crop rotation restrictions
Def/Folex+ ethephon	Very effective, warm & cool weather performance, whitefly control	Odor, spray restrictions
Sodium chlorate + paraquat **Shark, ET**	Less effective cheap, warm-cool weather performance Replacement for above and cheap, broadleaf control	Salts

Pay attention to the calendar, the weather, and consider how much risk you want to take in choosing a final harvest date. Consider these steps:

1. Keep an eye on predicted trends in the weather.
2. Consider your own experience with how many days of harvest will likely be needed from harvest of your first field to the last field.
3. Decide what you think is the last harvest date you consider to be an acceptable risk.

4. Count back about 21-28 days from those desired harvest dates, and start with your defoliation program on those dates no matter what maturity stage (what NACB) the crop is in.

University Acala and Upland cotton defoliation trials in the 1980's and 1990's suggest that, on the average, defoliations initiated at 8 NACB could result in yield losses of about 5% when compared with initiation at 4 NACB, while those initiated at 6 NACB would reduce yields 2 to 3%. However, those same studies acknowledged that when a very large percentage of the total crop consists of bolls on the upper 6 to 9 fruiting branches, losses from early defoliant applications can be substantially more (over 10%). Particularly under circumstances of mostly a mid-canopy and top-crop, the closer you can get to 4 to 6 NACB prior to first defoliant application, the lower the yield loss.



NACB Technique Defoliation Timing

- When plants on average area at 3 Nodes Above Cracked Boll (Pima)
- When plants on average are at 4 Nodes Above Cracked Boll (Upland)

Harvest Aid Considerations for White Fly, Vigorous, Late- Maturing or Fields in SJV

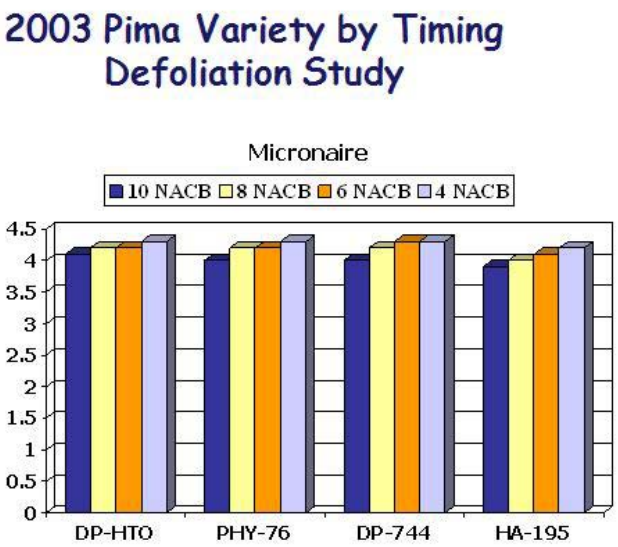
In a year like this one, with some repeated observations of persistent late season silverleaf whitefly in some areas, there may be advantages to stepping up the timing of harvest aid application timing to start the process of removing leaves that encourage continuing populations of whitefly and perhaps aphids. If you are not likely to gain a large amount of yield waiting for very late bolls on the plants, the advantages of limiting whitefly populations and sticky cotton potential likely outweighs the value of yield gains. Approaches to consider could include:

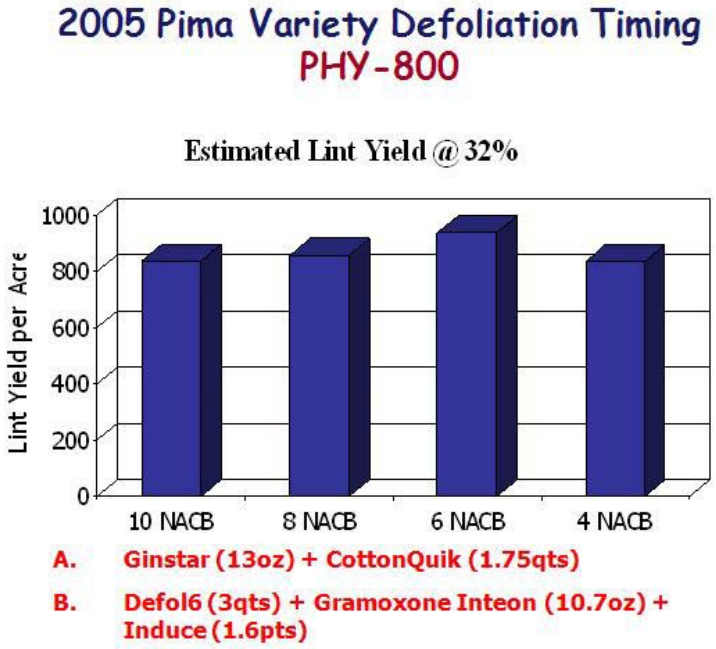
A. Treatments starting at 6 NACB (40% OB) as a pre-treatment of 3-6 oz of Ginstar/Adios treatments or 3-6 oz of Ginstar, Adios treatments plus a boll opener (more aggressive) Start even at 8 NACB in Pima. You may need to go even earlier on Pima if the crop is not maturing due to cold weather.

