2007 Vegetable Trial Report

January 2008

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Department of Horticulture and Landscape Architecture
Division of Agricultural Sciences and Natural Resources
Oklahoma State University

The Department of Horticulture and Landscape Architecture, cooperating departments and experimental farms conducted a series of experiments on field vegetable production. Data were recorded on a majority of aspects of each study, and can include crop culture, crop responses and yield data. This report presents those data, thus providing up-to-date information on field research completed in Oklahoma during 2007.

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

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

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Crop Culture

Carrot Cultivar Trial

Spring 2007, Lane, Oklahoma

J. Shrefler, L. Brandenberger, L. K. Wells, T. Goodson

Fresh vegetables can be marketed by family farms in outlets such as farmers' markets, on-farm retail stands and local grocery stores. An additional option for Oklahoma growers is the "Farm to School" program which seeks to provide locally grown produce in school lunch programs. Development of this program requires the identification of types and cultivars of fruits and vegetables that are acceptable to school nutrition specialists and students and that can be harvested during times of year that school is in session. Ease of preparation in school kitchens is an additional factor that would favor use of vegetables in the program. Carrot is one candidate vegetable that is nutritious and that could be used fresh with minimal preparation. Many carrot varieties are developed for processing while others are better suited to fresh use. A trial was conducted at Lane in the spring of 2007 to evaluate 16 fresh-use type cultivars for productivity in the spring growing season. The varieties and sources are shown in Table 1.

The trial was conducted on a Bernow fine sandy loam soil. The field was used the previous year for squash production under organic-approved weed control practices. Soil was prepared by disking and making beds 6 feet wide with a combination tiller and bed shaper. The field was fertilized using 600 lbs / acre of 10-20-10 fertilizer prior to disking. Due to difficulties with planter adjustment, beds were lowered at planting time using a Do-All tillage implement, followed by a roller, prior to seeding. Carrots were sown with a research cone type plot-seeder on April 2, 2007. Four equally-spaced rows were planted 12 inches apart on beds with 6 foot centers. The field was irrigated with overhead irrigation as needed to keep the soil surface moist until germination was deemed complete. On May 11, Lorox DF herbicide was applied to the entire field at 1 lb product per acre to control emerged weeds. Occasional hand removal of yellow nutsedge was also used. During the growth of this crop extremely wet field conditions were experienced.

Carrots were harvested on June 20 and 21 by collecting all carrots over a 2 meter length of row. Plots had two rows of carrots 25 feet in length and harvest samples were collected from inner rows. Following harvest, tops were removed and length was measured for the longest 5 carrots of each sample. Roots having defects, which were primarily split roots or multiple growing points, were culled from the sample and counted. Marketable roots were then sorted according to diameter and weighed by size category.

Marketable carrot yield data are shown in Table 1. Although numerical values for yield ranged from 3.4 to 11.6 tons per acre, no significant differences were detected among varieties. Mean individual root weights ranged from 0.6 to 1.7 ounces and significant differences were found among cultivars. Differences were not detected among lengths of the 5 longest carrots of each sample.

Carrot root size distribution data is shown in Table 2. Carrots sizes ranged from less than ¾ inch to greater than 1¼ inch in diameter. For all size categories the percent number of roots and the percentage of root weights differed among cultivars.

These data provide new information that can be used to select carrot cultivars for fresh market use. The data provides an initial indication of cultivar differences in terms of root weight and size distribution. Additional trialing during other growing seasons is needed to ascertain overall cultivar performance.

Table 1. Spring 2007 Carrot Cultivar Trial, Lane, OK.

Variety	Seed Source	Yield in Tons/acre		Root weight (oz.)	Root length[x] (inches)	Percent defects[w]	
		Marketable[z]	Culls[y]			Forks	Splits
710005	Seminis	3.4	0.4	0.8 c-d[v]	5.3	9	3
Abaco	Seminis	11.6	2.3	1.7 a	6.0	12	6
Anushka	Seminis	9.2	1.9	1.7 a	6.0	9	6
Austria	Bejo	9.3	2.4	1.1 a-d	6.9	18	8
Bejo 2546	Bejo	9.9	0.4	1.3 a-c	6.5	3	1
Crème De Lite	Nunhems	6.6	0.7	1.0 c-d	5.6	11	1
Invicta	Seminis	7.3	1.7	1.1 b-d	5.6	21	3
Kamaran	Bejo	9.4	0.7	0.9 c-d	6.5	6	2
Maverick	Nunhems	9.1	2.1	1.1 b-d	7.6	17	8
Nelson	Bejo	11.1	1.6	0.9 c-d	6.3	5	9
Rainbow	Bejo	10.0	1.7	1.1 a-d	6.4	13	5
SugarSnax 54	Nunhems	4.5	0.8	0.7 c-d	5.9	15	3
Sun 255	Nunhems	8.1	1.8	0.8 c-d	7.2	18	4
TenderSnax	Nunhems	4.3	0.4	0.6 d	5.9	8	1
Topcut 93	Nunhems	6.3	1.2	0.7 c-d	5.5	17	0
Tripleplay 58	Nunhems	4.1	0.4	0.7 c-d	6.4	8	1
		n.s.[u]	n.s.		n.s.	n.s.	n.s.

[z] Marketable=marketable roots.
[y] Culls=unmarketable defective roots.
[x] Root length=mean length of five longest roots.
[w] Percent defects= weight of each defect category divided by total yield (marketable + culls) x 100.
[v] Means followed by the same letter are not different using Duncan's MRT where P=0.05.;
[u] "n.s." indicates that no statistical differences were detected.

Table 2. Spring 2007 Carrot Cultivar Trial, Lane, OK.

Variety	Seed Source	Percent number of roots[z]			Percent weight[y]		
		<¾"	¾-1¼"	>1¼"	<¾"	¾-1¼"	>1¼"
710005	Seminis	30 b-e[x]	41 a-c	12 c-d	17 a-d	47 b-c	20 b-d
Abaco	Seminis	9 d-e	19 c	53 a	1 d	10 D	70 a
Anushka	Seminis	7 e	39 a-c	39 b	2 c-d	35 c-d	53 a
Austria	Bejo	17 d-e	56 a-b	1 d	6 c-d	66 a-c	1 d
Bejo 2546	Bejo	20 c-e	60 a-b	16 c	5 c-d	61 a-c	30 b
Crème De Lite	Nunhems	23 c-e	51 a-b	13 c-d	12 b-d	60 a-c	24 b-c
Invicta	Seminis	30 b-e	38 a-c	9 c-d	24 a-d	40 b-c	14 b-d
Kamaran	Bejo	22 c-e	63 a	5 c-d	7 c-d	73 a-b	11 b-d
Maverick	Nunhems	21 c-e	54 a-b	1 d	12 b-d	60 a-c	2 d
Nelson	Bejo	22 c-e	66 a	1 d	9 b-d	91 a	2 d
Rainbow	Bejo	20 c-e	61 a	3 c-d	7 c-d	70 a-b	6 c-d
SugarSnax 54	Nunhems	35 a-e	47 a-c	0 d	22 a-d	62 a-c	0 d
Sun 255	Nunhems	40 a-d	40 a-c	0 d	23 a-d	55 b-c	0 d
TenderSnax	Nunhems	49 a-c	43 a-c	0 d	33 a-c	59 a-c	0 d
Topcut 93	Nunhems	54 a-b	30 b-c	0 d	40 a-b	43 b-c	0 d
Tripleplay 58	Nunhems	63 a	30 b-c	0 d	43 a	44 b-c	0 d

[z] Percent number of roots=Percentage of roots for each three diameter categories.
[y] Percent weight=Percentage weight for each of the three diameter categories.
[x] Means followed by the same letter are not different based on Duncan's MRT where P=0.05.

Food Safety on Leafy Greens

Summer 2007

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Introduction and objective: The safety of fresh produce is extremely important for the U.S. food system. In the past, food-borne disease outbreaks made the news much less often. Recently, however, both the frequency of food-borne disease outbreaks and the publicity surrounding them have increased dramatically. A good example of what can occur was the 2006 food-borne outbreak from contaminated fresh spinach. Between August 23rd and October 6th of that year, 199 cases of illness were reported with 3 to 4 deaths attributed to the outbreak. The pathogen involved was E. coli O157:H7, which was carried on washed, bagged fresh spinach. The objective of this study was to initiate research efforts to lay the groundwork for future studies involving several crop groups. These studies will be designed to identify safe application timings for organic soil amendments in order to help prevent future food-borne disease outbreaks.

Methods: The study was conducted at the Oklahoma State University Vegetable Research station in Bixby, Oklahoma. Plots were arranged in a randomized block design with four replications, each plot consisted of 4 rows on 12 inch row centers, rows were 15 feet long. Included in the study was one treatment inoculated with generic E. coli and a non-inoculated control. Prior to planting or inoculation with E. coli the entire test area received 0.5 lb ai/acre of Treflan (trifluralin) incorporated to a depth of 1-2 inches with a tractor mounted rototiller. On 5/23/07 and 5/24/07 spent mushroom compost (SMC) was applied to all plots at a rate of approximately 180 lbs/plot providing an equivalent application rate of 65.3 tons/acre. Treatment plots inoculated with E. coli received SMC as a split application with 135 lbs/plot of non-inoculated SMC followed by 45 lbs/plot of SMC inoculated with about $3x10^9$ CFU (colony forming units) per gram of compost to yield an effective inoculation rate of about $3x10^4$ CFU / gram of applied SMC. All SMC applications were made uniformly to the surface of each plot then incorporated to a depth of 1.5 inches with one pass of a tractor mounted rototiller (non-inoculated plots first followed by inoculated plots). Following application and incorporation of the spent mushroom compost, plots were direct seeded to Purple Top White Globe turnip on 5/24/07 using a research cone planter at a seeding rate of approximately 500,000 seeds/acre (non-inoculated plots first followed by inoculated plots). Each plot had soil samples taken on 5/31/07, 6/07/07, 6/14/07, 6/21/07, 6/28/07, 7/05/07, and 7/12/07, leaf samples were collected on each date except for 5/31/07 and 6/07/07. Field samples were collected then transferred to the laboratory in an ice-chest with ice. Samples were processed the following day with coliform counts recorded on each of the seven sample dates and E. coli counts recorded for samples taken on 6/14/07 through 7/12/07.

Results and discussion: No predictable differences were observed for the average numbers of either coliform or E. coli bacteria in the soil or on turnip leaves for any of the sample dates (Tables 1-4). There are several reasons why this may have occurred. First, there was record breaking rainfall during the time that the study was conducted and some flooding of the plots did take place. Because of this, it is highly probable that E. coli was moved from treatment plots into non-inoculated control plots. Second, there is speculation that the spent mushroom compost may have some anti-microbial activity. Third, there was a detectable level of bacteria in the spent mushroom compost. All these are possible explanations for the absence of notable differences in bacterial counts between the treatment plots and the non-inoculated control plots.

In conclusion, the authors would recommend that these studies be repeated with some modifications, including the use of a different carrier medium to reduce the possibility of either adding or inhibiting the growth of bacteria to the treated and non-treated plots and testing in another season, when hopefully no flooding will occur.

Acknowledgements: The authors wish to thank Brian Kahn for sharing spent mushroom compost that was used in this study.

Table 1 – Average[1] Number of Coliform Bacteria Detected in Plot Soil

(CFU /gram soil)							
	5/31/07	**6/07/07**	**6/14/07**	**6/21/07**	**6/28/07**	**7/05/07**	**7/12/07**
Inoculated Plots	$2.28 x10^4$	$8.01 x10^3$	$3.80 x10^4$	$4.30 x10^3$	$3,19 x10^4$	$8.95 x10^4$	$9.19 x10^4$
Control Plots	$1.45 x10^3$	$1.73 x10^4$	$2.44 x10^5$	$2.61 x10^5$	$3.26 x10^5$	$1.78 x10^5$	$1.62 x10^5$

1. n = 4 plots.

Table 2 – Average[1] Number of *E. coli* Bacteria Detected in Plot Soil

(CFU /gram soil)					
	6/14/07	**6/21/07**	**6/28/07**	**7/05/07**	**7/12/07**
Inoculated Plots	$5.50 x10^2$	$4.5 x10^2$	<100	$6.25 x10^2$	<100
Control Plots	<100	<100	<100	<100	$1.00 x10^2$

1. n = 4 plots.

Table 3 – Average[1] Number of Coliform Bacteria Detected on Turnip Leaves

(CFU /gram leaf tissue)					
	6/14/07	**6/21/07**	**6/28/07**	**7/05/07**	**7/12/07**
Inoculated Plots	$1.57 x10^6$	$1.32 x10^6$	$4.55 x10^6$	$2.27 x10^6$	$1.24 x10^6$
Control Plots	$6.30 x10^5$	$1.53 x10^6$	$1.67 x10^6$	$3.54 x10^6$	$3.64 x10^5$

1. n = 4 plots.

Table 4 – Average[1] Number of *E. coli* Bacteria Detected on Turnip Leaves

(CFU /gram leaf tissue)					
	6/14/07	**6/21/07**	**6/28/07**	**7/05/07**	**7/12/07**
Inoculated Plots	$1.36 x10^5$	<100	<100	<100	<100
Control Plots	$2.37 x10^5$	$2.25 x10^2$	<100	<100	<100

1. n = 4 plots.

Greens Variety Trial

Fall 2007

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Introduction and objective: Brassica greens are an important commercial vegetable crop for producers within Oklahoma. These crops are grown for both processing and for fresh market. During the past few years as consumers have begun to give more consideration to the nutritional content of their diets, crops such as brassica greens have become more popular because of their high levels of vitamins and minerals. Cultivar trials are an important tool in for increasing production efficiency, particularly in regard to disease resistance. The objective of this trial was to observe improved cultivars of brassica greens for yield, quality, and disease resistance.

Methods: The study was completed at the Oklahoma State University Vegetable Research station in Bixby, Oklahoma. Plots were arranged in a randomized block design with four replications, each plot consisted of 4 rows on 12 inch row centers 20 feet long. Seeding rate was approximately 435,600 seeds per acre. Plots were direct seeded on 9/20/07 using a research cone planter. Weed control included 0.5 lb ai/acre of Treflan (trifluralin) applied pre-plant incorporated on 9/17/07 and some hand weeding. Other pest control efforts included two sprays for insect control, no fungicides were used for disease control. The study received 50 lbs N/acre using 46-0-0 on 10/05/07 and 100 lbs N/acre on 10/11/07 using 85 lbs N/acre from 46-0-0 and 15 lbs N/acre from 21-0-0-24. Nine cultivars were included in the study (Table 1). White rust infections in the study were naturally occurring and ratings were made at harvest time. The rating scale that was used was a 0 to 10 scale where 0 represents no visible symptoms and 10 represents 100% coverage of the crop leaves with white rust pustules. Data recorded at harvest included overall plot yields and disease ratings for white rust.

Results and discussion: White rust was only observed on the cultivar Indian Red Giant. Indian Red Giant had a white rust rating of 2.0 while all other cultivars had zero ratings. Kale yields were highest for Red Russian which yielded 9.7 tons/acre compared to Darkibor and Winterbor which had 5.8 and 5.5 tons/acre, respectively. Mustard yields did not vary significantly and were 9.4 and 8.5 tons/acre, respectively, for Indian Red Giant and Miike Giant. Mustard spinach yields were highest for Summer Fest and Green Boy which had yields of 15.7 and 13.7 tons/acre, respectively.

In general, the authors felt that there was a good distribution of white rust throughout the trial because of the consistent infection that was observed on Indian Red Giant mustard. Based upon this it appears that other cultivars in the trial are resistant to white rust. Yields were highest for mustard spinach with Summer Fest and Green Boy being the highest yielding cultivars in the trial. In conclusion, the authors would recommend that further trialing of these and additional cultivars be done in spring 2008 to provide an opportunity to observe how they will perform during a different season and environmental conditions.

Acknowledgements: The authors wish to thank Allen Canning Company for their support of this study.

Table 1. Fall 2007 Greens cultivar trial, Bixby, OK

Cultivar	Type	Company	White rust[z]	Yield tons/acre[y]
Red Russian	Kale	Pacific Seed	0 b[x]	9.7 bc
Darkibor	Kale	Bejo	0 b	5.8 d
Winterbor	Kale	Bejo	0 b	5.5 d
Indian Red Giant	Mustard	Takii	2 a	9.4 bc
Miike Giant	Mustard	Takii	0 b	8.5 c
Choho	Mustard spinach	Takii	0 b	10.9 b
Green Boy	Mustard spinach	Takii	0 b	13.7 a
Misome	Mustard spinach	Takii	0 b	11.0 b
Summer Fest	Mustard spinach	Takii	0 b	15.7 a

[z] White Rust 0-10 scale, 0=no white rust, 10=leaf 100% covered by white rust.
[y]Yield data on 11/8/07.
[x]Numbers in a column followed by the same letter exhibited no significant differences based on Duncan's Multiple Range Test where P=0.05.

