2012 Vegetable Trial Report

January 2013

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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 2012.

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

Sweet Corn Variety Trial, Bixby, Oklahoma
Spring 2012

Brian Kahn, Lynda Carrier, Robert Havener, and Robert Adams, Oklahoma State University

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 24 varieties (yellow or bicolor) for yield, earliness, and overall quality. Varieties were grouped as se or sh_2 for isolation purposes.

Materials and Methods: Plots were fertilized with 50 lbs. N/acre, harrowed, and then direct seeded on April 19. 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 April 19, at the rate of ¾ pint/acre. Plots were rated for seedling vigor on May 11. Overall early vigor was good. Final thinning to 20 plants per row was completed on May 11 for the sh_2 trial and on May 14 for the se trial. The entire study was top-dressed with urea to supply 75 lbs. N/acre on May 14 and 50 lbs. N/acre on June 7. Insecticide applications began just before silking and continued throughout the harvest period. Supplemental water was applied with overhead irrigation, but plants were under water stress by the end of the study. Each variety was harvested one time at its peak maturity.

Results and Summary: Results are shown on the following page. Standards of comparison were 'Incredible R/M' in the se group and 'GSS 0966' in the sh_2 group. Corn earworm control was better than in many previous years, although most ears had some damage.

se group: Marketable yields did not differ for number of ears, but varied for tonnage. The early 'Profit' set its ears low and had the shortest ears in the trial. 'Synergy' is recommended for trial as an early bicolor se corn; it had an above-average shucked ear appearance in the last se trial (2010) and this year. The new "R/M" versions of 'Bodacious' and 'Incredible' looked as good as the originals and continue to be recommended for Oklahoma, while 'Applause' should be considered for trial. 'Miracle' yielded well but had some ears with a low shucked appearance rating. The two Syngenta cultivars are GMOs (genetically engineered for earworm resistance) and were statistically comparable to 'Incredible R/M' for yield. They had less earworm damage than all other entries except 'Kristine.' Some husked ears of 'Lancelot' looked lumpy because kernel size was inconsistent, especially compared to 'Cameo', a cultivar of similar maturity that is now recommended for Oklahoma.

sh_2 group: Marketable yields did not differ for tonnage but varied for number of ears. Overall, only 'Mirai 160Y', 'Sentinel', and 'Yosemite' yielded less than 'GSS 0666.' 'Sentinel' usually had only one marketable-size ear per stalk, but ears tended to be fat and attractive, with huge flags. ‘Yosemite’ had vigorous plants but variable maturity and large ears, making it difficult to determine harvest timing. Both should be trialed again. ‘Legion’ and ‘Bueno’ have been in trial before. Overall, ‘Legion’ may have an edge and could have a niche as a bicolor to follow ‘Obsession.’ ‘BSS 0977’, ‘GSS 0966’, ‘Obsession’, ‘Passion’, and ‘7143’ are all recommended for Oklahoma, and this trial reaffirmed those recommendations. Note that ‘BSS 0977’ has consistently been later in maturity than what the catalog description would suggest. ‘Awesome’ and ‘Stellar’ showed potential for early corns, although both had relatively high cull yields. Corn earworm damage did not differ among entries, an unusual result given that ‘GSS 0966’ and ‘BSS 0977’ are GMOs (genetically engineered for earworm resistance). The two GMOs did seem to show less extensive earworm damage than the other entries, but both had some damage far enough below the ear tips to rate at 2.5 or sometimes 3.0.

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 2012 Sweet Corn Variety Trial, Bixby[z].

Variety	Company/ Source	C[y]	Vigor rating[x]	Market yield (sacks/A)[w]	Yield (tons/A) Market	Culls	Days to harvest	In-shuck rating[v]	Shucked rating[v]	Avg ear dia. (inches)	Avg ear length (inches)	Corn earworm damage[u]
Group: se												
Miracle	Crookham	Y	4.0	252	4.2	0.6	74	3.3	3.8	1.9	7.6	3.3
Bodacious R/M	Crookham	Y	3.8	250	3.5	0.6	67	3.2	3.0	1.7	6.9	3.5
Applause	Crookham	Y	4.0	244	3.0	0.3	67	4.0	3.7	1.7	6.7	3.7
Ka-Ching	Crookham	BC	3.5	238	2.9	0.6	70	4.2	2.7	1.7	7.5	3.2
Incredible R/M	Crookham	Y	4.3	234	4.2	0.7	74	2.8	2.3	1.9	7.8	3.8
Lancelot	Harris Moran	BC	4.0	232	4.1	0.7	74	3.7	3.8	1.9	7.8	3.2
Cameo	Crookham	BC	3.0	223	4.0	0.4	74	3.3	3.0	1.9	8.1	3.3
GH 0851	Syngenta	Y	4.0	213	3.3	0.3	74	4.2	2.7	1.8	8.0	2.3
BC 0805	Syngenta	BC	4.3	209	3.5	0.5	74	4.2	2.0	1.8	8.6	2.2
Synergy	Seedway	BC	4.7	209	3.0	0.3	67	3.3	2.3	1.8	6.9	3.0
Kristine	Crookham	BC	4.3	207	3.2	0.3	70	3.8	2.8	1.8	7.2	2.5
Profit	Crookham	BC	3.5	201	2.5	0.4	67	3.8	3.8	1.8	6.2	3.2
	Mean	--	4.0	226	3.5	0.5	71	3.7	3.0	1.8	7.4	3.1
	LSD $_{0.05}$	--	NS	NS	1.1	NS	--	0.6	0.7	0.1	0.4	0.6
Group: sh₂												
Legion	Syngenta	BC	4.2	303	4.4	0.4	77	2.7	3.0	1.8	7.0	3.3
BSS 0977	Syngenta	BC	4.0	289	4.0	0.2	77	2.3	2.8	1.7	7.3	2.7
GSS 0966	Syngenta	Y	4.2	277	4.0	0.3	74	2.5	3.0	1.7	7.5	2.7
Bueno	Crookham	BC	4.0	275	4.4	0.5	74	1.8	3.0	1.9	7.5	3.5
Obsession	Seedway	BC	4.3	275	5.0	0.4	70	3.0	2.0	1.8	8.0	3.2
Passion	Seedway	Y	3.7	275	5.0	0.2	70	2.3	2.7	1.8	8.0	3.5
7143	Seedway	BC	4.3	254	5.2	0.5	74	1.8	2.7	1.9	8.1	3.5
Stellar	Seedway	BC	4.7	232	4.3	1.0	70	2.5	3.3	1.9	7.5	3.2
Awesome	Seedway	BC	4.7	230	4.1	1.1	67	2.5	2.2	1.9	7.4	2.7
Mirai 160Y	Centest	Y	4.3	221	3.5	0.4	70	2.2	2.2	1.7	7.7	3.2
Sentinel	Harris Moran	Y	4.3	209	4.6	0.5	77	1.8	1.8	2.0	7.9	3.3
Yosemite	Harris Moran	Y	4.3	207	4.8	0.9	70	1.3	2.5	1.9	8.4	3.5
	Mean	--	4.2	254	4.4	0.5	73	2.2	2.6	1.8	7.7	3.2
	LSD $_{0.05}$	--	NS	56	NS	0.5	--	0.8	0.6	0.1	0.4	NS

[z]Seeded April 19, 2012; Plot size: 1.8m x 6.0m (2 rows/plot, 3 plots each variety, plots thinned to 20 plants/row.) Harvested 6/25/12 to 7/5/12.
[y]C=Color (BC=bicolor, Y=yellow)
[x]Vigor rating: 1=will not make stand, 5=thick stand and good vigor.
[w]One sack = 60 ears.
[v]Appearance rating: 1=best, 5=poorest.
[u]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. Earworm control: Pounce, Asana & Lannate were alternated and applied a total of 7 times between silking & harvest to entire planting.

Muskmelon Variety Trial, Helena, OK

Brian Kahn, Lynda Carrier, and Lynn Brandenberger, Oklahoma State University
Cooperating with Don Frech and Nelson Frantz
Agri-Services, Oklahoma Department of Corrections

Introduction: Muskmelons have historically been important crops in Oklahoma. Although today production is more for local markets (including Farm-to-School), the "Western shipper" type of melon is adapted to our production conditions and remains important. The objective of this trial was to determine adaptation and yield potential of 10 Western shipper muskmelons under northwestern Oklahoma conditions.

Methods: Three long raised beds on ≈ six foot centers were made available for the trial at the James Crabtree Correctional Center (JCCC) farm in Helena, OK. Each bed constituted a replication, creating a randomized complete block design with three replications. All beds had buried drip irrigation lines and two were covered with black plastic mulch. Plots were seeded on 5/8/12. Holes were made two feet apart in rows and five seeds were sown per hole by pressing seeds into the soil. There were 10 "hills" per plot, so plots were 20 feet long, with at least 10 feet within rows between plots. Thinning occurred on 5/24/12. At this time, we observed that the two rows with plastic had very poor stands and were full of empty seed coats. It appeared mice had gotten under the plastic and eaten the seeds. Nearly all the plots in the row without plastic had 10 good hills of seedlings. We transplanted some seedlings to try to create at least one mulched plot with 10 hills of two seedlings each for each cultivar, plus thinned the non-mulched plots to the target stand of two plants per hill. Plots were subsequently irrigated, fertilized, and provided with pest control according to JCCC farm protocols. Plots were harvested and data were taken from 7/26/12 through 9/6/12. Harvested fruits were separated into marketable and cull categories and weighed individually. Additional observations of fruit characteristics were made on 8/15/12.

Results: Vegetative growth and fruit set were very good despite record heat and drought conditions. Only the bare soil replication was useable for 'Gold Express', 'Holbrook', and 'Rocket', while the other entries had at least one useable mulched replication (Table 1). 'Acclaim' had relatively small fruit but was highly productive. 'Acclaim' has also performed well in our previous trials but can be difficult to find in seed catalogs. 'Gold Express', 'Rocket', and 'El Camino' all had above-average yields and relatively low cull production, and should be considered for further trial. 'Expedition' also should be trialed again, despite below-average yields, because its fruit were large and relatively attractive. 'Navigator' was recommended by a local source, but it did not distinguish itself in this trial. Finally, 'Yuma Grande' would be the only entry that we would not recommend after this trial. Fruits were elongated to football-shaped, were relatively susceptible to rot, and those sampled had an insipid flavor.

Table 1. Summer 2012 Muskmelon Variety Trial, OK Department of Corrections, Helena.[z]

		Bare soil rep. only				Based on all useable reps.[y]	
		Marketable fruit			Cull fruit		
Variety	**Company/ Source**	**no./A**	**tons/A**	**lbs./fruit**	**no./A**	**Avg. wt. per marketable fruit (lbs.)**	**% (by no.) of fruit that were marketable**
Acclaim	Syngenta	18,150	32.4	3.6	1,452	3.3	91
Gold Express	Syngenta	13,794	26.9	3.9	726	3.9	95
Rocket	Harris Moran	13,794	26.8	3.9	1,089	3.9	93
El Camino	Syngenta	10,890	24.0	4.4	1,089	4.1	90
Holbrook	Seedway	10,527	29.0	5.5	4,719	5.5	69
Dacona	Seedway	9,801	23.1	4.7	1,815	5.0	82
Expedition	Harris Moran	7,623	20.7	5.4	1,452	5.7	79
Navigator	Harris Moran	7,260	19.0	5.2	1,452	5.0	71
Yuma Grande	Seedway	5,808	18.8	6.5	6,171	6.2	59
Nitro	Harris Moran	5,082	15.0	5.9	1,452	5.9	76
	Mean	10,273	23.6	4.9	2,142	4.8	80

[z] Seeded May 8, 2012; Plot size: 6 ft. x 20 ft. (10 "hills" per plot with 2 ft. between hills; thinned and transplanted where necessary with a goal of 2 plants per "hill"). Harvested 7/26/12 to 9/6/12.
[y] Only the bare soil replication had 10 complete hills of each variety. The other two replications, on black plastic, had variable stands, and neither mulched replication was useable for Gold Express, Holbrook, and Rocket.

Okra Branching Study, Bixby, OK

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In Cooperation with Rodney Farris, Robert Havener, Robert Adams
Oklahoma State University, Vegetable Research Station

Introduction: Okra is a warm season vegetable known for its tolerance of warm summer temperatures and yield of tender seed pods used in a number of ways for cooking and canning. It is a staple of traditional southern cooking in many forms including boiled, breaded and fried, and pickled. As producers adopt more intense management of this traditional crop, efforts continue in breeding cultivars that will have increased yields produced in less space. One approach to these breeding goals is to select for increased branching and flowering in a breeding line. Field observations indicate that progress can be made in developing okra cultivars that have higher levels of both branching and fruiting. The objective of this study was to determine if several advanced selections for increased branching and fruiting do actually branch and fruit at a higher level than their parental line.

Methods: Five advanced okra lines selected for increased branching and fruiting were compared to the parental line of 'Clemson Spineless'. The study was arranged in a randomized block design with five replications. Plots consisted of one 20 foot row of a given line with rows on 18 foot centers. Plots were direct seeded with a research planter on 6/12/12 at the OSU Vegetable Research Station in Bixby, Oklahoma at a rate of four seeds per row foot. Prior to planting, trifluralin herbicide was applied as a preplant incorporated application at 0.625 lbs. AI /acre. On 6/25/12 plants in each plot were thinned to one plant per row foot and fertilized with urea (46-0-0) at a rate of 20 lbs. of nitrogen per acre. Additional weed control for plot maintenance used hand hoeing and a layby application of trifluralin on 719/12. Data was recorded on 9/06/12 for number of branches and fruit present and on 10/01/12 for number of fruit.

