# 2010 Vegetable Trial Report

**MP-164**

**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 2010.

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

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

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## Seed Sources

Centest Inc.
23017 RTE 173
Harvard, IL 60033
(815) 943-6752

Chriseed (Brand of Alf Christianson)
P.O. Box 98
Mount Vernon, WA 98273
www.chriseed.com

Crookham Co.
P.O. Box 520
Caldwell, ID 83606-0520
www.crookham.com

Dewitt Seed Co.
P.O. Box 5556
Norman, OK 73070
www.dewittseed.com

Harris Seeds
355 Paul Rd. P.O. Box 24966
Rochester, NY 14624-0966
www.harrisseeds.com

Johnny's Selected Seeds
955 Benton Avenue
Winslow, ME 04901
www.johnnyseeds.com

Mesa Maize
202 Industrial Blvd.
Olathe, CO 81425
www.mesamaize.com

Pase Seeds
1581 Milestrip Rd.
North Collins, NY 14111
www.paseseeds.com

Rupp Seeds Inc.
17919 County Road B
Wauseon, OH 43567
www.ruppseeds.com

Seedway
99 Industrial Rd.
Elizabethtown, PA 17022
www.seedway.com

Syngenta Seeds, Inc. (Rogers)
P.O. Box 4188
Boise, ID 83711-4188
www.syngenta.com

Otis S. Twilley Seed Co., Inc.
P.O. Box 4000
Hodges, SC 29653
www.twilleyseed.com

Victory Seeds
P.O. Box 192
Molalla, OR 97038
www.victoryseeds.com

Willhite Seed Inc.
P.O. Box 23
Poolville, Texas 76487-0023
www.willhiteseed.com

Zeraim Gedera
P.O.B 103
Gedera 70750
www.zeraim.com

## The following have provided funding for the support of research in 2010

- Allens Quality Vegetables
- Crookham Co.
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# Cowpea for Soil Building and Forage

**OSU Research Stations Chickasha and Perkins, OK**
**Chad Godsey, Mark Gregory, Lynn Brandenberger, Lynda Carrier**

**Introduction and Objectives:** Production soils in the southern U.S. are typically low in organic matter due to a long growing season. It is common to observe soil organic matter levels at or below 0.5 % within Oklahoma. Organic matter is a critical issue for stand establishment, fertility, and general soil tilth. Use of cowpea as a soil builder and as a forage crop has historically been an integral part of sustainable farming systems. Cowpea forage has high levels of total digestible nutrients for grazing animals and is a hardy warm season legume that produces well under less than ideal conditions. The objective of these trials was to observe several established cultivars of forage cowpea along with recently released breeding lines for fresh yield and forage quality.

**Materials and Methods:** Field preparation included clean tillage of the plot area prior to planting. The trials were established on 6/25/10 and 6/28/10 at Oklahoma State experiment stations in Chickasha and Perkins, respectively. All plots were direct seeded using a research cone planter with four rows on 12 inch centers and a 20 feet plot length. Seeding rate at both sites was 152,460 seed per acre. Immediately following planting a preemergence herbicide application was made using a tank-mix of Dual Magnum (S-metolachlor) at 0.75 lbs ai/acre + Pursuit (imazethapyr) at 0.063 lbs ai/acre. Both sites were dryland sites with no supplemental irrigation. Plots were harvested with a forage plot harvester on 8/16/10 and 9/15/10 at Chickasha and Perkins, respectively.

**Table 1.** 2010 forage cowpea variety trials, Chickasha & Perkins, OK

| Variety | Seed source | Chickasha 8/16/2010 | | Perkins 9/15/2010 | |
|---|---|---|---|---|---|
| | | % TN[y] | Yield (fresh wt lbs./acre) | % TN[y] | Yield (fresh wt lbs./acre) |
| 1T97K-819-132 | UC Davis | 3.1 a | 26499 a-b[z] | 2.3 a | 46591 a-b |
| 58-53 | UC Davis | 3.4 a | 25337 a-c | 2.4 a | 44032 a-c |
| 58-57 | UC Davis | 3.2 a | 18803 c-e | 2.3 a | 27860 c-d |
| Catjang | Standard | 3.1 a | 20207 b-e | 2.4 a | 44450 a-c |
| CC-110-1 | UC Davis | 3.2 a | 20013 b-e | 2.4 a | 51546 a |
| CC-27 | UC Davis | 3.3 a | 27128 a | 2.0 a | 34395 a-d |
| CC-36 | UC Davis | 3.1 a | 18779 c-e | 2.3 a | 42544 a-d |
| CC-85-2 | UC Davis | 3.2 a | 23474 a-d | 2.4 a | 44577 a-c |
| Chinese Red | Standard | 3.0 a | 16650 e | 2.3 a | 27697 c-d |
| Cover Crop | Standard | 2.9 a | 18247 d-e | 2.2 a | 25247 d |
| Iron Clay | Standard | 3.1 a | 25289 a-c | 2.4 a | 38859 a-d |
| Red Ripper | Standard | 3.2 a | 21393 a-e | 2.4 a | 27389 c-d |
| US 1136 | US Vegetable Lab | 3.3 a | 27177 a | 2.5 a | 29911 b-d |
| US 1137 | US Vegetable Lab | 3.3 a | 20957 a-e | 2.6 a | 38424 a-d |
| US 1138 | US Vegetable Lab | 3.4 a | 23208 a-e | 2.3 a | 36808 a-d |
| UCR1340 | UC Davis | 3.2 a | 20086 b-e | 2.8 a | 39404 a-d |
| UCR779 | UC Davis | 3.3 a | 23668 a-d | 2.4 a | 45085 a-c |
| UCR830 | UC Davis | 3.4 a | 23377 a-d | 2.5 a | 37008 a-d |
| Victor | Standard | 3.2 a | 23813 a-d | 2.3 a | 43324 a-c |

[y] TN=Total Nitrogen as percent Nitrogen
[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.

## 2010 Cover Crops, Southern Peas, and Sweet Corn

**WWAREC, Lane, Ok. Warren Roberts & Wyatt O'Hern**

| Cover Crops | Yield of first time peas * (Tons per Acre) | Yield of second time peas * (Tons per Acre) | Yield of first time corn * (Tons per Acre) | Yield of second time corn* (Tons per Acre) |
|---|---|---|---|---|
| Bob Oats | 1.4 A | 1.2 A | 1.8 AB | 1.0 B |
| Crimson Clover | 1.1 A | 1.1 A | 1.0 BC | 2.0 AB |
| Yellow Madrid Sweet Clover | 0.9 A | 1.0 A | 2.5 A | 2.2 AB |
| Marshall Ryegrass | 1.0 A | 1.0 A | 0.6 C | 1.2 B |
| Elbon Rye | 0.9 A | 0.9 A | 1.3 ABC | 2.5 AB |
| Hairy Vetch | 1.2 A | 0.7 A | 1.6 ABC | 1.7 B |
| Arrowleaf Clover | 1.1 A | 0.9 A | 2.4 A | 2.5 AB |
| Wheat | 1.0 A | 1.2 A | 1.8 ABC | 3.6 A |

Southern Peas and Sweet Corn were planted following either one year of cover crops, or two years of cover crops. With the two year cover crops, the field was fallow between the first and second cover crop.
*First time peas means one year of southern peas following two years of cover crops
* First time corn means one year of corn following two years of cover crops
* Second time peas means the second year of southern peas following the second year of cover crops
* Second time corn means the second year of corn following the second year of cover crops
Means separation by Duncan MRT
Litter at 1 ton per acre applied 5-24-2010
Golden Bantam corn planted 5-27-2010; 3 rows on 3 ft centers with 12 inch in-row spacing
Quick-Pick Pinkeye southern peas planted 5-27-2010; 3 rows on 3 ft centers with 4 inch in-row spacing
20 ft of the center row of southern peas harvested 7-28-2010;
20 ft of the center row of corn harvested 8-3-2010;
Seeding rate for wheat, rye and oats was 75 lbs/A
Seeding rater for ryegrass, and hairy vetch was 30 lbs/A
Seeding rate for Yellow Madrid Sweet Clover was 20 lbs/A
Seeding rate for Crimson Clover was 15 lbs/A
Seeding rate for Arrowleaf Clover was 10 lbs/A

**Preliminary Report**

# Hoop-House Fresh Greens Production

**Rex and Marie Koelsch Cooperating with Oklahoma State University**
**Lynn Brandenberger, Brian Kahn, Sue Gray, Lynda Carrier**

## Introduction:

Cool season greens can be produced throughout the fall-winter-spring in unheated hoop houses because of their tolerance to cold temperatures. This project is being carried out at four locations in the state (Ardmore, Lane, Oklahoma City, and Tulsa). The project includes trialing several leafy greens crops that can be grown for local fresh market sales. Leafy greens in the replicated trials include several brassica greens (collard, kale, mustard, spinach-mustard, turnip, broccoli raab) and spinach, chard, and Romaine lettuce. The project is working to determine which crops will have the highest potential for profitability for fresh producers within the state.

## Methods:

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. Plots were direct seeded with a hand push planter (Johnny's 9156 seeder) with 4.5 inch row spacing and approximately 8 to 9 seeds/linier foot on 9/24/10. Plots were replicated four times in a randomized plan. Plant stands of collard, kale, and lettuce were less than optimal and plots of these species were reseeded on 10/8/10. Fresh weights were recorded at each harvest on 10/20/10, 10/29/10, 11/2/10, and 11/3/10. Additional harvests are expected throughout the remainder of 2010 and into the spring of 2011.

