August 16, 2009

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Regulator Public Docket (7502P)
Environmental Protection Agency
1200 Pennsylvania Ave., NW.,
Washington, DC 20460-001

Subject: Re-registration of fomesafen (Docket # EPA-HQ-OPP-2006-0239)

IMPACT OF EPA'S ECOLOGICAL RISK ASSESSMENT FOR FOMESAFEN

By

Stanley Culpepper
P. O. Box 748
Tifton, GA 31794
229-392-5202

THE UNIVERSITY OF GEORGIA
COOPERATIVE EXTENSION
Colleges of Agricultural and Environmental Sciences & Family and Consumer Sciences

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Summary

Current proposed US Environmental Protection Agency (EPA) Re-Registration regulations for fomesafen will cripple cotton and vegetable production in Georgia. These regulations in Georgia cotton alone would potentially reduce farm gate values in excess of $156 million. Additionally, these regulations would eliminate the most effective tool to manage Palmer amaranth and morningglory in 67% of Georgia's snap bean acreage (farm gate value of $22.6 million). These regulations will also eliminate the benefits of fomesafen currently being developed for fruiting vegetables and cucurbits (farm gate value exceeding $387 million), including its role as a key herbicide in the development of methyl bromide alternative systems. These proposed regulations would negatively impact Georgia's number 3 (cotton), 18 (watermelon), 19 (soybean), 20 (bell peppers), 31 (tomato), 38 (yellow and winter squash), 41 (snap beans), 42 (cantaloupe), 43 (zucchini squash), 44 (eggplant), and 47th (other peppers) most valuable agricultural commodities.

The EPA's objective, to protect endangered species from any pesticide, including fomesafen, is admirable, and the University of Georgia strongly supports this mission. However, we believe this objective can be achieved without such detrimental regulations. Realistically, some Georgia growers dependent on fomesafen will have only two options if these regulations are passed into law: 1) stop producing the impacted crops or 2) producing these crops following current practices while ignoring the law. Additionally, these regulations would likely prohibit The University of Georgia from 1) developing alternatives to methyl bromide, 2) developing effective weed management programs for cotton and soybean producers, and 3) hampering the adoption of new pesticides that are safer for the environment, the applicator, and the end user. With these proposed regulations being similar for both clomazone and fomesafen, one would anticipate similar proposed regulations for all herbicides (if not all pesticides) once each product faces re-registration. Regulations such as those proposed by the EPA will not only greatly restrict agricultural production in the United States, they will also restrict the ability of University and Industry researchers from developing new and innovative technologies that are needed to feed the world.

The authors of this document are struggling to understand the validity of these proposed regulations. First, how did the EPA determine "that the use of pesticides containing fomesafen is likely to adversely affect a variety of listed species"? A literature search of many endangered plant species in Georgia and their relationship with fomesafen showed little to no data results; this suggests to us that the sensitivity of endangered plant species to fomesafen may not have been determined scientifically. Secondly, we challenge the theory that an 850-foot buffer between a target area and a wetlands, waterway, or other endangered species habitat, is needed with a herbicide such as fomesafen. The University of Georgia has shown in this document that herbicide drift can be managed and, in some instances, avoided completely. Thus, the logic of assigning a buffer zone distance of 850 feet, considering the diversity of application techniques and environmental conditions, appears both non-scientific and unrealistic. The authors agree that additional efforts should be made to eliminate, or at least greatly reduce, off-target pesticide movement; however, the EPA should invest their efforts in working with manufactures and universities to improve application techniques and understand herbicide movement and fate before imposing restrictions that could regulate the American farmer out of business.

Obviously, no Georgia farmer wants any pesticide to move from the intended target area, and growers would welcome new and innovative ways to limit pesticide movement. The University of Georgia is willing to fully cooperate with the EPA and industry to conduct research to further understand the most effective ways to mitigate herbicide spray drift and volatility. Additionally, the University of Georgia is excited about using its Extension system to deliver new information on techniques that may eliminate off target pesticide movement.

Development, spread and impact of glyphosate-resistant Palmer amaranth in cotton

In 2004, glyphosate-resistant (GR) Palmer amaranth was confirmed in a 250-ha cotton field in Macon County, Georgia (Culpepper et al. 2006). By the end of 2007, GR biotypes had been documented in 20 Georgia counties. Samples collected from 2008 are currently being screened. Initial results from these efforts confirm resistance in 11 additional counties; glyphosate resistance is expected to be confirmed in samples taken from another 7 to 10 counties within a month (Figure 1). Currently, more than 700,000 Georgia agronomic acres are infested with GR Palmer amaranth.

