Texas High Plains Vegetable & Weed Control Research Program

Research Summary Reports

2007

Texas A & M University

Department of Horticultural Sciences
Texas Cooperative Extension &
Texas Agricultural Experiment Station

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INTRODUCTION:

The High Plains Vegetable & Weed Control Research Program is located at the Texas A & M University Research & Extension Center in Lubbock. The primary objective of the program is to evaluate herbicides and other weed control option, as well as crop production practices and varieties for vegetables produced on the Texas High Plains, as well as leafy green vegetables grown in the Wintergarden Region and Lower Valley of Texas, and to assist with vegetable research in cooperation with other universities through the United States.

This program would not be successful without the support of many support staff, private companies, government agencies and volunteers. Many thanks are given to Alisa K. Petty, Vegetable Research Technician at Lubbock; Jeff Koym, Potato Breeding Research Associate; and to summer assistant Mark McCallister for their assistance with field work and data collection during the season. The assistance and expertise of Jenifer Smith (Farm Director) and Debbie Cline and Roy Riddle with vegetable trials conducted at the Carolyn Lanier Youth Farm supported by the South Plains Food Bank are greatly appreciated. Also, many thanks to Wendy Durrett, Extension Secretary for her office support.

Notice:

This report is not intended as a book of recommendations for using unregistered pesticides on field or homegrown vegetables crops in Texas.

Growers and home gardeners should always read and follow label directions of any pesticides or other chemicals used in production of vegetables.

For more information, phone: 806-746-6101 or email at rwwallace@ag.tamu.edu

High Plains Vegetable Website*:* http://lubbock.tamu.edu/horticulture/

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Texas Cooperative Extension -
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Syngenta/Rogers Seeds

Asgrow/Seminis Seed

Pure Line Seeds

Products and Other In-Kind Donations –

South Plains Food Bank Farm
Helm Agro, Inc.
Dow AgroSciences
Gowan Company
Harris Moran
SunBurst Farms
Con Agra
Kimberly Seeds

Bayer CropScience
Del Monte Company
Allen Canning Company
Willhite Seeds
Valent
Texas Tech University

COOPERATORS:

Texas A & M University	Dr. Juan Anciso, Dr. Steven King, Dr. Larry Stein, Dr. Frank Dainello, Mike Foster, Dr. Ron French
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CHEMICALS USED FOR HERBICIDE TRIALS

PRODUCT	CHEMISTRY	COMPANY
Alanap-L 2EC	Naptalam	Chemtura
Barricade 4FL	Prodiamine	Syngenta
Basagran 4L	Bentazon	UAP
Bolero 8EC	Thiobencarb	Valent
Buctril 4EC	Bromoxynil	Bayer Cropsciences
Callisto 4SC	Mesotrione	Syngenta
Caparol 4L	Prometryn	Syngenta
Chateau 51WDG	Flumioxazin	Valent
Cobra 2EC	Lactofen	Valent
Command 3ME	Clomazone	FMC
Curbit 3EC	Ethalfluralin	UAP
Dacthal 6F	DCPA	AMVAC
Define 4SC	Flufenacet	Bayer Cropsciences
Dimension T & O 1EC	Dithiopyr	Dow AgroSciences
Dinamic 70G	Amicarbazone	Arvesta
Dual Magnum 7.62E	s-Metolachlor	Syngenta
Envoke 75WDG	Trifloxysulfuron	Syngenta
Eptam 7E	EPTC	Gowan
Eradicane 6.7-E	EPTC + safeners	Gowan
Everest 70WG	Flucarbazone-sodium	Arvesta
Exceed 57WG	Prosulfuron	Syngenta
Far-Go 4E	Triallate	Gowan
FireStorm 3E	Gramoxone	Chemtura
Gallery 75DF	Isoxaben	Dow AgroSciences
Goal 2XL	Oxyfluorfen	Dow AgroSciences
GoalTender 4L	Oxyfluorfen	Dow AgroSciences
Gramoxone Max 3EC	Paraquat	Syngenta
Gramoxone Inteon 2E	Paraquat	Syngenta
Grasp 2SC (GF-443)	Penoxsulam	Dow AgroSciences
Guardsman Max	Dimethenamid-p + Atrazine	BASF
KIH-485 60WDG		Kumai Chem. Ind.
Kerb 50W	Pronamide	Dow AgroSciences
Linex 50DF	Linuron	Griffin
Mandate 2EC	Thiazopyr	Dow AgroSciences
Matrix 25DF	Rimsulfuron	Dupont
Nortron 4SC	Ethofumesate	Bayer Cropsciences
Option 35WG	Foramsulfuon	Bayer Cropsciences
Outlook 6E	Dimethenamid-P	BASF
Paramount 75DF	Quinclorac	BASF
Poast 1.5EC	Sethoxydim	Mico Flo
Prefar 4E	Bensulide	Gowan
Progress 1.8EC	Etho. + Phen. + Desmed.	Bayer Cropsciences
Prowl H20 (3.8 ACS)	Pendimethalin	BASF
Pyramin 65DF	Pyrazon	Arysta LifeSciences
Python 80WDG	Flumetsulam	Dow AgroSciences
Raptor 1AS	Imazamox	BASF
Regiment 80WP	Bispyribac-sodium	Valent
Reflex 2L	Fomesafen	Syngenta

PRODUCT	CHEMISTRY	COMPANY
Rely 1EC	Glufosinate-ammonium	Bayer Cropsciences
Ro-Neet 6E	Cycloate	Helm-Agro
Roundup Original Max	Glyphosate	Monsanto
Sandea 75WDG	Halosulfuron	Gowan
Select 2EC	Clethodim	Valent
Sencor 75DF	Metribuzin	Bayer Cropsciences
Solicam DF	Norflurazon	Syngenta
Spartan 75WDG	Sulfentrazone	FMC
Spin-Aid 1.3EC	Phenmedipham	Bayer Cropsciences
Starane 1.5EC	Fluroxypyr	Dow AgroSciences
Stinger 3EC	Clopyralid	Dow AgroSciences
Strategy	Ethalfluralin + Clomazone	UAP
Suprend 80WDG	Prometryn + Trifloxysulfuron	Syngenta
Surflan A.S.	Oryzalin	Dow AgroSciences
Targa	Quizalafop	Gowan
Target 6Plus	MCPA	
Thistrol 2EC	MCPB	Nu-Farm Americas
UltraBlazer 2EC	Acifluorfen-sodium	BASF
UpBeet 50DF	Triflusulfuron-methyl	Dupont
V-10142 75WDG	Imazosulfuron	Valent
V-10146 3.3SC	Unknown	Valent
Valor 51WDG	Flumioxazin	Valent
Valor SX 51WDG	Flumioxazin	Valent

PRODUCT	CHEMISTRY	COMPANY
SURFACTANTS		
Activator 90	NIS	UAP
Herbimax	COC	UAP
Superb HC	COC	Agriliance
Class Act Next Gen.	Corn-based NIS + Amm. Sulf.	Agriliance
Preference	Soybean NIS	Agriliance
Prime Oil	Petroleum-based COC	Agriliance
Interlock	Penetrant/Drift Reduction	Agriliance

Maximum Daily High Temperatures and Monthly Rainfall at the Lubbock Agricultural Research & Extension Center

Day of the Week	March	April	May	June	July	August	Sept.
1	56.2	78.0	79.9	81.5	93.7	89.4	86.9
2	59.1	84.6	68.7	83.3	88.2	84.0	86.7
3	47.8	72.1	83.5	82.3	88.7	80.9	84.2
4	60.3	60.5	91.2	83.3	87.9	85.3	81.2
5	66.6	59.3	87.9	85.4	82.9	90.1	91.2
6	73.2	42.8	84.1	93.9	86.7	93.1	95.6
7	72.6	30.1	73.2	91.4	90.9	93.5	87.6
8	74.1	34.8	60.3	76.8	94.7	95.3	85.7
9	75.4	48.7	60.2	88.9	92.5	93.5	77.2
10	79.7	78.3	75.0	82.9	94.1	91.6	81.4
11	57.9	66.8	77.3	84.6	89.0	92.9	76.8
12	55.3	73.4	79.1	82.6	90.7	92.0	79.6
13	63.2	61.9	80.3	84.9	80.6	92.7	87.9
14	73.9	58.4	84.5	85.0	89.4	94.0	87.8
15	74.5	73.8	70.6	84.5	92.8	92.2	83.8
16	58.1	68.7	69.4	80.3	91.6	93.2	85.7
17	81.7	65.3	66.6	83.7	90.8	81.7	82.0
18	79.2	70.5	59.5	99.0	89.3	87.6	89.7
19	78.6	82.7	67.0	96.5	85.5	95.5	86.3
20	77.1	72.3	74.1	90.1	86.0	92.7	85.0
21	82.6	78.3	80.5	90.1	85.1	84.9	88.9
22	64.9	79.0	90.0	90.1	87.1	86.6	89.7
23	70.2	84.5	84.8	91.0	91.8	90.6	86.4
24	70.0	77.1	72.4	91.7	88.4	92.1	88.7
25	65.8	68.7	74.5	90.2	86.7	85.5	78.8
26	62.0	73.5	80.0	91.3	88.2	87.3	86.0
27	73.2	80.3	79.0	85.3	88.2	87.0	87.0
28	78.6	80.3	83.7	82.7	88.1	87.6	83.8
29	65.7	72.5	88.7	85.0	85.4	88.7	82.8
30	50.7	N/A	80.8	90.4	87.3	85.2	88.5
31	65.8		86.7		88.2	85.9	
Total Rainfall (inches)	5.59	1.01	5.27	2.57	0.61	2.21	2.53

Trial Results for the Texas High Plains

Evaluation of Starane for Crop Injury and Weed Control in Transplanted Onions

Russell W. Wallace & Alisa K. Petty

Texas Cooperative Extension & Texas Agricultural Experiment Station - Lubbock

Final Report

Objective: To evaluate the effects of POST-applied Starane 1.5EC (fluroxypyr) at selected rates and timings on crop injury, weed control and yield of transplanted onions.

Materials & Methods: The trial was conducted at a location (grower's field) near the Texas A & M University Research & Extension Center in Lubbock, Texas. The trial site was disked prior to initiation of the test and fertilized according to grower preferences, and preemergence herbicide applied. Onions (var. "Granero") were transplanted by hand in the field in late April 2007. Plots containing 2 rows of onions on 40" beds and 20' long were sprayed with the individually selected treatments at 2 – 3, 5 – 6 and 8 – 10 leaf stages, respectively (Table 1). Weed control and crop injury observations were recorded 7 – 14 days following each application. The entire test site was irrigated as needed, and all insect and disease pests were controlled by the grower. Yield data were not recorded in this trial due to excessive disease found within the onion bulbs, and the grower elected not to harvest the field. All data were subjected to analysis of variance and means separated using the Least Significant Difference at the 0.05 level.

Results and Discussion: When applied to 2 – 3 leaf onions, crop injury 10 days after treatment (DAT) was highest when Starane was applied at 0.67 pint/A; however, injury was minor and was observed to be minor twisting of the leaves, including at the base of the transplant (Table 2). No chlorosis or necrosis (leaf spotting) was observed with any Starane treatment. Starane applied at 0.33 pints/A also caused very minor leaf twisting. Buctril 4EC (bromoxynil) and GoalTender 4SC (oxyfluorfen) caused some minor leaf burn, though this was considered typical to those herbicides. Starane, applied at the high rate and tank-mixed with the graminicide Poast 1.5EC (sethoxydim) caused similar injury to treatments applied without it. Additionally, as the number of onion leaves increased the tolerance to Starane also increased, and less injury was observed when Starane was applied at the 5 – 6 leaf or 8 – 10 leaf stages.

Control of common sunflower (*Helianthus annuus*) was 98% or better with all treatments, regardless of the timing of the spray. Control was equivalent when Starane was applied early (1 – 3 leaf onions) compared to later (8 – 10 leaf) applications. Sunflower control was equivalent to that of GoalTender and Buctril, though symptomology was different. Death of sunflower by GoalTender and Buctril was through leaf and stem necrosis, whereas Starane caused stunting and leaf malformations typical of plant growth regulator injury. However, Palmer amaranth (*Amaranthus palmeri*) control was variable; and greater with the high rate of Starane at all crop stages. When averaged across all timings, the high rate gave 73.3% control compared to 52.9% in plots treated with the lower rate. Heavy nutsedge populations were present within the test area, but Starane had no visible effect on this weed regardless of rate or timing (no data shown).

The results of this study indicate that Starane applications are safe to transplanted onions in Texas at rates between 0.33 and 0.67 pints/A. Control of weeds like common sunflower is exceptional regardless of rate; however, Palmer amaranth is better controlled by applications of either GoalTender or Buctril. Nutsedge was not controlled by Starane application and alternative herbicides or weed control strategies should be employed to control it.

Table 1. Application Data for Starane Transplant Onion Trial: 2007

Application: 2-3 leaf POST

Location	Thiel Farm	Wind speed / direction	None
Date	5/13/07	Crop	Onions
Time of day	9:00 a.m.	Variety	Granero
Type of application	Broadcast (hooded)	Crop stage	2 – 3 leaves
Carrier	H_2O	Air temp. (^oF)	60
Gas (if not CO_2)	CO_2	Soil temp. (^oF)	62
GPA	20	Soil beneath	Moist
PSI	35	Soil surface	Dry
Nozzle tips	8002	% Relative humidity	Moderate
Nozzle spacing	18”	Sky conditions	Overcast
Boom width (“)	3.3’	# Replications	4
Boom height (“)	18”	Sprayed by	RWW
Weeds present: Nutsedge (spotty), Common sunflower (2 – 3 leaves), Palmer amaranth (1 – 3 leaves)			

Application:

Location	Thiel Farm	Wind speed / direction	None
Date	6/01/07	Crop	Onions
Time of day	9:00 a.m.	Variety	Granero
Type of application	Broadcast (hooded)	Crop stage	4 – 5 leaves
Carrier	H_2O	Air temp. (^oF)	85
Gas (if not CO_2)	CO_2	Soil temp. (^oF)	70
GPA	20	Soil beneath	Moist
PSI	35	Soil surface	Moist
Nozzle tips	8002	% Relative humidity	Moderate
Nozzle spacing	18”	Sky conditions	Overcast
Boom width (“)	3.3’	# Replications	4
Boom height (“)	18”	Sprayed by	AKP
Weeds present: Common sunflower (5 – 7 leaves), Palmer amaranth (4 – 7 leaves)			

Application:

Location	Thiel Farm	Wind speed / direction	0 – 5 / W
Date	6/07/07	Crop	Onions
Time of day	8:30 a.m.	Variety	Granero
Type of application	Broadcast (hooded)	Crop stage	8th leaf emerging
Carrier	H_2O	Air temp. (^oF)	78
Gas (if not CO_2)	CO_2	Soil temp. (^oF)	75
GPA	20	Soil beneath	Semi-moist
PSI	35	Soil surface	Dry
Nozzle tips	8002	% Relative humidity	Moderate
Nozzle spacing	18”	Sky conditions	Clear/Sunny
Boom width (“)	3.3’	# Replications	4
Boom height (“)	18”	Sprayed by	RWW
Weeds present: Common sunflower (8 – 12”); Palmer amaranth (12 – 16”); nutsedge present throughout entire site			

Table 2. Crop Injury and Weed Control with POST-Applied Starane in Transplanted Onions

Treatment	Rate/A @ 20 GPA	Timing (leaf stage)	-------- % Crop Injury --------			------ % Control ------	
			5/23	6/06	6/26	Sun-flower	Palmer amaranth
Untreated			0	0	0	0	0
Grower Standard + Starane 1.5EC	0.67 pt	2 – 3	13.8	1.3	0	99.0	87.5
Grower Standard + Starane 1.5EC	0.67 pt	5 – 6	NA	5.0	0	99.0	60.0
Grower Standard + Starane 1.5EC	0.67 pt	8 – 10	NA	NA	0	99.0	72.5
Grower Standard + Starane 1.5EC	0.33 pt	2 – 3	6.8	0	0	99.0	67.5
Grower Standard + Starane 1.5EC	0.33 pt	5 – 6	NA	3.8	0	99.0	33.8
Grower Standard + Starane 1.5EC	0.33 pt	8 – 10	NA	NA	0	98.0	57.5
Grower Standard + GoalTender 4SC	0.5 pt	2 – 3	3.2	0	0	98.0	97.0
Grower Standard + Buctril 4EC	0.5 pt	2 – 3	7.5	0	0	99.0	97.0
Grower Standard + Starane 1.5EC + Poast 1.5EC + COC	0.67 pt 2.0 pt 1.0% v/v	2 – 3	13.8	0	0	99.0	81.3
	LSD (0.05)		**2.8**	**1.7**	**0**	**1.3**	**34.0**

NA = No herbicide treatment applied at this time.

Evaluation of Starane for Crop Injury and Weed Control in Direct-Seeded Onions

Russell W. Wallace & Alisa K. Petty

Texas Cooperative Extension & Texas Agricultural Experiment Station - Lubbock

Final Report

Objective: To evaluate the effects of POST-applied Starane 1.5EC (fluroxypyr) at selected rates and timings on crop injury, weed control and yield of direct-seeded onions.

Materials & Methods: The trial was conducted at the Texas A & M University Research & Extension Center in Lubbock, Texas on an Acuff clay loam soil with an average pH of 7.7 and 1.1% organic matter. The trial site was disked prior to initiation of the test and beds listed at a distance of 40" apart. In addition, Prefar 4E (bensulide) herbicide was applied preplant incorporated (PPI) at 2.0 lbs ai/A, a typical practice for the state. Onions (var. "White Sweet Spanish") were seeded on March 8 in two rows per bed using a 2-row Monosem vacuum planter. Each plot contained 2 beds of onions and measured 6.7' by 20' and was irrigated as needed during the crop season. Starane was applied at the 2 – 3, 5 – 6 and 8 – 10 leaf stages using a CO_2-pressurized backpack sprayer with a hand-held boom equipped with 8002 nozzles that delivered 20 GPA at 30 PSI. Application data for each of the timings can be found in Table 1. Few weeds were present within the study until late in the season, and these were removed by hand. As a result, only crop injury and yield data were recorded. The entire test site was hailed on twice during early crop growth, which injured the leaves, and this included one event that occurred between the 5-leaf and 8-leaf stages. All data were subjected to analysis of variance and means separated using the Least Significant Difference at the 0.05 level.

Results and Discussion: When applied to 2 – 3 leaf onions, crop injury 11 days after treatment (DAT) was highest when Starane was sprayed at 0.67 pint/A; however, this injury was minimal and observed to be minor twisting of the leaves (Table 2). No chlorosis or necrosis (leaf spotting) was observed with any Starane treatment. Buctril 4EC (bromoxynil) and GoalTender 4SC (oxyfluorfen) caused some minor leaf burn, though this was considered typical to those herbicides. Starane, applied at the high rate and tank-mixed with the graminicide Poast 1.5EC (sethoxydim) caused similar injury to treatments applied without it. As the number of onion leaves increased (later timings), the tolerance to Starane also increased, and less injury overall was observed when Starane was applied at the 5 – 6 leaf or 8 – 10 leaf stages. Eight weeks (August 23) following applications made to 8-leaf onions, no visible crop injury was observed with any treatments.

