

## APPENDIX IX

### COTTON DEFOLIATION/HARVEST AID OPTIONS

Steven M. Brown, Extension Agronomist-Cotton  
A. Stanley Culpepper, Extension Agronomist-Weed Science

The following recommendations are guidelines for harvest aid application. Rates indicated are amount per acre. Specific rates should be adjusted according to temperature, humidity, day-length, plant leaf condition and maturity, expected weather, and desired effects such as defoliation, regrowth control, boll opening and/or weed control. Defoliant should be applied in a minimum spray volume of 5 gal/A by air and 10 gal/A by ground. Fields should fit into one of the following categories based on Temperature and Harvest Aid Function.

- I. EARLY SEASON (highs 90°F plus, lows 70°F plus)
- Defoliation Only [combinations provide more consistent defoliation than a single product - see E9-E12 and E16-E22]
- E1. DEF/Folex @ 1.5 pt (reduce to 1.25 pt if above 94°F)
  - E2. Aim EC @ 0.75 to 1 oz + NIS @ 0.25% v/v
  - E3. ET @ 1.5 oz + crop oil @ 0.5% v/v
  - E4. Harvade @ 8 oz + 1 pt crop oil
  - E5. Resource @ 4 to 8 oz + crop oil @ 1 pt - limited data, use precaution
  - E6. Blizzard @ 0.5 to 0.6 oz + crop oil @ 1 pt - limited data, use precaution
  - E7. Sodium Chlorate @ 3 lb (mature foliage only; do not mix with DEF/Folex or ethephon<sup>4</sup>)
- Regrowth control and defoliation [combinations provide more consistent defoliation than a single product]
- E8. Dropp<sup>1</sup>/Free Fall/Thidiazuron/Klean-Pik SC/50W @ 3.2 oz / 0.2 lb (for maximum regrowth control)
  - E9. Dropp<sup>1</sup>/Free Fall/Thidiazuron/Klean-Pik SC/50W @ 1.6 oz / 0.1 lb (for minimum regrowth control) + DEF/Folex @ 1 pt
  - E10. Dropp<sup>1</sup>/Free Fall/Thidiazuron/Klean-Pik SC/50W @ 2.0 oz / 0.125 lb (for good regrowth control) DEF/Folex @ 8 to 12 oz
  - E11. Dropp<sup>1</sup>/Free Fall/Thidiazuron/Klean-Pik SC/50W @ 2.5 oz / 0.15 lb (for superior regrowth control) DEF/Folex @ 4 to 6 oz
  - E12. Dropp<sup>1</sup>/Free Fall/Thidiazuron/Klean-Pik SC/50W @ 1.6 to 2.5 oz / 0.1 to 0.15 lb + (one of the following)
    - > Aim EC @ 0.75 to 1 oz + NIS @ 0.25% v/v
    - > ET @ 1.5 oz + crop oil @ 0.5% v/v
    - > Harvade @ 8 oz + 1 pt crop oil
    - > Resource @ 4 to 8 oz + crop oil @ 1 pt - limited data, use precaution
    - > Blizzard @ 0.5 to 0.6 oz + crop oil @ 1 pt - limited data, use precaution
- E13. Ginstar<sup>2</sup> @ 6.4 to 8 oz
- E14. glyphosate<sup>3</sup> @ 1.2 to 2 pt + (one of the following)
  - > DEF/Folex @ 1 pt
  - > Harvade @ 8 oz + 1 pt crop oil
- Boll opening and defoliation [combinations provide more consistent defoliation than a single product]
- E15. ethephon<sup>4</sup> @ 2.0 to 2.67 pt
  - E16. ethephon<sup>4</sup> @ 1.33 to 1.5 pt + (one of the following)
    - > DEF/Folex @ 1 to 1.25 pt
    - > Dropp<sup>1</sup>/Free Fall/Thidiazuron/Klean-Pik SC/50W @ 1.6 oz / 0.1 lb
    - > Ginstar<sup>2</sup> @ 4 to 6 oz
    - > Harvade @ 8 oz + 1 pt crop oil
    - > Aim EC @ 0.75 to 1 oz + NIS @ 0.25% v/v
    - > ET @ 1.5 oz + crop oil @ 0.5% v/v
    - > Resource @ 4 to 8 oz + crop oil @ 1 pt - limited data, use precaution
    - > Blizzard @ 0.5 to 0.6 oz + crop oil @ 1 pt - limited data, use precaution
  - E17. FirstPick<sup>5</sup> @ 1.75 to 2 qt + (one of the following)
    - > DEF/Folex @ 4 to 6 oz
    - > Dropp<sup>1</sup>/Free Fall/Thidiazuron/Klean-Pik SC/50W @ 1.6 oz / 0.1 lb
    - > Ginstar<sup>2</sup> @ 4 to 6 oz
    - > Harvade @ 8 oz + 1 pt crop oil
    - > Aim EC @ 0.75 to 1 oz
    - > ET @ 1.5 oz
    - > Resource @ 4 to 8 oz + crop oil @ 1 pt - limited data, use precaution
    - > Blizzard @ 0.5 to 0.6 oz + crop oil @ 1 pt - limited data, use precaution
  - E18. Finish 6 Pro @ 1.33 pt + (one of the following)
    - > DEF/Folex 4 to 6 oz
    - > Dropp<sup>1</sup>/Free Fall/Thidiazuron/Klean-Pik SC/50W @ 1.6 oz / 0.1 lb
    - > Ginstar<sup>2</sup> @ 4 to 6 oz
    - > Harvade @ 8 oz + 1 pt crop oil
    - > Aim EC @ 0.75 to 1 oz + NIS @ 0.25% v/v
    - > ET @ 1.5 oz + crop oil @ 0.5% v/v
    - > Resource @ 4 to 8 oz + crop oil @ 1 pt - limited data, use precaution
    - > Blizzard @ 0.5 to 0.6 oz + crop oil @ 1 pt - limited data, use precaution
- Boll opening, regrowth control, and defoliation
- E19. ethephon<sup>4</sup> @ 1.33 to 1.5 pt + (one of the following)
    - > Dropp<sup>1</sup>/Free Fall/Thidiazuron/Klean-Pik SC/50W @ 2.0 oz / 0.125 lb
    - > Ginstar<sup>2</sup> @ 6.4 oz