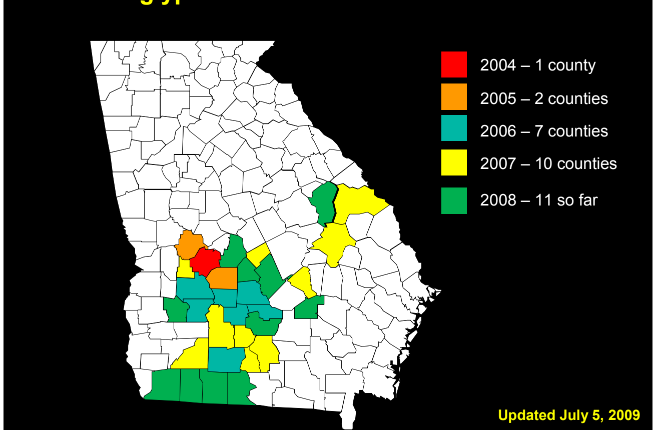


Figure 1. Georgia counties confirmed to be infested with glyphosate-resistant Palmer amaranth.

Glyphosate-resistant Palmer amaranth has become a tremendous threat to the cotton industry. Our inability to economically manage this pest is due to several reasons, including the following: 1) resistance movement through pollen (Sosnoskie et al. 2009 b, c, Figure 2), 2) rapid growth rate (Horak and Loughin 2000, Figure 3), 3) extremely large size (Mosyakin and Robertson 2008, Figure 4), its competitive ability (MacRae et al. 2008, Morgan et al. 2001, Rowland et al. 1999, Figure 5) and massive seed production (MacRae et al. 2008).

Figure 2. In-field pollen movement

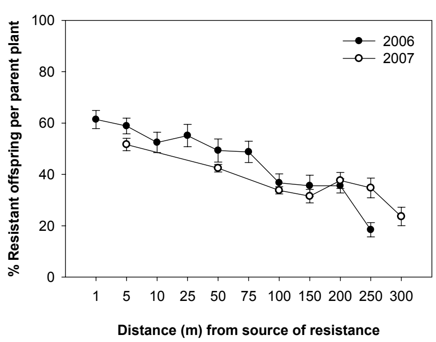


Figure 3. Rapid growth rate of Palmer amaranth in Georgia.

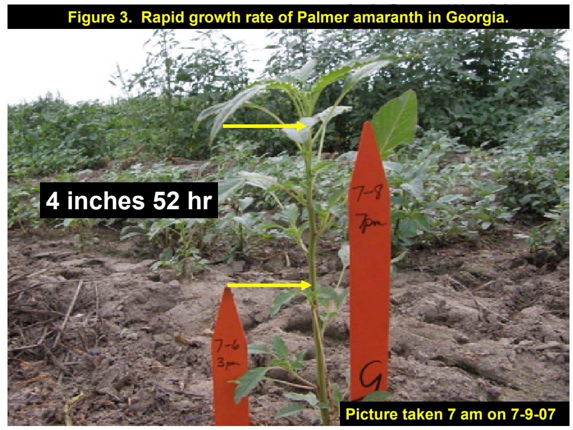
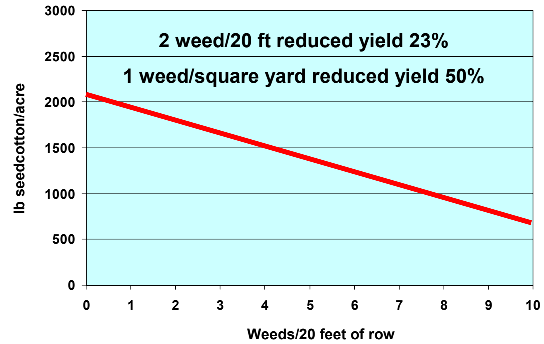


Figure 4. Rapid Growth Becoming Extremely Large

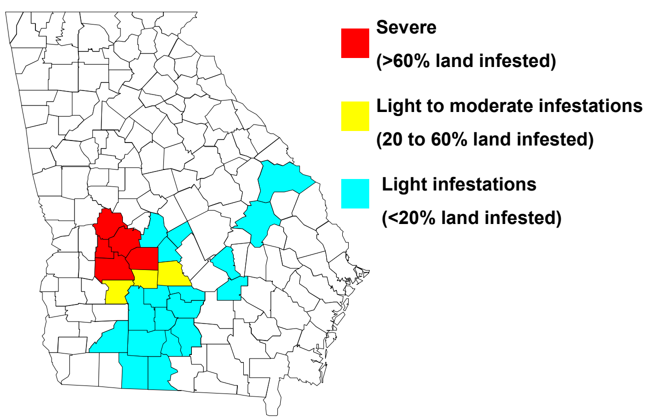
Figure 5. Cotton yield vs Palmer density



