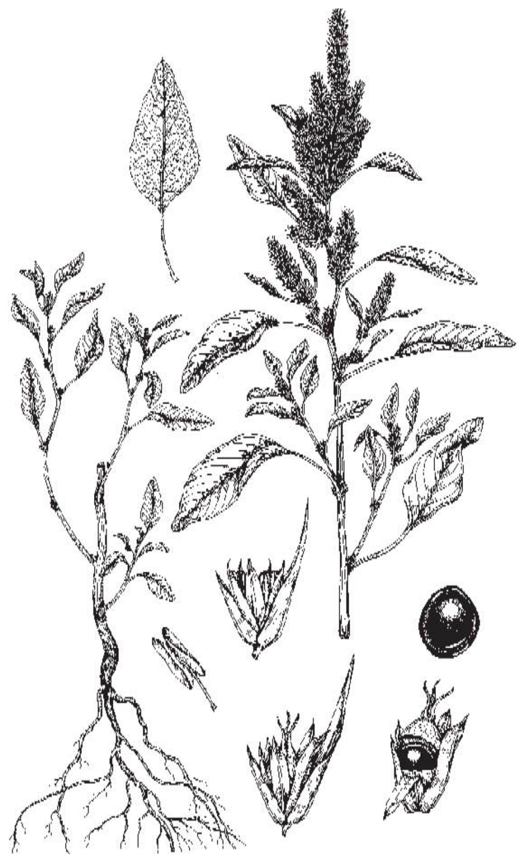
2010 Vegetable Weed Control Studies

February 2011



MP-162

Department of Horticulture and Landscape Architecture
Division of Agricultural Sciences and Natural Resources
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The Department of Horticulture and Landscape Architecture, cooperating departments and experimental farms conducted a series of experiments on field vegetable production. Data were recorded on a majority of aspects of each study, and can include crop culture, crop responses and yield data. This report presents those data, thus providing up-to-date information on field research completed in Oklahoma during 2010.

Small differences should not be overemphasized. Least significant differences (LSD) values are shown at the bottom of columns or are given as Duncan's letter groupings in most tables. Unless two values in a column differ by at least the LSD shown, or by the Duncan's grouping, little confidence can be placed in the superiority of one treatment over another.

When trade names are used, no endorsement of that product or criticism of similar products not named is intended.

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Cilantro Preemergence Weed Control

Spring 2010-Bixby, OK

Lynn Brandenberger, Lynda Carrier, Robert Havener, Bobby Adams

Introduction: Cultural work on cilantro has been ongoing at Oklahoma State during the past few years. Researchers have developed the basics for crop production, but work is continuing regarding weed control for this potential crop. Currently Prefar (bensulide) is labeled for cilantro weed control as a preplant incorporated herbicide. Although Prefar provides some control of weedy species during the early part of the production cycle, experience has shown Prefar alone is not capable of providing the level of control needed for commercial cilantro production in Oklahoma. The objective of this study was to compare different preemergence treatments to determine the level of crop safety and efficacy of several different pre herbicides.

Materials and Methods: The study included preemergence treatments some applied preplant incorporated and some as preemergence treatments following direct seeding. There were four different compounds alone and in combination for a total of 14 treatments (Table 1). All plots were arranged in a randomized block design with four replications. Plots included four rows of the Santo variety of cilantro planted on one foot row centers with a 20 foot plot length. Seeding rates were approximately 1.8 million seeds per acre. Plots were planted on 04/08/10 with pre and preplant incorporated (PPI) treatments being applied the same day. PPI treatments were applied with a tractor drawn plot sprayer and incorporated immediately following application with a Do-All field cultivator. Pre treatments were applied with a CO_2 sprayer using a hand-boom with a six foot wide spray pattern. The entire study area received 0.5 inch of overhead irrigation on 04/09/10. Application rate for spraying was 25 gallons of spray material per acre for all applications for both preplant incorporated and pre treatments. Plots received a total of 25 lbs of nitrogen per acre on 5/04/10. Emergence ratings were recorded on 4/30/10 crop injury on 5/04/10 and efficacy ratings were recorded just prior to harvest on 6/07/10. The rating scale that was used was a 0 to 100 scale where 0 represents no visible crop emergence, weed control or crop injury and 100 represents 100% emergence of the crop, control and or death of the weed species or the crop.

Results: Emergence did not vary between the different treatments (Table 1). Levels of emergence ranged from 83 to 91% on 4/30/10. Crop injury ratings were recorded on 5/04/10 and there were no differences between treatments with all ratings ranging between 1 and 8%. Control of weedy species did vary between treatments. Observations for Palmer amaranth (*Amaranthus palmeri*) were recorded as actual counts of the number of this species in plots. Prefar 4.0 PPI averaged 20 Palmer amaranth per plot, compared to 0 for Prefar 4.0 PPI + Lorox 0.5 pre and Prefar 6.0 PPI + Lorox 0.5 Pre. The four Prefar PPI treatments + Dual Magnum also provided good control of Palmer amaranth with an average of 1 Palmer amaranth per plot. Carpetweed (*Mollugo verticillata* L.) control varied between several treatments in the study. Prefar 4.0 PPI had 54% control of this species while Prefar 4.0 PPI + Lorox 0.5 Pre, Prefar 6.0 PPI + Lorox 0.5 Pre, and Prefar 6.0 PPI + Prowl H_2O 0.25 had control ratings of 96, 99, and 95%, respectively, for carpetweed. Yields did not vary between treatments. Yield ranged from 2784 to 4728 lbs per acre with Prefar 6.0 PPI, Prefar 4.0 PPI

+ Lorox 0.5 Pre, and Prefar 6.0 PPI + Lorox 0.5 Pre having yields of 4728, 4202, and 4347 lbs/acre, respectively.

Conclusions: All treatments in the study appear to be safe for use on cilantro. Emergence and crop injury ratings were acceptable for all treatments. Weed control did vary considerably with the highest level of control coming from Prefar combined with Lorox at 0.5 lbs for both weed species that were rated. Yield was highest for Prefar alone at 6.0 lbs, but this yield did not vary from other yields including those of the two Prefar + Lorox at 0.5 lbs treatments. Based upon the results the authors would conclude that combining Lorox at 0.5 lbs ai/acre with Prefar provides high levels of weed control and appears to be safe for use in cilantro. Additionally, Prowl H_2O appears to have potential and would warrant further study.

Acknowledgements: The authors would like to thank Mike DeRiso of Tessenderlo Kerley, Inc. for partial support of this study.

Table 1. 2010 Spring Cilantro weed control preemergence study, Bixby, OK. Emergence, injury, weed control, and yield.

	Emergence	Injury	Weed control		Yield
			Palmer amaranth	Carpet weed	
	4/30/10	5/04/10	6/07/10	6/07/10	6/07/10
Treatment descriptions lbs. ai/acre	-------%-------	-------%-------	---# per plot---	-------%-------	----lbs./acre----
Prefar 4.0 PPI	85 a	8 a	20 a	54 e	3140 a
Prefar 6.0 PPI	90 a	5 a	6 b-d	69 b-e	4728 a
Prefar 4.0 PPI + Dual Magnum 0.325	88 a	4 a	1 d	70 b-e	3730 a
Prefar 6.0 PPI + Dual Magnum 0.325	88 a	4 a	1 d	79 a-d	3331 a
Prefar 4.0 PPI + Dual Magnum 0.65	83 a	6 a	1 d	65 c-e	2877 a
Prefar 6.0 PPI + Dual Magnum 0.65	85 a	5 a	1 d	76 a-e	3013 a
Prefar 4.0 PPI + Lorox 0.1 Pre	91 a	4 a	7 b-d	85 a-c	3784 a
Prefar 6.0 PPI + Lorox 0.1 Pre	85 a	1 a	6 b-d	88 a-c	2704 a
Prefar 4.0 PPI + Lorox 0.5 Pre	91 a	6 a	0 d	96 a	4202 a
Prefar 6.0 PPI + Lorox 0.5 Pre	88 a	5 a	0 d	99 a	4347 a
Prefar 4.0 PPI + Prowl H_2O 0.25	85 a	4 a	9 b-d	84 a-d	3140 a
Prefar 6.0 PPI + Prowl H_2O 0.25	88 a	6 a	3 c-d	95 a	3449 a
Prowl H_2O 0.25	91 a	3 a	9 b-d	84 a-d	4084 a
Prowl H_2O 0.50	89 a	3 a	2 c-d	90 a-b	3022 a

[z] Numbers in a column followed by the same letter exhibited no significant differences based on Duncan's Multiple Range Test where P=0.05.

Cilantro Pre-Postemergence Weed Control

Spring 2010-Bixby, OK

Lynn Brandenberger, Lynda Carrier, Robert Havener, Bobby Adams

Introduction: Cultural work on cilantro has been ongoing at Oklahoma State during the past few years. Researchers have developed the basics for crop production, but work is continuing regarding weed control for this potential crop. Currently Prefar (bensulide) is labeled for cilantro weed control as a preplant incorporated herbicide. Although Prefar provides some control of weedy species during the early part of the production cycle, experience has shown Prefar alone is not capable of providing the level of control needed for commercial cilantro production in Oklahoma. The objective of this study was to compare combinations of preemergence and postemergence treatments to determine the level of crop safety and efficacy.

