

Dicamba-Based Weed Management Programs for 2017 XtendFlex Cotton

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Mitigating off-target movement of dicamba is the greatest challenge for a dicamba-based weed management system. Georgia has many areas where dicamba simply should not be applied; for areas where it can be applied safely, review labels closely. Mitigating off-target movement of dicamba and implementing sound programs are addressed. *The Georgia Cotton Commission, Cotton Incorporated, and Industry are primary funding sources!!*

Engenia and XtendiMax are the only dicamba formulations expected to be labeled for use at planting or in-season in XtendFlex Cotton.

Engenia and XtendiMax CAN NOT be tank mixed with any other product as of Jan 4, 2017. Tank mixes are discussed on back in hope of labels prior to use time.

CRITICAL STEPS FOR ON-TARGET DICAMBA APPLICATIONS (yes, it is complex)

1. Person responsible for an in-crop application of Engenia or XtendiMax must have attended the Using Pesticides Wisely Training.

2. At least 15 factors should be understood for success; only having the right nozzle or only applying in low winds will not end well (Fig 1).

3. Most broadleaf vegetables, fruits, and nuts are very sensitive to dicamba, avoid applications near these sensitive crops (Fig 2).

4. Produce, peanuts and many other crops do not have EPA residue tolerances for dicamba; drift could prevent sale of crop (entire field).

4. Apply in winds between 3 to 10 mph; drift distances can still be large. Land terrain and direction of wind have huge impacts on drift.

5. Sprayer ground speed influences drift greatly. Suggest staying under 10 mph; label requires <15 mph. Absolutely no aerial applications!

7. XtendiMax and Engenia label currently require TTI 11004 tips (options will expand in time). <63 psi is also required on XtendiMax label.

8. Max boom height above canopy or pest is 24". Drift distances can be cut nearly in half with a 24" boom height compared to one at 50".

9. Downwind buffers for 1X rate is 110 ft. Label clearly restricts any application being made with winds toward any specialty crop.

10. Labels are written to protect the manufacturer from drift. No matter the distance, if you have spray drift, you are solely responsible.

11. Strongly encourage applying dicamba through hoods or layby rigs. Make no more than 2 dicamba applications per year in a field.

12. DO NOT add AMS in tank with dicamba as this will increase volatility. Also, only mix dicamba with approved products.

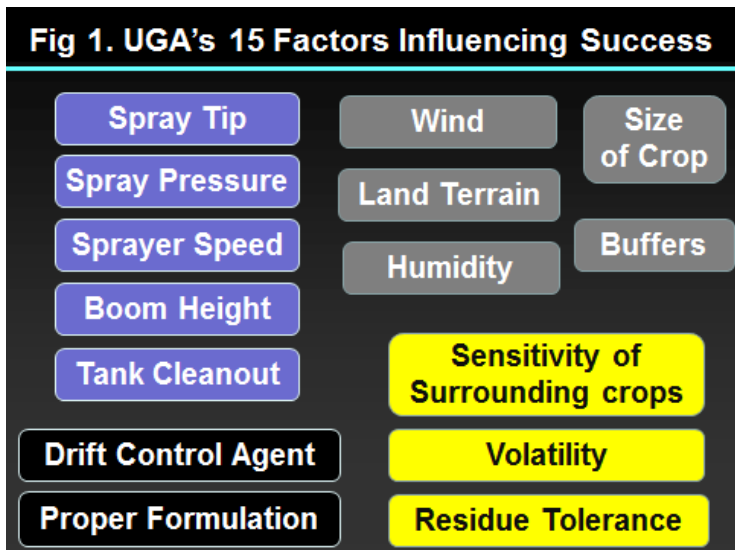


Fig 2. Visual Crop Sensitivity To Dicamba.

| Lower | Moderate | Severe | Extreme |
|---|---|--|---|
| Broccoli Cabbage Kale Mustard Pecan Turnip | Cantaloupe Cucumber Peach Peanut Squash | Cotton Pepper Tomato Watermelon | Grapes* Lima Bean Southern Pea Snap Bean Soybean Sweet potato* Tobacco* |
| >1/75X | 1/75-1/300X | 1/300-1/800X | < 1/800X |
| Herbicide Rate of Visually Detectable Injury | | | |
| For relative comparison, tomato, squash, and watermelon response to Roundup would be in the "lower" category. | | | |
| <small>*Data from literature; all other data generated in GA field studies</small> | | | |

Herbicide resistance is threatening the sustainability of ALL FAMILY FARMS. The use of cover crops and/or tillage with a diversified herbicide program will reduce herbicide dependency and improve weed control. DO NOT MAKE MORE THAN 2 DICAMBA APPLICATIONS PER YEAR IN A FIELD. HAND WEED ALL ESCAPES!



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J. Scott Angle, Dean and Director

POTENTIAL DICAMBA HERBICIDE PROGRAMS

STEP 1: Burndown: no Palmer emerged at plant.

Dicamba is not that effective controlling pigweed over 3". Standard programs using Valor (before Palmer emergence), Direx, and Gramoxone are better. Dicamba or 2,4-D should be considered for primrose, horseweed, and radish. No plant back interval exists for XtendiMax or Engenia in XtendFlex cotton; weeds should be killed ≥ 10 d before planting. Plantback interval for XtendFlex cotton following 2,4-D is similar to standard cultivars.

STEP 2: Preemergence (PRE) herbicide application.