Management of glyphosate-resistant Palmer amaranth in cotton

Cotton production is extremely vulnerable to GR Palmer amaranth, and managing GR Palmer amaranth in GR cotton has proven to be extremely difficult. The impact from glyphosate-resistant Palmer amaranth in cotton has become severe and was documented in a 2008 survey of Georgia Cooperative Extension Agents. The survey included five counties that were severely infested (greater than 60% of the agronomic land infested); three counties with light to moderate infestations (20 to 60% of the agronomic land infested); and 12 counties with light or no infestations (<20% of the agronomic land infested) (Figure 6).

Figure 6. GR Palmer amaranth infestation levels.



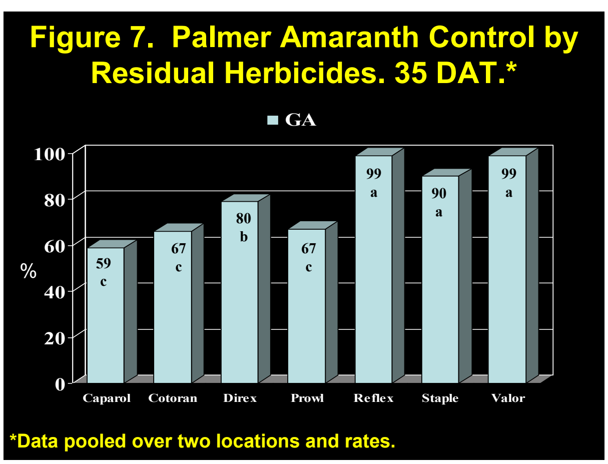
Results from the survey indicate that significant changes in cotton production have occurred in Georgia (Table 1). One such change is the increased use of residual at-plant herbicides. Prior to the occurrence of GR Palmer amaranth, growers in severely infested areas were treating less than 26% of their acreage with herbicides having soil residual activity; in 2008 at least 88% of the land was treated with two or more at-plant or pre-plant herbicides (Table 1). Similar results are noted in counties with light to moderate infestations. Even in counties where GR Palmer amaranth infestations are rare, residual herbicides are being applied on over 70% of the cotton acreage. In areas where resistance is not present, these residual herbicides are being used to prevent the on-set of resistance. Acceptable control of GR Palmer amaranth in cotton requires the use of residual herbicides applied throughout the crop (Culpepper et al. 2008a; Marshall 2009; Whitaker et al. 2007). The most effective (>90 % control) residual herbicides in cotton include fomesafen (Reflex), flumioxazin (Valor), and pyrithiobac (Staple) (Kichler et al. 2007; Figure 7).

Table 1. Georgia Cooperative Extension Service survey of the impacts of GR Palmer amaranth in Georgia cotton.

Survey Questions	GR Palmer amaranth infestation level					
	Severe		Light to Moderate		Light	
	2004*	2008*	2004	2008	2004	2008
Acres (%) treated with a DNA** herbicide	25	92	75	95	70	91
Acres (%) treated with a residual herbicide other than DNA	25	88	61	95	35	71
Strip-tillage production (% acres)	83	48	45	45	30	60
Herbicide incorporation through preplant tillage (% acres)	0	5	0	0	0	0
Adoption of glufosinate programs (% acres)	0	26	0	5	0	2
Cultivation (% acres)	0	20	0	25	22	12
Hand weeding (% acres)	0	45	0	35	1	37

*Resistance was not known to be present in 2004 but was confirmed in each county by 2008.

**DNA = dinitroanaline herbicide (e.g., trifluralin and pendimethalin).



Because of crop injury concerns, flumioxazin must be applied at least 14 days prior to cotton planting. When applied 14 days prior to planting, a strip-tillage operation must occur after flumioxazin application. This tillage operation reduces the activity of flumioxazin in the tilled area by 25 to 40% thereby providing adequate cotton tolerance but greatly reducing Palmer amaranth control (Culpepper personnel data, 2009 results available by Nov., 2009). Pyrithiobac can be applied at planting; however, this is an ALS herbicide and ALS- and glyphosate/ALS-resistant Palmer amaranth is common throughout Georgia (Heap 2009; Sosnoskie et al. 2009a; Wise et al. 2009). Thus, fomesafen, which can be applied immediately after cotton planting, is the most effective at-plant residual herbicide that can be applied in cotton to provide adequate control of glyphosate- and glyphosate/ALS-resistant Palmer amaranth.