Radish Variety Trial

Bixby, OK

Brian Kahn, Lynda Wells, Jeff Spears, Robert Havener, Robert Adams

Introduction and Objectives: Radishes are of interest to several local Oklahoma market outlets, including CSA's, farmers markets, and the Farm-to-School program. Hybrid varieties have recently become more common and current trial information is needed. The objective of this trial was to compare yields of 8 radish varieties, including 4 hybrids and 4 open-pollinated varieties.

Materials and Methods: The data reported here were generated from a larger experiment involving various compost treatments. The soil was prepared with a broadcast, preplant-incorporated application of urea to supply 50 lbs/acre of N on March 19. Trifluralin at 0.5 lbs/acre (a.i.) was applied and incorporated on March 22 for weed control. Various treatments of spent mushroom compost and yard waste compost were subsequently applied to the plots and lightly incorporated on April 3, followed by seeding of the radishes with a cone planter at a target rate of 18 seeds/foot of row. Seeding was on non-raised beds 6 feet wide, with four rows per bed spaced 1 foot apart. Experimental units were 15 feet long and consisted of two rows of one variety and two rows of a second variety, with only the middle rows (one per variety) used for data. No thinning was done. Plots were irrigated as needed using overhead sprinklers. Two once-over harvests were done, one on May 10 and another on May 18. Each time, all plants in a 1 meter (39 inch) section of row were pulled by hand, washed, graded into marketable and cull roots, counted, and weighed with tops intact. Marketable roots then had their tops removed and were weighed again. The minimum marketable root diameter was 5/8 inch, per USDA grading standards. For purposes of this report, data were combined over the two harvests and across compost treatments and the three replications; the only dependent variable in the analysis of variance was variety.

Results and Discussion: Overall, the hybrid group outyielded the open-pollinated group. 'Red Satin' stood out as a relatively early, large, attractive variety. The other three hybrids did not differ from each other in marketable yield Within the open-pollinated group, 'Fuego', 'Champion', and 'Cherry Belle' did not differ from each other in marketable yield. However, 'Fuego' was considered the best open-pollinated variety in that its marketable yield was similar to that of two of the hybrids. 'Fuego' also had an attractive, dark red root color. 'Red Silk' did poorly, although its marketable yield did not differ from that of 'Cherry Belle'. The greater vigor and yield potential make the hybrids a good choice for most producers. 'Fuego' was promising for those preferring an open-pollinated variety, while 'Red Silk' would not be recommended.

Table 1. Radish Variety Trial, Bixby, Spring 2007

Variety	Company/source	Genetics	Marketable yield[z] (ounces/yard)
Red Satin	Seedway	Hybrid	13.4 a[y]
Fireball	Sakata	Hybrid	8.4 b
Cherriette	Sakata	Hybrid	8.0 bc
Crunchy Royale	Sakata	Hybrid	7.3 bcd
Fuego	Rupp	Open-pollinated	5.5 cde
Champion	Seedway	Open-pollinated	5.2 de
Cherry Belle	Seedway	Open-pollinated	3.4 ef
Red Silk	Seedway	Open-pollinated	2.4 f
	Mean		6.7

[z]Mean yield of washed, topped, marketable roots per yard of row; average of two harvests.

[y]Means followed by the same letter do not differ according to Duncan's Multiple Range Test, 5% level.

Snapbean Trial

Spring 2007

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Introduction and objective: Snapbean is an important crop for Oklahoma producers accounting for a significant portion of vegetable crop acreage within the state. Producers have traditionally produced snapbeans for use by the canning industry, with some acreage for fresh market. One need that producers have is to widen the planting-marketing window for this crop. Planting is usually limited to early spring plantings and possibly fall plantings due to problems with pod set from high summer temperatures. This study was undertaken to determine what cultivars are more tolerant to high temperatures regarding pod set.

Methods: The study was completed at the Oklahoma State Vegetable Research station in Bixby, Oklahoma. Plots were arranged in a randomized block design with three replications, each plot consisting of 1 row 20 feet long. Nineteen snapbean cultivars were included in the trial. Plots were direct seeded on 5/14/07 using a research cone planter with row centers 36 inches apart at a seeding rate of approximately 10 seeds per foot. Weed control included 0.95 lb ai/acre of Dual Magnum (s-metolachlor) applied PRE immediately following planting and some hand weeding. Plots were fertilized with a total of 50 lbs of N per acre split between two applications. Cultivars were harvested on two different dates 7/06/07, 7/09/07, with harvest date determined by removing 10 seeds from pods of a cultivar then measuring the length of the seeds when placed end to end. Plots were harvested when 10 seeds were approximately 110 mm in length. One meter of each plot was harvested. Data recorded at harvest included ratings for vigor, lodging, pod rot, yield, and quality data.

Results and discussion: Vigor was rated on a 1 to 5 scale with 1 being poor vigor evidenced by slow growth and 5 being excellent growth. Igloo, GB 84, and Gold Rush had the highest vigor ratings of 4.5, 3.8, and 3.5, respectively (Table 1). Plants per foot recorded at harvest provided a view of seed viability and seedling survival. Gold Rush and Titan had the highest number of plants per foot with 9.1 and 9.0 plants per foot, respectively. Lodging ranged from a low of 7% for SB4285 to a high of 27% for Ambra and Envy. Culls were relatively low for the trial ranging from zero to approximately 15 bushels/acre. Marketable yield ranged from a low of 56 bushels/acre to a high of 187 bushels/acre. Ulysses, Dart, and Gold Rush were the highest yielding cultivars in the trial with 187, 154, and 150 bushels/acre yields, respectively.

Pod quality ratings were recorded at harvest and indicate the overall quality of pods considering color, length, uniformity of shape, seed size and other general visual parameters. Caprice and Dart had the highest pod quality with ratings of 4.8 and 4.3, respectively (Table 2). Pod rot ratings ranged from a low of 1.0 for GB 84 and Igloo to a high of 3.8 for Embassy. The percentage of pod weight was highest for Gold Rush and Ulysses which had 42 and 40%, respectively. Pod length was longest for Igloo and Ulysses which averaged 4.3 and 4.0 inches long, respectively. The pod set height varied from a low of 5.0 inches for SB4285 to a high of 9.3 inches for Igloo.

In conclusion, this year's trial did not experience the high temperatures of 2006, hence it was difficult to differentiate between cultivars regarding their performance at high temperatures. With the abundant rainfall received this year it provided a unique opportunity to observe how resistant cultivars were to various pod rots (*Pythium* sp. primarily). Although no analysis of correlation between pod rot ratings and pod set height was done it is interesting to note that the two cultivars with the least amount of pod rot were the highest pod setting cultivars GB 84 and Igloo).

Acknowledgements: The authors wish to thank Allen Canning, Asgrow-Seminis, Harris Moran, Pureline, and Syngenta seeds for support of this study.

Table 1. Snap bean variety trial, Bixby, Oklahoma. Planted 5/16/06, vigor, plants/ft, % lodging, Cull weight, Market yield.

Variety	Source	Vigor[z]	Plants/ft [z]	% lodging[y]	Cull wt. (bu/acre)[x]	Mkt. Yield (bu/acre)[x]
Ambra	Harris Moran	2.7 b-e [w]	8.8 a	27 a	6.5 a	121 a
Caprice	Harris Moran	2.7 b-e	8.3 a-b	12 a	5.2 a	143 a
Cruiser	Asgrow/Seminis	1.3 e	2.7 e	15 a	4.7 a	56 a
Dart	Harris Moran	2.7 b-e	8.5 a-b	10 a	9.8 a	154 a
Diplomat	Syngenta	3.3 a-d	7.0 a-d	15 a	2.4 a	78 a
Ebro	Asgrow/Seminis	2.7 b-e	6.8 a-d	10 a	6.9 a	100 a
Embassy	Syngenta	1.8 c-e	8.0 a-b	30 a	8.8 a	61 a
Envy	Harris Moran	2.5 b-e	5.6 c-d	27 a	6.5 a	96 a
GB 83	Pureline	2.7 b-e	7.9 a-b	15 a	9.5 a	143 a
GB 84	Pureline	3.8 a-b	5.6 c-d	12 a	0 a	90 a
Gold Rush	Pureline	3.5 a-c	9.1 a	15 a	9.6 a	150 a
Hayden	Syngenta	1.7 d-e	6.4 b-d	18 a	7.3 a	118 a
Herrera	Syngenta	1.8 c-e	5.0 d	13 a	9.8 a	99 a
Igloo	Pureline	4.5 a	8.5 a-b	5 a	2.2 a	88 a
Roma II	Syngenta	3.3 a-d	5.3 c-d	10 a	7.0 a	125 a
SB4285	Syngenta	1.7 d-e	7.3 a-c	7 a	1.2 a	92 a
Tapia	Asgrow/Seminis	2.3 b-e	7.4 a-c	8 a	10.6 a	107 a
Titan	Asgrow/Seminis	2.0 c-e	9.0 a	17 a	5.3 a	81 a
Ulysses	Asgrow/Seminis	2.3 b-e	8.4 a-b	25 a	14.7 a	187 a

[z] Vigor =1-5 scale, 1=poor, 5=excellent.
[y] %Lodging=percentage of plants that lodged.
[x] Cull weight and Yield=bushels per acre, one bushel=30 lbs.
[w] Numbers followed by the same letter are not significantly different based upon Duncan's multiple range test with P=0.05.

Table 2. Snap bean variety trial, Bixby, Oklahoma. 2007 pod quality measurements including: pod quality ratings, pod rot, pod weight, pod length, pod set height.

Variety	Source	Pod quality [z]	Pod Rot [y]	Pod weight (%)[x]	Pod length(in)	Pod set Height (in.)[w]
Ambra	Harris Moran	3.5 c-d [w]	3.0 a-c	34 a-d	3.8 a-c	8.3 a-c
Caprice	Harris Moran	4.8 a	2.3 a-e	36 a-c	3.4 c-d	8.0 a-d
Cruiser	Asgrow/Seminis	3.7 b-d	1.8 b-e	25 c-e	3.8 a-c	5.3 e
Dart	Harris Moran	4.3 a-b	1.7 c-e	33 a-e	3.7 a-c	8.3 a-c
Diplomat	Syngenta	3.7 b-d	2.0 b-e	22 d-e	3.6 b-d	8.0 a-d
Ebro	Asgrow/Seminis	2.7 e-f	1.3 d-e	27 b-e	3.5 b-d	8.7 a-c
Embassy	Syngenta	3.3 c-e	3.8 a	26 c-e	3.7 a-c	5.7 d-e
Envy	Harris Moran	4.0 b-c	2.8 a-d	31 a-e	3.5 b-d	8.3 a-c
GB 83	Pureline	3.2 d-e	2.7 a-d	32 a-e	3.9 a-c	7.0 a-e
GB 84	Pureline	3.5 c-d	1.0 e	28 b-e	3.7 a-c	9.0 a-b
Gold Rush	Pureline	3.0 d-f	2.0 b-e	42 a	3.7 a-c	7.3 a-e
Hayden	Syngenta	3.2 d-e	2.2 b-e	39 a-b	3.6 b-d	6.7 b-e
Herrera	Syngenta	3.0 d-f	2.0 b-e	32 a-e	3.0 d	6.3 c-e
Igloo	Pureline	3.2 d-e	1.0 e	21 e	4.3 a	9.3 a
Roma II	Syngenta	2.3 f	1.7 c-e	39 a-b	3.6 b-d	8.0 a-d
SB4285	Syngenta	3.7 b-d	2.3 a-e	31 a-e	3.4 b-d	5.0 e
Tapia	Asgrow/Seminis	2.7 e-f	1.5 c-e	27 b-e	3.3 c-d	6.7 b-e
Titan	Asgrow/Seminis	3.8 b-d	1.8 b-e	30 a-e	3.6 b-d	7.0 a-e
Ulysses	Asgrow/Seminis	3.8 b-d	3.3 a-b	40 a-b	4.0 a-b	6.3 c-e

[z] Pod quality=1-5 rating, 1=poor, 5=excellent.
[y] Pod rot=1-5 rating, 1=no pod rot, 5=most all pods have rot.
[x] Pod weight % = total pod weight/total weight of plants and pods x 100.
[w] Numbers followed by the same letter are not significantly different based upon Duncan's multiple range test with P=0.05.

Specialty Melon Variety Trial

Bixby, OK Spring 2007

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Oklahoma State University in cooperation with the
Oklahoma Department of Food and Forestry

Introduction and Objective: A preliminary specialty melon demonstration was carried out in 2006 at the Vegetable Research Station in Bixby. The demonstration included thirteen specialty melons of various types (Galia, Ananas, Canary, Crenshaw, Piel de Sapo). Melons were evaluated for several quality factors and plans were made for a replicated trial in 2007. Because of producer interest in the Galia types the 2007 trial concentrated on these melons and also included a few others. The objective of this trial was to determine quality and yield potential of twelve different melon cultivars for use by fresh market producers.

Methods: The study was conducted at the Vegetable Research Station in Bixby, Oklahoma. Plots were arranged in a randomized block design with three replications, each plot consisting of one row 24 feet long. The trial utilized raised beds spaced 6 feet apart covered with black plastic mulch and provided with buried drip tape for irrigation. Soil bedding, drip tape application, and mulch application were carried out on 4/21/07. Weed control between the covered beds included a preemergence application on 4/23/07 of Sandea (halosulfuron) + Curbit (ethalfluralin) at 0.016 and 0.75 lbs ai/acre, respectively. Twelve melon cultivars were direct seeded on 5/14/07 after punching holes through the plastic mulch at an in-row spacing of 2 feet. Seeding rate was 3 to 4 seeds per hole. Plants were later thinned to the best 2 per hole. The trial was fertilized through the drip irrigation system. Plots were harvested on 11 different dates beginning on 7/20/07 and ending on 8/17/07. Data recorded at harvest included individual fruit weights, number of culls, and soluble solids. A melon tasting was done on 8/06/07 with participants rating each cultivar for exterior appearance, interior appearance, taste, and overall preference. All ratings were made on a 0 to 10 scale with 0 representing the worst and 10 representing the best.

Results and Discussion: Three cultivars did not have adequate stands after thinning and were excluded from the analysis of variance. Stand problems resulted from field-related factors and not poor cultivar performance for Courier and Super 45, while Sweetie No. 6 had limited early seedling vigor (likely due to its small seeds).

All cultivars had some fruits culled due to superficial rind cracks. This problem was severe in Sweetie No. 6, and reportedly has occurred in trials in other states. As a result, this cultivar may be withdrawn from the market. Many fruit of Galia Max also were culled due to cracking. All cultivars also had some fruits culled due to disease spots on the rind. This was the predominant problem with Sensation, and was a common reason for culling with Deneb, Merak, and Passport.

Galia types: External appearance varied in this group. Galia Max looked like a large conventional netted muskmelon. Deneb and Merak were round and had a yellowish ground color that made determining maturity a challenge; however, the overall appearance tended to be good. Arava, Courier, Diplomat, Passport, and Visa looked relatively similar to each other. Passport was the earliest melon in the trial. The flavor of Arava seemed to vary more than most from one melon to another. Diplomat had the poorest performance in this group, but no one best melon was evident. Cultivar appearance should be considered for acceptance in specific markets.

Charentais types: These are the “true” European cantaloupes. They had sparse (Serenade) or no (Sweetie No. 6) netting and firm, very sugary orange flesh. Serenade was popular with the taste panel and may be a good choice for those with a market for this type of small melon. Determining maturity, however, may be a challenge.

Others: Sensation does not fit other melon classes. It was popular with the taste panel, but had a low yield and a lot of culls due to diseased fruit. The flavor could be a selling point, but it may require intensive disease management. Super 45 is a conventional Western shipper muskmelon. The taste panel was most familiar with this type of fruit, so its popularity was not surprising.