## COTTON DEFOLIATION/HARVEST AID OPTIONS (continued)

- E20. ethephon<sup>4</sup> @ 1.33 to 1.5 pt + Dropp<sup>1</sup>/Free Fall/Thidiazuron/Klean-Pik SC/50W @ 1.6 to 2.0 oz / 0.1 to 0.125 lb + (one of)  
> DEF/Folex @ 4 to 6 oz  
> Aim EC @ 0.75 to 1 oz + NIS @ 0.25% v/v  
> ET @ 1.5 oz + crop oil @ 0.5% v/v  
> Resource@ 4 oz + crop oil @ 1 pt - limited data, use precaution  
> Blizzard @ 0.5 oz + crop oil @ 1 pt - limited data, use precaution
- E21. FirstPick<sup>5</sup> @ 1.75 to 2 qt + (one of the following)  
> Dropp<sup>1</sup>/Free Fall/Thidiazuron/Klean-Pik SC/50W @ 1.6 to 2.0 oz / 0.1 to 0.125 lb  
> Ginstar<sup>2</sup> @ 6.4 oz
- E22. Finish 6 Pro @ 1.33 pt + (one of the following)  
> Dropp<sup>1</sup>/Free Fall/Thidiazuron/Klean-Pik SC/50W @ 1.6 to 2.0 oz / 0.1 to 0.125 lb  
> Ginstar<sup>2</sup> @ 6.4 oz

### II. MID SEASON (highs 80 to 89°F plus, lows 60 to 70°F)

Defoliation Only [combinations provide more consistent defoliation than a single product - see M9 and M13-M19]

- M1. DEF/Folex @ 1.5 pt  
M2. Aim EC @ 0.75 to 1 oz + crop oil @ 1% v/v  
M3. ET @ 1.5 oz + crop oil @ 0.5% v/v  
M4. Harvade @ 8 oz + 1 pt crop oil  
M5. Resource@ 4 to 8 oz + crop oil @ 1 pt - limited data, use precaution  
M6. Blizzard @ 0.5 to 0.6 oz + crop oil @ 1 pt - limited data, use precaution  
M7. Sodium Chlorate @ 4 lb (mature foliage only; do not mix with DEF/Folex or ethephon<sup>4</sup>)