In either GR or non-transgenic cotton, early season over-the-top options are limited to pyrithiobac (ALS herbicide). Pyrithiobac only suppresses emerged GR Palmer amaranth when it is less than 5 cm in height (Anonymous 2009c; Culpepper et al. 2008a). Again, Palmer amaranth resistant to pyrithiobac is very common throughout the Cotton Belt (Heap 2009; Wise et al. 2009), and Palmer amaranth populations with resistance to both glyphosate and pyrithiobac have been confirmed in Georgia (Sosnoskie et al. 2009a). Palmer amaranth with resistance to both glyphosate and ALS-inhibiting herbicides can not be managed or even suppressed with any topical herbicide in GR or non-transgenic cotton. Fluometuron plus MSMA can be directed to small cotton (sprayed to the bottom 2 inches of the plant), but the height differential necessary for directed application is rarely achieved because of the rapid growth rate of Palmer amaranth (Horak and Loughin 2000, Figure 3). Fluometuron and MSMA can be applied overtop of cotton, but these herbicides applied in this manner often adversely affect yield and maturity of cotton (Byrd and York 1987; Guthrie and York 1989) and do not adequately control Palmer amaranth at the rates recommended for topical application. Some directed herbicide options, such as diuron plus MSMA, can effectively control emerged Palmer amaranth (Culpepper et al. 2008a), but these applications are restricted by cotton size at time of application, often requiring cotton to be at least 30 cm in height (Anonymous 2009a). By the time cotton reaches this height, Palmer amaranth is often far too large for effective control in this manner.

Glufosinate-resistant cotton provides an alternative technology and herbicide mode of action for the control of GR Palmer amaranth. Glufosinate applied in a timely manner in glufosinate-resistant crops can control *Amaranthus* species (Beyers et al. 2002; Culpepper et al. 2008a; Gardner et al. 2006; Marshall 2009). Although glufosinate is less effective than glyphosate on non-GR Palmer amaranth, glufosinate-based systems have been more effective than glyphosate-based systems controlling GR Palmer amaranth (Culpepper et al. 2008a; Marshall 2009). This technology offers growers an opportunity, provided that glufosinate applications are timely, to manage emerged GR and ALS-resistant Palmer amaranth in cotton. The challenge is making applications of glufosinate to target plants less than 10 cm in height (Anonymous 2009b; Coetzer et al. 2002), especially when the weed can grow 5.0 cm per day under ideal field conditions (Figure 3).

Regardless of the cotton technology grown, the need for fomesafen is evident (Tables 2, 3, and 4). The benefits from adding fomesafen into a sound herbicide system, including residual at-plant herbicides, postemergence herbicides, and layby directed herbicides, are well documented. For example, Palmer amaranth control when adding fomesafen into a system of pendimethalin applied preemergence (PRE), glyphosate plus pyrithiobac topical, and diuron plus MSMA directed at layby improved late-season Palmer amaranth control by 52% and increased seed cotton yield by 73% (Table 2). In a system with pendimethalin applied PRE, glyphosate plus S-metolachlor topical, and diruon plus MSMA directed at layby, the addition of fomesafen improved late-season Palmer amaranth control by 34% and increased seed cotton yield by 693 lb/A (no yield was noted without fomesafen) (Table 3). When applying fluometuron instead of fomesafen in the system with pendimethalin applied PRE, glyphosate plus S-metolachlor topical, and diruon plus MSMA directed at layby, Palmer amaranth control by the fluometuron system was 22% less effective and yields were 75% less than compared to the same system using fomesafen. In a similar glufosinate-based system using residual at-plant herbicides, the addition of fomesafen improved Palmer amaranth control 17% and increased yields 25% (Table 4). Residual at-plant herbicide applications will be necessary in glufosinate-based programs to delay Palmer amaranth emergence, reduce the window of Palmer amaranth emergence, and reduce the overall number of emerged plants in a given area if growers are to be successful with this technology (Table 4).

Table 2. Impact of fomesafen in a Roundup Ready cotton herbicide program in Georgia, 2008.*

Herbicide system	% late-season glyphosate-Palmer amaranth control	Seed cotton yield (lb/A)
Pendimethalin PRE glyphosate POST 1 glyphosate POST 2 diuron + MSMA directed	0 d	0 d
Pendimethalin + **fomesafen** PRE glyphosate POST 1 glyphosate POST 2 diuron + MSMA directed	53 b	762 b
pendimethalin PRE glyphosate + pyrithiobac POST 1 glyphosate POST 2 diuron + MSMA directed	36 c	312 c
pendimethalin + **fomesafen** PRE glyphosate + pyrithiobac POST 1 glyphosate POST 2 diuron + MSMA directed	88 a	1160 a
*Pendimethalin = Prowl H20 2.1 pt/A; fomesafen = Reflex at 1 pt/A; glyphosate = Roundup WeatherMax at 22 oz/A; diuron = Direx at 1 qt/A; MSMA = MSMA at 2 lb ai/A and pyrithiobac = Staple LX at 1.7 fl oz/A. Data also available on web at gaweed.com (results are from C21-08).		

