PROJECT TITLE: Evaluation of Preemergence Herbicides for Annual Weed Control in Young Blueberry Fields (Final Report – Research).

GRANT CODE: SRSFC 2013-13

CONTACT INFORMATION:

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OBJECTIVE:

The primary objective is to evaluate several unlabeled preemergence herbicides for safety and efficacy in newly planted and containerized blueberries.

JUSTIFICTION:

The acreage of blueberries in Georgia and the Southeast continues to grow (~30K acres in Georgia). The blueberry acreage in the Southeast consists of both rabbiteye (*Vaccinium ashei*) and southern highbush (*Vaccinium corymbosum*) blueberries. Preemergence weed control is important during all growing stages of blueberry production, but weed control in blueberry fields during the first two years of establishment is usually the most challenging. If preemergence herbicides are not used judiciously, many growers throughout Georgia and the Southeast will experience heavy infestations of annual weeds (i.e. annual grasses, annual sedges, and broadleaf weeds from seed) during the establishment period. At present, we have several preemergence herbicide options, but more options are still needed during blueberry establishment. Currently, Surflan (oryzalin), Princep (simazine), and Gallery (isoxaben) are used during these periods of establishment, but many growers are experiencing unacceptable damage with Surflan/ Simazine combinations and the price of Surflan / Gallery combinations can be inhibitive. Other, herbicides such as Dual Magnum (metolachlor), Lasso (alachlor), and Pendulum (pendimethalin) have the potential to provide good weed control and safety on young blueberry plants. Unfortunately, there is little data on the safety of these products on young blueberries.

METHODS:

Field experiment (FR-12-13): The blueberry plants in the field experiment where Farthing highbush blueberry (*Vaccinium corymbosum* 'Farthing'), and where established in January of 2012. The field experiment was initiated on March 21, 2013, and where approximately 18 inch at the time of treatment. Blueberries were planted on 4 feet spacing and rows were 12 foot on center. All treatments were applied over-the-top with a CO_2 backpack sprayer calibrated to deliver 20 gallons per acre (GPA). Each treatment of each replication contained 3 live blueberry

plants at the time of treatment. Treatments were arranged in a randomized complete block (RCB) design, and consisted of 4 replications. Plant were irrigated by drip irrigation and watered on an as need bases. Ratings for plant injury where taken at 2, 5, 9, and 13 WAT. Data was analyzed using analysis of variance and means were exposed to Fisher=s least significant difference (LSD) test with a significance level of α=0.05. Treatment list is presented below.

Container experiment (FR-13-13): With the field experiment, 2" x 2" liners of Ochlockonee rabbiteye blueberry (*Vaccium ashei* 'Ochlockonee') where transplanted to one gallon containers in late February of 2013. The growing medium used was Old Castle 21G mix (one of several industry standards). Old Castle 21G has a bulk density of 17 to 20 pounds per cubic feet, and the pH range is 5.5 to 6.5. The mix contains processed pine bark, peat moss, vermiculite, and perlite. All plants also received a slow release fertilizer application (~1 Tablespoon of a 13-13-13 Osmocote or 16-6-11 Polyon / container) during the experiment. The container experiment was established on April 9, 2013, and where approximately 8" at the time of treatment. Plants where watered at least two times daily, but amount was varied occurring to temperatures and weather. Each water event provided approximately one half inch of water. Before herbicide applications were applied, 4 plants were assembled in a 6' x 6' area. Herbicide applications were made to 4 containers in the 6' x 6' area. All treatments were applied over-the-top of the blueberry with a CO_2 backpack sprayer calibrated to deliver 20 gallons per acre (GPA). After herbicide treatment was applied, pots were moved to assigned test area where they were arranged in a randomized complete block (RCB) design. Treatment list was identical to FR-12-13, and is listed below. Ratings for plant injury where taken at 2, 4, 8, and 12 WAT. Data was analyzed using analysis of variance and means were exposed to Fisher=s least significant difference (LSD) test with a significance level of α=0.05.