Results and discussion: On 9/06/12 differences were observed for fruit counts with line A-4 having significantly higher fruit counts than 'Clemson Spineless' or the other four advanced lines. A-4 had 12.6 fruit per plant compared to 3.0 to 5.5, respectfully, for 'Clemson Spineless' and line A-1. No differences were observed for branching on 9/06/12 and 10/01/12 or for fruiting on 10/01/12.
Although the results of this study did not conclusively prove that selecting lines for branching and fruiting is effective, it did indicate that there appears to be potential for improved fruiting through selection for that trait.

Acknowledgements: The authors wish to thank Robert Havener, Robert Adams, and Rodney Farris for their help on this study.

Table 1. 2012 okra branching and fruiting study, Bixby, OK.

Treatments	Fruiting		Branching
	9/06/12	10/01/12	9/06/12
Line A-1	5.5 b[z]	44.0 a	34.7 a
Line A-2	5.2 b	30.0 a	35.6 a
Line A-3	5.0 b	44.2 a	32.9 a
Line A-4	12.6 a	25.4 a	31.0 a
Line A-5	3.9 b	33.6 a	34.7 a
Clemson's spineless	3.0 b	48.2 a	34.9 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.

Soil Improvement Study, Bixby, Oklahoma

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In Cooperation with Rodney Farris, Robert Havener, Robert Adams
Oklahoma State University, Vegetable Research Station

Introduction: Levels of organic matter in agricultural soils in Oklahoma are commonly less than 1%. Long summers and decades of tillage combine to reduce the level of organic matter. Low organic matter can have serious effects upon production including poor stands, poor retention of water and plant nutrients, and generally poor tilth of production soils. The objectives of this multi-year study are to compare different means of increasing soil organic matter and the effects that increased organic matter may have on crop establishment and growth over a number of years.

Methods and Materials: Plots were arranged in a randomized block design with five replications. Treatments included a clean fallow check, cowpea (Victor) cover crop, sorghum x sudan cover crop (Hay Grazer BMR 6), sorghum x sudan + cowpea cover crop combination, and clean fallow + compost. Study treatments were initiated on 7/01/11 by direct seeding all cover crops in plots that were 12' x 26' which included 18 rows on six inch row centers. All cowpea seed were inoculated prior to planting with *Bradyrhizobium* species at a rate of 2.5 oz of inoculum per 50 lbs of seed. Clean fallow and compost plots were rototilled during the summer growth period. Sorghum/sudan cover crop plots were mown with a rotary mower at a height of 4-6 inches twice during the summer and the entire study was mown prior to fall tillage. Efforts in fall of 2011 included tilling the entire study area with a tractor mounted rototiller and applying spent mushroom compost to the clean fallow + compost plots at a rate of 8 tons of compost per acre. All plots were then rototilled to a depth of 3-4 inches on 9/20/11. Plots were planted to the spinach cultivar 'Olympia' on 9/28/11. Spinach received approximately 100 lbs. of nitrogen per acre as four side-dress applications during the growing season. Plots consisted of four rows of spinach on one foot row centers and plots were 26' long. Data collected included stand ratings and plants per 0.1 m^2 on 10/13/11 and 11/01/11, respectfully, and yield on 4/06/12. Harvest data included the total weight of spinach in pounds for each plot.

Results and discussion: Results for both emergence and plant populations did vary between the treatments (Table 1). Emergence ranged from 68 to 91% with the clean fallow + compost treatment having the highest emergence. Plant populations ranged from 8.8 to 14.4 plants per 0.1 $meter^2$ with the cowpea cover crop treatment having the highest number of plants. No differences were recorded between the different treatments for overall yield. Future plans include planting spinach for the 2012-2013 over-winter seasons with observation of crop stands and growth.

Table 1. 2012 soil improvement study, Bixby, OK.

Treatments	**Emergence %**	**Populations Plants/0.1 m^2**	**Yield in lbs.**
Clean fallow check	76 b[z]	8.6 b	7.5 a
Cowpea cover crop	70 b	14.4 a	5.4 a
Sorghum sudan cover crop	76 b	10.8 b	9.0 a
Sorghum sudan + cowpea cover crop	68 b	9.2 b	5.4 a
Clean fallow + compost	91 a	10.0 b	15.0 a

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

Over-Winter Spinach Nitrogen Sources, Bixby, OK
Fall 2011-Spring 2012

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Introduction: Over-winter spinach grown for the processing market is an important crop for Oklahoma producers in the eastern and western areas of the state. Nitrogen fertility for this commercial crop is critical for rapid growth and adequate yields. In the past, spinach producers have relied heavily on ammonium nitrate (34-0-0) for fertilization of overwintering spinach. This was due in part because ammonium nitrate is normally readily available for the crop even at cooler temperatures while urea and other sources are slower to convert to available forms of nitrogen. Due to potential restrictions for this nitrogen source, producers want to investigate the use of other forms of nitrogen for over-winter spinach. The objective of this study was to determine the effect of both ammonium (34-0-0) and urea (46-0-0) forms of nitrogen fertilizer on spinach crop yield and quality.

Methods: A composite soil sample for the entire study site was collected on 10/20/11 and tested for soil pH, nitrogen, phosphorus, and potassium levels. Soil test results reported nitrogen at 38 lbs. NO_3/acre providing a suitable level for testing different nitrogen sources for spinach. Plots were 18 feet wide and 30 feet long with 10 feet between plots for alleys. Plots were seeded down the center of each 18 feet wide plot. The site was direct seeded to spinach (cultivar 'Olympia') on 11/01/11 utilizing a nine row plot planter with a six inch row spacing (6" from row center to row center) at an approximate seeding rate of 1.5 million seed per acre. Treatments consisted of: 225 pounds of nitrogen per acre utilizing 34-0-0 and 21-0-0-24; 389 pounds of nitrogen per acre utilizing 46-0-0 and 21-0-0-24 (Table 1). All treatment areas received 21 lbs. of nitrogen per acre at planting from ammonium sulfate (21-0-0-24) applied with a cyclone hand spreader. Subsequent nitrogen applications were made on 2/01/12, 3/01/12, 3/15/12, and 3/27/12. Foliar nitrogen levels were tested on 3/15/12 and 4/02/12. Samples on 3/15/12 were collected as one subsample for each of the five replications for a given treatment and combined subsamples were tested for each treatment. Samples on 4/02/12 were collected and analyzed for each plot. Crop water needs were met through the overhead irrigation system. Plots were harvested with a mechanized plot harvester on 4/02/12 and 4/06/12 with individual plot yields being recorded.

Results and discussion: Levels of foliar nitrogen were analyzed on two dates, 3/15/12 and 4/02/12 i.e. two weeks before harvest and just prior to harvest. No differences were observed on either date for levels of nitrogen in spinach foliage (Table 2). Levels of nitrogen in the soil were analyzed for each treatment following harvest. Although no statistical differences were observed, the level of nitrogen in the soil ranged from 289 lbs. nitrogen per acre for the ammonium nitrate treatment to 451 lbs. nitrogen per acre for the urea treatment. Both nitrogen treatments resulted in high levels of nitrogen left over after the cropping season indicating the need for either a succeeding crop to utilize the nitrogen or the possibility of nitrogen leaching into the water table. Yields of spinach did not vary between the treatments in this study. Plot yields were 37.9 and 35.6 lbs., respectfully, for the ammonium nitrate and urea treatments.

There are several outcomes that should be discussed from these results. First, the 2011-2012 overwintering spinach crop season was unseasonably warm. This can have a direct and positive effect on the conversion of different forms of nitrogen in converting to available forms of nitrogen. The bottom line is as warm as it was, probably any form of nitrogen would have worked. Second, the levels of nitrogen that were applied were higher than were needed for crop growth and development, therefore making it difficult to observe differences caused from the slow conversion of nitrogen from urea.

In conclusion, the authors believe that more research is needed to fully answer the question of whether ammonium nitrate can be replaced by urea for overwinter spinach production in Oklahoma.

Acknowledgements: The authors want to thank Allen's Quality Vegetables for partial funding of this study.

Table 1. 2012 spinach nitrogen study, Bixby, OK., Nitrogen applications to study.

Date	Treatment	21-0-0-24 applied lbs. per acre	34-0-0 applied lbs. per acre	46-0-0 applied lbs. per acre	Actual nitrogen lbs. per acre
11/01/11	34-0-0	100	0	0	21
11/01/11	46-0-0	100	0	0	21
02/01/12	34-0-0	0	150	0	51
02/01/12	46-0-0	0	0	200	92
03/01/12	34-0-0	0	150	0	51
03/01/12	46-0-0	0	0	200	92
03/15/12	34-0-0	0	150	0	51
03/15/12	46-0-0	0	0	200	92
03/27/12	34-0-0	0	150	0	51
03/27/12	46-0-0	0	0	200	92
Total for crop	34-0-0	100	600	0	225
Total for crop	46-0-0	100	0	800	389

Table 2. 2012 spinach nitrogen study, Bixby, OK., pH, nitrogen, phosphorus, potassium, plot yields.

Date	Treatment	pH	Nitrogen per acre lbs.	Foliar nitrogen %	Phosphorus per acre lbs.	Potassium per acre lbs.	Plot yield lbs.
10/20/11	Entire study site	6.4	38	NA	114	269	NA
02/01/12	Entire study site	NA	33	NA	NA	NA	NA
03/15/12	34-0-0/composite	NA	NA	6.51a[z]	NA	NA	NA
03/15/12	46-0-0/composite	NA	NA	6.95a	NA	NA	NA
04/02/12	34-0-0	NA	NA	NA	NA	NA	37.9a
04/02/12	46-0-0	NA	NA	NA	NA	NA	35.6a
04/02/12	34-0-0 plot samples	NA	NA	6.18a	NA	NA	NA
04/02/12	46-0-0 plot samples	NA	NA	6.21a	NA	NA	NA
04/11/12	34-0-0 plot samples	NA	289	NA	NA	NA	NA
04/11/12	46-0-0 plot samples	NA	451	NA	NA	NA	NA

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

National Sweet Potato Collaborators Trial, Ft. Cobb, OK

Lynn Brandenberger, Lynda Carrier, and Dan Swart, Oklahoma State University
In Cooperation with Robert Weidenmaier, Michael Locke, and Micheal Brantes
Oklahoma State University, Ft. Cobb Research Station

Introduction and Objectives: Sweet potato has historically been grown for fresh and processing markets by growers throughout the southern U.S. Consumers have traditionally used fresh sweet potatoes for baking and boiling. In the past the canning industry has traditionally processed smaller roots not suitable for fresh market. During the past two decades, sweet potato production within the state of Oklahoma has decreased significantly due to increased production in south eastern U.S. Recently potato processors have begun to market new products, namely sweet potato fries. Consumer demand is increasing for this new product and processors are coming into Oklahoma to produce sweet potatoes for this growing market. As a result, there is a renewed need for current information on the performance of sweet potato clones by Oklahoma farmers. The objective of this study was observe advanced sweet potato breeding lines that have been developed by Louisiana State University and North Carolina State University breeding programs for their performance in Oklahoma.

Methods and Materials: The study was completed on the Caddo Research Station at Ft. Cobb, Oklahoma. Plots were arranged in a randomized block design with four replications, each plot consisted of one row on row centers six feet apart and plots were 20 feet in length. The experimental area was clean tilled by station personnel prior to planting. Plots were transplanted between May 30th and June 8th due to trial lines arriving on three different dates. The plots were established by transplanting slips (rooted sweet potato shoots) with an in-row spacing of 12 inches on un-bedded soil (flat on the ground). Immediately following transplanting, planted areas were treated with a preemergence application of Dual Magnum (S-metolachlor) at a rate of 0.95 lbs. active ingredient per acre. Subsequent weed control utilized hand weeding. The entire experimental area received 120 lbs. of nitrogen from three applications of 46-0-0 (Urea, 40 lbs. actual nitrogen/application) on 6/19/12, 7/03/12, and 7/17/12. Water needs of the crop were met using overhead irrigation from a pipe and riser system that was set and left in the field for the entire growing season. Plots were harvested during a two day period between October 8th and 9th. Data recorded at harvest included the weight of canners (1-2” diameter roots), number 1’s (2-3.5” diameter roots), Jumbos (>3.5” diameter roots) and culls (misshapen, too large or small roots).

Results: The yield of U.S. # 1’s ranged from 205 to 795 bushels per acre (bu/acre) (Table 1). L07-146, ‘O’Henry’, and L05-111 had the highest yields of # 1’s with 795, 681, and 640 bu/acre, respectively. Yield of canners and culls did not vary significantly. Jumbo yield was highest for ‘Beauregard B14’ and L05-111 which recorded 857 and 656 bu/acre, respectively. Total marketable yield ranged from a low of 476 to a high of 1501 bu/acre. L07-146, L05-111, and ‘Beauregard B14’ recorded the highest marketable yields with 1501, 1416, and 1319 bu/acre, respectively. The percentage of U.S. # 1’s was highest for ‘Evangeline’, ‘O’Henry’, and ‘Bonita’, respectively, with percentages recorded of 63.0, 62.5, and 60.2%.

Conclusions: For Oklahoma farmers that are growing for the processing market, Jumbos and U.S. # 1's are primarily what processors are wanting. Of the twelve lines/cultivars in the trial L07-146, L05-111, and 'Beauregard B14' had combined yields for U.S. # 1's and Jumbos of 1325, 1296, and 1253 bu/acre, respectively, indicating that these should be considered for processing production in the future. For fresh market farmers, 'O'Henry' should be considered if a white fleshed sweet potato is desired as it is a good yielder and also has a high percentage of U.S. # 1's, while orange fleshed types to consider would be 'Evangeline' and 'Covington' which yielded well in the study.

Acknowledgements: The authors wish to thank Robert Weidenmaier, Michael Locke, and Micheal Brantes for their support and cooperation in this study. We also want to thank NC State collaborator Ken Pecota and LSU collaborator Don LaBonte for providing advanced lines and advice for the trial. Last, but not least we want to thank Tony Zitterkopf with Hydro Sweet Potatoes for support and advice.