Onions were harvested by hand on August 23 (168 days after planting); however yields (Table 2) were lower than expected, and this was likely due to the two hail events combined with the typical lack of excellent growth with direct-seeded onions on the High Plains (majority are transplanted). Yields were highest in plots treated with GoalTender, Buctril and Starane + Poast, though only the GoalTender treatment was significantly higher than the untreated control. When averaged across timings, yields were 7,623 lbs/A when treated at the 0.67 pint rate compared to 7,747 lbs/A with the 0.33 pint rate (no difference). However, when averaged across both rates, yields decreased 20% and 26% for the 5 – 6 leaf and 8 – 10 leaf stages, respectively, when compared to applications made at the 2 – 3 leaf stage. This suggests that while visible injury may not be apparent, Starane applications may have reduced bulb yields when applied at timings later than 2 – 3 leaves.

The results of this study indicate that in general Starane applications are safe when applied to direct-seeded onions in Texas at rates between 0.33 and 0.67 pints/A. However, the data also suggest that applications later than 2 – 3 leaves may reduce bulb yields. However, the benefit of controlling weeds may offset this reduction in terms of hand-weeding costs, etc. Additional research is needed to determine whether this response can be repeated a second year as well as in other areas of Texas.

Table 1. Application Data for Starane Direct-Seeded Onion Trial: 2007

Application: 2-3 leaf POST

Location	LREC	**Wind speed / direction**	4 – 5 / NE
Date	5/12/07	**Crop**	Onions
Time of day	5:30 p.m.	**Variety**	White Sweet Spanish
Type of application	Broadcast	**Crop stage**	2 – 3 leaves
Carrier	H_2O	**Air temp. (^oF)**	82
Gas (if not CO_2)	CO_2	**Soil temp. (^oF)**	78
GPA	20	**Soil beneath**	Moist
PSI	35	**Soil surface**	Semi-Moist
Nozzle tips	8002	**% Relative humidity**	High
Nozzle spacing	18”	**Sky conditions**	Partly cloudy
Boom width (“)	3.3’	**# Replications**	4
Boom height (“)	18”	**Sprayed by**	RWW

Weeds present: Russian thistle (6 – 8”), Palmer amaranth (1 – 3 leaves); Kochia (66 – 10”)

Application: 5 – 6 leaf

Location	LREC	**Wind speed / direction**	0 – 10 / NW
Date	6/12/07	**Crop**	Onions
Time of day	12:45 p.m.	**Variety**	White Sweet Spanish
Type of application	Broadcast	**Crop stage**	5 – 6 leaves
Carrier	H_2O	**Air temp. (^oF)**	81
Gas (if not CO_2)	CO_2	**Soil temp. (^oF)**	85
GPA	20	**Soil beneath**	Moist
PSI	35	**Soil surface**	Dry
Nozzle tips	8002	**% Relative humidity**	High
Nozzle spacing	18”	**Sky conditions**	Clear/Sunny
Boom width (“)	3.3’	**# Replications**	4
Boom height (“)	18”	**Sprayed by**	RWW

Weeds present: None

Application: 8 – 10 leaf

Location	LREC	**Wind speed / direction**	10 – 12 / S
Date	6/22/07	**Crop**	Onions
Time of day	8:30 a.m.	**Variety**	White Sweet Spanish
Type of application	Broadcast	**Crop stage**	8 - 10 leaf
Carrier	H_2O	**Air temp. (^oF)**	75
Gas (if not CO_2)	CO_2	**Soil temp. (^oF)**	78
GPA	20	**Soil beneath**	Moist
PSI	35	**Soil surface**	Dry
Nozzle tips	8002	**% Relative humidity**	Moderate
Nozzle spacing	18”	**Sky conditions**	Clear/Sunny
Boom width (“)	3.3’	**# Replications**	4
Boom height (“)	18”	**Sprayed by**	RWW

Weeds present: None

Table 2. Crop Injury and Weed Control Evaluation with Starane in Direct-Seeded Onions

Treatment	Rate/A @ 20 GPA	Timing (leaf stage)	Onion Leaf Injury			Yield
			5/23	6/26	8/23	8/24
			------------------ % ------------------			lbs/A
Grower Standard*			0	0	0	7,692
Grower Standard + Starane 1.5EC	0.67 pt	2 – 3	9.3	0	0	9,110
Grower Standard + Starane 1.5EC	0.67 pt	5 – 6	NA	5.0	0	7,499
Grower Standard + Starane 1.5EC	0.67 pt	8 – 10	NA	6.3	0	6,259
Grower Standard + Starane 1.5EC	0.33 pt	2 – 3	3.8	0	0	9,013
Grower Standard + Starane 1.5EC	0.33 pt	5 – 6	NA	3.8	0	7,010
Grower Standard + Starane 1.5EC	0.33 pt	8 – 10	NA	8.8	0	7,217
Grower Standard + GoalTender 4SC	0.5 pt	2 – 3	2.0	0	0	10,852
Grower Standard + Buctril 4EC	0.5 pt	2 – 3	10.0	0	0	9,394
Grower Standard + Starane 1.5EC + Poast 1.5EC + COC	0.67 pt 2.0 pt 1.0% v/v	2 – 3	9.8	0	0	9,470
	LSD (0.05)		**4.5**	**3.5**	**0**	**2,749**

* Grower standard (Prefar 4E at 2.0 qts/A) applied PPI to all plots.
NA = Not applied at this time.

Basagran Tolerance in Direct-Seeded Onions

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Final Report

Objective: To evaluate the effects of POST-applied Basagran 4L (bentazon) at selected rates and timings on crop injury and yield of direct-seeded onions.

Materials & Methods: The trial was conducted at the Texas A & M University Research & Extension Center in Lubbock, Texas on an Acuff clay loam soil with an average pH of 7.7 and 1.1% organic matter. The trial site was disked prior to initiation of the test and beds listed at a distance of 40" apart. In addition, Prefar 4E (bensulide) herbicide was applied preplant incorporated (PPI) at 2.0 lbs ai/A, a typical practice for the state. Onions (var. "White Sweet Spanish") were seeded on March 8 in two rows per bed using a 2-row Monosem vacuum planter. Each plot contained 2 beds of onions and measured 6.7' by 20' with 6 replications, and was irrigated as needed during the crop season. GoalTender (oxyfluorfen) 4SC was applied at the 1-leaf stage while Basagran was applied at the 2-, 3-, and 5-leaf stages (some plots received up to 4 sprays) using a CO_2-pressurized backpack sprayer with a hand-held boom equipped with 8002 nozzles that delivered 20 GPA at 30 PSI. Basagran was applied at rates of 0.25, 0.50 and 1.0 lbs ai/A with and without crop oil concentrate (COC). Application data for the timings is found in Table 1. Few weeds were present within the study until late in the season, and these were removed by hand. The entire test site was hailed on twice during early crop growth, which injured the leaves, and this included one event that occurred between the 5-leaf and 8-leaf stages. Only crop injury and yield data were recorded. Data were subjected to analysis of variance and means separated using the Least Significant Difference at the 0.05 level.

Results and Discussion: Onion leaf injury recorded on June 26 was minor (less than 5%) when the multiple applications of Basagran were applied at the low rate (0.25 lb ai) regardless of whether COC was added to the spray (Table 2), and this continued through the end of the trial (August 23). Significantly higher injury was observed with the multiple applications of Basagran applied at 0.50 and 1.0 lb ai, and this injury increased with the addition of COC. Highest degree of injury was found on June 26 in onions treated with 1.0 lb ai, even though only 2 applications had been made. While less injury was found in onions sprayed without COC, in the case of Basagran at the 1.0 lb ai rate, it was not significantly less. GoalTender applications followed by Basagran twice at 0.50 lb ai showed less than 7% injury throughout the test. Observations made on August 23 suggest that by harvest time, there was no visible leaf injury with any treatment.

Onions were harvested by hand on August 24 (169 days after planting); however yields (Table 2) were lower than expected, and this was likely due to the two hail events combined with the typical lack of excellent growth with direct-seeded onions on the High Plains (majority are transplanted). No yields were significantly different from the untreated control. However, yields were highest in plots treated with GoalTender followed by Basagran (twice at 0.5 lb ai) or where Basagran was applied four times at 0.25 or 0.50 lb ai without COC. Yields were lowest where Basagran was applied twice at 1.0 lb ai with COC.

The results of this study indicate that Basagran applications are generally safe when applied four times to direct-seeded onions in Texas at rates between 0.25 and 0.50 (with and without COC) or when applied twice at 1.0 lb ai (without COC). Basagran may be considered as a "rescue treatment", especially in fields where nutsedge is an extremely competitive weed, though more research is needed to determine whether this response can be repeated a second year as well as in other areas of Texas.

Table 1. Application Data for Basagran Tolerance to Direct-Seeded Onions Trial: 2007

Application: 1-2 leaf

Location	LREC	**Wind speed / direction**	4 – 5 / NE
Date	5/12/07	**Crop**	Onions
Time of day	5:30 p.m.	**Variety**	White Sweet Spanish
Type of application	Broadcast	**Crop stage**	1 - 2 leaves
Carrier	H_2O	**Air temp. (^oF)**	82
Gas (if not CO_2)	CO_2	**Soil temp. (^oF)**	78
GPA	20	**Soil beneath**	Moist
PSI	35	**Soil surface**	Semi-Moist
Nozzle tips	8002	**% Relative humidity**	High
Nozzle spacing	18”	**Sky conditions**	Partly cloudy
Boom width (“)	6.7’	**# Replications**	6
Boom height (“)	18”	**Sprayed by**	RWW

Weeds present: Russian thistle (6 – 8”), Palmer amaranth (1 – 3 leaves); Kochia (66 – 10”)

Application: 3-leaf

Location	LREC	**Wind speed / direction**	15 / SW
Date	5/23/07	**Crop**	Onions
Time of day	2:00 p.m.	**Variety**	White Sweet Spanish
Type of application	Broadcast	**Crop stage**	3 leaves
Carrier	H_2O	**Air temp. (^oF)**	83
Gas (if not CO_2)	CO_2	**Soil temp. (^oF)**	80
GPA	20	**Soil beneath**	Moist
PSI	35	**Soil surface**	Dry/compact
Nozzle tips	8002	**% Relative humidity**	Moderate
Nozzle spacing	18”	**Sky conditions**	Partly cloudy/sunny
Boom width (“)	3.3’	**# Replications**	6
Boom height (“)	18”	**Sprayed by**	RWW

Weeds present: None

Application: 5 – 6 leaf

Location	LREC	**Wind speed / direction**	0 – 10 / NW
Date	6/12/07	**Crop**	Onions
Time of day	12:45 p.m.	**Variety**	White Sweet Spanish
Type of application	Broadcast	**Crop stage**	5 – 6 leaves
Carrier	H_2O	**Air temp. (^oF)**	81
Gas (if not CO_2)	CO_2	**Soil temp. (^oF)**	85
GPA	20	**Soil beneath**	Moist
PSI	35	**Soil surface**	Dry
Nozzle tips	8002	**% Relative humidity**	High
Nozzle spacing	18”	**Sky conditions**	Clear/Sunny
Boom width (“)	3.3’	**# Replications**	6
Boom height (“)	18”	**Sprayed by**	RWW

Weeds present: None

Application: 8 – 10 leaf

Location	LREC	**Wind speed / direction**	10 – 12 / S
Date	6/22/07	**Crop**	Onions
Time of day	8:30 a.m.	**Variety**	White Sweet Spanish
Type of application	Broadcast	**Crop stage**	8 – 10 leaf
Carrier	H_2O	**Air temp. (^oF)**	75
Gas (if not CO_2)	CO_2	**Soil temp. (^oF)**	78
GPA	20	**Soil beneath**	Moist
PSI	35	**Soil surface**	Dry
Nozzle tips	8002	**% Relative humidity**	Moderate
Nozzle spacing	18”	**Sky conditions**	Clear/Sunny
Boom width (“)	3.3’	**# Replications**	6
Boom height (“)	18”	**Sprayed by**	RWW

Weeds present: None

Table 2. Crop Injury and Weed Control Evaluation with Basagran in Direct-Seeded Onions

Treatment	Rate (lbs ai/A) @ 20 GPA	Timings	Injury June 26	Injury August 23	Yield August 24
			-------% -------		lbs/A
Grower Standard**			0	0	8,110
Grower Standard + Basagran 4L	0.25	2-lf + 3-lf + (2 and 4 weeks later)	1.7	0	10,700
Grower Standard + Basagran 4L + COC	0.25 1.0% v/v	2-lf + 3-lf + (2 and 4 weeks later)	0	0	9,277
Grower Standard + Basagran 4L	0.50	2-lf + 3-lf + (2 and 4 weeks later)	2.5	0	10,452
Grower Standard + Basagran 4L + COC	0.50 1.0% v/v	2-lf + 3-lf + (2 and 4 weeks later)	10.0	2.5	9,059
Grower Standard + Basagran 4L	1.00	2-lf + (2 weeks after the 3-lf spray)	19.2	0	9,327
Grower Standard + Basagran 4L + COC	1.00 1.0% v/v	2-lf + (2 weeks after the 3-lf spray)	23.3	0	7,696
Grower Standard + Basagran 4L + GoalTender 4SC	0.50 0.063	2-lf + (4 weeks later) 1-lf + (2 weeks later)	5.0	0	10,487
Grower Standard + Basagran 4L + GoalTender 4SC + NIS	0.50 0.063 0.25% v/v	2-lf + (4 weeks later) 1-lf + (2 weeks later)	6.7	0	8,568
Grower Standard + Handweed		As-needed	0	0	9,713
		LSD (0.05)	**5.0**	**2.3**	**2,868**

** Grower standard (Prefar 2.0 qts/A) applied PPI

Evaluation of Reflex and Ultra Blazer for Crop Injury, Weed Control and Yield in Snap Beans

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Final Report

Objective: To evaluate and compare the effects of POST-applied Reflex 2L (fomesafen) and Ultra Blazer 2EC (acifluorfen) to Basagran 4L (bentazon) for crop injury, weed control and yield of processing snap beans (*Phaseolus vulgaris*).

Materials & Methods: The trial was conducted at the Lubbock City Farm located in East Lubbock, Texas on a sandy loam soil with a pH of 8.1 and 1.1% organic matter. The trial site was disked prior to initiation and fertilized using irrigation water that contained 17 ppm nitrates (approximately 3.5 lbs N per inch of water). Prior to planting, Treflan 4HF (trifluralin) was applied preplant incorporated (PPI) to the entire test area. Snap beans (var. "Titan") were planted on April 30 into plots containing 2 rows 40" apart, and plots measured 6.67' by 25'. Twenty-one days following planting, herbicide treatments containing selected rates and combinations of Reflex, Ultra Blazer, Basagran and Sandea 75WDG (halosulfuron) were applied to one row using a CO_2-pressurized backpack hood sprayer with a hand-held boom equipped with two 8002 nozzles that delivered 20 GPA at 30 PSI. Application and environmental data can be seen in Table 1. Weed control and crop injury observations were recorded 2 and 5 weeks after application (May 23). The entire test site was irrigated as needed with an overhead center pivot sprinkler system, and all insect and disease pests controlled as needed. Yield data was recorded on July 5 by randomly selecting a 3' section in the treated row and removing and weighing all bean pods. The trial was a RCBD with 4 replications and all data were subjected to analysis of variance and means separated using the LSD at the 0.05 level.

Results and Discussion: Crop injury was very low, and remained less than 10% regardless of herbicide or rate (Table 2). Control of Palmer amaranth (*Amaranthus palmeri*) and common sunflower (*Helianthus annuus*) was 96% or better throughout the test. Bean yields were not significantly different from the Treflan control (Table 2), suggesting that weed pressure was not a factor in reducing yields. However, trends in the data showed that when averaged across treatments, beans treated with Ultra Blazer (either alone or tank-mixed) had yields that were 24% less compared to similarly averaged Reflex treatments. When applied alone, Ultra Blazer caused bean yields to decrease as the rate increased from 6.0 oz to 24.0 oz/A, but Reflex treatments tended to remain more stable, regardless of rate applied. Highest yields were found in plots treated with Basagran + Reflex (6.0 oz/A), and in plots treated with either Sandea or Basagran alone.

The results of this research suggest that Ultra Blazer has potential for "rescue" POST applications in snap beans, though low rates must be used, and there is high potential for reduced yields. Reflex has good potential for use in West Texas, and this research demonstrates that it has good crop safety and offers excellent weed control. Future discussions with Syngenta should allow a possible Section 24c label (with restrictions) for use of Reflex in snap beans grown on the Texas High Plains.

Table 1. Application and Environmental Data for Snap Bean Herbicide Trial

Location	Lubbock City Farm	**Wind speed / direction**	15 / SW
Date	5/23/07	**Crop**	Snap Beans
Time of day	9:00 a.m.	**Variety**	Titan
Type of application	Broadcast (hooded)	**Crop stage**	1 – 2 trifoliates
Carrier	H_2O	**Air temp. (^oF)**	74
Gas (if not CO_2)	CO_2	**Soil temp. (^oF)**	69
GPA	20	**Soil beneath**	Moist
PSI	35	**Soil surface**	Moist
Nozzle tips	8002	**% Relative humidity**	High
Nozzle spacing	18"	**Sky conditions**	Partly cloudy
Boom width (")	3.3'	**# Replications**	4
Boom height (")	18"	**Sprayed by**	RWW

Weeds present: Nutsedge (5 - leaves), Common sunflower (2 – 3 leaves), Palmer amaranth (1 – 3 leaves)

Table 2. Effect of Herbicide Treatments on Injury, Weed Control and Yield of Snap Beans

Treatment	Product Rate/A	% Injury	% Weed Control				Yield
		Snap beans	Palmer amaranth	Common Sunflower	Palmer amaranth	Common Sunflower	lbs/A
		June 4	----------- June 4 -----------		------------ June 26 -----------		July 5
Treflan 4HF*	16.0 oz	0	0	0	0	0	6,459
Basagran 4L + COC	24.0 oz + 1% v/v	0	97	97	98	97	7,760
Ultra Blazer 2E + NIS	24.0 oz + 0.25% v/v	8	99	98	99	98	3,407
Ultra Blazer 2E + NIS	16.0 oz + 0.25% v/v	4	99	98	99	99	5,996
Ultra Blazer 2E + NIS	12.0 oz + 0.25% v/v	3	99	98	99	96	5,062
Ultra Blazer 2E + NIS	6.0 oz + 0.25% v/v	3	99	98	97	98	6,282
Reflex 2L + NIS	20.0 oz + 0.25% v/v	3	99	99	99	99	5,648
Reflex 2L + NIS	16.0 oz + 0.25% v/v	3	99	99	99	99	6,929
Reflex 2L + NIS	12.0 oz + 0.25% v/v	3	99	99	99	99	7,270
Reflex 2L + NIS	6.0 oz + 0.25% v/v	3	99	96	98	98	5,580
Reflex 2L + NIS	4.0 oz + 0.25% v/v	0	99	97	99	97	5,846
Sandea 75WDG + NIS	0.5 oz + 0.25% v/v	3	99	99	99	99	7,562
Basagran 4L + Reflex 2L + NIS	24.0 oz 6.0 oz + 0.25% v/v	0	99	99	99	98	8,291
Basagran 4L + Reflex 2L + NIS	24.0 oz 4.0 oz + 0.25% v/v	0	98	99	98	99	5,076
Basagran 4L + Ultra Blazer 2E + NIS	24.0 oz 12.0 oz + 0.25% v/v	6	99	99	99	98	4,442
Basagran + Ultra Blazer 2E + NIS	24.0 oz 6.0 oz + 0.25% v/v	3	99	99	99	98	4,551
Sandea 75WDG + Reflex 2L + NIS	0.5 oz 6.0 oz + 0.25% v/v	0	99	99	98	99	6,963
Sandea 75WDG + Reflex 2L + NIS	0.5.0 oz 4.0 oz + 0.25% v/v	0	98	99	98	99	6,793
Sandea 75WDG + Ultra Blazer 2E + NIS	0.5 oz 12.0 oz + 0.25% v/v	5	99	98	99	99	3,059
Sandea 75WDG + Ultra Blazer 2E + NIS	0.5.0 oz 6.0 oz + 0.25% v/v	8	99	99	99	99	6,609
	LSD (0.05)	**6**	**1**	**2**	**1**	**2**	**3,407**

* Treflan 4HF applied PPI to all plots.