Regrowth control and defoliation [combinations provide more consistent defoliation than a single product]

- M8. Dropp<sup>1</sup>/Free Fall/Thidiazuron/Klean-Pik SC/50W @ 3.2 oz / 0.2 lb  
M9. Dropp<sup>1</sup>/Free Fall/Thidiazuron/Klean-Pik SC/50W @ 2.0 to 2.3 oz / 0.125 to 0.14 lb + (one of the following)  
> DEF/Folex @ 1 pt  
> Harvade @ 8 oz + 1 pt crop oil  
> Aim EC @ 0.75 to 1 oz + crop oil @ 1% v/v  
> ET @ 1.5 oz + crop oil @ 0.5% v/v  
> Resource@ 4 to 8 oz + crop oil @ 1pt - limited data, use precaution  
> Blizzard @ 0.5 to 0.6 oz + crop oil @ 1 pt - limited data, use precaution

M10. Ginstar<sup>2</sup> @ 6.4 to 8 oz

- M11. glyphosate<sup>3</sup> @ 1.2 to 2 pt + (one of the following)  
> DEF/Folex @ 1 pt  
> Harvade @ 8 oz + 1 pt crop oil  
> Aim EC @ 0.75 to 1 oz + crop oil @ 1% v/v  
> ET @ 1.5 oz + crop oil @ 0.5% v/v  
> Resource@ 4 to 8 oz + crop oil @ 1pt - limited data, use precaution  
> Blizzard @ 0.5 to 0.6 oz + crop oil @ 1 pt - limited data, use precaution

Boll opening and defoliation [combinations provide more consistent defoliation than a single product]

- M12. ethephon<sup>4</sup> @ 2 to 2.67 pt  
M13. ethephon<sup>4</sup> @ 1.5 to 2 pt + (one of the following)  
> DEF/Folex @ 1 to 1.25 pt  
> Dropp<sup>1</sup>/Free Fall/Thidiazuron/Klean-Pik SC/50W @ 1.6 oz / 0.1 lb  
> Ginstar<sup>2</sup> @ 6.4 oz  
> Harvade @ 8 oz + 1 pt crop oil  
> Aim EC @ 0.75 to 1 oz + crop oil @ 1% v/v  
> ET @ 1.5 oz + crop oil @ 0.5% v/v  
> Resource@ 4 to 8 oz + crop oil @ 1pt - limited data, use precaution  
> Blizzard @ 0.5 to 0.6 oz + crop oil @ 1 pt - limited data, use precaution
- M14. FirstPick<sup>5</sup> @ 2 qt + (one of the following)  
> DEF/Folex @ 8 to 12 oz  
> Dropp<sup>1</sup>/Free Fall/Thidiazuron/Klean-Pik SC/50W @ 1.6 oz / 0.1 lb  
> Ginstar<sup>2</sup> @ 6.4 oz  
> Harvade @ 8 oz + 1 pt crop oil  
> Aim EC @ 0.75 to 1 oz  
> ET @ 1.5 oz  
> Resource@ 4 to 8 oz + crop oil @ 1 pt - limited data, use precaution  
> Blizzard @ 0.5 to 0.6 oz + crop oil @ 1 pt - limited data, use precaution
- M15. Finish 6 Pro @ 1.33 to 1.5 pt + (one of the following)  
> DEF/Folex @ 8 to 12 oz  
> Dropp<sup>1</sup>/Free Fall/Thidiazuron/Klean-Pik SC/50W @ 1.6 oz / 0.1 lb  
> Ginstar<sup>2</sup> @ 6.4 oz  
> Harvade @ 8 oz + 1 pt crop oil  
> Aim EC @ 0.75 to 1 oz + crop oil @ 1% v/v  
> ET @ 1.5 oz + crop oil @ 0.5% v/v  
> Resource@ 4 to 8 oz + crop oil @ 1 to 2 pt - limited data, use precaution  
> Blizzard @ 0.5 to 0.6 oz + crop oil @ 1 pt - limited data, use precaution

