

RESIDUAL HERBICIDE CARRYOVER SIMULATION IN TRANSPLANTED VIDALIA ONIONS II

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Introduction. Herbicide resistance issues with Palmer amaranth has increased the use of residual herbicides in agronomic cropping systems. Specifically in cotton, growers have become more reliant on herbicides such as Direx, Staple or Envoke for control of weed species while in peanut most Georgia fields are treated with Cadre or Strongarm. For previous simulated carryover studies, Envoke, Strongarm, Staple, and Firstrate injured onion 26, 73, 86, and 86% in 2003-2004, respectively and 13 to 44% in 2005-2006. These same herbicides also reduced yield. Cadre and Direx injured transplanted onion 6% during both seasons but did not reduce yield. These previous research efforts have lead to increased awareness about herbicide carryover potential.

With the increase in weed herbicide resistance in Georgia, many farmers are now using even more residual herbicides. In the previous research, we focused on ALS (acetolactate synthesis) inhibitor modes of action. However, with weed resistance farmers are now applying more PPO (protoporphyrinogen oxidase) inhibitor modes of action. These include Reflex (fomesafen), Ultra Blazer (acifluorfen), Cobra (lactofen), and Spartan (sulfentrazone) herbicides. Although rotation of various crop species is usually beneficial, the potential for these herbicides applied in cotton, peanut, or soybean to carryover to onion is of greatest concern to Georgia Vidalia onion producers. All of these herbicides can have residual activity that can be very beneficial in controlling weeds in their respective agronomic crops, but some pose a serious threat to a following onion crop (Table 1). Studies were therefore conducted to evaluate the potential for onion injury and affects on yield.

Materials and method. A field experiment was conducted at the Vidalia Onion and Vegetable Research Center near Lyons, GA in autumn 2007-2008 and 2008-2009. The area was conventionally tilled by moldboard plowing then smoothed with a rotary tiller to form six foot wide beds. This area had not been previously exposed to any of the herbicides evaluated for this experiment. On October 22, 2007 and October 29, 2008, residual herbicides were applied with a CO₂-pressurized backpack sprayer with 15 gallons of water per acre. Treatments included Classic (chlorimuron, ALS herbicide) at 0.13 and 0.26 oz product/acre, Reflex at 4 and 8 oz product/acre, Ultra Blazer at 6 and 12 oz product/acre, Cobra at 3.1 and 6.2 oz product/acre, Spartan at 6 oz product/acre, and Sencor (metribuzin, triazine herbicide) at 2 and 4 oz product/acre. A nontreated control was also included. The intent is to simulate herbicide carryover by using approximately one-half and one-fourth of the labeled rate of each herbicide to their respective crop. All plots were irrigated immediately after herbicide applications to insure soil incorporation.

The experimental design was a randomized complete block with four replications (blocks). Plots consisted of four transplanted onion rows per bed which was 25 feet long. Sapele Sweet Onion bulbs were hand transplanted approximately 1 inch deep in early December 2008 and 2009. Additional irrigation was applied as needed and fertilizer was applied based on soil test recommendations for onion production. The entire test was maintained weed-free throughout the growing season by a blanket treatment of Prowl plus Goal within two days of onion transplanting.

Onion injury ratings for stunting and bleaching were visually estimated using a scale of 0% (no injury) to 100% (death) during the course of the study and prior to harvest. Yield was determined by hand harvesting all onion from 10 feet of the center two rows of each plot, and recording their number and weight. Cumulative number and yield per acre are reported.

Results and Discussion. These results are intended for **research purposes only**. The University of Georgia neither recommends nor supports planting onion behind herbicides prior to label planting intervals; thus, one must **FOLLOW ALL LABEL RESTRICTIONS**.

Onion injury, fresh weight, bulbs per acre, and average bulb weights were herbicide dependent (Table 2). Injury and yield weight variables were very telling with respect to onion response.