B. Treatments starting at 3-4 NACB (50-65% OB) with Ginstar, Adios at 5-10 oz; in combination with a boll opener material (such as Prep, Cotton Quick, Finish); or Def/Folex or ET, Shark, plus a boll opener or Sodium Chlorate plus paraquat. Some studies have shown whitefly populations reduced even more with use of Def/Folex instead of other materials.

C. In many cases in both Acala & Pima, a final app. of chlorate & Paraquat, Shark, or ET will also be useful in desiccating remaining leaves & improving opening of last-remaining bolls. Shark or ET app. will also help dry remaining broadleaf weeds.

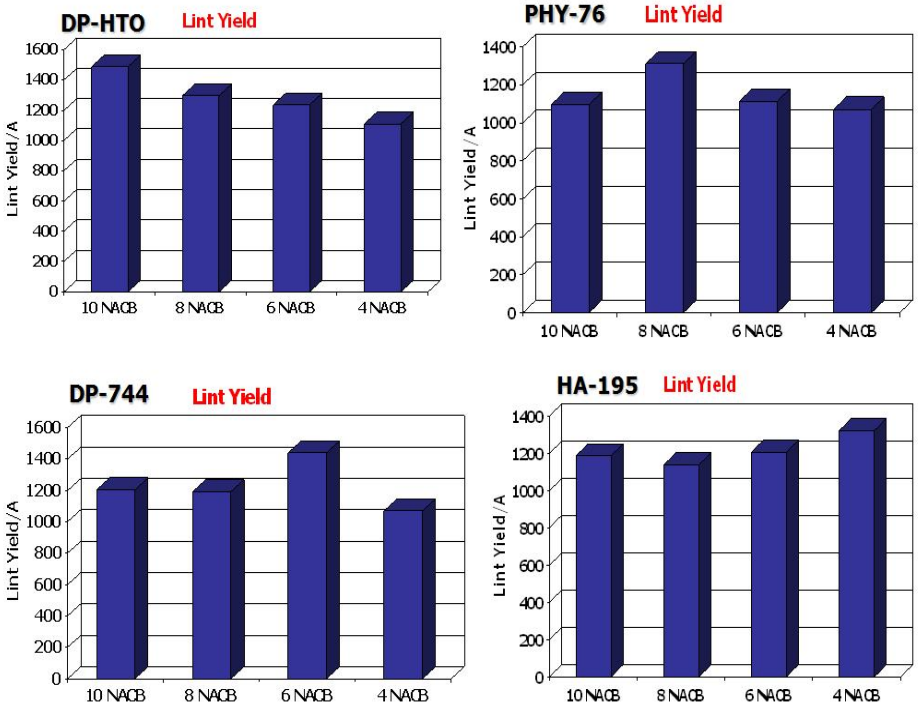
The following are UCCE studies conducted on Pima and Acala from 2003 to 2010 demonstrating yield and quality responses to different timings and varieties. Pima studies with Phytogen 800 in 2011 and 2012 demonstrated similar results with a slight yield and micronaire reduction with applications starting at 6-8 NACB however this may need to be done on some fields to get the crop off ahead of poor weather conditions.