Table 1. Speciality Melon Variety Trial, Bixby, OK 2007

		Fruit weight/acre (1000 lbs)^z				Fruit number/acre (1000's)^z			Fruit size (lbs)		
Variety	**Seed source**	**Mkt**	**Early mkt ^y**	**Culls**	**Total**	**Mkt**	**Culls**	**Total**	**Mkt**	**All**	**Soluble solids (%) ^x**
Galia Max	Hollar	40.8	2.1	23.9	64.7	7.6	4.5	12.1	5.1	5.5	9.0
Deneb	Syngenta	38.4	0.6	7.0	45.4	10.0	2.4	12.1	3.2	3.5	8.4
Visa	Hollar	35.4	10.3	22.4	57.8	9.7	6.0	15.4	3.3	3.7	8.1
Merak	Syngenta	32.4	1.2	15.4	47.8	8.8	4.5	13.3	3.1	3.4	9.3
Arava	Johnny's	32.4	11.2	9.1	41.4	9.1	3.3	12.1	3.5	3.3	7.1
Serenade	Johnny's	29.9	3.6	3.3	33.3	16.9	1.8	18.8	1.7	1.8	15.7
Passport	Hollar	28.7	21.2	12.7	41.4	7.9	3.6	11.5	3.0	3.3	7.2
Diplomat	Hollar	15.7	4.8	21.5	37.2	5.1	5.7	10.9	2.5	3.3	7.8
Sensation	Hollar	13.0	4.8	11.5	24.5	3.6	3.6	7.0	3.1	3.4	9.7
	Mean	29.6	6.7	14.2	43.9	8.8	3.9	12.7	3.1	3.5	9.1
	$LSD_{0.05}$	19.4	9.1	9.4	28.7	5.1	2.7	5.7	0.9	0.6	1.7
Courier	Hollar	27.5	1.5	4.8	32.4	6.7	1.5	8.2	3.8	3.9	8.6
Super 45	Willhite	15.1	0.6	1.8	16.9	4.2	0.6	4.8	3.0	3.4	9.5
Sweetie No. 6	Johnny's	9.7	5.1	13.9	23.6	6.4	8.2	14.5	1.2	1.7	14.0
	Overall mean	26.6	5.4	12.4	39.0	7.9	3.9	11.8	3.0	3.3	9.5

^z Yields in lbs/acre and number of fruit/acre were calculated from plot yields. Harvested: 7/20/07 to 8/17/07 (11 picks).
^y Early harvest 7/20/07 to 7/30/07 (4 picks).
^x Soluble solids=percent soluble solids using a refractometer. Two readings done per variety at each harvest if available.

Table 2. Speciality Melon Variety Trial, Bixby, OK 2007 Melon tasting

Variety	**Seed source**	**Exterior appearance ^z**	**Interior appearance ^z**	**Taste ^z**	**Overall ^z**
Arava	Johnny's	7.6	6.8	5.1	6.3
Courier	Hollar	6.3	6.1	4.0	4.9
Deneb	Syngenta	6.6	6.9	4.6	6.4
Diplomat	Hollar	6.7	6.2	3.6	4.7
Galia Max	Hollar	7.8	7.1	4.6	5.6
Merak	Syngenta	6.7	6.7	5.5	5.6
Passport	Hollar	6.1	7.2	3.4	4.8
Sensation	Hollar	7.4	7.8	6.9	8.1
Serenade	Johnny's	7.2	8.5	8.4	8.3
Sweetie No. 6	Johnny's	6.6	6.6	6.2	6.3
Visa	Hollar	7.9	7.7	4.6	5.9
Super 45	Willhite	8.9	9.1	7.7	8.8
	Mean	7.2	7.2	5.4	6.3
	$LSD_{0.05}$	NS	NS	2.2	2.1

^z 0-10 scale, 10 being best, based on 11 participants August 6, 2007

Spinach Nutritional Study

Spring 2007

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Introduction and objective: Nitrogen fertilization of cool season leafy greens crops such as spinach is different from warm season crops. Part of what makes it different is the influence of cold weather. One question that has surfaced in the last few years is how temperature affects the availability of nitrogen from different sources such as urea or nitrate forms. Although producers would often prefer using urea as a nitrogen source because of its availability in the market place, there are concerns about nitrogen availability from this source at cool temperatures in the fall-winter-spring growing season that many greens crops are produced in. The objective of this study was to determine the feasibility of using urea (46-0-0) as a primary source of nitrogen for spring grown spinach compared to ammonium nitrate (34-0-0).

Methods: The study was completed at the Oklahoma State University Vegetable Research station in Bixby, Oklahoma. Plots were arranged in a randomized block design with four replications, each plot consisting of 4 rows of spinach on 12 inch row centers 20 feet long. Seeding rate was approximately 250,000 seeds per acre. On 3/12/07, plots received their pre-plant fertilizer treatments and were lightly tilled then direct seeded to the spinach cultivar Padre using a research cone planter. Weed control included 0.65 lb ai/acre of Dual Magnum (S-metolachlor) applied PRE immediately following planting and some hand weeding. Plots were replanted on 4/05/07 due to flood damage. Eight treatments were included in the study with four rates of nitrogen and two nitrogen sources, either urea or ammonium nitrate (Table 1). Data recorded at harvest included overall plot yields. Soil samples were taken from each plot prior to study initiation on 3/12/07 and following harvest on 6/06/07 and were analyzed for pH, N-PK.

Results and discussion: Although yields did not vary significantly for any of the treatments in the study (Table 2) there was considerable variability between replications as a result of record breaking rainfall. In general, yield increased with increasing rates of nitrogen. At most rates of nitrogen, ammonium nitrate (34-0-0) treatments had higher yields than the urea (46-0-0) treatments. Soil test results for pH, P and K were not different for treatment plots for either the pre-study or post-study analysis. Pre-study levels of P and K were adequate for field production of spinach ranging from 106 to 114 lbs of P_2O_5/acre and 171 to 194 lbs of K_2O/acre. Pre-study nitrogen levels did not vary between treatment plots and ranged from 5.8 to 8.5 lbs of N/acre. Post-study nitrogen levels varied significantly for several treatments. The 34-0-0 and 46-0-0 treatments at 115 lbs N/acre had significantly lower levels of residual N post-study than all other treatments, 35 and 34 lbs N/acre, respectively. The two middle rates of N (236 and 365 lbs) did not vary for post-study residual nitrogen among themselves. Post-study N levels for the 485 lbs N/acre rate had significantly higher levels of residual N than several of the treatments. The high rate of ammonium nitrate had 200 lbs of N, significantly higher than any other treatment while the highest rate of urea had 139 lbs of residual nitrogen.

In conclusion, although there was considerable variability between replications, there were strong trends observed in the study for different forms and levels of nitrogen and their effect upon yields. It would be beneficial to repeat these studies to determine if these trends would become significant during seasons that did not receive record rainfall. Furthermore, based on the results, considerable amounts of residual nitrogen remained from the higher rates of nitrogen while the crop did not necessarily respond with corresponding increases in yield. Producers should take into consideration the cost and benefits of increased nitrogen application and what to do about residual nitrogen that is left in the soil following the completion of a cropping cycle.

Acknowledgements: The authors wish to thank Allen Canning Company for their support of this study.

Table 1. Spring 2007 spinach fertility study, Bixby, OK. Treatment list including application dates, N-P-K rates and nitrogen sources.

Date applied	34-0-0	46-0-0	34-0-0	46-0-0	34-0-0	46-0-0	34-0-0	46-0-0
3/12/07	16-16-16[z]	16-16-16	28-16-16	28-16-16	51-16-16	51-16-16	68-16-16	68-16-16
4/26/07	10-0-0	10-0-0	15-0-0	15-0-0	32-0-0	32-0-0	42-0-0	42-0-0
5/11/07[y]	35-0-0	35-0-0	70-0-0	70-0-0	90-0-0	90-0-0	120-0-0	120-0-0
5/18/07[y]	35-0-0	35-0-0	70-0-0	70-0-0	90-0-0	90-0-0	120-0-0	120-0-0
5/31/07	19-0-0	19-0-0	53-0-0	53-0-0	102-0-0	102-0-0	135-0-0	135-0-0
Total N-P-K	115-16-16	115-16-16	236-16-16	236-16-16	365-16-16	365-16-16	485-16-16	485-16-16

[z] Preplant fertilizer applications made on 3/12/07 included 16 lbs of N-P-K/acre applied to all plots utilizing 17-17-17 fertilizer, nitrogen rates above 16 lbs/acre utilized the appropriate nitrogen fertilizer to make up the difference (34-0-0 or 46-0-0).

[y] All treatment applications on 5/11/07 and 5/18/07 included 21-0-0-24 at a rate of 100 lbs/acre as a source of sulfur for all treatments, resulting in all treatments receiving a total of 48 lbs of sulfur/acre rate, nitrogen rates above 21 lbs/acre utilized the appropriate nitrogen fertilizer to make up the difference (34-0-0 or 46-0-0).

Table 2. Spring 2007 spinach fertility study, Bixby, OK. Yield, pH, and nitrogen levels.

Treatments		Yield lbs/acre	pH	Nitrogen lbs/acre	
Fertilizer	**lbs/acre**	**6/04/07**	**3/12/07**	**3/12/07**	**6/06/07**
34-0-0	115	3405 a[z]	6.7 a	8.5 a	35 d
46-0-0	115	2213 a	6.7 a	7.0 a	34 d
34-0-0	236	4333 a	6.7 a	6.0 a	103 bc
46-0-0	236	5850 a	6.7 a	7.8 a	79 c
34-0-0	365	9180 a	6.8 a	7.3 a	106 bc
46-0-0	365	6781 a	6.6 a	6.3 a	118 bc
34-0-0	485	9751 a	6.9 a	5.8 a	200 a
46-0-0	485	7150 a	6.8 a	8.5 a	139 b

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

Summer Squash Variety Trial

Bixby, OK 2007

Brian Kahn, Lynda Wells, Robert Havener and Robert Adams

Introduction and Objectives: Summer squashes are picked while still small and immature, and have thin edible skins. The three main kinds of summer squash grown in Oklahoma are green zucchini, yellow straightneck, and yellow crookneck. This year's trial was conducted at the Bixby Vegetable Research Station and featured 10 varieties of yellow straightneck summer squash.

Materials and Methods: Raised beds were created on 5' centers, with trickle irrigation tubing buried down the center of each bed but without plastic mulch. Varieties were direct seeded on May 14, 2007. Five seeds were sown per "hill" with 3 hills per plot and hills 2' apart within rows. Plots were 6' long and were arranged in a randomized block design with 3 replications. Rain had prevented preplant fertilization, so plots were topdressed with 60 lbs/acre of N from urea on May 31. Final thinning to 2 plants per hill occurred on June 5. Plants were sidedressed with 70 lbs/acre of N from urea on June 19. Additional fertilizer was supplied periodically through the trickle irrigation system. Insecticides were applied twice prior to harvesting. Plants were harvested 3 times a week starting on June 25 and final harvest on July 20 with 11 picks total.

Results and discussion: 'Superpik' and 'Fortune' were the best overall cultivars in the trial. At least one type of mosaic virus was present in the trial, but infection was too variable to rate. However, the resistance of 'Conqueror III' appeared to hold up well, while 'Enterprise' was distinctly susceptible. Most of the cultivars rating 3.5 or 4 for fruit appearance were variable in shape. 'Cougar' fruit had a good light yellow color, but many were distinctly bulbous below a neck, making them look overmature.

Table 1. Summer Squash Variety Trial, Bixby, 2007 (Yellow Straightneck type)

Variety^{y}	Company/ source	Yield (ctns/A)^{z} Market	Early mkt.^{y}	Culls^{x}	Total^{w}	Avg. mkt. fruit wt. (lbs.)	Fruit Appearance Ratings^{v}
Superpik	Harris	499	195	267	767	0.39	2
Fortune	Syngenta	388	154	289	677	0.40	2.5
Sunray	Harris	348	124	205	554	0.40	3.5
Conqueror III	Seedway	327	150	292	619	0.41	3.5
Cougar	Harris	318	177	293	611	0.38	4
Patriot II	Rupp	315	127	381	697	0.44	4
Goldbar	Rupp	276	150	241	517	0.37	3.5
Daisey	Rupp	235	114	290	524	0.39	3
Liberator III	Seedway	232	138	278	510	0.44	3.5
Enterprise	Syngenta	211	124	285	496	0.37	4
	Mean	315	145	282	597	0.40	3.3
	$LSD_{0.05}$	155	NS	NS	NS	NS	- -

^{z}One carton=42 pounds
^{y}Early market = harvest dates 6/25/07 to 7/3/07 (4 picks)
^{x}Predominant reason for culls was overmature fruit.
^{w}Total yield=market + culls
^{v}Overall appearance rating: 1=best, 5=worst; in order: shape, uniformity, color, defects.

Sweet Corn Variety Trial

Bixby, Oklahoma, Spring 2007

Brian Kahn, Lynda Wells, Robert Havener and Robert Adams

Introduction and Objectives: High quality sweet corn is a very popular vegetable in Oklahoma. Small scale production can be sold directly on the farm or at roadside stands, farmer's markets and local stores. Large scale production requires a considerable investment in harvesting equipment and packing facilities. Corn earworm is a serious insect pest, and sweet corn production should not be attempted without an adequate insecticide spray program during the silking to harvest stages.

The genetics of sweetness in corn have become increasingly complicated. For many years, varieties could be classified as either normal sweet (su_1), sugary-enhanced (se), or supersweet (sh_2). Now varieties with genetic combinations have been introduced to the market. Check with your seed company representative before planting a new variety to learn about isolation requirements.

Objectives of this trial were to evaluate 22 varieties (yellow or bicolor) from the sh_2 isolation group for yield, earliness, and overall quality.

Materials and Methods: Plots were direct seeded on May 17. Plots were 20 ft long with 3 feet between rows and 2 rows per plot. Varieties were replicated 3 times in a randomized block design. Plots were sprayed with S-metolachlor herbicide on May 18, at the rate of ¾ pint/acre. Plots were thinned to 20 plants per row on June 7. Plant vigor ratings also were taken on June 7. Fertilizer was applied two times, May 17 at 50 lbs. N/acre and June 19 at 75 lbs. N/acre. Insecticide applications began on July 3 (just before silking) and continued throughout the harvest period. Supplemental water was applied with overhead irrigation. Each variety was harvested one time at its peak maturity.

Results and Summary: Results are shown on the following page. The standard of comparison was 'GSS 0966'. Wildlife damage resulted in some plot-to-plot variability. Statistical differences could not be demonstrated for number of sacks per acre as the coefficient of variation (c.v.) was 33. However, a separate analysis using the two best replications (not presented) indicated a top grouping of 'Obsession', 'Ranger', 'XtraTender 282A', 'Surpass', and 'BSS 0982'. When combined with differences in marketable tons per acre, this top grouping expanded to include 'Passion' and 'Optimum'. Only 'Obsession' and 'Passion' statistically exceeded 'GSS 0966' in marketable tons per acre. 'Optimum' has done well for an early corn in our last three trials, although ear appearance may not always match that of later cultivars. The Attribute® corns generally showed good earworm resistance, as expected.

One objective of this trial was to compare several Mirai™ cultivars with other sweet corns. Mirai™ cultivars are marketed as having particularly good eating quality. Taste is very subjective; however, several people in our research group tested Mirai™ cultivars against others harvested on the same days, and most felt that the eating quality was very good. After three years of testing, it appears the Mirai™ cultivars are not as well adapted to Oklahoma as some others, especially the initial releases numbered in the 100's. One reason for this is that they tend to be early, and Oklahoma's long growing season favors full-season cultivars. However, for Oklahoma markets where volume of production is less important and a premium can be earned for outstanding flavor, the Mirai™ cultivars are worth considering. We definitely would encourage those growing Mirai™ cultivars to follow a good corn earworm management program and to carefully follow guidelines provided by Centest, including attention to stand establishment.

Producers should consider data from several years before selecting varieties, and always test a new variety on a small acreage at first.

Table 1. Spring 2007 Sweet Corn Variety Trial, Bixby[z].