Table 1. National sweet potato collaborators trial, 2012, Ft. Cobb, OK.

Source	Selections	U.S. # 1's Bu/acre	Canners Bu/acre	Jumbos Bu/acre	Total mrkt. Bu/acre	U.S. # 1's %	Culls Bu/acre
			Orange fleshed				
LSU	Beauregard B14	396 cd	66 a	857 a	1319 abc	29.9 e	89.0 a
NCSU	Beauregard B94-14	418 cd	149 a	578 bc	1145 bcd	36.6 de	71.2 a
NCSU	Covington	328 de	129 a	407 cde	864 de	38.7 de	86.4 a
LSU	L05-111	640 ab	120 a	656 ab	1416 ab	45.3 cd	30.5 a
LSU	L07-146	795 a	176 a	530 bcd	1501 a	53.6 abc	48.6 a
NCSU	NC04-032	222 e	133 a	122 f	476 f	46.6 cd	100.6 a
NCSU	NC05-198	231 e	100 a	158 ef	489 f	46.3 cd	106.7 a
NCSU	NC07-364	205 e	77 a	196 ef	478 f	50.1 abcd	49.5 a
LSU	Evangeline	543 bc	133 a	186 ef	861 de	63.0 a	30.5 a
			White fleshed				
LSU	Bonita	476 cd[z]	113 a	184 ef	773 e	60.2 ab	65.5 a
LSU	O'Henry	681 ab	99 a	328 def	1108 cd	62.5 a	31.1 a
NCSU	NC07-847	327 de	88 a	272 ef	686 ef	47.8 bcd	30.0 a

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

Spring Heirloom Tomato Trial, Jenks, OK

Brian Kahn, Lynn Brandenberger, Lynda Carrier, Kenda Woodburn
OSU Department of Horticulture and Landscape Architecture
Cooperating with Southwood Farm, Jenks, Oklahoma

Introduction: Interest in heirloom tomatoes is increasing for a number of reasons including the ability to save seed from year to year, perceptions about flavor, and the desire to observe older traditional cultivars on a local basis. Therefore, an observational trial was established at Southwood Landscape and Garden Center's Market House in Jenks, OK.

Methods: The trial entries included twelve different heirloom cultivars selected for their potential in Oklahoma. Cultivars included not only U.S. developed tomatoes, but also two originally from Russia. Transplants for the trial were grown at OSU in Stillwater. The trial site was transplanted on April 23, 2012 onto free-standing raised beds that were covered with plastic mulch, with drip irrigation tape for watering. Support of the tomato plants was with either a stake and weave system or with cattle panels utilized in the plots.
The following tables describe the heirloom indeterminate tomato cultivars that were included in the trial. We want to thank Tomato Grower's Supply Company for donating seeds for this trial. Tomato descriptions are adapted from Tomato Grower's Supply website at: http://www.tomatogrowers.com/

Results: Six entries stood out:

- Sioux – Top yield, 76% marketable, decent flavor rating.
- Arkansas Traveler – Good yield despite small fruit size, 75% marketable, bred in Arkansas so is locally adapted, looked good at Bixby in 1999.
- Azoychka – Early, with above-average yields. Would like to see it again to figure out why it had only 68% marketable; the fruits we saw were nice.
- Brandywine – Performed better in 2012 than at Bixby in 1999 and had outstanding flavor. Like Azoychka, would like to figure out why it had only 66% marketable fruit.
- Pineapple – Beat Virginia Sweets as a bicolor, although fruits averaged smaller than expected, 71% marketable, decent flavor rating.
- Cherokee Purple – Near average yield. Known to be soft and was only 66% marketable, but rated high for flavor (also at Bixby in 1999).

Six entries were less impressive:

- White Queen – Probably IS the best of the whites, as claimed (85% marketable), but white tomatoes are a real niche market and the taste panel disliked it.
- Valencia – Small fruits with below-average yield and only 69% marketable, although it was rated well for flavor (also at Bixby in 1999).
- Black from Tula – Performed poorly, with low marketable yields and high culls.
- Brandywine OTV – Nothing special, supposed to have better heat-set than Brandywine but no evidence for that.
- Virginia Sweets – Huge fruits but low yields. Beaten by Pineapple for yield and flavor.
- Mexico – Late, made huge vines with big fruits but low yields. Good flavor, but too rank a plant relative to what it yielded (inefficient use of field/garden space).

2012 Heirloom Tomato Trial Entries		
Cultivar	**Origin**	**Abbreviated Description (from Tomato Grower's Supply)**
Arkansas Traveler	Released in 1971 by the University of Arkansas	Known for its ability to produce fruit in hot weather. **Pink** tomatoes that are 6 to 8 oz. 85 days.
Azoychka	Russian heirloom	Small **yellow** beefsteak tomato that matures early. Smooth, lemon yellow fruit weighs about 8 oz. 70 days.
Black From Tula	Russian heirloom	**Deep reddish-brown** beefsteak fruits are smooth in texture and weigh from 8 to 12 oz. Seems to set well even when weather turns hot. 75-80 days.
Brandywine	Amish heirloom since 1885	Large **pink-red** fruit can become 1 ½ lbs. Vines grow quite tall and have potato-leaved foliage. 80 days.
Brandywine OTV	Strain from a natural cross between Yellow Brandywine and an unknown red tomato.	These tomatoes are **red**, foliage is potato-leaved, and yield is often greater than that of regular Brandywine, especially since OTV Brandywine reportedly sets fruit more easily in warm weather. Fruit weighs about 1 lb. 85 days.
Cherokee Purple	Heirloom from Tennessee.	Plants bear 10 to 12 oz. **dusky rose/purple** fruit with deep brick red interiors. Thin skin and soft flesh. 80 days.
Mexico	Family heirloom brought to the U.S. by a Mexican family living in the Midwest.	Very large plants set huge, **dark pink** fruits that weigh more than 1 lb. 80 days.
Pineapple	Heirloom	**Bicolored red and yellow** fruit grows very large, up to 2 lbs., and is streaked with red both inside and out. 85 days.
Sioux	Released in 1944 by the University of Nebraska	An average size (6 oz.), **red** tomato. Reliably large harvests even in hot weather. 70 days.
Valencia	Heirloom from Maine	Relatively early, 8 to 10 oz. **orange** fruit with few seeds. 76 days.
Virginia Sweets	Heirloom	Producer of **gold-red bicolor** fruit that weigh at least 1 pound each. Golden yellow beefsteaks are colored with red stripes that turn into a ruby blush on top of the golden fruit. 80 days.
White Queen	Heirloom	Reputed to have the nicest shape and white color for the 'white' varieties. Fruit weighs 8 to 12 oz., with ribbed shoulders. Ripen to **pale creamy yellow** with little cracking. 85 days.

Table 1. Spring/Summer 2012 Heirloom Tomato Demonstration, Jenks, OK.

Cultivar	Marketable fruit (no.)	Marketable fruit (lbs.)	Average weight per marketable fruit (oz.)	Cull fruit (no.)	Cull fruit (lbs.)	Total fruit (no.)	Total fruit (lbs.)	Percent of total fruit that were marketable, by number (%)	Taste panel rating[z] (1 to 5 scale)
Sioux	169	63.0	6.0	54	24.4	223	87.4	76	3.1
Arkansas Traveler	144	45.9	5.1	47	14.0	191	59.9	75	2.7
Azoychka	107	46.5	7.0	50	23.8	157	70.3	68	2.7
White Queen	94	48.6	8.3	16	9.5	110	58.1	85	2.3
Brandywine	83	60.7	11.7	42	35.4	125	96.1	66	4.3
Pineapple	81	33.0	6.5	33	15.8	114	48.8	71	3.1
Cherokee Purple	67	44.3	10.6	35	23.8	102	68.1	66	3.8
Valencia	51	19.9	6.2	23	8.1	74	28.0	69	3.2
Black from Tula	49	31.6	10.3	45	29.4	94	61.1	52	3.0
Brandywine OTV	49	23.1	7.5	15	8.4	64	31.5	77	3.1
Virginia Sweets	29	36.9	20.3	12	13.7	41	50.6	71	2.7
Mexico	28	29.0	16.6	6	8.1	34	37.1	82	3.5
Mean	79	40.2	9.7	32	17.9	111	58.1	72	3.1

[z] Taste rating scale ranges from 1 to 5, with 1 representing poor taste and 5 representing good taste. Number of panelists was 27. Test conducted at the Tulsa County Extension Center on July 13, 2012.

Tomato Trial for Heat-set Capabilities, Stillwater, OK

Lynn Brandenberger, Brian Kahn, and Lynda Carrier, Oklahoma State University
Cooperating with James Motes

Introduction and Objectives: Locally grown fresh produce is increasing in popularity throughout the U.S. including Oklahoma. Within a given market there are several vegetables that are a "must have", tomato being one such item. Tomatoes have been produced in Oklahoma since people began gardening here. Growing tomatoes during hot weather has always been difficult for farmers. The problem is fruit set which usually stops completely during the hotter periods of June and July. In 2011, farmers had few if any tomatoes for market due to the early and intense hot weather that was experienced. Farmers continue to request help with this ongoing problem. The objective of this study was to trial tomato varieties with heat-set capabilities and use plasticulture to manage soil temperature and moisture levels to determine if gains can be made in tomato yield during the hot months of summer.

Methods: Tomato transplants were grown at the Oklahoma State University research greenhouse. Tomatoes were direct seeded in flats on 3/28/12 into a peat lite mix and were transplanted into commercial field plots on 4/26/12. The study was organized in the field as a randomize block design with three replications. Plots were six feet wide and twelve feet long and included six transplants with an in-row spacing of two feet between plants. Plot areas utilized black plastic mulch and drip irrigation for all plots. Water and fertility needs of the study were met following the normal production practices of the operation. The study was harvested seven times between 6/24/12 and 7/20/12. Harvest data included number of marketable fruit, weight in pounds of marketable fruit, weight in pounds of cull fruit and reasons for culling.

Results: Overall marketable yield ranged from 11,132 to 17,243 lbs. per acre (Table 1). 'Solar Fire' and 'Tribeca' yielded 17,243 and 17,021 lbs. of marketable tomatoes, respectively, per acre while 'Tasti-Lee' produced 16,597 lbs. 'Biltmore' had the lowest yield of marketable tomatoes in the study. Early yield was highest for 'Tasti-Lee' and 'Tribeca', both which yielded 7,442 lbs. in the first three harvests. Two other cultivars, 'Rocky Top' and 'Tribute' also had high early yields with 6,514 and 6,615 lbs., respectively. Culls resulted from several causes including blossom end rot early in the season and cracks, catfacing, with some fruit rots during the remainder of the season. The cultivar with the lowest level of culls was 'Redline' which had 4,255 lbs. of culls per acre, while 'Red Deuce' had the highest level of culls at 11,858 lbs. Tomato individual fruit weight did not vary significantly and averaged approximately 0.42 lbs. per fruit.

Conclusions: There were cultivars in the trial that were obvious leaders in yield and earliness. Considering the cultivars in the trial, 'Solar Fire', 'Tribeca', and 'Tasti-Lee' all yielded well overall with 'Tasti-Lee' and 'Tribeca' both being leaders in early yield as well. Based upon the trial results the authors would suggest that 'Solar Fire', 'Tasti-Lee', 'Tribeca', and 'Tribute' should be included in future trials that are geared toward heat tolerance.

Acknowledgements: The authors wish to thank Jim Motes for the great job that his farm did in collecting data and completing this year's trial.

Table 1. 2012 Heat-set tomato trial, Motes farm, Stillwater, OK.

Cultivar	Seed source	Marketable yield/acre Overall (lbs.)	Marketable yield/acre Early (lbs.)	Culled yield/acre (lbs.)	Average fruit weight (lbs.)
Bella Rosa	Seedway	12,120 a[z]	3,953 cd	8,773 abc	0.42 a
Biltmore	Seedway	11,132 a	3,489 d	6,877 bcd	0.42 a
Florida 91	Seedway	12,846 a	4,376 bcd	5,526 bcd	0.47 a
Red Bounty	Seedway	12,443 a	4,618 bcd	9,196 ab	0.47 a
Red Defender	Harris	12,080 a	3,933 cd	7,845 abcd	0.42 a
Red Deuce	Seedway	13,895 a	3,428 d	11,858 a	0.48 a
Redline	Seedway	13,774 a	5,506 abcd	4,255 d	0.45 a
Rocky Top	Seedway	13,673 a	6,514 ab	5,405 bcd	0.41 a
Solar Fire	Seedway	17,243 a	6,373 abc	4,901 cd	0.40 a
Tasti-Lee	Twilley	16,597 a	7,442 a	4,275 d	0.35 a
Tribeca	Seedway	17,021 a	7,442 a	6,897 bcd	0.37 a
Tribute	Seedway	15,871 a	6,615 ab	5,183 bcd	0.41 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.

Tomato Trial for Heat-set Capabilities, Coyle, OK

Lynn Brandenberger, Brian Kahn, and Lynda Carrier, Oklahoma State University
Cooperating with Wayne Whitmore

Introduction and Objectives: Locally grown fresh produce is increasing in popularity throughout the U.S. including Oklahoma. Within a given market there are several vegetables that are a "must have", tomato being one such item. Tomatoes have been produced in Oklahoma since people began gardening here. Growing tomatoes during hot weather has always been difficult for farmers. The problem is fruit set which usually stops completely during the hotter periods of June and July. In 2011, farmers had few if any tomatoes for market due to the early and intense hot weather that was experienced. Farmers continue to request help with this ongoing problem. The objective of this study was to trial tomato varieties with heat-set capabilities and use plasticulture to manage soil temperature and moisture levels to determine if gains can be made in tomato yield during the hot months of summer.

