Impact of Early Defoliation on California Cotton

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Abstract

The objectives were to evaluate the impacts of the rate and timing of early applications compared to later standard timings of Ginstar (*thidiazuron + diuron*) or Ginstar plus Finish (*ethephon + cyclanilide*) on defoliation, desiccation, open boll, yield, and fiber quality.

Acala:

Results in 2006/2007 demonstrated that early applications of harvest aides gave improved defoliation, desiccation, and open boll. In 2008 and 2009, Ginstar and Finish applied at rates of 4-6 oz/acre and 12 oz/acre respectively, at the 4 nodes above cracked boll (NACB) stage, followed by a 2nd treatment at 6-8 oz/acre and 20 oz/acre, resulted in significantly greater defoliation and desiccation, and improved open boll percentages when compared to similar treatments with an earlier application beginning at the 6 NACB stage. There were no significant lint yield or micronaire differences between treatments initiated at 6 or 4 NACB.

Pima:

There was no significant difference between treatments initiated at 6-8 or 4-5 NACB for defoliation, desiccation, open boll, lint yield , or micronaire in 2009/2010. In 2010, micronaire was reduced with early treatments.

Introduction

Defoliation is an integral pre-harvest step in Acala and Pima cotton (*Gossypium hirsutum; Gossypium barbadense*) production. Improper defoliation timing will compromise both cotton yield and quality. Optimal timing for defoliant application varies with each year, depending on weather, crop maturity, plant vigor, soil type, cotton market value, cultivar, and input costs . A well-timed and effective defoliation can be beneficial to growers in many ways; for example, applying defoliants early will advance the start of harvest and reduce the duration of exposure of plants to late season Silverleaf Whitefly (*Bermisa argentifiolii*), and Cotton aphid (*Aphis gossypii*) infestations. Defoliants are also much more effective while temperatures are still warm (>80°F) and an earlier defoliation can avoid the adverse conditions later in the season that can impact harvest efficacy and delay harvests. Generally, recommendations are that the first applications of harvest aid chemicals should be made when the majority of the field has reached 60 to 65 percent open bolls, or at about 4 NACB. Often, there are situations where using a calendar approach to defoliation timing is more appropriate to complete harvest before fall rain or fog conditions occur.

Materials and Methods

Studies were conducted at the West Side Research Center in Five Points, CA. Applications were made to Acala Roundup Ready Flex Phytogen 725RF and to Pima Delta Pine 340 and Roundup Ready Flex Phytogen 8002RF. A randomized complete block with four replications was used with plots of four 40 inch rows and 65 feet long. Treatments were applied using a high clearance sprayer with speed of 4 mph, flat fan broadcast nozzles (8002) at 15 gpa and 40 psi.

Acala:

In 2008, the 1st application for the 6 NACB was applied on Oct. 7th with a temperature of 75ºF. The 2nd application for the 6 NACB was applied on Oct. 16th with a temperature of 75ºF. The 1st application for the 4 NACB was applied on Oct. 14th with a temperature of 82ºF. The 2nd application for the 4 NACB was applied on Oct. 23rd with a temperature of 82ºF. The field had extreme lygus bug pressure throughout the season (10-30 per 50 sweeps). Pix treatments were applied two times at maximum rates and the field was deficit irrigated to manage growth (5 weeks between irrigations).

In 2009, the 1st application for the 6 NACB was applied on Sep. 10th with a temperature of 87ºF. The 2nd application for the 6 NACB was applied on Sep. 22nd with a temperature of 84ºF. The 1st application for the 4 NACB was applied on Sep. 15th with a temperature of 81ºF. The 2nd application for the 4 NACB was applied on Sep. 24th with a temperature of 84ºF. Evaluations were made on 7 days intervals.

Pima:

In 2009, the 1st application for the 6-8 NACB was applied on Sep. 22nd with a temperature of 84ºF. The 2nd application for the 6-8 NACB was applied on Oct. 1st with a temperature of 77ºF. The 1st application for the 4-5 NACB was applied on Oct. 6th with a temperature of 75ºF. The 2nd application for the 4-5 NACB was applied on Oct. 13th with a temperature of 78ºF.