Snap Bean Plantback Following Stinger and Nortron Applications in Spinach

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Final Report

Objective: To evaluate the effects of POST-applied Stinger 3EC (clopyralid) and Nortron 4SC (ethofumesate) when applied to spinach (*Spinacia oleracea*) and the potential residual carryover to a following crop of snap beans (*Phaseolus vulgaris*).

Materials & Methods: The trial was conducted at the Texas A & M University Research & Extension Center located in Lubbock on an Acuff clay loam soil with a pH of 7.7 and 1.1% organic matter. Spinach (var. "DMC 66-09") was planted March 8 on 40" beds into 2-row plots measuring 6.7' x 35'. Preemergence (PRE) and postemergence (POST) herbicides were applied using a CO_2-pressurized backpack sprayer with a hand-held boom equipped with four 8002 nozzles that delivered 20 GPA at 30 PSI. Application and environmental data are shown in Table 1. The spinach crop was allowed to grow to maturity (May 25), then plants shredded and the beds reshaped for bean planting. Snap beans (var. "Titan") were planted May 31 into the same 2-row plots as previously mentioned. No additional herbicides were sprayed on the beans, though the entire test area was cultivated twice. Crop injury ratings were recorded for both the spinach and snap bean crops. The entire test site was furrow-irrigated, and insects and diseases controlled as needed. Snap bean yields were recorded on August 6 by randomly selecting a 3' section from one row and removing all bean pods. The trial was a RCBD with 4 replications and all data were subjected to analysis of variance and means separated using the LSD at the 0.05 level.

Results and Discussion: Dual Magnum 7.62E (s-metolachlor), the grower standard caused minor crop stunting (11%) when observations were recorded on April 26 (Table 2). Spinach injury was highest (36%) where Nortron was applied PRE at 1.0 lb ai/A. Typical injury from both Dual Magnum and Nortron was observed as crop stunting. When applied POST, Spin-Aid 1.3EC (phenmedipham) caused similar injury to POST-applied Nortron (11 – 20%), and this injury occurred as leaf chlorosis and tip burn. Where Stinger was applied POST, crop injury was observed as leaf twisting and malformations, as well as slight stunting. Crop injury with Stinger increased from 4% to 17.5% as the rate of application increased from 0.06 to 0.25 lbs ai/A. By May 13, spinach injury was still apparent with most treatments, though it was reduced.

Snap bean emergence was not statistically lower with any herbicide treatment when sprayed in spinach (Table 2). However, where Stinger was applied POST at 0.25 lb ai, bean emergence was reduced 22% compared to the handweeded (non-treated) control. Although Nortron applied PRE at 1.0 lb ai stunted spinach 36%, no effects on bean emergence were observed. Similarly, where Nortron was applied POST, and where Stinger was applied at 0.063 – 0.125 lb ai, there was no significant reduction in emergence. By June 11, minor (6% or less) bean stunting was observed where Nortron had been applied PRE or POST, and where Spin-Aid was applied POST. Severe snap bean injury was observed where Stinger was applied at 0.25 lb ai, and minor injury observed with the lower rates. The injury to snap beans from Stinger applications was observed as severe plant twisting and stunting. Snap bean yields however, were significantly influenced by the herbicide treatments. Where Stinger was applied to spinach, the severe injury delayed crop growth (and flowering) causing there to be few bean pods, and therefore no yields were recorded. No significant yield reductions were found with all other treatments with the exception of the Spin-Aid treatment. Yields in those plots averaged 31% less than where Dual Magnum (grower standard) was applied, and 12% less than the handweeded control.

The results of this research demonstrate that Nortron applied POST to spinach is safe to subsequent plantings of snap beans in rotation (6 weeks after spraying), and may be a candidate for POST applications (for spinach); however, Stinger applied POST in spinach will severely stunt snap beans if planted within 6 weeks of application. The crop rotation restrictions found on the federal Stinger label should be strictly adhered to in Texas.

Table 1. Application and Environmental Data for Spinach Herbicide Treatments

Location	LREC	**Wind speed / direction**	8 - 10 / N
Date	3/09/07	**Crop**	Spinach
Time of day	7:30 a.m.	**Variety**	DMC 66-09
Type of application	Broadcast (PRE)	**Crop stage**	Seed
Carrier	H_2O	**Air temp. (°F)**	49
Gas (if not CO_2)	CO_2	**Soil temp. (°F)**	50
GPA	20	**Soil beneath**	Moist
PSI	35	**Soil surface**	Dry
Nozzle tips	8002	**% Relative humidity**	Low
Nozzle spacing	18”	**Sky conditions**	Clear
Boom width (“)	3.3’	**# Replications**	4
Boom height (“)	18”	**Sprayed by**	RWW, AKP

Weeds present: None

Location	LREC	**Wind speed / direction**	8 – 10 / SW
Date	4/20/07	**Crop**	Spinach
Time of day	9:00 a.m.	**Variety**	DMC 66-09
Type of application	Broadcast (POST)	**Crop stage**	4 – 5 leaves
Carrier	H_2O	**Air temp. (°F)**	56
Gas (if not CO_2)	CO_2	**Soil temp. (°F)**	54
GPA	20	**Soil beneath**	Moist
PSI	35	**Soil surface**	Moist
Nozzle tips	8002	**% Relative humidity**	Moderate
Nozzle spacing	18”	**Sky conditions**	Clear
Boom width (“)	3.3’	**# Replications**	4
Boom height (“)	18”	**Sprayed by**	AKP

Weeds present: None

Table 2. Evaluation of Spinach Herbicides on Subsequent Snap Bean Planting

Treatment	**Rate lbs ai/A**	**% Spinach Injury**		**Bean Emergence**	**Bean Injury**	**Bean Yield**
		April 26	**May 13**	**3’ row**	**June 11**	**lbs/A**
Handweeded		0	0	27.5	0	9,743
Dual Magnum 7.62E	0.65	11.3	5.0	26.0	3.8	12,509
Nortron 4SC	1.0	36.3	27.5	25.8	6.3	9,593
Dual Magnum 7.62E + Spin-Aid 1.3EC	0.65 0.98	20.0	11.3	23.8	2.5	8,639
Dual Magnum 7.62E + Nortron 4SC	0.65 0.164	11.3	7.5	25.0	5.0	10,404
Dual Magnum 7.62E + Nortron 4SC	0.65 0.328	22.5	15.0	23.3	0	11,766
Dual Magnum 7.62E + Stinger 3EC	0.65 0.063	3.8	1.3	26.3	20.0	0
Dual Magnum 7.62E + Stinger 3EC	0.65 0.125	11.3	6.3	23.8	22.5	0
Dual Magnum 7.62E + Stinger 3EC	0.65 0.25	17.5	18.8	21.5	51.3	0
	LSD (0.05)	**11.6**	**15.2**	**5.8**	**9.4**	**2,950**

Herbicide Screen for Weed Control, Crop Injury and Yield in Cantaloupe

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Texas Cooperative Extension & Texas Agricultural Experiment Station - Lubbock

Final Report

Objective: To evaluate crop injury, weed control and yield for preemergence (PRE) applications of Dual Magnum 7.62E, Matrix 25WG and Spartan 75WDG when compared to standard herbicides applied in Texas-grown cantaloupes (*Cucumis melo*).

Materials & Methods: The trial was conducted at the Texas A & M University Research & Extension Center located in Lubbock on an Acuff clay loam soil with a pH of 7.7 and 1.1% organic matter. Cantaloupe (var. "Jumbo Hales Best") was planted June 8 on 40" beds into 2-row plots measuring 13.3' x 20'. Preemergence (PRE) herbicides were applied immediately following planting using a CO_2-pressurized backpack sprayer with a hand-held boom equipped with four 8002 nozzles that delivered 20 GPA at 30 PSI. Application and environmental data are shown in Table 1. Crop emergence and injury, as well as weed control and yield were recorded during the study. The site was furrow-irrigated, and insects and diseases controlled as needed. Cantaloupes were harvested 5 times beginning on August 21 and ending on September 3. Fruit number and weights were recorded during each harvest and totaled for analysis. The trial was a RCBD with 4 replications and all data were subjected to analysis of variance and means separated using the LSD at the 0.05 level.

Results and Discussion: Cantaloupe emergence was significantly influenced by herbicide treatment (Table 2). Matrix (rimsulfuron) and Spartan (sulfentrazone) reduced cantaloupe emergence by an average 57% and 69%, respectively, when compared to the handweeded control. Dual Magnum (s-metolachlor) had an average 14% less, and emergence in Command 3ME (clomazone) plots was reduced 12%. Crop injury recorded on July 27 showed similar trends to reduced emergence in that significantly higher injury was found in plots treated with Matrix and Spartan. While injury was moderate (15% or less) with other treatments, it was not different compared to the handweeded control.

Palmer amaranth (*Amaranthus palmeri*) control was highest on July 27, approximately 7 weeks after application. However, control was significantly lower from the handweeded control in plots treated with Prefar 4E (bensulide) and Command (both labeled for use on cantaloupes), and with the low rate of Matrix. Weed control with Sandea 75WDG (halosulfuron, labeled), Curbit 3EC (ethalfluralin, a grower standard), Dual Magnum, and Spartan was good; however the high rate of Matrix was inadequate, though not significantly different. By August 16, control of Palmer amaranth was generally lower, and was poor with Prefar, Command, and both rates of Matrix.

Cantaloupe yield was 22% higher in plots treated with Curbit when compared to the handweeded control. This result indicates that handweeding plots can injure plants causing a yield reduction. Yields were also significantly lower in plots treated with Dual Magnum (0.75 or 1.0 lb ai/A) or any rate of Matrix and Spartan. In addition, while not injurious to cantaloupes, weed control was poor in plots treated with Command, and yields were reduced significantly through weed competition.

The results of this trial indicate that the herbicides Curbit, Prefar, Sandea and Command are safe on cantaloupes though control of Palmer amaranth may vary, and best control is with Curbit. While Matrix, Spartan and Dual Magnum gave good to excellent control, emergence and crop injury are too high for consideration as potential registration candidates (except for Dual Magnum at 0.5 lb ai). Cantaloupe yields were negatively influenced by crop injury with Matrix and Spartan, and by poor weed control with Command.

Table 1. Application and Environmental Data for Cantaloupe Herbicide Treatments

Location	LREC	**Wind speed / direction**	0 - 3 / NE
Date	6/09/07	**Crop**	Cantaloupe
Time of day	9:00 a.m.	**Variety**	Jumbo Hale's Best
Type of application	Broadcast (PRE)	**Crop stage**	Seed
Carrier	H_2O	**Air temp. (^oF)**	69
Gas (if not CO_2)	CO_2	**Soil temp. (^oF)**	72
GPA	20	**Soil beneath**	Moist
PSI	35	**Soil surface**	Semi-Moist
Nozzle tips	8002	**% Relative humidity**	High
Nozzle spacing	18"	**Sky conditions**	Overcast
Boom width (")	6.7'	**# Replications**	4
Boom height (")	18"	**Sprayed by**	RWW

Weeds present: None

Table 2. Effect of Herbicides Applied Preemergence on Weed Control, Cantaloupe Injury and Yield

Trt #	Treatment	Rate lbs ai/A	Emergence	Crop injury	% Control Palmer amaranth		Total yield
			No. per 15'	July 27	July 27	August 16	Cwt/A
1	Untreated	----	30.2	0	0	0	161.3
2	Handweed	----	27.0	0	99.0	99.0	224.1
3	Prefar 4E	5.0	28.3	6.3	62.5	55.0	223.4
4	Sandea 75WDG	0.023	25.0	12.5	92.5	86.3	215.7
5	Curbit 3EC	1.5	31.8	5.0	91.3	90.0	287.5
6	Command 3ME	0.19	24.0	8.8	30.0	11.3	109.6
7	Dual Magnum 7.62E	0.5	23.0	13.8	90.0	85.0	199.8
8	Dual Magnum 7.62E	0.75	25.8	15.0	94.8	92.5	180.5
9	Dual Magnum 7.62E	1.0	20.8	15.0	93.5	87.5	174.1
10	Matrix 25WG	0.015	14.5	26.3	71.3	48.8	76.7
11	Matrix 25WG	0.03	9.0	43.7	78.5	72.5	77.0
12	Spartan 75WDG	0.15	16.5	50.0	89.8	78.8	69.5
13	Spartan 75WDG	0.20	4.8	77.3	96.8	87.5	14.3
14	Spartan 75WDG	0.25	4.5	84.8	98.0	92.5	16.0
		LSD (0.05)	**9.4**	**19.1**	**23.3**	**21.7**	**97.9**

Sinbar Tank-Mixes for Weed Control, Crop Injury and Yield in Direct-Seeded Watermelon

Russell W. Wallace & Alisa K. Petty

Texas Cooperative Extension & Texas Agricultural Experiment Station - Lubbock

Final Report

Objective: To evaluate the effects of selected preemergence (PRE) herbicide treatments applied alone or in tank-mix with Sinbar 80WP (terbacil) on weed populations, crop injury and yield of watermelons grown under conditions on the Texas High Plains.

Materials & Methods: The trial was conducted at the Lubbock City Farm located in East Lubbock, Texas on a sandy loam soil with a pH of 8.1 and 1.1% organic matter. Watermelons (var. “Verona”) were planted on April 27 into plots measuring 18’ x 35’ with each plot containing two rows at 40” apart. Herbicide treatments containing Sinbar, Prefar 4E (bensulide), Sandea 75WDG (halosulfuron) or Curbit 3EC (ethalfluralin) alone or tank-mixed were applied using a CO_2-pressurized backpack sprayer with a hand-held boom equipped with four 8002 nozzles that delivered 20 GPA at 30 PSI. Application and environmental data can be seen in Table 1. Weed control and crop injury observations were recorded on June 4 and June 25. The entire test site was irrigated as needed with an overhead center pivot sprinkler system, and all insect and disease pests controlled as needed. Watermelons were fertilized using irrigation water that contained 17 ppm nitrates (approximately 3.5 lbs N per inch of water). On June 4 the entire test site was sprayed with a postemergence treatment of Sandea to control a severe nutsedge population. Yield data was not recorded in this study due to excessive growth of existing weeds within the test area, as well as poor crop emergence. The trial was conducted as a RCBD with 4 replications and all data were subjected to analysis of variance and means separated using the LSD at the 0.05 level.

Results and Discussion: Crop emergence was low in this study and less than 50% of the planted watermelon seed emerged. From what did emerge, there was not a significant difference between herbicide treatments with all considered safe to watermelons (Table 2). Initial watermelon injury was highest with Sinbar applied at 0.20 lb ai/A (twice the registered rate), though it averaged only 11% and the crop recovered within several weeks. Higher crop injury was also associated with treatments of Sandea, though this was less that 8% in all treatments.

When compared to the handweeded control on June 4, significantly lower control of Palmer amaranth (*Amaranthus palmeri*) occurred in plots treated with Sinbar (all rates) alone, and with Prefar applied alone (Table 3). Control with all other herbicides alone or combined with Sinbar gave 91% control or better. Common sunflower (*Helianthus annuus*) control with Sinbar (0.05 lb ai) was poor; however, when the rate was increased to 0.1 or 0.2 lb ai, control was 97% or better. Control with Prefar and Curbit alone was also poor (25% or less), but when tank-mixed with the low or high rate of Sinbar, control increased significantly. Sandea applied alone or tank-mixed with Sinbar gave excellent (98%) control. Control of nutsedge (*Cyperus* spp.) was generally poor with all treatments. By June 25 control of common sunflower and nutsedge was excellent, primarily due to the Sandea application made on June 4. However, Palmer amaranth control was reduced where Sinbar was applied alone, and where Prefar or Prefar + Sinbar treatments were applied. No yields were recorded in this study due to the low emergence as well as excessive weed growth from existing Palmer amaranth found within the plots by harvest time.

The results of this study indicate that Sinbar alone did not adequately control the three species evaluated, however, neither did Prefar or Curbit (standards). Tank-mixing Prefar or Curbit with Sinbar significantly improved control of Palmer amaranth and common sunflower, and should be considered a good choice for direct-seeded watermelons. Additional research is needed to evaluate other locations for effects of Sinbar on other weed species and yield in direct-seeded and transplanted watermelons in Texas.