**Fall 2010 hoop-house greens trial yield and number of plants per plot on 11/3/10. Rex and Marie Koelsch cooperating with Oklahoma State University.**

| Crop | Variety | Source | Average weight (lbs.)$^{z}$ | Average number plants |
|---|---|---|---|---|
| Spinach | Olympia | Chriseed | 3.3 | 106 |
| Chard | Rhubarb Chard | Harris | 1.9 | 62 |
| Romaine Lettuce | Green Towers | Seedway | | |
| Broccoli Raab | Zamboni | Seedway | | |
| Collard | Champion | DeWitt | 1.8 | 32 |
| Kale | Vates Blue Curled Scotch | DeWitt | | |
| Mustard | Southern Giant Curled | DeWitt | 3.1 | |
| Spinach Mustard | Savanna | Chriseed | 7.7 | 80 |
| Turnip | Southern Green | Chriseed | 9.6 | 130 |

$^{z}$ Average weight and average number of plants per plot

## 2009 Organic Corn (Golden Bantam)

**WWAREC, Lane, Ok. Warren Roberts & Wyatt O'Hern**

| Trt # | Treatments | Lbs/acre | N/acre | P2O5/acre | K2O/acre | Yield tons/acre | Duncan |
|---|---|---|---|---|---|---|---|
| 1 | Cotton Seed Meal | 1667 | 100 | 17 | 17 | 2.7 | AB |
| | Bone Meal | 333 | 0 | 33 | 0 | | |
| | Potash | 367 | 0 | 0 | 183 | | |
| 2 | Corn Gluten | 1000 | 100 | 0 | 0 | 2.0 | B |
| | Bone Meal | 500 | 0 | 50 | 0 | | |
| | Potash | 400 | 0 | 0 | 200 | | |
| 3 | Corn Gluten | 625 | 63 | 0 | 0 | 2.8 | AB |
| | Cotton Seed Meal | 625 | 38 | 6 | 6 | | |
| | Bone Meal | 438 | 0 | 44 | 0 | | |
| | Potash | 388 | 0 | 0 | 194 | | |
| 4 | Cotton Seed Meal | 1667 | 100 | 17 | 17 | 3.2 | A |
| | Rock Phosphate | 222 | 0 | 33 | 0 | | |
| | Potash | 367 | 0 | 0 | 183 | | |
| 5 | Corn Gluten | 1000 | 100 | 0 | 0 | 2.9 | AB |
| | Rock Phosphate | 333 | 0 | 50 | 0 | | |
| | Potash | 400 | 0 | 0 | 200 | | |
| 6 | Corn Gluten | 625 | 63 | 0 | 0 | 2.8 | AB |
| | Cotton Seed Meal | 625 | 38 | 6 | 6 | | |
| | Rock Phosphate | 292 | 0 | 44 | 0 | | |
| | Potash | 388 | 0 | 0 | 194 | | |
| 7 | Alfalfa Meal | 2500 | 75 | 50 | 50 | 3.5 | A |
| | Corn Gluten | 250 | 25 | 0 | 0 | | |
| | Potash | 300 | 0 | 0 | 150 | | |
| 8 | Poultry Litter | 2500 | 50 | 50 | 50 | 2.5 | AB |
| | Corn Gluten | 500 | 50 | 0 | 0 | | |
| | Potash | 300 | 0 | 0 | 150 | | |
| 9 | Poultry Litter | 2000 | 40 | 40 | 40 | 2.0 | B |
| | Cotton Seed Meal | 1000 | 60 | 10 | 10 | | |
| | Potash | 300 | 0 | 0 | 150 | | |
| 10 | Poultry Litter | 5000 | 100 | 100 | 100 | 2.4 | AB |

## 2010 Organic Corn (Golden Bantam)

**WWAREC, Lane, Ok. Warren Roberts & Wyatt O'Hern**

| Trt # | Treatments | Lbs/acre | N/acre | P2O5/acre | K2O/acre | Yield tons/acre | Duncan |
|---|---|---|---|---|---|---|---|
| 1 | Cotton Seed Meal | 1667 | 100 | 17 | 17 | 2.8 | AB |
| | Bone Meal | 333 | 0 | 33 | 0 | | |
| | Potash | 367 | 0 | 0 | 183 | | |
| 2 | Corn Gluten | 1000 | 100 | 0 | 0 | 3.8 | A |
| | Bone Meal | 500 | 0 | 50 | 0 | | |
| | Potash | 400 | 0 | 0 | 200 | | |
| 3 | Corn Gluten | 625 | 63 | 0 | 0 | 2.5 | BC |
| | Cotton Seed Meal | 625 | 38 | 6 | 6 | | |
| | Bone Meal | 438 | 0 | 44 | 0 | | |
| | Potash | 388 | 0 | 0 | 194 | | |
| 4 | Cotton Seed Meal | 1667 | 100 | 17 | 17 | 2.3 | BC |
| | Rock Phosphate | 222 | 0 | 33 | 0 | | |
| | Potash | 367 | 0 | 0 | 183 | | |
| 5 | Corn Gluten | 1000 | 100 | 0 | 0 | 3.0 | AB |
| | Rock Phosphate | 333 | 0 | 50 | 0 | | |
| | Potash | 400 | 0 | 0 | 200 | | |
| 6 | Corn Gluten | 625 | 63 | 0 | 0 | 2.9 | AB |
| | Cotton Seed Meal | 625 | 38 | 6 | 6 | | |
| | Rock Phosphate | 292 | 0 | 44 | 0 | | |
| | Potash | 388 | 0 | 0 | 194 | | |
| 7 | Alfalfa Meal | 2500 | 75 | 50 | 50 | 3.4 | AB |
| | Corn Gluten | 250 | 25 | 0 | 0 | | |
| | Potash | 300 | 0 | 0 | 150 | | |
| 8 | Poultry Litter | 2500 | 50 | 50 | 50 | 3.0 | AB |
| | Corn Gluten | 500 | 50 | 0 | 0 | | |
| | Potash | 300 | 0 | 0 | 150 | | |
| 9 | Poultry Litter | 2000 | 40 | 40 | 40 | 2.4 | BC |
| | Cotton Seed Meal | 1000 | 60 | 10 | 10 | | |
| | Potash | 300 | 0 | 0 | 150 | | |
| 10 | Poultry Litter | 5000 | 100 | 100 | 100 | 1.6 | C |

# 2010 Pumpkin Variety Trial

**OSU Vegetable Research Station-Bixby, OK**

**Brian Kahn, Lynn Brandenberger, Lynda Carrier, Robert Havener, Robert Adams**

**Introduction and Objectives:** Pumpkin is a seasonal crop that is very popular in the U.S. in the fall. Fall pumpkins are normally planted in June and harvested in late September and early October in Oklahoma. Several challenges are involved in growing pumpkins including pest control issues such as weed, insect, and disease control. One key concern is the control of plant viral diseases such as cucumber mosaic virus (CMV), squash mosaic virus (SqMV), and watermelon mosaic virus-2 (WMV-2). Another concern is powdery mildew, an important fungal disease that can cause extensive early defoliation. The trial at Bixby was designed to observe not only performance characteristics (yield, fruit quality, color) of hybrid and open-pollinated varieties, but also to observe trial entries for tolerance or resistance to plant diseases.

**Materials and Methods:** Field preparation included deep tillage of the plot area and creating raised free-standing beds for planting with a bed shaper. The trial was replicated 3 times in a randomized block design. All plots were hand seeded on 6/21/10 on top of the non-mulched raised beds with 15ft. bed centers and a finished plant spacing of three feet between plants in the 24ft. long plots (8 plants/plot). Strips of sorghum x sudan haygrazer were planted between raised beds on 6/22/10 as windbreaks and to aid in virus control. The windbreaks were mown three times during the season to a height of 2 ft. to reduce competition with the pumpkin crop. All pumpkin plots received a tankmix of preemergence herbicide including Sandea (halosulfuron) at 0.032 lbs. active ingredient (ai/acre) per acre and Curbit (ethalfluralin) at 0.56 lbs ai/acre on 6/22/10. Immediately following the herbicide application the experimental area received 0.5 inches of water via an overhead irrigation system. Plots received a total of 110 lbs. of nitrogen per acre from 46-0-0, 75 lbs/acre on 7/16/10 and 35 lbs/acre on 8/02/10. Insect and disease control consisted of applications of both insecticide and fungicide on 10 to 14 day intervals. Crop water needs were met using regular scheduled irrigations from the overhead linear irrigation system.

**Results and Discussion:** Cultivars were organized into five groups. Each group was relatively comparable in average weight per fruit, and included at least one hybrid cultivar.

<u>Group 1</u>: Within Group 1, 'Baby Pam' usually was statistically comparable to 'Touch of Autumn', but the handles on 'Baby Pam' were longer, thicker, and tan. A concern with 'Baby Pam' was lack of early seedling vigor. 'Touch of Autumn' beat every other entry for number of fruit per acre on a trial-wide basis (Table 2). Its fruit were relatively uniform and very attractive, showing a nice contrast of orange skin and green handles. The edge in this group definitely went to the hybrid 'Touch of Autumn.'

<u>Group 2</u>: The three entries here were distinct from each other. 'Small Sugar' matched the hybrid 'Orange Smoothie' for yield, although it was less uniform in appearance. 'Small Sugar' is a classic pie pumpkin and appearance is less of a concern. 'Orange Smoothie' showed why it was chosen as an All-America™ winner. It had a relatively high yield of smooth, attractive fruit that would be ideal for painting. 'Winter Luxury' had a unique appearance, with a rough white netting, almost like a netted muskmelon. Perhaps because of this trait, it seemed to be more susceptible to damage from pickleworms attacking the rind. It is another classic pie pumpkin, and it had better uniformity than 'Small Sugar' (Table 4).

<u>Group 3</u>: 'Orange Bulldog' was unique in that it belongs to a different species (*Cucurbita maxima*) from the other entries. It is not yet a pure line and it showed a lot of genetic variation for fruit size, fruit shape, and rind color. It was bred for virus resistance and it also appeared to have some tolerance to powdery mildew (Table 1). It could be a novelty that would attract attention in a display. However, none of the fruit would ever be mistaken for a *Cucurbita pepo* jack-o-lantern-type pumpkin, even though some were pinkish-orange with a flattened globe shape. 'Tom Fox' was not especially impressive overall, and was generally inferior to the hybrid 'Charisma' within this group. 'Charisma' was vigorous and produced the (numerically, not statistically) highest weight of fruit per acre on a trial-wide basis. It showed some early tolerance to powdery mildew, but the tolerance did not hold up into early October (Table 1). Still, it easily was the best overall performer in this group.

Group 4: With average weights per fruit ranging from 10.5 to 13.3 lbs., pumpkins in this group would be versatile in ultimate use. ‘Magician’ showed some tolerance to powdery mildew (Table 1) and had good fruit uniformity (Table 4). ‘Howden’ and ‘Trojan’ were statistically comparable to ‘Magician’ in many traits and would be good open-pollinated alternatives in this group, with perhaps a slight edge to ‘Trojan’ for yield (Table 3). ‘Wolf’ may have been at a yield disadvantage, because extra space was not provided for it as recommended. It had rank vine growth and late maturity, as per its catalog description. We would hesitate to recommend ‘Wolf’ except as a specialty item for growers with a market for a pumpkin with huge, distinctive handles.