## COTTON DEFOLIATION/HARVEST AID OPTIONS (continued)

Boll opening, regrowth control, and defoliation

- M16. ethephon<sup>4</sup> @ 1.5 to 2 pt + (one of the following)
- > Dropp<sup>1</sup>/Free Fall/Thidiazuron/Klean-Pik SC/50W @ 2.0 to 2.6 oz / 0.125 to 0.16 lb
  - > Ginstar<sup>2</sup> @ 6.4 to 8 oz
- M17. ethephon<sup>4</sup> @ 1.5 to 2 pt + Dropp<sup>1</sup>/Free Fall @ 2.0 to 2.3 oz / 0.125 to 0.14 lb + (one of the following)
- > + DEF/Folex @ 8 to 10 oz
  - > Aim EC @ 0.75 to 1 oz + NIS @ 0.25% v/v
  - > ET @ 1.5 oz + crop oil @ 0.5% v/v
  - > Resource @ 4 oz + crop oil @ 1 pt - limited data, use precaution
  - > Blizzard @ 0.5 oz + crop oil @ 1 pt - limited data, use precaution
- M18. FirstPick<sup>5</sup> @ 2.0 qt + (one of the following)
- > Dropp<sup>1</sup>/Free Fall/Thidiazuron/Klean-Pik SC/50W @ 2.0 to 2.3 oz / 0.125 to 0.14 lb
  - > Ginstar<sup>2</sup> @ 6.4 to 8 oz
- M19. Finish 6 Pro @ 1.33 to 1.5 pt + (one of the following)
- > Dropp<sup>1</sup>/Free Fall/Thidiazuron/Klean-Pik SC/50W @ 2.0 to 2.3 oz / 0.125 to 0.14 lb
  - > Ginstar<sup>2</sup> @ 6.4 to 8 oz

III. LATE SEASON (highs below 80°F, lows below 60°F) NOTE: Under these conditions, cotton should sometimes be preconditioned and then defoliated (see Section IV) or routinely defoliated with combinations which include ethephon<sup>4</sup>.

Defoliation only [combinations provide more consistent defoliation than a single product- see L10-L12]

- L1. DEF/Folex @ 1.5 pt + Gramoxone Max/Inteon, Firestorm, or Parazone @ 1 to 6 oz
- L2. Harvade @ 8 oz + 1 pt crop oil
- L3. Ginstar<sup>2</sup> @ 8 to 10 oz
- L4. Aim EC @ 1 oz + crop oil @ 1% v/v
- L5. ET @ 1.5 oz + crop oil @ 0.5% v/v
- L6. Resource @ 4 to 8 oz + crop oil @ 1 to 2 pt - limited data, use precaution
- L7. Blizzard @ 0.5 to 0.6 oz + crop oil @ 1 pt - limited data, use precaution
- L8. Sodium Chlorate @ 4 lb

Boll opening and defoliation [combinations provide more consistent defoliation than a single product]

- L9. ethephon<sup>4</sup> @ 2 to 2.67 pt
- L10. ethephon<sup>4</sup> @ 1.5 to 2.67 pt + (one of the following)
- > DEF/Folex @ 1.25 to 1.5 pt
  - > Ginstar<sup>2</sup> @ 8 to 10 oz
  - > Harvade @ 8 oz + 1 pt crop oil
  - > Aim EC @ 1 oz + crop oil @ 1% v/v
  - > ET @ 1.5 oz + crop oil @ 0.5% v/v
  - > Resource @ 4 to 8 oz + crop oil @ 1 to 2 pt - limited data, use precaution
  - > Blizzard @ 0.5 to 0.6 oz + crop oil @ 1 pt - limited data, use precaution
- L11. FirstPick<sup>5</sup> @ 2 qt + (one of the following)
- > DEF/Folex @ 1 to 1.5 pt
  - > Ginstar<sup>2</sup> @ 8 to 10 oz
  - > Harvade @ 8 oz + 1 pt crop oil
  - > Aim EC @ 1 oz
  - > ET @ 1.5 oz
  - > Resource @ 4 to 8 oz + crop oil @ 1 to 2 pt - limited data, use precaution
  - > Blizzard @ 0.5 to 0.6 oz + crop oil @ 1 pt - limited data, use precaution
- L12. Finish 6 Pro @ 1.5 pt + (one of the following)
- > DEF/Folex @ 1 to 1.5 pt
  - > Ginstar<sup>2</sup> @ 8 to 10 oz
  - > Harvade @ 8 oz + 1 pt crop oil
  - > Aim EC @ 1 oz + crop @ 1% v/v
  - > ET @ 1.5 oz + crop oil @ 0.5% v/v
  - > Resource @ 4 to 8 oz + crop oil @ 1 to 2 pt - limited data, use precaution
  - > Blizzard @ 0.5 to 0.6 oz + crop oil @ 1 pt - limited data, use precaution