Table 1. Application and Environmental Data for PRE Herbicide Treatments

Location	City Farm, Lubbock	**Wind speed / direction**	5 – 10 / E
Date	4/28/07	**Crop**	Watermelons
Time of day	9:30 a.m.	**Variety**	Verona
Type of application	Broadcast	**Crop stage**	Seed
Carrier	H_2O	**Air temp. (^oF)**	67
Gas (if not CO_2)	CO_2	**Soil temp. (^oF)**	65
GPA	20	**Soil beneath**	Moist
PSI	35	**Soil surface**	Dry
Nozzle tips	8002	**% Relative humidity**	Moderate
Nozzle spacing	18"	**Sky conditions**	Clear / Sunny
Boom width (")	6.7'	**# Replications**	4
Boom height (")	18"	**Sprayed by**	RWW

Weeds present: None

Table 2. Effects of Herbicide Treatments on Crop Emergence and Injury in Watermelons

Treatment	**Rate**	**Emergence**	**% Watermelon Injury**	
	lbs/A	**No./plot**	**June 4**	**June 25**
Untreated	Season-long	9.3	0	0
Hand weed	Season-long	10.8	0	0
Sinbar 80WP	0.05	7.8	5.0	0
Sinbar	0.10	8.3	2.5	0
Prefar 4E	5.0	11.5	2.5	2.5
Sandea 75WDG	0.03	9.5	7.5	7.5
Curbit 3EC	1.5	11.0	0	5.0
Prefar + Sinbar	5.0 0.05	10.3	2.5	2.5
Prefar + Sinbar	5.0 0.10	8.5	0	0
Curbit + Sinbar	1.5 0.05	9.0	5.0	2.5
Curbit + Sinbar	1.5 0.10	10.5	5.0	5.0
Sandea + Sinbar	0.03 0.05	8.8	7.5	5.0
Sandea + Sinbar	0.03 0.10	11.3	8.8	0
Sinbar	0.20	10.3	11.3	3.8
	LSD (0.05)	**4.4**	**9.0**	**6.2**

Table 3. Effects of Herbicide Treatments on Weed Control in Direct-Seeded Watermelons

Treatment	Rate	Palmer amaranth	Common Sunflower	Nutsedge	Palmer amaranth	Common Sunflower	Nutsedge
	lbs/A	June 4			June 25		
		% Control					
Untreated	Season-long	0	0	0	0	99	99
Hand weed	Season-long	99	99	99	99	99	99
Sinbar 80WP	0.05	64	65	13	19	99	99
Sinbar	0.10	89	97	13	65	99	99
Prefar 4E	5.0	75	25	25	73	99	99
Sandea 75WDG	0.03	97	98	73	85	99	99
Curbit 3EC	1.5	95	13	0	88	99	99
Prefar + Sinbar	5.0 0.05	86	84	0	70	99	99
Prefar + Sinbar	5.0 0.10	91	98	49	79	99	99
Curbit + Sinbar	1.5 0.05	94	71	30	91	99	99
Curbit + Sinbar	1.5 0.10	96	97	30	95	99	99
Sandea + Sinbar	0.03 0.05	95	99	49	80	99	99
Sandea + Sinbar	0.03 0.10	96	99	68	85	99	99
Sinbar	0.20	85	98	30	68	99	99
	LSD (0.05)	**11**	**31**	**33**	**16**	**0**	**0**

Evaluation of Watermelon Varieties for Yield and Quality on the Texas High Plains

Russell W. Wallace & Alisa K. Petty

Texas Cooperative Extension & Texas Agricultural Experiment Station - Lubbock

Final Report

Objective: To evaluate 8 diploid and 21 triploid watermelon varieties for yield and quality when grown under environmental conditions on the Texas High Plains.

Materials and Methods: The trial was conducted at Texas A & M University Research & Extension Center located in Lubbock, Texas. The farm is located on an Acuff clay loam soil with a pH of 7.2 and 1.0% organic matter. The trial site was disked prior to initiation of the test and preemergence herbicide applied. Watermelon varieties were seeded in the greenhouse into 72-celled flats containing a soil-less media on April 9 and then transplanted by hand in the field on May 15 (during 2007, the plants were transplanted late due to wet field conditions). Transplants were spaced into single rows at a distance of 3' within row and 8' between rows. Diploid watermelon variety "Sugar Lee" was also transplanted as a spacer at the beginning and end of each plot, and bee hives were brought in to improve pollination. The crop was monitored regularly during the season for weeds, insects and diseases, and the entire test was drip irrigated. Plots were harvested by hand on August 17 and then again on August 29. Fruit was weighed individually, and categorized by size and culls. Watermelons from several plots within the test site were stolen prior to the second harvest, and yields in those plots were estimated.

Results and Discussion: Early-season, cool wet conditions slowed crop growth during the first month following transplanting. In addition, temperatures were also cool to moderate throughout the duration of the trial (the highest recorded temperature at the site was in the high 90's), and this may have affected overall yields (see Maximum Daily Temperatures and Monthly Rainfall, page 7).

The top three yielding diploid (seeded) varieties included Jamboree, Summer Flavor 800 and Hybrid ACX 193D, and these varieties averaged over 48,000 lbs per acre (Table 1). Percent grade quality showed that Hybrid ACX 193D had a larger size distribution, including fruit weighing more than 30.0 lbs when compared to the other two top varieties. The lowest yields were found with Royal Sweet and Diablo varieties, which had yield approximately 25% less when compared to Jamboree.

The top yielding triploid (seedless) variety in this test was Matrix, which had over 59,000 lbs of fruit per acre, and had yields 17% higher than the top-yielding diploid variety (Table 1). Yields were also over 50,000 lbs per acre for RWT 8174, Summer Sweet 5244 and RWT 8203. The lowest yields were found in the varieties Super Seedless 9601, RWT 8173 and Sugar Heart. All three of these varieties had yields less than 35,000 lbs per acre. Overall, the triploid varieties had very few fruit that were found in categories weighing more than 25 lbs. In general, percent culls were relatively low for the entire test, with the exception of RWT 8173 which had 20.0% culls (mostly blossom end rot).

The results of this test suggest that some varieties performed better than others when grown under conditions of the Texas High Plains. Yield potential may have increased if the varieties had been grown on black plastic mulch; however, this is not a typical practice for watermelon growers on the High Plains. Additional information regarding other statewide trials evaluating these same varieties for 2007 can be found at the following website: http://aggie-horticulture.tamu.edu/vegetable/watermelon/index.html.

Table 1. 2007 Statewide Watermelon Variety Trial Results - Lubbock, TX

Entry	Total Yield (lbs/A)*	Harvested fruit (% fruit size grade) > 30	25-30	20-25	15-20	10-15	5-9	%culls
Diploids								
Jamboree	49,753	0	17.4	32.7	20.9	20.6	4.2	4.2
Summer Flavor 800	49,604	0	5.6	15.0	27.9	11.2	30.0	10.3
Hybrid ACX 193D	48,848	13.1	11.3	12.5	29.0	19.8	9.6	4.7
Ole	47,691	6.3	22.2	19.8	28.4	13.8	3.5	6.0
Summer Velvet 2800HQ	45,085	8.3	4.2	19.5	44.5	5.5	7.0	11.0
Escarlett	38,417	12.2	13.4	30.5	16.8	20.0	7.1	0
Royal Sweet	37,429	0	11.3	33.1	23.8	20.6	11.2	0
Diablo	34,736	0	15.0	15.0	20.0	19.2	30.8	0
Triploids								
Matrix	59,968	0	6.1	12.1	29.1	25.8	23.9	3.0
RWT 8174	58,026	0	0	6.7	39.0	30.1	18.3	5.9
Summer Sweet 5244	50,838	0	0	0	49.0	32.6	13.3	5.1
RWT 8203	50,106	0	0	9.9	32.7	36.1	14.8	6.5
Super Seedless 9570	48,170	0	0	0	25.8	44.2	18.1	11.9
TRI-X 313	47,789	0	0	15.3	36.8	34.7	6.2	7.0
TRI-X Palomar	47,453	0	0	3.4	20.4	49.5	23.4	3.3
Super Crisp 32	45,617	0	0	20.4	31.1	27.8	14.1	6.6
TRI-X Triple Threat	45,175	0	0	0	23.9	50.7	19.2	6.2
Super Seedless 7187	44,259	0	7.3	10.8	42.2	25.2	12.3	2.2
Super Seedless 7177	43,315	0	3.6	6.3	32.9	46.8	8.3	2.1
Super Seedless 7167	42,707	0	0	0	40.9	35.6	11.6	11.9
Sweet Delight	41,718	1.8	0	6.7	22.0	23.4	37.6	8.5
Sweet Slice Plus	41,078	0	2.5	10.9	28.3	42.6	12.1	3.5
TRI-X 212	39,785	0	0	5.6	21.6	37.3	27.5	8.0
Hybrid ACR 7125	38,315	0	0	11.1	22.9	40.3	25.7	0
Sweet Slice	38,254	0	0	6.4	42.0	33.2	14.6	3.8
RWT 8207	37,740	0	0	7.8	22.5	38.3	31.4	0
Super Seedless 9601	34,984	0	0	10.8	24.1	23.1	32.1	9.9
RWT 8173	32,026	0	0	26.5	32.7	9.4	11.4	20.0
Sugar Heart	31,250	0	0	3.1	22.6	53.7	15.0	5.6
LSD (0.05)	**18,293**	**7.3**	**12.5**	**15.2**	**25.1**	**26.6**	**21.7**	**13.4**

* Total yield calculations are based on each variety planted in the entire field. Some yields were estimated in selected plots (or rep) due to theft of melons.

Snap Bean Variety On-Farm Yield Performance

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Final Report

Objective: To compare three snap bean varieties to the standard bean variety (BBL 156) for yield and quality performance when grown under grower conditions on the Texas High Plains.

Materials & Methods: The trial was conducted in a commercial grower's field in Farwell, TX during the 2007 growing season. The bean varieties were planted in strips within the field during mid-July and harvested on September 18. All varieties were managed for pests, fertilized and irrigated by the grower according to processor specifications. At harvest, all bean pods were removed by hand from three 3-foot sub-samples taken randomly within each variety. All bean pods were weighed and categorized by sieve size into classes 1 – 3, 4 and 5. All data was subjected to analysis of variance and means separated using the Least Significant Difference at the 5% level.

Results and Discussion: The number of bean plants per 3-foot of row was similar for BBL 156, KSI 196 and Hayden when evaluated at harvest (see Table 1). HS 418 had 18% lower plant numbers when compared to the average of all three other varieties. Sieve size weight percentage of the total yield was significantly higher (67.7%) in #5 sieve category for Hayden when compared to the other three varieties. This was likely due to Hayden maturing several days earlier than all other varieties. Similarly, BBL 156 had significantly higher #5 sieve beans when compared to both KSI 196 and HS 418. Weights in sieve #4 beans were all significantly different from each other, with the lowest percentage found in Hayden followed by BBL 156, HS 418 and KSI 196. When added together (sieve #4 + sieve#5), the variety with the highest percentage was Hayden followed by BBL 156, KSI 196 and HS 418. Total bean yields were highest with BBL 156 at 13.9 tons/A, followed by Hayden, KSI 196 and HS 418.

Results of this trial indicate that BBL 156 continues to be an excellent variety choice in terms of high yields and size distribution, especially if looking for an even distribution of sieve categories #4 and #5. Hayden is a high yielding variety, but sieve size distribution would likely have been similar to BBL 156 if the beans had been harvested several days earlier. KSI 196 and HS 418 had yields that were 35 – 40% less than BBL 156, and had higher percentages of sieve 4 size beans compared to sieve #5.

Table 1. Snap bean sieve size weight percentages and total yield.

Variety	**No. of plants**	**Sieve size category (% of total weight)**			**Total Yield**
	3' of row	**#1 – #3**	**#4**	**#5**	**Tons/A**
BBL 156 **	16.3	18.4	41.7	39.9	13.9
KSI 196	17.3	22.6	64.6	12.8	9.1
HS 418	13.6	26.5	52.8	20.7	8.4
Hayden	16.3	10.3	22.0	67.7	12.4
LSD (0.05)	**-----**	**8.9**	**10.3**	**16.0**	**2.4**

** Grower standard

Evaluation of Processing Snap Bean Varieties for Heat Tolerance

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Texas Cooperative Extension & Texas Agricultural Experiment Station - Lubbock

Final Report

Objective: To evaluate and compare selected snap bean (*Phaseolus vulgaris*) varieties for heat tolerance, lodging, quality and yield performance when grown on the Texas High Plains.

Materials & Methods: The trial was conducted at the Lubbock City Farm located in East Lubbock, Texas on a sandy loam soil with a pH of 8.1 and 1.1% organic matter. The trial site was disked prior to planting and fertilized using irrigation water that contained 17 ppm nitrates (approximately 3.5 lbs N per inch of water). Sixteen snap bean varieties were planted at three timings: early-, mid-, and late-season on May 23, June 20, and July 23, respectively, into plots containing two rows 40" apart and 50' long. Immediately following planting, Dual Magnum 7.62E was applied preemergence over the entire test, and each test was cultivated once. The entire test site was irrigated as needed with an overhead center pivot sprinkler system, and all insect and disease pests controlled as needed. At harvest, whole plants were removed by hand from randomly-selected 3' sections. The entire plants were weighed after which all pods were removed, separated by sieve size and weighed again. The trial was a RCBD with 4 replications and all data were subjected to analysis of variance and means separated using Student-Newman-Keuls at the 0.05 level.

Results and Discussion: Average air temperatures were not as high in 2007 compared to those recorded in 2006 (see Figure 1). Only one day during the season reached 99^{o} F, and that was in mid-June. Throughout the remainder of the season high temperatures fluctuated between 82^{o} – 94^{o} F, and this likely influenced yields and bean podset. Bean yield averaged across all varieties was lowest when planted early (May 22), and was likely a result of early-season cool temperatures (Table 1). When analyzed within the May 22 planting date, yields were highest with SB4355 followed by BBL 156 (grower standard), Nash and KSI 196. PLS 75 and Hayden had significantly lower yields compared to BBL 156. When planted on June 20, yields were highest with HS 418G followed by BBL 156, Heat Resistant Nelson, Huntington, and SB4355. Only PLS 75 had yields significantly lower than BBL 156. Planting varieties during late July showed that BBL 156 had the highest yield, and this was significantly higher than yields from KSI 196, HS 418G, Hayden, Nash, Huntington, Rockport, Tapia, Roma II and Herrera.

Bean emergence by variety was not significantly different from BBL 156 except for HS 418G (Table 2). The average days to maturity (harvest) was almost 4 days later than BBL 156 for Titan, while Tapia was almost 4 days earlier. Percent bean pod weight (% of total plant biomass) was highest with BBL 156 (56.3%) indicating that this variety had the highest bean pod/total plant weight ratio. KSI 196 and HS 418G (round types), PLS 75 (small sieve type), and Tapia, Roma II and Herrera (flat types) all had percent bean pod weights significantly lower than BBL 156. Average plant lodging was only observed with varieties planted July 23, and was greatest (60 – 70%) in varieties BBL 156, HS 418G, PLS 84, Hayden, Rockport, Titan and Roma II. The least amount of lodging (0%) occurred with PLS 75 (small sieve type), Huntington (round type), and Tapia or Herrera (flat types). Greater lodging was associated with varieties that had higher percent bean pod biomasses with the exception of Huntington. This result indicates that Huntington was able to support higher yields without significant lodging, critical for harvesting and pod health. Bean variety influenced average pod sieve size (Table 2). The highest percent total of sieve size 4 + 5's was found with Hayden (69.4%) followed by BBL 156 (60.9%), HS 418G (60.6%) and PLS 84 (60.3%).

The results of this study indicate that BBL 156 continues to be an excellent choice when planted at any time during the growing season. However, due to its high lodging potential, other varieties may be more suitable and further investigations are needed. Although yields were 15% lower than BBL 156, Huntington is an excellent candidate due to the low lodging potential observed in this trial.

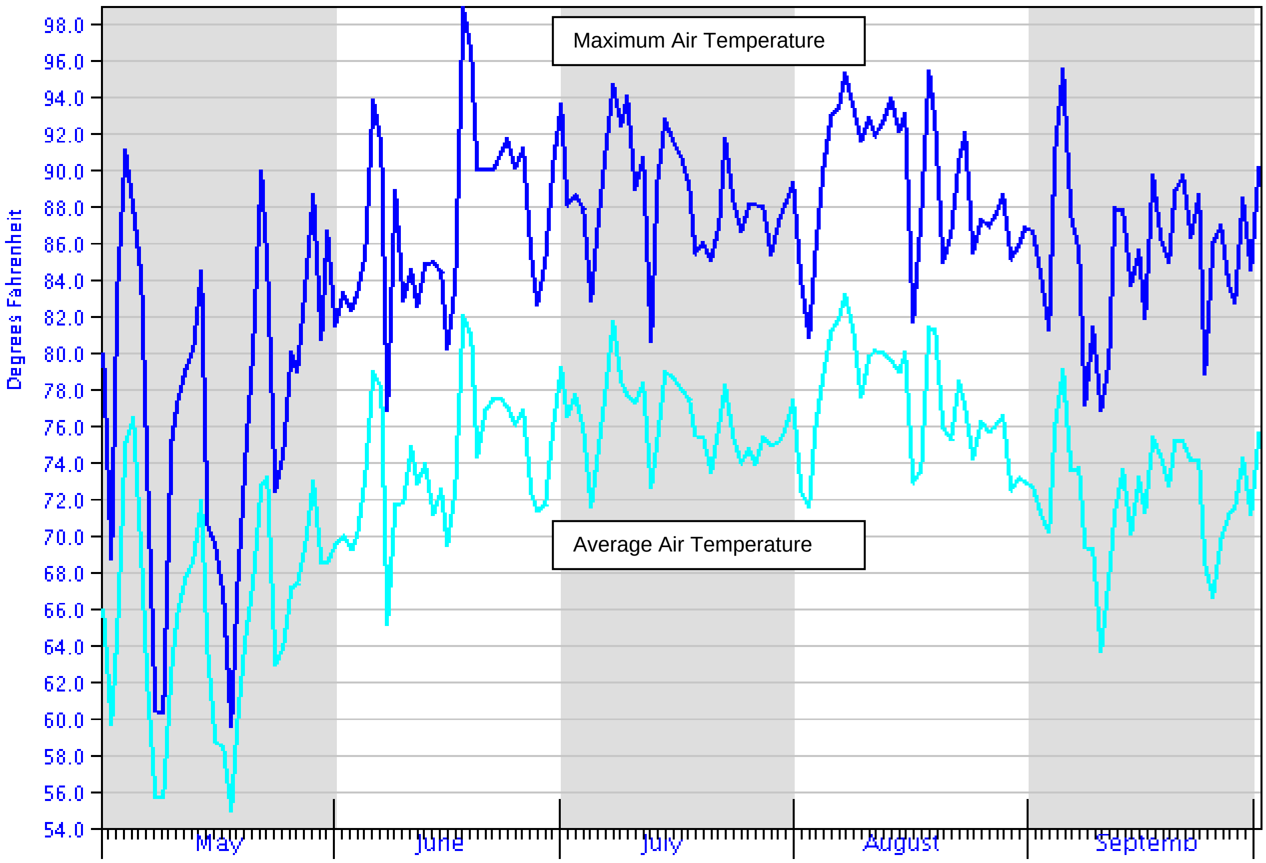

Figure 1. The daily maximum high and average air temperatures for the Lubbock area during the 2007 growing season.

Table 1. The effect of variety on snap bean yield performance when planted early-, mid- and late-season on the Texas High Plains.