Variety[y]	Company/ Source	Genetics/ Color	Stand rating[y]	Market yield (sacks/ A)[x]	Yield (tons/A)		Number days to harvest	In-shuck rating[w]	Shucked rating[w]	Avg ear dia. (inches)	Avg ear length (inches)	Corn earworm damage[v]
					Market	Culls						
Obsession	Seedway	bicolor	4.5	359	6.3	0.3	64	1.7	1.5	1.7	7.9	2.0
Passion	Seedway	yellow	4.7	299	7.0	0.3	67	3.2	1.5	1.9	8.0	2.0
Optimum	Crookham	bicolor	3.8	287	4.6	0.3	64	3.3	3.0	1.8	7.3	3.0
BSS 0982	Syngenta	Attribute® bicolor	4.5	283	5.2	0.2	67	1.7	2.2	1.9	7.7	1.3
Ranger	Seedway	yellow	4.0	279	5.3	0.4	70	2.8	2.2	1.8	7.1	2.0
Xtra Tender 282A	Harris	bicolor	4.7	271	4.6	0.3	67	1.7	2.2	1.9	7.3	2.7
BSS 0977	Syngenta	Attribute® bicolor	4.3	258	4.4	0.1	70	2.0	1.5	1.8	7.1	1.0
XTH 1575	Seedway	yellow	3.5	250	4.3	0.5	62	1.7	2.5	1.6	7.6	2.0
Fantastic	Seedway	bicolor	4.0	238	4.0	0.6	60	2.2	2.7	1.7	7.5	2.7
Overland	Syngenta	yellow	4.3	230	4.4	0.3	70	2.5	1.5	2.0	8.3	2.7
Surpass	Crookham	bicolor	3.5	230	3.4	0.5	64	3.8	2.5	1.7	7.2	3.3
GSS 0966	Syngenta	Attribute® yellow	4.8	226	3.8	0.1	70	1.7	1.2	1.9	7.1	1.0
Mirai 350BC	Centest	bicolor	4.2	226	4.2	0.2	62	3.5	2.3	1.8	7.5	2.0
Mirai 301BC	Centest	bicolor	3.3	212	3.4	0.3	62	3.0	2.3	1.8	7.8	2.0
Double Up	Syngenta	bicolor	4.7	203	3.7	0.1	60	2.5	2.2	1.7	7.9	2.7
Mirai 336BC	Centest	bicolor	4.5	203	3.8	0.4	64	2.5	2.7	1.9	8.2	3.0
Xtra Tender 278A	Seedway	bicolor	3.0	203	3.6	1.0	67	2.0	2.8	1.9	7.9	2.0
Mirai 302BC	Centest	bicolor	3.8	201	3.7	0.6	64	3.0	2.0	2.0	7.9	2.3
Mirai 308BC	Centest	bicolor	3.0	181	2.8	0.2	62	3.5	2.8	1.7	7.2	3.0
Mirai 148Y	Centest	yellow	3.8	160	2.7	0.6	60	3.3	2.3	1.7	8.1	2.7
Mirai 130Y	Centest	yellow	4.0	114	1.9	0.1	60	4.0	2.5	1.8	7.7	2.5
Mirai 131Y	Centest	yellow	3.8	111	1.8	0.2	60	2.8	2.8	1.7	7.9	2.5
		Mean	4.1	233	4.1	0.4	64	2.6	2.2	1.8	7.7	2.3
		$LSD_{0.05}$	0.6	NS	2.4	NS	--	0.6	0.5	0.1	0.3	0.7

[z]Seeded May 17, 2007; Plot size: 1.8m x 6.0m (2 rows/plot, 3 plots each variety, plots thinned to 20 plants/row.) Harvested 7/16/07 to 7/26/07

[y]Rating: 1=may not make stand, 2= minimal stand, 3=average vigor and some thinning needed, 4=good vigor and must thin, 5=excellent vigor and must thin. Ratings were taken on June 7, 2007.

[x]One sack = 60 ears

[w]Rating: 1=best, 5=poorest

[w]Rating: 1=no damage, 2=earworm damage <½" from tip, 3=earworm damage <1" from tip, 4=earworm damage <1½" from tip, 5=earworm damage >1½" from tip.

[v]Earworm control: Pounce, Asana & Lannate were alternated and applied a total of 7 times between silking & harvest to entire planting.

Watermelon Fertility Study

Summer 2007

Lynn Brandenberger, Hailin Zhang, Lynda Wells
Oklahoma State University
Cooperating with Dennis and Virgil Slagell SSS Farms, Hydro, Oklahoma

Introduction and objective: Fertilizer use in commercial watermelon production often includes the use of nitrogen (N) at rates between 100 to 120 pounds of N/acre and potassium (K) at up to 250 pounds of K_2O/acre. A preliminary study completed in 2006 demonstrated that lower rates of N and P did not affect yield in commercial watermelons. The objective of this year's study was to determine if this would hold true in a subsequent year with different weather conditions.

Methods: The study was completed in summer 2007 at the SSS Farm near Hydro, Oklahoma. It included a randomized block design with three replications with 4 treatments made up of different rates of nitrogen and potassium (Table 1).The study was transplanted on 5/22/07 to 80% 'Sugar Shack' (Triploid seedless cultivar) and 20% 'Allsweet' (Diploid pollinator cultivar) into a loamy sand soil. Plots consisted of six rows 15 feet long on 9 foot row centers with an in-row plant spacing of 2.5 feet (approximately 1,500 plants/acre) for a total of 6 plants/row x 6 rows for a total of 36 plants/plot. Soil samples were collected from each plot on 5/23/07 and sent to be analyzed by the Oklahoma State Soil Testing lab (Table 3). The supplemental Potassium treatment (60 lb K_2O/acre) was applied immediately following soil sampling using 0-0-60 fertilizer. Preplant applications of fertilizer were made by the producer at a total of 11-45-60 lbs/acre of N-P_2O_5-K_2O. Additional applications of nitrogen by the producer to the entire experimental area included 10 lbs/acre of N on 6/03/07 and another 10 lbs/acre on 7/02/07. Additional nitrogen applications were made to treatment plots utilizing urea (46-0-0) at the appropriate rates to plots on 6/25/07, 7/10/07, and 7/25/07 (Table 1). Harvest data including individual fruit weights and number of cull fruit were recorded on 8/16/07 and 8/30/07.

Results and discussion: No differences were observed for any of the different treatments that were recorded in this study (Table 3). The authors conclude several things from this. First, based upon the results of soil tests that were conducted (Table 2), it appears that levels of all nutrients that were measured were adequate for watermelon production although available soil nitrogen appeared low. There was very little variation in the pH level of the samples. Second, watermelon is not known to be a crop that requires high levels of nitrogen, the main component of treatments in the study. Because of this, possibly the low rate of nitrogen was adequate to produce yields that were not different from any of the higher rates.

In conclusion, after carrying out these investigations during a two year period the authors would conclude that producers should review their production goals and decide if the extra expense of additional fertilizer inputs is worth the added cost especially when soil test P and K show 100% sufficiency. Furthermore producers should also consider the environmental impact of using unneeded fertilizers.

Acknowledgements: The authors wish to thank Dennis, Virgil, and Alison Slagell for the support and help given to make this study possible.

Table 1. Treatment descriptions and application information for watermelon nutritional study, Hydro, OK, 2007.

Treatment	Overall Nitrogen rate	Number of Nitrogen applications	Potassium application rate
1	50	4	60
2	80	5	60
3	120	6	60
4	80	5	120 (60 x 2)

Table 2. Soil test results including pH, nitrate nitrogen, and plant available P and K. Soil samples were collected on 5/23/07.

Plot	pH	N (lbs/A)	P (lbs/A)	K (lbs/A)
101	6.6	17	278	260
102	6.6	19	356	278
103	6.7	22	338	298
104	6.6	14	270	277
201	6.4	18	137	287
202	6.2	16	202	281
203	6.0	18	364	297
204	6.1	18	326	314
301	6.3	21	141	319
302	6.1	20	276	346
303	5.8	17	374	379
304	5.7	17	356	365
Averages	**6.3**	**18**	**285**	**308**

Table 3. Effects of nitrogen and potassium treatments on watermelon performances. Hydro, OK, 2007

Treatment lbs/acre	Bottle necks /acre	Number fruit/acre	Yield lbs./acre	Average fruit size (lbs)
50-45-60 lbs N-P-K[y]	179 a[z]	4768 a	97266 a	19.9 a
80-45-60 lbs N-P-K	179 a	5181 a	103679 a	20.0 a
120-45-60 lbs N-P-K	36 a	4732 a	95076 a	19.7 a
80-45-120 lbs N-P-K	125 a	4643 a	92145 a	19.5 a

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

[y]N-P-K= lbs of Nitrogen, Phosphorous (P_2O_5), Potassium (K_2O) on a per acre basis.

Disease Management

Efficacy of Fungicides on Control of Spinach Anthracnose

Bixby, 2007

John Damicone and Lucas Pierce, OSU Entomology and Plant Pathology

Introduction and Objective: White rust is the most important foliar disease of spinach in Oklahoma. Anthracnose, caused by the fungus Colletotrichum dematium, had been occasionally observed as a minor leaf disease. In the fall of 2004, anthracnose was a severe problem in some commercial spinach fields in eastern Oklahoma that had received fungicide sprays for white rust. We previously evaluated several fungicides registered for use on spinach to control anthracnose and did not achieve adequate control with any of the products. The objective of this trial was to evaluate experimental fungicides in comparison to fungicides registered for use on spinach (Quadris and Cabrio) for control of anthracnose.

Materials and Methods: The trial was conducted at the Oklahoma Vegetable Research Station in Bixby, OK in a field of Wynona silty clay loam previously cropped to soybeans. Granular fertilizer (50-0-0 lb/A N-P-K) was incorporated into the soil prior to seeding the cultivar Melody on 14 Mar. The herbicide Dual Magnum II 7.6E at 0.67 pt/A was broadcast immediately after seeding. Plots were top-dressed with additional granular fertilizer (50-0-0 lb/A N-P-K) on 12 Apr. Plots consisted of 4-row beds, 20-ft long, with rows spaced 15 in. apart. An isolate of the pathogen recovered from a commercial spinach fields in the fall of 2004 was grown for 3 weeks on moistened, double-autoclaved oat kernels at room temperature. The inoculum was broadcast at a rate of 100 ml/plot on 12 Apr, just prior to the first fungicide application. The experimental design was a randomized complete block with four blocks separated by a 5-ft-wide fallow buffer. Treatments were broadcast through flat-fan nozzles (8002vk) spaced 18 inches apart with a CO2-pressurized wheelbarrow sprayer. The sprayer was calibrated to deliver 25 gal/A at 40 psi. Treatments were applied on 7-day intervals beginning at the first true-leaf stage. Plots were irrigated as necessary as needed to promote spinach emergence and growth. Rainfall during the cropping period (14 Mar to 10 May) totaled 2.36 inches in Mar, 1.91 inches in Apr, and 5.67 inches in May. On 9 May, disease was assessed in plots by estimating the percentage of leaves with anthracnose (including defoliation) and defoliation alone in two areas per plot. On 10 May, disease incidence (percentage of leaves with anthracnose) and severity (percentage of leaf area with anthracnose) were assessed on harvested leaves. Six, 1-ft row segments were harvested arbitrarily from the middle two rows of each plot. The harvested leaves were bulked, mixed, and disease severity was visually estimated on 30 blindly sampled leaves.

Results: Anthracnose developed late in the season, just before the trial was terminated, but reached high levels (Table 1). In the plot ratings, Switch and Endorse reduced disease incidence and defoliation compared to the untreated control. Other treatments were not effective or had higher levels of anthracnose compared to the control. In disease assessment on harvested leaves, disease incidence levels were higher than for the plot ratings because young lesions were present that were not readily apparent when plots were viewed at a distance. None of the treatments reduced disease incidence in the leaf ratings compared to the control. However, disease severity was reduced for the Vangard, Switch, Endorse, and Scala treatments.

Table 1. Evaluation of fungicides for control of anthracnose on spinach ('Melody'), Bixby - 2007.

	Anthracnose (%)			
	Plot rating[2]		Leaf rating[3]	
Treatment and rate/A (timing)[1]	incidence	defoliation	incidence	severity
Quadris 2.08F 12.3 fl oz (1-4)	32.5 bc[4]	10.2 ab	50.8	21.4 abcde
Cabrio 20EG 12 oz (1-4)	25.0 cd	5.2 bcd	64.1	29.7 a
Vangard 75WG 7.5 oz (1-4)	27.5 cd	7.1 bc	50.0	18.2 cde
Switch 62.5WG 12.5 oz (1-4)	8.4 e	1.5 d	48.3	12.4 e
Endorse 2.5W 2.2 lb (1-4)	17.5 de	3.9 cd	46.6	16.0 de
Enable 2F 8 fl oz (1-4)	32.5 cd	10.0 ab	59.1	22.4 abcd
Folicur 3.6F 6 fl oz (1-4)	46.2 a	15.0 a	69.1	29.8 a
Scala 5SC 18 fl oz (1-4)	30.6 c	7.7 bc	61.6	19.9 bcde
Topsin 70W 8 oz (1-4)	25.0 cd	6.9 bc	65.8	28.2 ab
V-10135 50DW 1 lb (1-4)	31.8 c	8.7 bc	64.1	27.4 abc
Oxidate 1 gal (1-4)	42.5 a	14.4 a	60.0	21.3 abcde
Control	28.7 c	6.9 bc	68.3	30.9 a
LSD (P=0.05)[5]	10.4	5.3	NS	9.8

[1] The timing numbers (1-4) correspond to the spray dates of 1=12 Apr, 2=19 Apr, 3=26 Apr, and 4= 4 May.
[2] Plots rated for anthracnose incidence (including defoliation) and defoliation alone on 9 May.
[3] Disease incidence (leaves with anthracnose) and severity (leaf area with anthracnose) from 30 leaves per plot on 10 May.
[4] Values in a column followed by the same letter are not significantly different at P=0.05 according Fisher's Least Significant Difference Test at P=0.05.
[5] Fisher's Least Significant Difference; NS=treatment effect not significant at P=0.05.

Conclusions: Anthraconse control with fungicides continues to be difficult as none of the treatments evaluated resulted in a high level of disease control. Switch and Endorse were generally the most effective products tested and appear to warrant further evaluation.

Acknowlegdements: Financial support from the IR-4 efficacy program and Allen Canning Company is greatly appreciated.

Efficacy of Fungicides for Control of Cottony Leak on Snap Bean

Bixby – 2007

John Damicone and Lucas Pierce, OSU Entomology and Plant Pathology

Introduction and Objective: Pod decay is a problem in the production for snap beans grown for processing in Oklahoma and surrounding states. Lower pods, particularly those in contact with the soil, develop a wet rot with profuse growth of white, fluffy mold (mycelium). The disease appears to increase within the canopy through direct contact of diseased pods with adjacent, healthy pods and leaves. Plants in areas with dense foliar growth appear to be most severely affected. Pod decay from Pythium aphanidermatum, the cause of "cottony leak" on numerous vegetable crops, has been a primary cause of pod decay in previous field trials. The objective of this study was to evaluate the effectiveness of fungicides, particularly those with reported activity against water molds, on control of pod decay of snap bean.

Materials and Methods: The trial was conducted at the Oklahoma Vegetable Research Station in Bixby, OK in a field of Wynona silty clay loam previously cropped to soybeans and where pod decay has been a previous problem. The field received 150 lb/A of 18-46-0 N-P-K granular fertilizer prior to planting the cultivar Roma II on 19 Apr. Plots were top-dressed with additional granular fertilizer at 46-0-0 lb/A N-P-K as urea on 16 May. Weeds were controlled by broadcasting Basagran (1 pt/A), Fusilade DX (12 fl oz/A), Reflex (0.75 pt/A), and NIS (0.5 pt/A) on 17 May. The experimental design was a randomized complete blocks with four replications. Plots consisted of two, 20-ft-long rows spaced 3 ft apart. Fungicide sprays were directed through three flat-fan nozzles (8002vk) per row using a CO2-pressurized wheelbarrow sprayer. The sprayer was calibrated to deliver 43 gal/A at 40 psi. The first application was made on 6 June when pods first developed, and a second application was made on 14 June. Rainfall during the cropping period (19 Apr to 25 June) totaled 0.30 inches in April, 7.55 inches in May, and 7.12 inches in June. Plots did not require irrigation for the entire trial period. Yield was taken on 21 June when the beans graded 126 mm (combined length of the largest seed from 10 large pods). Pods were stripped from 1 m of row and classified as disease or healthy. Cottony leak was present at very low levels at harvest. Cottony leak developed to moderate levels by 25 June. Disease incidence was then measured by counting the number of 6-inch row segments with cottony leak. The counts were converted to the percentage of row length affected.

Results: Excessive rain during May and June caused prolonged periods of saturated soil which reduced plant growth and canopy development. A dry, red-colored decay of pods was present at harvest. Isolations revealed the cause of this decay to be Rhizoctonia solani. Incidence by weight of harvest beans ranged from 2 to 10% and did not differ among treatments (data not shown). The cottony leak that developed within 4 days after harvest was primarily caused by P. aphanidermatum although P. ultimum and Phytophthora nicotianae var. parasitica were also isolated. Disease incidence ranged 14 to 27%, but did not differ among treatments (Table 1). There was a numerical trend for reduced cottony leak for the Ranman treatment which is consistent with previous trials.

Table 1. Effect of fungicides on control of Pythium cottony leak of 'Roma II' snap beans at Bixby, OK - 2007.