Group 5: The two pumpkins in this group had relatively low numbers of fruit per acre (Table 2), but within the group, ‘Mustang’ beat ‘Gold Rush’ (Table 3). ‘Mustang’ showed good tolerance to powdery mildew (Table 1) and had a good, uniform orange color (Table 4). ‘Gold Rush’ had the largest fruits on a trial-wide basis (Table 2). The handles on ‘Gold Rush’ were nearly as thick as those on ‘Wolf’ (Table 4), although they were shorter (data not presented). A few ‘Gold Rush’ fruits had poor color, possibly due to virus infection, and further trials would be needed before deciding whether or not it would be recommended.

**Table 1.** 2010 Pumpkin Variety Trial, Bixby, OK

| Cultivar | Hybrid/ Open Poll. | Source | Stand 7/27/2010 | % Powdery mildew infection 7/27/2010 | % Powdery mildew infection 10/5/2010[y] | % Defoliation 10/5/2010[y] |
|---|---|---|---|---|---|---|
| Baby Pam | O.P. | Seedway | 10.0 a[z] | 48 b-f | 85 a-b | 46 a-c |
| Touch of Autumn | Hybrid | Seedway | 9.0 a | 42 c-f | 58 c-d | 36 b-c |
| Small Sugar | O.P. | Willhite | 9.7 a | 75 a-b | 92 a | 75 a |
| Orange Smoothie | Hybrid | Twilley | 9.0 a | 55 a-e | 87 a-b | 51 a-c |
| Winter Luxury | O.P. | Johnny's | 8.7 a | 80 a | 95 a | 82 a |
| Orange Bulldog | O.P. | UGA | 9.0 a | 28 e-f | 39 d | 22 c |
| Tom Fox | O.P. | Johnny's | 9.3 a | 68 a-c | 88 a-b | 53 a-c |
| Charisma | Hybrid | Johnny's | 8.0 a | 30 e-f | 82 a-b | 50 a-c |
| Magician | Hybrid | Seedway | 7.0 a | 32 e-f | 56 c-d | 18 c |
| Howden | O.P. | Willhite | 7.3 a | 63 a-d | 93 a | 62 a-b |
| Wolf | O.P. | Seedway | 7.7 a | 40 d-f | 69 b-c | 30 b-c |
| Trojan | O.P. | Seedway | 8.3 a | 53 a-e | 81 a-b | 51 a-c |
| Mustang | Hybrid | Seedway | 8.3 a | 22 f | 39 d | 18 c |
| Gold Rush | O.P. | Seedway | 8.3 a | 47 c-f | 84 a-b | 49 a-c |

[y] Powdery mildew and defoliation ratings on 10/5/2010 rated by Dr. John Damicone.
[z] Numbers in a column followed by the same letter exhibited no significant differences based on Duncan's Multiple Range Test where P=0.05.

**Table 2.** 2010 Pumpkin Variety Trial, Bixby, OK

| Cultivar | Average weight per fruit (lbs.) | Number of fruit per acre | Weight of fruit per acre (lbs.) |
|---|---|---|---|
| Baby Pam | 1.8 i[z] | 3509 b-d | 6272 d |
| Touch of Autumn | 1.9 h-i | 5364 a | 10346 c-d |
| Small Sugar | 3.0 g-i | 3791 b-c | 11261 c-d |
| Orange Smoothie | 3.8 g-h | 4033 b | 15387 a-d |
| Winter Luxury | 4.3 g | 2501 c-f | 10918 c-d |
| Orange Bulldog | 8.1 f | 2743 b-e | 22199 a-b |
| Tom Fox | 8.5 f | 1331 f-g | 11156 c-d |
| Charisma | 9.0 e-f | 2743 b-e | 25483 a |
| Magician | 10.5 d-e | 2178 d-f | 23135 a-b |
| Howden | 12.2 c-d | 1170 f-g | 14226 b-d |
| Wolf | 12.7 c | 484 g | 6179 d |
| Trojan | 13.3 c | 1452 e-g | 19320 a-c |
| Mustang | 15.3 b | 1533 e-g | 23861 a-b |
| Gold Rush | 19.2 a | 807 g | 15117 a-d |

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

**Table 3.** 2010 Pumpkin Variety Trial, Bixby, OK

| Cultivar | Average weight per fruit (lbs.) | Number of fruit per acre | Weight of fruit per acre (lbs.) |
|---|---|---|---|
| ***Group 1*** | | | |
| Baby Pam | 1.8 a [z] | 3509 a | 6272 a |
| Touch of Autumn | 1.9 a | 5364 a | 10346 a |
| ***Group 2*** | | | |
| Small Sugar | 3.0 b | 3791 a | 11261 a |
| Orange Smoothie | 3.8 a | 4033 a | 15387 a |
| Winter Luxury | 4.3 a | 2501 a | 10918 a |
| ***Group 3*** | | | |
| Orange Bulldog | 8.1 a | 2743 a | 22199 a |
| Tom Fox | 8.5 a | 1331 b | 11156 a |
| Charisma | 9.0 a | 2743 a | 25483 a |
| ***Group 4*** | | | |
| Magician | 10.5 b | 2178 a | 23135 a |
| Howden | 12.2 a-b | 1170 b | 14226 a-b |
| Wolf | 12.7 a | 484 b | 6179 b |
| Trojan | 13.3 a | 1452 a-b | 19320 a |
| ***Group 5*** | | | |
| Mustang | 15.3 a | 1533 a | 23861 a |
| Gold Rush | 19.2 a | 807 b | 15117 a |

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

**Table 4.** 2010 Pumpkin Variety Trial, Bixby, OK

| | Uniformity ratings[x] | | | Circumference [y] | | Fruit Shape [y] | |
|---|---|---|---|---|---|---|---|
| **Cultivar** | **Size** | **Shape** | **Color** | **Ped. (in.)** | **Fruit (in.)** | **Height (in.)** | **Width (in.)** |
| ***Group 1*** | | | | | | | |
| Baby Pam | 2.7 b [z] | 3.7 a | 3.3 a | 2.1 a | 15.6 a | 3.6 a | 4.6 a |
| Touch of Autumn | 3.8 a | 5.0 a | 4.3 a | 1.6 b | 15.0 a | 3.9 a | 4.4 a |
| ***Group 2*** | | | | | | | |
| Small Sugar | 2.5 b | 3.0 b | 2.5 a | 2.2 b | 17.7 a | 4.9 c | 5.3 a |
| Orange Smoothie | 3.7 a | 4.2 a | 4.0 a | 2.6 a | 20.1 a | 5.9 a | 5.8 a |
| Winter Luxury | 3.7 a | 3.8 a | 2.8 a | 2.1 b | 20.3 a | 5.3 b | 5.8 a |
| ***Group 3*** | | | | | | | |
| Orange Bulldog | 1.8 a | 1.2 b | 1.0 a | 1.7 b | 28.5 a | 7.0 a | 8.1 a |
| Tom Fox | 2.7 a | 2.3 b | 2.2 a | 3.5 a | 26.8 a | 7.3 a | 7.3 a |
| Charisma | 3.3 a | 4.2 a | 3.3 a | 3.0 a | 29.7 a | 7.8 a | 8.3 a |
| ***Group 4*** | | | | | | | |
| Magician | 4.0 a | 3.8 a | 4.2 a | 4.4 b | 30.3 a | 9.1 a | 8.2 a |
| Howden | 2.7 a | 2.2 a | 2.2 b | 3.6 b | 27.8 a | 10.6 a | 8.0 a |
| Wolf | 3.0 a | 3.0 a | 3.0 a-b | 6.5 a | 29.1 a | 9.1 a | 8.5 a |
| Trojan | 2.8 a | 2.3 a | 2.8 b | 3.4 b | 32.2 a | 9.6 a | 8.9 a |
| ***Group 5*** | | | | | | | |
| Mustang | 3.0 a | 3.2 a | 4.5 a | 3.7 b | 33.7 a | 9.8 a | 9.1 a |
| Gold Rush | 3.0 a | 3.0 a | 2.8 a | 6.0 a | 35.8 a | 10.7 a | 10.0 a |

[x] Uniformity ratings on a 1-5 scale, 1=least, 5=most uniform in size, shape, and color within a cultivar.
[y] Circumference and fruit shape measurements taken on three fruit per plot that were closest to the average weight per fruit for that plot. Ped. = peduncle circumference just above the fruit attachment flair.
[z] Numbers in a column (by group) 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

**Departments of Horticulture and Plant and Soil Science, Oklahoma State University**
**Lynn Brandenberger, Hailin Zhang, Eric Stafne, and Lynda Carrier**

**Introduction:** Growers in the southern U.S. face serious problems due to low levels of organic matter in production soils. Organic matter levels in agricultural soils of Oklahoma commonly are less than 1%. 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 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 four year period.

**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/sudan cover crop (Hay Grazer BMR 6), sorghum/sudan + cowpea cover crop combination, and clean fallow + compost. Study treatments were initiated on 6/21/10 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 will be rototilled during the summer growth period. Sorghum/sudan cover crop plots will be mown with a rotary mower at a height of 4-6 inches and the entire study will be mown on prior to fall tillage and planting of a strawberry crop. Following fall tillage compost will be applied to the clean fallow + compost plots at a rate of 8 tons of compost per acre and then rototilled to a depth of 3-4 inches for incorporation.

**Results:** At this point there are no results to share on this study. In fall 2009 spinach was planted in all plots of the experiment, but none was harvested due to poor stands which were the result of heavy rains. Efforts this fall included soil preparation for planting of annual strawberries on 9/27/10 and subsequent planting of plots to the strawberry cultivar 'Chandler' on 10/07/10. Strawberries are being grown on raised beds utilizing drip irrigation and black plastic mulch. Alleys between strawberry beds were planted to wheat as a cover crop on 10/08/10 to prevent soil erosion and for stabilizing the sides of the raised beds. Future plans include fall plantings of spinach in 2011 and 2013 and strawberries in 2012.