Variety	Source	Type	Planting Date			
			5/22	6/20	7/23	Average
			---------------- Yield (tons/A) ----------------			
BBL 156	Syngenta/Rogers	Round	3.8	5.6	6.3	5.2
KSI 196	Kimberly Seeds	Round	3.7	3.2	4.6*	3.9
Heat Resistant Nelson	Kimberly Seeds	Round	1.9**	5.1	5.0	4.0
HS 418G	Kimberly Seeds	Round	2.4	10.2**	4.2**	5.6
PLS 75	Pure Line Seeds	Round	1.0**	1.6**	3.2**	1.9**
PLS 84	Pure Line Seeds	Round	2.9	3.9	5.0	3.9
Hayden	Syngenta/Rogers	Round	1.9**	3.4	4.0**	3.1
Nash	Syngenta/Rogers	Round	3.8	3.0	3.6**	3.5
Huntington (SB4285)	Syngenta/Rogers	Round	3.5	4.9	4.7**	4.4
SB4355	Syngenta/Rogers	Round	3.9	4.8	5.4	4.7
Rockport (SB 4327)	Syngenta/Rogers	Round	2.9	3.5	4.4**	3.6
Titan	Asgrow/Seminis	Round	3.0	4.4	5.4	4.3
Ulysses	Asgrow/Seminis	Round	2.9	4.6	5.0	4.2
Tapia	Asgrow/Seminis	Flat	3.3	3.2	4.4**	3.6
Roma II	Syngenta/Rogers	Flat	3.1	3.6	3.3**	3.4
Herrera	Syngenta/Rogers	Flat	2.6	3.1	3.7**	3.0
		Average	**2.9**	**4.2**	**4.5**	**3.9**

** Indicates that varieties within columns are significantly different from the grower standard (BBL 156) at the 5% level according to Student-Newman-Keuls Test.

Table 2. Influence of variety when averaged over three planting dates on snap bean emergence, days to maturity, % bean pod weight, lodging, and % sieve sizes when grown on the Texas High Plains.

Variety	Emergence	Maturity	Pod weight	Lodging	Average bean pod sieve size		
	No. of plants/3' of row	# Days to harvest	% of total plant weight	Rank[1]	1 – 3	4	5
					----- % of total by weight -----		
BBL 156	16.9	62.7	56.3	3.5	39.1	27.1	33.8
KSI 196	18.9	62.7	46.0**	2.5	50.8	23.7	25.5
Heat Resistant Nelson	18.4	65.0	49.2	2.0	69.3**	24.5	6.2**
HS 418G	11.8**	64.7	46.6**	3.5	39.4	32.8	27.8
PLS 75	14.9	64.3	35.0**	1.0	100.0**	0**	0**
PLS 84	12.8	64.3	41.5**	3.5	39.8	25.2	35.1
Hayden	18.0	63.7	49.4	3.5	30.1	22.7	47.1
Nash	19.1	64.0	54.3	2.5	74.6**	21.5	3.9**
Huntington (SB4285)	18.8	63.0	54.1	1.0	41.2	27.7	31.1
SB4355	16.4	63.3	48.5	2.5	40.8	23.7	35.5
Rockport (SB 4327)	18.1	65.0	49.7	3.5	93.3**	5.5**	1.3**
Titan	15.3	66.0**	51.5	3.0	42.4	27.8	29.7
Ulysses	18.9	61.3	52.3	2.0	54.1	26.5	19.4
Tapia	15.9	58.7**	44.8**	1.0	46.9	26.6	26.5
Roma II	17.2	62.3	43.5**	3.0	53.9	28.2	17.9
Herrera	16.6	64.3	39.7**	1.0	61.1**	22.1	16.8

[1]Lodging only occurred with beans planted late-season on July 23. Lodging rankings were recorded as follows: 1 = 0% (no lodging observed); 2 = 25%; 3 = 50%; 4 = 75%; and 5 = 100%.

** Indicates that varieties within columns are significantly different from the grower standard (BBL 156) at the 5% level according to Student-Newman-Keuls Test.

Effects of Revus 2.09SC Combinations for Control of *Phytophthora* in Chile Peppers

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Texas Cooperative Extension & Texas Agricultural Experiment Station - Lubbock

Final Report

Objective: To evaluate the efficacy of Revus 2.09SC combinations and application timings for control of *Phytophthora* root and fruit rot in transplanted chile peppers.

Materials & Methods: The trial was conducted at Texas A & M University Research & Extension Center located in Lubbock, Texas. The farm is located on an Acuff clay loam soil with a pH of 7.2 and 1.0% organic matter. The trial site was disked prior to initiation of the test and fertilized with 100 lbs N/A, and preemergence herbicide applied. Peppers (var. "Numex Joe E. Parker") were seeded in the greenhouse into 72-celled trays filled with a soil-less media, and then transplanted in the field on June 8 using a single-row cup transplanter. Each plot contained 2 rows (40" apart) of peppers with 20 plants per row (15" spacing) for a total of 40 plants/plot and each plot measured 6.7' x 25'. Peppers were allowed to grow for approximately 3 weeks at which point (on June 29) the first preventative fungicide treatments were sprayed. On July 5 each plot was inoculated by hand with *Phytophthora capscici* grown on autoclaved wheat seed. Approximately 1.0 ounce of inoculated seed was spread and incorporated at the base of the first plant in each row for all plots (a total of 2 plants/plot). The entire test site was irrigated to keep soil as moist as possible in order to encourage disease symptoms, and all other pests controlled using standard grower practices. Yield and other data were collected on September 19 by cutting the 5 plants closest to the inoculated plant and counting diseased plants, and recording total plant weight, total fruit weight, and the number of diseased fruit. In addition, crop vigor and the total number of diseased plants/plot were recorded. All data was subjected to analysis of variance and means separated using the Least Significant Difference at the 0.05 level.

Results and Discussion: Although the soil within the test site was kept as moist as possible, infection by *Phytophthora* to nearby pepper plants was low and spread no further than 1 - 3 plants from the point of inoculation. Percent diseased plants/plot was highest with Treatment 3, where a low rate of Kocide was applied (Table 1). It is not clear why the low rate of Kocide 3000 would result in higher percentage of diseased plants as Treatment 5 had no Kocide, and that number was 50% less. It is likely that the high number of diseased plants in Treatment 3 is an anomaly. In general, overall crop vigor was good to excellent in all plots, regardless of spray treatments.

Pepper yield was found to be greatest in Treatment 2 (Table 2), but this yield was not significantly greater than any other treatment in this test. Similarly, percent fruit weight per plant was greatest in Treatment 2, but was not different when compared to any other treatment, including the untreated control. As a result of the yield and percent fruit weight per plant data, no determination of the effects of individual treatments can be made for this test. However, the data in Table 2 also show that Treatment 2 had less (though not significantly) diseased fruit per plot (from the harvested 5 plants) compared to all other treatments.

In general, no specific treatment performed better when statistically compared to any other treatment in this trial. These results are likely due to the low infection rate and spread of the inoculated source of *Phytophthora capscici*. Treatment 2 was somewhat more effective in controlling or reducing pepper fruit rot in this test, though more research data is needed.

Table 1. Effects of Foliar Revus 2.09SC Combinations and Application Timings on Plant Infection and Growth in Inoculated Peppers

No.	Treatment[1]	Product Rate / A	Weekly Timing	% Infected Plants Per Plot	Crop Vigor Per Plot[2]
1	*Untreated*			5.6	3.9
2	*Revus +*	8.0 oz	1 2 4 5		
	Activator 90 +	0.125% v/v	1 2 4 5		
	Kocide 3000 +	1.5 lb	1 2 4 5		
	Ridomil Gold Copper	2.0 lb	3 6	5.6	3.8
3	*Revus +*	8.0 oz	1 2 4 5		
	Activator 90 +	0.125% v/v	1 2 4 5		
	Kocide 3000 +	0.75 lb	1 2 4 5		
	Ridomil Gold Copper	2.0 lb	3 6	11.3	3.5
4	*Revus +*	8.0 oz	1 3 5		
	Activator 90 +	0.125% v/v	1 3 5		
	Kocide 3000 +	1.5 lb	1 3 5		
	Ridomil Gold Copper	2.0 lb	2 4 6	4.4	3.8
5	*Revus +*	8.0 oz	1 3 5		
	Activator 90 +	0.125% v/v	1 3 5		
	Ridomil Gold Copper	2.0 lb	2 4 6	5.0	3.8
6	*Ridomil Gold Copper*	2.0 lb	1 2 3 4 5 6	6.9	3.6
	LSD (0.05)			**5.5**	**0.5**

[1] Product formulations: Revus 2.09SC; Kocide 3000 46.1 DF; Ridomil Gold Copper 65WP.

[2] Crop vigor was determined by ranking plant growth accordingly: 1 = poor; 2 = fair; 3 = good; 4 = excellent.

Table 2. Effects of Foliar Revus 2.09SC Combinations and Application Timings on the Yield Characteristics of Inoculated Peppers

No.	Treatment[1]	Product Rate / A	Weekly Timing	Yield (lbs) Per 5 Harvested Plants	Percent Fruit Weight/Plant	Percent Diseased Fruit Per Plot
1	*Untreated*			4.7	65.2	8.8
2	*Revus +*	8.0 oz	1 2 4 5			
	Activator 90 +	0.125% v/v	1 2 4 5			
	Kocide 3000 +	1.5 lb	1 2 4 5			
	Ridomil Gold Copper	2.0 lb	3 6	6.1	67.8	5.3
3	*Revus +*	8.0 oz	1 2 4 5			
	Activator 90 +	0.125% v/v	1 2 4 5			
	Kocide 3000 +	0.75 lb	1 2 4 5			
	Ridomil Gold Copper	2.0 lb	3 6	3.4	63.1	11.3
4	*Revus +*	8.0 oz	1 3 5			
	Activator 90 +	0.125% v/v	1 3 5			
	Kocide 3000 +	1.5 lb	1 3 5			
	Ridomil Gold Copper	2.0 lb	2 4 6	5.2	65.9	7.0
5	*Revus +*	8.0 oz	1 3 5			
	Activator 90 +	0.125% v/v	1 3 5			
	Ridomil Gold Copper	2.0 lb	2 4 6	5.1	67.1	11.5
6	*Ridomil Gold Copper*	2.0 lb	1 2 3 4 5 6	3.8	56.8	10.6
	LSD (0.05)			**3.3**	**12.6**	**13.2**

[1] Product formulations: Revus 2.09SC; Kocide 3000 46.1 DF; Ridomil Gold Copper 65WP.

Texas High Plains Fresh Market Tomato Variety Trial: 2007

Variety	Source	Descriptions (tolerance and resistance)	Crop Vigor[3]	Total Yield	Marketable Yield[4]	Radial Fruit Cracking	Average Fruit Wt.
			August 1	cwt/A	cwt/A	%	oz
Tormenta[1]	Bejo Seeds	73 days, Fusarium, Verticillium, Tobacco Mosaic Virus (TMV)	2.5	230.1	230.1	0	2.5
Polbig	Bejo Seeds	Early set (57–60 days), Verticillium, Fusarium	2.5	224.7	209.0	7.2	4.7
Sun King	Tomato Growers	Heat/fruit crack tolerances, 75 days, Tomato Yellow Leaf Curl Virus (TYLCV), Verticillium, Fusarium, Alternaria, TMV	2.6	207.2	187.5	10.9	6.3
Camel	Harris Moran[2]	Medium maturity, Fusarium, Gray leaf spot, TSWV, Verticillium, Root knot nematodes	2.4	188.4	155.0	19.9	6.1
Bella Rosa	Sakata[2]	Heat tolerance, mid-early harvest, TSWV, Alternaria, Fusarium, Gray leaf spot	2.4	184.3	165.4	10.7	5.8
Solar Fire	Harris Moran[2]	Heat and fruit crack tolerances, 72 days, Fusarium, Verticillium, Gray leaf spot	1.9	164.2	157.3	4.5	5.1
Phoenix	Seminis	Heat tolerance, fruit crack tolerance, Fusarium, Alternaria, Verticillium, Gray leaf spot	2.6	147.1	138.3	5.8	6.1
Classy Lady	Nunhems[2]	80 days, medium determinate, Alternaria, Fusarium, Verticillium, Root knot nematodes, Gray leaf spot	1.9	142.6	77.4	44.5	5.9
Sun Master	Tomato Growers	Heat tolerance, 72 days, Verticillium, Fusarium, Alternaria, TMV	2.8	139.2	118.7	12.9	5.2
Crista	Harris Moran[2]	Medium maturity, Verticillium, Fusarium, TSWV, Root knot nematodes	2.0	124.8	96.8	23.1	6.2
Amelia	Harris Moran[2]	Crack tolerance, medium maturity, Verticillium, Fusarium, Gray leaf spot, TSWV, Root knot nematodes	2.3	123.1	81.9	34.4	6.3
Shady Lady	Tomato Growers	Excellent foliage for preventing sunburn, 75 days, Verticillium, Fusarium, Alternaria, TMV	2.6	104.5	78.5	23.7	5.5
Escudero	Harris Moran[2]	Medium maturity, Fusarium, Verticillium	2.1	103.9	99.3	4.6	5.3
BHN 444	Tomato Growers	A “Texas SuperStar” variety, 75 days, Tomato Spotted Wilt Virus (TSWV), Verticillium, Fusarium	2.3	94.8	79.6	16.1	5.1
		LSD (0.05)	**0.8**	**69.3**	**69.5**	**9.3**	**0.9**

[1] Tormenta is a Roma type tomato; all others are round, red determinate varieties. [2] Seed provided by Champion Seed Company.
[3] Crop vigor: 1 = poor; 2 = fair; 3 = good; 4 = excellent. [4] State of Texas average yield for 2002 – 2006 was 132 cwt/A (marketable).

Photos of Tomato Varieties: 2007

Amelia

Bella Rosa

BHN 444

Camel

Classy Lady

Escudero

Phoenix

Polbig

Shady Lady

Solar Fire

Sun King

Sun Master

Scurry County Home Gardener Tomato Variety Test Results

Greg Gruben, Russell W. Wallace & Alisa K. Petty

Scurry County Extension, Snyder, TX and Texas Cooperative Extension & Texas Agricultural Experiment Station - Lubbock

Final Report

Objective: To evaluate the effect of seven tomato varieties for yield and heat tolerance when grown under home garden conditions in Scurry County, Texas.

Materials & Methods: The trial was conducted by Mr. Eddie Williams, a home gardener located in Scurry County. Four plants of each variety were transplanted on June 20 into a clay loam soil with a pH of 7.8 and organic matter 1.5%. Each plant was caged and allowed to grow under typical practices associated with home gardeners. Plants were not pruned and there was no special fertilizer applied. Plants were watered as-needed with a soaker hose. Each variety was harvested separately every four to six days, and all fruit was weighed.

Results and Discussion: All varieties planted were medium to large, round red determinate types, with the exception of Tormenta, which was a Roma type. Results of the trial indicate that Tormenta had the highest total yields, followed by Escudero, Amelia and Camel. Lowest yields were found with the variety Bella Rosa (Table 1). Average yields per plant followed a similar pattern as total yields. Tormenta had yields that averaged 17% more than Escudero (the leading round, determinate type). Bella Rosa had the lowest yields and was 52% and 42% less than Tormenta and Escudero, respectively. Tormenta and Amelia were first harvested on July 23, at least 4 days prior to any other variety. Bella Rosa, Solar Fire and Escudero had extended peak harvests (high weight harvests) compared to the other varieties, while Camel and Amelia peaked twice during the season. Tormenta, while having the highest yields, peaked in mid- to late June. The results of this study suggest that Tormenta is an excellent Roma type tomato for growing in Scurry County, and that Escudero and Amelia are also good candidates.

Scurry County Fresh Market Tomato Variety Trial: 2007

Variety	Source	Total Yield	Average Yield	Harvest	Peak Times of Harvest
		lbs	lbs/plant	Date	Dates
Tormenta[1]	Bejo Seeds	33.3	8.3	7/23	8/13 – 8/28
Camel	Harris Moran[2]	21.5	5.4	7/31	8/28, 9/23
Bella Rosa	Sakata[2]	16.0	4.0	7/31	7/31 – 8/28
Solar Fire	Harris Moran[2]	20.9	5.2	7/31	7/31 – 9/06
Crista	Harris Moran[2]	20.0	5.0	7/31	8/22 – 8/28
Amelia	Harris Moran[2]	25.7	6.4	7/23	7/31 -9/01, 9/16
Escudero	Harris Moran[2]	27.7	6.9	7/27	7/31 – 9/08
	Average	**23.6**	**5.9**	**---**	**---**

[1] Tormenta is a Roma type tomato; all others are round, red determinate varieties.
[2] Seed provided by Champion Seed Company.

Soil Compaction and Mulch Effects on Vegetable Crops

Project Funded by the Southern Region – SARE (Sustainable Agriculture Research & Education)

Written by Roy Riddle with Debbie Cline, Jenifer Smith (South Plains Food Bank) and Russ Wallace

2007 REPORT

Introduction: The South Plains Food Bank Youth Farm (Lubbock, TX) has been using a woven plastic as mulch for the past four years. An examination of plants at the end of the 2006 growing season showed signs of insufficient root development. It was suspected that there was a problem with soil compaction. A proposal was submitted to the SR-SARE for a Producer Grant to study soil compaction on three plots (treatments) at the farm. The treatments would include a "South Plot: that would remain as is with woven plastic mulch covering, the "Central Plot" would have the woven plastic removed, the soil chiseled, covered with the equivalent of six tons per acre compost, rotary tilled and then recovered with the woven plastic mulch. The "North Plot" would be chiseled, covered with the equivalent of six tons per acre compost, rotary tilled and remain uncovered (no woven plastic mulch) during the growing season.

Implementation:

1. During the winter of 2006-2007 the composting, chiseling and tilling was accomplished. Surface drip lines with one foot spacing of emitters and a .257 GPH capacity was installed on all plots with the same control valves to insure an equal amount of water and nutrients.

2. March 10, 2007 two hundred gallons of humic acid was applied to the plots through the drip system along with two gallons of fish emulsion and one gallon of sea weed.

3. March 12 & 13 half of each plot was planted with onion plants. These were new plants harvested the previous week.

4. March 17 the farm was flooded. Four and one half inches of rain fell within a few hours flooding the Central and North Plots. At this time I considered the possibility of not completing the research, however after consultation with other growers and specialists decided that there was no better way to measure compaction than in extreme weather conditions. This year the conditions have been extreme. The normal annual rainfall for the farm is eighteen inches. By the end of August we have received more than twenty one inches of rain with most of it falling March thru July.

5. After the flood each plot had a hard pan averaging seven inches below the surface with occasional spots five inches below the surface. An additional two hundred gallons of humic acid was applied to the plots through the drip system.

6. Every ten days an additional gallon of fish emulsion and one quart of sea weed was applied through the drip system through out the growing season.

7. April 14 twenty five Celebrity tomato plants were planted in each plot for a total of seventy five plants. Fifty California Wonder bell pepper plants were planted on the same day.

8. A compaction test was made on April 14 with the hard pan averaging ten inches below the surface. The hard pan was shallow and was only approximately one inch thick.

9. Three adjoining plots on the east side of the three chosen plots had a hard pan remaining at the five to seven inch level and the thickness was more than three inches. Only fifty gallons of humic acid had been applied to these plots before and after the flood.