Table 3. Impact of fomesafen in a strip-tillage Roundup Ready cotton herbicide program in Georgia, 2007.*

Herbicide system	% late-season glyphosate-resistant Palmer amaranth control	Seed cotton yield (lb/A)
pendimethalin PRE glyphosate + *S*-metolachlor POST 1 glyphosate POST 2 diuron + MSMA directed	23 c	0 c
pendimethalin + **fomesafen** PRE glyphosate + *S*-metolachlor POST 1 glyphosate POST 2 diuron + MSMA directed	67 a	639 a
pendimethalin + fluometuron PRE glyphosate + *S*-metolachlor POST 1 glyphosate POST 2 diuron + MSMA directed	45 c	161 b
*Pendimethalin = Prowl H20 2.5 pt/A; fomesafen = Reflex at 1 pt/A; glyphosate = Roundup WeatherMax at 22 oz/A; diuron = Direx at 1 qt/A; fluometuron = Cotoran at 1.25 qt/A; MSMA = MSMA at 2 lb ai/A; and S-metolachlor = Dual Magnum 1 pt/A. Data also available on web at gaweed.com (results are from C4-07).		

Table 4. Impact of fomesafen in a Liberty Link cotton herbicide program.*

Herbicide System	% late-season glyphosate-resistant Palmer amaranth control	Seed cotton yield (lb/A)
pendimethalin PRE glufosinate POST 1 diuron + MSMA directed	77 b	903 b
pendimethalin + **fomesafen** PRE glufosinate POST 1 diuron + MSMA directed	95 a	1197 a
glufosinate POST 1 glufosinate POST 3 diuron + MSMA directed	74 b	680 c
*Pendimethalin = Prowl H20 2.1 pt/A; fomesafen = Reflex at 1 pt/A; glufosinate = Ignite 280 at 23 or 29 oz/A; diuron = Direx at 1 qt/A; MSMA = MSMA at 2 lb ai/A. Data also available on web at gaweed.com (results are from C22-06).		

Impact of EPA's proposed regulations on Georgia's cotton production

To determine the economic impact of the EPA's proposed regulations, the University of Georgia determined the location of 4980 acres used to produce agricultural commodities including both cotton and vegetable crops in Tift County, Georgia. The subset acres in the county were chosen to obtain a representative field shape and size of the county and state. Each field border was marked using GIS software. Simultaneously, the borders of wetlands and waterways where potential endangered species may reside were also marked with the software. Of the 4980 acres in Tift County, a buffer of 850 feet as proposed by the EPA would eliminate the use of fomesafen on 3303 of these acres thereby reducing the amount of potential land treated with fomesafen by 67%. Tift county field shapes and sizes are an excellent indicator for field shapes and sizes across the state; thus, results from the county project will be used to conduct economic losses for the entire state of Georgia.

To determine economic impact from these proposed regulations, the numbers used for cotton acres produced and its value were averaged over the past three years using figures from the Georgia Farm Gate Value Report (http://www.caed.uga.edu/publications/annual.html#2008). Reports concluded that Georgia cotton was planted on 1.15 million acres have a value of $652.8 million. With 67% of the land potentially not treated because of EPA regulations, the impact would be on 770,000 acres (0.67 X 1.15 million acres) of cotton with a value exceeding $437.4 million ($652.8 million X .67). Of this 770,000 of cotton land impacted, approximately 51% (value determined by University of Georgia agent survey) of this land is infested with moderate to severe populations of Palmer amaranth. Thus, 393,000 acres (770,000 X 0.51 = 392,700) valued at over $223 million (437.4 X 0.51 = 223.1) is at risk from increased competition by Palmer amaranth. Moderate and severe populations of Palmer will reduce cotton yield significantly (Tables 2 and 3), with yield losses likely to exceed 70% if growers are restricted from using fomesafen. Thus, those 393,000 acres would potentially produce 70% (or more) less yield thereby reducing value at least $156 million ($223 million X 0.7 = $156 million less value). It is critical to mention, increased picker costs from Palmer amaranth infestations (Rowland et al. 1999) and the impact from foreign plant matter (pigweed plant parts) in the lint were not included in this calculation.