# Southern Cooperative Cowpea Trial

### Spring 2010, Bixby, Oklahoma

**Lynn Brandenberger, Lynda Carrier**

**Introduction:** The Southern Cooperative trials are an ongoing effort by scientists at 5 Land Grant Universities and the U.S.D.A to provide performance data for advanced breeding lines in a wide variety of production environments. The Bixby trial results provide Oklahoma producers with a look at potential new cultivars for the future.

**Materials and Methods:** Plots consisted of one row 20 feet long with 36 inches between rows. Seed were spaced 5 seeds per foot and were planted on 6/02/10. A tank-mix of Dual Magnum at 0.75 lb ai/acre + Pursuit at 0.063 lb ai/acre was applied preemergence following planting on 6/02/10 for weed control. After the herbicide application the entire experimental area received 0.5 inches irrigation with an overhead irrigation system. Supplemental water was supplied through the same overhead irrigation system. Plots were fertilized on 6/17/10 with 25 lbs N/acre. The trial included 4 replications for the 10 replicated lines and 2 replications for the 12 observational lines (Tables 1, 2). The trial was machine harvested on 9/07/10 dry yields were recorded subsequently. Data was analyzed using Duncan's multiple range test with comparisons made between varieties within a pea type (blackeye, cream, and pinkeye) compared only to other peas within that given type.

**Results and Discussion:** No differences were observed between breeding lines for yield except for the pinkeye group in the replicated test (Table 1). AR 01-821 and AR 01-1293 had higher yields (1075 and 1176 lbs dry weight per acre, respectively) than other pinkeye breeding lines or 'Coronet' the industry standard. Pinkeye yields ranged from 445 to 1176 lbs of dry seed per acre and from 943 to 2327 lbs of imbibed seed per acre. Both Arkansas breeding lines also had the highest imbibed weights in the pinkeye group.

**Conclusions:** Both AR 01-821 and AR 01-1293 were the highest yielding peas in the trial and warrant consideration for release for Oklahoma production. In the observational trials LA 97-8 had the highest yield in the pinkeye types followed by TX2044-4-6-4-0PEgc, LA 5-114, and LA 2-12 all of which should be considered for entries in replicated trials in the future.

**Acknowledgements:** The authors would like to thank Bob Heister for combining the peas.

**Table 1.** Spring 2010 Southern Pea Trial, Bixby, OK. Replicated Trial.

| Variety | Source | Imbibed Yield | Shelled yield lbs./acre[y] | |
|---|---|---|---|---|
| | | ***Blackeye types*** | | |
| TX2012-5-1-2-0BE | Texas A & M | 1181 | 557 | a[z] |
| TX2028-2-2-0BEgc | Texas A & M | 1100 | 533 | a |
| ARK Blackeye #1 | Industry Standard | 1729 | 851 | a |
| | | ***Cream types*** | | |
| LA 96-4 | Louisiana State | 1110 | 503 | a |
| Early Acre | Industry Standard | 1275 | 652 | a |
| | | ***Pinkeye types*** | | |
| TX2044-5-2-0PEgc | Texas A & M | 943 | 445 | b |
| LA 96-74 | Louisiana State | 989 | 472 | b |
| AR01-821 | U of Arkansas | 2155 | 1075 | a |
| AR01-1293 | U of Arkansas | 2327 | 1176 | a |
| Coronet | Industry Standard | 959 | 485 | b |

[y] Dry shelled wt.=mechanically harvested on 9/07/10 yield in lbs./acre.
[z] Numbers in a column (by type) followed by the same letter exhibited no significant differences based on Duncan's Multiple Range Test where P=0.05.

**Table 2.** Spring 2010 Southern Pea Trial, Bixby, OK. Observational Trial.

| Variety | Source | Imbibed Yield | Shelled yield lbs./acre[y] | |
|---|---|---|---|---|
| | | ***Blackeye types*** | | |
| TX2028-2-2-1-0BEgc | Texas A & M | 1321 | 628 | a[z] |
| ARK Blackeye #1 | Industry Standard | 1677 | 806 | a |
| | | ***Cream types*** | | |
| AR01-1781 | U of Arkansas | 2356 | 1107 | a |
| Early Acre | Industry Standard | 1909 | 987 | a |
| | | ***Pinkeye types*** | | |
| TX2044-4-6-4-0PEgc | Texas A & M | 1429 | 675 | a |
| TX2044-6-5-0PEgc | Texas A & M | 1039 | 486 | a |
| LA 97-8 | Louisiana State | 1837 | 871 | a |
| LA 2-12 | Louisiana State | 1351 | 643 | a |
| LA 5-114 | Louisiana State | 1458 | 675 | a |
| AR07-216 | U of Arkansas | 1113 | 479 | a |
| AR07-1279 | U of Arkansas | 1368 | 585 | a |
| Coronet | Industry Standard | 1143 | 563 | a |

[y] Dry shelled wt.=mechanically harvested on 9/07/10 yield in lbs./acre.
[z] Numbers in a column (by type) followed by the same letter exhibited no significant differences based on Duncan's Multiple Range Test where P=0.05.

# Spring 2010 Sweet Corn Variety Trial, Bixby, Oklahoma

**Brian Kahn, Lynda Carrier, Robert Havener, and Robert Adams**

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

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

Objectives of this trial were to evaluate 25 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 direct seeded on April 27. 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. Types were separated into two groups, with $sh_2$ types in one area of the field and se and mixed hybrids in the other area. Plots were sprayed with S-metolachlor herbicide on April 27, at the rate of ¾ pint/acre. Plots were thinned to 20 plants per row on May 27. Overall early vigor was good. Fertilizer was applied three times (April 27, May 27, and June 17) using urea to supply 50 lbs. N/acre on each date. Insecticide applications began in May (just before silking) and continued throughout the harvest period. Supplemental water was applied with overhead irrigation. Each variety was harvested one time at its peak maturity.

**Results and Summary:** Results are shown on the following page. Standards of comparison were 'Incredible' in the se group and 'GSS 0966' in the $sh_2$ group.

<u>se group</u>: The top 8 varieties did not differ in number of marketable sacks per acre, and only 'Powwow' differed from 'Incredible' in sacks per acre. 'Powwow' had poor cob fill and did not seem well adapted. 'Synergy' was impressive for an early corn, both for yield and for having an above-average ear appearance. 'Synergy' plants also had many immature secondary ears, suggesting additional yield potential where more than one harvest can be made (as in a home garden). 'Applause' was earlier than 'Incredible' and should be trialed again. The two Syngenta cultivars are GMOs (genetically engineered for earworm resistance). While earworm damage usually was restricted on these two cultivars, they did not differ statistically in earworm damage from a few of the non-GMO entries.

<u>$sh_2$ group</u>: The top 7 varieties did not differ in number of marketable sacks per acre. However, 'Marvel', 'Mirai 138Y', and 'Mirai 336BC' all produced fewer sacks per acre than 'GSS 0966.' 'Passion' had some ears with poor tip cover, but it also had the (numerically) highest tonnage and should definitely be trialed again. 'Obsession' was third highest (numerically) in marketable sacks per acre in the 2008 trial, as well as in this trial, and is recommended for grower trial in Oklahoma where bicolors are desired. 'BSS 0977' and 'Xtra Tender 1283' were mature at 76 days, but harvest was delayed by weather. 'BSS 0977' and 'GSS 0966' are GMOs, and had less earworm damage than the other $sh_2$ entries with one exception. 'Ravelin' was very susceptible to corn earworm damage; however, apart from damaged tips, the shucked ears were very attractive, especially for an early cultivar.

One objective of this trial was to compare several Mirai™ cultivars with other sweet corns. Mirai™ cultivars are marketed as having particularly good eating quality. Taste is very subjective; however, after five years of testing, it appears that the claim of superior flavor in the Mirai™ cultivars has merit. Yield and vigor are improving in the newer Mirai™ cultivars. They tend to be early, which puts them at a tonnage disadvantage, but in 2010 'Mirai 148Y' and 'Mirai 301BC' matched the yield performance of 'GSS 0966.' For Oklahoma markets where volume of production is less important and a premium can be earned for outstanding flavor, the newer Mirai™ cultivars are definitely worth considering. Those growing Mirai™ cultivars should follow a good corn earworm management program and carefully follow guidelines provided by Centest, including attention to stand establishment.