Materials and Methods: The study included combinations of preemergence and postemergence herbicides for each treatment. There were four different compounds alone and in combination for a total of 16 treatments (Tables 1 and 2). All plots were arranged in a randomized block design with four replications. Plots included four rows of the Santo variety of cilantro planted on one foot row centers with a 20 foot plot length. Seeding rates were approximately 1.8 million seeds per acre. Plots were planted on 04/08/10 with pre and preplant incorporated (PPI) treatments being applied the same day. PPI treatments were applied with a tractor drawn plot sprayer and incorporated immediately following application with a Do-All field cultivator. Pre treatments were applied after planting using a CO_2 sprayer hand-boom with a six foot wide spray pattern. The entire study area received 0.5 inch of overhead irrigation on 04/09/10. A majority of postemergence treatments were applied with the tractor drawn plot sprayer on 5/18/10, except for Lorox at 2.5 and 3.0 lbs ai/acre which were applied with a hand-boom CO_2 sprayer. Application rate for spraying was 25 gallons of spray material per acre for all applications including both pre and postemergence applications. Plots received a total of 25 lbs of nitrogen per acre on 5/04/10. Emergence ratings were recorded on 5/04/10, crop injury on 5/25/10 and efficacy ratings were recorded on 5/25/10 for volunteer soybean (*Glycine max*) and henbit (*Lamium amplexicaule* L.) and on 6/07/10 for carpetweed (*Mollugo verticillata* L.). Plant counts were made for live Palmer amaranth (*Amaranthus palmeri*) seedlings on 6/07/10. Plots were harvested on 6/07/10 with yield being recorded in pounds fresh weight. The rating scale used for ratings was a 0 to 100 scale where 0 represents no visible crop emergence, weed control or crop injury and 100 represents 100% emergence of the crop, control and or death of the weed species or the crop.

Results: Crop emergence ranged from 85 to 93% and did not vary between treatments (Table 1). Ratings for crop injury were recorded 7 days after post applications of Lorox. Crop injury did not vary between treatments and ranged from 1 to 8% (Table 1). There were no differences in control of different weed species for any treatments (Table 2). Control of volunteer soybean seedlings in the plots ranged from 80 to 95%. Control of henbit ranged from 73 to 100% with 14 of 16 treatments providing 100% control. Carpetweed control was excellent with all treatments providing 100% control of this weed species. No live Palmer amaranth seedlings were observed in any of the plots. Although there were no differences observed between treatments for yield, yield did range from 1997 to 4002 lbs fresh weight per acre. The three highest yielding treatments were Prefar 4.0 PPI + Lorox 0.1 Pre + Lorox 1.5 post, Prefar 6.0 PPI + Lorox 0.5 Pre + Lorox 1.5 post, and Prefar 4.0 PPI + Lorox 0.5 Pre + Lorox 1.5 post, respectively, with yields of 4002, 3648, and 3603 lbs fresh weight per acre.

Conclusions: Generally all treatments provided excellent weed control with low levels of crop injury. Although there were no differences in yield, this could easily have been a result of field variability. In general, the higher yielding treatments included Prefar PPI + Lorox pre + Lorox post at 1.5 lbs ai/acre. Based upon the results the authors would conclude that Lorox, Prefar, Dual Magnum, and Prowl H_2O appear to have good safety for use in cilantro production and combinations of these preemergence herbicides with postemergence applications of Lorox will provide ample weed control for the commercial production of cilantro.

Acknowledgements: The authors would like to thank Mike DeRiso of Tessenderlo Kerley, Inc. for partial support of this study.

Table 1. 2010 Spring Cilantro weed control pre/postemergence study, Bixby, OK. Emergence, crop injury, and yield.

	Emergence	Injury	Yield
	5/04/10	5/25/10	6/07/10
Treatment descriptions lbs. ai/acre	------------%------------	------------%------------	-------lbs./acre-------
Prefar 4.0 PPI + Lorox 1.5 post	89 a[z]	8 a	2795 a
Prefar 6.0 PPI + Lorox 1.5 post	89 a	5 a	3439 a
Prefar 4.0 PPI + Dual Magnum 0.325 + Lorox 1.5 post	88 a	4 a	3095 a
Prefar 6.0 PPI + Dual Magnum 0.325 + Lorox 1.5 post	89 a	4 a	3276 a
Prefar 4.0 PPI + Dual Magnum 0.65 + Lorox 1.5 post	85 a	6 a	2677 a
Prefar 6.0 PPI + Dual Magnum 0.65 + Lorox 1.5 post	88 a	5 a	3140 a
Prefar 4.0 PPI + Lorox 0.1 Pre + Lorox 1.5 post	91 a	4 a	4002 a
Prefar 6.0 PPI + Lorox 0.1 Pre + Lorox 1.5 post	88 a	1 a	3494 a
Prefar 4.0 PPI + Lorox 0.5 Pre + Lorox 1.5 post	89 a	6 a	3603 a
Prefar 6.0 PPI + Lorox 0.5 Pre + Lorox 1.5 post	88 a	5 a	3648 a
Prefar 4.0 PPI + Prowl H_2O 0.25 + Lorox 1.5 post	86 a	4 a	3076 a
Prefar 6.0 PPI + Prowl H_2O 0.25 + Lorox 1.5 post	85 a	6 a	3485 a
Prowl H_2O 0.25 + Lorox 1.5 post	89 a	3 a	3321 a
Prowl H_2O 0.50 + Lorox 1.5 post	90 a	3 a	2514 a
Prefar 6.0 PPI + Lorox 2.5 post	90 a	1 a	1997 a
Prefar 6.0 PPI + Lorox 3.0 post	93 a	4 a	2813 a

[z] Numbers in a column followed by the same letter exhibited no significant differences based on Duncan's Multiple Range Test where P=0.05.

Table 2. 2010 Spring Cilantro weed control pre/postemergence study, Bixby, OK. Weed control.

	Weed control			
	Soybean	Henbit	Carpetweed	Palmer amaranth
	5/25/10	5/25/10	6/07/10	6/07/10
Treatment descriptions lbs. ai/acre	------------------------% control-----------------------			---# per plot---
Prefar 4.0 PPI + Lorox 1.5 post	88 a[z]	73 a	100 a	0 a
Prefar 6.0 PPI + Lorox 1.5 post	94 a	99 a	100 a	0 a
Prefar 4.0 PPI + Dual Magnum 0.325 + Lorox 1.5 post	81 a	100 a	100 a	0 a
Prefar 6.0 PPI + Dual Magnum 0.325 + Lorox 1.5 post	89 a	100 a	100 a	0 a
Prefar 4.0 PPI + Dual Magnum 0.65 + Lorox 1.5 post	88 a	100 a	100 a	0 a
Prefar 6.0 PPI + Dual Magnum 0.65 + Lorox 1.5 post	95 a	100 a	100 a	0 a
Prefar 4.0 PPI + Lorox 0.1 Pre + Lorox 1.5 post	94 a	100 a	100 a	0 a
Prefar 6.0 PPI + Lorox 0.1 Pre + Lorox 1.5 post	89 a	100 a	100 a	0 a
Prefar 4.0 PPI + Lorox 0.5 Pre + Lorox 1.5 post	88 a	100 a	100 a	0 a
Prefar 6.0 PPI + Lorox 0.5 Pre + Lorox 1.5 post	90 a	100 a	100 a	0 a
Prefar 4.0 PPI + Prowl H_2O 0.25 + Lorox 1.5 post	93 a	100 a	100 a	0 a
Prefar 6.0 PPI + Prowl H_2O 0.25 + Lorox 1.5 post	86 a	100 a	100 a	0 a
Prowl H_2O 0.25 + Lorox 1.5 post	86 a	100 a	100 a	0 a
Prowl H_2O 0.50 + Lorox 1.5 post	80 a	100 a	100 a	0 a
Prefar 6.0 PPI + Lorox 2.5 post	88 a	100 a	100 a	0 a
Prefar 6.0 PPI + Lorox 3.0 post	95 a	100 a	100 a	0 a

[z] Numbers in a column followed by the same letter exhibited no significant differences based on Duncan's Multiple Range Test where P=0.05.

Preemergence Weed Control on Cucumber

Lynn Brandenberger & Lynda Carrier Oklahoma State University
Cooperating with Crow Vegetable Farms Rick and Claudia Crow

Introduction: Cucumber is grown by many fresh market producers in Oklahoma. Weed control for this crop is crucial because labor costs are increasing and available hoeing crews are becoming more difficult to find. Weed infested fields can be a source of insect and disease pests along with the obvious loss of yield and additional harvest cost. The objective of this study was to provide a practical field demonstration of several labeled herbicides for use in commercial cucumber production in Oklahoma.

Methods and Materials: This demonstration was initiated with the application of preemergence herbicide treatments on 6/11/10 in a commercial cucumber field that had been direct seeded on 6/10/10. The cultivars of cucumber that were direct seeded were 'Eureka' and 'Thunder' at Crow Vegetable Farms in Pottawatomie county, OK. Seed were in rows with 6 foot row centers and spaced approximately 1.0 foot apart in the row. Plots were arranged in a randomized block design with four replications, each plot being 6 x 20 feet. Five different treatment applications were made following planting using a single rate of Sandea (halosulfuron), Curbit (ethalfluralin), two different tank mixes of Command (clomazone) + Curbit + Sandea at two rates, and one rate of Strategy (commercial pre-mixed solution containing clomazone and ethalfluralin) (Table 1). Plots were rated for percent injury on 6/30/10 and 7/28/10, stand counts and percent weed control ratings were made on 6/30/10.