10. May 12 fifty additional Celebrity tomato plants were planted in each plot. In addition seventy five Better Bell plants were planted in each plot on that day. A special application of 250 gallons of fish and sea weed mix was applied after planting. The mix consisted of one gallon of fish emulsion and one quart of sea weed.

11. The onions were harvested June 21 and 22, however they could not be stored due to heavy moisture content. Each time the soil began to dry out it rained again. The harvest provided 450 pounds from the South Plot, 455 pounds from the Central Plot and 395 pounds from the North Plot. The largest onions were harvested from the South Plot where no tilling or composting had taken place. Second largest was the Central Plot where the mulch was removed and then replaced after chiseling and tilling. The onions grown on the Central Plot were of more uniform size than those grown on the other plots. The least productive area was the plot that remained without mulch. Since onions have a shallow root system there was very little noticeable difference in root development. Perhaps the standard development of roots could be attributed to the fact that all nutrients are released in a small area surrounding the drip line emitters?

12. During June a number of tomato plants begin to wilt from the bottom upward. Plants were pulled and roots examined. Root development was good and Early Blight was suspected to be the cause. Throughout June and July plants continued to wilt from the bottom upward. A solution of one table spoon of soda and one ounce of sea weed per gallon of water was applied weekly beginning in July. Some plants recovered, however many did not due delayed preventative measures, rainfall, and high humidity. Examination of root systems of dying plants continued. Root development was in a diameter of six to eight inches with shallow tap roots especially in the South Plot where no chiseling had taken place. The blight also affected the plots east of the three research plots.

13. Tomatoes and peppers were harvested during July, August and September. The harvested totals are:

Plot	Crop	Culls (#)	Marketable (#)	Total (#).	Weight (lbs)
South	Peppers	487	2173	2660	295
Central	Peppers	561	2386	2947	409
North	Peppers	517	2880	3397	458
South	Tomatoes	607	1564	2181	723
Central	Tomatoes	743	1573	2316	698
North	Tomatoes	672	1957	2629	728

Results and Discussion:

1. More tomatoes and peppers were produced on the plot that was not covered with plastic mulch (North Plot). The plants in general were healthier and produced more fruit. Fruit quality was fair to poor because of excessive moisture content.

2. The Central Plot (woven plastic put back on) was also a good producer; however it contained twenty five fewer plants because of losses to blight.

3. The higher than normal rainfall and the high humidity resulted in a higher population of worms, viruses, and moisture content in the fruit. The humidity averaged greater than 50% when it is normally less than 30% in this area of Texas.

4. Root development was best in the North Plot (no woven plastic mulch) where the soil had been cultivated, followed by the Central Plot that had been cultivated and recovered with plastic mulch. The root development in the South Plot was shallow and very limited. This plot had not been cultivated in four years.

Root and plant development assessment: Root development in the South Plot was shallow and did not spread outward from the holes cut in the plastic mulch. Whether this was due to using drip irrigation and all nutrients delivered near the plant or other factors has not been determined at this time. The stalk was smaller than plants grown in the other two plots. Scaffolding was smaller and the plants were a good foot shorter than those grown in the North Plot and six to eight inches shorter than those grown in the Central Plot. This presents a good indication that soil compaction is limiting root and plant growth. Fruit size was smaller and more sun burn was prevalent on fruit grown on this plot.

The root and plant development in the Central Plot that had been cultivated with the plastic mulch returned to it were more dynamic than those in the South Plot. A deeper thicker root system developed. The roots spread two or three inches beyond the holes cut in the plastic mulch. However the plants were six to eight inches shorter than those grown in the North Plot and the foliage was not as dense. The stalks showed strong thick growth of three quarters to one inch in diameter. There was less sun burn than found on the South Plot and the fruit size was larger.

The roots and plant development were best on vegetables grown in the North Plot that had been cultivated and was grown without mulch. The root systems were thicker, more dense and spread three to four inches further from the stalk. Stalks were strong measuring one to one and a half inches in diameter. Fruit quality was larger with less sun burn. The scaffolding was thicker and stronger than those on the other two plots.

First impressions on effects of treatments are:

1. Cultivation is necessary. Whether we can go two or more years will be determined as the test continues.

2. The plastic mulch helped to hold down weed pressure, however there was better plant and root development with better fruit quality where there was no mulch.

3. More than normal rainfall had some effect on growth and quality of the fruit and will be compared with the 2008 production.

4. Plants were all healthy when transplanted and were growing well until the blight struck.

5. Even with limited root development the onions grown on the South Plot were as large as those on other plots. However the most uniform production was on the Central Plot that was covered with Plastic Mulch. The onions fared better when planted on the plastic mulch.

6. Both the peppers and onion plants were larger on the North Plot, six to eight inches smaller on the Central Plot and another six to eight inches smaller on the South Plot. This again shows me that cultivation is necessary when using plastic mulch in our soils.

7. The use of humic acid seemed to have helped in reducing soil compaction at the eight inch level however; I could not see that much affect to the root systems. This study will continue.

RESULTS OF SOIL COMPACTION TESTS

A Dickey-John Soil Compaction Tester was used to conduct all compaction tests. The Producer conducted the tests. Depth is in inches.

MONTH	PLOT	0 – 200 PSI	200 – 300 PSI	Over 300 PSI	0 – 200 PSI
April	South	5	7	8	10
	Central	8	--	9	10
	North	7	8	10	11
	Adjoining	5	6	7	--
May	South	6	7	8	10
	Central	8	9	--	10
	North	8	9	--	11
	Adjoining	5	6	7	--
June	South	8	9	10	12
	Central	8		9	10
	North	8	9	--	11
	Adjoining	5	--	6	--
July	South	7	8	10	12
	Central	8	9	--	10
	North	8	9	--	11
	Adjoining	4	--	5	--
August	South	6	8	10	11
	Central	7	8	9	11
	North	8	9	10	12
	Adjoining	4	--	5	--
September	South	7	8	9	10
	Central	7	8	--	10
	North	8	10	--	11
	Adjoining	5	--	6	--
Before Humic Acid Application					
	South	5	7	8	12
	Central	5	8	10	11
	North	6	7	8	10
	Adjoining	5	--	6	--

Humic acid appeared to have an effect in relieving soil compaction pressure when I compare the adjoining plot with the three SARE plantings. However, the more than normal rain fall and higher humidity than we normally seen in West Texas may have also affected the test.

One half of each plot was planted in onions, one fourth in tomatoes and one fourth in peppers. Compaction was tested at six random locations in each plot and each planting.

Trial Results for the Texas Wintergarden

Preemergence Herbicide Screen for Crop Injury and Yield in Cilantro

Russell W. Wallace & Alisa K. Petty

Texas Cooperative Extension & Texas Agricultural Experiment Station - Lubbock

Final Report

Objective: To evaluate the efficacy and phytotoxicity of preemergence (PPI, PRE) applications of selected herbicides for control for crop injury and yield in fresh cut cilantro (*Coriandrum sativum* cv. "Leisure").

Materials & Methods: The trial was conducted at the Del Monte Research Farm, located in Crystal City, Zavala County, Texas. The farm is located on a Bookout clay loam soil with a pH of 7.7 and 1.0% organic matter. The trial site was disked prior to initiation of the test listed into 40" beds. Cilantro seed (provided by Dr. Carlos Lazcano, J & D Produce) was planted by hand using a single-row Earthway seeder on December 15, 2006 into plots measuring 6.67' x 20'. Herbicide treatments were applied using a CO_2-pressurized backpack sprayer equipped with four flat fan nozzles that delivered 20 GPA at 35 PSI (Table 1). PPI treatments were incorporated immediately, and PRE herbicides were applied following planting. The entire test site was fertilized, irrigated, and all pests controlled using standard grower practices for the farm. Yields were obtained by hand-cutting the cilantro at a 1.0" height in a 5' randomly-selected section on March 21, 2007. The trial was conducted as an RCBD with 4 replications and all data were subjected to analysis of variance and means separated using the Least Significant Difference at the 0.05 level.

Results and Discussion: Weed pressure in this study was very low; therefore no weed control ratings were recorded. Significant cilantro injury was observed on January 9, 2007 (4 weeks after treatment) in plots treated with Spartan 75WDG (sulfentrazone) and Outlook 6E (dimethenamid-p) (see Table 2). This injury was observed as stunting only, and no leaf necrosis/chlorosis or reduction in emergence was noted. Slight injury (10% or less) was observed in plots treated with Prowl H_2O 3.8AS, Dacthal 6L (DCPA), Define 4SC (flufenacet) and Dual Magnum 7.62E (s-metolachlor). By February 3, injury with Spartan, Caparol 4E (prometryn), and Dacthal had increased slightly while all other treatments remained the same. When compared to Trifluralin 4HF (trifluralin), yields in plots treated with Define, Outlook and Spartan were significantly lower (average 45%). All other treatments including Caparol and Linex 50DF (linuron) had yields statistically equivalent to Trifluralin and the untreated control.

Results of this trial indicate that pre-applied treatments of Trifluralin, Dacthal, Dual Magnum, Prowl H_2O, Caparol and Linex at the rates evaluated are safe for use in Texas-grown cilantro. While weed control data was not available, crop injury ratings suggest that the previously mentioned herbicides may have potential for future registration. Further investigations are needed to verify this data especially in different locations and on other soil types.

Table1. Application and Environmental Data for Herbicide Treatments in Cilantro

Location	Crystal City, TX	Wind speed / direction	None
Date	December 15, 2006	Crop	Cilantro
Time of day	9:00 a.m.	Variety	Leisure
Type of application	Broadcast	Crop stage	Seed
Carrier	H_2O	Air temp. (^oF)	63
Gas (if not CO_2)	CO_2	Soil temp. (^oF)	59
GPA	20	Soil beneath	Moist
PSI	35	Soil surface	Semi-moist
Nozzle tips	8002	% Relative humidity	High
Nozzle spacing	18"	Sky conditions	Overcast / Foggy
Boom width (")	6.7'	# Replications	4
Boom height (")	18"	Sprayed by	RWW

Weeds present: None

Table 2. Effects of Herbicide Treatments on Crop Injury and Yield in Cilantro

Treatment	Rate (lbs ai/A)	Timing	% Injury	% Injury	Yield (lbs/A)
			Jan. 9	**Feb. 3**	**Mar. 21**
Untreated		None	0	0	14,850
Trifluralin 4HF	0.75	PPI	0	3.8	15,510
Dacthal 6L	10.0	PRE	8.8	15.0	12,870
Dual Magnum 7.62E	0.65	PRE	6.3	10.0	12,210
Define 4SC	0.60	PRE	10.0	12.5	9,240
Outlook 6E	0.50	PRE	26.3	22.5	8,910
Prowl H_2O 3.8AS	1.00	PRE	10.0	12.5	12,870
Spartan 75WDG	0.1	PRE	41.3	56.3	7,590
Caparol 4E	1.6	PRE	2.5	16.3	12,540
Linex 50DF	0.5	PRE	2.5	6.3	10,560
LSD (0.05)			**11.4**	**16.2**	**6,189**

Stinger Rate and Poast Tank-Mix Comparison for Crop Injury and Yield in Swiss Chard

Russell W. Wallace & Alisa K. Petty

Texas Cooperative Extension & Texas Agricultural Experiment Station - Lubbock

Final Report

Objective: To evaluate the efficacy and phytotoxicity of postemergence (POST) applications of Stinger 3EC (clopyralid) alone and in combination with Poast 1.5EC (sethoxydim) for weed control, crop injury and yield in fresh cut Swiss chard (*Beta vulgaris* cv. "Fordhook Giant").

Materials & Methods: The trial was conducted at the Del Monte Research Farm, located in Crystal City, Zavala County, Texas. The farm is located on a Bookout clay loam soil with a pH of 7.7 and 1.0% organic matter. The trial site was disked prior to initiation of the test listed into 40" beds. Swiss chard seed was planted by hand using a single-row Earthway seeder on December 14, 2006 into plots measuring 3.3' x 20'. Herbicide treatments were applied using a CO_2-pressurized backpack hooded sprayer equipped with two flat fan nozzles that delivered 20 GPA at 35 PSI (Table 1). The entire test site was fertilized, irrigated, and all pests controlled using standard grower practices. Yields were measured by hand-cutting the Swiss chard at a 1.0" height in a 5' randomly-selected section on March 21, 2007. The trial was conducted as an RCBD with 4 replications and all data were subjected to analysis of variance and means separated using the Least Significant Difference at the 0.05 level.

Results and Discussion: Weed pressure in this study was very low; therefore no weed control ratings were recorded. All Stinger-treated plots had significantly higher injury compared with the untreated control, however, this injury was 13% or less when Stinger was applied alone (without COC [crop oil concentrate] or Poast). Increasing rates of Stinger did not result in higher crop injury. This injury was observed as minor stunting; and there was no leaf twisting or malformations observed in this trial. When tank-mixed with Poast, crop injury averaged 35% higher compared to treatments with Stinger alone (though still 20% or less). Regardless of this injury, Swiss chard yields were statistically equal with all Stinger and Stinger + Poast combinations. Higher crop injury did not result in lower yields, suggesting that Stinger is safe regardless of the rate used.

The results of this study indicate that Stinger is safe for postemergence use when applied to 4 – 5 leaf Swiss chard at 4.0 to 8.0 oz/A in Texas. In addition, combining Poast plus a COC (for grass control) with Stinger may potentially cause slightly higher crop injury, however, yields will likely not be affected.

Table1. Application and Environmental Data for Herbicide Treatments in Swiss Chard

Location	Crystal City, TX	Wind speed / direction	15 / N
Date	January 22, 2006	Crop	Swiss chard
Time of day	9:30 a.m.	Variety	Fordhook Giant
Type of application	Broadcast (hooded)	Crop stage	4 – 5 leaves
Carrier	H_2O	Air temp. (^oF)	49
Gas (if not CO_2)	CO_2	Soil temp. (^oF)	42
GPA	20	Soil beneath	Wet
PSI	35	Soil surface	Wet
Nozzle tips	8002	% Relative humidity	Moderate
Nozzle spacing	18"	Sky conditions	Overcast
Boom width (")	6.7'	# Replications	4
Boom height (")	18"	Sprayed by	AKP

Weeds present: None

Table 2. Effects of Herbicide Treatments on Crop Injury and Yield in Swiss Chard

Treatment	Rate of Product/A	Timing	% Injury	Yield
			Feb. 3	**March 21**
Untreated			0	22,770
Stinger 3EC	4.0 oz	EPOST 4 - 5 leaf	11.3	21,120
Stinger	6.0 oz	EPOST 4 - 5 leaf	12.5	24,420
Stinger	8.0 oz	EPOST 4 - 5 leaf	11.3	22,110
Stinger + COC	4.0 oz 1% v/v	EPOST 4 - 5 leaf	8.8	22,440
Stinger + COC	6.0 oz 1% v/v	EPOST 4 - 5 leaf	16.3	22,765
Stinger + COC	8.0 oz 1% v/v	EPOST 4 - 5 leaf	17.5	23,430
Stinger + Poast 1.5EC + COC	4.0 oz 1.5 pints 1% v/v	EPOST 4 - 5 leaf	17.5	21,450
Stinger + Poast + COC	6.0 oz 1.5 pints 1% v/v	EPOST 4 - 5 leaf	20.0	25,410
Stinger + Poast + COC	8.0 oz 1.5 pints 1% v/v	EPOST 4 - 5 leaf	16.3	26,070
		LSD (0.05)	**6.7**	**5,199**

Herbicide Screen for Mustard, Turnip, Kale and Collard Greens

Russell W. Wallace & Alisa K. Petty

Texas Cooperative Extension & Texas Agricultural Experiment Station - Lubbock

Final Report

Objective: To compare herbicides applied preplant (PPI), preemergence (PRE) and postemergence (POST) on leafy kale (*Brassica oleracea*), collard (*B. oleracea* var. *acephala*), mustard (*B. juncea*) and turnip (*B. rapa*) greens for crop injury, yield and control of fumitory (*Fumaria ofinicalis* L.) and London rocket (*Sisymbrium irio*).

Materials & Methods: The trial was conducted at the Del Monte Research Farm, located in Crystal City, Zavala County, Texas. The farm is located on a Bookout clay loam soil with a pH of 7.7 and 1.0% organic matter. The trial site was disked prior to initiation of the test and shaped into 40" beds. Far-Go 4EC (triallate) was applied PPI prior to planting (Table 1), while Dacthal 6L (DCPA), Prefar 4E (bensulide), Dual Magnum 7.62E (s-metolachlor), Outlook 6E (dimethenamid-p), Spartan 75WDG (sulfentrazone), Prowl H_2O 3.8AS (pendimethalin), Nortron 4SC (ethofumesate), Bolero 8EC (thiobencarb), KIH 485 85WDG, and Kerb 50W (pronamide) were applied PRE (Table 3), and Kerb, Everest 70WG (flucarbazone), Stinger 3EC (clopyralid) and Starane 1.5EC (fluroxypyr) were applied POST at the 4 – 5 leaf stage following emergence. All crops were seeded on December 14, 2006 using an Earthway hand-push single-row planter into one-row plots measuring 3.3' x 20'. Herbicides were applied using a CO_2-pressurized backpack hooded sprayer and hand-held boom equipped with two flat fan nozzles that delivered 20 GPA at 35 PSI (Tables 1 & 3). The entire test site was fertilized, irrigated, and all pests controlled using standard grower practices. Crop injury, weed populations and yield were recorded. The trial was conducted as an RCBD with 4 replications for each crop, and all data were subjected to analysis of variance with means separated using the Least Significant Difference at the 0.05 level.

Results and Discussion: Control of fumitory was 85% or higher with all PRE-applied herbicides except Dacthal, Far-Go, Spartan (low rate) and Bolero (Table 2). POST applications of Everest or Stinger did not improve fumitory control following PRE Dacthal applications. London rocket control was poor when Dacthal, Prefar, Far-Go, Spartan and Bolero were applied PRE. Stinger failed to control London rocket applied POST.

Dacthal and Prefar (grower standards) treatments caused 18% or less injury to all crops, with the highest injury found in kale plots. When averaging all herbicides within crops, injury was greatest in kale, followed by mustard, turnips and collard greens. The greatest herbicide injury when averaged across crops was observed with POST treatments of Starane (43%) and Everest (27%), as well as with PRE treatments of the high rates of Outlook (35%) and Spartan (37%), and the single rate of Nortron (22%). Spartan applied at 0.1 lb ai/A caused significant injury to kale and turnips, while only minor injury (5%) to mustard and collards. Dual Magnum applied at either rate caused 25% injury to kale when applied PRE, but only 14% or less when applied to mustard, turnips and collards. KIH 485 applications gave 9 – 21% injury across all crops. Prowl H_2O and Bolero consistently gave the least amount of injury of all PRE applied herbicides. When applied POST, Kerb injury was significantly reduced in kale, as well as in all three other crops, suggesting that POST use is safe in brassica crops. Similarly, Stinger gave little to no injury in all crops.