IV. PRECONDITIONING: Fields with dense canopy of foliage and significant numbers of green bolls may require two applications. The goal is to remove much of the foliage with an initial application, exposing unopen bolls. The follow-up application should be made 7 to 10 days later when sufficient leaf drop has occurred to allow spray coverage of bolls with ethephon<sup>4</sup>, FirstPick<sup>5</sup>, or Finish 6 Pro.

Initial preconditioning treatment

- P1. DEF/Folex @ 0.5 to 1.25 pt
- P2. ethephon<sup>4</sup> @ 0.67 to 1.33 pt
- P3. glyphosate<sup>3</sup> @ 1.2 to 2 pt
- P4. ET @ 1.5 oz + crop oil @ 0.5% v/v
- P5. Aim EC @ 1 oz + crop oil @ 1% v/v
- P6. Resource @ 4 oz + crop oil @ 1 to 2 pt - limited data, use precaution
- P7. Blizzard @ 0.5 oz + crop oil @ 1 pt - limited data, use precaution

Follow-up treatments

Should include Boll Openers with harvest aid mixtures listed in Sections I, II, and III.

## COTTON DEFOLIATION/HARVEST AID OPTIONS (continued)

### V. HARVEST AID WEED MANAGEMENT

- W1. Gramoxone Max, Firestorm, or Parazone @ 1 to 4 oz or Gramoxone Inteon @ 3 to 5 oz in combination with standard defoliant mixtures. Use lowest rate during warm temperatures. Avoid off-target drift, especially to pines.
- W2. Glyphosate (Roundup, etc.) @ 1 to 2 pt in combination with DEF/Folex, Harvade, and/or ethephon<sup>4</sup>. Glyphosate provides fair suppression of regrowth in non-RR cotton. Avoid off-target drift.
- W3. Harvade @ 8 oz + crop oil 1 pt. Effective on mature weeds including morningglory, sicklepod, tropic croton, Florida beggarweed.
- W4. Aim EC @ 1 oz + crop oil @ 1% v/v. Effective on morningglory, coffee senna, tropical spiderwort.
- W5. ET @ 1.5 oz + crop oil @ 0.5% v/v. Effective on morningglory.
- W6. a) Defoliate, then b) Desiccate with Gramoxone Max/Inteon, Firestorm, or Parazone as listed below.

Desiccants for Cotton Harvest Preparation

Desiccant	lb AI/Gal	Formulation Rate/Acre	Spray Volume, gal/A	
			Ground	Air
Gramoxone Max, Firestorm, Parazone	3.0	1 to 4 oz <sup>1</sup> 5.5 oz to 1.5 pt <sup>2</sup>	10 to 20	5
Gramoxone Inteon	2.0	3 to 5 oz <sup>1</sup> 1 to 2 pt	10 to 20	5
Sodium Chlorate	4 to 6	3 to 6 lb AI	15 to 30	5 to 10

<sup>1</sup> For addition to defoliant mixtures in cotton at least 75% open. Improves activity in colder, late season conditions. May cause crop desiccation (90°F and above) and damage to immature bolls.

<sup>2</sup> For desiccation of weeds and cotton regrowth after defoliation. Rates of 8 to 16 oz are usually sufficient. Add surfactant at 1 to 2 qts/100 gals spray solution. Be prepared to harvest in a timely manner to minimize bark problems.