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

**Table 1.** Spring 2010 Sweet Corn Variety Trial, Bixby[z] .

| Variety[y] | Company/ Source | Color[y] | Market yield (sacks/A)[x] | Yield (tons/A) Market | Yield (tons/A) Culls | Number days to harvest | In-shuck rating[w] | Shucked rating[w] | Avg ear dia. (inches) | Avg ear length (inches) | Corn earworm damage[v] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Group: se*** | | | | | | | | | | | |
| Applause | Crookham | Y | 277 | 3.6 | 0.5 | 70 | 3.7 | 3.3 | 1.7 | 6.9 | 3.7 |
| BC 0805 | Syngenta | BC | 277 | 5.0 | 0.9 | 76 | 3.2 | 3.3 | 1.8 | 7.7 | 2.5 |
| GH 0851 | Syngenta | Y | 277 | 4.9 | 0.4 | 76 | 3.3 | 3.0 | 1.8 | 8.0 | 2.7 |
| Incredible | Crookham | Y | 264 | 4.9 | 0.6 | 76 | 3.7 | 2.3 | 1.8 | 7.4 | 4.0 |
| Merlin | Mesa Maize | Y | 246 | 4.4 | 0.7 | 72 | 4.0 | 3.3 | 1.8 | 8.1 | 3.3 |
| Precious Gem | Mesa Maize | BC | 238 | 4.4 | 0.4 | 72 | 3.5 | 3.0 | 1.8 | 7.9 | 3.2 |
| Synergy | Seedway | BC | 230 | 3.2 | 0.5 | 65 | 3.2 | 2.5 | 1.6 | 7.1 | 3.2 |
| Sumptuous | Mesa Maize | Y | 228 | 4.1 | 0.2 | 72 | 3.5 | 3.2 | 1.9 | 7.9 | 3.7 |
| Cameo | Crookham | BC | 223 | 4.4 | 0.5 | 76 | 3.0 | 2.8 | 1.9 | 7.6 | 3.7 |
| Montauk | Mesa Maize | BC | 221 | 3.9 | 0.6 | 72 | 3.3 | 3.5 | 1.8 | 7.3 | 3.7 |
| Powwow | Mesa Maize | BC | 178 | 2.4 | 1.3 | 70 | 3.0 | 3.7 | 1.7 | 7.1 | 4.0 |
| | Mean | | 242 | 4.1 | 0.6 | 72 | 3.4 | 3.1 | 1.8 | 7.5 | 3.4 |
| | $LSD_{0.05}$ | | 51 | 1.0 | 0.7 | -- | 0.5 | 0.7 | 0.09 | 0.3 | 0.8 |
| ***Group: $sh_2$*** | | | | | | | | | | | |
| BSS 0977 | Syngenta | BC | 367 | 5.1 | 0.2 | 79 | 2.5 | 3.2 | 1.7 | 6.7 | 2.0 |
| Passion | Seedway | Y | 361 | 6.0 | 0.3 | 72 | 3.2 | 2.3 | 1.8 | 7.8 | 4.2 |
| Obsession | Seedway | BC | 330 | 4.6 | 0.3 | 70 | 2.2 | 3.0 | 1.7 | 7.5 | 3.2 |
| Garrison | Syngenta | Y | 326 | 5.2 | 0.2 | 72 | 2.5 | 3.2 | 1.7 | 6.8 | 4.5 |
| Legion | Syngenta | BC | 324 | 5.0 | 1.2 | 76 | 2.2 | 3.2 | 1.7 | 6.9 | 3.0 |
| GSS 0966 | Syngenta | Y | 308 | 4.1 | 0.2 | 72 | 2.2 | 2.5 | 1.6 | 6.7 | 2.2 |
| Mirai 148Y | Centest | Y | 308 | 4.3 | 0.5 | 65 | 3.5 | 3.2 | 1.7 | 7.8 | 4.0 |
| Xtra Tender 1283 | Seedway | Y | 285 | 4.4 | 0.8 | 79 | 2.8 | 2.5 | 1.8 | 6.9 | 4.0 |
| Bueno | Crookham | BC | 275 | 4.2 | 1.0 | 76 | 2.7 | 3.2 | 1.8 | 6.9 | 4.3 |
| Mirai 301BC | Centest | BC | 271 | 3.7 | 0.3 | 70 | 2.7 | 2.7 | 1.9 | 7.1 | 3.2 |
| Ravelin | Syngenta | Y | 240 | 3.3 | 0.3 | 65 | 2.7 | 2.0 | 1.6 | 7.0 | 4.5 |
| Marvel | Crookham | Y | 226 | 3.7 | 0.5 | 72 | 3.8 | 3.3 | 1.8 | 7.1 | 3.8 |
| Mirai 138Y | Centest | Y | 174 | 2.6 | 0.5 | 65 | 2.5 | 3.7 | 1.6 | 7.1 | 3.5 |
| Mirai 336BC | Centest | BC | 172 | 2.6 | 0.3 | 65 | 2.8 | 3.3 | 1.5 | 7.6 | 3.2 |
| | Mean | | 283 | 4.2 | 0.5 | 71 | 2.7 | 2.9 | 1.7 | 7.1 | 3.5 |
| | $LSD_{0.05}$ | | 77 | 1.4 | 0.5 | -- | 0.5 | 0.7 | 0.06 | 0.3 | 0.8 |

[z]Seeded April 27, 2010; Plot size: 1.8m x 6.0m (2 rows/plot, 3 plots each variety, plots thinned to 20 plants/row.) Harvested 7/1/10 to 7/15/10
[y]BC = bicolor, Y = yellow
[x]One sack = 60 ears
[w]Rating: 1=best, 5=poorest
[v]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.

## 2010 Cherry Tomato Cultivar Trial

**WWAREC, Lane, Ok. Warren Roberts & Wyatt O'Hern**

| Cultivar | Seed Company | Type | Trellis Method | | Yield in Tons per Acre |
|---|---|---|---|---|---|
| Cherry Grande | Tomato Growers | Determinate | Stake and Weave | Non-pruned | 20.2 |
| Cherry Grande | Tomato Growers | Determinate | Stake and Weave | Pruned | 24.4 |
| Mountain Belle Vf | Tomato Growers | Determinate | Stake and Weave | Non-pruned | 19.1 |
| Mountain Belle Vf | Tomato Growers | Determinate | Stake and Weave | Pruned | 17.8 |
| Baxter's Early Bush | Tomato Growers | Determinate | Stake and Weave | Non-pruned | 16.0 |
| Baxter's Early Bush | Tomato Growers | Determinate | Stake and Weave | Pruned | 18.4 |
| Small Fry | Tomato Growers | Determinate | Stake and Weave | Non-pruned | 17.3 |
| Small Fry | Tomato Growers | Determinate | Stake and Weave | Pruned | 16.1 |
| Principe Borghese | Victory Seed Company | Determinate | Stake and Weave | Non-pruned | 16.2 |
| Principe Borghese | Victory Seed Company | Determinate | Stake and Weave | Pruned | 15.4 |
| Gold Nugget | Victory Seed Company | Determinate | Stake and Weave | Non-pruned | 15.9 |
| Gold Nugget | Victory Seed Company | Determinate | Stake and Weave | Pruned | 15.6 |
| Black Cherry | Victory Seed Company | Indeterminate | Overhead Trellis | Non-pruned | 9.6 |
| Black Cherry | Victory Seed Company | Indeterminate | Overhead Trellis | Pruned | 5.5 |
| Brown Berry | Pase Seeds | Indeterminate | Overhead Trellis | Non-pruned | 12.4 |
| Brown Berry | Pase Seeds | Indeterminate | Overhead Trellis | Pruned | 5.0 |
| Washington Cherry | Johnny's Selected Seeds | Determinate | Stake and Weave | Non-pruned | 5.6 |
| Washington Cherry | Johnny's Selected Seeds | Determinate | Stake and Weave | Pruned | 6.0 |
| Smarty | Johnny's Selected Seeds | Determinate | Stake and Weave | Non-pruned | 1.6 |
| Smarty | Johnny's Selected Seeds | Determinate | Stake and Weave | Pruned | 2.7 |

Determinate and indeterminate tomatoes were grown with and without pruning. Determinate tomatoes were trellised with a stake and weave system, and indeterminate tomatoes were grown with an overhead wire and vertical string system.
Tomatoes were seeded in greenhouse on 3-24-2010 and transplanted on 5-5-2010
Plots were 3 ft x 15 ft, with 6 plants per plot, with 2 ft between plants
Plants were trellised on 5-27-2010. Plants were harvested weekly beginning 6-24-2010 and ending 8-13-2010
Fertilizer was not applied. Previous cover crop was crimson clover.

## 2010 Organic Cherry Tomato Cultivar Trial and Cover Evaluation

**WWAREC, Lane, Ok. Warren Roberts & Wyatt O'Hern**

| Cultivar | Treatment | Trellis Method | Yield in Tons per Acre |
|---|---|---|---|
| Baxter's Early Bush | Hoop house | Stake and Weave | 23.0 |
| Washington Cherry | Hoop house | Stake and Weave | 15.3 |
| Baxter's Early Bush | Uncovered | Stake and Weave | 16.4 |
| Washington Cherry | Uncovered | Stake and Weave | 6.0 |

Two cultivars of cherry tomatoes were grown either inside a plastic covered hoop-house, or outside with no cover.

There were two replications of each treatment.

Tomatoes were seeded in a greenhouse on 3-24-2010 and transplanted to the field or hoop-house on 5-07-2010.

Plots were 3 ft x 15 ft, with 6 plants per plot, with 2 ft between plants.

Plants were trellised on 5-28-2010.

Tomatoes were harvested weekly beginning 6-21-2010 and ending 8-20-2010.

Previous cover crop was crimson clover. No fungicides were applied.

# Tomato Variety Trial

### Spring 2010, Bixby, Oklahoma

**Brian Kahn, Lynda Carrier, Robert Havener, and Robert Adams**

**Introduction and Objectives:** Commercial tomato production in Oklahoma is almost exclusively for fresh market. Oklahoma tomato crops usually are established with transplants in the spring for summer production. This trial was designed to evaluate yield and fruit quality of 16 determinate tomato cultivars. Plants were grown using surface drip irrigation and the stake-and-weave cultural system.

**Materials and Methods:** Plants were started in the greenhouse on March 22, 2010. Peat pots 2¼ inches in diameter were used with a peat-based plug and seedling mix. Plants were removed from the greenhouse to be "hardened off" on April 15. A preplant application of urea to supply 50 lbs/A of N was made at Bixby on April 15, followed by an application of trifluralin at 0.75 lbs/A (a.i.) and incorporation. Plants were transplanted to the field on April 20. There were 6 plants per plot arranged in a randomized block design with 3 replications. Plots were 5.9 ft x 11.8 ft. with plants spaced at 24 in. within rows. Each plant received one cup of a starter solution made from 6 lbs. 20-20-20 fertilizer plus 1/2 pint diazinon per 100 gallons of water. Metal posts for the stake-and-weave system were installed beginning on May 7. Plants were pruned by removing all suckers up to the one immediately below the first flower cluster on May 17, after which the first string was installed. Additional strings were installed as needed during the season. Plants were sidedressed with 75 lbs/A of N from urea on May 25. Insecticide applications began on May 18 and continued through July 1, with a total of 5 applications. Fungicide applications began on June 17 and continued to July 1, with a total of 3 applications. Harvest began on June 21 and continued 2 times weekly until July 15, with a total of 8 harvests.

**Results and Discussion:** Results are shown on the following pages. The trial area flooded over the weekend of June 26-27. This did not initially affect fruit yield or quality, but ultimately shortened plant life and the length of the trial. There was considerable plot-to-plot variability, and yields were not statistically different. Tomatoes that set well in high temperatures are a definite advantage for Oklahoma production, but heat-set ability alone does not guarantee high marketable yields. 'Florida 91' continues to be a recommended standard for Oklahoma. 'Solar Fire' is being recommended after performing well in three consecutive trials, and 'Scarlet Red' should be considered for trial by Oklahoma producers. Tomato spotted wilt virus was not a factor in the 2010 trial.