The treatment lists for both experiments were identical and listed below:

Treatment Number	Treatment Name	Formulation	Application Rate
1	Princep (simazine)	4 L	4.0 lb ai/A (4.0 qt/A)
2	Surflan (oryzalin)	4 L	4.0 lb ai/A (4.0 qt/A)
3	Princep (simazine)	4 L	2.0 lb ai/A (2.0 qt/A)
3	Surflan (oryzalin)	4 L	2.0 lb ai/A (2.0 qt/A)
4	Surflan (oryzalin)	4 L	2.0 lb ai/A (2.0 qt/A)
4	Gallery (isoxaben)	75 DF	0.75 lb ai/A (1.0 lb/A)
5	Gallery (isoxaben)	75 DF	1.0 lb ai/A (1.33 lb/A)

6	Chateau (flumioxazin)	51 DF	0.38 lb ai/A (12.0 oz)
7	Dual Magnum (metaloachlor)	7.62 L	1.91 lb ai/A (1.0 qt/A)
7	Surflan (oryzalin)	4 L	2.0 lb ai/A (2.0 qt/A)
8	Dual Magnum (metaloachlor)	7.62 L	3.81 lb ai/A (2.0 qt/A)
9	Surpass (acetochlor)	6.4 L	1.66 lb ai/A (1.0 qt/A)
9	Surflan (oryzalin)	4 L	2.0 lb ai/A (2.0 qt/A)
10	Surpass (acetochlor)	6.4 L	3.2 lb ai/A (2.0 qt/A)
11	Prowl H20 (pendimethalin)	3.8 L	3.8 lb ai/A (4.0 qt/A)
12	Solicam (norflurazon)	78.6 DG	2.36 lb ai/A (3 lb/A)
13	Alion (indazaflam)	1.7 L	0.03 lb ai/A (2.5 oz/A)
14	Alion (indazaflam)	1.7 L	0.06 lb ai/A (5.0 oz/A)
15	Control		

Plant injury was taken on a (0-100 scale) and numbers represented the following:

Value	**Plant Symptoms**
0	No visual injury present
10-30	Minimal injury to desirable plant. Less than 10% of the plant leaf service area showing chlorosis and necrosis.
40-70	More noticeable plant injury or stunting. Greater than 50% of the leaf area showing symptoms of chlorosis and/or necrosis.
80-90	Plants severally injured. Most of the leaves and leaf surface showing signs of chlorosis and necrosis.
100	Plant appears dead. No signs of regrowth.

RESULTS:

Field experiment (FR-12-13): Little weed growth was observed in the field trial, and no weed

control ratings were taken at any of the rating dates. Though significant injury was observed with several of the experimental treatments, no injury exceeded 28% during the experimental rating period (see data below). Significant injury was seen with the Princep and Chateau treatments at 5 WAT. Injury significantly different from the non-treated was seen with Solicam at 2 and 5 WAT. Alion 2.5 oz/A rate at 2 and 5 weeks after treatment (WAT), and Alion 5.0 oz/A rate at 2, 5 and 9 WAT where also causing significant injury when compared to the non-treated control. No injury with any of the treatments was recorded at 12 WAT.

Container experiment (FR-13-13): Significant injury was also observed with several of the experimental treatments; however, no injury exceeded 25% during the experimental rating period (see data below). Significant injury was observed with Alion 2.5 and 5.0 oz/A rate at 2, 4, and 8 weeks after treatment (WAT). Injury significantly different from the non-treated control was observed with Princep, Chateau, and Solicam at both 2 and 4 WAT. No injury with any of the treatments was recorded at 12 WAT.

CONCLUSIONS:

Injury was observed with Pricep, Chateau, Solicam, and Alion during both experiments, but was transient and had dissipated by the 12 WAT rating in both experiments. Although over-the-top applications of these herbicides is questionable, directed applications that limit foliar contact would probably be acceptable to most growers. Several of these herbicides already have bearing application labels (Surflan, Pricep, and Solicam), but Dual Magnum, Gallery, and Alion could possibly have a good fit in a preemergence weed control program in young blueberry plant.