Methods: Tomato transplants were grown at the Oklahoma State University research greenhouse. Tomatoes were direct seeded in flats on 3/28/12 into a peat lite mix and were transplanted into commercial field plots on 5/08/12. The study was organized in the field as a randomize block design with three replications. Plots were seven and one half feet wide and twelve feet long and included six transplants with an in-row spacing of two feet between plants. Plot areas utilized black plastic mulch and drip irrigation for all plots. Water and fertility needs of the study were met following the normal production practices of the operation. The study was harvested six times between 7/11/12 and 8/03/12. Harvest data included number of marketable fruit, weight in pounds of marketable fruit, weight in pounds of cull fruit and reasons for culling.

Results: Overall marketable yield ranged from 5,042 to 14,073 lbs. per acre (Table 1). 'Bella Rosa' and 'Tribute' yielded 14,073 and 11,758 lbs. of marketable tomatoes, respectively, per acre while 'Biltmore' and 'Rocky Top' produced 11,092 and 10,204 lbs., respectively. 'Red Bounty' had the lowest yield of marketable tomatoes in the study. Early yield (first three harvests) was highest for three top overall yielding tomatoes. Early yields for 'Bella Rosa', 'Tribute', and 'Biltmore' were 8,066, 6,071, and 5,042 lbs., respectively, for the first three harvests. Culls resulted from several causes including blossom end rot, lots of small fruit, and some green shoulders, cracks, zipper-scar, and sunburn. The cultivar with the lowest level of culls was 'Tribeca' which had 1,110 lbs. of culls per acre, while 'Bella Rosa' had the highest level of culls at 2,783 lbs. Tomato individual fruit weight was highest for 'Red Deuce' which averaged approximately 0.38 lbs. per fruit.

Conclusions: Considering the cultivars in the trial, 'Bella Rosa', 'Tribute', and 'Biltmore' all yielded well overall with all three being leaders in early yield as well. Based upon the trial results the authors would suggest that 'Bella Rosa', 'Tribute', and 'Biltmore' tomato cultivars should be included in future trials that are geared toward heat tolerance.

Acknowledgements: The authors wish to thank Wayne Whitmore for the great job that his farm did in collecting data and completing this year's trial.

Table 1. 2012 Heat-set tomato trial, Whitmore farm, Coyle, OK.

Cultivar	Seed source	Marketable yield/acre Overall (lbs.)	Marketable yield/acre Early (lbs.)	Culled yield/acre (lbs.)	Average fruit weight (lbs.)
Bella Rosa	Seedway	14,073 a[z]	8,066 a	2,783 a	0.30 bc
Biltmore	Seedway	11,092 a	5,042 a	1,513 a	0.31 bc
Florida 91	Seedway	9,599 a	4,638 a	1,795 a	0.31 bc
Red Bounty	Seedway	5,042 a	3,066 a	2,178 a	0.30 bc
Red Defender	Harris	8,631 a	4,356 a	2,541 a	0.31 bc
Red Deuce	Seedway	9,842 a	4,558 a	1,492 a	0.38 a
Redline	Seedway	7,986 a	4,356 a	2,036 a	0.31 bc
Rocky Top	Seedway	10,204 a	4,356 a	2,057 a	0.32 bc
Solar Fire	Seedway	9,962 a	3,953 a	1,734 a	0.35 ab
Tasti-Lee	Twilley	6,997 a	3,972 a	2,823 a	0.28 c
Tribeca	Seedway	9,842 a	4,356 a	1,110 a	0.30 bc
Tribute	Seedway	11,758 a	6,071 a	2,258 a	0.33 abc

[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.

Watermelon Variety Trial, Jenks, OK

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In Cooperation with Joe Schulte, Joe Baird and Brenda Baird, Southwood Farm
And Micah Anderson, Oklahoma Department of Agriculture Food and Forestry

Introduction and Objectives: Watermelon had the highest acreage of any vegetable crop reported for Oklahoma in the 2007 USDA Agricultural Census. Watermelon is a popular summer favorite of consumers not only for its sweet taste, but also as a source of lycopene a nutritional component of several fruit and vegetable crops. Variety trials are important sources of information for local farmers when selecting varieties that will perform best under their local conditions. Farmers can glean information from trial reports about yield potential, disease resistance, fruit size and other pertinent data. The objective of this trial was to observe how seedless and diploid pollinator watermelon varieties would perform in the Tulsa county area of Jenks.

Methods and Materials: The trial was completed at the Southwood Urban Farm in Jenks, OK. It included six watermelon varieties, three triploid seedless and three diploid seeded types. All trial entries were established as transplants. Transplants were grown from seed by Southwood Gardens and transplanted into the field on 6/07/12 by hand into free standing raised beds with black plastic mulch and drip irrigation (installed by ODAFF Plasticulture Program). The trial was organized in a randomized block design with three replications. Plots were one row wide and 30 feet long with spacing between row centers being eight feet and in-row spacing for plants being three feet. Crop water and nutritional needs were supplied through the drip irrigation system using a municipal water source. Harvests were on 7/18/12, 7/24/12, 8/01/12, and 8/02/12 with harvest data including individual fruit weights.

Results: ‘Solitaire’, ‘Imagination’, and ‘Tri X 313’ were the three seedless varieties in the trial. All were similar in size with fruit weights averaging 10.9, 9.6, and 12.9 lbs. for ‘Solitaire’, ‘Imagination’, and ‘Tri X 313’, respectively (Table 1). Yield varied considerably for these varieties with yields of 20,254 for ‘Solitaire’, 8,367 for ‘Imagination’, and 30,338 lbs. per acre for ‘Tri X 313’. Diploid seeded varieties in the trial included ‘Delta’, ‘Sangria’, and ‘Jamboree’. The yields for this group ranged from 9,507 and 9,636 for ‘Jamboree’ and ‘Sangria’, respectively, to 14,937 lbs. per acre for ‘Delta’. Fruit size for the seeded watermelons was considerably larger than the seedless types. Average fruit weight was 23.9, 19.2, and 21.2 for ‘Delta’, ‘Sangria’, and ‘Jamboree’, respectively.

Conclusions: The authors conclude that based on yield ‘Tri X 313’ and ‘Delta’ would be cultivars that should be considered for commercial plantings. In addition, it should be understood that this was the initial trial for the varieties included and that varietal decisions should be based upon further trialing.

Acknowledgements: The authors wish to thank Joe Schulte and Joe and Brenda Baird for their support and cooperation in the completion of this study.

Table 1. Jenks watermelon cultivar trial, 2012. Yield and average fruit weight.

Watermelon variety	Seed source	Types		Yield per lbs. acre	Average fruit weight in lbs.
		Triploid seedless	Diploid seeded		
Imagination	Syngenta	x		8,367	9.6
Solitaire	Golden Valley	x		20,254	10.9
Tri X 313	Syngenta	x		30,338	12.9
Delta	Seminis		x	14,937	23.9
Sangria	Syngenta		x	9,636	19.2
Jamboree	Syngenta		x	9,507	21.2

Extended Season Leafy Greens, Ardmore, OK
Fall 2011Through Spring 2012

C. Rohla and S. Upson, Noble Foundation

Introduction: Production of vegetables in high tunnels (hoop houses) are utilized throughout the world. High tunnels are plastic covered bowed, frames that receive only passive solar heat for warmth. High tunnels are used to extend the growing season of warm season vegetable crops such as tomatoes, peppers, and cucurbits. These structures allow farmers to start crops much earlier in the spring and to continue production much later in the fall. Using high tunnels is advantageous, but without supplemental heat, warm season crops cannot be grown in these structures during the coldest months of the year (December-February). A key aspect of fresh market growing is producing and selling crops year round. The objective of this trial was to observe different cool season leafy green crops to determine the feasibility of production in high tunnels during fall, winter, and spring.

Methods and materials: This study was conducted at the Noble Foundation in Ardmore, OK. The hoop house structure used for the study was 20 feet in width and 68 feet in length, covered with a single layer of clear polyethylene film. The study consisted of nine different cool season leafy greens including, spinach, spinach mustard, collard, kale, chard, leaf lettuce, romaine lettuce, mustard and turnip. Crops were planted in permanent raised beds within the structure. Beds were solarized in August and in preparation for planting soil samples were taken and beds leveled and plots measured and marked in September. Plots were replicated four times in a randomized design and consisted of approximately 12.5 square feet per plot. Fertility levels of the beds were targeted at 120 lbs. of nitrogen, 150 lbs. of phosphorus and 150 lbs. of potassium per acre. All plots expect romaine lettuce, were seeded using a hand push planter (Johnny's 9156 seeder) with rows 4.5 inches apart and approximately 8 to 9 seeds/linear foot on October 7, 2011. Romaine lettuce was planted as transplants on October 7, 2011. Plots were spot reseeded on October 18, 2010. Harvest began on November 9, 2011 and was completed on May 25, 2012 (24 different harvest dates). Romaine lettuce was replanted as transplants following the harvests on December 7, 2011 and again on April 3, 2012. Data recorded included fresh harvest weight, pest issues and other issues with the plantings. Crops were given to employees of the Noble Foundation and feedback information about preference for each of the different crops was requested.

Results: Romaine lettuce and chard had the higher overall yields compared to collard, spinach, spinach mustard, mustard, kale, turnip and leaf lettuce (Table 1). Yield ranged from a low of 1.6 pounds for kale to 3.2 pounds for romaine lettuce per square foot. All greens produced early yields (November-December) ranging from 1.7 pounds per square foot for romaine lettuce to 0.3 pounds for kale (Figure 1). Late season yields (April-May) ranged from 1.4 pounds per square foot for chard to 0.14 pounds for collard. Spinach-mustard and turnip started bolting in February and did not have any late production.

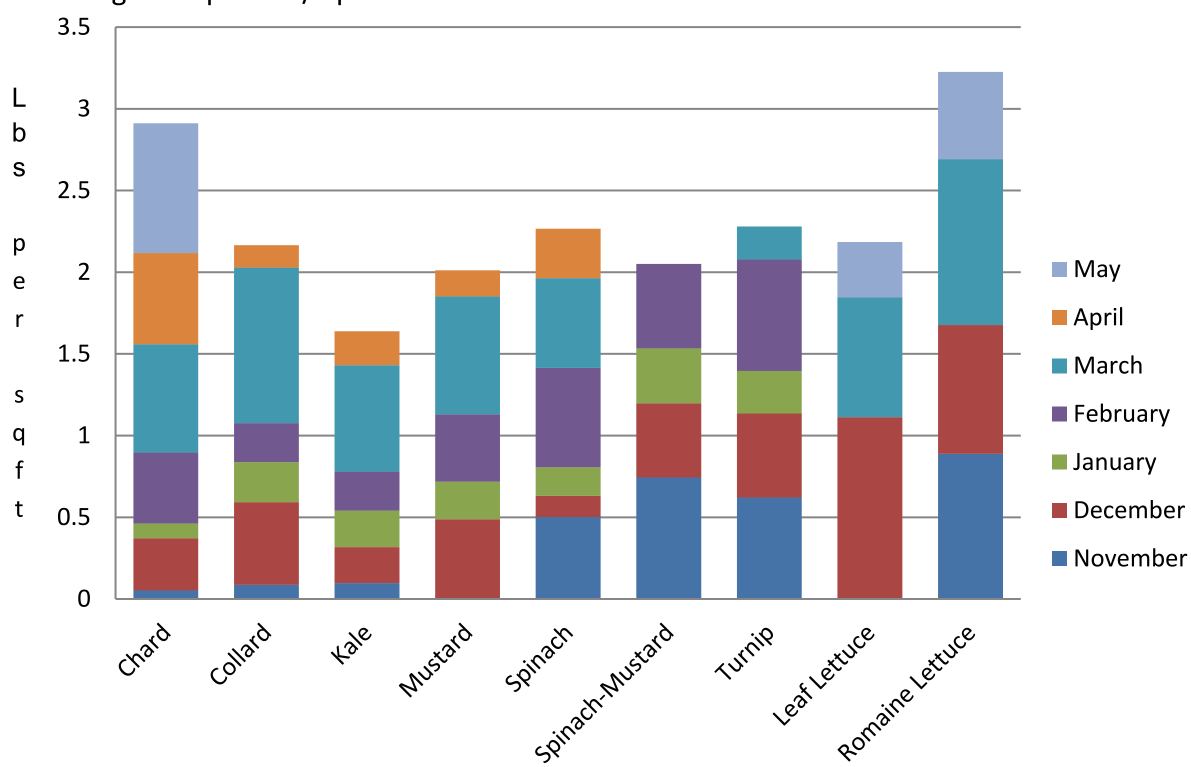
These results indicate that the production of cool season leaf greens is possible for extending the productive growing season inside hoop houses. There are differences in yield potential and harvest periods. Issues to note included some problems with crops bolting (flowering) during higher temperatures, producing unmarketable crops and ending the production earlier than the previous year.

Table 1. 2011-12 Extended season leafy greens, Noble Foundation, Ardmore, OK.

Crop	Variety	Source	Yield (lbs) per sq.ft.	
Swiss chard	Rhubarb Chard	Harris	2.9	a[z]
Collard	Champion	DeWitt	2.2	b-c
Kale	Vates Blue Curled Scotch	DeWitt	1.6	c
Mustard	Southern Giant Curled	DeWitt	2.0	b-c
Spinach	Olympia	Chriseed	2.3	b
Spinach Mustard	Savanna	Chriseed	2.1	b-c
Turnip	Southern Green	Chriseed	2.3	b
Leaf Lettuce	Red Grand Rapids	Johnny's	2.2	b-c
Romaine Lettuce	Green Towers	Seedway	3.2	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.

Figure 1. 2011-2012 Noble Foundation: Monthly and total yields of leafy greens pounds/sq.ft.