Treatment and rate/A (timing[1])	Cottony leak (% row length)[2]	Yield (cwt/A)[3]
Ridomil Gold/Copper 65W 2.5 lb (1,2)	22.2	147.1
Revus 2.08F 8.2 fl oz (1,2)	25.4	144.7
V-10161 4 fl oz (1,2)	17.5	147.4
KIF-230 10W 7.1 oz (1,2)	21.3	130.7
Ranman 3.3F 2.75 fl oz (1,2)	13.9	121.2
Cabrio 20WG 1 lb (1,2)	26.8	142.5
Check	25.0	133.8
LSD (P=0.05)[4]	NS	NS

[1] Timing numbers (1 and 2) correspond to the spray dates of 1=6 June and 2=14 June.
[2] Number of 6-inch row segments with cottony leak on 25 June. Counts were converted to the percentage of row length affected.
[3] Pod grade at harvest was 126 mm (total length of the largest seed in each of 10 large pods).
[4] Fisher's Least Significant Difference. NS=treatment effect not significant at P=0.05.

Conclusions: Similar trials have been conducted over four years at this site. Disease typically develops late in the season, just after the maturity level when beans are normally harvested. Disease incidence is highly variable which makes separation of treatments difficult. Fungicides generally have not provided a high level of cottony leak control. Methods for producing greater and more uniform levels of disease are needed.

Acknowledgements: Financial support from Allen Canning Co. and Syngenta Crop Protection is greatly appreciated.

Cultivar and Fungicide Effects on Snap Bean Pod Decay

Bixby – 2007

John Damicone and Lucas Pierce, OSU Entomology and Plant Pathology

Objective: Pod decay is a disease problem in the production of snap beans for processing in Oklahoma and surrounding states. Lower pods, particularly those in contact with the soil, develop a wet rot with profuse growth of white, fluffy mold (mycelium). The disease appears to increase within the canopy through direct contact of diseased pods with adjacent, healthy pods and leaves. Plants in areas with dense foliar growth appear to be most severely affected. Pod decay from Pythium aphanidermatum and P. ultimum which cause "cottony leak" on numerous vegetable crops, have been the primary causes of pod decay in previous field trials. In general, fungicides have not provided good control of pod decay. The objective of this study was to screen various snap bean cultivars for their reaction to pod decay in a field with a history of the disease. While true resistance to a general pathogen like Pythium may not be available, cultivars with an upright growth habit may permit plants to escape the disease. Fungicide deposition to the lower pods may also be improved with such cultivars. Therefore, cultivars were evaluated both with and without a fungicide program for pod decay. Cultivars included the regional standards of 'Roma II' for flat or romano types, and 'Nelson' for round types.

Materials and Methods: The trial was conducted at the Oklahoma Vegetable Research Station in Bixby where pod decay has been a previous problem. The field received 27-69-0 lb/A N-P-K granular fertilizer prior to planting on 19 Apr at a rate of 9 seeds/ft. Plots were top-dressed with additional granular fertilizer at 46-0-0 lb/A N-P-K on 16 May. Weeds were controlled by broadcasting Basagran (1 pt/A), Fusilade DX (12 fl oz/A), Reflex (0.75 pt/A), and NIS (0.5 pt/A) on 17 May. The experimental design was a split-plot with four randomized complete blocks. Main plots consisted of four, 20-ft-long rows of each cultivar spaced 3 ft apart. Sub plots consisted of two rows left untreated, and two rows treated with Ridomil Gold/Copper. Ridomil Gold/Copper was applied as a directed spray through three flat-fan nozzles (8002vk) per row using a CO2-pressurized wheelbarrow sprayer. The sprayer was calibrated to deliver 34 gal/A at 40 psi. The first application was made on 6 June when pods first developed, and an additional application was made on 14 June. Rainfall during the cropping period (19 Apr to 25 June) totaled 0.30 inches in Apr, 7.55 inches in May, and 7.12 inches in June. Plots were not irrigated because of the excessive rainfall during the cropping period.

Plants approached maturity before symptoms of cottony leak developed. Therefore, each cultivar was harvested on 21 June by cutting plants from a typical 1-m row segment within each sub plot and hand-picking the pods. Weights were taken for healthy pods and pods with decay. At harvest, pod decay symptoms were almost entirely reddish brown lesions near the pod tips. Cultivars with round pods were graded by determining the percentage of a 500 g sample at each sieve size. Cultivars with flat pods were graded by measuring the total length of the largest seed from each of 10 large pods. Cultivars were evaluated for lodging, plant height, canopy size, and height of the lowest pods on 25 June. Symptoms of pod decay consistent with cottony leak developed by 25 June. Disease incidence was measured by counting the number of 6-inch row segments with pod decay in each sub plot. The counts were converted to the percentage of row length affected.

Results: Rainfall was 2 inches above normal (30-year average) for May and 6 inches above normal for June. Average monthly temperature was above normal for May and nearly normal for June. Excessive rain during May and June caused prolonged periods of saturated soil which reduced plant growth and canopy development and differences in plant growth characteristics among cultivars were not as great as in a previous trial in 2004. There was variation in lodging, canopy density, and pod height among cultivars (Table 1). The cultivars Tapia, Ebro, and Bogata had the lowest lodging scores and smallest plant canopies. Pod set height was highest for Primo and Romano 942. Yields were generally good except for Igloo which had poor stands.

At harvest on 21 June, pod decay symptoms consisted mostly of dry, red-colored lesions near the pod tips. Isolations revealed the cause of this decay to be Rhizoctonia solani. This disease is often called pod tip blight or web blight. Levels of pod tip blight were negatively correlated ($P<0.05$) with lodging ($r=-0.27$), plant canopy density ($r=-0.25$), and pod height ($r=-0.22$). Incidence by weight of harvested beans ranged from 0 to 10% and did not differ among the fungicide treatments (Table 2).

The effect of cultivar and the cultivar by fungicide interaction on pod tip blight were significant. In the untreated sub plots, none of the cultivars with flat pods had lower levels of pod tip blight compared to Roma II. Cerler had low levels of this disease among the flat types. Among the cultivars with round pods, SB 4261, PLS 75, and Igloo had lower levels of pod tip blight compared to Nelson.

Symptoms of cottony leak did not develop until 25 June, 4 days after harvest. The cottony leak was caused by P. aphanidermatum although P. ultimum and Phytophthora nicotianae var. parasitica were also isolated from diseased pods. There were no significant correlations between levels of cottony leak and lodging, plant height, Canopy density or pod height. Disease incidence, measured as the percentage of row feet with symptoms, ranged from 3 to 18% in untreated check sub plots (Table 2). Only the main effects of cultivar and fungicide program on cottony leak were significant. Averaged over cultivars, fungicide treatment reduced levels of cottony leak by 50%. Averaged over fungicide treatments, none of the cultivars with flat pods had lower levels of cottony leak compared to Roma II. Among the cultivars with round pods, Igloo had less cottony leak than Nelson.

Table 1. Plant characteristics and yield of snap bean cultivars evaluated for reaction to pod decay, Bixby - 2007.

Cultivar	Pod type	Lodging (1-10)[1]	Plant height (in.)	Canopy (1-4)[2]	Pod height (1-5)[3]	Yield (cwt/A)[4]
Igloo	round	1.7	12.4	2.0	2.0	22.3
Roma II	flat	2.2	10.4	2.0	1.2	99.7
PLS 75	round	1.5	11.3	2.0	2.2	82.3
R00.35558	round	2.5	12.3	3.0	1.0	108.4
Tapia	flat	1.2	12.4	1.5	1.5	100.1
Ebro	flat	0.0	11.5	1.2	1.0	94.3
Bogota	flat	1.0	12.1	1.7	2.5	117.7
Cerler	flat	5.0	12.3	3.7	2.7	119.1
Moncayo	flat	3.0	10.9	2.0	1.2	120.9
SB 4261	round	1.7	12.1	2.7	1.2	146.6
Primo	flat	4.2	12.8	3.5	3.2	156.0
Romano 942	flat	6.7	14.4	4.2	3.2	149.6
Navarro	flat	4.0	12.8	3.2	2.7	143.7
Nelson	round	2.0	12.0	2.5	1.2	114.6
LSD (P=0.05)[5]		1.5	1.4	0.6	0.7	26.7

[1] 1 = 0% lodged, 10 = 100% lodged on 23 June.
[2] 1 = least dense, 4 = most dense on 23 June.
[3] Height of oldest pods, 1 = low, 5 = high on 23 June
[4] Plots were harvested before pod rot developed by hand harvesting 1 m of row in the check (no fungicide) sub-plots on 24 June for all cultivars except Igloo, PLS 118, PLS 75, Cerler, and Nelson which were harvested on 1 July.
[5] Least significant difference.

Table 2. Effects of cultivar and fungicide program on pod decay in snap bean cultivars, Bixby - 2007.

Cultivar	Pod type	Cottony leak (%)[1]			Pod tip blight (%)[2]		
		check[3]	RG/C[4]	mean[5]	check	RG/C	mean
Igloo	round	3.5	0.0	1.7	0.0	3.4	1.7
Roma II	flat	16.5	4.5	10.5	3.9	3.7	3.8
PLS 75	round	11.5	6.0	8.7	1.8	1.8	1.8
R00.35558	round	18.2	8.5	13.4	5.9	2.4	4.1
Tapia	flat	8.0	5.2	6.6	6.0	3.7	4.9
Ebro	flat	6.7	9.7	8.2	9.9	5.1	7.5
Bogota	flat	18.2	10.0	14.1	9.1	7.2	8.2
Cerler	flat	5.5	4.7	5.1	1.6	0.7	1.1
Moncayo	flat	12.2	6.7	9.5	5.2	5.5	5.3
SB 4261	round	14.7	7.7	11.2	1.7	5.2	3.4
Primo	flat	13.0	5.2	9.1	1.8	2.1	1.9
Romano 942	flat	12.7	4.7	8.7	1.7	3.5	2.5
Navarro	flat	12.2	2.5	7.4	7.0	2.7	4.8
Nelson	round	18.7	9.0	13.9	8.5	1.1	4.8
mean[6]		12.3 a	6.0 b		4.5	3.5	
LSD (P=0.05)[7]				6.0	5.5	4.8	

[1] Number of 6-inch row segments with 'cottony leak' symptoms on 25 June, 4 days after harvest. Counts were converted to the percentage of row length affected.
[2] Percentage of pods with rot by weight at harvest on 21 June. Most diseased pods had reddish brown lesions from which *Rhizoctonia* was isolated.
[3] Check = no fungicide.
[4] RG/C = Ridomil Gold/Copper 65W at 2.5 lb/A on 6 June and 14 June.
[5] Average over check and Ridomil/Copper treatments.
[6] Average over cultivars. Means followed by the same letter are not statistically different.
[7] Least significant difference.

Table 3. Grade characteristics of snap bean cultivars evaluated for reaction to pod decay, Bixby - 2007.

Cultivar	Pod type	Sieve size (%)[1]				
		1	2	3	4	5
Igloo	round	8.6	7.2	18.1	45.1	20.9
PLS 75	round	17.9	39.4	33.0	9.7	0.0
R00.35558	round	3.1	7.8	29.1	23.2	37.4
SB 4261	round	0.9	2.7	14.5	21.4	60.4
Nelson	round	2.4	10.9	41.5	30.8	14.4
		Seed size (mm)[2]				
Roma II	flat	134				
Tapia	flat	102				
Ebro	flat	106				
Bogota	flat	117				
Cerler	flat	126				
Moncayo	flat	126				
Primo	flat	108				
Romano 942	flat	120				
Navarro	flat	114				

[1] Percentage of pods in each sieve size from a 500 g sample.
[2] Total seed length of the largest seed from 10 large pods.

Conclusions: This study was previously run in 2004 when levels of cottony leak were higher than in 2007. Trials in 2005 and 2006 were crop failures. Differences in levels of cottony leak among cultivars was not as clear in 2007 compared to 2004 when all of the cultivars with flat pods except Moncayo had significantly less cottony leak compared to Roma II. However, fungicide effects were greater in this trial compare to 2004. Factors other than just high soil moisture must affect cottony leak development because the high levels of rainfall experienced in this trial produced prolonged periods of saturated soil that should have been favorable for spread and development of water molds such as *Pythium*. Cotony leak continues to develop late in the season, after optimum maturity. Better methods are needed to produce severe and more uniform cottony leak development. Newer cultivars being utilized by the industry should be evaluated in future trials.

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Evaluation of Fungicides for Control of Spinach White Rust

Stillwater, 2007

John Damicone, OSU Entomology and Plant Pathology

Introduction and Objective: White rust, caused by the fungus *Albugo occidentalis*, is the most important foliar disease of spinach in Oklahoma. Multiple fungicide applications are generally required to effectively manage white rust. Quadris (azoxystrobin) and Cabrio (pyraclostrobin) are the primary fungicides used to manage white rust. However, these Group 11 (strobulurin) fungicides have been prone to resistance problems with other crops. For example, widespread resistance to Group 11 fungicides has developed in the downy mildew, powdery mildew, and gummy stem blight pathogens of cucurbits. Therefore, resistance management guidelines have been developed and labelled which require the alternation of Quadris and Cabrio with fungicides that have a different mode of action. Unfortunately, there are few fungicides registered for use on spinach with non-Group 11 modes of action. An objective of this study was to evaluate non-Group 11 fungicides for white rust control in comparison to Quadris and Cabrio.

Materials and Methods: The trial was conducted at the Oklahoma State University Plant Pathology Research Farm in Stillwater in a field of Norge loam with a history of white rust and previously cropped to spinach. Granular fertilizer (78-46-0 lb/A N-P-K) was incorporated into the soil prior to planting the cultivar 'Melody' on 17 Sep. Weeds were controlled by hand hoeing. Fall armyworms were controlled with Ambush 2E at 12.8 fl oz on 28 Sep. Plots consisted of 4-row beds, 20-ft long, with rows spaced 15 in. apart. The experimental design was a randomized complete block with four blocks separated by a 5-ft-wide fallow buffer. Treatments were broadcast through flat-fan nozzles (8002vk) spaced 18 inches apart with a CO_2-pressurized wheelbarrow sprayer. The sprayer was calibrated to deliver 25 gal/A at 40 psi. Treatments were applied on 7-day intervals beginning at the first true-leaf stage. Rainfall during the cropping period (17 Sep to 8 Nov) totaled 0.45 inches for Sep, 3.30 inches for Oct, and 0.0 inches for Nov. Plots received a total of 3.5 inches of sprinkler irrigation to promote stand establishment, plant growth, and disease development. Plots were visually assessed for disease incidence (percentage of leaves with rust) in three areas per plot on 8 Nov. Disease incidence (percentage of leaves with rust) and severity (percentage of leaf area with rust) were also assessed on 8 Nov from harvested leaves. Five 6-inch row segments were harvested arbitrarily from the middle two rows of each plot. The harvested leaves were bulked, mixed, and disease severity was visually estimated on 30 blindly sampled leaves.

Results: Rainfall and temperature were about normal (30-year average) in October. The trial suffered from hail damage during Oct., but the new leaves were produced and older damaged leaves became diseased. White rust appeared early in the trial and was present at an incidence of <1.0% when the first application was made on 11 Oct. White rust became severe in the trial reaching an incidence of 70% and a severity of over 25% in the untreated check at harvest (Table 1). The group 11 check treatments (Quadris and Cabrio) continued to provide good to excellent disease control. Despite the severe disease pressure, Cabrio provided a high level of disease control. Of the non-Group 11 fungicides, none were effective except for Ranman. Ranman reduced disease severity by about 50% and the level of white rust control with Ranman alone was not adequate.

Table 1. Evaluation of fungicides for control of white rust on spinach ('Melody'), Stillwater - 2007.

Treatment and rate/A (Timing[1])	White rust (%) Plot disease incidence[2]	Leaves w/rust[3]	Leaf area w/ rust[4]
Quadris 2.08F 12.3 fl oz (1-4)	15.0 e	24.1 d	4.7 de
Cabrio 20EG 0.75 lb (1-4)	1.8 e	2.5 e	0.1 e
KIF-230 10W 7.1 oz (1-4)	53.3 bc	57.5 bc	21.6 bc
Ranman 400F 2.75 fl oz + Sylwett L-77 2.0 fl oz (1-4)	37.5 d	50.8 c	13.7 cd
Revus 2.08F 8.2 fl oz (1-4)	65.8 ab	73.3 ab	25.9 ab
Switch 62.5WG 12.5 oz (1-4)	49.2 cd	59.1 bc	27.3 ab
Oxidate 1 gal (1-4)	69.6 a	79.1 a	32.8 a
Untreated check	65.8 ab	70.0 ab	27.5 ab
LSD(P≤0.05)[3]	14.8	18.5	9.6

[1] Application numbers (1-4) correspond to the spray dates of 1=11 Oct, 2=18 Oct, 3=25 Oct, 4=1 Nov.
[2] Visual estimation of disease incidence from 3 areas per plot on 8 Nov.
[3] Disease incidence from 30 harvested leaves per plot on 8 Nov.
[4] Disease severity from 30 harvested leaves per plot on 8 Nov.
[5] Least significant difference. Values in a column followed by the same letter are not statistically different.