Fomesafen and its impacts on fruiting vegetables and cucurbits

Weed control tactics currently available in vegetables grown on bareground and plasticulture are extremely limited. However, IR-4, the University systems, and the EPA have been working extensively to increase the number of tools available for vegetable growers to manage weeds. One such tool is fomesafen for use in fruiting vegetables (including tomato, pepper, and eggplant) as well as in cucurbits (watermelon, cantaloupe, and squash). These vegetables are extremely valuable and are essential to Georgia's economy (Table 7). Fomesafen can be used effectively to control two of the most troubling weeds in vegetables: Palmer amaranth and yellow nutsedge (Table 8). For example, the addition of fomesafen to a typical watermelon program improved control of Palmer amaranth and yellow nutsedge at least 93% and essentially doubled the yields being produced. The University of Georgia and Georgia vegetable producers are anxiously awaiting full registration of fomesafen in these vegetable crops. Labels are hopeful for the 2011 production season.

Table 7. Farm Gate Value of Impacted Vegetable Crops in Georgia

Georgia Farm Gate Values – State Wide

Crop	------- Bareground ------- Acres	Farm Gate Value	------- Plasticulture ------- Acres	Farm Gate Value
Banana Pepper	55	$552,053	105	$1,053,919
Bell Pepper	777	$13,242,969	5,078	$86,548,003
Cantaloupe	1,603	$7,775,488	3,305	$16,031,184
Eggplant	206	$2,216,075	722	$7,767,019
Hot Pepper	79	$792,949	503	$5,048,776
Snap Bean	13,219	22,588,108		
Squash	3,310	$14,374,697	2,291	$9,949,375
Tomato	457	$5,827,896	3,437	$43,830,371
Watermelon	8,754	$37,815,634	15,461	$66,788,614
Winter Squash	246	$1,068,331	105	$455,995
Zucchini	2,345	$10,157,470	1,125	$4,872,986
Total within production regime	31,051	$116,411,670	32,132	$242,346,242
Total	**Acres = 63,183; Value 358,757,912**			

Source: *2007 Georgia Farm Gate Value Report, The University of Georgia, Center for Agribusiness and Economic Development*

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Table 8. Watermelon, yellow nutsedge, and Palmer amaranth response to programs with and without fomesafen, Georgia, 2007.

Herbicide System	% late-season Palmer amaranth control	% late-season yellow nutsedge control	Watermelon yield
ethalfluralin	0	0	13 fruit; 129 lbs
ethalfluralin + fomesafen	98	93	27 fruit; 246 lbs
*Ethalfluralin = Curbit 2.0 pt/A; fomesafen = Reflex at 1 pt/A; data also available on web at gaweed.com (results are from Veg30-2007).			

Fomesafen needed to assist in the replacement of methyl bromide

Continued efforts are underway in Georgia to implement effective and economical alternatives to methyl bromide. Currently, MIDAS (methyl idodide) and the Georgia 3-WAY (1,3-dichloropropene, metam sodium, chloropicrin) are potential replacements for methyl bromide in regards to pest management. Once registered, Paladin (dimethyl disulfide plus chloropicrin) has proven to be effective in managing many pests and has the potential to be adopted depending on the price structure and our ability to manage its odor.

Although both the 3-WAY and Paladin appear promising, neither fumigant system will stand alone in managing weedy pests (Culpepper et al. 2008b; Table 8). The high cost of MIDAS limits use rates to the point where adequate weed control cannot be achieved (Table 9). The 3-WAY (during summer/fall applications) and MIDAS (at economical rates) do not provide adequate nutsedge control and the Paladin system does not adequately control grasses or *Amaranthus* (Tables 8 and 9). Therefore, an herbicide program must be developed to compliment each of these fumigant systems.

Studies are currently in progress to evaluate the impact of fomesafen on fumigant systems in Georgia, including MIDAS, the Georgia 3-WAY, and Paladin, in hopes of improving control of both yellow nutsedge and A*maranthus* species while possibly reducing the amount of fumigant being applied. Initial results from the MIDAS experiment (Table 9) clearly document the impact of fomesafen in nutsedge control; the number of emerged nutsedge plants was reduced by more than 50% when fomesafen was applied in conjunction with a fumigant as compared to the fumigant applied alone.