**Spring Tomato Replicated Variety Trial – Bixby, 2010**

Summary of notes recorded by B.A. Kahn throughout the trial. Specific observations of vines were performed on 23 June. All notes based on three plots per variety. An asterisk (*) indicates a variety claimed to have resistance to tomato spotted wilt virus (TSWV).

| Variety | Notes |
|---|---|
| Amelia* | Performed well in 2006 but not in 2008 and was mediocre in 2010, with relatively high radial cracking. |
| Bella Rosa* | An average variety that still need further trials. |
| BHN 589 | Included because the fruit have a reputation for good flavor. Relatively tall vines. Not a top performer, but acceptable. |
| Crista* | Relatively large fruit but above-average radial cracking (also seen in 2008). |
| Finishline* | Relatively large fruit but above-average radial cracking. |
| Fletcher* | Flattened globe shape. Needs further trials. |
| Florida 7514 | Fruit relatively small, but uniform. Also yielded well in 2008. Needs further trials. |
| Florida 7964* | Appears to set well in heat, but has small fruit and some are pointed (also seen in 2008). |
| Florida 91 | Decent yields, low culls, crack-resistant; continues to be a standard of comparison for adaptation to Oklahoma. |
| Mountain Glory* | Low culls and some nice fruit. Needs further trials. |
| Nico* | Flattened globe shape. Produced well in 2008 and 2010. Had radial cracking problems in 2008 but not in 2010. |
| Phoenix | Some nice fruit. Needs further trials. |
| Redline* | Largest fruit in the trial; also produced large fruit in 2008. Seemed less prone to radial cracking than ‘Finishline’. Needs further trials. |
| RFT 6153 | Looked productive in guard rows in past trials but did not perform as well as a replicated entry in 2010. Had some blossom-end rot. Needs further trials. |
| Scarlet Red | Relatively large fruit and yielded well, but had some misshapen fruit (also seen in 2008). One plot’s vines were notably dense and bushy. Should be considered for trial in Oklahoma. |
| Solar Fire | Appears to set well in heat. Fruit size tends to be slightly below average, and some fruit are pointed, but has performed well overall in three consecutive trials and is now recommended for Oklahoma. |

**Tomato Variety Trial – Bixby, 2010[z]**

| | | Yield (ctns/A)[y] | | | | | |
|---|---|---|---|---|---|---|---|
| Variety/line | Seed source | Marketable | Early mkt[x] | Culled[w] | Total[v] | Resistance to radial cracking[u] | Average mkt. fruit wt. (lbs) |
| Scarlet Red | Seedway | 609 | 130 | 139 | 748 | 3.5 | 0.42 |
| Nico | Seedway | 609 | 217 | 116 | 724 | 2 | 0.34 |
| Solar Fire | Seedway | 605 | 121 | 98 | 704 | 2 | 0.38 |
| Florida 7964 | Zeraim Gedera | 574 | 163 | 115 | 689 | 3.5 | 0.31 |
| Florida 7514 | Rupp | 538 | 103 | 66 | 604 | 2 | 0.33 |
| Florida 91 | Seedway | 507 | 89 | 74 | 581 | 1 | 0.38 |
| Fletcher | Seedway | 479 | 144 | 93 | 572 | 3 | 0.37 |
| Redline | Syngenta | 422 | 171 | 70 | 491 | 1 | 0.45 |
| Bella Rosa | Seedway | 400 | 98 | 101 | 501 | 2 | 0.36 |
| Crista | Seedway | 398 | 116 | 164 | 563 | 5 | 0.42 |
| Phoenix | Rupp | 394 | 142 | 94 | 488 | 1 | 0.40 |
| Amelia | Seedway | 388 | 44 | 127 | 515 | 5 | 0.40 |
| Finishline | Seedway | 385 | 139 | 139 | 524 | 5 | 0.43 |
| Mountain Glory | Syngenta | 385 | 221 | 62 | 447 | 2 | 0.35 |
| BHN 589 | Seedway | 370 | 147 | 96 | 466 | 3 | 0.38 |
| RFT 6153 | Seedway | 352 | 76 | 112 | 463 | 1 | 0.37 |
| | Mean | 463 | 133 | 104 | 567 | -- | 0.38 |
| | $LSD_{0.05}$ | NS | NS | NS | NS | -- | .08 |

[z]Transplanted: April 20, 2010
Plot size: 5.9' x 11.8'; 6 plants per plot.
Harvested: 6/21/10 to 7/15/10 (8 picks). A selective harvest on June 10 removed a total of 26 fruits showing blossom end rot. Cull weights include values for culls harvested on June 10.
[y]One ctn (carton) = 25 lbs.
[x]Early harvest: 6/21/10 to 6/28/10 (3 picks).
[w]Predominant reasons for culls were cracking and insect damage.
[v]Total = marketable + culls.
[u]Scale of 1=excellent to 5=poor, with 3=average.

# Watermelon Potassium Fertility 2010-Hydro, OK

**Lynn Brandenberger, Hailin Zhang, Lynda Carrier Oklahoma State University**
**Cooperating with Dennis and Virgil Slagell Triple S Farms, Hydro, Oklahoma**

**Introduction and objective:** Fertilizer use in commercial watermelon production often includes the use of nitrogen (N) at rates between 100 to 120 pounds of N/acre and potassium (K) at up to 250 pounds of $K_2O$/acre. Preliminary studies completed in 2006 and 2007 demonstrated that lower rates of N and P did not affect yield in commercial watermelons. The objective of this year's study was to determine if supplemental phosphorus at 26 lbs. and potassium at 60 lbs. per acre rates on a large plot basis would result in improved yield of watermelon.

**Methods:** The study was completed in summer 2010 at the Triple S Farm near Hydro, Oklahoma. It included a randomized block design with three replications with two treatments. Treatments consisted of applications of 105-26-60 lbs per acre of N-$P_2O_5$-$K_2O$ and 100-0-0 pounds per acre of N-$P_2O_5$-$K_2O$. The study was transplanted on 5/15/10 to 80% 'Majestic' (Triploid seedless cultivar) and 20% 'Allsweet' (Diploid pollinator cultivar) into a loamy sand soil. Plots consisted of three rows 15 feet long on 9 feet row centers with an in-row plant spacing of 2.5 feet resulting in 18 plants per plot. The supplemental phosphorus and potassium treatment (26 lbs $P_2O_5$ and 60 lb $K_2O$/acre) was applied as a preplant application. Vine lengths were recorded on 6/8/10 and harvest data including individual fruit weights and the number of cull fruit were recorded on 8/05/10.

**Results and discussion:** No differences were observed for vine length with both treatments averaging 1.6 feet in length (Table 1). Yield data recorded in August indicated no differences in overall yield, fruit number, fruit weight, and culls. Overall yields were 33,074 and 41,827 lbs per acre, respectively, for treatments with 105-26-60 and 100-0-0 pounds per acre of N-$P_2O_5$-$K_2O$.

**Conclusions:** Based upon the results of this study it would appear that there are no beneficial effects from supplemental applications of phosphorus and potassium for watermelon growth and yield. That said there is more to the story than has been mentioned above. First, the study area met with a serious infestation of spider mites in June. Although the field was treated, the infestation resulted in serious crop injury and we feel that additional harvests would have resulted if the injury had not occurred. Second, if there had been additional harvests there is a possibility that differences between the two treatments may have come to light. The authors would recommend that the study be repeated at least one more season to determine if more conclusive results can be observed.

**Acknowledgements:** The authors would like to thank Triple S Farms and Dennis and Virgil Slagell for all of their help and assistance in completing this study.

**Table 1.** 2010 Watermelon Fertility study, Triple S Farms, Hydro, OK

| **Treatment** | **Yield 8/05/10 (lbs/acre)** | **Number fruit/acre** | **Average wt. (lbs.)** | **Culls (lbs/acre)** | **Vine length 6/08/10 (feet)** |
|---|---|---|---|---|---|
| 105-26-60 lbs N-$P_2O_5$-$K_2O$ | 33074 a | 1968 a | 17.4 a | 510 a | 1.6 a |
| 100-0-0 lbs N-$P_2O_5$-$K_2O$ | 41827 a | 2194 a | 19.9 a | 0 a | 1.6 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.

# Disease Management

## Control of Bacterial Spot on Susceptible and Resistant Bell Pepper Cultivars, 2010

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

The trial was at the Entomology and Plant Pathology Research Farm in Stillwater, OK in a field of Easpur loam previously cropped to wheat. 'Jupiter' is susceptible and 'Aristotle' contains the *Bs2* gene for resistance to bacterial spot. Granular fertilizer at 51-0-68 lb/A (N-P-K) and the herbicide Trifluralin 4E at 1.5 pt/A were broadcast and incorporated into the soil prior to transplanting on 22 Jun. The experimental design was a slit plot with four blocks separated by a 10-ft fallow buffer. Treatment (spray program) was the whole-plot factor and cultivar was the sub-plot factor. Whole plots consisted of two rows, one of each cultivar, spaced 3 ft apart. Each row contained six plants spaced 1.5 ft apart. Sprays were directed using three flat-fan nozzles (8002vk) per row mounted on a boom attached to a wheelbarrow sprayer. The sprayer was calibrated to deliver 42 gal/A at 40 psi. Nine sprays were applied on a 7-d schedule beginning 27 Jul. Plots were inoculated with an isolate of bacterial spot from peppers grown on a nearby commercial farm. The bacterium was suspended in sterile tap water at $10^7$ cfu/ml and sprayed to runoff onto one plant per sub plot on 28 Jul. Rainfall during the cropping period (1 Jul to 31 Oct) totaled 4.39 in. for Jul, 2.51 in. for Aug, 2.78 in. for Sep, and 1.16 in. for Oct. Plots received sprinkler irrigation at 0.25 to 0.5 in. per application 30 times that totaled 8.0 in. of water. Disease incidence, the percentage of leaves with bacterial spot (including defoliation) was visually estimated in three areas of each subplot on 14 Oct. Peppers were harvested five times from 30 Aug to 2 Nov.