Conclusions: Under severe disease pressure, none of the non-Group 11 fungicides (KIF-230, Ranman, Revus, Switch, or Oxidate) provided adequate control of white rust. Ranman provided the best disease control of the non-Group 11 fungicides. Ranman has looked good in previous trials when alternated with Cabrio. Cabrio continued to provide excellent disease control.

Acknowledgements: This trial was supported by funds from the IR-4 (minor use) Project and Allen Canning Co. The valuable assistance of Rocky Walker and Brian Heid, OSU Plant Pathology Farm, in the establishment and maintenance of the trial is appreciated.

Control of Bacterial Leaf Diseases on Turnip Greens

Bixby, 2007

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Introduction and Objective: Bacterial leaf spot (*Pseudomonas syringae* pv. *maculicola*; Psm) and Xanthomonas leaf spot (*Xanthomonas campestris* pv. *armoraceae;* Xca) are important bacterial leaf spots on turnip greens and other Brassica leafy greens in Oklahoma. Because they are caused by bacteria, fungicides that are effective for the control of Cercospora leaf spot, the major fungal leaf spot disease in Oklahoma, are not effective on these bacterial leaf spots. Copper hydroxide (Kocide), copper sulfate (Cuprofix, Basicop) and the plant defence activator acibenzolar-s-methyl (Actigard) have been previously evaluated for control of bacterial leaf diseases on turnip greens. Adequate disease control has not been observed with these products. The objective of this trial was to evaluate new products with reported activity on bacterial diseases (i.e. bactericides and plant defence activators) for control of bacterial leaf diseases on turnip greens.

Materials and Methods: The trial was conducted at the Oklahoma Vegetable Research Station in Bixby, OK in a field of Wynona silt loam previously cropped to soybeans. Granular fertilizer (50-0-0 lb/A N-P-K) and the herbicide Treflan 4E at 1.5 pt/A were incorporated into the soil prior to planting the cultivar 'Alamo' on 4 Apr. Plots were top dressed with additional granular fertilizer (50 lb/A N-P-K) on 3 May. Plots consisted of 4-row beds, 20-ft long, with rows spaced 12 inches apart. The experimental design was a randomized complete block with four blocks separated by a 5-ft-wide fallow buffer. Treatments were broadcast through flat-fan nozzles (8002vk) spaced 18 inches apart with a CO_2-pressurized wheelbarrow sprayer. The sprayer was calibrated to deliver 25 gal/A at 40 psi. Treatments were applied on 7-day intervals beginning when plants had 5-6 true leaves. Plots were inoculated by spraying a 3 ft section of each outer row with bacterial suspensions (10^7 cells/ml) on 9 May, 5 days after the first treatment application. One outer row was inoculated with Psm while the other outer row was inoculated with Xca. Rainfall during the cropping period (4 Apr to 31 May) totaled 1.39 inches for April and 7.55 inches for May. Plots received sprinkler irrigation to promote stand establishment and plant growth as necessary during April. Plots were visually assessed for disease incidence (percentage of leaves with symptoms) in three areas per plot on 31 May. Disease incidence (percentage of leaves with symptoms) and severity (percentage of leaf area with symptoms) were also assessed on 31 May from harvested leaves. Five 6-inch row segments were harvested arbitrarily from the middle two rows of each plot. The harvested leaves were bulked, mixed, and disease severity was visually estimated on 30 blindly sampled leaves.

Results: Rainfall and monthly average temperature were above normal (30-year average) during May. Symptoms of the bacterial leaf spot diseases were apparent at harvest, but Cercospora leaf spot also developed in the trial and it was difficult to distinguish between the bacterial leaf spot diseases and the fungal leaf spot. Therefore, ratings were taken on the diseases together. Tanos, a fungicide reported to provide partial control of bacterial diseases and Keyplex, a nutrient solution reported to induce plant resistance to disease were the only treatments that reduced disease incidence and severity (Table 1). Disease was generally severe in all plots and none of the treatments provided an adequate level of disease control.

Table 1. Evaluation of bactericides and other products for control of bacterial leaf diseases on turnip greens ('Alamo'), Bixby - 2007.

Treatment and rate/A (Timing[1])	Disease (%)[2]		
	Plot disease incidence[3]	Symptomatic leaves[4]	Symptomatic leaf area[5]
Kocide 4.5LF 1.33 pt (1-4)	42.9 ab	64.2 a	17.8 bcd
Actigard 50WG 1.3 oz (1-4)	49.9 a	44.1 bc	15.7 bcd
Oxidate 1 gal (1-4)	44.1 ab	63.3 a	22.0 abc
Actinovate SP 6 oz (1-4)	31.2 bc	49.2 abc	14.9 bcd
Kasumin 2L 100 ppm (1-4)	44.5 a	57.5 ab	16.9 bcd
Omega Grow 6.4 fl oz (1-4)	43.3 ab	63.3 a	16.1 bcd
KPhite 3 pt (1-4)	37.1 abc	57.5 ab	15.9 bcd
Tanos 50DF 8 oz (1-4)	29.1 c	35.8 c	9.2 d
Keyplex 350-DP 2 qt (1-4)	28.7 c	48.3 abc	13.3 cd
Physpe 4 9.7 fl oz (1-4)	44.1 ab	60.8 ab	16.7 bcd
Citrex 3.84 fl oz (1-4)	50.0 a	50.0 abc	26.8 a
Untreated check	48.3 a	48.3 abc	23.8 ab
LSD(P≤0.05)[6]	13.2	18.0	9.0

[1] Application numbers (1-4) correspond to the spray dates of 1=4 May, 2=11 May, 16 May, 4=25 May.
[2] Bacterial leaf spot diseases and Cercospora leaf spot were all present and evaluated together.
[3] Visual estimation of disease incidence from 3 areas per plot on 31 May.
[4] Disease incidence from 30 harvested leaves per plot on 31 May.
[5] Disease severity from 30 harvested leaves per plot on 31 May.
[6] Least significant difference. Values in a column followed by the same letter are not statistically different.

Conclusions: Tanos and Keyplex provided a measurable level of disease control in this trial, but the presence of Cercospora leaf spot in the trial confounded results. The disease control observed with Tanos might have been mostly due to control of Cercospora leaf spot. Tanos is a mixture of the fungicides cymoxanil and famoxadone and labeled for control of fungal disease and suppression of bacterial diseases on some other vegetable crops. Famoxidone is a group 11 (strobilurin) that may have activity on Cercospora. The trial should be repeated with all plots receiving cover sprays of Quadris or Cabrio to control Cercospora leaf spot. Cercospora leaf spot was not expected in this trial because the disease had not been observed on the station for several years and the field had been rotated.

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Evaluation of Fungicides for Control of Watermelon Downy Mildew

Stillwater, 2007

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Introduction and Objective: Gummy stem blight was observed as a severe disease of watermelons in 2006 in western Oklahoma where is destroyed several late-planted fields. Prior to 2006, the disease had been periodically observed in southeastern Oklahoma, but was considered a minor foliar disease in the state. Gummy stem blight has been a severe problem in the southeastern United States for many year where it has developed resistance to Group 1 (Benlate and Topsin) and Group 11 (Quadris, Cabrio) fungicides. The disease is seed and debris borne. On watermelons, it primarily attacks foliage and vines, but not fruit. Gummy stem blight has proven difficult to control and intensive fungicide programs that use rotations of chlorothalonil (e.g. Bravo) and pyraclostrobin + boscalid (Pristine= Endura + Cabrio) are recommended where gummy stem blight is a recurring problem. The objective of this study was to evaluate fungicide programs for control of gummy stem blight. However, following inoculation of plots with the gummy stem blight fungus, the disease failed to develop. Instead, downy mildew became severe in the plots. Downy mildew is a foliar disease of watermelon that is airborne and is sporadically severe in Oklahoma. While the choice of treatments was not ideal for a downy mildew trial, some of the broad-spectrum fungicides used in the spray program such as chlorothalonil (e.g. Bravo), mancozeb (e.g. Dithane, Penncozeb), and pyraclostrobin (e.g. Cabrio) are known to have activity on downy mildew and anthracnose.

Materials and Methods: The trial was located at the OSU Entomology/Plant Pathology Research Farm in Stillwater in a field of Norge loam previous cropped to winter peas. Granular fertilizer (56-86-86 lb/A N-P-K) and lime (1.2 ton/A) were incorporated prior to direct seeding the variety ‘Royal Sweet’ on 16 July at a rate of 3 seeds per ft. The herbicides Dual Magnum II at 1 pt/A and Sandia 75DF at 0.75 oz/A were broadcast after planting to control weeds. Plots were top-dressed with additional granular fertilizer (37-0-0 lb/A N-P-K) on 15 Aug. Plots were single, 25-ft-long rows spaced 15 ft apart. Plots were then thinned to a 2-ft within row spacing. Squash bugs were controlled with Ambush 2E at 12.8 oz/A on 14 Sep. Plots were inoculated by sprinkling oat kernels colonized by the gummy stem blight fungus along the center of each plot on 17 Aug. Treatments were arranged in a randomized complete block design with four replications. Fungicides were broadcast through flat-fan nozzles (8002vk) spaced 18 inches apart using a CO2-pressurized wheelbarrow sprayer. The sprayer was calibrated to deliver 24 gal/A at 40 psi. Fungicides were applied six times on 7-day intervals beginning at flowering on 17 Aug. Rainfall during the cropping period (17 Aug to 2 Oct) totaled 1.2 inched for July, 1.31 inches for Aug, and 4.6 in for Sep. Plots received sprinkler irrigations at 0.5 inches per application to promote plant growth and disease development on 29 July, 3 Aug, 7 Aug, 10 Aug, 14 Aug, 1 Sep, and 24 Sep. Disease was assessed by visually estimating the percentage of leaves with symptoms and defoliated in three areas of each plot. Yield of marketable melons weighing 14 or more lb was taken on 2 Oct.

Results: Rainfall was below normal (30-year avg.) for July but above normal for Sep. Average monthly temperature was above normal for July and below normal for Sep. Gummy stem blight did not develop in the trial despite inoculation. Downy mildew first appeared in an unsprayed guard plot on 14 Sep when the 5th fungicide application was made. By 21 Sep, downy mildew became severe in unsprayed check plots and increased to cause 75% defoliation at harvest on 2 Oct (Table 1). All fungicide programs except the full-season program with the experimental fungicide DPX-Lem17 provided excellent disease control on 21 Sep. On 2 Oct, 2 weeks after the last fungicide application, all treatments except DPX-Lem17 continued to provide good control of defoliation, however; downy mildew on the foliage increased to over 15% for the Bravo/Endura, Bravo/Folicur, Topsin/Pencozeb, and Bravo/Switch programs. The full-season Penncozeb and Bravo programs, and the Bravo/Pristine and Bravo/Cabrio continued to provide excellent disease control until harvest. The disease apparently developed too late in the cropping period to affect yield as yields did not differ among the treatments. Yield differences may have become apparent if the trial had been extended for a second harvest. However, additional applications may have been needed to maintain productive foliage for a second harvest.

Table 1. Effects of fungicides for control of downy mildew on watermelon ('Royal Sweet'), Stillwater - 2007.

Treatment and rate/A (timing)[1]	DM (%)[2]	Defoliation (%)[3]	DM (%)[2]	Defoliation (%)[3]	Yield (cwt/A)[4]
	21 Sep	21 Sep	2 Oct	2 Oct	
Penncozeb 75DF 3.0 lb (1-6)	0.0	0.0	4.9	0.0	280.4
Bravo 6F 2 pt (1-6)	0.0	0.0	5.0	0.0	319.8
Bravo 6F 2 pt (1,3,5) Pristine 38WG 18.5 fl oz (2,4,6)	0.2	0.0	8.3	0.0	331.8
Bravo 6F 2 pt (1,3,5) Endura 70W 5.2 oz (2,4,6)	8.5	0.0	19.1	3.3	205.5
Bravo 6F 2 pt (1,3,5) Folicur 3.6F 6 fl oz (2,4,6)	3.4	0.0	17.9	1.3	240.4
Topsin 70W 0.5 lb + Penncozeb 75DF 2.0 lb (1-6)	4.3	0.0	19.7	2.9	283.1
Bravo 6F 2 pt (1,3,5) Switch 62.5WG 12.5 fl oz (2,4,6)	2.6	0.0	15.0	2.1	241.5
Bravo 6F 2 pt (1,3,5) Cabrio 20WG 1 lb (2,4,6)	1.4	0.0	7.1	0.4	265.9
DPX-Lem17 1.67E 16.8 fl oz (1-6)	50.8	22.5	85.0	71.7	214.2
Check	78.3	40.0	84.6	74.6	214.4
LSD (P=0.05)[5]	15.0	9.3	11.4	5.9	NS

[1] Timing numbers 1 to 6 corresponds to the spray dates of 1=17 Aug, 2=24 Aug, 3=31 Aug, 4=7 Sep, 5=14 Sep, and 6=21 Sep.
[2] Leaves with symptoms of downy mildew (including defoliation).
[3] Leaves defoliated from downy mildew.
[4] Marketable melons weighing 14 lb or more taken on 2 Oct.
[5] Least significant difference. NS=treatment effect not significant.

Conclusions: Preventive spray programs using broad-spectrum fungicides such as Bravo and Penncozeb were effective in controlling downy mildew. The fungicides Pristine, Endura, Folicur, Switch, and Cabrio were used in alternation with Bravo for possible enhanced control of gummy stem blight over Bravo alone. Since gummy stem blight did not develop, these fungicides did not improve downy mildew control compared to full-season Bravo or Penncozeb programs. It is interesting to note that resistance to group 11 fungicides (including Cabrio) has been reported for both gummy stem blight and downy mildew in other areas of the country. However, the Bravo/Cabrio program, while performing no better than Bravo alone, still provided excellent control of downy mildew in this trial. These results indicate that the downy mildew strain affecting this trial was still sensitive to Group 11 fungicides.

Acknowledgements: The assistance of Rocky Walker and Brian Heid at the Entomology/Plant Pathology Research Farm in the establishment and maintenance of the trial is appreciated.

Watermelon Foliar Fungicide Timing Trial

Lane, OK

Jim Shrefler, Tony Goodson, Benny Bruton, and John Damicone

Foliar diseases are a persistent threat to watermelon production in Oklahoma. Any of several diseases including Anthracnose, Downy Mildew and Powdery Mildew can result in yield and fruit quality loss when foliage is damaged. Effective fungicides are available for the control of these diseases. However, growers are faced with the challenge of determining when to apply fungicides to obtain maximum effectiveness. Several options available for determining fungicide application timing include using preset scheduled (for example, weekly), applications based on general weather forecasts, or applying when disease symptoms appear. Each of these has benefits and downsides. The last, although most often used, is a particularly poor choice because fungicides are most effective when applied as a preventive practice rather than as a “cure”. An additional means of deciding when to apply fungicides is an anthracnose forecaster that was developed for determining fungicide application timing in watermelon. The forecaster is Internet based and is available on the Oklahoma Mesonet weather system at http://agweather.mesonet.org/horticulture/default.html , currently at no charge. It is recommended that the forecaster be used on a trial basis until its dependability can be verified. One concern is that the forecaster is specific for anthracnose. Consequently, forecasts obtained with the forecaster do not consider the infection of watermelon by other diseases. This trial was conducted to compare the efficacy of two broad spectrum fungicide treatments using application timings based on a preset schedule and the anthracnose forecaster.

Materials and Methods: The trial was conducted at Lane, Oklahoma at the Wes Watkins Agricultural Research and Extension Center on a sandy loam soil. Beds four feet wide were constructed on 24-foot centers. A single row of watermelon (XT 100) was transplanted July 18, 2007 at the center of each bed at 1 plant per 3 feet of row. Sandea herbicide at 0.75 oz per treated acre and Strategy at 2 pints per treated acre were applied as a directed spray after planting. Volunteer herbicide was applied broadcast on August 17 to control grass weeds. Drip irrigation was used once the crop was established.