In 2010, the 1st application for the 6-8 NACB was applied on Oct. 13th with a temperature of 78ºF. The 2nd application for the 6-8 NACB was applied on Oct. 19th with a temperature of 80ºF. The 1st application for the 4-5 NACB was applied on Oct. 21st with a temperature of 78ºF. The 2nd application for the 4-5 NACB was applied on Oct. 26th with a temperature of 75ºF.

In 2011, the 1st application for the 6-8 NACB was applied on Oct. 3rd with a temperature of 74ºF. The 2nd application for the 6-8 NACB was applied on Oct. 13th with a temperature of 83ºF. The 1st application for the 4-5 NACB was applied on Oct. 17th with a temperature of 78ºF. The 2nd application for the 4-5 NACB was applied on Oct. 27th with a temperature of 57ºF.

Fig. 1: 1st application to Pima (DP 340) on Oct. 13, 2010.

Fig. 2: Harvest of Acala (Phy 725RF) treatments

Table 1: Pretreatment Approach in Acala (PHY-725RF)

Acala Cotton								
			21 DAT					
			Defoliation		Desiccation		Open Boll	
Treatments	Rates/A	Timing	2008	2009	2008	2009	2008	2009
1. Ginstar + Agridex	4 oz + 1 pt	6 NACB	50	73	66	53	80	88
B. Ginstar + Finish + Agridex	6 oz + 20 oz + 1 pt							
2. Ginstar + Agridex	6 oz + 1 pt	6 NACB	53	76	68	53	79	87
B. Ginstar + Finish + Agridex	6 oz + 20 oz + 1 pt							
3. Ginstar + Finish + Agridex	4 oz + 12 oz + 1 pt	6 NACB	58	84	59	59	81	90
B. Ginstar + Finish + Agridex	6 oz + 20 oz + 1 pt							
4. Ginstar + Finish + Agridex	6 oz + 12 oz + 1 pt	6 NACB	55	81	61	60	85	90
B. Ginstar + Finish + Agridex	6 oz + 20 oz + 1 pt							
5. Ginstar + Agridex	6 oz + 1 pt	6 NACB	65	76	53	53	80	88
B. Ginstar + Finish + Agridex	8 oz + 20 oz + 1 pt							
6. Ginstar + Agridex	4 oz + 1 pt	4 NACB	71	90	60	69	93	93
B. Ginstar + Finish + Agridex	6 oz + 20 oz + 1 pt							
7. Ginstar + Agridex	6 oz + 1 pt	4 NACB	68	86	71	35	89	95
B. Ginstar + Finish + Agridex	6 oz + 20 oz + 1 pt							
8. Ginstar + Finish + Agridex	4 oz + 12 oz + 1 pt	4 NACB	71	91	66	63	93	93
B. Ginstar + Finish + Agridex	6 oz + 20 oz + 1 pt							
9. Ginstar + Finish + Agridex	6 oz + 12 oz + 1 pt	4 NACB	73	95	61	63	91	94
B. Ginstar + Finish + Agridex	6 oz + 20 oz + 1 pt							
10. Ginstar + Agridex	6 oz + 1 pt	4 NACB	71	90	66	85	90	89
B. Ginstar + Finish + Agridex	8 oz + 20 oz + 1 pt							
11. Untreated	-----		28	31	11	10	73	89

Table 2: Pretreatment Approach in Acala (PHY-725RF)