Extended Season Leafy Greens, Lane, OK
Fall 2011 through Spring 2012

J. Shrefler, W. Roberts, T. Goodson, W. O'Hern, M. Taylor and L. Brandenberger
Wes Watkins Agricultural Research and Extension Center, Oklahoma State University

Introduction: This is the second year results of trials conducted at Lane, Oklahoma in Atoka County. The objective of this trial was to conduct trial plantings of different cool season leafy green crops to determine the feasibility of production of these crops in high tunnels during fall, winter, and spring in southeast Oklahoma. This trial is part of a study being conducted at four locations in Oklahoma. For this location the trial was conducted on the same plot of land as in the previous year. Materials and methods used in the 2011-2012 trial were similar to those of the 2010-2011 trial with the exception of the use of drip irrigation and an earlier plant date for the 2011-2012 trial.

Methods and materials: The trial was conducted at the Wes Watkins Agricultural Research and Extension Center at Lane in Atoka County, Oklahoma. Three tunnels measuring 12 feet wide and 40 feet long were used. The tunnels are each covered with a single layer of clear, 6 mil ultraviolet protected polyethylene film. Nine different cool season greens were grown including spinach, Swiss chard, Romaine lettuce, red leaf lettuce, collard, kale, mustard, spinach mustard (mild type mustard), and turnip (Table 1). The tunnels are portable and each fits over two semi-permanent beds that have been in place for several years. Prior to planting, the houses were removed to roto-till the beds and incorporate poultry litter with an amount determined by soil test results and OSU vegetable fertilizer recommendations. Fertility levels were targeted at 120 lbs. of nitrogen and 150 lbs. of phosphorus and potassium per acre. During the growing season when plant appearance indicated nutrient stress the plots were side dressed with a soluble 20-20-20 fertilizer applied through the drip irrigation system. Applications began on December 28 using 0.625 lbs. N / 1000 sq. ft. (27 lbs. N / acre). Plots of all crops except the two lettuce cultivars were direct seeded with a hand planter (Glaser Seeder - Johnny's 9461 seeder) with rows 4.5 inches apart and approximately 8 to 9 seeds/linear foot on 9/2/11. Lettuce was started in Speedling brand styrofoam trays using a standard vegetable plug mix. For the first planting lettuce was transplanted on October 28. A second transplanting was made in late winter. Plots were replicated three times in a randomized block design and consisted of an area measuring approximately 16 sq. ft. per plot. Each tunnel included a complete set of plots of each crop species. Crops were generally harvested when leaves reached a height of about 12 inches. Exceptions are lettuce which was harvested as entire heads. Spinach did not get as tall as other crops and was harvested at about eight inches. At any given harvest event, only those crops achieving marketable quality material were harvested. Harvest began on 11/9/11 and ended on 5/31/12. Data that was recorded included fresh weight at each harvest.

Results: Total yields are given in Table 1. Romaine lettuce, which was allowed to produce full size heads before harvest, was the highest yielding of all crops. Spinach was the lowest yielding of all crops. The remaining crops all produced total yields within 1 to 2 lbs. per square foot over the duration of the trial. Crop yield on a monthly basis is presented in Figure 1. Harvest began in November with Swiss chard, collard, kale, mustard, spinach mustard and turnip. During December the harvest of chard, collard and mustard continued leaf lettuce also became harvestable. Except for lettuce, these crops continued to produce during January although at lower harvest weights. Also during January, spinach, kale, spinach mustard and turnip became available for harvest. Moving into February, all crops produced harvestable yield with the exception of Romaine lettuce. Romaine lettuce grew well through the winter months but head development had not progressed to the point of producing commercially marketable heads. After January there were no additional marketable yields of mustard, spinach mustard or turnip. This was due to the crops bolting. During March the yields of spinach, chard, leaf lettuce, collard and kale progressed steadily. Romaine lettuce was also ready for harvest during this month. Bolting of collard and kale was also progressing and there was no additional harvest of these crops beyond March. Final harvest of spinach and chard occurred during April. Final lettuce harvest was achieved in late May for both lettuce types as some plants began showing signs of bolting.

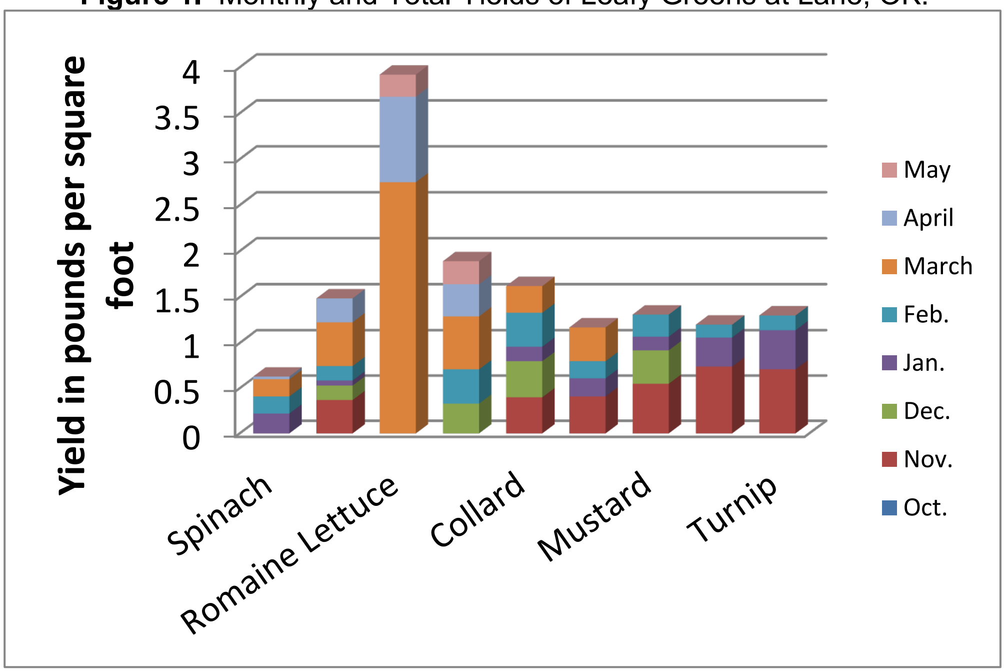
Acknowledgements: The authors thank Mr. Jim Vaughan, Ms. Jacquie Pruit, Mr. John Johnson, Mr. Shannon Reese and Mr. Phil Powell for their assistance with maintaining fields and hoop houses and for assistance with data collection.

Table 1. 2011-12 Leafy Greens crops and total yields, WWAREC, Lane, OK.

Crop	Variety	Source	Yield (lbs) per sq.ft.	
Spinach	Olympia	Chriseed	0.61	d[z]
Swiss chard	Rhubarb Chard	Harris	1.48	bc
Romaine Lettuce	Green Towers	Seedway	3.93	a
Red Leaf lettuce	Vulcan	Johnny's	1.89	b
Collard	Champion	DeWitt	1.62	bc
Kale	Vates Blue Curled Scotch	DeWitt	1.18	cd
Mustard	Southern Giant Curled	DeWitt	1.39	bc
Spinach Mustard	Savanna	Chriseed	1.21	bcd
Turnip	Southern Green	Chriseed	1.31	bc

[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.

Figure 1. Monthly and Total Yields of Leafy Greens at Lane, OK.



Photos of Lane Extended Season Leafy Greens 2011-2012

Movable Hoop Houses

Drip Irrigation Tape

November 7, 2011

Lettuce Ready to Plant

January 5, 2012

March 28 –Some Crops Bolted

Extended Season Leafy Greens, Oklahoma City, OK
Fall 2011 through Spring 2012

Julia Laughlin, Oklahoma State University

Introduction: The second year of season extension research using hoop house (high tunnel) production techniques and different cool season leafy green crops to determine the feasibility of production in high tunnels during fall, winter, and spring.

Methods and materials: This year's trial was again completed on the grounds of the Oklahoma State University – Oklahoma City Horticulture Department. The high tunnel used for the trial is 30 feet wide and is 100 in length and is covered by a single layer of clear polyethylene film. There were nine different cool season greens that were grown including spinach, Swiss chard, romaine lettuce, red leaf lettuce, collard, kale, mustard, spinach mustard (mild type mustard), and turnip. The greens were direct seeded in prepared soil except for the two lettuce entries which were transplanted. Composted chicken manure and Humor were tilled into the beds. Plots were direct seeded with a hand push planter (Johnny's 9156 seeder) on September 26, 2011. Plots were replicated three times in a randomized design and consisted of an area of approximately 6 sq. ft. per plot. Harvests began on November 16, 2011 and were completed by May 15. Data recorded included fresh weight at each harvest. Crops were protected with a medium weight row cover during the coldest nights of January and February, although these were infrequent.

Results: Overall yields were highest for Kale (Table 1). Yield ranged from a low of 4.3 lbs. of spinach to a high of 16.0 lbs. of Kale per sq. ft. Pest pressure was minimal although aphids were present near the conclusion of harvesting. No distinct tolerance to cold was observed between different crops that were grown, possible because we used row covers to prevent damage.

Based on these results and last year's results, high tunnel production of these greens would allow a producer to have marketable greens throughout the winter season, extending the growing season and helping to fill the winter market void.

Table 1. 2011-12 Leafy Greens crops and total yields, OSU/OKC, OK.

Crop	Variety	Source	Yield lbs. per sq. ft.
Spinach	Olympia	Chriseed	4.3
Chard	Rhubarb Chard	Harris	6.4
Romaine Lettuce	Green Towers	Seedway	10.2
Read Leaf Lettuce	Vulcan	Johnny's	5.3
Collard	Champion	DeWitt	11.0
Kale	Vates Blue Curled Scotch	DeWitt	16.0
Mustard	Southern Giant Curled	DeWitt	10.8
Spinach Mustard	Savanna	Chriseed	14.7
Turnip	Southern Green	Chriseed	14.1

Photos of Oklahoma City Extended Season Leafy Greens 2011-2012

Mid-winter growth on right

Early greens growth on left

Photos of Tulsa Extended Season Leafy Greens 2011-2012

Fall 2011 Field Day

Flowering brassica greens spring 2012

End door ventilation

Fall 2012 grasshopper damage

Extended Season Leafy Greens Study, Tulsa, Oklahoma
Fall 2011 through Spring 2012

L. Brandenberger, B. Kahn, Sue Gray, and L. Carrier, Oklahoma State University
Cooperating with Rex and Marie Koelsch "Our Farm"

Introduction: The study this year was a continuation of the first year study. There were some adjustments made to how the work was carried out including dropping broccoli raab and adding another leaf lettuce to take its place and the use of transplants for both lettuce entries. The objective of this study was to observe different cool season leafy green crops to determine the feasibility of production in high tunnels during fall, winter, and spring.

Methods and materials: The study was completed at "Our Farm" located in west Tulsa County. The site is a commercial fresh market farm growing both field and high tunnel crops for sale on a local basis. The high tunnel used for the study has metal bows 18 feet in diameter and is 100 in length and is covered by a single layer of clear polyethylene film. There were nine different cool season greens that were grown including spinach, Swiss chard, romaine lettuce, red leaf lettuce, collard, kale, mustard, spinach mustard (mild type mustard), and turnip. Raised soil beds within the hoop-house were prepared for planting in early September including soil testing to determine the levels of nitrogen, potassium, and phosphorus and soil pH. Fertility levels were targeted at 120 lbs. of nitrogen and 150 lbs. of phosphorus and potassium per acre. Direct seeded plots (spinach, chard, collard, kale, mustard, spinach mustard, and turnip) were seeded with a hand push planter (Johnny's 9156 seeder) with rows 4.5 inches apart and approximately 8 to 9 seeds/linier foot on 9/20/11. Both romaine and red leaf lettuce plots were established with transplants on 9/28/11 with transplants started in the greenhouse on 9/07/11. Plots were replicated four times in a randomized design and consisted of an area of approximately 16 sq. ft. per plot. Harvests began on 10/25/11 and were completed on 4/27/12 (30 different harvest dates). Data recorded included fresh weight at each harvest.

Results: Overall yields were highest for turnip compared to spinach, Swiss chard, collard, kale, and mustard (Table 1). Yield ranged from a low of 0.45 pounds for kale to 2.8 pounds of turnip greens per sq. ft. The highest early yields (October-November) came from turnip, spinach mustard, and mustard (Figure 1). Early yields ranged from 0 lbs. per sq. ft. for collard to 0.92 lbs. for turnip. Pest problems included grasshoppers early in the season and aphids later in the season. There was a record breaking cold winter during the first year (2010-2011) of this study. The second year, this being Oklahoma, the weather was just the opposite i.e. very warm all winter. Of the two seasons, the cool season crops in the study performed best during the extreme cold of 2010-2011, compared to the warmth of 2011-2012. Problems encountered in 2011-2012 included higher levels of insect damage both early (grasshoppers) and season long (aphids) and bolting (flowering) of most of the cruciferous greens (collard, kale, mustard, spinach mustard, and turnip) due to the warm temperatures. One improvement in study results came from the use of transplants for both lettuce cultivars included in the study. Transplants were started in the greenhouse early and then transplanted into the high tunnel. The net result was earlier and multiple harvests from new transplants for each successive crop. Prices for the duration of the study ranged from $1.30-1.50/lb. for most of the crops to $4.00/lb. for spinach, $2.00/lb. for Swiss chard and kale, and $3.00 per plant for lettuce.

Based on these results, the authors would conclude that production of cool season leafy greens is possible during the coldest months of the year. We did see differences in yield potential and also heat tolerance of crops included in the study.