Average monthly temperature was near normal (30-yr avg) from Jul through Oct. Rainfall was above normal in July, but below normal from Aug through Oct. Bacterial spot increased to moderate levels compared to previous trials. The effect of treatment (spray program) was significant (P<0.01) for disease incidence, the effect of cultivar was significant (P<0.01) for both disease incidence and yield, and the treatment x cultivar interaction was significant (P=0.05) for yield. Averaged over treatments, the resistance cultivar Aristotle had less disease (8.8%) and more yield (194.9 cwt/A) compared to the susceptible cultivar Jupiter (51.1% disease, 60.0 cwt/A yield). Over cultivars, all treatments except Quintec-Regalia reduced incidence of bacterial spot compared to the untreated check. All treatments increased yields of Aristotle, but none increased yields of Jupiter. The combination of cultivar resistance and spray program was the most effective strategy for bacterial spot control. Phytotoxicity symptoms were not observed.

| Treatment and rate/A (Timing)[Z] | Bacterial spot (%) | | | Yield (cwt/A) | | |
|---|---|---|---|---|---|---|
| | Aristotle | Jupiter | average | Aristotle | Jupiter | average |
| Check | 37.1 | 61.0 | 49.0 a[Y] | 122.6 c | 47.6 a | 85.1 |
| Kocide 3000 1.25 lb (1-9) | 2.5 | 37.9 | 20.2 cd | 179.8 b | 94.0 a | 136.9 |
| Kocide 3000 1.35 lb + Penncozeb 75DF 2 lb (1-9) | 1.6 | 46.7 | 24.2 cd | 206.5 ab | 89.1 a | 147.8 |
| Cuprofix Ultra 40DF 3 lb (1-9) | 0.0 | 56.7 | 28.3 bcd | 190.7 ab | 61.7 a | 126.2 |
| Cuprofix Ultra 40DF 3 lb + Penncozeb 75DF 2 lb (1-9) | 2.9 | 30.8 | 6.9 d | 208.9 ab | 91.1 a | 150.0 |
| Kocide 3000 1.25 lb (1,3,5,7,9) Agrimycin 17W 0.5 lb (2,4,6,8) | 8.3 | 50.8 | 29.6 bcd | 228.6 a | 17.9 a | 123.3 |
| Kocide 3000 1.25 lb (1,3,5,7,9) Quintec 2.08F 6 fl oz (2,4,6,8) | 4.2 | 50.0 | 27.1 bcd | 194.0 ab | 60.5 a | 127.2 |
| Kocide 3000 1.25 lb (1,3,5,7,9) Regalia 5% 1 qt (2,4,6,8) | 5.8 | 61.6 | 33.7 bc | 220.6 ab | 52.4 a | 136.5 |
| Quintec 2.08F 6 fl oz (1,3,5,7,9) Regalia 5% 1 qt (2,4,6,8) | 17.1 | 65.0 | 41.0 ab | 202.0 ab | 25.8 a | 113.9 |
| LSD (P=0.05)[X] | | | 14.4 | 46.3 | NS | |

[Z] Timings (1-9) are spray dates 1=27 Jul, 2=3 Aug, 3=9 Aug, 4=20 Aug, 5=24 Aug, 6=31 Aug, 7=7 Sep, 8-14 Sep, and 9=22 Sep.
[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 at P=0.05.

## Evaluation of Fungicides for Control of Pumpkin Powdery Mildew, 2010

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

The experiment was conducted at the Oklahoma State University Cimarron Valley Research Station in Perkins in a field of Teller loam previously cropped to wheat and pumpkins. Granular fertilizer (46-0-0 lb/A N-P-K) was incorporated into the soil prior to seeding on 13 Jul. The herbicides Dual II Magnum 7.6E at 1 pt/A and Sandea 75WG at 0.75 lb/A were broadcast for weed control on 14 Jul. Squash bug was controlled with Ambush 2E at 12.8 fl oz/A on 13 Aug, 27 Aug, and 10 Sep. Treatments were arranged in a randomized complete block design with four replications separated by a 10-ft fallow buffer. Plots were single, 25-ft-long rows spaced 15 ft apart with a 2-ft within row spacing between plants. Fungicides were broadcast using a boom with five flat-fan nozzles (8003vk) spaced 18 inches apart that was mounted to a CO2-pressurized wheelbarrow sprayer. The sprayer was calibrated to deliver 33 gal/A at 40 psi. Fungicides were applied six times on ca. 7-d intervals beginning on 13 Aug. Rainfall during the cropping period (13 Jul to 29 Oct) totaled 1.45 in. for Jul, 1.32 in. for Aug, 2.95 in. for Sep, and 2.24 in. for Oct. Plots received 1 in. of sprinkler irrigation on 9 Aug. Disease was assessed visually estimating the percentage of leaves with disease (including defoliation) and defoliation alone in three areas of each plot on Sep. Yield was taken on 29 Oct.

Rainfall was below normal (30-yr average) and average monthly temperature was above normal for Aug, Sep, and Oct. The hot and dry conditions inhibited powdery mildew development, but bacterial leaf spot became severe. Powdery mildew appeared in late Sep and only reached 12% in the untreated check. All treatments had numerically less powdery mildew than the untreated check, but differences were not significant at P=0.05. Treatment effects on bacterial leaf spot also were not significant. Yields were high compare to previous trials at this sight, but about 50% of the fruit had lesions from bacterial leaf spot. Treatment effects on levels of fruit infection also were not significant. Phytotoxicity symptoms were observed.

| Treatment and rate/A (timing)[Z] | Powdey mildew (%)[Y] | Bacterial leaf spot (%)[X] | Defoliation (%)[W] | Yield (cwt/A)[V] | |
|---|---|---|---|---|---|
| | | | | Healthy | Diseased |
| Bravo 6F 2 pt (1,3,5) Procure 4SC 6 fl oz (2,4,6) | 1.8 a[U] | 47.5 a | 30.4 a | 137.8 a | 176.7 a |
| Bravo 6F 2 pt (1,3,5) Quintec 2.08F 6 fl oz (2,4,6) | 0.0 a | 63.7 a | 35.8 a | 164.7 a | 99.6 a |
| Bravo 6F 2 pt (1,3,5) Folicur 3.6F 6 fl oz (2,4,6) | 0.0 a | 52.1 a | 22.1 a | 179.3 a | 115.2 a |
| Bravo 6F 2 pt (1,3,5) Inspire Super 2.8F 20 fl oz (2,4,6) | 0.0 a | 63.3 a | 36.3 a | 154.8 a | 137.5 a |
| Bravo 6F 2 pt (1,3,5) Inspire Super 2.8F 14 fl oz (2,4,6) | 0.0 a | 60.0 a | 28.3 a | 169.0 a | 129.1 a |
| Bravo 6F 2 pt (1,3,5) Quadris Top 2.7F 14 fl oz (2,4,6) | 1.2 a | 59.1 a | 25.0 a | 173.7 a | 110.3 a |
| Bravo 6F 2 pt (1,3,5) Revus Top 4.16F 7 fl oz (2,4,6) | 2.9 a | 53.3 a | 29.6 a | 189.4 a | 110.1 a |
| Microthiol 80DF 5 lb (1-6) | 3.3 a | 55.8 a | 36.6 a | 171.7 a | 125.3 a |
| Bravo 6F 2 pt (1,3,5) Torino 3.4 fl oz (2,4,6) | 0.0 a | 61.7 a | 25.4 a | 217.7 a | 118.0 a |
| Check | 12.5 a | 60.4 a | 29.6 a | 121.3 a | 187.4 a |
| LSD (*P*=0.05)[T] | NS | NS | NS | NS | NS |

[Z] Timings (1-6) are spray dates 1=13 Aug, 2=20 Aug, 3=27 Aug, 4=3 Sep, 5=10 Sep, and 6=22 Sep.
[Y] Percentage of leaves with powdery mildew.
[X] Percentage of leaves with bacterial leaf spot.
[W] Percentage of leaves defoliated primarily from bacterial leaf spot.
[V] Fruit with (diseased) or without (healthy) bacterial fruit spots.
[U] Values in a column followed by the same letter are not statistically different according to Fisher's Least Significant Difference Test.
[T] Least significant difference, NS= treatment effect not significant at *P*=0.05.

# Effect of Fungicides on Control of Pod Decay Diseases of Snap Beans, 2010

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

The trial was conducted at the Oklahoma Vegetable Research Station in Bixby, OK in a field of in a field of Wynona silty clay loam previously cropped to soybeans. Granular fertilizer (27-69-0 lb/A N-P-K) was broadcast and incorporated into the soil prior to planting the cultivar 'Nelson' on 14 Apr. The herbicides Basagran 4L at 1 pt/A, Reflex 2E at 0.75 pt/A, and Fusilade DX 2E at 0.75 pt/A were applied post emergence in a tank mixture on 29 Apr. Plots were top-dressed with granular fertilizer (50-0-0 lb/A N-P-K) on 29 Apr and 10 May. Plots consisted of four 20-ft-long rows spaced 36 in. apart. The experimental design was a randomized complete block with four replications separated by a 5-ft-wide fallow buffer. Treatments were applied at the first appearance of pods and again 7-d later. Fungicides were directed through three flat-fan nozzles (8002vk) per row using a CO2 pressurized wheelbarrow sprayer. The sprayer was calibrated to deliver 34 gal/A at 40 psi. Rainfall during the cropping period (14 Apr to 17 Jun) totaled 1.44 in. for Apr, 5.59 in for May, and 3.60 in for Jun. Plots received sprinkler irrigation as needed to promote crop development. Snap beans were harvested and disease was assessed on 17 Jun when the pods graded 1=2.5%, 2=7.1%, 3=18.9%, 4=31.4%, and 5=40.0% for sieve sizes 1-5. Cottony leak incidence was evaluated by counting the number of 6-in. row segments with disease. The counts were converted to the percentage of row length affected. Yield was assessed by hand harvesting 1-m of row from each plot. The pods were classified as either healthy, or diseased with symptoms of cottony leak (*Pythium* or *Phytophthora* spp.) or pod tip blight (*Rhizoctonia solani*). Pod disease incidence was based on the percentage of total pod weight affected.