Experimental treatments included an untreated check and fungicide treatments of 1. a tank mix of Dithane 75DF and Topsin 70WP and 2. Bravo Weatherstick. Each of these was applied using two decision-making options: 1. apply at first flowering and then bi-weekly thereafter or 2. apply at first flowering and then based on recommendation by the Mesonet anthracnose forecaster. For all applications, Dithane was used at 2 lbs. product per treated acre, Topsin at ½ lb. and Bravo Weatherstick at 1 pint. All applications were made using 21 gallons per acre of spray mixture. The sprayer consisted of a tractor mounted boom fitted with 8003 flat fan nozzles, spaced 20 inches on a straight boom, which were connected to a closed tank system that uses pressurized air to deliver the spray mixture. Spray mixtures were prepared in either 3 or 5 gallon tanks and agitated immediately before spray application. Fungicide application was initiated when staminate flowers first became evident on approximately 50% of the plants. Initial fungicide applications were made on August 14. Subsequent applications were made to the bi-weekly treatments on 8-28, 9-11 and 9-24 and to the forecaster treatments on 8-20, 9-6 and 9-17.

The experimental design was a randomized complete block with four replications. Individual plots consisted of a 38 foot long section of a single watermelon row. Treatment applications covered an expanse of 24 feet that was centered on the plot row. The tractor on which the spray boom was mounted traveled with wheels centered on the adjacent row and did not drive over the vines of plot rows. Visual evaluations of disease symptoms on watermelon foliage and defoliation were made on 9-28 and 10-5 and of defoliation on 10-18. Marketable size fruits were harvested and weighed on 10-3 and 10-11.

Results and Discussion: Visible symptoms of foliar disease became evident in late September and disease was evaluated on Sept. 28 Oct. 5 and Oct. 18 (Table 1). Soon after initial observation of disease substantial defoliation was obvious in the untreated check plots. No differences were detected among the treatments receiving fungicide at the initial evaluation. However, within a week of the initial evaluation the Bravo treatments showed signs of reduced disease control as compared to Dithane+Topsin. At the final evaluation of defoliation on Oct. 18 only the Dithane+Topsin treatment resulted in reduced disease levels compared to the untreated plots.

All mature watermelon fruit were harvested on Oct. 3 and 11. Total yields and yields for individual harvest dates are presented in Table 2. Significant differences were found among treatments for the initial harvest date but not for the second or the total harvest.

Foliage loss in untreated plots of this trial was rapid. The primary disease observed was downy mildew. Following the initial fungicide application, the Anthracnose Model and the bi-weekly timing each resulted in making 3 fungicide applications.

Table 1. Evaluation of Downey Mildew control in watermelon at Lane in 2007.

		Visual Disease Evaluation[1]				
Fungicide Treatment	**Application timing**	**Disease[2] 9-28**	**Defoliated[3] 9-28**	**Disease 10-5**	**Defoliated 10-5**	**Defoliated 10-18**
Untreated	-	86 a[4]	56 a	100 a	100 a	99 a
Dithane + Topsin	Bi-Weekly	12 b	2 b	11 c	33 c	79 b
Dithane + Topsin	Forecaster	14 b	3 b	10 c	27 c	85 ab
Bravo	Bi-Weekly	20 b	5 b	34 b	55 b	97 a
Bravo	Forecaster	15 b	3 b	21 cb	38 b	88 ab

[1] Visual evaluations where 0 = no disease or defoliation and 100 = all leaves affected.
[2] Percent (%) diseased is the portion of leaves with disease symptoms.
[3] Defoliation refers to the portion of foliage lost from a complete canopy.
[4] Values in a column followed by the same letter are not significantly different ($LSD_{0.05}$).

Table 2. Fruit yield in the 2007 watermelon foliar fungicide timing trial at Lane.

Fungicide Treatment	**Application Timing**	Yield (lbs. per acre)[1]		
		Oct. 3	**Oct. 11**	**Total**
Untreated	---	7581 a[2]	9327	16908
Dithane + Topsin	Bi-Weekly	2462 c	15782	18244
Dithane + Topsin	Forecaster	3867 bc	11782	15650
Bravo	Bi-Weekly	3624 bc	8407	12031
Bravo	Forecaster	5868 ab	11300	17168
			NS[3]	NS

[1] Fruit of marketable size at Oct. 3 and 11. Lowest fruit weight included is 10 lbs.
[2] Values in a column followed by the same letter are not significantly different ($LSD_{0.05}$).
[3] NS indicates no statistical differences among means within a column.

Weed Management

Cowpea Preemergence Herbicide Demonstration

Summer 2007

Lynn Brandenberger and Lynda Wells
Oklahoma State University
Cooperating with Merlyn and Lillian Schantz Hydro, Oklahoma

Introduction and objective: An important aspect of introducing new herbicides for use in commercial production is demonstrating their effectiveness and safety on the crops that they will be used on. The objective of this on-farm demonstration was to demonstrate the potential of Spartan (sulfentrazone) for use in cowpea.

Methods: The study was completed in summer 2007 at L&M Farms near Hydro, Oklahoma. It included a randomized block design with three replications utilizing three rates of Spartan (sulfentrazone) and one rate of Dual Magnum (S-metolachlor) as a check (Table 1). The study was direct seeded on 5/23/07 to Early Scarlet cowpea. Plots consisted of two rows 20 feet long on three foot row centers with an in-row seed spacing of 8 seeds per foot. All treatments were applied preemergence to the crop immediately following planting utilizing a CO_2 research sprayer with a 6 foot wide hand-held spray-boom at an overall rate of 25 GPA. A soil sample was collected from the plot area and analyzed by the Oklahoma State Soil Testing lab for pH.

Results and discussion: Results from the soil analysis indicated a soil pH of 5.7. No differences were observed between the Spartan treatments and the Dual Magnum check for crop damage (Table 1). Crop damage was observed as stunting from shortened internodes and fewer leaves. On 6/25/07 stunting ranged from a low of 3.3% for the two low rates (0.07 and 0.14) of Spartan to 8.3% for the highest rate of Spartan (0.1875). Stunting decreased over time and ranged from 0% for the Dual Magnum check to only 1.7% for Spartan at the 0.07 and 0.1875 rates on 7/11/07.

In conclusion, it would appear that Spartan caused very little damage to Early Scarlet cowpea under the conditions that existed in the summer of 2007. A word of caution is needed though, Spartan holds promise for control of several troublesome weeds, but as soil pH increases so does the activity of this compound. Therefore further testing is warranted in soils of pH of 7.0 and greater to determine if this material will be safe for use in cowpea in more alkaline soils.

Acknowledgements: The authors wish to thank Merlyn and Lillian Schantz for their support and help in completing this demonstration.

Table 1. 2007 Cowpea Spartan study, Hydro, OK.

	Percent Stunting [z]	
Treatment lbs ai/acre	**6/25/07**	**7/11/07**
Dual Magnum 0.75	5.0 a [y]	0.0 a
Spartan 0.07	3.3 a	1.7 a
Spartan 0.14	3.3 a	0.0 a
Spartan 0.1875	8.3 a	1.7 a

[z] Average percent stunting to cowpeas

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

Preemergence Efficacy Trial

Spring 2007

Lynn Brandenberger, Lynda Wells, Robert Havener and Robert Adams
Oklahoma State University

Introduction and objective: Screening new materials for effectiveness in weed control is an important aspect of working with small acreage crops. Although herbicide screening normally includes observing different compounds for both weed control and crop damage this past spring a study was initiated where the untreated check did not emerge and because of this only efficacy was recorded in the study. The objective of this study was to determine the efficacy of several preemergence treatments for control of Palmer amaranth (*Amaranthus palmeri* S. Watts.), Carpetweed (*Mollugo verticillata* L.), and Goosegrass (*Eleusine indica*).

Methods: The study was completed at the Oklahoma State University Vegetable Research station in Bixby, Oklahoma. Plots were arranged in a randomized block design with three replications, each plot being 6 x 20 feet. Eleven treatments and an untreated check were included in the study. Herbicide treatments included two rates of Command 3ME (clomazone), Everest (flucarbazone), Lorox (linuron), Nortron (ethofumesate), and three rates of Spartan (sulfentrazone). Preemergence treatments were applied on 4/26/07 utilizing a CO_2 research sprayer with a 6 foot wide hand-held spray-boom. Immediately following application, the entire plot area received approximately 0.5 inch of irrigation from an overhead sprinkler system. Weed counts were recorded on 6/13/07 in each plot utilizing a 0.5 square meter area marker.

Results and discussion: All treatments except for Nortron at 0.25 lb ai/acre resulted in Palmer amaranth numbers lower than the untreated check (Table 1). Spartan at all rates had zero Palmer amaranth, while Command 3ME, Everest, Lorox, and Nortron at 0.5 lb ai/acre had from 0.3 to 1.7 amaranth per 0.5 square meter. Carpetweed control only varied significantly for the three rates of Spartan compared to the untreated check, all other treatments were not effective in the control of this weed species. Spartan had 2.7, 1.3, and 1.0 carpetweed per 0.5 square meter, respectively, at rates of 0.025, 0.050, and 0.100 lb ai/acre compared to the untreated check which recorded 14 carpetweeds. Only Everest at 0.010 lb ai/acre resulted in significantly higher numbers of goose grass than either the untreated check or other treatments.

In conclusion, the Vegetable Research Station has dense and uniform populations of both Palmer amaranth and carpetweed throughout the station. This makes the station an excellent location to test for control of these two broadleaf weed species. All treatments provided higher levels of Palmer amaranth control than the untreated check except for the low rate of Nortron, while only Spartan provided improved control of carpetweed.

Table 1. 2007 Preemergence herbicide trial, Bixby, OK.

Treatment lbs ai/acre	Weed Control (Number weeds) [z]					
	Palmer amaranth		Carpet Weed		Goose grass	
Untreated check	4.0	a [y]	14.0	a	1.7	b
Command 3ME 0.188	0.7	c-d	14.7	a	0.3	b
Command 3ME 0.375	1.3	b-d	14.0	a	0.0	b
Everest 0.010	1.7	b-c	10.3	a	6.0	a
Everest 0.020	0.7	c-d	8.0	a-b	2.3	b
Lorox 0.1	1.3	b-d	10.7	a	2.0	b
Lorox 0.2	0.3	c-d	8.3	a-b	1.3	b
Nortron 0.25	2.7	a-b	8.0	a-b	1.7	b
Nortron 0.50	1.3	b-d	10.0	a	2.0	b
Spartan 0.025	0.0	d	2.7	b-c	2.3	b
Spartan 0.050	0.0	d	1.3	c	1.7	b
Spartan 0.100	0.0	d	1.0	c	1.3	b

[z] Weed control=average number of weeds in a ½ M^2 , ratings on 6/13/07

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

Racer Efficacy Study

Fall 2007

Lynn Brandenberger, Charles Webber III, James Shrefler, and Lynda Wells
Oklahoma State University

Introduction and objective: Weed control is a serious concern for commercial vegetable producers because of the limited number of herbicides available for this group of minor crops and the potential for crop injury. Organic producers of vegetables have an even bigger challenge since their weed control tools are limited to cultural methods exclusively. One method of weed control used in conventional production is the stale seed-bed where planting beds are prepared and weeds are allowed to germinate and are subsequently controlled by the application of a contact herbicide with no residual activity. After existing weeds are controlled then seed or transplants are planted directly into the seed-bed. This method has appeal for a number of reasons, but organic producers have not been able to utilize this method for lack of an organic material that could be used as a contact herbicide. Additional uses for an organic contact herbicide would also include post directed applications with directed sprays and hooded sprayers. Racer (ammonium nonanoate) is labeled for non-food use and efforts are currently underway to label it as a bio-herbicide for organically grown food crops. The main component of Racer is ammonium nonanoate which occurs in nature and is primarily formed from biodegradation of higher fatty acids. The objective of this study was to investigate different nozzles, rates of active ingredients, and overall rates of spray material for the control of endemic weed populations.

Methods: The study was completed at the Oklahoma State University Vegetable Research station in Bixby, Oklahoma. Plots were arranged in a randomized complete block design with four replications, each plot consisted of an area 10 feet wide by 15 feet long. The entire experimental area was disk-harrowed then cultivated using a "Do-all" finish cultivator on 8/30/07. Treatments were applied on 9/13/07 using a tractor mounted CO_2 sprayer with 3 nozzles with a 20-inch nozzle spacing for a total spray width of 60 inches. To maintain the same spray pattern for each nozzle type, the nozzle pressure was held constant and tractor speed was adjusted to achieve different overall application rates i.e. 35 or 70 gallons per acre (gpa). Treatments included two nozzle types operated at recommended nozzle pressures (TeeJet XR8003 at 59 psi and TeeJet XR8005 at 83 psi), three application concentrations of Racer (8.0, 11.2, and 14.4 lbs ai/a), and two application volumes (35 and 70 gpa) for a total of 12 treatments (Table 1). Plots were rated on 9/14/07, 9/17/07, and 9/20/07 for percent control of Palmer amaranth (*Amaranthus palmeri* S. Watts.), carpetweed (*Mollugo verticillata* L.), and crabgrass (*Digitaria* species) on a 0 to 100% scale 0% = no weed control and 100% = complete control i.e. dead plants. Also included on the same dates were counts of the three different weed species within a 0.1 meter^2 area that was flagged on the first count for each plot with successive counts taken at the same area within the plot. Live weed species were counted if there was any green tissue visible on the plants. Plants that exhibited no green tissue were not counted.

Results and discussion: In general, herbicidal activity on weed populations that were present in the study was observed as burning and subsequent necrosis of plant tissues that were present at the time of application. This is normal for other contact herbicides such as paraquat that are used as "burn-down" materials. Depending on the weed species, some plants began to recover during the seven day period that plots were rated, but all weed species were adversely affected. Regarding rates of Racer, the lowest rate (8.0 lbs ai/acre) did not perform as well compared to higher rates of 11.2 and 14.4 lbs ai/acre (Tables 1 and 2). This was true for all three weed species included in the study. Generally speaking, a greater number of 8003 nozzle treatments had higher levels of control than the 8005 treatments, but the 8005-35-11.2 treatment had the highest rating for nine of the twelve ratings that were taken.

Palmer amaranth control from Racer was highest on 9/14/07 for the 8003-35-11.2, 8003-35-14.4, 8005-35-11.2, 8005-35-14.4, and 8003-70-14.4 which ranged from 96 to 93% control (Table 1). On 9/17/07, Palmer amaranth control was highest for 8005-35-11.2, 8003-70-14.4, 8005-35-14.4, 8003-35-11.2, and 8003-70-11.2 and ranged from 89 to 73% control. Treatment 8005-35-11.2 recorded 91% control on 9/20/07, the highest level of Palmer Amaranth control for that date.

Racer control of carpet weed was high with several treatments providing 100% control of this weed species on 9/14/07 (Table 1). 8003-35-11.2, 8003-35-14.4, 8005-35-11.2, 8005-35-14.4, 8003-70-14.4, and 8005-70-14.4 ranged from 100 to 97% control for carpet weed on 9/14/07. Carpet weed control decreased somewhat for the second and third ratings, but on the last day, ratings were still 92% and above for six of the twelve treatments.

Crabgrass control ranged from 88 to 95% on 9/14/07 for 8003-35-11.2, 8003-70-11.2, 8003-35-14.4, 8005-35-11.2, 8005-35-14.4, and 8003-70-14.4 (Table 2). On 9/20/07 four treatments, 8003-70-11.2, 8003-70-14.4, 8005-35-11.2, and 8005-35-14.4 had ratings of 91% and above.

Only carpet weed on 9/17/07 and 9/20/07 varied significantly for number of live weeds (Table 3), the remainder of weed species and dates did not vary for number of live weeds present. On 9/17/07 all treatments except for 8003-70-8 had significantly fewer carpetweeds than the untreated check. Of the treatments that had lower numbers of live carpetweeds 8005-35-14.4, 8005-70-14.4, and 8005-35-11.2 recorded zero, 0.3, and 0.3 weeds compared to the untreated check that had 5.0 weeds per 0.1 M^2. On 9/20/07, all Racer treatments had fewer live carpetweeds than the untreated check. Treatments including 8005-35-14.4, 8005-70-14.4, and 8003-35-11.2 had 0.3 to 0. 5 live carpetweeds per 0.1 M^2.

In general, Racer proved to be an effective contact herbicide for controlling the three weed species that were included in the study. The two higher rates of Racer (11.2 and 14.4 lbs ai/acre) were more effective than the 8.0 lbs ai/acre rate, although even the low rate resulted in higher levels of weed control than the untreated check. It appears that the overall spray application rate of 70 gpa probably diluted the active ingredient enough to reduce its effectiveness. Based upon the results, the authors would recommend further study to determine if similar results would be observed during a different season with different conditions, but would recommend examining rates of 11.2 and 14.4 lbs ai/acre and overall application rates of 35 gpa.