### VI. PERFORMANCE RATING OF HARVEST AIDS BY FUNCTION

Product	Function				
	remove mature foliage	remove juvenile foliage	open bolls	suppress regrowth	desiccate weeds
PPOs <sup>6</sup> - Aim, ET, Resource, Blizzard	G	F	P	P	F
DEF/ Folex	G-E	P-F	P	P	P
Dropp <sup>1</sup> /Free Fall/Thidiazuron/Klean-Pik	G-E	G	P	G-E	P
Ginstar <sup>2</sup>	G-E	G	P	G-E	P
Harvade	G-E	P	P	P	F-G
ethephon <sup>4</sup>	F-G	F	E	P	P
sodium chlorate	F	P	P	P	F-G
glyphosate <sup>3</sup>	P	F	P	F-G	G
Gramoxone Max/ Inteon, Firestorm, Parazone	F	F	F	P	G
FirstPick <sup>5</sup>	G	G	E+	P	F
Finish 6 Pro	G-E	G	E+	F	P

P=poor, F=fair, G=good, E=excellent

## COTTON DEFOLIATION/HARVEST AID OPTIONS (continued)

### General Notes:

<sup>1</sup> Dropp<sup>1</sup>/Free Fall/Thidiazuron/Klean-Pik.

FORMULATIONS: These products were formerly 50WP formulations. Most are now available as liquid formulations (ex. Dropp SC) with 1.0 pt of the liquid providing equivalent ai as 1.0 lb of the 50WP. Dropp SC at 1.6 oz provides equivalent ai as Dropp 50WP at 0.1 lb (1 lb to 10 acres). Other liquid / dry comparisons: 2.0 oz = 0.125 lb (1 lb to 8 acres); 2.3 oz = 0.14 lb (1 lb to 7 acres); 2.7 oz = 0.17 lb (1 lb to 6 acres); 3.2 oz = 0.2 lb (1 lb to 5 acres).

DESSICATION: Combinations of these products with DEF/Folex have a tendency to cause “leaf sticking” when temperatures exceed 94°F, in combinations with spray adjuvants, or where calibration errors occur. Consider reducing rates by 10 to 20% when temperatures exceed 94°F.

RAINFASTNESS: These products are sensitive to wash-off if rain occurs within 6 to 12 hours after application. Addition of DEF/Folex or ammonium sulfate (2 lb/A) enhances absorption and rainfastness and should be a routine practice with these products.

REGROWTH: Regrowth control or suppression is minimal with these products at rates below 1.6 oz/A or 0.1 lb/A

<sup>2</sup> Ginstar contains both thidiazuron and diuron. Adios and Ready Pik are generic harvest-aid products which contain the same ai as in Ginstar. Limited data are available with these products. Regrowth control or suppression is minimal with Ginstar<sup>2</sup> rates below 6.4 oz.

<sup>3</sup> Roundup or generic glyphosate products will NOT provide regrowth suppression on RR or RF cotton.

<sup>4</sup> ethephon (Prep, Ethephon 6, Super Boll, Boll'd, Setup 6SL, etc.). A 2 lb ai/gal formulation of ethephon, Ethephon MFX, may be available; it requires an obvious adjustment in rates (by 3 x).

<sup>5</sup>FirstPick has replaced Cotton Quik..

<sup>6</sup> PPO products perform best in the presence of mature foliage with limited juvenile leaves. Use of these products in fields with a predominance of juvenile foliage may cause rapid regrowth and/or dessication.

OFF-TARGET CONCERNS: Beware of off-target movement of harvest aid products, especially with aerial applications. Drift can cause problems in nearby pine trees, pecan orchards, vegetables, etc.

ADJUVANTS: Adding spray adjuvant may enhance activity of treatments when temperatures are low. However, adjuvants may sometimes cause “leaf sticking” during periods of high temperature, and thus, these products should be used with caution early in the season.

Addition of Gramoxone Max or Firestorm @ 1 to 4 oz or Gramoxone Inteon @ 1.5 to 6 oz may aid defoliation and weed desiccation with standard harvest aid mixtures. Off-target movement may cause injury to sensitive plants such as pine trees.