Progress Report for 2005

TITLE: Evaluation of Herbicides for Yellow and Purple Nutsedge (*Cyperus esculentus* and *C. rotundus*) and Annual Sedges Control (*Cyperus spp*.) in Young Blueberry Fields (Research Proposal).

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Objectives:

1. Conduct research that will identify herbicides that are safe to young blueberries and give effective weed control, and to identify herbicides that can be requested for EPA registration through collaboration with IR-4.
    a. Determine tolerance of one and two year old blueberries to herbicides.
    b. Determine the effect of these herbicides on annual broadleaf and grass weeds found in blueberry fields.

Justification:

Currently, there is a lack of herbicides registered for young blueberries either because the restrictions on the label prevent use on young blueberries or there is no data on blueberry. Weeds are considered to be one of the most troublesome challenges that a blueberry grower faces. The most critical time for weed control in a blueberry field is during the first two years of establishment. At this time the blueberry plant is not a good competitor with weeds.

Methodologies:

Herbicide treatments were directed down both sides of the blueberry (10 to 27" tall) row on August 2, 2005. Treatments included Sandea at 0.67 oz/A, Envoke at 0.15 oz/A, Basagran at 1.0 pt/A, and a new herbicide (V-10142) being developed for nutsedge control in tomatoes by Valent.

An additional trial was conducted to evaluate yellow nutsedge control and blueberry tolerance of preemergence herbicide treatments. Treatments included Dual Magnum at 1.0 pt/A, Chateau at 2 oz /A, Sandea at 0.5 oz/A, Solicam at 5 lb/A, Eptam at 3.5 pt/A, and Envoke at 0.15 oz/A. Treatments were directed on each side of the blueberry row on April 29, 2005.

Results:

Sandea and Envoke appeared to be relatively safe (0 to 5% injury) when directed properly. Slightly more injury was visible with V-10142 (8%) and Basagran (12%). In another related trial to evaluate V-10142's efficacy on nutsedge, it gave 100% control of yellow nutsedge.

Visible crop injury from the second study evaluating yellow nutsedge control and blueberry tolerance of preemergence herbicide treatments ranged from 5 to 10% however by 54 days after treatment injury was 0%. Sandea controlled yellow nutsedge 90% and 85% 25 and 54 days after treatment, respectively. Envoke provided fair control 25 days after treatment and no control 54 days after treatment. Dual Magnum provided 75% yellow nutsedge control 54 days after treatment. Solicam control averaged 70% throughout the trial.

In 2006 blueberry seedlings will be established at the Horticultural Crops Research Station in Castle Hayne, NC and at the Sandhills Research Station in Jackson Springs, NC. The trials completed in 2005 will be repeated at both locations to aid in identifying herbicides that are safe to young blueberry plants and that give effective nutsedge and broadleaf weed control. Once herbicides are identified that are safe to young blueberries they will be submitted to the IR-4 program for consideration for registration by EPA.

Impact Statement:

These trials are useful in identifying potential herbicides for weed control in newly established blueberry fields.

OBJECTIVE / JUSTIFICATION: Acreage of blueberries, both rabbiteye (*Vaccinium ashei*) and southern highbush(*Vaccinium corymbosum*), have been on the increase in the Southeastern United States. When new blueberry fields are planted the most critical period for weed control is during the first two years of establishment. During this establishment period, many growers throughout the southeast experience heavy infestations of yellow and purple nutsedge (*Cyperus esculentus* and *C. rotundus*), and annual sedges (*Cyperus spp*.). At present, there are no herbicides labeled for selective postemergent sedge control during this establishment period. There are, however, several postemergent herbicides that are known to be safe to plants in the blueberry family (Ericaeae) that control sedges (e.g. halosulfuron and sulfentrazone). The goal of this study was to evaluate the safety of both halosulfuron and sulfentrazone on highbush and rabbiteye blueberries.