Table 8. Pepper growth and weed control with DMDS and the 3-WAY. [1]

Fumigant Options[2]	Plant Stand (#/A)	Plant Height (120 plant per plot avg.)	*Amaranth* (# plant/A)	Crabgrass[3] (# plant/A)	Nematode[4] (0-10)
DMDS 60 G	17,378 a	18.3 a	47 c	580 a	3.8 a
DMDS 50 G	16,408 a	17.5 a	80 b	700 a	6.0 a
DMDS 40 G	15,923 a	17.6 a	120 a	778 a	4.0 a
3-WAY	17,063 a	16.9 a	28 c	19 a	2.0 a

[1]Values within a column followed by the same letter are not different at $P = 0.05$.
[2]DMDS = dimethyl disulfide plus chloropicrin 79:21; 3-WAY = Telone II fb chloropicrin fb Vapam. DMDS injected 8 inches below the bed top; Telone II shank injected 14 inches deep; chloropicrin injected 8 inches deep; Vapam injected 4 inches below the bed top.
[3]Once grasses reached 3 inches in height, Select was applied over the trial area.
[4]Nematode gall ratings were evaluated with 0 = no galling and 10 = severe galling.

Table 9. Yellow nutsedge response to the addition of fomesafen to a MIDAS fumigant system in pepper.

Fumigant/Herbicide System (broadcast rate)	Number of yellow nutsedge plants emerging through mulch at 31 DAT	Number of yellow nutsedge plants emerging through mulch at 52 DAT	Number of yellow nutsedge plants emerging through mulch at 63 DAT
MIDAS 98:2 at 100 lb/A	65	110	108
MIDAS + fomesafen (0.25 lb ai/A)	15	47	52
*Fomesafen = Reflex 1 pt/A; data will be published fall of 2009 as Veg8-09.			

Fomesafen and its use in snap beans

Georgia is currently one of the largest producers of snap beans in the country with a farm gate value exceeding $22 million. Many of Georgia's snap bean acres are rotated with cotton. With the current Palmer amaranth infestation levels developed in cotton, snap bean producers face severe populations of Palmer amaranth. No research has documented the competitive ability of snap bean with Palmer amaranth; however, research has documented that green bean losses exceeding 65% occur when competing with redroot pigweed (*Amaranthus* retroflexus) (Mirshekari et al. 2007). Horak and Loughin (2000) determined that Palmer amaranth plants grew at rates of 0.18 to 0.21 cm GDD^{-1} (growing degree days, base temperature of 10˚C), which are 30 to 160% greater than the rates of height growth observed for similar species including: common waterhemp (*A. rudis*) (0.11 to 0.16 cm GDD^{-1}), tumble pigweed (*A. albus*) (0.08 to 0.09 cm GDD^{-1}), and redroot pigweed (0.09 to 0.12 cm GDD^{-1}). This suggests that snap bean losses can approach 100% without complete or nearly complete Palmer amaranth control. Although dinitroanaline herbicides and metolachlor are labeled for use in snap bean, they do not provide adequate control when applied without fomesafen (Kichler et al. 2007). The lack of adequate control by dinitroanalines and metolachlor is likely a response to extremely high seed bank populations that have increased due to the onset of glyphosate-resistance when rotated with cotton. For example, if metolachlor provided 90% control of a Palmer amaranth emergence of 484,000 seed per acre (typical emergence populations) then there would be over 48,000 plants per acre that would not be controlled by metolachlor and snap bean could not be harvested. In addition to issues with Palmer amaranth, various morningglory species are present in every snap bean production field in Georgia. Fomesafen is the only tool available for use in snap bean to effectively control morningglory; if adequate control of morningglory is not obtained mechanical harvesting is not feasible.

Endangered plant species in Georgia and their relationship with fomesafen

Numerous endangered plant species have been documented in Georgia, including American chaffseed, Buckthorn, Dwarf witchalder, Georgia plume, Granite rock stonecrop, Harper Fimbry, Hairy rattleweed, Lax Watermilfoil, Ocmulgee skullcap, Parrot pitcher-plant, Pondberry, Pondspice, Variable-leaf Indian-plaintain, and Wagner spleenwort. The EPA's assessment resulted in a determination that the use of fomesafen is likely to adversely affect a variety of listed endangered species. The authors have searched the literature to understand the relationship of these endangered species and fomesafen and, with the exception of Buckthorn, cannot find scientific data supporting the EPA's claims that fomesafen will harm these plants. With Buckthorn, the data actually suggest that this plant may not sensitive to fomesafen.

It is important that the authors stress their support in protecting endangered plant and animal species in our state. And, in fact, the lack of data, which potentially disproves the EPA's assessment on endangered plant species sensitivity to fomesafen, is not relevant. What is relevant is that we, as stewards of our environment, work diligently to make sure fomesafen stays in the intended target area. We believe that this can be done without EPA regulatory actions creating an 850-foot buffer around fomesafen-treated fields, thereby seriously impacting agronomic and vegetable production in the state of Georgia.