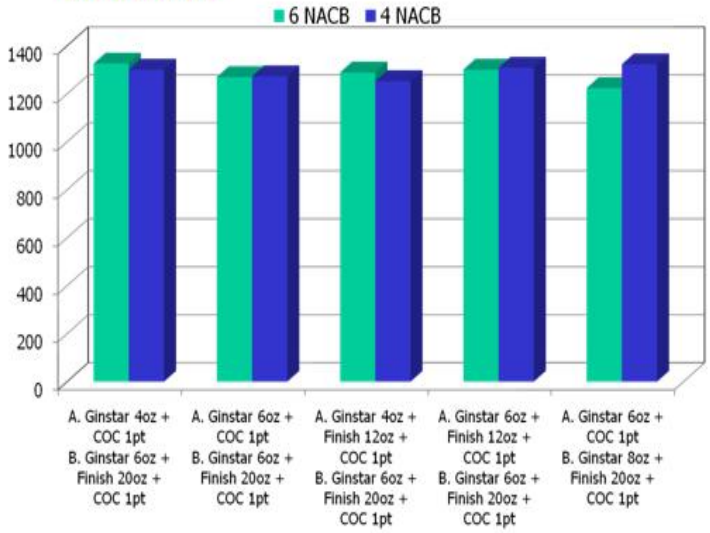
Varieties/Def. Pima Timing Studies-2003, 2004 2 locations
1 Def. Timing Study, PHY-76 2003, 2005