PROCEDURE / METHODOLOGIES:

Georgia Sites: In Georgia, three sites were chosen for the testing. Site #1 and #2 were located in Alma, Georgia. At site #1, the southern highbush blueberries (*Vaccinium corymbosum* 'Star') were approximately 2 year old, and over-the-top applications were applied on June 23, 2005. At site #2 the rabbiteye blueberries (*Vaccinium ashei* 'Brightwell' and 'Powderblue') were approximately 1 year old and had been established for less than 6 months. Over-the-top applications to site #2 were also applied on June 23, 2005. Site #3 was located in Griffin, Georgia, liners of southern highbush blueberries (*Vaccinium corymbosum* 'Millenium', *Vaccinium c.* 'O'Neal', *Vaccinium c.* 'Windsor') were transplanted into 1 gallon nursery pots allowed to grow for approximately 2 month. Over-the-top applications were applied May 13, 2005. Treatments applied at all 3 locations were identical, and consisted of the following:

Treatment #	Treatment	Formulation	Formulation Rate
1	Spartan	75 DF	3.0 oz/A
2	Spartan	75 DF	6.0 oz/A
3	Spartan	75 DF	12.0 oz/A
4	Spartan	75 DF	24.0 oz/A
5	Spartan	4 L	3.0 oz/A
6	Spartan	4 L	6.0 oz/A
7	Spartan	4 L	12.0 oz/A
8	Spartan	4 L	24.0 oz/A
9	Sandea	75 DF	0.5 oz/A
10	Sandea	75 DF	1.0 oz/A
11	Sandea	75 DF	2.0 oz/A
12	Sandea	75 DF	4.0 oz/A
13	Control		

All sprays solutions contained the surfactant Dynamic applied at a rate of 0.25% solution volume to volume. Dynamic is 100% active propriety blend of polyalkyleneoxide modified polydimethylsiloxane, polyoxypropylene-polyoxyethylene block copolymer, and methylated vegetable oils. In both field studies, plot size was approximately 6 x 12, and contained 3 plants per treatment. Test was applied as a randomized complete block with 4 replications. Applications of the containerized tests were done as follows, seventy-two one gallon pots of each species were placed in a 6 ft. x 6 ft. area. Herbicide treatments were then applied, and pots were moved to assigned test area where they were arranged in a randomized complete block (RCB) design. All treatments were applied with a CO^2 backpack sprayer equipped with 8002 flat fan spray tips. Sprayer was calibrated to deliver 20 gallons per acre (GPA).

RESULTS AND CONCLUSION:

Georgia sites: At site #1 and 2, data was taken at 2, 4, 8, and 16 weeks after treatment (WAT), and at site #3 data was taken at 1, 2, 3, 4, 8, 11, and 21 WAT. Blueberry 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.

At site #1, significant injury to highbush blueberry 'Star' was only seen at 8 and 16 WAT. The highest recorded injury was 33% with the 4.0 oz rate of Sandea (Table 1). At site #2, injury ratings of rabbiteye blueberry 'Brightwell' and 'Powderblue'did not exceed 29%, and significant injury followed no pattern (Table 2 and 3). At site #3, highbush blueberry 'Millenium' was significantly damaged by all Sandea treatments at 8, 11 and 21 WAT (Table 4). The 4L formulation of Spartan caused significant damage to Millenium at early rating periods, but injury had dissipated to non-significant levels by 21 WAT. Injury ratings with O'Neal was significantly damaged by all Sandea treatments at 8 and 21 WAT (Table 5). Spartan injury to O'Neal was significant only at 3 WAT, but did not exceed 23%, dissipated to non-significant levels by 21 WAT. Injury ratings to Windsor blueberries were significant with all the Sandea treatments at 8 and 21 WAT (Table 6). Although significant injury occurred with Spartan throughout the ratings of Windor blueberries did not exceed 10% during any of the rating periods.

Injury to blueberry varieties occurred with both Spartan and Sandea. It also appears that blueberries express varietial sensitivity to Spartan and Sandea. In general Spartan damage was minimal and tended to dissipate as rating continued. Injury with the liquid formulation of Spartan tended to be worse than the dry flowable formulation. Injury with Sandea was unacceptable in the blueberry container test (site #3), but did not exceed 26% in any of the field trials (sites #1 and 2). More field testing needs to be performed to determine if Sandea could be used as an over-the-top spray or as a post directed spray on young plants.

Table #1. Highbush blueberry injury (*Vaccinium corymbosum* 'Star') injury at site #1 (Alma, Georgia) 2005.