Results: The number of plants per plot was not different between treatments on 6/30/10, but crop injury ratings on that date did differ between treatments (Table 1). For this first rating, the highest level of injury was 26% for the Sandea at 0.032 lbs ai/acre tank mixed with Curbit and Command. Injury ratings on 7/28/10 also varied between treatments. Injury on this date was highest for Curbit 1.1 and Strategy 0.65 treatments that had 41 and 46% injury, respectively. Control ratings for Palmer amaranth and crabgrass differed between treatments on 6/30/10. The highest level of Palmer amaranth control was 100% for Sandea alone at 0.032 and the two tank mixes containing Command + Curbit + Sandea. Crabgrass control on this date was highest for Curbit, the two Command + Curbit + Sandea tank mixes, and Strategy which ranged from 76 to 99% control for this weed species.

Conclusions: Plant stands were not affected by any of the treatments, while injury and weed control were. Injury was lowest at the last rating for Sandea alone and in combination with Curbit and Command. Tank mixes combining Command + Curbit + Sandea and Strategy by itself provided the highest level of control for crabgrass while control of this weed species was lowest for Sandea alone. Palmer amaranth control was highest for Sandea alone and tank mixes that combined Command + Curbit + Sandea.

Acknowledgements: The authors would like to thank the Crow family for their help and support in completing this demonstration.

Table 1. 2010 Cucumber herbicide study, Crow Vegetable Farms, Pottawattamie county, OK

	Plant stand	% Injury		% Weed control 6/30/10	
Treatment lbs. ai/acre	**6/30/10**	**6/30/2010**	**7/28/2010**	**Palmer amaranth**	**crabgrass**
Sandea 0.032	13 a	14 a-b	16 b	100 a	58 c
Curbit 1.1	18 a	0 b	41 a	29 b	76 b
Command 0.15 + Curbit 0.56 + Sandea 0.024	14 a	16 a-b	0 c	100 a	95 a
Command 0.15 + Curbit 0.56 + Sandea 0.032	10 a	26 a	9 b-c	100 a	99 a
Strategy 0.65	14 a	0 b	46 a	23 b	100 a

[y] Plant stand=number of plants/plot, plots 6’ x 20’

[z] Numbers in a column followed by the same letter exhibited no significant differences based on Duncan’s Multiple Range Test where P=0.05.

Grape Herbicide Screening 2010

Bixby, Oklahoma

Eric Stafne, Lynn Brandenberger, Lynda Carrier, and Becky Carroll

Grape production in the state of Oklahoma is a growing industry with production being utilized for wine, juice, and fresh table grapes. Weed control for a perennial crop such as grape is particularly important during the establishment period when newly planted vines are small and competing with weedy species for light, water and nutrients. Currently there are several preemergence herbicides that have shown potential for season long control for several weed species. The objective of this study was to screen three preemergence herbicides for their potential for weed control in Oklahoma grapes.

Methods and Materials: Plots were arranged in a randomized block design with five replications, each plot consisted of 5 vines on 12 foot row centers with 6 feet between vines in the row. Plant population was approximately 605 plants per acre of 'Chambourcin' grape on 101-14 Mgt. rootstock. Plots were transplanted on 4/16/09 by hand. Treatments included three different compounds Callisto (mesotrione) pre, Sandea (halosulfuron) pre, Spartan (sulfentrazone) pre at two rates for a total of six pre treatments and a glyphosate-post check. Pre treatments were applied on 5/25/10 and all plots including the glyphosate check were sprayed with glyphosate (2% solution) on 5/25/10. Ratings were recorded for phytotoxicity and efficacy on 6/23/10 and 7/16/10. The rating scale that was used was a 0 to 100 scale where 0 represents no visible crop damage or weed control and 100 represents 100% of the crop or weed species being dead or non-existent.

Results: Crop injury to the grapes did not vary between treatments (Table 1). Injury ratings four weeks after treatment (WAT) on 6/23/10 ranged between 11 to 26% with Sandea at 0.048 lbs ai/acre having the highest level of damage. On 7/16/10 (6 WAT) injury ranged from 3 to 15% with Sandea at 0.048 again recording the highest level of damage. Control of Palmer amaranth (*Amaranthus palmeri*) on 6/23/10 ranged from 0 to 99% (Table 1). The highest level of control for this weed species was 93, 87, and 99%, respectively, for Callisto 0.24 lbs ai/acre and Spartan at 0.1875 and 0.375 lbs ai/acre. Palmer amaranth control on 7/16/10 was highest for the two Spartan treatments with 83 and 84% control, respectively, for the 0.1875 and 0.375 lb ai/acre rates. Carpet weed (*Mollugo verticillata*) control was highest for Callisto at 0.24 lbs ai/acre and Spartan at 0.1875 lbs ai/acre on 6/23/10. Control ratings for this weed species were 69 and 75%, respectively, for Callisto at 0.24 lbs ai/acre and Spartan at 0.1875 lbs ai/acre. Control of weedy species of grasses (goosegrass-*Eleusine indica* and crabgrass-*Digitaria* sp.) on 6/23/10 was highest for Callisto 0.24 lb ai/acre and Spartan at 0.1875 and 0.375 lbs ai/acre with 48, 51, and 46% control, respectively. Grass control was highest for Spartan at 0.375 lbs ai/acre on 7/16/10 with 77% control.

Conclusions: Based upon the data the authors would conclude that both Callisto and Spartan appear to have adequate crop safety and were the most efficacious herbicides in the study.

Acknowledgements: The authors want to thank the U.S.D.A IR-4 project for partial support of this study.

Table 1. 2010 Grapes Herbicide trial, Bixby, OK.

	% Injury		% Control				
			Palmer amaranth		Carpet weed	Grass weed species	
Treatment/ acre	6/23/10	7/16/10	6/23/10	7/16/10	6/23/10	6/23/10	7/16/10
Round-up post check	11 a[z]	4 a	0 d	7 c	0 c	0 b	4 c
Callisto 0.12 pre	14 a	4 a	47 b	25 b-c	25 b-c	32 a-b	6 c
Callisto 0.24 pre	16 a	3 a	93 a	38 b-c	69 a	48 a	13 c
Sandea 0.024 pre	13 a	10 a	20 c	48 b	43 a-b	34 a-b	21 b-c
Sandea 0.048 pre	28 a	15 a	37 b-c	37 b-c	58 a-b	38 a	22 b-c
Spartan 0.1875 pre	16 a	5 a	87 a	83 a	75 a	51 a	48 b
Spartan 0.375 pre	13 a	9 a	99 a	84 a	58 a-b	46 a	77 a

[z] Numbers in a column followed by the same letter exhibited no significant differences based on Duncan's Multiple Range Test where P=0.05.

Preemergence Weed Control on Pepper

Lynn Brandenberger & Lynda Carrier Oklahoma State University
Cooperating with Schantz Farms

Introduction: Very few herbicides are available for commercial peppers for either pre or postemergence weed control. Preemergence weed control normally consists of post-transplanting treatments of Dual Magnum over the top of the crop. This method has been utilized for several years, but there is a need for additional pre herbicides for use on the crop. The objective of this trial was to determine if Prowl H_2O (pendamethalin) has potential as a preemergence herbicide for use in commercial pepper production when applied preplant.

Methods and Materials: This study was initiated on 4/14/10 in a commercial pepper field of 'OKALA' pepper in Blaine County, OK. Plants were in rows with 3 foot row centers and spaced approximately 2.5 feet apart in the row. Plots were arranged in a randomized block design with four replications, each plot being 6 x 20 feet. Treatment applications were made pre-plant using two different rates of Prowl H_2O (0.95 and 1.4 lbs. ai/acre) with a CO_2 hand-boom sprayer at an overall rate of 25 gpa.

Results: Injury ratings on 6/8/10 varied between the low and high rate of Prowl H_2O (Table 1). Injury for the 0.95 lb. ai/acre rate was 3% and injury was 10% for the 1.43 lb ai/acre rate. Although higher in injury, the 1.43 lb rate would be considered relatively safe for use on pepper. Weed control did not vary between treatments in the study. Both rates of Prowl H_2O resulted in high levels of control for Palmer amaranth (*Amaranthus palmeri* S. Wats.). In conclusion, the authors observed that both rates of Prowl H_2O when used for weed control in spice pepper were safe for the crop with injury at or below 10% and both rates provided good control of Palmer amaranth. Further study would be recommended for both crop safety and for determining the effect of this herbicide on crop yield.

Table 1. Pepper herbicide study pre treatments, Spring 2010, Hydro, OK

	% Injury	% control Palmer Amaranth
Treatment lbs ai/ac	6/8/2010	6/8/2010
Prowl H_2O 0.95	3 b	100 a
Prowl H_2O 1.43	10 a	100 a

[z] Numbers in a column followed by the same letter exhibited no significant differences based on Duncan's Multiple Range Test where P=0.05.

June Postemergence Weed Control in Pepper

Hydro, OK-2010

Lynn Brandenberger and Lynda Carrier Oklahoma State University
Cooperating with Schantz Farms

Introduction: Commercial peppers have few herbicides available for weed control. Postemergence broadleaf weed control is normally handled by hand hoeing. Hoeing is an expensive method, often costing several hundred dollars per acre if the producer is able to find labor to do it. Therefore there is a need to identify potential postemergence herbicides that can be utilized for controlling broadleaf weeds in pepper fields. The objective of this study was to screen several herbicides and combinations of herbicides that may have potential for weed control in commercial pepper production when applied early season as a postemergence application with a hooded sprayer.