Yields of kale, mustard, turnip and collard greens were generally associated with crop injury ratings, in that higher injury resulted in lower yields (Table 4). Yields of kale and collard greens were significantly lower when compared to the untreated only when Everest was applied POST. In mustard, yields were significantly reduced when Outlook (high rate), Spartan (high rate) and Nortron were applied PRE, while both Everest and Starane reduced yields. Turnip yields decreased where Far-Go, Outlook and Spartan (high rates), Nortron, and Everest were applied. The results of this study suggest that Prowl H_2O, Dual Magnum and KIH 485 applied PRE, and Kerb applied POST may have good potential for use in all four leafy brassica crops. However, additional research is needed to improve application timings and rates if these herbicides are to have any potential for use in these leafy green crops.

Table1. Application and environmental data for PPI and PRE treatments in leafy brassicas

Location	Crystal City, TX	**Wind speed / direction**	None
Date	December 14, 2006	**Crop**	Leafy brassicas
Time of day	7:30 a.m.	**Variety**	See above
Type of application	Broadcast	**Crop stage**	Seed
Carrier	H_2O	**Air temp. (^oF)**	50
Gas (if not CO_2)	CO_2	**Soil temp. (^oF)**	52
GPA	20	**Soil beneath**	Semi-Moist
PSI	35	**Soil surface**	Moist
Nozzle tips	8002	**% Relative humidity**	High
Nozzle spacing	18”	**Sky conditions**	Overcast/Foggy
Boom width (“)	6.7’	**# Replications**	4
Boom height (“)	18”	**Sprayed by**	RWW

Weeds present: None

Table 2. Effect of herbicide treatments on weed control and leafy brassicas injury

No.	Treatment	Rate (lbs ai/A)	Timing	Fumitory	London Rocket	Kale	Mustard	Turnip	Collard
				------- % Control -------		------------ % Crop Injury on Feb. 2 ------------			
1	Untreated			0	0	0	0	0	0
2	Dacthal 6L	7.5	PRE	84	49	16	4	0	4
3	Prefar 4E	6.0	PRE	92	31	18	0	9	8
4	Far-Go 4EC	3.0	PPI	40	38	14	5	19	0
5	Dual Magnum 7.62E	0.65	PRE	97	93	25	14	5	5
6	Dual Magnum	0.325	PRE	96	85	23	6	6	4
7	Outlook 6E	0.5	PRE	99	87	29	49	39	21
8	Outlook	0.25	PRE	98	97	28	19	13	10
9	Spartan 75WDG	0.2	PRE	87	83	54	44	34	15
10	Spartan	0.1	PRE	99	75	40	28	4	4
11	Spartan	0.05	PRE	73	50	19	11	19	5
12	Prowl H_2O 3.8AS	0.5	PRE	87	84	14	6	1	0
13	Nortron 4SC	1.0	PRE	98	82	24	23	24	15
14	Bolero 8EC	1.0	PRE	81	68	14	0	3	0
15	KIH 485 85WDG	0.04	PRE	99	89	21	9	18	18
16	Kerb 50W	1.0	PRE	98	95	43	6	5	14
17	Dacthal + Kerb 50W	7.5 1.0	PRE EPOST	99	94	3	3	5	8
18	Dacthal + Everest 70WG	7.5 0.03	PRE EPOST	61	95	31	26	28	23
19	Dacthal + Stinger 3EC	7.5 0.187	PRE EPOST	61	55	11	0	0	3
20	Dacthal + Starane 1.5EC	7.5 0.094	PRE EPOST	93	61	54	45	35	36
		LSD (0.05)		**34**	**35**	**22**	**11**	**14**	**11**

Table 3. Application and environmental data for POST treatments in leafy brassicas

Location	Crystal City, TX	**Wind speed / direction**	15 / SW
Date	January 22, 2007	**Crop**	Leafy brassicas
Time of day	8:00 a.m.	**Variety**	See above
Type of application	Broadcast	**Crop stage**	4 – 5 leaves
Carrier	H_2O	**Air temp. (^oF)**	42
Gas (if not CO_2)	CO_2	**Soil temp. (^oF)**	49
GPA	20	**Soil beneath**	Moist
PSI	35	**Soil surface**	Moist
Nozzle tips	8002	**% Relative humidity**	Moderate
Nozzle spacing	18”	**Sky conditions**	Overcast
Boom width (“)	6.7’	**# Replications**	4
Boom height (“)	18”	**Sprayed by**	AKP

Weeds present: Fumitory, London rocket

Table 4. Effect of herbicide treatments on leafy brassicas yield

No.	Treatment	Rate (lbs ai/A)	Timing	Kale	Mustard	Turnip	Collard
				----- Yield (lbs/A) -----			
1	Untreated			10,138	24,855	17,005	13,081
2	Dacthal 6L	7.5	PRE	12,427	23,546	19,295	17,332
3	Prefar 4E	6.0	PRE	12,423	26,163	15,697	17,332
4	Far-Go 4EC	3.0	PPI	10,137	25,508	10,792	18,313
5	Dual Magnum 7.62E	0.65	PRE	14,716	23,873	18,967	18,313
6	Dual Magnum	0.325	PRE	11,444	23,546	14,062	20,929
7	Outlook 6E	0.5	PRE	10,138	14,062	10,463	15,039
8	Outlook	0.25	PRE	13,406	21,257	15,043	17,005
9	Spartan 75WDG	0.2	PRE	6,867	13,081	7,521	11,773
10	Spartan	0.1	PRE	10,138	20,930	12,754	15,695
11	Spartan	0.05	PRE	9,811	22,529	14,716	13,735
12	Prowl H_2O 3.8AS	0.5	PRE	13,731	24,200	17,986	15,370
13	Nortron 4SC	1.0	PRE	10,465	17,005	9,811	14,389
14	Bolero 8EC	1.0	PRE	12,754	26,163	16,024	16,349
15	KIH 485 85WDG	0.04	PRE	11,771	22,238	11,769	15,368
16	Kerb 50W	1.0	PRE	9,483	23,219	15,370	16,678
17	Dacthal + Kerb 50W	7.5 1.0	PRE EPOST	10,138	21,911	17,659	12,752
18	Dacthal + Everest 70WG	7.5 0.03	PRE EPOST	2,289	2,943	5,886	7,849
19	Dacthal + Stinger 3EC	7.5 0.187	PRE EPOST	13,079	28,452	17,005	15,370
20	Dacthal + Starane 1.5EC	7.5 0.094	PRE EPOST	12,425	16,351	12,425	16,024
		LSD (0.05)		**5,632**	**5,060**	**6,388**	**3,976**

Evaluation of PPI Herbicides Followed by Spartan Applied PRE in Mustard Greens

Russell W. Wallace & Alisa K. Petty

Texas Cooperative Extension & Texas Agricultural Experiment Station - Lubbock

Final Report

Objective: To evaluate preemergence (PPI) herbicide applications of Treflan 4HF (trifluralin), Prefar 4E (bensulide) and Dacthal 6L (DCPA) followed by two rates of Spartan 75WDG (sulfentrazone) applied PRE for crop injury, London rocket (*Sisybrium irio*) control and yield of mustard greens (*Brassica juncea*).

Materials & Methods: The trial was conducted at the Del Monte Research Farm, located in Crystal City, Zavala County, Texas. The farm is located on a Bookout clay loam soil with a pH of 7.7 and 1.0% organic matter. The trial site was disked prior to initiation of the test and shaped into 40" beds. Treflan, Prefar and Dacthal were applied PPI prior to planting, while Spartan was applied PRE following planting. Mustard greens (var. "Southern Giant Curled") was planted on December 14, 2006 using a single-row, hand-push Earthway seeder into plots measuring 3.3'' x 20'. Herbicide treatments were applied using a CO_2-pressurized backpack sprayer and hand-held boom equipped with four flat fan nozzles that delivered 20 GPA at 35 PSI (Table 1). The entire test site was fertilized, irrigated, and all pests controlled using standard grower practices. Crop injury, weed populations and yield were recorded. The trial was conducted as an RCBD with 4 replications and all data were subjected to analysis of variance with means separated using the Least Significant Difference at the 0.05 level.

Results and Discussion: Mustard injury was recorded on February 3, 2007 and showed that regardless of the PPI herbicide treatment, crop injury was generally high (10 – 46%) when Spartan was applied PRE (Table 2). These results are opposite to those previously tested with Spartan during 2005 (*R. Wallace, Texas High Plains Vegetable & Weed Control Research Summary Reports: 2006*). When averaged across both Spartan rates within each PPI treatment, there were no significant differences between PPI herbicides. However, when analyzed across all PPI herbicides, crop injury was significantly higher with the 0.2 lb ai/A rate of Spartan when compared to the lower rate and the untreated control.

London rocket control was significantly higher in all herbicide treated plots compared to the untreated control (Table 2). There were no differences in weed control between the PPI + Spartan (either rate) treatments, and no differences were observed between the averaged rates of Spartan. All PPI herbicide treatments, either with or without both rates of Spartan significantly controlled London rocket better than the untreated control.

Mustard yields were significantly influenced by both PRE-applied Spartan rates in this test, but not by any of the PPI treatments (Table 2). While both rates of Spartan significantly reduced mustard yields, the average low rate treatment had yields 42% higher than the average high rate of Spartan. These results indicate that in contrast to reports from 2005, Spartan is likely not a good choice for herbicide registration in mustard greens.

Table 1. Application and Environmental Data for Spartan PRE Treatments in Mustard

Location	Crystal City, TX	**Wind speed / direction**	None
Date	December 15, 2006	**Crop**	Mustard
Time of day	8:00 a.m.	**Variety**	Southern Giant Curled
Type of application	Broadcast /Hooded	**Crop stage**	Seed
Carrier	H_2O	**Air temp. (^oF)**	60
Gas (if not CO_2)	CO_2	**Soil temp. (^oF)**	58
GPA	20	**Soil beneath**	Moist
PSI	35	**Soil surface**	Semi-Moist
Nozzle tips	8002	**% Relative humidity**	High
Nozzle spacing	18"	**Sky conditions**	Overcast/Foggy
Boom width (")	3.3'	**# Replications**	4
Boom height (")	18"	**Sprayed by**	RWW

Weeds present: None

Table 2. Effect of PPI herbicide treatments followed by PRE-applied Spartan on stunting, London rocket control and yield in mustard greens

Treatment	Rate (lbs ai/A)	Timing	% Crop Stunting	% London Rocket Control	Yield
			Feb. 3	Feb. 23	lbs/A
Untreated			0	0	15,371
Treflan 4HF	0.75	PPI	8	72	12,754
Prefar 4E	6.0	PPI	6	66	11,446
Dacthal 6L	10.0	PPI	6	93	12,427
Treflan	0.375	PPI	9	68	10,138
Prefar	3.0	PPI	5	56	14,062
Dacthal	5.0	PPI	15	58	8,830
Treflan + Spartan 75WDG	0.75 0.2	PPI PRE	41	71	1,962
Treflan + Spartan	0.75 0.1	PPI PRE	23	94	10,465
Treflan + Spartan	0.375 0.2	PPI PRE	34	80	7,195
Treflan + Spartan	0.375 0.1	PPI PRE	21	84	8,503
Prefar + Spartan	6.0 0.2	PPI PRE	46	84	5,232
Prefar + Spartan	6.0 0.1	PPI PRE	20	83	9,484
Prefar + Spartan	3.0 0.2	PPI PRE	26	81	5,232
Prefar + Spartan	3.0 0.1	PPI PRE	10	69	8,101
Dacthal + Spartan	10.0 0.2	PPI PRE	43	90	3,924
Dacthal + Spartan	10.0 0.1	PPI PRE	14	84	9,157
Dacthal + Spartan	5.0 0.2	PPI PRE	30	93	6,214
Dacthal + Spartan	5.0 0.1	PPI PRE	18	93	7,195
Spartan	0.2	PRE	34	85	7,195
Spartan	0.1	PRE	18	88	10,792

Stinger Rate and Tank-Mix Comparisons for Crop Injury in Processing Spinach

Russell W. Wallace & Alisa K. Petty

Texas Cooperative Extension & Texas Agricultural Experiment Station - Lubbock

Final Report

Objective: To evaluate postemergence (POST) applications of Stinger 3EC (clopyralid) applied alone and in combination with Poast 1.5EC (sethoxydim) or Spin-Aid 1.3EC (phenmedipham) for crop injury and yield in processing spinach varieties (*Spinacia oleracea*).

Materials & Methods: The trial was conducted at the Del Monte Research Farm, located in Crystal City, Zavala County, Texas. The farm is located on a Bookout clay loam soil with a pH of 7.7 and 1.0% organic matter. The trial site was disked prior to initiation of the test and shaped into 80" beds. Spinach varieties (DMC 66-07, DMC 66-09, DMC 66-16 and PV-0496) were planted using a commercial vacuum planter that seeded 14 lines/80" bed at a density of approximately 750,000 seeds/A on November 28, 2006. Individual plots measured 6.7' x 25'. Herbicide treatments were applied using a CO_2-pressurized backpack sprayer equipped with four flat fan nozzles that delivered 20 GPA at 35 PSI (Table 1). The entire test site was fertilized, irrigated, and all pests controlled using standard grower practices. Due to the large size of the test and the lack of significant injury, no yields were recorded. The trial was conducted as an RCBD with 4 replications within each spinach variety. All data were subjected to analysis of variance and means separated using the Least Significant Difference at the 0.05 level.

Results and Discussion: There were very few weeds within the test site and therefore no weed control data was recorded. However, all spinach varieties showed some early mild injury symptoms (leaf twisting, malformations) as a result of Stinger and Stinger tank-mix applications (Table 2). While there were significant differences between treatments, this injury was 9% or less for all varieties, and it dissipated within 4 weeks following application. As a result, no further injury ratings were recorded. No specific variety within the field test showed any increased potential for injury, nor did any treatment demonstrate a higher degree of injury across all varieties. Therefore it can be assumed that no yield losses occurred as a result of the Stinger applications. Results of this trial suggest that the use of Stinger applied alone or in combination with Poast or Spin-Aid is safe to the four varieties of processing spinach evaluated.

Table1. Application and Environmental Data for Herbicide Treatments in Spinach

Location	Crystal City, TX	Wind speed / direction	15 / N
Date	December 28, 2006	Crop	Spinach
Time of day	12:00 p.m.	Variety	Multiple
Type of application	Broadcast	Crop stage	4 – 5 leaves
Carrier	H_2O	Air temp. (^oF)	70
Gas (if not CO_2)	CO_2	Soil temp. (^oF)	67
GPA	20	Soil beneath	Semi-moist
PSI	35	Soil surface	Semi-moist
Nozzle tips	8002	% Relative humidity	High
Nozzle spacing	18"	Sky conditions	Overcast
Boom width (")	6.7'	# Replications	4
Boom height (")	18"	Sprayed by	AKP

Weeds present: None

Table 2. Effects of Stinger Treatments on Crop Injury in Four Processing Spinach Varieties

Treatment	Rate (lbs ai/A)	Timing	DMC 66-07	DMC 66-09	DMC 66-16	PV-0496
			-------------- % Crop Injury --------------			
Untreated			0	0	0	0
Dual Magnum 7.62E *Handweed*	0.65	PRE Season-Long	0	0	0	0
Dual Magnum *Stinger 3EC*	0.65 0.0625	PRE EPOST (4-5 leaves)	1.3	2.5	2.5	0
Dual Magnum *Stinger*	0.65 0.125	PRE EPOST (4-5 leaves)	2.5	1.3	5.0	2.5
Dual Magnum *Stinger +* *Poast 1.5EC +* *COC*	0.65 0.0625 0.28 1% v/v	PRE EPOST (4-5 leaves)	5.3	0	3.8	3.8
Dual Magnum *Stinger +* *Poast +* *COC*	0.65 0.125 0.28 1% v/v	PRE EPOST (4-5 leaves)	8.8	2.5	8.8	7.5
Dual Magnum *Stinger +* *Spin-Aid 3EC*	0.65 0.0625 0.98	PRE EPOST (4-5 leaves)	2.5	2.5	5.0	5.0
Dual Magnum *Stinger +* *Spin-Aid*	0.65 0.125 0.98	PRE EPOST (4-5 leaves)	6.3	3.8	7.5	8.8
Dual Magnum *Stinger +* *Spin-Aid*	0.65 0.0625 0.49	PRE EPOST (4-5 leaves)	2.5	0	2.5	2.5
Dual Magnum *Stinger +* *Spin-Aid*	0.65 0.125 0.49	PRE EPOST (4-5 leaves)	5.0	1.3	6.3	6.3
		LSD (0.05)	**3.8**	**2.8**	**4.2**	**3.8**

Evaluation of Herbicide Rate Combinations in Processing Spinach

Russell W. Wallace & Alisa K. Petty

Texas Cooperative Extension & Texas Agricultural Experiment Station - Lubbock

Final Report

Objective: To evaluate the effects of Ro-Neet 6E (cycloate), Dual Magnum 7.62E (s-metolachlor), Outlook 6E (dimethenamid-p) and Nortron 4SC (ethofumesate) applied alone and in combination at selected rates on crop injury, fumitory (*Fumaria ofinicalis* L.) control and yield of processing spinach (*Spinacia oleracea*).

Materials & Methods: The trial was conducted at the Del Monte Research Farm, located in Crystal City, Zavala County, Texas. The farm is located on a Bookout clay loam soil with a pH of 7.7 and 1.0% organic matter. The trial site was disked prior to initiation of the test and shaped into 80" beds. Ro-Neet was applied PPI prior to planting, while Dual Magnum, Outlook and Nortron were applied PRE following planting. Spinach (var. "DMC 66-09") was planted on November 27, 2006 using a commercial vacuum planter that seeded 14 lines of spinach into plots measuring 6.7'' x 25'. Herbicide treatments were applied using a CO_2-pressurized backpack sprayer and hand-held boom equipped with four flat fan nozzles that delivered 20 GPA at 35 PSI (Table 1). The entire test site was fertilized, irrigated, and all pests controlled using standard grower practices. Crop injury, weed populations and yield were recorded. The trial was conducted as an RCBD with 4 replications and all data were subjected to ANOVA with means separated using the LSD at the 0.05 level.

Results and Discussion: In general, a higher degree of herbicide injury was observed in this study compared to previous trials. Crop emergence was significantly reduced in all three treatments where Outlook and Nortron were applied compared to the control (Table 2). Additionally, comparing treatments where Nortron was applied (combined or alone) to all others indicated a significant reduction in emergence, suggesting that Norton reduces emergence at the 1.0 lb/A rate. Crop stunting was significantly higher than the untreated control for all herbicide treatments with the exception of Dual Magnum and Ro-Neet applied alone, as well as Ro-Neet + the two lower rates of Dual Magnum, and the lowest rate of Outlook. Greatest injury was found where Outlook + Nortron were tank-mixed. Outlook alone caused significant injury at the two higher rates. Fumitory control was excellent with all herbicide treatments. Spinach yields were highest in the untreated plots followed by treatments of Dual Magnum (2 lower rates) and Ro-Neet alone. The standard rate of Dual Magnum (0.65 lbs ai/A) caused a significant (18%) reduction in yield compared to the untreated control. All other treatments applied alone or in combination resulted in significant yield reductions. Greatest yield reductions were found in plots treated with Nortron alone or in combination, followed by treatments where Outlook was applied alone.