Acala Cotton						
			Lint Yield (lbs/acre)		Micronaire	
Treatments	Rates/A	Timing	2008	2009	2008	2009
1. Ginstar + Agridex	4 oz + 1 pt	6 NACB	1326	1776	4.3	4.1
B. Ginstar + Finish + Agridex	6 oz + 20 oz + 1 pt					
2. Ginstar + Agridex	6 oz + 1 pt	6 NACB	1271	1813	4.3	4.1
B. Ginstar + Finish + Agridex	6 oz + 20 oz + 1 pt					
3. Ginstar + Finish + Agridex	4 oz + 12 oz + 1 pt	6 NACB	1289	1807	4.3	4.1
B. Ginstar + Finish + Agridex	6 oz + 20 oz + 1 pt					
4. Ginstar + Finish + Agridex	6 oz + 12 oz + 1 pt	6 NACB	1301	1756	4.3	4.1
B. Ginstar + Finish + Agridex	6 oz + 20 oz + 1 pt					
5. Ginstar + Agridex	6 oz + 1 pt	6 NACB	1225	1764	4.3	4.1
B. Ginstar + Finish + Agridex	8 oz + 20 oz + 1 pt					
6. Ginstar + Agridex	4 oz + 1 pt	4 NACB	1301	1848	4.4	4.2
B. Ginstar + Finish + Agridex	6 oz + 20 oz + 1 pt					
7. Ginstar + Agridex	6 oz + 1 pt	4 NACB	1274	1834	4.3	4.1
B. Ginstar + Finish + Agridex	6 oz + 20 oz + 1 pt					
8. Ginstar + Finish + Agridex	4 oz + 12 oz + 1 pt	4 NACB	1254	1858	4.4	4.1
B. Ginstar + Finish + Agridex	6 oz + 20 oz + 1 pt					
9. Ginstar + Finish + Agridex	6 oz + 12 oz + 1 pt	4 NACB	1310	1803	4.3	4.1
B. Ginstar + Finish + Agridex	6 oz + 20 oz + 1 pt					
10. Ginstar + Agridex	6 oz + 1 pt	4 NACB	1323	1798	4.5	4.1
B. Ginstar + Finish + Agridex	8 oz + 20 oz + 1 pt					
11. Untreated	-----		1110	1665	4.5	4.3
LSD (0.05)			NS	NS	NS	0.14
% CV			7.35	4.45	3.07	2.30

Table 3: Pretreatment Approach in Pima (DP340 2009/2010) (PHY-8002RF 2011)

Pima Cotton										
			21 DAT							
			Defoliation			Desiccation			Open Boll	
Treatments	Rates/A	Timing	2009	2010	2011	2009	2010	2011	2009	2010	2011
1. Ginstar + Finish + Agridex	4 fl oz + 12 fl oz + 1 pt	6-8 NACB	90	84	80	69	89	59	90	94	90
B. Ginstar + Finish + Agridex	8 fl oz + 20 fl oz + 1 pt										
2. Ginstar + Finish + Agridex	4 fl oz + 12 fl oz + 1 pt	6-8 NACB	93	84	80	69	84	63	89	87	90
B. Ginstar + Finish + Agridex	10 fl oz + 20 fl oz + 1 pt										
3. Ginstar + Finish + Agridex	6 fl oz + 12 fl oz + 1 pt	6-8 NACB	90	84	80	73	89	63	90	94	90
B. Ginstar + Finish + Agridex	8 fl oz + 20 fl oz + 1 pt										
4. Ginstar + Finish + Agridex	6 fl oz + 12 fl oz + 1 pt	6-8 NACB	91	84	80	68	88	59	89	90	90
B. Ginstar + Finish + Agridex	10 fl oz + 20 fl oz + 1 pt										
5. Ginstar + Agridex	6 fl oz + 1 pt	6-8 NACB	89	84	80	65	93	66	86	91	91
B. Ginstar + Finish + Agridex	8 fl oz + 20 fl oz + 1 pt										
6. Ginstar + Finish + Agridex	6 fl oz + 12 fl oz + 1 pt	4-5 NACB	88	81	86	60	85	75	88	93	92
B. Ginstar + Finish + Agridex	8 fl oz + 20 fl oz + 1 pt										
7. Ginstar + Finish + Agridex	6 fl oz + 12 fl oz + 1 pt	4-5 NACB	88	81	86	55	86	75	88	94	93
B. Ginstar + Finish + Agridex	10 fl oz + 20 fl oz + 1 pt										
8. Ginstar + Agridex	6 fl oz + 1 pt	4-5 NACB	81	80	85	55	83	75	84	88	92
B. Ginstar + Finish + Agridex	8 fl oz + 20 fl oz + 1 pt										
9. Untreated			55	44	70	25	6	24	89	77	85

Table 4: Pretreatment Approach in Pima (DP340 2009/2010) (PHY-8002RF 2011)