Classic and Spartan injury were significant each year ranging from 22 to 89%. These data would indicate that transplanted onion was not tolerant to these herbicides. In contrast, transplanted onion was less sensitive to Reflex, Ultra Blazer, Cobra and Sencor with injury ranging from 0 to 16% for the two years of the study. The number of onion bulbs/acre was not significantly affected by any herbicide in 2007-2008 indicating that the herbicides did not kill transplanted onions. However, in 2008-2009 stands were reduced to 21,050 bulbs/acre for Spartan indicating that the transplanted onion was killed.

Yield data were reflective of injury and different from stand counts (Table 2). Classic yield ranged from 13,980 to 40,940 lbs/acre, was rate dependent, and with reductions up to 70% on the nontreated control. These results indicate that Classic carryover may not reduce plant stands but will likely reduce bulb size. The only PPO herbicide with this level of yield reduction was Spartan, at 17 to 73%. Reflex, Ultra Blazer, and Cobra injury was variable from one year to the next, indicating that there was potential for negative effects on transplanted Vidalia onion.

This research indicates that there needs to be further evaluation of some of the herbicides used in cotton, peanut, and soybean cotton and peanut with respect to plant back restrictions for transplanted onion. The onion plant back (rotational) restrictions for all herbicides, especially, Spartan and Classic must be followed. Not following these guidelines could result in potential crop failure.

Growers are reminded that products such as Treflan, Prowl, Dual Magnum, Outlook, Ignite, and Valor would be excellent control options for Palmer amaranth in agronomic crop production without the potential for carryover into a transplanted onion crop.

Table 1. Onion rotational restrictions.

| Herbicide (chemical name) | Label rotational restriction |
|----------------------------|--------------------------------------|
| | Months after application* |
| Classic (chlorimuron) | 30 |
| Reflex (fomesafen) | 18** |
| Ultra Blazer (acifluorfen) | 100 days** |
| Cobra (lactofen) | Not listed on label |
| Sencor (metribuzin) | 18 |
| Spartan (sulfentrazone) | 12** (following successful bioassay) |

*Does not specify transplant or seeded for any herbicide.

**Falls under 'any other crop' on herbicide registration label

Table 2. University of Georgia 2007-2008 and 2008-2009 residual herbicide simulation in transplanted Vidalia onions^a.

| Herbicide | Rate | Injury prior to harvest | | Onion bulb yield | | | |
|--------------|------|-------------------------|-----------|------------------|-----------|--------------|-----------|
| | | oz produt/acre | | Bulbs | | Fresh weight | |
| | | % | | #/acre | | lb/acre | |
| | | 2007-2008 | 2008-2009 | 2007-2008 | 2008-2009 | 2007-2008 | 2008-2009 |
| Classic | 0.13 | 39 b | 22 c | 64610 a | 59530 a | 35250 c | 40910 b |
| Classic | 0.26 | 83 a | 58 b | 62440 a | 63160 a | 13980 d | 22360 c |
| Reflex | 4.0 | 10 cd | 4 d | 60980 a | 64610 a | 42580 abc | 45850 ab |
| Reflex | 8.0 | 10 cd | 6 d | 66790 a | 57650 a | 45450 ab | 48060 ab |
| Ultra Blazer | 6.0 | 6 cd | 4 d | 83890 a | 63160 a | 47370 ab | 48642 ab |
| Ultra Blazer | 12.0 | 4 cd | 2 d | 63160 a | 50820 a | 48390 a | 44690 ab |
| Cobra | 3.1 | 9 cd | 0 d | 63890 a | 58810 a | 49260 a | 48640 ab |
| Cobra | 6.2 | 14 c | 2 d | 66790 a | 66790 a | 46360 ab | 50420 ab |
| Sencor | 2.0 | 1 cd | 6 d | 63160 a | 55900 a | 41850 abc | 42830 ab |
| Sencor | 4.0 | 6 cd | 16 c | 61710 a | 55900 a | 40620 bc | 44360 ab |
| Spartan | 6.0 | 29 b | 89 a | 63890 a | 21050 b | 39390 bc | 14370 c |
| Nontreated | | 0 d | 0 d | 66070 a | 66070 a | 47410 ab | 54940 a |

^aHerbicide treatments applied October, onions transplanted in December, followed by a blanket treatment of Prowl plus Goal applied to the entire test.