Methods and Materials: The study field was transplanted to the pepper cultivar 'Okala' on 4/20/10 with a between row spacing of three feet and transplant in-row spacing of 17 inches. The study included nine different treatments utilizing six different herbicides (Valor-flumioxazine, Aim-carfentrazone ethyl, glyphosate, Sharpen-saflufenacil, Staple-pyrithiobac sodium, Prowl H_2O- pendimethalin) some alone and some in combination (Table 1). All treatments were applied to plots eight rows wide (24 feet) by 50 feet in length in a randomized design with three replications on 6/01/10. Treatment applications were with a hooded sprayer at an overall rate of 17 gallons of spray solution per acre. Treatments were rated for % injury on 6/8/10 and 7/22/10 and weed counts were made for two weed species on 6/8/10. Fresh weights were recorded for three plants per plot on 10/15/10.

Results and Discussion: Injury ratings for both 6/8/10 and 7/22/10 did not vary between the untreated check and each of the herbicide treatments (Table 1). The amount of injury on 6/8/10 ranged from 0% for Valor 0.67 lbs ai/acre + glyphos 0.69 lbs ai/acre and Sharpen 0.022 + Prowl H_2O 1.5 lbs ai/acre to 10 and 12% for Staple LX 0.05 + glyphos 0.69 and Valor 0.067, respectively. Injury on 722/10 ranged between 0 to 3% with no differences between treatments. The number of plants of cut-leaf evening primrose (*Oenothera laciniata*) and golden crownbeard *(Verbesina encelioides*) for a particular weed species was not different on 6/8/10 for treatments or the untreated check. There were no differences in the fresh weight of plants for treatments in the study. Fresh weight ranged from 8.9 lbs for Staple LX 0.05 + glyphos 0.69 to 10.6 lbs for Valor 0.067.

Conclusions: Based upon the results of this study, the authors conclude that Valor, Aim, Sharpen, Staple, and glyphosate when applied with a hooded sprayer at the rates and combinations studied appear to have adequate crop safety for use in commercial pepper production. Additional studies would be useful in determining other application methods for use in pepper production.

Acknowledgements: The authors want to thank the Schantz family for all their help and support in completing this study. We also want to thank Valent, BASF, FMC, and DuPont companies for product support.

Table 1. Pepper herbicide study, Spring 2010, Hydro, OK

Treatment lbs ai/ac	% Injury 6/8/2010		% Injury 7/22/2010		# of weeds/plot 6/8/2010 Primrose		# of weeds/plot 6/8/2010 Golden crownbeard		Fresh weight (lbs.)[y]	
Untreated check	3	a	0	a	2	a	0	a	9.7	a
Valor 0.034	7	a	0	a	7	a	3	a	9.4	a
Valor 0.067	12	a	0	a	5	a	0	a	10.6	a
Valor 0.034 + glyphos 0.69	7	a	2	a	8	a	5	a	9.1	a
Valor 0.067 + glyphos 0.69	0	a	2	a	8	a	0	a	9.5	a
Sharpen 0.022	2	a	2	a	10	a	0	a	9.2	a
Sharpen 0.022 + Prowl H_2O 1.5	0	a	0	a	3	a	0	a	9.2	a
Sharpen 0.022 + Aim 0.025	2	a	3	a	7	a	0	a	9.6	a
Staple LX 0.05 + glyphos 0.69	10	a	0	a	7	a	0	a	8.9	a

[y] Fresh weight = fresh weight of 3 whole plants in lbs. on 10/15/2010

[z] Numbers in a column followed by the same letter exhibited no significant differences based on Duncan's Multiple Range Test where P=0.05.

July Postemergence Weed Control in Pepper

Hydro, OK 2010

Lynn Brandenberger and Lynda Carrier Oklahoma State University
Cooperating with Schantz Farms

Introduction: Commercial peppers have few herbicides available for weed control. Postemergence broadleaf weed control is normally handled by hand hoeing. Hoeing is an expensive method, often costing several hundred dollars per acre if the producer is able to find labor to do it. Therefore there is a need to identify potential postemergence herbicides that can be utilized for controlling broadleaf weeds in pepper fields. The objective of this study was to screen several herbicides and combinations of herbicides that may have potential for weed control in commercial pepper production when applied later in the season as a postemergence application with a shielded sprayer.

Methods and Materials: The study field was transplanted to the pepper cultivar 'Okala' on 4/14/10 with a between row spacing of three feet and transplant in-row spacing of 17 inches. The study included nine different treatments utilizing six different herbicides (Valor-flumioxazine, Aim-carfentrazone ethyl, glyphosate, Sharpen-saflufenacil, Staple-pyrithiobac sodium, Prowl H_2O- pendimethalin) some alone and some in combination (Table 1). All treatments were applied to plots four rows wide (12 feet) by 40 feet in length in a randomized design with three replications on 7/22/10. Treatment applications were with a shielded sprayer at an overall rate of 20 gallons of spray solution per acre. Treatments were rated for % injury on 8/5/10 and fresh weights were recorded for three plants per plot on 10/15/10.

Results and Discussion: Injury ratings on 8/5/10 did not vary between the untreated check and any of the herbicide treatments (Table 1). The levels of injury were low and ranged between 0 to 2% for all treatments and the untreated check. There were no differences in the fresh weight of plants for treatments in the study. Fresh weight ranged from 10.5 to 12.1 lbs.

Conclusions: Based upon the results of this study, the authors conclude that Valor, Aim, Sharpen, Staple, and glyphosate when applied with a shielded sprayer at the rates and combinations used appear to have adequate crop safety for use in commercial pepper production. Additional studies would be useful in determining other application methods for use in pepper production.

Acknowledgements: The authors want to thank the Schantz family for all their help and support in completing this study. We also want to thank Valent, BASF, FMC, and DuPont companies for product support.

Table 3. Pepper herbicide study, Summer 2010, Hydro, OK

Treatment lbs ai/ac	% Injury 8/5/2010	Fresh weight (lbs.)[y] 10/15/2010
Untreated check	2 a	12.1 a
Valor 0.034	3 a	10.7 a
Valor 0.067	2 a	11.2 a
Valor 0.034 + Glyphos 0.69	0 a	10.5 a
Valor 0.067 + glyphos 0.69	2 a	11.2 a
Sharpen 0.022	2 a	11.3 a
Sharpen 0.022 + Prowl H_2O 1.5	2 a	11.2 a
Sharpen 0.022 + Aim 0.025	0 a	10.7 a
Staple LX 0.05 + glyphos 0.69	2 a	12.0 a

[y] Fresh weight = weight of 3 whole plants in lbs.

[z] Numbers in a column followed by the same letter exhibited no significant differences based on Duncan's Multiple Range Test where P=0.05.

Mulching Methods for Weed Control in a Certified Organic Production System

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Abstract: Reducing weed competition is a critical step in organic cropping systems. Use of black plastic as a weed barrier is widely used and effective. The expense associated with black plastic as well as the ecological impact of disposal has a negative impact with its use. Research was conducted at Lane, Oklahoma on certified organic land at the USDA/OSU Wes Watkins research center to compare the impact of mulching types on weed control and herb yields. The 4 mulching treatments included black plastic, hay mulch (wheat and cereal rye), hay mulch over newsprint, and bare soil (no mulch). Four herbs, basil (*Ocimum basilicum* L.), sage (*Salvia officinalis* L.), garlic chives (*Allium tuberosum* Rottler ex Spreng.), and arugula (*Eruca vesicaria* (L.) Cav. ssp. *sativa* (Mill.) Thell.), were transplanted into the four mulching treatments in 4 replications. Weed control efficacy of the mulching treatments were determined by recording the time required to maintain the plots weed-free by hoeing and hand-weeding. Herb yields were determined for each mulching treatment. Arugula and garlic chives produced the best yields on the black plastic. Basil and sage produced their highest yields when grown without a mulch (bare ground). The black plastic and bare soil treatments required the most time to handweed compared to the hay and hay/newsprint mulches, which required the least. The research demonstrated the importance of selecting the appropriate mulch for the specific herb and the potential benefits of natural and biodegradable mulches.

Introduction: The weed control challenges for horticulture production are formidable; however, these challenges are even greater for those considering organic crop production. Organic weed control methods include crop rotations, cover crops, planting systems, mechanical methods, organic herbicides, and mulches. Although mechanical weed control through cultivation is useful for controlling weeds between rows, it is ineffective for controlling weeds between plants within rows. Mulches have the potential to conserve soil moisture, reduce soil erosion, and minimize weed growth. Although plastic mulch has advantages in weed control, initial cost and disposal add to the overall production costs. Alternative mulches were investigated to reduce weed competition.

Objective: Hay mulch (wheat and cereal rye), hay/newsprint mulch, and bare soil (no mulch) were compared to black plastic to determine the impact on herb yields and time to remove weeds (handweeding and hoeing).