Pima Cotton							
			Lint Yield (lbs/acre)			Micronaire	
Treatments	Rates/A	Timing	2009	2010	2011	2009	2010
1. Ginstar + Finish + Agridex	4 fl oz + 12 fl oz + 1 pt	6-8 NACB	1645	1301	1690	4.0	3.8
B. Ginstar + Finish + Agridex	8 fl oz + 20 fl oz + 1 pt						
2. Ginstar + Finish + Agridex	4 fl oz + 12 fl oz + 1 pt	6-8 NACB	1584	1198	1711	4.0	3.9
B. Ginstar + Finish + Agridex	10 fl oz + 20 fl oz + 1 pt						
3. Ginstar + Finish + Agridex	6 fl oz + 12 fl oz + 1 pt	6-8 NACB	1635	1306	1593	4.0	3.8
B. Ginstar + Finish + Agridex	8 fl oz + 20 fl oz + 1 pt						
4. Ginstar + Finish + Agridex	6 fl oz + 12 fl oz + 1 pt	6-8 NACB	1601	1269	1646	4.0	3.8
B. Ginstar + Finish + Agridex	10 fl oz + 20 fl oz + 1 pt						
5. Ginstar + Agridex	6 fl oz + 1 pt	6-8 NACB	1616	1224	1579	4.0	3.8
B. Ginstar + Finish + Agridex	8 fl oz + 20 fl oz + 1 pt						
6. Ginstar + Finish + Agridex	6 fl oz + 12 fl oz + 1 pt	4-5 NACB	1610	1455	1673	4.0	4.0
B. Ginstar + Finish + Agridex	8 fl oz + 20 fl oz + 1 pt						
7. Ginstar + Finish + Agridex	6 fl oz + 12 fl oz + 1 pt	4-5 NACB	1633	1274	1704	3.9	4.2
B. Ginstar + Finish + Agridex	10 fl oz + 20 fl oz + 1 pt						
8. Ginstar + Agridex	6 fl oz + 1 pt	4-5 NACB	1658	1080	1711	4.0	4.2
B. Ginstar + Finish + Agridex	8 fl oz + 20 fl oz + 1 pt						
9. Untreated			1610	891	1667	4.1	4.3
LSD (0.05)			NS	NS	NS	NS	0.2
% CV			5.11	17.76	4.29	2.79	3.43

Fig. 3: Early Acala defoliation (6 NACB) compared to the (4 NACB) plots on Sept. 17. 2007

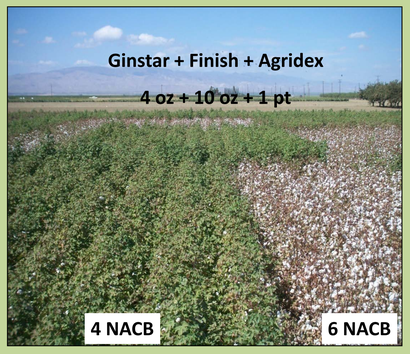
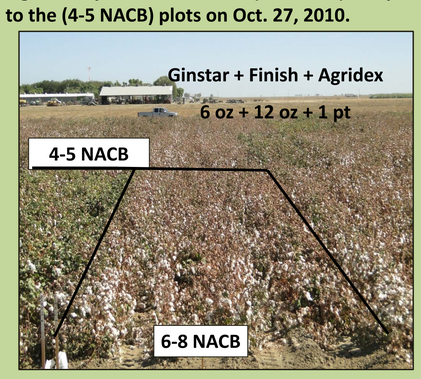


Fig. 4: Early Pima defoliation (6-8 NACB) compared to the (4-5 NACB) plots on Oct. 27, 2010.



Summary

- **Acala:** Ginstar and Finish applications at the 4 NACB stage, followed by a 2nd treatment, resulted in significantly greater defoliation and desiccation, and improved open boll when compared to similar treatments with an earlier application beginning at the 6 NACB stage. There were no significant lint yield or micronaire differences between treatments at 6 or 4 NACB. These results were contrary to our previous studies conducted in 2006/2007 where the 6 NACB application improved boll opening bringing about an earlier harvest.
- **Pima:** There was no significant difference between treatments initiated at 6-8 or 4-5 NACB for defoliation, desiccation, open boll, lint yield, or micronaire in 2009/2010. In 2010, micronaire was reduced with early treatments.
- Often, there are situations where using a calendar approach to defoliation timing is most appropriate to complete harvest before fall rain or fog conditions occur, especially during short growing seasons.