2003 Pima Variety by Timing Defoliation Study

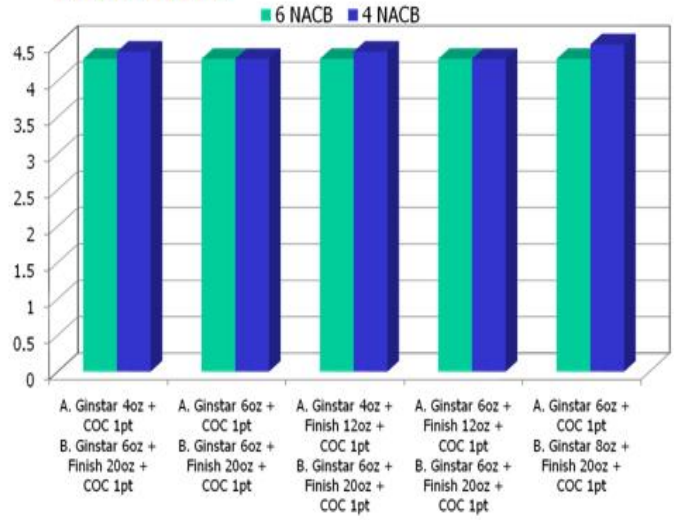


2008 Acala Defoliation – Ginstar Pretreatment Approach

Lint Yield

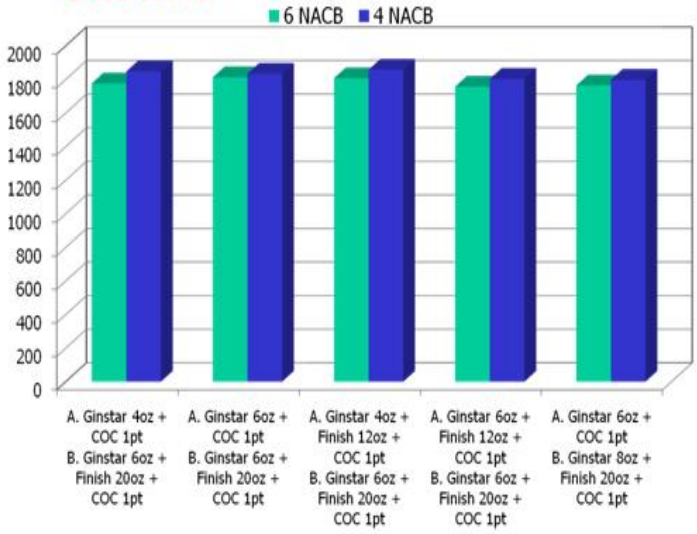


Micronaire

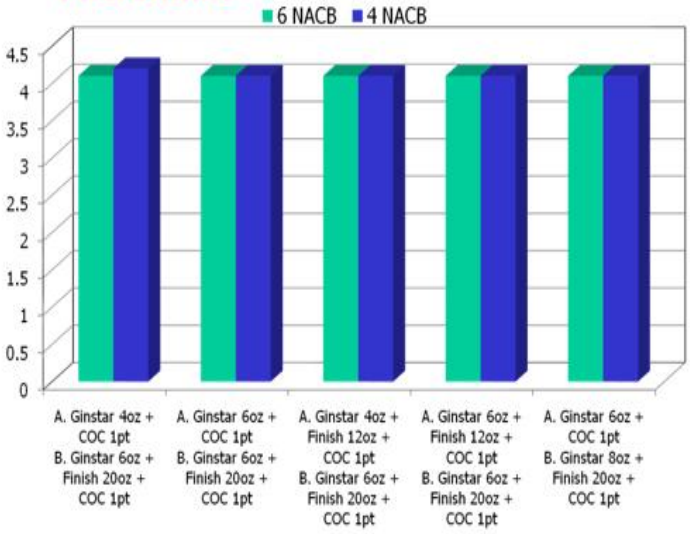


2009 Acala Defoliation – Ginstar Pretreatment Approach

Lint Yield



Micronaire



Ginstar (2 Step Approach) Pima Study
DP-340
UCCE – WSREC

Treatments	Rates/A	2009 Lint Yield lbs/A 6 NACB	2009 Lint Yield lbs/A 4 NACB	2009 Micronaire 6 NACB	2009 Micronaire 4 NACB	2010 Lint Yield lbs/A 6 NACB	2010 Lint Yield lbs/A 4 NACB	2010 Micronaire 6 NACB	2010 Micronaire 4 NACB
1. Ginstar + Finish + Agridex	6 oz + 12 oz + 1 pt	1635	1610	4.0	4.0	1177	1201	3.8	4.0
B. Ginstar + Finish + Agridex	8 oz + 20 oz + 1 pt								
2. Ginstar + Finish + Agridex	6 oz + 12 oz + 1 pt	1601	1633	4.0	3.9	1269	1274	3.8	4.2
B. Ginstar + Finish + Agridex	10 oz + 20 oz + 1 pt								
3. Ginstar + Agridex	6 oz + 1 pt	1616	1658	4.0	4.0	1224	1080	3.8	4.2
B. Ginstar + Finish + Agridex	8 oz + 20 oz + 1 pt								
4. Untreated		1610		4.1		891		4.3	

Ginstar (2 Step Approach) Pima Study
PHY-802RF
UCCE – WSREC

Treatments	Rates/A	2011 Lint Yield (lbs/A) 6 NACB	2011 Lint Yield (lbs/A) 4 NACB	2011 Micronaire 6 NACB	2011 Micronaire 4 NACB	2012 Lint Yield (lbs/A) 6 NACB	2012 Lint Yield (lbs/A) 4 NACB	2012 Micronaire 6 NACB	2012 Micronaire 4 NACB
1. Ginstar + Finish + Agridex	4 fl oz + 12 fl oz + 1 pt	1694	1720	4.0	4.2	1959	1983	3.6	3.6
B. Ginstar + Finish + Agridex	8 fl oz + 20 fl oz + 1 pt								
2. Ginstar + Finish + Agridex	4 fl oz + 12 fl oz + 1 pt	1723	1651	4.1	4.2	1857	1949	3.7	3.7
B. Ginstar + Finish + Agridex	10 fl oz + 20 fl oz + 1 pt								
3. Ginstar + Finish + Agridex	6 fl oz + 12 fl oz + 1 pt	1653	1691	3.9	4.1	1861	1910	3.7	3.7
B. Ginstar + Finish + Agridex	8 fl oz + 20 fl oz + 1 pt								
4. Ginstar + Finish + Agridex	6 fl oz + 12 fl oz + 1 pt	1680	1721	4.0	4.0	1922	1882	3.6	3.7
B. Ginstar + Finish + Agridex	10 fl oz + 20 fl oz + 1 pt								
5. Ginstar + Agridex	6 fl oz + 1 pt	1594	1708	3.9	4.0	1874	1914	3.6	3.7
B. Ginstar + Finish + Agridex	8 fl oz + 20 fl oz + 1 pt								
6. Untreated		1633		4.3		1866		3.7	