Methods and Materials: The experiment was conducted on certified organic land at the USDA/OSU Wes Watkins Research Center, Lane, OK. The soil was a Bernow fine sandy loam, 0-3% slope (fine-loamy, siliceous, thermic Glossic Paleudalf). The field was prepared for planting on April 26, 2010 with raised beds on 6-ft centers. Plastic mulch was applied on April 27 and the hay and the hay/newsprint mulches were applied on April 29. Two to three inches of hay (wheat and cereal rye) mulch was placed over bare soil for the hay mulch treatment or over sheets of newsprint for the hay/newsprint mulch treatment.

All mulches (black plastic, hay, and hay/newsprint) covered a 6-ft wide strip the length of the raised bed. Every other raised bed was planted to produce 12-ft centers between planted rows. Herbs (basil, arugula, garlic chives, and sage) were transplanted into the field on May 3, 2010. All plots were handweeded and hoed to a width of 6 feet on a weekly basis. The time required to produce weed-free plots by handweeding were recorded for each plot. All herbs were harvested on September 7, 2010 and fresh weights determined.

Results and Discussion:
Weed Removal Although black plastic mulch required the greatest time to handweed, primarily due to the weed removal along edges of the plastic mulch, the total time required for all mulching treatments was very low compared to typical expectations. The weed pressure in this research study were minimal due to the location's historical low weed populations, the use of drip irrigation to promote crop growth while reducing soil moisture for weed growth, and early removal of weeds. The hay mulch decreased the weeding time by 17% compared to the black plastic mulch and 11% compared the bare ground (no mulch) (Figure 1).

Herb Yields
Mulching types significantly influenced herb yields. Black plastic mulch produced the greatest yields for arugula and garlic chives, and the second greatest yields for basil and sage (Table 1). Basil produced the highest herb yields for each mulching type. Arugula had the greatest percentage differences due to mulching treatments. Sage and basil yields were greater when grown on bare ground, although the black plastic produced the second highest yields (Table 1). When comparing the biodegradable (hay and hay/newsprint) mulches, the hay/newsprint mulch herb yields were greater than the hay mulch herbs. The herb yields for the hay mulch were significantly lower than all other mulching treatments.

Conclusions: Arugula and garlic chives produced the best yields on black plastic compared to basil and sage, which grew best on bare ground (no mulch). The black plastic and the bare soil required the most time to hand weed compared to the hay and hay/newsprint mulches, although the weeding times for all treatments were minimal due to the low weed pressure. These results demonstrated the importance of selecting the appropriate mulch for the specific herb and the potential benefits of natural and biodegradable mulches.

Figure 1. Impact of mulching treatments on the relative time to remove weeds by hand weeding.

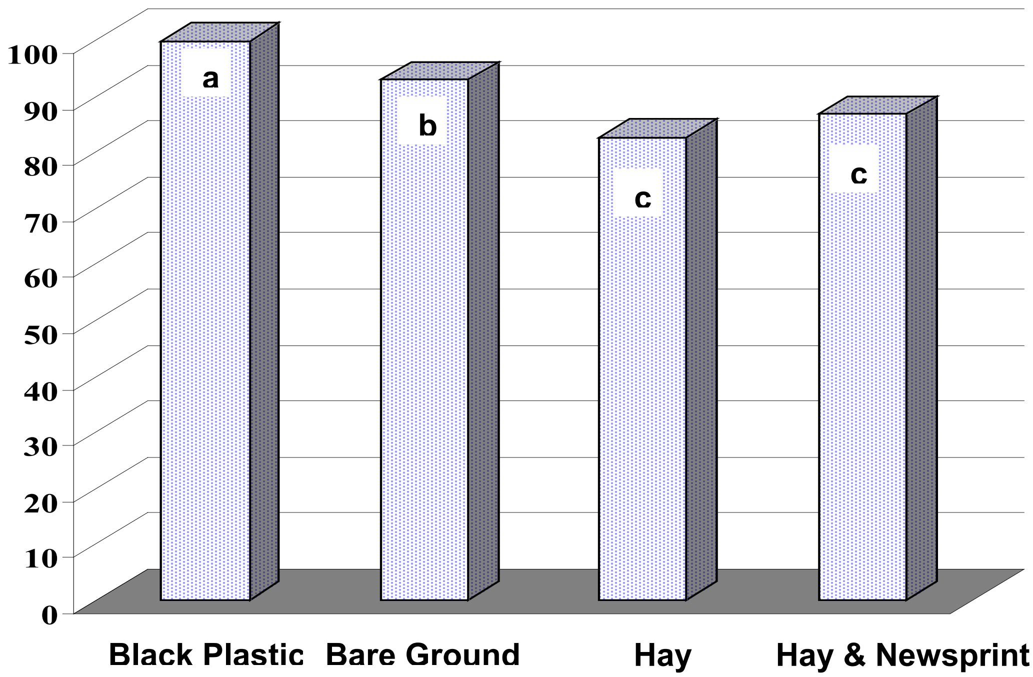

Table 1. Impact of mulching treatment on herb fresh yields (g) averaged across 4 replications in 2010.

Mulching Treatment	Basil	Arugula	Sage	Garlic Chives
	g	g	g	g
Black Plastic	6612.4 b	2374.1 a	784.0 b	256.3 a
Bare Ground	7225.0 a	740.2 b	954.4 a	100.2 b
Hay*	2500.6 d	252.0 d	126.5 c	52.4 c
Hay* and Newsprint	3550.4 c	643.2 c	712.2 b	138.4 b

*Hay (wheat and cereal rye straw)

Acknowledgements: The authors would like to thank Buddy Faulkenberry and Amy Helms, USDA, ARS, Research Technicians for their field work, data processing, and leadership of the field crews. We would also like to thank Michael Mobbs and Cody Sheffield for field maintenance and data collection. We would also like to thank Jim Vaughn, John Johnson, Shannon Reece, Phil Powell, Tony Goodson, Jaquie Pruit, Lacey Howery for their help in harvesting the herbs.

Scythe® (Pelargonic Acid) Weed Control in Bell Peppers

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Abstract: Organic squash (*Cucurbita pepo* L.) producers need appropriate herbicides that can effectively provide season- long weed control. Research was conducted in southeast Oklahoma (Atoka County, Lane, OK) to determine the impact of a potential organic herbicide on weed control efficacy, crop injury, and yields. The experiment included Scythe® (57% pelargonic acid) applied post-directed at 3, 6, and 9% v/v application rates, plus an untreated weedy-check and an untreated weed-free check with 4 replications. Yellow squash, cv. 'Enterprise', was direct-seeded on June 21, 2010 into raised 91-cm centered beds. The primary weeds included smooth crabgrass (*Digitaria ischaemum* (Schreb.) Schreb. ex Muhl.), cutleaf groundcherry (*Physalis angulata* L.), and spiny amaranth (*Amaranthus spinosus* L.). Scythe® was post-directed applied on July 13 and then reapplied 8 days later (July 21). Grass weed control (78%) and broadleaf weed control (69%) with the 9% Scythe® treatment were at their lowest levels at 7 days after the initial spray treatment (DAIT). Smooth crabgrass (98%), cutleaf groundcherry (94%), and spiny amaranth control (94%) control peaked at 9 DAIT (1 day after the sequential treatment) with the 9% application rate. Scythe® at 9% also resulted in the greatest crop injury at 9 DAIT (12.5%). The sequential application of Scythe® significantly increased grass and broadleaf control at all application rates. The 6 and 9% Scythe® treatments produced equivalent squash yields (squash/acre and lb/acre) as the weed-free treatment and greater yields than the weedy check.

Introduction: Organic squash (*Cucurbita pepo* L.) producers need appropriate herbicides that can effectively provide season-long weed control. Although corn gluten meal has shown promise as an early-season pre-emergent organic herbicide in squash production, any uncontrolled weeds can inflict serious yield reductions by the end of the growing season. Organic squash producers need additional organic herbicides that can affectively provide affective post-emergent weed control. Previous research with post-emergence organic contact herbicides determined that these herbicides must be applied to very young/small weeds if acceptable weed control is expected. A potential solution to increase weed control efficacy on larger weeds and decrease squash injury is the use of multiple/sequential post-directed herbicide applications (herbicides sprayed at the base of the crop rather than over-the-top).

Objective: Research was conducted in southeast Oklahoma (Atoka County, Lane, OK) to determine the impact of sequential post-directed applications of a potential organic herbicide on weed control efficacy, crop injury, and yields.

Materials and Methods: The experiment included 5 weed control treatments. Scythe was applied at 3 rates (3, 6, and 9% v/v), plus an untreated weedy-check and an untreated weed-free check) with 4 replications. Yellow squash, cv. 'Enterprise', was direct-seeded on June 21, 2010 into raised 91-cm centered beds. Scythe® was post-directed applied (40 gpa, 8004, 0.40 gpm) on July 13 and then reapplied 8 days later (July 21). At the time of initial applications smooth crabgrass (*Digitaria ischaemum* (Schreb.) Schreb. ex Muhl.) was 3 – 6 inches tall, cutleaf groundcherry (*Physalis angulata* L.) was 2 – 3 inches tall, and spiny amaranth (*Amaranthus spinosus* L.) was 2 – 3 inches tall. Weed control and injury (phytotoxicity) ratings were collected at 1, 3, 7, 9, 11, 16, 22, and 28 days after the initial treatment (DAIT). Weed control ratings represent the percent weed control for a treatment compared to the weedy-check. A 0 to 100% visual rating system was used in which 0% represented no weed control, while 100% represented complete weed control. A 0 to 100% visual rating system was used in which 0% represented no crop injury, while 100% represented crop death. Weed control and crop injury data were converted using an arcsine transformation to facilitate statistical analysis and mean separation. Squash fruit was harvested from July 28, 2010 through August 20, 2010 (10 harvests). All data were subjected to ANOVA[1] and mean separation using LSD with P=0.05.