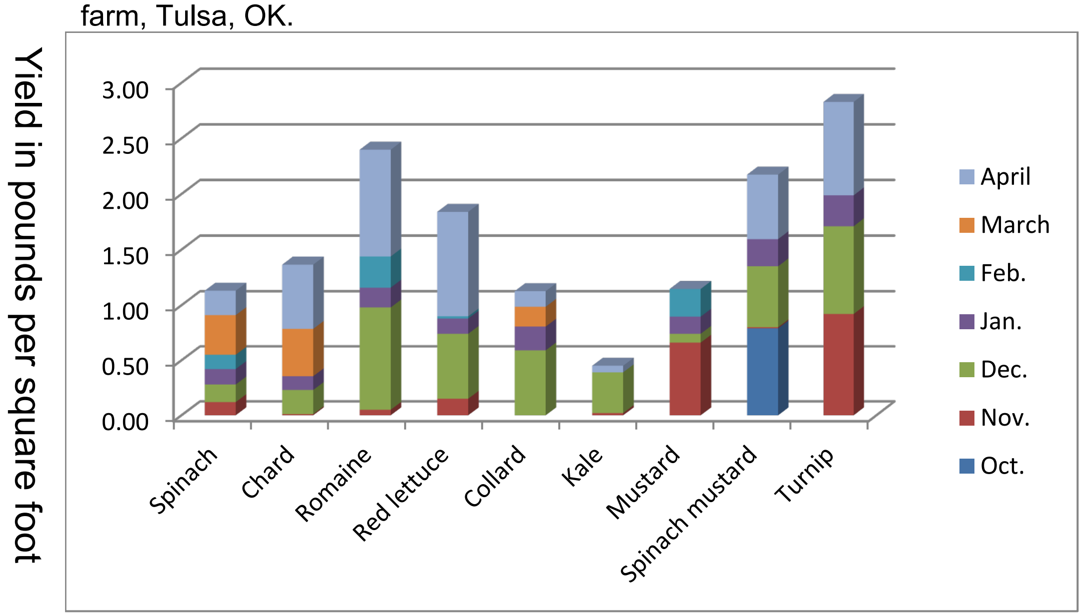
Acknowledgements: The authors wish to thank the Koelsch family for their interest and support of this project and the Oklahoma Department of Agriculture Food and Forestry for their support of the project through the specialty crop grant program.

Table 1. 2011-12 Leafy Greens Variety study, Koelsch Farm, Tulsa, OK.

Crop	Variety	Source	Yield (lbs) per sq.ft.	
Spinach	Olympia	Chriseed	1.1	cd[z]
Swiss chard	Rhubarb Chard	Harris	1.4	bcd
Romaine lettuce	Green Towers	Seedway	2.4	ab
Red leaf lettuce	Vulcan	Johnny's	1.8	abc
Collard	Champion	DeWitt	1.1	cd
Kale	Vates Blue Curled Scotch	DeWitt	0.45	d
Mustard	Southern Giant Curled	DeWitt	1.1	cd
Spinach Mustard	Savanna	Chriseed	2.2	abc
Turnip	Southern Green	Chriseed	2.8	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.

Figure 1. 2011-2012 monthly and total yields of leafy greens per square foot, Koelsch farm, Tulsa, OK.



Disease Management

Anthracnose Control on Spinach

Spring 2012

John Damicone and Tyler Pierson
OSU Department of Entomology and Plant Pathology

Methods: The experiment was conducted at the Entomology and Plant Pathology Research Farm in Stillwater in a field of Easpur loam previously cropped to wheat. Granular fertilizer (35-0-0 lb/A, N-P-K) was incorporated into the soil prior to planting the variety 'Melody' on 6 Mar at a seeding rate of two seeds per inch. The herbicide Parallel 7.8E at 0.75 pt/A was broadcast post-emergence on 26 Mar. Plots were top-dressed with granular fertilizer (23-0-0 lb/A, N-P-K) on 9 Apr. Plots consisted of 4-row beds, 20-ft long, with rows spaced 14 in. apart. The experimental design was a randomized complete block with four replications separated by a 5-ft-wide fallow buffer. Fungicides were broadcast using flat-fan nozzles (Tee-jet 8002vk) spaced 18-in. apart with a CO_2-pressurized wheelbarrow sprayer. The sprayer was calibrated to deliver 26 gal/A at 40 psi. Treatments were applied on ca. 7-day intervals beginning at the first true-leaf stage on 13 Apr. Plots were inoculated with the anthracnose fungus by spreading 50 ml of oat kernels colonized by the fungus along the center of each plot immediately after the first treatments were applied on 13 Apr. Plots received a total of 2.45 inches of sprinkler irrigation at 0.1 to 0.5 in. water per application as needed to promote crop and disease development. Rainfall during the cropping period (6 Mar to 8 May) totaled 3.92 in. for Mar, 6.16 in. for Apr, and 0.01 in for May. Disease incidence (percentage of leaves with symptoms) and severity (percentage of leaf area with symptoms) were assessed on 8 May. Five, 6-in.-long row segments were harvested arbitrarily from the middle two rows of each plot. The harvested leaves were bulked and mixed, and disease severity was visually estimated on 30 blindly sampled leaves.

Results: Rainfall was nearly 4 inches above normal (30-yr avg.) from Mar through Apr, and average daily temperature was 9 and 5°F above normal for Mar and Apr, respectively. The plant stand was generally poor, and the crop grew poorly as a result of the wet and warm conditions. Anthracnose developed to moderate levels compared to previous trials. None of the fungicides reduced levels of anthracnose compared to the untreated check. None of the treatments caused leaf injury (phytotoxicity) symptoms.

Treatment and rate/A (timing)[z]	Anthracnose (%)	
	Leaves w/ disease	Leaf area w/ disease
Fontelis 1.7F 1.5 pt (1-3)	44.2 a[y]	16.8 a
Cabrio 20WG 1 lb (1-3)	33.3 a	12.1 a
Fontelis 1.7F 1 pt + Cabrio 20WG 1 lb (1-3)	41.6 a	12.3 a
Switch 62.5WG 14 oz (1-3)	42.5 a	14.1 a
Switch 62.5WG 11 oz + Cabrio 20WG 1 lb (1-3)	32.5 a	9.6 a
Vanguard 75WG 7.5 fl oz (1-3)	40.0 a	9.4 a
Vanguard 75WG 7.5 fl oz + Cabrio 20WG 1 lb (1-3)	44.2 a	20.4 a
Priaxor 4.17F 4 fl oz (1-3)	47.5 a	22.3 a
Untreated Check	39.1 a	14.4 a
LSD (P=0.05)[x]	NS	NS

[z] The numbers (1-3) correspond to the spray dates of 1=13 Apr, 2=20 Apr, and 3=27 Apr.
[y] Values in a column followed by the same letter are not statistically different according to Fisher's least significant difference test.
[x] Fisher's least significant difference, NS=treatment effect not significant at P=0.05.

White Rust Control on Spinach
In Fall Cropped Spinach, 2011

John Damicone and Tyler Pierson
OSU Department of Entomology and Plant Pathology

Methods: The experiment was conducted at the Entomology and Plant Pathology Research Farm in Stillwater in a field of Easpur loam previously cropped to wheat. The field was planted with the variety 'Avon" on 21 Sep at a seeding rate of two seeds per inch. The herbicide Dual II Magnum 7.6E at 0.67 pt/A was broadcast after planting on 27 Oct. Plots were top-dressed with granular fertilizer (46-0-0 lb/A, N-P-K) on 17 Oct. Plots consisted of 4-row beds, 20-ft long, with rows spaced 14 in. apart. The experimental design was a randomized complete block with four replications separated by a 5-ft-wide fallow buffer. Fungicides were broadcast using flat-fan nozzles (Tee-jet 8002vk) spaced 18-in. apart with a CO_2-pressurized wheelbarrow sprayer. The sprayer was calibrated to deliver 26 gal/A at 40 psi. Treatments were applied on ca. 7-day intervals beginning at the first true-leaf stage on 14 Oct. Plots received a total of 1.85 inches of sprinkler irrigation at 0.1 to 0.5 in. water per application as needed to promote crop and disease development. Rainfall during the cropping period (21 Sep to 30 Nov) totaled 1.25 in. for Sep, 3.04 in. for Oct, and 2.62 in. for Nov. Disease incidence (percentage of leaves with symptoms) and severity (percentage of leaf area with symptoms) were assessed on 29 Nov. Five, 6-in.-long row segments were harvested arbitrarily from the middle two rows of each plot. The harvested leaves were bulked and mixed, and disease severity was visually estimated on 30 blindly sampled leaves.

Results: Rainfall and average daily temperature were near normal during Oct and Nov. White rust developed to severe levels in some plots, but the distribution of the disease was not uniform. All fungicides except QGU42 were effective however disease pressure was not sufficient to differentiate effective treatments. None of the treatments caused leaf injury (phytotoxicity) symptoms.

Treatment and rate/A (timing)[z]	White rust (%)	
	Leaves w/ rust	Leaf area w/ rust
QGU 100OD 4.8 fl oz (1-6)	40.8 a	6.5 a
QGU 100OD 2.4 fl oz (1-6)	43.3 a	13.0 a
QGU 100OD 1.2 fl oz (1-6)	9.1 b	0.6 a
Tanos 50WG 8 oz + Aliette 80WG 2 lb (1,3,5) Presidio 4F 4 fl oz (2,4,6)	0.0 b	0.0 a
Quadris 2.08F 12.3 fl oz (1,3,6) Presidio 4F 4 fl oz (2,4,6)	0.0 b	0.0 a
Cabrio 20WG 12 oz (1,3,5) Presidio 4F 4 fl oz (2,4,6)	0.0 b	0.0 a
Cabrio 20WG 12 oz (1,3,5) Ranman 3.3F 2.75 fl oz (2,4,6)	0.0 b	0.0 a
Quadris 2.08F 12.3 fl oz (1,3,6) Ranman 3.3F 2.75 fl oz (2,4,6)	0.0 b	0.0 a
Untreated check	35.8 a	4.7 a
LSD (P=0.05)[x]	21.4	NS

[z] The numbers (1-6) correspond to the spray dates of 1=14 Oct, 2=21 Oct, 3=28 Oct, 4=4 Nov, 5=11 Nov, and 6=18 Nov.

[y] Values in a column followed by the same letter are not statistically different according to Fisher's least significant difference test.

[x] Fisher's least significant difference, NS=treatment effect not significant at P=0.05.

White Rust and Anthracnose Control on Spinach
Spring, 2012

John Damicone and Tyler Pierson
OSU Department of Entomology and Plant Pathology

Methods: Fungicides were evaluated for control of white rust at the Entomology and Plant Pathology Research Farm in Stillwater in a field of Easpur loam previously cropped to spinach. Granular fertilizer (35-0-0 lb/A, N-P-K) was incorporated into the soil prior to planting the variety 'Avon' on 6 Mar at a seeding rate of two seeds per inch. The herbicide Parallel 7.8E at 0.75 pt/A was broadcast post-emergence on 26 Mar. Plots were top-dressed with granular fertilizer (23-0-0 lb/A, N-P-K) on 9 Apr. Plots consisted of 4-row beds, 20-ft long, with rows spaced 14 in. apart. The experimental design was a randomized complete block with four replications separated by a 5-ft-wide fallow buffer. Fungicides were broadcast using flat-fan nozzles (Tee-jet 8002vk) spaced 18-in. apart with a CO_2-pressurized wheelbarrow sprayer. The sprayer was calibrated to deliver 26 gal/A at 40 psi. Treatments were applied on ca. 7-day intervals beginning at the first true-leaf stage on 6 Apr. Plots received a total of 2.15 inches of sprinkler irrigation at 0.1 to 0.5 in. water per application as needed to promote crop and disease development. Rainfall during the cropping period (6 Mar to 8 May) totaled 3.92 in. for Mar, 6.16 in. for Apr, and 0.01 in for May. Disease incidence (percentage of leaves with symptoms) and severity (percentage of leaf area with symptoms) were assessed on 8 May. Five, 6-in.-long row segments were harvested arbitrarily from the middle two rows of each plot. The harvested leaves were bulked and mixed, and disease severity was visually estimated on 30 blindly sampled leaves.

Results: Rainfall was nearly 4 inches above normal (30-yr avg.) from Mar through Apr, and average daily temperature was 9 and 5°F above normal for Mar and Apr, respectively. White rust did not develop in the trial, but anthracnose reached moderate levels compared to previous trials at this site. None of the fungicide programs reduced levels of anthracnose compared to the untreated check. None of the treatments caused leaf injury (phytotoxicity).

Treatment and rate/A (timing)[z]	Anthracnose (%)	
	Leaves w/ disease	Leaf area w/ disease
Reason 4.13F 8.2 fl oz (1,3) Presidio 4F 4 fl oz (2,4)	54.2 a[y]	21.4 a
Reason 4.13F 8.2 fl oz (1,3) Ranman 3.33F 2.75 fl oz (2,4)	41.6 a	14.5 a
Tanos 50WG 8 oz + Aliette 80WG 2 lb (1,3) Presidio 4F 4 fl oz (2,4)	47.5 a	16.3 a
Tanos 50WG 8 oz + Aliette 80WG 2 lb (1,3) Ranman 3.33F 2.75 fl oz (2,4)	39.2 a	16.2 a
Quadris 2.08F 12.3 fl oz (1,3) Presidio 4F 4 fl oz (2,4)	55.8 a	21.7 a
Quadris 2.08F 12.3 fl oz (1,3) Ranman 3.33F 2.75 fl oz (2,4)	43.3 a	13.9 a
Cabrio 20WG 12 oz (1,3) Presidio 4F 4 fl oz (2,4)	39.1 a	12.1 a
Cabrio 20WG 12 oz (1,3) Ranman 3.33F 2.75 fl oz (2,4)	47.5 a	20.4 a
Untreated check	46.7 a	17.4 a
LSD (P=0.05)[x]	NS	NS

[z] The numbers (1-4) correspond to the spray dates of 1=6 Apr, 2=12 Apr, 3=20 Apr, and 4=27 Apr.
[y] Values in a column followed by the same letter are not statistically different according to Fisher's least significant difference test.
[x] Fisher's least significant difference, NS=treatment effect not significant at P=0.05.