Acknowledgements: The authors wish to thank U.S.D.A. Interregional Project # 4 (IR-4) and Falcon Lab LLC for their support of this research.

Table 1. 2007 Racer efficacy study, Bixby, OK, Control of weedy species.

Treatments[y]	**Palmer amaranth % control of weedy species[z]**			**Carpet Weed % control of weedy species**		
Nozzle-gpa-ai	**9/14/07**	**9/17/07**	**9/20/07**	**9/14/07**	**9/17/07**	**9/20/07**
Check	0 e[x]	0 d	0 e	0 c	0 d	0 c
8003-35-8	60 b-c	61 a-b	70 a-d	75 a-b	74 a-b	66 a-b
8003-70-8	31 c-d	28 c	50 d	79 a-b	49 c	44 b
8003-35-11.2	96 a	75 a	84 a-c	100 a	95 a	92 a
8003-70-11.2	78 a-b	73 a	79 a-c	97 a	94 a	93 a
8003-35-14.4	96 a	66 a-b	85 a-b	100 a	95 a	94 a
8003-70-14.4	93 a	86 a	85 a-b	98 a	97 a	92 a
8005-35-8	44 c-d	43 b-c	63 b-d	91 a-b	80 a-b	70 a-b
8005-70-8	24 d-e	18 c-d	60 b-d	68 b	55 b-c	49 b
8005-35-11.2	94 a	89 a	91 a	100 a	99 a	95 a
8005-70-11.2	40 c-d	44 b-c	58 c-d	91 a-b	75 a-b	73 a-b
8005-35-14.4	93 a	85 a	75 a-d	99 a	99 a	93 a
8005-70-14.4	58 b-c	66 a-b	76 a-c	97 a	89 a	71 a-b

[z]Percent control of individual weedy species.
[y]Treatments=Nozzle type, gpa=gallons per acre, ai=lbs active ingredient per acre.
[x] Numbers in a column followed by the same letter exhibited no significant differences based on Duncan's Multiple Range Test where P=0.05.

Table 2. 2007 Racer efficacy study, Bixby, OK, Control of weedy species.

Treatments[y]	Crabgrass			Total		
	% control of weedy species[z]			% control of all weedy species		
Nozzle-gpa-ai	9/14/07	9/17/07	9/20/07	9/14/07	9/17/07	9/20/07
Check	0 d[x]	0 d	0 d	0 f	0 f	0 d
8003-35-8	50 c	50 c	59 c	77 c	64 b-d	65 b-c
8003-70-8	56 b-c	56 b-c	59 c	63 d	39 e	55 c
8003-35-11.2	91 a	91 a	89 a-b	95 a	88 a	88 a-b
8003-70-11.2	88 a	88 a	91 a-b	90 a	85 a-b	88 a-b
8003-35-14.4	90 a	90 a	89 a-b	96 a	83 a-b	88 a-b
8003-70-14.4	95 a	95 a	91 a-b	93 a	88 a	87 a-b
8005-35-8	75 a-c	75 a-c	64 c	84 a-b	56 c-e	66 b-c
8005-70-8	48 c	48 c	70 b-c	58 c	48 d-e	64 b-c
8005-35-11.2	93 a	93 a	96 a	95 a	93 a	95 a
8005-70-11.2	73 a-c	73 a-c	78 a-c	75 a-c	74 a-c	68 b-c
8005-35-14.4	91 a	91 a	91 a-b	96 a	90 a	86 a-b
8005-70-14.4	80 a-b	80 a-b	88 a-b	85 a-b	81 a-b	84 a-b

[z]Percent control of individual weedy species.
[y]Treatments=Nozzle type, gpa=gallons per acre, ai=lbs active ingredient per acre.
[x] Numbers in a column followed by the same letter exhibited no significant differences based on Duncan's Multiple Range Test where P=0.05.

Table 3. 2007 Racer efficacy study, Bixby, OK, Number of live weeds by species.

Treatments[y]	Palmer amaranth			Carpet Weed			Crab grass		
	Number of live weeds in 0.1 M^{2z}								
Nozzle-gpa-ai	9/14/07	9/17/07	9/20/07	9/14/07	9/17/07	9/20/07	9/14/07	9/17/07	9/20/07
Check	3.0 a[x]	2.3 a	2.3 a	4.5 a	5.0 a	6.0 a	24 a	19 a	22 a
8003-35-8	1.0 a	1.0 a	1.0 a	3.3 a	0.5 b-c	1.0 b	40 a	33 a	32 a
8003-70-8	1.8 a	1.5 a	1.8 a	5.5 a	3.0 a-b	2.5 b	24 a	21 a	23 a
8003-35-11.2	1.0 a	1.0 a	1.0 a	4.3 a	0.8 b-c	0.5 b	27 a	12 a	13 a
8003-70-11.2	1.0 a	0.8 a	0.8 a	5.5 a	1.0 b-c	0.8 b	18 a	15 a	18 a
8003-35-14.4	1.5 a	1.3 a	1.8 a	6.8 a	0.5 b-c	0.8 b	26 a	13 a	15 a
8003-70-14.4	1.0 a	0.3 a	0.5 a	6.5 a	0.5 b-c	1.3 b	37 a	23 a	23 a
8005-35-8	2.0 a	1.0 a	1.3 a	4.0 a	1.5 b-c	1.3 b	37 a	32 a	30 a
8005-70-8	1.8 a	1.5 a	2.0 a	4.0 a	2.3 b-c	2.0 b	27 a	26 a	26 a
8005-35-11.2	1.3 a	0.8 a	0.8 a	7.8 a	0.3 c	1.0 b	21 a	17 a	18 a
8005-70-11.2	2.0 a	1.3 a	1.0 a	4.0 a	1.0 b-c	1.3 b	22 a	25 a	20 a
8005-35-14.4	3.5 a	2.5 a	2.8 a	5.0 a	0.0 c	0.3 b	31 a	16 a	17 a
8005-70-14.4	2.8 a	0.8 a	1.5 a	8.5 a	0.3 c	0.3 b	41 a	30 a	29 a

[z] Number of live weeds by species in 0.1 M^2.
[y]Treatments=Nozzle type, gpa=gallons per acre, ai=lbs active ingredient per acre.
[x]Numbers in a column followed by the same letter exhibited no significant differences based on Duncan's Multiple Range Test where P=0.05.

Pepper Preemergence Study

Spring 2007

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Cooperating with Dean Smith SS Farms

Introduction and objective: Screening new herbicides for crop safety and effectiveness is important for small acreage crops. One of the highest costs involved in producing vegetable crops is the cost of hand weeding which often costs hundreds of dollars per acre. The objective of this study was to determine the crop safety and efficacy of several preemergence treatments for control of Palmer amaranth (*Amaranthus palmeri* S. Watts.), Carpetweed (*Mollugo verticillata* L.), and Primrose (*Oenothera sp.*).

Methods: The study was completed in a commercial pepper field of OSU 'Super Hot' that was transplanted on 5/16/07 in Caddo County, Oklahoma at SS Farms. Plants were in rows with 3 foot row centers and spaced approximately 2.5 feet apart in the row. Plots were arranged in a randomized block design with three replications, each plot being 6 x 20 feet. Seven treatments and an untreated check were included in the study. Herbicide treatments included one rate of Dual Magnum (S-metolachlor), Outlook (dimethenamid-P), Nortron (ethofumesate), and two rates of Spartan (sulfentrazone), and Goal (oxyfluorfen). Preemergence treatments were applied on 5/16/07 following transplanting utilizing a CO_2 research sprayer with a 6 foot wide hand-held spray-boom. Weed counts were recorded on 6/25/07 for each plot, fresh plant weights were recorded for five random plants per plot on 11/06/07.

Results and discussion: Stunting was significantly higher for both rates of Spartan and Goal when compared to the untreated check, Dual Magnum, Outlook, and Nortron (Table 1). Spartan at 0.1 and 0.2 lb ai/acre and Goal at 0.25 and 0.5 lb ai/acre had 63, 80, 57, and 80% stunting, respectively. No differences were observed for control of Palmer amaranth or primrose. All herbicide treatments had significantly fewer carpetweeds than the untreated check. No differences were observed in the number of plants per plot. The fresh weight of five plants was only lower for Spartan at 0.2 lb ai/acre. This treatment had a weight of 4.6 lbs for five plants compared to the untreated check that had 7.6 lbs for five plants.

Although there were no differences recorded for the number of Palmer amaranth or primrose, the surrounding field and plot areas were hand weeded during the season accounting for the lack of differences. Both Spartan and Goal treatments resulted in serious stunting of pepper, but by the end of the season plants had recovered in all treatments except for the highest rate of Spartan. The authors would recommend further study be undertaken to determine if lower rates of Spartan and Goal could be utilized while still maintaining adequate weed control.

Acknowledgements: The authors wish to thank Dean Smith for supplying labor and crop inputs to make the study successful.

Table 1. 2007 Pepper herbicide study, Hinton, OK.

Treatment lbs ai/acre	Stunting[z]		Weed Control (No. weeds)[y] Palmer amaranth		Carpet Weed		Primrose		Number Plants[x]		Weight (5 plants) (lbs.)[w]	
Untreated check	12	b[v]	2	a	43	a	3	a	19.0	a	7.6	a
Dual Magnum 0.65	17	b	0	a	2	b	4	a	18.3	a	7.9	a
Outlook 0.5	17	b	0	a	6	b	2	a	19.7	a	7.6	a
Nortron 1.0	7	b	0	a	10	b	0	a	22.0	a	8.8	a
Spartan 0.1	63	a	0	a	0	b	1	a	16.7	a	8.4	a
Spartan 0.2	80	a	0	a	0	b	0	a	15.0	a	4.6	b
Goal 0.25	57	a	0	a	0	b	2	a	17.7	a	9.3	a
Goal 0.5	80	a	0	a	0	b	1	a	15.0	a	8.0	a

[z] Percent stunting to pepper plants.
[y] Weed control=average number of weeds per plot, ratings on 6/25/07
[x] Number of plants in 2 rows, Plot area 6' wide x 20' long
[w] Weight of 5 plants in a plot
[v] Numbers in a column followed by the same letter exhibited no significant differences based on Duncan's Multiple Range Test where P=0.05.

Snapbean Tolerance to Reflex and Dual Magnum

Spring 2007

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Introduction and objective: Snapbeans are an important crop for vegetable producers in Oklahoma. They are used primarily by the canning industry, but considerable acreage is also grown by fresh market producers. A large portion of this crop utilizes preemergence herbicides for weed control. One important issue related to herbicide use is the development of herbicide resistant weed species and identifying new herbicides to counter this problem. The objective of this study was to screen herbicide combinations utilizing Reflex (fomesafen) and Dual Magnum (S-metolachlor) at two different use rates to determine how tolerant snapbeans are at these use rates.

Methods: The study was carried out at the Oklahoma State University Vegetable Research Station at Bixby, Oklahoma. Plots were direct seeded on 5/14/07 using a research cone planter, each plot having 2 rows of the cultivar Ulysses planted on 36 inch row centers at approximately 8 seeds per foot. Following planting, preemergence herbicide treatments were applied with a hand-boom CO_2 sprayer with a 6 foot wide spray pattern on 5/14/07. Treatments included 2 rates of Reflex and Dual Magnum: Reflex at 0.0125 plus Dual Magnum at 0.53 lb ai/acre; Reflex at 0.25 plus Dual Magnum at 1.10 lb ai/acre and untreated as a check (Table 1). The entire study area received approximately 0.5 inch of overhead irrigation immediately following herbicide application. Plots were arranged in a randomized block design with 4 replications. Data recorded at harvest on 7/09/07 included plant weights, marketable yield and cull yield in pounds.

Results and discussion: No differences were recorded for plant weights or yields in the study (Table 1). In general it appears that neither of the herbicide combinations had any detrimental effect on crop growth and development. Although no differences were recorded it does appear that there is a trend toward increased plant weight and yield from the use of the two treatments. Plant weights ranged from 1.22 lbs/plant for the untreated check up to a high of 1.87 lbs/plant for the highest rate of Reflex + Dual Magnum. Yields again reflected this trend with marketable yields ranging from 2364 lbs/acre for the untreated check to a high of 3745 lbs/acre for the higher herbicide rates.

In conclusion, it appears that these combinations of Reflex and Dual Magnum are safe for use in snapbean production. Furthermore, the trend toward larger plants and higher yields for the herbicide treatments provides some indication that these treatments provided higher levels of weed control resulting in increased yield. Future work will be needed to determine if these trends hold true over different seasons and growing conditions.

Table 1. 2007 Green Bean preemergence herbicide study, Bixby, OK.

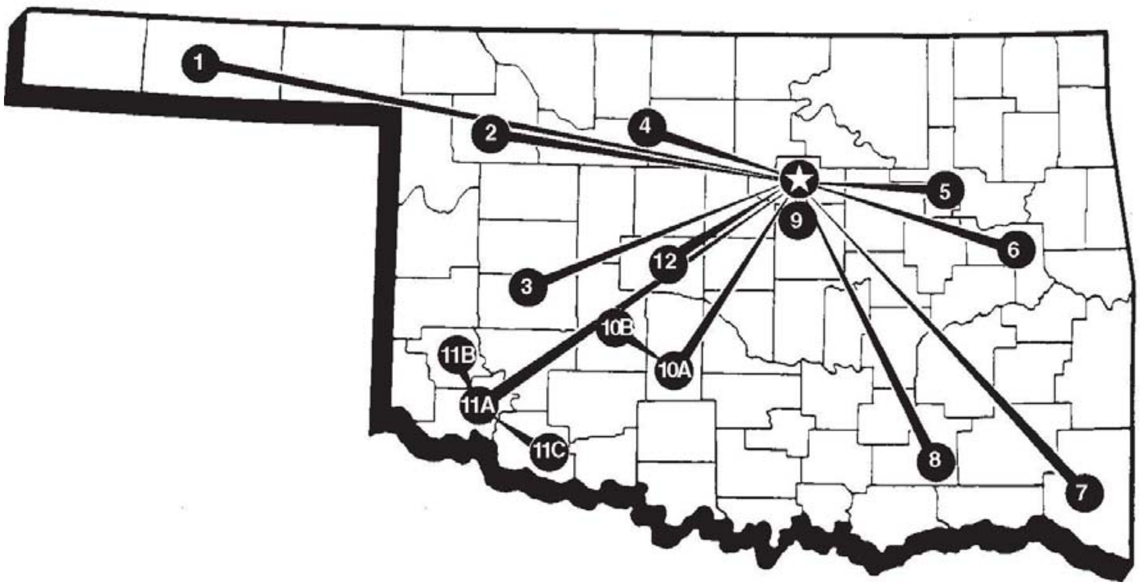
	Individual Plant Wt. [z]	**Yield lbs./acre** [y]	
Treatment lbs ai/acre		**Marketable**	**Cull**
Untreated check	1.22 a [x]	2364 a	336 a
Reflex 0.125 + Dual Magnum 0.53	1.58 a	3030 a	268 a
Reflex 0.25 + Dual Magnum 1.10	1.87 a	3745 a	450 a

[z] Total wt. of an individual plant with pods.
[y] Marketable and cull yield of pods. Harvested on 7/9/07
[x] Numbers in a column followed by the same letter exhibited no significant differences based on Duncan's Multiple Range Test where P=0.05.

SI (METRIC) CONVERSION FACTORS

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

THE OKLAHOMA AGRICULTURAL EXPERIMENT STATION
SYSTEM COVERS THE STATE



✪	**MAIN STATION—*Stillwater and adjoining areas***
1.	**Oklahoma Panhandle Research and Extension Center—*Goodwell***
2.	**Southern Plains Range Research Station—*Woodward***
3.	**Marvin Klemme Range Research Station—*Bessie***
4.	**North Central Research Station—*Lahoma***
5.	**Oklahoma Vegetable Research Station—*Bixby***
6.	**Eastern Research Station—*Haskell***
7.	**Kiamichi Forestry Research Station—*Idabel***
8.	**Wes Watkins Agricultural Research and Extension Center—*Lane***
9.	**A. Agronomy Research Station—*Perkins***
	B. Oklahoma Fruit and Pecan Research Station—*Perkins*
10.	**A. South Central Research Station—*Chickasha***
	B. Caddo Research Station—*Ft. Cobb*
11.	**A. Southwest Research and Extension Center—*Altus***
	B. Sandyland Research Station—*Mangum*
	C. Southwest Agronomy Research Station—*Tipton*
12.	**Grazingland Research Laboratory—*El Reno***