Results and Discussion: Control of smooth crabgrass (98%) and broadleaf weeds (cutleaf groundcherry and spiny amaranth) (94%), peaked at 9 DAIT (1 day after the sequential treatment) with the 9% application rate (Tables 1 and 2). Smooth crabgrass control (78%) and broadleaf weed control (69%) with the 9% Scythe® treatment were at their lowest levels at 7 DAIT spray treatment (Tables 1 and 2). Yellow nutsedge plants did not emerged until after the initial treatment and the first evaluation date (1 DAIT) (Table 3). Yellow nutsedge control with 9% Scythe® peaked at 9 DAIT (41%) with the lowest nutsedge control at 7 DAIT (7.5%) and 28 DAT (5%) (Table 3). Scythe® at 9% v/v rate resulted in the greatest crop injury at 9 DAIT (12.5%) (Table 4).

The sequential application of Scythe® (two applications 8 days apart) significantly increased smooth crabgrass, broadleaf, and yellow nutsedge control when Scythe® was applied at 6 and 9% v/v (Tables 1, 2, and 3). Scythe® at 6 and 9% produced significantly greater squash yields (fruit/acre and lb/acre) than the weedy-check with no significant difference from the weed-free control (Table 5). Scythe® at 9% did result in a slight numerical yield depression compared to the weed-free control (Table 5), apparently due to crop injury (Table 4).

Conclusions: Weed control and crop injury increased as application rates increased with weed control peaking for grass, broadleaf, and nutsedge control at 9 DAT, 1 day after the sequential treatment. The significantly greater crop injury at 1, 3, and 9 DAT for the 9% Scythe® had a numerical but not significant impact on squash yields. Sequential post-directed applications of Scythe® resulted in significant increase in weed control across the weed species tested.

[1] SAS Institute Inc., 100 SAS Campus Drive, Cary, NC 27513.

Acknowledgements: The authors would like to thank Buddy Faulkenberry, Research Technician (USDA, ARS), for his leadership, field work, and data processing, Michael Mobbs and Conner Garison, student workers (USDA, ARS), for their field work and data entry, and Tony Goodson (OSU), Jaquie Pruit (OSU), and Lacey Howery (OSU) for assistance with field work.

Table 1. Smooth crabgrass control as a result of sequential post-directed applications of Scythe® (57% pelargonic acid) applied at 3, 6, and 9% v/v in squash.

Weed Control	Days After Initial Treatment							
Treatment	1	3	7	9	11	16	22	28
	% Smooth Crabgrass Control							
Scythe 3%	58.75 c	53.75 c	37.5 d	67.50 c	45.00 c	37.5 c	32.5 c	27.50 c
Scythe 6%	83.75 b	88.75 b	87.5 b	94.75 c	88.75 b	82.5 b	80.0 b	81.25 b
Scythe 9%	88.75 b	92.25 b	77.5 c	97.75 b	94.75 b	87.5 b	85 .0b	83.75 b
Weedy-Check	0 d	0 d	0 e	0 d	0 d	0 d	0 d	0 d
Weed-Free	100 a	100 a	100 a	100 a	100 a	100 a	100 a	100 a

Values in a column followed by the same letter are not significantly different at *P* =.05 LSD.

Table 2. Broadleaf (cutleaf groundcherry and spiny amaranth) weed control (%) as a result of sequential post-directed applications of Scythe® (57% pelargonic acid) applied at 3, 6, and 9% v/v in squash.

Weed Control	Days After Initial Treatment							
Treatment	1	3	7	9	11	16	22	28
	% Broadleaf Control							
Scythe 3%	68.75 b	62.5 c	41.25 c	61.25 d	45.00 d	42.50 c	45.00 d	27.5 c
Scythe 6%	81.25 b	85.0 b	72.50 b	87.50 c	75.00 c	75.00 b	67.50 c	70.0 b
Scythe 9%	61.25 b	85.0 b	68.75 b	93.75 b	86.25 b	82.50 b	78.75 b	72.5 b
Weedy-Check	0 c	0 d	0 d	0 e	0 e	0 d	0 e	0 d
Weed-Free	100 a	100 a	100 a	100 a	100 a	100 a	100 a	100 a

Values in a column followed by the same letter are not significantly different at *P* =.05 LSD.

Table 3. Yellow nutsedge control as a result of sequential post-directed applications of Scythe® (57% pelargonic acid) applied at 3, 6, and 9% v/v in squash.

Weed Control Treatment	Days After Initial Treatment							
	1	3	7	9	11	16	22	28
	% Yellow Nutsedge Control							
Scythe 3%	*	2.50 d	1.25 d	2.50d	2.75 d	1.5 d	1.50 d	0.25 c
Scythe 6%	*	8.75 c	4.25 c	10.00 c	15.00 c	6.5 c	3.25 c	3.50 b
Scythe 9%	*	15.0 b	7.5 b	41.25 b	36.25 b	14.5 b	8.25 b	5.00 b
Weedy-Check	*	0 e	0 d	0 e	0 e	0 e	0 e	0 c
Weed-Free	*	100 a	100 a	100 a	100 a	100 a	100 a	100 a

Values in a column followed by the same letter are not significantly different at *P* =.05 LSD.
*Yellow nutsedge did not emerge until after the initial weed control application and the 1 DAIT evaluation.

Table 4. Squash injury (%) as a result of sequential post-directed applications of Scythe® (57% pelargonic acid) applied at 3, 6, and 9% v/v.

Weed Control Treatment	Days After Initial Treatment															
	1		3		7		9		11		16		22		28	
	% Crop Injury															
Scythe 3%	1.8	c	2.5	b	2.0	a	4.35	b	3.3	a	0.0	a	0	a	0	a
Scythe 6%	3.5	b	4.8	b	2.8	a	8.00	ab	4.3	a	0.5	a	0	a	0	a
Scythe 9%	8.3	a	8.3	a	3.0	a	12.50	a	7.0	a	1.0	a	0	a	0	a
Weedy-Check	0.0	d	0.0	c	0.0	b	0.0	c	0.0	b	0.0	a	0	a	0	a
Weed-Free	0.0	d	0.0	c	0.0	b	0.0	c	0.0	b	0.0	a	0	a	0	a

Values in a column followed by the same letter are not significantly different at *P* =.05 LSD.

Table 5. Impact of sequential post-directed applications of Scythe® (57% pelargonic acid) applied at 3, 6, and 9% v/v on marketable squash fruit number (#/acre) and yield (lb/acre).

Weed Control Treatment	Fruit Production		Yield	
	fruit/acre		lb/acre	
Scythe 3%	9,559	ab	4,285	bc
Scythe 6%	22,627	a	10,874	a
Scythe 9%	17,545	ab	7,858	ab
Weedy-Check	1,815	c	939	c
Weed-Free	18,997	ab	8,950	ab

Values in a column followed by the same letter are not significantly different at *P* =.05 LSD.

Post-Directed Application of a Potential Organic Herbicide for Bell Peppers

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Abstract: Organic pepper (*Capsicum annuum* L.) producers need appropriate herbicides that can effectively provide post-emergent weed control. Research was conducted in southeast Oklahoma (Atoka County, Lane, OK) to determine the impact of a potential organic herbicide on weed control efficacy, crop injury, and yields. The experiment included Scythe® (57% pelargonic acid) applied post-directed at 3, 6, and 9% v/v application rates, plus an untreated weedy-check and an untreated weed-free check with 4 replications. Bell pepper, cv. 'Jupiter', was transplanted on May 28, 2010 into 1 row per 91-cm wide raised beds. The primary weeds included smooth crabgrass (*Digitaria ischaemum* (Schreb.) Schreb. ex Muhl.), cutleaf groundcherry (*Physalis angulata* L.), and spiny amaranth (*Amaranthus spinosus* L.). Scythe® was post-directed applied on June 16 and then reapplied 8 days later (June 25). Smooth crabgrass (55.6%) and cutleaf groundcherry (66.3%) control peaked at 1 day after initial treatment (DAIT) with the 9% application rate. Scythe® at 9% v/v rate also resulted in the greatest crop injury at 1 DAT (13.75%). The sequential application of Scythe® did not significantly increase grass or broadleaf control. Although weed control and crop yields increased as application rates increased, the less than satisfactory weed control produced significantly lower pepper yields that the weed-free treatment.

Introduction: Oklahoma producers are interested in sweet onion (*Allium cepa* L.) as an alternative crop for farm diversification. Onions do not compete well with weeds due to their slow growth rate, short height, non-branching plant structure, low leaf area, and shallow root system. The weed control challenges for onion production are even greater for those considering organic crop production. Although corn gluten meal has shown promise as an early-season pre-emergent organic herbicide in sweet onion production, any uncontrolled weeds can inflict serious yield reductions by the end of the growing season. Organic onion producers need additional organic herbicides that can affectively provide affective post-emergent weed control.