			Injury to Highbush (*Vaccinium corymbosum* 'Star')			
Treatment #	Treatment	Formulation Rate	2 WAT	4 WAT	8 WAT	16 WAT
1	Spartan 75 DF	3.0 oz/A	8 a	5 a	5 cd	13 def
2	Spartan 75 DF	6.0 oz/A	5 a	5 a	5 cd	13 def
3	Spartan 75 DF	12.0 oz/A	13 a	5 a	5 cd	10 ef
4	Spartan 75 DF	24.0 oz/A	14 a	5 a	5 cd	23 bc
5	Spartan 4 L	3.0 oz/A	14 a	5 a	5 cd	10 ef
6	Spartan 4 L	6.0 oz/A	8 a	5 a	5 cd	8 fg
7	Spartan 4 L	12.0 oz/A	6 a	5 a	8 bc	18 cde
8	Spartan 4 L	24.0 oz/A	14 a	5 a	6 bc	20 bcd
9	Sandea 75 DF	0.5 oz/A	6 a	5 a	6 bc	18 cde
10	Sandea 75 DF	1.0 oz/A	4 a	5 a	3 de	15 c-f
11	Sandea 75 DF	2.0 oz/A	8 a	5 a	9 b	28 ab
12	Sandea 75 DF	4.0 oz/A	5 a	5 a	14 a	33 a
13	Control		0 a	0 b	0 e	0 g
LSD			8.8	0.0	3.2	10.3

Table #2. Rabbiteye blueberry injury (*Vaccinium ashei* 'Brightwell') at site #2 (Alma, Georgia) 2005.

			Injury to Rabbiteye (*Vaccinium ashei* 'Brightwell')			
Treatment #	Treatment	Formulation Rate	2 WAT	4 WAT	8 WAT	16 WAT
1	Spartan 75 DF	3.0 oz/A	18 a-d	26 a-d	9 a	10 bc
2	Spartan 75 DF	6.0 oz/A	9 cde	14 de	8 a	23 abc
3	Spartan 75 DF	12.0 oz/A	31 a	20 a-d	14 a	25 ab
4	Spartan 75 DF	24.0 oz/A	23 abc	25 a-d	11 a	10 bc
5	Spartan 4 L	3.0 oz/A	13 b-e	15 cde	14 a	28 ab
6	Spartan 4 L	6.0 oz/A	13 b-e	18 bcd	10 a	18 abc
7	Spartan 4 L	12.0 oz/A	20 a-d	28 abc	14 a	15 abc
8	Spartan 4 L	24.0 oz/A	26 ab	23 a-d	9 a	15 abc
9	Sandea 75 DF	0.5 oz/A	9 cde	30 ab	10 a	25 ab
10	Sandea 75 DF	1.0 oz/A	8 de	28 abc	10 a	20 abc
11	Sandea 75 DF	2.0 oz/A	6 de	18 bcd	8 a	38 a
12	Sandea 75 DF	4.0 oz/A	9 cde	33 a	11 a	15 abc
13	Control		0 e	3 e	3 a	0 c
LSD			14.5	13.4	9.4	23.4

Table #3. Rabbiteye blueberry injury (*Vaccinium ashei* 'Powderblue') at site #2 (Alma, Georgia) 2005.

			Injury to Rabbiteye (*Vaccinium ashei* 'Powderblue')			
Treatment #	Treatment	Formulation Rate	2 WAT	4 WAT	8 WAT	16 WAT
1	Spartan 75 DF	3.0 oz/A	8 cde	11 bc	14 abc	29 a
2	Spartan 75 DF	6.0 oz/A	11 cde	5 bc	10 bc	29 a
3	Spartan 75 DF	12.0 oz/A	24 b	8 bc	8 bc	15 ab
4	Spartan 75 DF	24.0 oz/A	18 bc	15 ab	15 abc	15 ab
5	Spartan 4 L	3.0 oz/A	13 bcd	9 bc	13 abc	13 ab
6	Spartan 4 L	6.0 oz/A	10 cde	13 bc	19 abc	13 ab
7	Spartan 4 L	12.0 oz/A	11 cde	8 bc	6 bc	10 ab
8	Spartan 4 L	24.0 oz/A	39 a	15 ab	15 abc	15 ab
9	Sandea 75 DF	0.5 oz/A	14 bcd	28 a	20 ab	13 ab
10	Sandea 75 DF	1.0 oz/A	5 de	28 a	26 a	10 ab
11	Sandea 75 DF	2.0 oz/A	13 bcd	18 ab	19 abc	11 ab
12	Sandea 75 DF	4.0 oz/A	6 cde	18 ab	20 ab	13 ab
13	Control		0 e	0 c	6 c	0 b
LSD			11.3	13.1	14.1	21.9

Table #4. Injury to southern highbush blueberries (*Vaccinium corymbosum* 'Millenium') at site #3 (Griffin, Georgia) 2005.