IMPACT STATEMENT:

Title: Preemergence herbicides for use in young blueberries.

Situation: There has been a considerable increase of Georgia grown blueberries over the past twenty years. As of 2013, Georgia has outpaced every other state in the nation to become number one in blueberry acreage. The blueberry species grown are rabbiteye blueberries (*Vaccinium ashei*) and southern highbush blueberries (*Vaccinium corymbosum*). Weeds continue to be a problem during all stages of establishment, and the control measures are limited.

Response: Research was begun to screen a large spectrum of herbicide and herbicide combinations that are safe at all stages of blueberry production, but with particular emphasis on young newly planted blueberries.

Results: Several herbicides, including isoxaben, metolachlor, and indazaflam, were identified as an excellent preemergence herbicide that had potential for use as preemergence herbicides in recently planted blueberries.

University of Georgia, Dept. of Hort.

Evaluation of Pre-herbicides for Tolerance in Young Field Grown Blueberries.

Trial ID: FR-12-13
Protocol ID: FR-12-13
Location: Alma, GA
Study Director: Dr. Mark Czarnota
Project ID: Field Blueberries
Investigator: Dr. Mark Czarnota
Sponsor Contact: Georgia Blueberry

Trt No.	Treatment Name	Rate	Rate Unit	Appl Code	1	2	3	4
Crop Code					VACCO FA	VACCO FA	VACAS OC	VACAS OC
Crop Scientific Name					Vaccinium cory>	Vaccinium cory>	Vaccinium cory>	Vaccinium cory>
Crop Name					Blueberry, Hig>	Blueberry, Hig>	Blueberry, Hig>	Blueberry, Hig>
Part Rated					LEAF C	LEAF C	LEAF C	LEAF C
Rating Date					4/3/2013	4/25/2013	5/23/2013	6/19/2013
Rating Type					DAMHER	DAMHER	DAMHER	DAMHER
Rating Unit					percent	percent	percent	percent
Number of Subsamples					1	1	1	1
Rating Timing					2 WAT	5 WAT	9 WAT	13 WAT
Days After First/Last Applic.					-6 -6	16 16	44 44	71 71
Trt-Eval Interval					35 DA-A	35 DA-A	63 DA-A	456 DA-A
Number of Decimals					0	0	0	0
1	Surflan	4	qt/a	A	0 c	0 d	0 b	0 a
2	Princep	4	qt/a	A	0 c	4 c	0 b	0 a
3	Princep	2	qt/a	A	0 c	0 d	0 b	0 a
	Surflan	2	qt/a	A				
4	Surflan	2	qt/a	A	0 c	0 d	0 b	0 a
	Gallery	1.0	lb/a	A				
5	Gallery	1.33	lb/a	A	0 c	0 d	0 b	0 a
6	Chateau	12	oz/a	A	0 c	8 b	0 b	0 a
7	Dual Magnum	1	qt/a	A	0 c	0 d	0 b	0 a
	Surflan	2	qt/a	A				
8	Dual Magnum	2	qt/a	A	0 c	0 d	0 b	0 a
9	Surpass	1	qt/a	A	0 c	0 d	0 b	0 a
	Surflan	2	qt/a	A				
10	Surpass	2	qt/a	A	0 c	0 d	0 b	0 a
11	Prowl H20	4	qt/a	A	0 c	0 d	0 b	0 a
12	Solicam	3	lb/a	A	3 c	10 b	1 b	0 a
13	Alion	2.5	oz/a	A	6 b	4 c	0 b	0 a
14	Alion	5	oz/a	A	28 a	20 a	4 a	0 a
15	UTC				0 c	0 d	0 b	0 a
LSD (P=.05)					2.8	3.0	2.0	0.0
Standard Deviation					2.0	2.1	1.4	0.0
CV					81.81	70.74	424.68	0.0
Bartlett's X2					0.949	5.25	1.173	0.0
P(Bartlett's X2)					0.622	0.154	0.279	.
Replicate F					0.391	1.727	0.554	0.000
Replicate Prob(F)					0.7602	0.1761	0.6480	1.0000
Treatment F					52.188	28.507	1.990	0.000
Treatment Prob(F)					0.0001	0.0001	0.0432	1.0000

Part Rated
LEAF = foliage
C = Crop is Part Rated

Means followed by same letter do not significantly differ (P=.05, LSD)
Mean comparisons performed only when AOV Treatment P(F) is significant at mean comparison OSL.