Research with post-emergence organic contact herbicides determined that these herbicides must be applied to very young/small weeds if acceptable weed control is expected. Previous onion research with over-the-top applications of potential organic contact herbicides determined that at affective weed control herbicide rates onion injury was detrimental to profitable yields. A potential solution to increase weed control efficacy on larger weeds and decrease onion injury is the use of multiple/sequential post-directed herbicide applications (herbicides sprayed at the base of the crop rather than over-the-top).

Objective: The objective of the current research was to determine the impact of sequential post-directed applications of a potential organic herbicide on weed control efficacy, crop injury, and yields.

Material and Methods: The experiment included 5 weed control treatments. Scythe® (57% pelargonic acid) was applied at 3 rates (3, 6, and 9% v/v), plus an untreated weedy-check and an untreated weed-free check) with 4 replications. Scythe® is not yet cleared for organic crop use. Always read and follow the herbicide label. Bell pepper, cv. 'Jupiter' were transplanted on May 28, 2010.

Scythe® was post-directed applied (40 gpa, 8004, 0.40 gpm) on June 16, 2010 and then reapplied 8 days later (June 24, 2010). At the time of initial applications smooth crabgrass (*Digitaria ischaemum* (Schreb.) Schreb. ex Muhl.) was 3 – 4 inches tall, cutleaf groundcherry (*Physalis angulata* L.) was 2 inches tall, spiny amaranth (*Amaranthus spinosus* L.) was 3 – 4 inches tall, and yellow nutsedge (*Cyperus esculentus* L.) was 4-6 inches tall.

Weed control and injury (phytotoxicity) ratings were collected at 1, 3, 7, 9, 11, 16, 21, and 28 days after the initial treatment (DAIT). Weed control ratings represent the percent weed control for a treatment compared to the weedy-check. A 0 to 100% visual rating system was used in which 0% represented no weed control, while 100% represented complete weed control. A 0 to 100% visual rating system was used in which 0% represented no crop injury, while 100% represented crop death. Weed control and crop injury data were converted using an arcsine transformation to facilitate statistical analysis and mean separation. Pepper fruit was harvested on August 12, 2010. All data were subjected to ANOVA[2] and mean separation using LSD with P=0.05.

Results and Discussion: Grass/smooth crabgrass (55.6%) and broadleaf weed control (66.3%) peaked at 1 day after treatment (DAIT) with the 9% application rate (Table 1 and 2). Yellow nutsedge control (33.1%) peaked at 3 DAIT with the (5 rate and declining to 5.63% control at 28 DAIT (Table 3). Scythe® at 9% v/v rate also resulted in the greatest crop injury at 1 DAIT (13.75%) (Table 4).

The sequential application of Scythe® (two applications 8 days apart) did not significantly increase grass, broadleaf, or yellow nutsedge control for Scythe applied at 3, 6, and 9% v/v (Table 1, 2, and 3). The lack of weed control for Scythe® application rates of 3, 6, and 9% reduced the number and weight of peppers compared to the weed-free treatment (Table 5).

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[2] SAS Institute Inc., 100 SAS Campus Drive, Cary, NC 27513.

Table 1. Smooth crabgrass control as a result of sequential post-directed applications of Scythe® (57% pelargonic acid) applied at 3, 6, and 9% v/v in bell peppers.

Weed Control Treatment	Days After Initial Treatment							
	1	3	7	9	11	16	21	28
	% Smooth Crabgrass Control							
Scythe 3%	25.3 c	12.8 c	12.2 c	16.5 c	17.3 c	9.6 c	3 d	2.9 d
Scythe 6%	37.5 bc	26.3 c	23.2 c	36.3 b	36.9 b	26.9 b	13.8 c	13.8 c
Scythe 9%	55.6 b	49.4 b	42.5 b	49.4 b	46.9 b	39.4 b	23.8 b	20 b
Weedy-Check	0 d	0 d	0 d	0 d	0 d	0 d	0 d	0 e
Weed-Free	100 a	100 a	100 a	100 a	100 a	100 a	100 a	100 a

Values in a column followed by the same letter are not significantly different at *P* =.05 LSD.

Table 2. Broadleaf (cutleaf groundcherry and spiny amaranth) weed control (%) as a result of sequential post-directed applications of Scythe® (57% pelargonic acid) applied at 3, 6, and 9% v/v in bell pepper.

Weed Control Treatment	Days After Initial Treatment							
	1	3	7	9	11	16	21	28
	% Broadleaf Control							
Scythe 3%	22.5 d	17.5 d	16.3 d	29.4 c	23.8 c	19.4 d	16.3 d	12.1 d
Scythe 6%	43.8 c	31.9 c	31.9 c	47.5 b	44.4 b	40.6 c	28.8 c	26.3 c
Scythe 9%	66.3 b	64.4 b	57.5 b	58.8 b	53.1 b	53.8 b	40 b	35.6 b
Weedy-Check	0 e	0 e	0 e	0 d	0 d	0 e	0 e	0 e
Weed-Free	100 a	100 a	100 a	100 a	100 a	100 a	100 a	100 a

Values in a column followed by the same letter are not significantly different at *P* =.05 LSD.

Table 3. Yellow nutsedge control as a result of sequential post-directed applications of Scythe® (57% pelargonic acid) applied at 3, 6, and 9% v/v in bell pepper.

Weed Control Treatment	Days After Initial Treatment							
	1	3	7	9	11	16	21	28
	% Yellow Nutsedge Control							
Scythe 3%	3.3 c	10.1 c	7.5 cd	2.1 d	2.1 cd	1.3 c	1 c	1 c
Scythe 6%	14.9 b	8.6 c	8 c	9.9 c	6.4 c	4.5 c	3.5 bc	3.1 b
Scythe 9%	30.6 b	33.1 b	26.3 b	21.9 b	28.1 b	25.0 b	6.3 b	5.6 b
Weedy-Check	0 c	0 c	0 d	0 d	0 d	0 c	0 c	0 c
Weed-Free	100 a	100 a	100 a	100 a	100 a	100 a	100 a	100 a

Values in a column followed by the same letter are not significantly different at *P* =.05 LSD.

Table 4. Bell pepper injury (%) as a result of sequential post-directed applications of Scythe® (57% pelargonic acid) applied at 3, 6, and 9% v/v.

Weed Control Treatment	Days After Initial Treatment							
	1	3	7	9	11	16	21	28
	% Crop Injury							
Scythe 3%	7 b	2.5 b	1 ab	1.5 a	1 bc	0 b	0 b	0 a
Scythe 6%	8 b	2 b	1 b	2 a	1 b	1 a	1 a	0 a
Scythe 9%	13.8 a	6.5 a	1.8 a	1.5 a	2 a	1.8 a	1 a	0 a
Weedy-Check	0 c	0 c	0 c	0 b	0 c	0 b	0 b	0 a
Weed-Free	0 c	0 c	0 c	0 b	0 c	0 b	0 b	0 a

Values in a column followed by the same letter are not significantly different at *P* =.05 LSD.

Table 5. Impact of sequential post-directed applications of Scythe® (57% pelargonic acid) applied at 3, 6, and 9% v/v on marketable bell pepper fruit number (#/acre) and yield (lb/acre).

Weed Control Treatment	Fruit Production	Yield
	fruit/acre	lb/acre
Scythe 3%	242 b	11.2 b
Scythe 6%	484 b	12.29 b
Scythe 9%	1936 ab	52.37 b
Weedy-Check	484 b	17.49 b
Weed-Free	2904 a	159.03 a

Values in a column followed by the same letter are not significantly different at *P* =.05 LSD.

Conclusions

Although weed control and crop yields increased as application rates increased, the less than satisfactory weed control produced significantly lower pepper yields that the weed-free treatment. In this research, satisfactory weed control was never achieved with the weeds present at their specific maturity level and size with the application rates tested. Increasing the application rate or spraying the weeds at an earlier growth stage should improve weed control efficacy and benefit yields.

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Organic weed control for cantaloupe methods comparison trial

Jim Shrefler, Charles Webber, Merritt Taylor, Warren Roberts

Introduction and objectives: Effective weed control is needed for successful melon production. Synthetic herbicides that are available for non-organic melon production cannot be used in organic production. This results in reduced options for both long term perennial weed control and weed control in a given crop. In addition to organic producers needs, herbicide use is not practical in many garden situations, whether organic or not. Thus a number of different producer categories have a need for weed management alternatives in vining crops such as cantaloupe. This trial evaluated and compared several potential methods for controlling weeds in melons. Objectives were to determine effectiveness for controlling weeds and effects on crop growth and yield.

Materials and Methods: The crop was direct seeded June 3, 2010 at the Lane Agriculture Center in southeast Oklahoma. The cultivar Caravel was planted in rows spaced 6 feet apart on raised beds. Plants were spaced 2 feet apart in row. Overhead irrigation was used immediately after planting and drip irrigation used as needed thereafter. Treatments included 1. Plastic Mulch(black polyethylene), 2. Landscape Fabric (woven polypropylene), 3. Cultivate as long as possible (tractor mounted rolling cultivator), 4. Flame as long as possible, 5. Greenmatch herbicide (d-limonene) applied postemergence, 6. Corn gluten meal banded (bands along-side the untreated crop row) as preemergence herbicide and 7. Matran Herbicide (clove oil) applied postemergence. Treatments 3-7 also included hand hoeing on an as-needed basis until vine growth prevented doing so without damaging vines.
Weed populations and crop vigor were assessed on June 18. Nutsedge populations were assessed again on 7/20. Melons were harvested August 9, 17, 24 & Sept. 1. Melons were graded based on diameter and sound and decayed fruits of each size category were counted.