Research in progress in Georgia understanding herbicide drift and volatility

Our research efforts to understand herbicide drift and volatility have increased significantly during 2009. This increased effort is driven by the development of dicamba- and 2,4-D-resistant cotton and soybeans and the potential impact these herbicides might have on non-target crops if they were not maintained within the treated area. Thus far, the most interesting study conducted focused on the movement of 2,4-D, both physical wind spray drift as well as volatility. The study design was implemented as shown in Figure 8. In figure 8, the green square in the center of the diagram and the study was a 12 by 25 foot treated area. The experiment focused on 2,4-D and cotton because cotton is more sensitive to 2,4-D than most other crops are to any other herbicide. In fact rates as low as 1/1200 of the normal use rate of 2,4-D can injure cotton as much as 45% (Marple et al. 2008). Cotton sensitivity to 2,4-D appears to be about three times greater than that of tomato, watermelon, or cantaloupe (Culpepper data available by Oct., 2009); thus, cotton and 2,4-D are an absolute worst case scenario to document herbicide movement.

Results of this study noted 2,4-D (Weedar, amine formulation) movement was actually no greater than 18 inches from the sprayed target area (Figures 9 through 13). Data from this study will be available during the fall of 2009. The authors of this document are not suggesting that there should be no concerns about drift, but rather that drift can be managed by understanding proper application procedures and by understanding the movement of spray in various environmental conditions. Although this research is focusing on 2,4-D and not fomesafen, it is expected that spray particle movement fomesafen should be similar to that of 2,4-D when applied with the same equipment in the same environment.

Additional studies with a similar application approach in different environments (i.e., varying winds, moistures etc.,) are planned for 2010. These studies can be used to help determine the distance of movement in varying conditions. Once unfavorable conditions are documented, the data can be used to help manufactures and the EPA develop label restrictions prohibiting applications in certain environments. Additionally, these labels will likely provide the appropriate as well as the ideal application techniques (i.e., pressure, spray tip, spray volume) that should be used to limit herbicide movement. The need for the EPA to arbitrarily assign a distance of 850 feet between treated areas and habitats that could house endangered species lacks scientific merit as proven by our research.

Figure 8. Off-target Movement of 2,4-D Amine in Cotton Field Design – Drift and Volatility Assessment

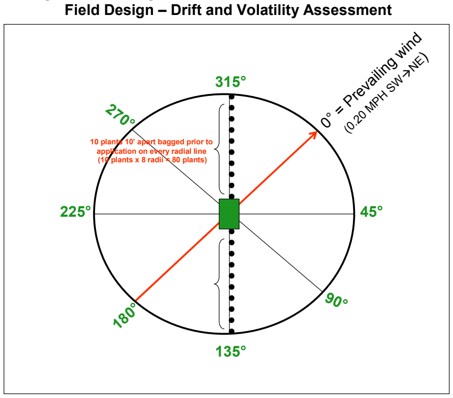

Figure 9. Covering of plants to study volatility.

Figure 10. Application of 2,4-D at 1 qt/A.

Figure 11. Injury from 2,4-D application.

Impact on The University of Georgia's ability to develop methyl bromide alternative systems and to develop programs to control glyphosate-resistant Palmer amaranth

Currently, the bulk of research being conducted to develop methyl bromide alternative systems for Georgia growers is conducted at the University of Georgia's Ponder Research Farm. At this location, an 850-foot buffer between wooded and swamp areas would negate 100% of the acres currently utilized for this research. This area has been critical in developing the Georgia 3-WAY which is now used on 60% of plasticulture acreage in Georgia. Additionally, this alternative has been adopted to varying levels in Florida, South Carolina, and North Carolina. Fomesafen is likely to be a key component of the sustainability of the Georgia 3-WAY and other potential alternatives to methyl bromide. Without herbicides such as fomesafen, alternatives to methyl bromide are likely not sustainable and the need for methyl bromide would greatly increase.

Also at the University of Georgia Ponder research farm, systems to manage glyphosate-resistant Palmer amaranth are being developed. The land currently used for this research would be reduced by at least 75% because of proposed regulations. If we can not develop effective and economical production systems for cotton and soybean quickly, cotton and soybean production will cease in Georgia and throughout the Southeast.

Regulations such as those proposed by the EPA will not only greatly restrict agricultural production in the United States, it will also restrict the ability of University and Industry researchers from developing new and innovative technologies that are needed to feed the world.

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