Effect of Fungicide Application Timing on White Rust Control
Fall-Cropped Spinach, 2011

John Damicone and Tyler Pierson
OSU Department of Entomology and Plant Pathology

Methods: The objective of this study was to identify the best starting point for calendar and weather-based fungicide programs in order to minimize the number of applications while maintaining good disease control. The experiment was conducted at the Entomology and Plant Pathology Research Farm in Stillwater in a field of Easpur loam previously cropped to spinach. The field was planted with the variety 'Avon' on 21 Sep at a seeding rate of two seeds per inch. The herbicide Dual II Magnum 7.6E at 0.67 pt/A was broadcast after planting on 27 Oct. Plots were top-dressed with granular fertilizer (46-0-0 lb/A, N-P-K) on 17 Oct. Plots consisted of 4-row beds, 20-ft long, with rows spaced 14 in. apart. The experimental design was a randomized complete block with four replications separated by a 5-ft-wide fallow buffer. The first spray for the calendar (7-day) program, and monitoring of the weather based program (Spinach White Rust Advisor; http://agweather.mesonet.org/) began at the first true leaf stage, 7 days after first true leaf, and 14 days after first true leaf. Applications made according to the weather-based program were made within 3 days of a spray recommendation. Following each application made according to the weather-based program, plots were considered protected for the next 7 days. For each program and starting point, the fungicides Cabrio 20WG at 0.75 lb/A and Presidio 4F at 4 fl oz/A were alternated with Cabrio applied first. Fungicides were broadcast using flat-fan nozzles (Tee-jet 8002vk) spaced 18-in. apart with a CO_2-pressurized wheelbarrow sprayer. The sprayer was calibrated to deliver 26 gal/A at 40 psi. Plots received a total of 1.85 inches of sprinkler irrigation at 0.1 to 0.5 in. water per application as needed to promote crop and disease development. Rainfall during the cropping period (21 Sep to 29 Nov) totaled 1.25 in. for Sep, 3.04 in. for Oct, and 2.62 in. for Nov. Disease incidence (percentage of leaves with symptoms) and severity (percentage of leaf area with symptoms) were assessed on 29 Nov. Five, 6-in.-long row segments were harvested arbitrarily from the middle two rows of each plot. The harvested leaves were bulked and mixed, and disease severity was visually estimated on 30 blindly sampled leaves.

Results: Rainfall and average daily temperature were near normal during Oct and Nov. White rust only developed in a few plots and reached low levels compared to previous trials at this site. Treatments sprayed according to the weather-based program received fewer sprays per season, but disease pressure was not sufficient to differentiate treatments. None of the treatments caused leaf injury (phytotoxicity) symptoms.

Program - Starting point (timing)[z]	**Sprays (no.)**	**Leaves w/rust (%)**	**Leaf area w/rust (%)**
Calendar - 1st true leaf (1-6)	6	0.0 a[y]	0.00 a
Calendar - 1st true leaf + 7 d (2-6)	5	0.0 a	0.00 a
Calendar - 1st true leaf + 14 d (3-6)	4	0.8 a	0.08 a
Advisory - 1st true leaf (A1, A2)	2	0.8 a	0.04 a
Advisory - 1st true leaf + 7 d (A1, A2)	2	0.0 a	0.00 a
Advisory - 1st true leaf + 14 d (A2)	1	2.5 a	0.17 a
Untreated check	0	4.1 a	0.22 a
LSD(P=0.05)[x]		NS	NS

[z] The timings 1 to 6 correspond to the spray dates of 1=14 Oct, 2=21 Oct, 3=28 Oct, 4=4 Nov, 5=11 Nov, and 6=18 Nov for the calendar program; and the timings A1 to A2 correspond to the spray dates of A1=25 Oct and A2=7 Nov.

[y] Values in a column followed by the same letter are not statistically different according to Fisher's least significant difference test.

[x] Least significant difference, NS=treatment effect not significant.

Watermelon Anthracnose Control

Summer-Fall, 2012

John Damicone and Tyler Pierson
OSU Department of Entomology and Plant Pathology

Methods: The experiment was conducted at the Entomology/Plant Pathology Research Farm in Stillwater, OK in a field of Easpur loam previously cropped to wheat. Granular fertilizer (22-58-0 lb/A N-P-K) was incorporated into the soil prior to direct seeding 'Crimson Sweet' on 13 Jun. The herbicides Sonalan 3E at 3.5 pt/A and Permit 75DF at 0.75 oz/A were broadcast after planting to control weeds. Plots were top-dressed with granular fertilizer (50-0-0 lb/A N-P-K) on 9 Jul. Plots were single, 25-ft-long rows spaced 15 ft apart. Plots were thinned to a 2-ft within row spacing. Insects were controlled with Actara 25WG at 2.5 oz/A on 31 Jul, and with Warrior 1F at 3.84 fl oz/A + Actara 25DF at 3 oz/A on 7 Sep. Treatments were arranged in a randomized complete block design with four replications and a 10-ft fallow buffer separating replications. Fungicides were broadcast through flat-fan nozzles (8003vk) spaced 18-in. apart using a CO_2-pressurized wheelbarrow sprayer. The sprayer was calibrated to deliver 33 gal/A at 40 psi. Treatments received six applications on ca. 7-d intervals beginning 16 Aug. Plots were inoculated with the anthracnose fungus by spreading 50 ml of oat kernels colonized by the fungus along the center of each plot on 16 Aug. Rainfall during the cropping period (13 Jun to 8 Oct) totaled 1.27 in. for Jun, 0.07 in. for Jul, 2.64 in. for Aug, 1.10 in. for Sep, and 0.0 in. for Oct. Plots received 31 applications of sprinkler irrigation that totaled 11.3 in. of water. Disease incidence was assessed by visually estimating disease incidence (percentage of leaves with symptoms that included defoliation) and defoliation (percentage of leaves defoliated) in three areas of each plot. Yield of marketable watermelons weighing ≥12 lb was taken on 24 Sep. Watermelons were classified as diseased or healthy based on the presence or absence of anthracnose lesions.

Results: Rainfall was 57% below normal (30 yr avg.) and average temperatures were above normal in Jun and Jul. The hot and dry conditions delayed anthracnose development until Sep. Disease increased until an early freeze terminated the crop on 8 Oct. All treatments reduced anthracnose incidence and defoliation compared to the untreated check. All treatments except Catamaran+LBG-61 and Bravo + Luna Experience had higher yields of healthy melons than the untreated check, but treatment effects were not significant for yield of diseased and total melons. None of the treatments caused leaf injury (phytotoxicity) symptoms.

Treatment and rate/A (timing)[z]	Disease (%)[y]	Defoliation (%)[x]		Yield (cwt/A)[w]		
	18 Sep	18 Sep	8 Oct	Healthy	Diseased	Total
Bravo 6F 2 pt (1-6)	0.9 b[v]	0.0 b	47.5 b	518.6 a	149.2	667.8
Bravo 6F 2 pt (1,3,5) Quadris Top 2.72F 14 fl oz (2,4,6)	0.8 b	0.0 b	25.4 cd	536.4 a	201.0	737.4
Penncozeb 75DF 2 lb + Topsin 70W 0.5 lb (1-6)	1.6 b	0.0 b	16.7 d	445.2 a	191.4	636.6
Penncozeb 75DF 3 lb (1-6)	2.2 b	0.4 b	27.9 cd	452.3 a	179.4	631.8
Catamaran 5.3F 5 pt (1,3,5) LBG-61 4F 4 pt (2,4,6)	0.7 b	0.0 b	36.6 bc	332.3 ab	212.2	544.5
Bravo 6F 2 pt (1,3,5) Fontelis 1.67F 1 pt (2,4,6)	2.8 b	0.0 b	32.9 bcd	505.0 a	158.3	663.3
Bravo 6F 2 pt (1,3,5) Luna Experience 3.3F 17 fl oz (2,4,6)	6.7 b	2.1 b	40.8 bc	327.5 ab	268.8	596.3
Bravo 6F 2 pt (1,3,5) Luna Sensation 4.2F 7.6 fl oz (2,4,6)	1.9 b	0.0 b	25.0 cd	524.6 a	171.7	696.3
Untreated Check	44.2 a	20.2 a	99.6 a	181.5 b	340.7	522.2
LSD (*P*=0.05)[u]	6.6	2.9	18.1	226.9	NS	NS

[z] 1 to 6 correspond to the spray dates of 1=16 Aug, 2=23 Aug, 3=29 Aug, 4=5 Sep, 5=12 Sep, and 6=19 Sep.
[y] Plot foliage with anthracnose (including defoliation).
[x] Leaves defoliated from anthracnose.
[w] Marketable watermelons weighing $\geq$12 lb with (diseased) and without (healthy) anthracnose lesions, and the total of diseased and healthy watermelons.
[v] Values in a column followed by the same letter are not significantly different according to Fisher's least significant difference test at *P*=0.05, NS= treatment effect not significant at P=0.05
[u] Least significant difference, NS=treatment effect not significant at *P*=0.05.

Weed Management

Preemergence Weed Control in Pepper, Hydro, OK

Lynn Brandenberger and Lynda Carrier
Oklahoma State University
In Cooperation with
Schantz Family Farms

Introduction: Pepper production in Oklahoma includes pepper for fresh market and for processing. Weed control during production is critical due to the competitiveness of several weed species with peppers. Some herbicides are labeled for this crop, but are not effective enough to be the sole means of control. Weed control by herbicides is supplemented by cultivation and hand hoeing. Although effective, it is difficult and expensive to hire hoe crews for weed control. Costs for hand hoeing can be several hundred dollars per acre if labor is available. Therefore there is a need to identify potential preemergence herbicides that can be utilized for controlling broadleaf weeds in pepper fields. The objective of this study was to screen herbicides that may have potential for weed control in commercial pepper production when applied early in the season as a preemergence application.

Methods and Materials: The study field was transplanted to the pepper cultivar 'Okala' on 4/24/12 for the after planting treatments and on 4/26/12 for the pre-plant treatments. Row spacing was three feet between row centers with a transplant in-row spacing of 17 inches. The study included six different herbicide treatments including Lorox (linuron), Chateau (flumioxazin), League (imazosulfuron), Outlook (dimethenamid), Dual Magnum (S-metolachlor), and Warrant (acetochlor) and also included non-treated checks for both pre and post-transplant treatment blocks (Table 1). Lorox, Chateau, and League were applied pre-transplant while Outlook, Dual Magnum, and Warrant were applied over the top following transplanting. All treatments were applied to plots two rows wide (6 feet) by 20 feet in length in a randomized design with four replications on 4/26/12. Treatment applications were with a hand boom CO_2 sprayer at an overall rate of 25 gallons of spray solution per acre. Treatments were rated for injury, control of buffalo burr (*Solanum rostratum* Dun.), and carpetweed (*Mollugo verticillata* L.) on 5/30/12 and 6/19/12, fresh weights were recorded for five plants per plot on 10/02/12.

Results and Discussion: In general injury was less for the post-transplant compared to the pre-transplant treatments (Table 1). Pre-transplant treatments ranged from 13 to 53% injury on 5/30/12 while the post-transplant treatments ranged from 0 to 6% injury on the same day. Chateau applied pre-transplant had the highest level of injury at 53% while Dual Magnum and Warrant applied post-transplant had 0 and 6%, respectively. Injury on 6/19/12 ranged from zero for Dual Magnum applied post-transplant to 41% for Chateau applied pre-transplant. Control of buffalo burr was highest for Chateau applied pre-transplant for both days, but did not vary significantly from the other herbicide treatments except for League applied pre-transplant for the 5/30/12 rating. Carpetweed control was highest for Chateau for both rating dates at 98 and 100% control on 5/30/12 and 6/19/12, respectively. Most herbicide treatments had high levels of carpetweed control (84-98%) for the 5/30/12 date except Lorox which recorded 50% control. On 6/19/12 Chateau and League had the highest level of carpetweed control with ratings of 100 and 94%, respectively. No differences were recorded for fresh weights of 5 plants for any of the treatments except the untreated check in the post-transplant application block which had 14.4 lbs. of fresh weight.

Conclusions: Differences between treatments in this study occurred for injury and control of buffalo burr and carpetweed. The highest level of injury came from the Chateau pre-transplant treatment, but so did the highest level of weed control for both weed species in the study. The standard preemergence treatment included in the study was Dual Magnum which caused little injury and did a respectable job of weed control. The authors would conclude that taking a second look at Chateau as a preemergence application at lower rates may be warranted for future work since it had the highest level of weed control in the study and did not significantly lower fresh weight of pepper.

Acknowledgements: The authors want to thank the Schantz family for their help and support in completing this study. We also want to thank Syngenta, Tessenderlo Kerley, BASF, Valent and Monsanto companies for product support.

Table 1. 2012 Pepper preemergence weed control, Hydro, OK

Treatment lbs. ai/acre	Injury %		Buffalo Bur control %		Carpetweed control %		Fresh wt. 5 plants lbs.
Pre-Transplant	5/30/2012	6/19/2012	5/30/2012	6/19/2012	5/30/2012	6/19/2012	10/2/12
Untreated check	0 c[z]	13 b-c	0 c	0 b	0 d	0 e	10.4 b
Lorox 0.75	14 b	25 a-b	83 a-b	89 a	50 c	83 c-d	10.3 b
Chateau 0.067	53 a	41 a	98 a	93 a	98 a	100 a	10.7 ab
League 0.1875	13 b	16 b-c	76 b	81 a	96 a	94 a-b	8.8 b
Post-Transplant							
Untreated check	0 c	5 c	0 c	0 b	0 d	0 e	14.4 a
Outlook 0.5625	6 b-c	10 b-c	81 a-b	83 a	98 a	78 d	11.5 ab
Dual Magnum 0.71	0 c	0 c	91 a-b	86 a	89 a-b	76 d	12.8 ab
Warrant 0.9375	1 c	6 b-c	84 a-b	85 a	84 b	88 b-c	12.5 ab

[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.