Two herbicide active ingredients should be applied PRE together, even in a dicamba system. Higher rates of a single active ingredient are less effective than two ingredients at lower rates (Fig 3). Research suggests Reflex + Warrant or Direx, Direx + Warrant, or Brake F16 are great options. Select rates per acre that have minimal injury potential on your soil such as: Reflex (10-12 oz), Direx (12-16 oz), Warrant (2-2.5 pt), and Brake F16 (1 pt). Currently, neither XtendiMax nor Engenia can be tank mixed with other herbicides; thus, these products alone are not effective options. If/when mixtures with Warrant are approved then Warrant (3 pt/A) + Engenia (12.8 oz/A) or XtendiMax (22 oz/A) will be a little less effective than Reflex mixes but would offer lower injury potential.

STEP 3: Sequential POST's are needed for most fields.

Current Engenia and XtendiMax label restrictions prohibit tank mixtures. Programs currently labeled without tank mixes are in Table 1.

Table 1. Labeled dicamba systems as of Jan 9, 2017.

| POST 1 ~17 d after PRE ¹ | POST 2 ~ 13-17 d after POST 1 ¹ |
|--|--|
| <i>Biggest pigweed in field 3"</i> : Engenia 12.8 oz/A or XtendiMax 22 oz/A followed 4-24 hr ² later by Liberty or Roundup + Dual Mag. or Warrant | <i>Biggest pigweed in field 3"</i> : Engenia 12.8 oz/A or XtendiMax 22 oz/A followed 4-24 hr ² later by Liberty or Roundup + Dual Mag. or Warrant |

¹Day interval assumes PRE residual herbicides were activated.

²REI for dicamba is 24 hr; protective equipment must be worn if entering treated area in <24 hr.

TANK MIXTURES SHOULD NOT be applied unless approved by the U.S. EPA. As of Jan 9, they are not approved. To determine if mixes have been approved, visit www.engeniatankmix.com or www.xtendimaxapplicationrequirements.com. Table 2 provides potential tank mixes, once approved, that have been effective in research over the past decade.

Table 2. Dicamba systems only for use if tank mixes are approved by EPA.

| POST 1 ~17 d after PRE ¹ | POST 2 ~ 13-17 d after POST 1 ¹ |
|--|---|
| <i>Biggest pigweed in field 3"</i> : Engenia 12.8 oz/A or XtendiMax 22 oz/A + glyphosate or Liberty ⁴ add Dual Mag. or Warrant if ok with injury ² | <i>Biggest pigweed in field 3"</i> : Engenia 12.8 oz/A or XtendiMax 22 oz/A + glyphosate or Liberty ^{3,4} |

¹Day interval assumes PRE residual herbicides were activated.

²Injury of 25%+ with leaf shed has occurred with 3-way mixes; research notes complete recovery if sprayed before 8-lf cotton. Roundup + dicamba has lowest injury potential.

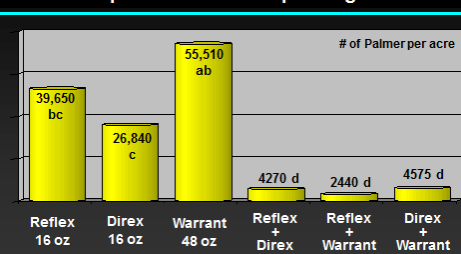
³A residual is not needed with POST 2 assuming a timely layby application.

⁴Liberty vs. glyphosate mixes for Palmer = 1) If Palmer can be killed with Liberty mix then it is better. 2) If Palmer is too large to be killed with Liberty mix and the layby will be timely then glyphosate mix improves coverage with the layby likely improving control Fig 7.

STEP 4: Layby Needs to Be Directed and NOT OVERTOP.

A directed or hooded application is needed for auxin systems as it will improve farm sustainability through improved weed control and resistance management while reducing injury (Fig 4, 5, 6, & 7). Direx + MSMA (best for pigweed) or Roundup + Direx are great options; adding Envoke, XtendiMax, or Engenia improves morningglory control. For grasses, make sure to utilize Roundup.

Figure 3. Number of emerged Palmer amaranth per acre 21 d after planting.

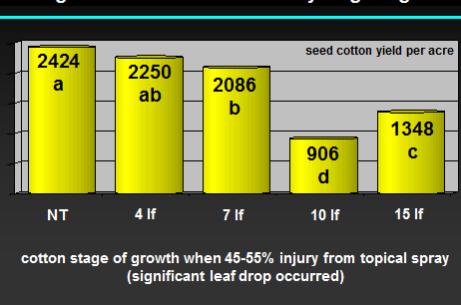


Tank mixes = Reflex 12 oz/A + Direx 12 oz/A or Warrant 2 pt/A; Direx 1 pt/A + Warrant 3 pt/A. The non-treated control consisted of 1,464,000 per acre; LSD 21 K.

Figure 4. Cotton Response to Topical Vs. Directed Herbicide Applications After the 8 lf Stage.



Figure 5. Impact from 45-55% contact herbicide damage on cotton as influenced by stage of growth.

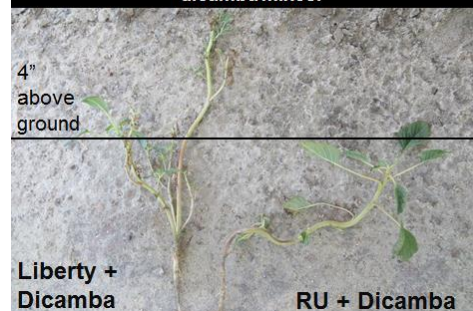


cotton stage of growth when 45-55% injury from topical spray (significant leaf drop occurred)

Fig 6. Why risk not covering Palmer with Overtop Spray After 8 leaf.....directed layby more effective!!!



Fig 7. Height comparison of plants surviving dicamba mixes.



Liberty +
Dicamba

RU + Dicamba