University of Georgia, Dept. of Hort.

Evaluation of Pre-herbicides for Tolerance in Container Grown Blueberries.

Trial ID: FR-13-13
Protocol ID: FR-13-13
Location: Griffin, GA
Study Director: Dr. Mark Czarnota
Project ID: Field Blueberries
Investigator: Dr. Mark Czarnota
Sponsor Contact: Georgia Blueberry

Trt No.	Treatment Name	Rate	Rate Unit	Appl Code	1	2	3	4
	Crop Code				VACAS OC	VACCO FA		
	Crop Scientific Name				Vaccinium ashe>	Vaccinium ashe>	Vaccinium ashe>	Vaccinium ashe>
	Crop Name				Blueberry, Rab>	Blueberry, Rab>	Blueberry, Rab>	Blueberry, Rab>
	Part Rated				LEAF C	LEAF C	LEAF C	LEAF C
	Rating Date				4/23/2013	5/7/2013	6/4/2013	7/2/2014
	Rating Type				DAMHER	DAMHER	DAMHER	DAMHER
	Rating Unit				percent	percent	percent	percent
	Number of Subsamples				1	1	1	1
	Rating Timing				2 WAT	4 WAT	8 WAT	12 WAT
	Days After First/Last Applic.				26 26	40 40	68 68	461 461
	Trt-Eval Interval				35 DA-A	35 DA-A	63 DA-A	456 DA-A
	Number of Decimals				0	0	0	0
1	Surflan	4	qt/a	A	0 d	0 e	0 c	0 a
2	Princep	4	qt/a	A	9 bc	4 d	0 c	0 a
3	Princep	2	qt/a	A	0 d	0 e	0 c	0 a
	Surflan	2	qt/a	A				
4	Surflan	2	qt/a	A	0 d	0 e	0 c	0 a
	Gallery	1.0	lb/a	A				
5	Gallery	1.33	lb/a	A	0 d	0 e	0 c	0 a
6	Chateau	12	oz/a	A	5 c	8 c	0 c	0 a
7	Dual Magnum	1	qt/a	A	0 d	0 e	0 c	0 a
	Surflan	2	qt/a	A				
8	Dual Magnum	2	qt/a	A	0 d	0 e	0 c	0 a
9	Surpass	1	qt/a	A	0 d	0 e	0 c	0 a
	Surflan	2	qt/a	A				
10	Surpass	2	qt/a	A	0 d	0 e	0 c	0 a
11	Prowl H20	4	qt/a	A	0 d	0 e	0 c	0 a
12	Solicam	3	lb/a	A	9 bc	11 b	5 b	0 a
13	Alion	2.5	oz/a	A	11 b	9 bc	4 b	0 a
14	Alion	5	oz/a	A	25 a	18 a	9 a	0 a
15	UTC				0 d	0 e	0 c	0 a
	LSD (P=.05)				4.1	3.5	2.0	0.0
	Standard Deviation				2.9	2.4	1.4	0.0
	CV				73.88	75.32	120.13	0.0
	Bartlett's X2				4.291	4.368	1.014	0.0
	P(Bartlett's X2)				0.368	0.358	0.602	.
	Replicate F				0.182	0.255	0.848	0.000
	Replicate Prob(F)				0.9077	0.8574	0.4752	1.0000
	Treatment F				23.872	20.086	13.848	0.000
	Treatment Prob(F)				0.0001	0.0001	0.0001	1.0000

Part Rated
LEAF = foliage
C = Crop is Part Rated

Means followed by same letter do not significantly differ (P=.05, LSD)
Mean comparisons performed only when AOV Treatment P(F) is significant at mean comparison OSL.