			Injury to Highbush (*Vaccinium corymbosum* 'Millenium')		
Treatment #	Treatment	Formulation Rate	8 WAT	11 WAT	21 WAT
1	Spartan 75 DF	3.0 oz/A	0 d	0 b	
2	Spartan 75 DF	6.0 oz/A	0 d	0 b	
3	Spartan 75 DF	12.0 oz/A	0 d	0 b	
4	Spartan 75 DF	24.0 oz/A	0 d	0 b	
5	Spartan 4 L	3.0 oz/A	0 d	0 b	
6	Spartan 4 L	6.0 oz/A	17 bcd	17 b	
7	Spartan 4 L	12.0 oz/A	7 cd	0 b	
8	Spartan 4 L	24.0 oz/A	7 cd	0 b	
9	Sandea 75 DF	0.5 oz/A	20 a-d	3 b	10 b
10	Sandea 75 DF	1.0 oz/A	40 a	40 a	20 a
11	Sandea 75 DF	2.0 oz/A	30 ab	40 a	20 a
12	Sandea 75 DF	4.0 oz/A	27 abc	57 a	20 a
13	Control		0 d	0 b	0 c
LSD			21.7	20.7	8.4

Table #5. Injury to southern highbush blueberries (*Vaccinium corymbosum* 'O'Neal') at site #3 (Griffin, Georgia) 2005.

			Injury to Highbush (*Vaccinium corymbosum* 'O'Neal')		
Treatment #	Treatment	Formulation Rate	8 WAT	11 WAT	21 WAT
1	Spartan 75 DF	3.0 oz/A	0 d	0 c	
2	Spartan 75 DF	6.0 oz/A	17 cd	17 c	
3	Spartan 75 DF	12.0 oz/A	7 d	7 c	
4	Spartan 75 DF	24.0 oz/A	0 d	0 c	
5	Spartan 4 L	3.0 oz/A	23 bcd	0 c	
6	Spartan 4 L	6.0 oz/A	17 cd	10 c	
7	Spartan 4 L	12.0 oz/A	37 abc	17 c	
8	Spartan 4 L	24.0 oz/A	60 a	33 bc	
9	Sandea 75 DF	0.5 oz/A	37 abc	33 bc	17 a
10	Sandea 75 DF	1.0 oz/A	50 ab	33 bc	17 a
11	Sandea 75 DF	2.0 oz/A	53 a	63 ab	20 a
12	Sandea 75 DF	4.0 oz/A	57 a	83 a	20 a
13	Control		0 d	0 c	0 b
LSD			26.7	39.6	7.3

Table #6. Injury to southern highbush blueberries (*Vaccinium corymbosum* 'Windsor') at site #3 (Griffin, Georgia) 2005.

			Injury to Highbush (*Vaccinium corymbosum* 'Windsor')		
Treatment #	Treatment	Formulation Rate	8 WAT	11 WAT	21 WAT
1	Spartan 75 DF	3.0 oz/A	0 d	0 b	
2	Spartan 75 DF	6.0 oz/A	7 d	0 b	
3	Spartan 75 DF	12.0 oz/A	0 d	0 b	
4	Spartan 75 DF	24.0 oz/A	0 d	0 b	
5	Spartan 4 L	3.0 oz/A	0 d	0 b	
6	Spartan 4 L	6.0 oz/A	0 d	0 b	
7	Spartan 4 L	12.0 oz/A	0 d	0 b	
8	Spartan 4 L	24.0 oz/A	0 d	0 b	
9	Sandea 75 DF	0.5 oz/A	27 c	17 b	13 a
10	Sandea 75 DF	1.0 oz/A	43 b	17 b	13 a
11	Sandea 75 DF	2.0 oz/A	53 a	47 a	20 a
12	Sandea 75 DF	4.0 oz/A	57 a	50 a	20 a
13	Control		0 d	0 b	0 b
LSD			9.2	23.5	7.3