In general, the results of this study indicate that Outlook and Nortron are not viable candidates for preemergence use in spinach production. Previous research indicated that Nortron may have some potential though with these results, a registration will not likely be pursued. Ro-Neet applied PPI followed by Dual Magnum PRE appears to be a good combination; however, spinach injury decreases and yields increase as the rate of Dual Magnum drops from 0.65 lb ai/A to 0.163 lb ai. There is no such pattern when Dual Magnum is applied alone, suggesting an interaction between the two herbicides.

Table1. Application and Environmental Data for PRE Treatments in Spinach

Location	Crystal City, TX	**Wind speed / direction**	5 – 10 / SW
Date	November 28, 2006	**Crop**	Spinach
Time of day	8:00 a.m.	**Variety**	DMC 66-09
Type of application	Broadcast	**Crop stage**	Seed
Carrier	H_2O	**Air temp. (^oF)**	73
Gas (if not CO_2)	CO_2	**Soil temp. (^oF)**	71
GPA	20	**Soil beneath**	Semi-Moist
PSI	35	**Soil surface**	Moist
Nozzle tips	8002	**% Relative humidity**	Low
Nozzle spacing	18"	**Sky conditions**	Clear
Boom width (")	6.7'	**# Replications**	4
Boom height (")	18"	**Sprayed by**	RWW

Weeds present: None

Table 2. Effect of herbicides on fumitory populations and spinach emergence, stunting and yield

Treatment	Rate	Timing	Emergence (Dec. 13)	Crop Stunting (Feb. 2)	Fumitory Population (Feb. 22)	Yield (Feb. 22)
	lbs ai/A		No. / 0.25 m^2	%	No. / Plot	lbs/A
Untreated	0	Season	46	0	65	25,311
Dual Magnum 7.62E	0.65	PRE	49	13	0	20,696
Dual Magnum	0.325	PRE	51	3	0.3	23,474
Dual Magnum	0.1625	PRE	48	4	6	23,948
Dual Magnum + Nortron 4SC	0.65 1.0	PRE PRE	43	64	0	6,934
Dual Magnum + Nortron	0.325 1.0	PRE PRE	42	50	0	11,474
Dual Magnum + Nortron	0.1625 1.0	PRE PRE	34	71	0	6,422
Outlook 6E	0.50	PRE	44	54	0	7,933
Outlook	0.25	PRE	47	25	0	16,859
Outlook	0.125	PRE	46	8	1	19,637
Outlook + Nortron	0.50 1.0	PRE PRE	27	94	0	185
Outlook + Nortron	0.25 1.0	PRE PRE	31	93	0	1,104
Outlook + Nortron	0.125 1.0	PRE PRE	32	86	0	2,844
Ro-Neet 6E + Dual Magnum	3.00 0.65	PPI PRE	39	25	0	16,318
Ro-Neet + Dual Magnum	3.00 0.325	PPI PRE	53	14	0	19,496
Ro-Neet + Dual Magnum	3.00 0.1625	PPI PRE	41	11	0	20,481
Ro-Neet + Outlook	3.00 0.50	PPI PRE	36	85	0	2,244
Ro-Neet + Outlook	3.00 0.25	PPI PRE	38	48	0	11,763
Ro-Neet + Outlook	3.00 0.125	PPI PRE	44	30	0	16,933
Nortron	1.0	PRE	40	48	0	13,400
Ro-Neet	3.00	PPI	45	0	0	21,777
Ro-Neet + Nortron	3.00 1.00	PPI PRE	40	90	0	2,496
	LSD (0.05)		**10**	**15**	**5**	**3,930**

Evaluation of Spinach Planting Density and Herbicide Rate on Weed Control and Yield

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Final Report

Objective: To evaluate preemergence (PPI, PRE) applications of Dual Magnum 7.62E (s-metolachlor), Ro-Neet 6E (cycloate) and Outlook 6E (dimethenamid-p) applied at two rates to three planting densities of processing spinach (*Spinacia oleracea*) for crop injury, fumitory (*Fumaria ofinicalis* L.) control and yield.

Materials & Methods: The trial was conducted at the Del Monte Research Farm, located in Crystal City, Zavala County, Texas. The farm is located on a Bookout clay loam soil with a pH of 7.7 and 1.0% organic matter. The trial site was disked prior to initiation of the test and shaped into 80" beds. Ro-Neet was applied PPI prior to planting, while Dual Magnum (grower standard in the Texas Wintergarden) and Outlook were applied PRE following planting. Spinach (var. "DMC 66-09") was planted on November 27, 2006 using a commercial vacuum planter that seeded 14 lines/80" bed at low, medium and high densities of 505,263, 838,866 and 1,010,526 per acre, respectively, into plots measuring 6.7' x 25'. Herbicide treatments were applied using a CO_2-pressurized backpack sprayer and hand-held boom equipped with four flat fan nozzles that delivered 20 GPA at 35 PSI (Table 1). The entire test site was fertilized, irrigated, and all pests controlled using standard grower practices. Crop injury, weed populations and yield (one cutting only) were recorded during the test. The trial was conducted as an RCBD with 4 replications and all data were subjected to analysis of variance with means separated using the LSD at the 0.05 level.

Results and Discussion: The average treatment responses for each spinach density x herbicide comparison are shown in Table 2. Responses averaged over herbicide rate showed that Outlook caused significant crop injury (stunting) compared to all other treatment combinations, regardless of planting density (Figure 1). Dual Magnum also caused some moderate stunting in this test (a response often observed by growers), followed by only minor injury with Ro-Neet.

The effects of planting density and the potential competitive nature of spinach on weed populations are clearly shown in Figure 2, where the number of fumitory weeds decreased as the spinach density increased from low to high within the untreated plots. Dual Magnum and Outlook gave excellent control of fumitory regardless of spinach density, and though Ro-Neet control was less, it was not significant. The results suggest that increasing spinach planting densities may offer increased weed suppression in cases where herbicides fail to control adequately.

Finally, spinach yields in plots treated with Outlook were reduced an average 41% compared to the nontreated control plots (Figure 3). Similarly, spinach yields in Dual Magnum plots were reduced 15%. Only Ro-Neet had average yields comparable to the nontreated controls. When herbicide treatments were averaged across planting densities, yields were only 4.4% higher when seeding rates increased from low to medium planting densities. However, when planted at the high density, yields increased 17.6% suggesting that it is more profitable to seed at the higher rate, especially where herbicide injury potential is high and if multiple cutting/harvesting will occur.

The overall results of this test indicate that the highest seeding rate gave higher yields and that regardless of herbicide rate, that Outlook was too injurious and should not be a candidate for use in spinach production. Although the grower standard, Dual Magnum continues to reduce yields 10 – 15%, especially when compared to nontreated or Ro-Neet-treated spinach. Reduced weed control with Ro-Neet however, suggests that even with the yield reduction, Dual Magnum remains the ideal choice. Ro-Neet, when applied to spinach planted at high seeding rates, may have potential, especially when considering that spinach can also help suppress weeds at that density. There is a need to continue evaluating Dual Magnum at lower rates in high density spinach, given that there continues to be yield reductions.

Table1. Application and Environmental Data for Herbicide Treatments in Spinach

Location	Crystal City, TX	**Wind speed / direction**	5 – 10 / SW
Date	November 28, 2006	**Crop**	Spinach
Time of day	10:00 a.m.	**Variety**	DMC 66-09
Type of application	Broadcast	**Crop stage**	Seed
Carrier	H_2O	**Air temp. (^oF)**	75
Gas (if not CO_2)	CO_2	**Soil temp. (^oF)**	71
GPA	20	**Soil beneath**	Semi-moist
PSI	35	**Soil surface**	Dry
Nozzle tips	8002	**% Relative humidity**	Low
Nozzle spacing	18"	**Sky conditions**	Clear
Boom width (")	6.7'	**# Replications**	4
Boom height (")	18"	**Sprayed by**	RWW

Weeds present: None

Table 2. Average Treatment Effects for Stunting, Weed Populations and Yield in Spinach When Herbicides Were Applied at Two Rates in Three Planting Densities for Spinach

Treatment	Crop Density	Rate lbs ai/A	Timing	% Crop Stunting	% Crop Stunting	Fumitory Population	Harvested Yield
				Jan. 8	Feb. 21	No./Plot	Tons/A
Untreated	Low	0	Season	0	0	14	11.8
Ro-Neet 6E	Low	3.4	PPI	9	4	0	10.8
Ro-Neet	Low	1.7	PPI	9	0	2	10.1
Dual Magnum 7.62E	Low	0.65	PRE	15	10	0.8	9.9
Dual Magnum	Low	0.325	PRE	14	4	0	9.9
Outlook 6E	Low	0.5	PRE	68	39	0	5.2
Outlook	Low	0.25	PRE	43	21	0.8	7.7
Untreated	Medium	0	Season	0	0	11.5	11.9
Ro-Neet 6E	Medium	3.4	PPI	4	0	0	10.6
Ro-Neet	Medium	1.7	PPI	0	0	6	12.0
Dual Magnum 7.62E	Medium	0.65	PRE	16	1	0	10.0
Dual Magnum	Medium	0.325	PRE	16	1	0	10.2
Outlook 6E	Medium	0.5	PRE	66	39	0	4.3
Outlook	Medium	0.25	PRE	33	9	0.8	9.7
Untreated	High	0	Season	0	0	4.1	13.7
Ro-Neet 6E	High	3.4	PPI	4	0	0	12.8
Ro-Neet	High	1.7	PPI	0	0	4.9	13.5
Dual Magnum 7.62E	High	0.65	PRE	13	0	0	10.8
Dual Magnum	High	0.325	PRE	9	0	0	12.4
Outlook 6E	High	0.5	PRE	60	33	0	6.6
Outlook	High	0.25	PRE	74	3	0.8	10.1

Figure 1. The Effects of Planting Density and Herbicide Treatment on Spinach Injury in 2006

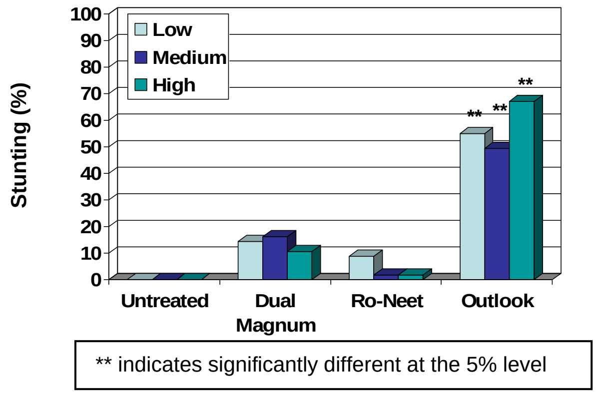


Figure 2. The Effects of Planting Density and Herbicide Treatment on Fumitory Populations in 2006

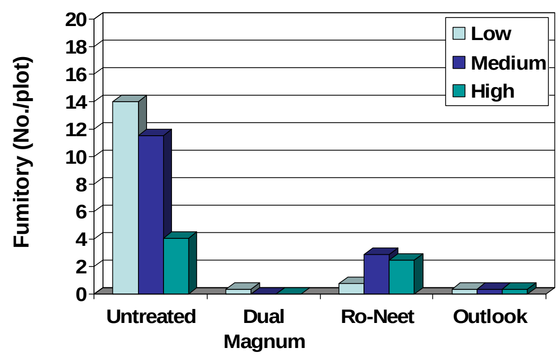
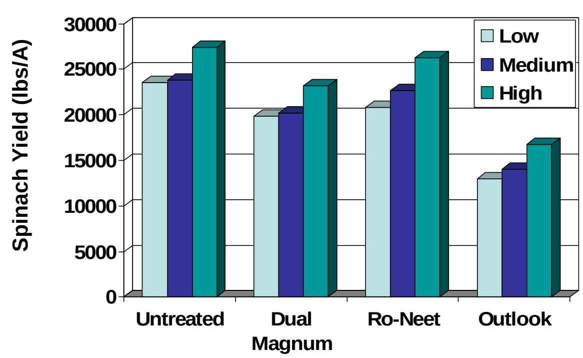


Figure 3. The Effects of Planting Density and Herbicide Treatment on Spinach Yield in 2006



Evaluation of Far-Go, Eptam and Prefar on Weed Control and Crop Injury in Spinach

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Final Report

Objective: To evaluate the efficacy and phytotoxicity of preemergence (PPI, PRE) applications of Far-Go, Eptam and Prefar herbicides for control of fumitory and winter weeds, and crop injury and yield in processing spinach (cultivar "DMC 66-09").

Materials & Methods: The trial was conducted at the Del Monte Research Farm, located in Crystal City, Zavala County, Texas. The farm is located on a Bookout clay loam soil with a pH of 7.7 and 1.0% organic matter. The trial site was disked prior to initiation of the test and herbicides applied using a CO_2-charged backpack sprayer equipped with four flat fan nozzles that delivered 20 GPA at 35 PSI (Table 1). PPI treatments were incorporated immediately following planting, and PRE herbicides were applied following planting. Spinach was seeded into beds 80" wide on November 28, 2006 into plots measuring 6.67' x 25'. The entire test site was fertilized, irrigated (drip), and all pests controlled using standard grower practices for the farm. Yields were obtained by cutting the spinach at 1.0" with a band-harvester at maturity. All data was subjected to analysis of variance and means separated using the Least Significant Difference at the 0.05 level.

Table1. Application and Environmental Data for Herbicide Applications in Spinach

Location	Crystal City, TX	Wind speed / direction	10 – 15/SW
Date	November 27, 2006	Crop	Spinach
Time of day	3:30 p.m.	Variety	DMC 66-09
Type of application	Broadcast (PPI)	Crop stage	None
Carrier	H_2O	Air temp. (^oF)	79
Gas (if not CO_2)	CO_2	Soil temp. (^oF)	72
GPA	20	Soil beneath	Semi-moist
PSI	35	Soil surface	Dry
Nozzle tips	8002 EVS	% Relative humidity	Low
Nozzle spacing	18"	Sky conditions	Overcast
Boom width (")	6.7'	# Replications	4
Boom height (")	18 – 20"	Sprayed by	RWW

Weeds present: None

Location	Crystal City, TX	Wind speed / direction	0
Date	November 28, 2006	Crop	Spinach
Time of day	8:00 a.m.	Variety	DMC 66-09
Type of application	Broadcast (PRE)	Crop stage	None
Carrier	H_2O	Air temp. (^oF)	62
Gas (if not CO_2)	CO_2	Soil temp. (^oF)	70
GPA	20	Soil beneath	Semi-moist
PSI	35	Soil surface	Dry
Nozzle tips	8002 EVS	% Relative humidity	Low
Nozzle spacing	18"	Sky conditions	Overcast
Boom width (")	6.7'	# Replications	4
Boom height (")	18 – 20"	Sprayed by	RWW

Weeds present: None

Location	Crystal City, TX	Wind speed / direction	5 – 10/SW
Date	December 29, 2006	Crop	Spinach
Time of day	10:00 a.m.	Variety	DMC 66-09
Type of application	Broadcast (POST)	Crop stage	3-4 leaves
Carrier	H_2O	Air temp. (^oF)	66
Gas (if not CO_2)	CO_2	Soil temp. (^oF)	61
GPA	20	Soil beneath	Semi-moist
PSI	35	Soil surface	Semi-moist
Nozzle tips	8002 EVS	% Relative humidity	High
Nozzle spacing	18"	Sky conditions	Overcast
Boom width (")	6.7'	# Replications	4
Boom height (")	18 – 20"	Sprayed by	AKP

Weeds present: henbit, London rocket, fumitory

Results and Discussion: Percent crop injury 6 weeks after treatment (WAT) on January 8 was greatest with triallate + bensulide applied PPI, and was significantly higher compared to all other treatments except where triallate was applied PPI at 6.0 lbs either alone or in combination with EPTC 7E or EPTC 20G (Table 2). Injury (10%) with s-metolachlor (grower standard) was equivalent to triallate alone (low rate), though the combination of s-metolachlor + triallate resulted in increased spinach injury (26%). By 10 WAT crop injury was significantly lower in plots treated with s-metolachlor or where triallate was applied at 3.0 lbs a.i./A either alone or when combined with s-metolachlor compared to all other treatments. Where triallate was applied alone at 6.0 lbs a.i./A or when combined with EPTC or bensulide, injury remained high throughout the crop season. Control of fumitory was excellent (99%) regardless of rate and treatment when evaluated 10 WAT (Table 2). However, some fumitory plants were found within the plots at harvest (13 WAT), indicating there was some breakdown by the season's end. However, all herbicide-treated plots had significantly less fumitory plants compared to the untreated plots, and the greatest numbers were found where triallate was applied at the lower rate. Finally, all herbicide treatments significantly reduced spinach yields compared to the untreated plots except where triallate was applied alone at the low rate (Table 4). Even the grower standard (s-metolachlor) reduced yields by 16%. However, where triallate was applied at 6.0 lbs a.i./A alone or in combination with other herbicides, yields were further reduced (23% or greater).

The results of this research suggest that triallate may have a fit for use in spinach production, though more research is needed on improved crop safety and weed spectrum. There is an indication that triallate may have potential for use as a tank-mix partner with s-metolachlor, or applied alone at a rate of 3.0 lbs a.i./A.

Table 4. Herbicide Effects on Crop Injury, Weed Control and Yield in Processing Spinach

Treatment	Product Rate / A	Timing	% Crop Injury		% Control (Fumitory)	No. Fumitory / Plot at Harvest	Total Yield (tons/A)
			Jan. 8	Feb. 2	Feb. 2	Feb. 22	Feb. 22
Untreated			0	0	0	34.5	12.6
s-Metolachlor 7.62E	0.65	PRE	10.0	3.8	99.0	0.3	10.5
Triallate 4E + *s-Metolachlor 7.62E*	3.0 0.65	PPI PRE	26.3	16.3	99.0	0.3	10.3
Triallate 4E	3.0	PPI	15.0	5.0	99.0	5.0	11.4
Triallate 4E	6.0	PPI	33.8	32.5	99.0	0.8	9.2
Triallate 4E *EPTC 7E*	6.0 + 7.0	PPI 3-leaf POST	28.8	25.0	99.0	0.5	9.1
Triallate 4E *EPTC 20G*	6.0 + 24 lbs/A	PPI 3-leaf POST	32.5	31.3	99.0	0.8	9.5
Triallate 4E *Bensulide 4E*	3.0 + 2.0	PPI PPI	40.0	27.5	99.0	2.8	9.8
		LSD (0.05)	**9.2**	**12.1**	**0**	**11.1**	**1.6**