Results: In general, mulches provided greatest weed prevention (Table 1). Early crop vigor was best with plastic mulch and landscape fabric treatments and CGM. Plastic mulch and landscape fabric treatments appeared to protect the recently emerged seedling from soil washing due to heavy rainfall. Corn gluten meal effects on vigor are unclear but may reflect the additional nitrogen provided by the CGM. Overall total yields were similar across treatments (Table 2). However, overall marketable yields differed for some treatments (Table 3). Greatest total yields at the first harvest were obtained with mulch and landscape fabric treatments (Table 3). For subsequent harvests yield differences were not detected among treatments. A primary cause for the loss of marketability was fruit decay (data not shown). Decay ranged from 35 to 70% of fruits being affected but no treatments differences for percent decayed fruit were detected.

Acknowledgements: The authors acknowledge the technical support of Tony Goodson, Buddy Faulkenberry, and Wyatt O'hern.

Table 1. Weed populations and crop vigor

Treatment	Weed population counts						Crop vigor[1]
	6-17					7-20	6-17
	Ground-cherry	Pigweed	Carpet-weed	Annual grasses	Yellow nutsedge	Yellow nutsedge	Crop Vigor[1]
	weeds per square foot						
Mulch	5.1 b[2]	.1	0.4 b	0.4 b	0.1 b	0.8 b	9.0 a
Fabric	6.7 b	0	0.4 b	1.1 b	0 b	1.2 b	9.2 a
Cultivation	38.4 a	1.7	4.5 a	8.0 ab	3.0 a	4.6 a	8.0 bc
Flame	24.7 ab	1.2	5.6 a	7.2 ab	1.5 a	6.5 a	6.7 d
Greenmatch	17.5 ab	.9	5.7 a	9.8 a	1.5 a	5.5 a	7.2 cd
CGM	38.2 a	1.9	7.2 a	8.4 ab	1.7 a	5.2 a	8.5 ab
Matran	35.2 a	0.8	4.5 a	10.1 a	2.0 a	5.6 a	7.0 cd

[1] Crop vigor where 10 = excellent vigor and 0 = dead.
[2] Means within a column followed by a common letter are not different based on Duncan's Multiple Range test with alpha=0.05.

Table 2. Melon total yields averaged across fruit sizes at four harvest dates.

Treatment	Harvest				
	Overall	Aug 9	Aug 17	Aug 24	Sept 1
	fruit number per acre				
Mulch	12380	6130 a[1]	4320	1490	431
Fabric	10930	4360 b	3990	2000	581
Cultivation	12120	2610 cd	6860	1850	799
Flame	12270	3080 bc	6170	2250	762
Greenmatch	12270	3010 bcd	5440	2320	1488
CGM	11250	1420 d	6210	2210	1416
Matran	10930	1890 cd	5300	2980	762

[1] Means within a column followed by a common letter are not different based on LSD test with alpha=0.05.

Table 3. Melon marketable yields averaged across fruit sizes at four harvest dates.

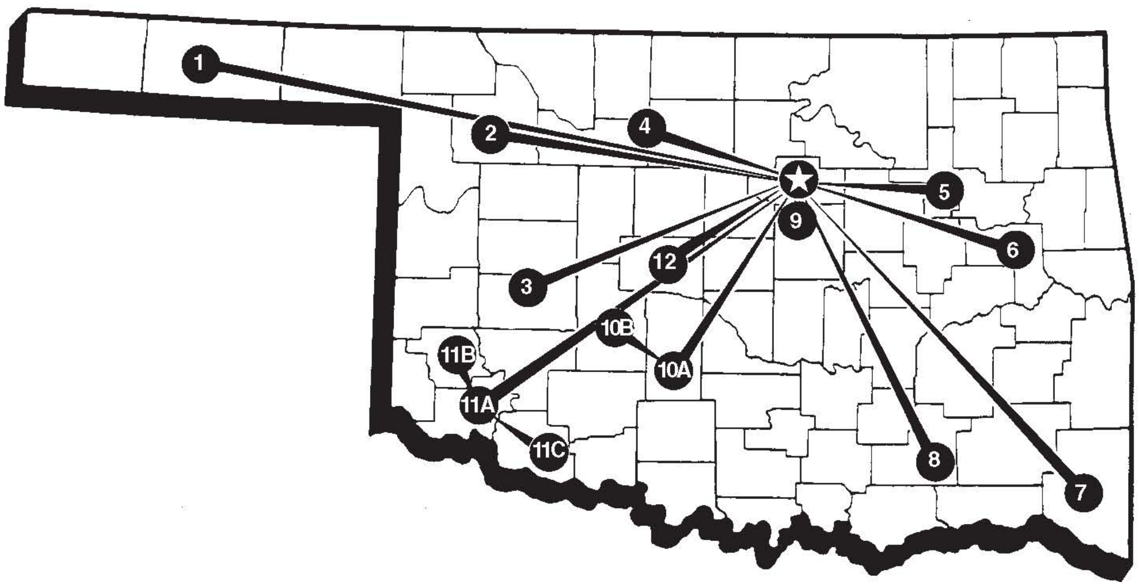
Treatment	Harvest				
	Overall	Aug 9	Aug 17	Aug 24	Sept 1
	fruit number per acre				
Mulch	6280 ab[1]	3270	2180	580	250
Fabric	5410 ab	2030	2320	730	327
Cultivation	5480 ab	1160	3050	730	544
Flame	5920 ab	1780	2430	1200	508
Greenmatch	7840 a	2320	3410	1200	907
CGM	4720 b	580	2470	980	690
Matran	4430 b	940	1960	1090	436

[1] Means within a column followed by a common letter are not different based on LSD test with alpha=0.05.

SI (METRIC) CONVERSION FACTORS

Approximate Conversions to SI Units					*Approximate Conversions from SI Units*				
Symbol	**When you know**	**Multiply by**	**To Find**	**Symbol**	**Symbol**	**When you know**	**Multiply by**	**To Find**	**Symbol**
		LENGTH					**LENGTH**		
in	inches	25.40	millimeters	mm	mm	millimeters	0.0394	inches	in
ft	feet	0.3048	meters	m	m	meters	3.281	feet	ft
yd	yards	0.9144	meters	m	m	meters	1.094	yards	yds
mi	miles	1.609	kilometers	km	km	kilometers	0.6214	miles	mi
		AREA					**AREA**		
in^2	square inches	645.2	square millimeters	mm^2	mm^2	square millimeters	0.00155	square inches	in^2
ft^2	square feet	0.0929	square meters	m^2	m^2	square meters	10.764	square feet	ft^2
yd^2	square yards	0.8361	square meters	m^2	m^2	square meters	1.196	square yards	yd^2
ac	acres	0.4047	hectacres	ha	ha	hectacres	2.471	acres	ac
mi^2	square miles	2.590	square kilometers	km^2	km^2	square kilometers	0.3861	square miles	mi^2
		VOLUME					**VOLUME**		
fl oz	fluid ounces	29.57	milliliters	mL	mL	milliliters	0.0338	fluid ounces	fl oz
gal	gallon	3.785	liters	L	L	liters	0.2642	gallon	gal
ft^3	cubic feet	0.0283	cubic meters	m^3	m^3	cubic meters	35.315	cubic feet	ft^3
yd^3	cubic yards	0.7645	cubic meters	m^3	m^3	cubic meters	1.308	cubic yards	yd^3
		MASS					**MASS**		
oz	ounces	28.35	grams	g	g	grams	0.0353	ounces	oz
lb	pounds	0.4536	kilograms	kg	kg	kilograms	2.205	pounds	lb
T	short tons (2000 lb)	0.907	megagrams	Mg	Mg	megagrams	1.1023	short tons (2000 lb)	T
		TEMPERATURE (exact)					**TEMPERATURE (exact)**		
□F	degrees Fahrenheit	(□F-32) /1.8	degrees Celsius	□C	□C	degrees Fahrenheit	9/5(□C)+32	degrees Celsius	□F
		FORCE and PRESSURE or STRESS					**FORCE and PRESSURE or STRESS**		
lbf	poundforce	4.448	Newtons	N	N	Newtons	0.2248	poundforce	lbf
lbf/in^2	poundforce per square inch	6.895	kilopascals	kPa	kPa	kilopascals	0.1450	poundforce per square inch	lbf/in^2

THE OKLAHOMA AGRICULTURAL EXPERIMENT STATION
SYSTEM COVERS THE STATE



✪ **MAIN STATION—*Stillwater and adjoining areas***

1. **Oklahoma Panhandle Research and Extension Center—*Goodwell***
2. **Southern Plains Range Research Station—*Woodward***
3. **Marvin Klemme Range Research Station—*Bessie***
4. **North Central Research Station—*Lahoma***
5. **Oklahoma Vegetable Research Station—*Bixby***
6. **Eastern Research Station—*Haskell***
7. **Kiamichi Forestry Research Station—*Idabel***
8. **Wes Watkins Agricultural Research and Extension Center—*Lane***
9. **A. Agronomy Research Station—*Perkins***
   B. Oklahoma Fruit and Pecan Research Station—*Perkins*
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    B. Caddo Research Station—*Ft. Cobb*
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    B. Sandyland Research Station—*Mangum*
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