Postemergence Weed Control in Pepper, Hydro, OK

Lynn Brandenberger and Lynda Carrier
Oklahoma State University
In Cooperation with
Schantz Family Farms

Introduction: Pepper production in Oklahoma includes pepper for fresh market and for processing. Weed control following crop establishment is critical due to the competitiveness of several weed species with peppers. Weed control by existing herbicides is supplemented by cultivation and hand hoeing. Although effective, it is difficult and expensive to hire hoe crews for weed control. Therefore there is a need to identify potential postemergence herbicides that can be utilized for controlling broadleaf weeds in pepper fields. The objective of this study was to screen several herbicides that have potential for weed control in commercial pepper production when applied later in the season as a postemergence application with a shielded sprayer.

Methods and Materials: The study field was transplanted to the pepper cultivar 'Okala' on 4/23/12. Row spacing was three feet between row centers with a transplant in-row spacing of 17 inches. The study included seven different herbicide treatments that utilized five different herbicides Fierce (flumioxazin + pyroxasulfone), Lorox (linuron), Sharpen (saflufenacil), Chateau (flumioxazin), Aim (carfentrazone) and also included a non-treated check (Table 1). All treatments were applied to plots six rows wide (18 feet) by 40 feet in length in a randomized block design with four replications on 6/22/12. Treatment applications were with a commercial shielded sprayer at an overall rate of 18 gallons of spray solution per acre. Treatments were rated for injury on 7/03/12, 8/07/12, and 9/15/12. Control ratings of purslane (*Portulaca oleracea* L.) and carpetweed (*Mollugo verticillata* L.) were completed on 8/07/12 and 9/05/12, fresh weights were recorded for five plants per plot on 10/02/12.

Results and Discussion: Injury was highest for treatments that contained Sharpen on 7/03/12 and 8/07/12 all other treatments had significantly lower injury ratings. Injury on 7/03/12 for Sharpen alone was 18.8% and Sharpen combined with Aim was 20%. Injury ratings on 8/07/12 were 11.3 and 25%, respectively, for Sharpen alone and combined with Aim. Purslane control was highest for Fierce on 8/07/12 (92.5%) and highest for Chateau + Aim on 9/05/12 (71.3%). Several other treatments had reasonably high levels of purslane control on 8/07/12 these included Lorox, Chateau alone and Chateau + Aim with control ratings ranging from 77.5 to 82.5%. Carpetweed control was highest for Fierce, Lorox, and Chateau + Aim on 8/07/12. These treatments ranged from 86.3 to 93.8% control for carpetweed on the first rating date. Control was highest for Chateau + Aim on 9/05/12 with a 90% control rating. Fresh weight yield did not vary between treatments.

Conclusions: Although the highest levels of injury were observed from the Sharpen treatments the crop did appear to recover with fresh weight not being significantly different from other treatments and the non-treated check. Furthermore, Sharpen recorded some of the lowest levels of control for both purslane and carpetweed. Fierce treated plots showed the highest level of initial control for both purslane and carpetweed, but the control decreased over time particularly when compared to the Chateau + Aim treatment that recorded the highest level of control for both weed species on the second rating date. In conclusion, the authors would suggest that further studies are needed to determine optimal rates for Fierce, Lorox, and Aim and that Sharpen should be dropped from future studies due to its high level of injury and low levels of weed control.

Acknowledgements: The authors want to thank the Schantz family for their help and support in completing this study. We also want to thank Syngenta, Tessenderlo Kerley, BASF, Valent and Monsanto companies for product support.

Table 1. 2012 Pepper postemergence shielded sprayer weed control, Hydro, OK

Treatment lbs. ai/acre	**Injury %**			**Purslane control %**		**Carpetweed control %**		**Yield 5 plants lbs.**
	7/3/12	8/7/12	9/5/12	8/7/12	9/5/12	8/7/12	9/5/12	10/2/12
Untreated check	0.0 b[z]	0.0 c	0.0 a	0.0 d	0.0 c	0.0 d	0.0 b	9.8 a
Fierce @ 0.414	0.0 b	1.3 c	0.0 a	92.5 a	56.3 ab	93.8 a	51.3 ab	9.1 a
Lorox @ 1.0	1.3 b	0.0 c	0.0 a	82.5 ab	31.3 abc	86.3 a	62.5 a	9.8 a
Sharpen @ 0.056	18.8 a	11.3 b	0.0 a	23.8 cd	17.5 bc	32.5 bc	46.3 ab	8.3 a
Chateau @ 0.1275	0.0 b	3.8 c	0.0 a	77.5 ab	42.5 abc	88.8 a	65.0 a	10.3 a
Sharpen @ 0.056 + Aim @ 0.025	20.0 a	25.0 a	2.5 a	18.8 cd	30.0 abc	26.3 cd	60.0 ab	9.6 a
Chateau @ 0.1275 + Aim @ 0.025	0.0 b	1.3 c	0.0 a	77.5 ab	71.3 a	90.0 a	90.0 a	10.4 a
Lorox @ 1.0 + Aim @ 0.025	0.0 b	1.3 c	1.3 a	50.0 bc	43.8 abc	57.5 b	55.0 ab	8.5 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.

Watermelon Preemergence Weed Control, Hydro, OK

Lynn Brandenberger and Lynda Carrier
Department of Horticulture & Landscape Architecture
In Cooperation with Dennis and Virgil Slagell

Introduction and Objectives: Watermelon is a major vegetable crop grown in the state of Oklahoma. Weed control on this crop is crucial for commercial growers particularly as labor costs increase and availability of hoeing crews becomes less. Weed infested fields can be a source of insect and disease pests along with the obvious loss of yield and additional harvest cost. The objective of this study was to determine the effectiveness and crop safety of preemergence herbicides for use in commercial watermelon production in Oklahoma.

Methods and Materials: Plots were arranged in a randomized block design with three replications, each plot consisted of three rows on row centers nine feet apart and plots were 30 feet in length. Watermelon was direct seeded 6/18/12 using a seed mixture of triploid seedless (‘Majestic’) and a diploid pollinator (‘All Sweet’). In-row plant spacing was 24 inches between plants. Treatments included three herbicides: Sandea (halosulfuron); Dual Magnum (S-metolachlor); Chateau (flumioxazin), treatments included a single herbicide or combinations (Table 1). All treatments received an application of Sandea (halosulfuron) at a rate of 0.023 lbs. ai/acre rate at seeding. At vining applications were made on 7/17/12 between rows. The third application for Dual Magnum was made on 8/07/12 between rows and over the row middles. Crop injury ratings were recorded on 8/07/12 and weed control was recorded for Palmer amaranth (*Amaranthus palmeri*) on 8/07/12 and 9/05/12. The middle row of each three row plot was harvested on 9/05/12 with individual fruit weights being recorded.

Results: Crop injury ranged from zero to seven percent with the Sandea at planting and tank-mix of Sandea plus Chateau at vining treatment having the highest injury (Table 1). Palmer amaranth control was highest on 8/07/12 for treatments receiving Dual Magnum or a tank-mix of Sandea plus Chateau at vining. These treatments ranged from 95 to 100% control of Palmer amaranth. There were no differences recorded for control of Palmer amaranth on 9/05/12. Although yields ranged from 14,235 to 29,716 lbs. per acre no significant differences were recorded for yield.

Conclusions: At vining treatments that included either Dual Magnum or Chateau did provide higher levels of weed control than the Sandea alone treatment. Dual Magnum at vining only and the Sandea plus Chateau tank-mix treatments resulted in a general trend toward higher yields at harvest compared to the other two treatments in the study. Of note was the treatment that included two applications of Dual Magnum (at vining and three weeks later), this treatment recorded no injury on 8/07/12, but had the lowest yield recorded in the study. One explanation that the authors would offer is that we should have done one more injury rating on 9/05/12, which may have indicated more damage from this treatment after the 8/07/12 application of Dual Magnum that not only treated between the rows, but also over the top of the row. The authors would conclude that further research on the treatments that provided the highest level of weed control may result in more conclusive results.

Acknowledgements: The authors wish to thank Dennis and Virgil Slagell for their support and cooperation in this study and Kim and Jacob for helping harvest the plots. We also want to thank Gowan, Syngenta, and Valent companies for providing herbicides for this study.

Table 1. 2012 Weed control in watermelon, Hydro, OK

Treatment	lbs. ai/acre	8/7/12 % Injury	Palmer amaranth 8/7/12 % control	Palmer amaranth 9/5/12 % control	Yield 9/5/12 lbs./acre
Sandea @ planting + @ vining	0.023 0.023	0 a	43 c	82 a	23,679 a
Sandea @ planting + Dual Magnum @ vining	0.023 0.950	0 a	95 b	97 a	24,448 a
Sandea @ planting + Dual Magnum @ vining + Dual Magnum 3 wks. later	0.023 0.950 0.950	0 a	95 b	97 a	14,235 a
Sandea @ planting + Sandea & Chateau @ vining	0.023 0.023 0.064	7 a	100 a	100 a	29,716 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.

SI (METRIC) CONVERSION FACTORS

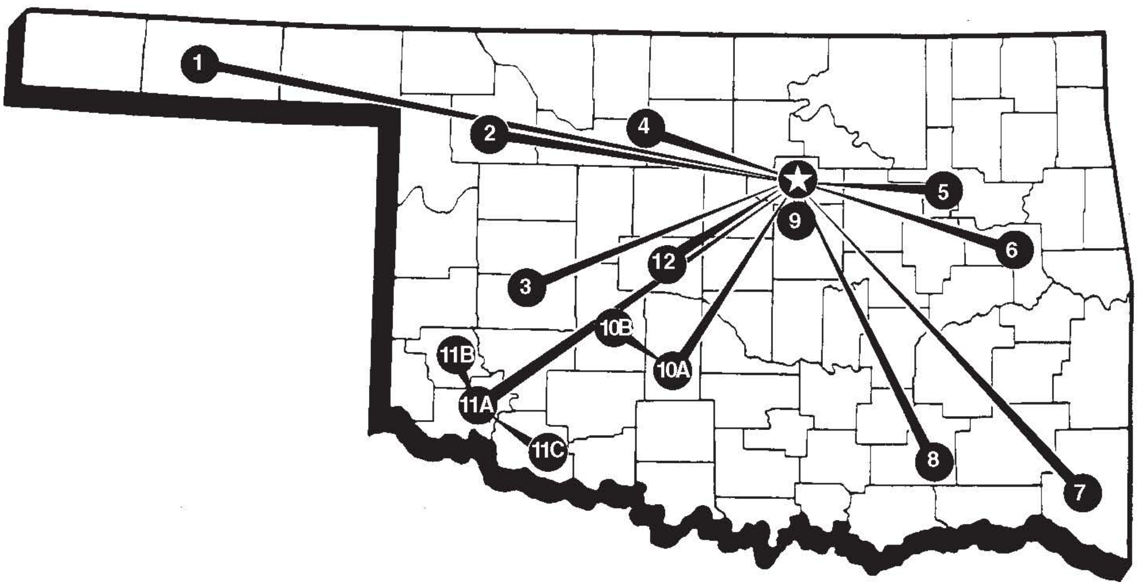
Approximate Conversions to SI Units

Symbol	When you know	Multiply by	To Find	Symbol
		LENGTH		
in	inches	25.40	millimeters	mm
ft	feet	0.3048	meters	m
yd	yards	0.9144	meters	m
mi	miles	1.609	kilometers	km
		AREA		
in^2	square inches	645.2	square millimeters	mm^2
ft^2	square feet	0.0929	square meters	m^2
yd^2	square yards	0.8361	square meters	m^2
ac	acres	0.4047	hectacres	ha
mi^2	square miles	2.590	square kilometers	km^2
		VOLUME		
fl oz	fluid ounces	29.57	milliliters	mL
gal	gallon	3.785	liters	L
ft^3	cubic feet	0.0283	cubic meters	m^3
yd^3	cubic yards	0.7645	cubic meters	m^3
		MASS		
oz	ounces	28.35	grams	g
lb	pounds	0.4536	kilograms	kg
T	short tons (2000 lb)	0.907	megagrams	Mg
		TEMPERATURE (exact)		
□F	degrees Fahrenheit	(□F-32) /1.8	degrees Celsius	□C
		FORCE and PRESSURE or STRESS		
lbf	poundforce	4.448	Newtons	N
lbf/in^2	poundforce per square inch	6.895	kilopascals	kPa

Approximate Conversions from SI Units

Symbol	When you know	Multiply by	To Find	Symbol
		LENGTH		
mm	millimeters	0.0394	inches	in
m	meters	3.281	feet	ft
m	meters	1.094	yards	yds
km	kilometers	0.6214	miles	mi
		AREA		
mm^2	square millimeters	0.00155	square inches	in^2
m^2	square meters	10.764	square feet	ft^2
m^2	square meters	1.196	square yards	yd^2
ha	hectacres	2.471	acres	ac
km^2	square kilometers	0.3861	square miles	mi^2
		VOLUME		
mL	milliliters	0.0338	fluid ounces	fl oz
L	liters	0.2642	gallon	gal
m^3	cubic meters	35.315	cubic feet	ft^3
m^3	cubic meters	1.308	cubic yards	yd^3
		MASS		
g	grams	0.0353	ounces	oz
kg	kilograms	2.205	pounds	lb
Mg	megagrams	1.1023	short tons (2000 lb)	T
		TEMPERATURE (exact)		
□C	degrees Fahrenheit	9/5(□C)+32	degrees Celsius	□F
		FORCE and PRESSURE or STRESS		
N	Newtons	0.2248	poundforce	lbf
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***