Rainfall was near normal (30-yr. avg) but average temperature was above normal for May and Jun. The warm temperatures accelerated crop development and the beans were 14-d early compared to previous trials at this site. Despite the beans being slightly over-mature at harvest, incidence of cottony leak was low and did not differ among treatments. Incidence of pod tip blight (reddish brown colored dry rot of the pod tips) was also low, but treatment effects were significant. Revus, had higher levels of pod tip blight than the untreated check; and Ridomil/Gold Copper, Reason, K-Phite, Quadris+ProPhyt, and Curzate had reduced levels of disease pod tip blight compared to the untreated check. The Quadris+ProPhyt treatment had the lowest level of pod tip blight. Yield did not differ among treatments. No phytotoxicity symptoms were observed for any of the treatments.

| Treatment and rate/A[Z] | Cottony leak (% row length) | Cottony leak (% pods) | Pod tip blight (% pods) | Yield (cwt/A) |
|---|---|---|---|---|
| Kocide 3000 1.25 lb | 0.6 a[Y] | 0.10 a | 1.8 bc | 34.2 a |
| Ridomil Gold/Copper 65W 2.5 lb | 0.0 a | 0.32 a | 0.5 cd | 34.9 a |
| Ranman 3.3F 2.75 fl oz | 0.0 a | 0.23 a | 0.8 bcd | 44.9 a |
| Reason 4.13F 8.2 fl oz | 0.0 a | 0.00 a | 0.4 cd | 39.7 a |
| K-Phite 4.4L 3 qt | 3.1 a | 0.02 a | 0.7 cd | 32.5 a |
| Quadris 2.08F 10 fl oz + ProPhyt 4.2L 4 pt | 0.0 a | 0.19 a | 0.0 d | 37.0 a |
| Curzate 60DF 5 oz | 0.6 a | 0.04 a | 0.3 cd | 36.4 a |
| Presidio 4F 8 fl oz | 0.6 a | 1.19 a | 1.0 bcd | 36.5 a |
| Revus 2.08F 8 fl oz | 0.6 a | 0.00 a | 4.1 a | 41.1 a |
| Check | 0.0 a | 0.00 a | 2.3 b | 33.3 a |
| LSD (P=0.05)[X]… | NS | NS | 1.5 | NS |

[Z] Treatments were applied on 2 Jun and 8 Jun.
[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 at P=0.05.

# Evaluation of Fungicides for Control of White Rust in Fall-Cropped Spinach, 2009

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

The experiment was conducted at the Entomology/Plant Pathology Research Farm in Stillwater, OK in a field of Easpur loam previously cropped to spinach and with a history of white rust. The herbicide Dual II Magnum 7.6E at 0.67 pt/A was broadcast immediately after planting the cultivar 'Melody' on 25 Sep. Plots were top-dressed with granular fertilizer (50-0-0 lb/A N-P-K) on 28 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 (8002vk) spaced 18-in. apart with a CO2-pressurized wheelbarrow sprayer. The sprayer was calibrated to deliver 25 gal/A at 40 psi. Treatments were applied on ca. 7-d intervals beginning at the first true-leaf stage on 4 Nov. Plots were irrigated lightly (about 0.1 in. water) each day for a week after planting to promote stand establishment. Thereafter, plots received two applications of sprinkler irrigation that totaled 0.5 in. of water. Rainfall during the cropping period (25 Sep to 7 Dec) totaled 0 in. for Sep, 7.24 in. for Oct, 1.55 in. for Nov, and 0.1 in. for Dec. Disease incidence (percentage of leaves with rust) and severity (percentage of leaf area with rust) were assessed on 7 Dec. Five, 6-in.-long row segments were harvested arbitrarily from the middle two rows of each plot. The harvested leaves were bulked, mixed, and disease severity was visually estimated on 30 blindly sampled leaves.

Rainfall was 3.7 inches above normal (30-yr avg) and average temperature was 8oF below normal for Oct when in rained 15 days. Rainfall was below normal and temperature above normal for Nov. The cool wet conditions in Oct delayed spinach growth and promoted early disease development. White rust was already present when the first application was made and disease levels in the untreated check were severe compared to previous trial at this site. All treatments except Prophyt-Quadris, K-Phite-Quadris, and Revus reduced disease incidence and severity compared to the untreated check. Cabrio and Presidio were most effective and the only treatments that provided an acceptable level of disease control. No phytotoxicity symptoms were observed.

| Treatment and rate/A (Timing)[Z] | White Rust (%) | |
|---|---|---|
| | Incidence | Severity |
| Quadris 2.08F 12.3 fl oz (1-4) | 31.6 cd[Y] | 13.0 bc |
| Cabrio 20WG 0.75 lb (1-4) | 15.0 ef | 4.5 de |
| Ranman 3.3F 2.75 fl oz + Silwet-L77 2 fl oz (1-4) | 30.0 cde | 9.6 cd |
| Curzate 60DF 5 oz (1-4) | 41.7 bc | 15.0 abc |
| Presidio 4F 4 fl oz (1-4) | 5.0 f | 1.7 e |
| K-Phite 4.4L 4 pt (1,3) Quadris 2.08F 10 fl oz (2,4) | 40.8 bc | 15.3 abc |
| Prophyt 4.2L 3 pt (1) 4 pt (3) Quadris 2.08F 10 fl oz (2,4) | 39.1 bc | 16.6 abc |
| Revus 2.08F 8 fl oz (1-4) | 50.8 ab | 18.9 ab |
| Prophyt 4.2L 4 pt + Kocide 3000 1 lb (1-4) | 23.3 de | 9.2 cde |
| Check | 58.3 a | 22.3 a |
| LSD (*P*=0.05)[X]… | 15.2 | 7.6 |

[Z] Timings (1-4) are spray dates 1=4 Nov, 2=12 Nov, 3=20 Nov, and 4=25 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.

## Evaluation of Fungicides for Control of Foliar Diseases in Spring-Cropped Spinach, 2010

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

The experiment was conducted at the Oklahoma State University Entomology/Plant Pathology Research Farm in Stillwater in a field of Easpur loam with a history of white rust and previously cropped to spinach. Granular fertilizer (75-0-0 lb/A N-P-K) was incorporated into the soil prior to planting the cultivar 'Melody' on 31 Mar. The herbicide Dual II Magnum 7.6E at 0.67 pt/A was broadcast on 5 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 (8002vk) spaced 18-in. apart with a CO2-pressurized wheelbarrow sprayer. The sprayer was calibrated to deliver 25 gal/A at 40 psi. Treatments were applied on ca. 7-d intervals beginning at the first true-leaf stage on 7 May. Plots were irrigated lightly (about 0.1 in. water) each day for nine days after planting to promote stand establishment. Thereafter, plots received six applications of sprinkler irrigation that totaled 1.5 in. of water. Rainfall during the cropping period (1 Apr to 24 May) totaled 3.61 in. for Apr and 5.82 in. for May. Disease incidence (percentage of leaves with disease) and severity (percentage of leaf area with disease) were assessed on 24 May. Five, 6-in.-long row segments were harvested arbitrarily from the middle two rows of each plot. The harvested leaves were bulked, mixed, and disease severity was visually estimated on 30 blindly sampled leaves.

Rainfall was near normal (30-yr avg) for Apr and 3 in. above normal for May. Average temperature was within ±2oF of normal for Apr and May. White rust pressure was light compared to previous trials at this site, but anthracnose unexpectedly reached severe levels by harvest. All treatments except Quadris-Presidio reduced white rust levels compared to the untreated check. However, none of the treatments affected anthracnose incidence or severity. No phytotoxicity symptoms were observed.

| Treatment and rate/A (Timing)[Z] | White Rust (%) | | Anthracnose (%) | |
|---|---|---|---|---|
| | Incidence | Severity | Incidence | Severity |
| Quadris 2.08F 12.3 fl oz (1-3) | 1.7 b[Y] | 0.1 b | 66.7 a | 18.5 a |
| Quadris 2.08F 12.3 fl oz (1,3)<br>Prophyt 4.2L 3 pt (2) | 3.3 b | 0.3 b | 60.8 a | 13.9 a |
| Quadris 2.08F 12.3 fl oz (1,3)<br>Aliette 80WG 3 lb (2) | 2.5 b | 0.2 b | 58.3 a | 9.9 a |
| Quadris 2.08F 12.3 fl oz (1,3)<br>Presidio 4F 4 fl oz (2) | 20.0 ab | 9.7 a | 55.8 a | 11.1 a |
| Quadris 2.08F 12.3 fl oz (1,3)<br>Actigard 50DF 0.75 oz (2) | 2.5 b | 0.1 b | 55.0 a | 12.9 a |
| Check | 43.3 a | 11.2 a | 62.5 a | 17.7 a |
| LSD (P=0.05)[X] | 24.4 | 8.7 | NS | NS |

[Z] Timings (1-3) are spray dates 1=7 May, 2=17 May, and 3=21 May.
[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 at P=0.05.

## Evaluation of Fungicides for Control of Watermelon Anthracnose, 2010

**John Damicone and Tyler Pierson**
**OSU Deptartment of Entomology and Plant Pathology**

The experiment was conducted at the Entomology/Plant Pathology Research Farm in Stillwater, OK in a field of Easpur loam previously cropped to watermelons. Plots were direct-seeded with the cultivar 'Sunsugar' on 24 Jun. The herbicides Dual II Magnum II 7.64E at 1 pt/A and Sandia 75DF at 0.75 oz/A were broadcast after planting to control weeds. Plots were top-dressed with granular fertilizer (46-0-0 lb/A N-P-K) on 13 July. Plots were single, 20-ft-long rows spaced 15 ft apart. Plots were thinned to a 2-ft within row spacing. Squash bugs were controlled Ambush 2E at 12.6 fl oz/A on 10 Aug and 25 Aug. 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 CO2-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 10 Aug. Plots were inoculated with C. obiculare on 24 Aug by spreading 50 ml of colonized oat kernels along the center of each plot. Rainfall during the cropping period (24 June to 16 Sep) totaled 0.02 in. for Jun, 4.39 in. for Jul, 2.51 in. for Aug, and 2.52 in. for Sep. Plots received 17 applications of sprinkler irrigation that totaled 4.6 inches of water. Disease incidence was assessed on 16 Sep 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 or more lb was taken on 17 Sep. Watermelons were classified as diseased or healthy based on the presence or absence of anthracnose lesions.

Rainfall and average temperature during the cropping period were nearly normal compared to the 30-yr avg. Anthracnose appeared in late Aug and the disease reached severe levels in the untreated check by harvest. All treatments reduced anthracnose incidence and defoliation compared to the untreated check. Quadris Top and Penncozeb provided the best disease control. Levels of anthracnose were negatively correlated with yield of healthy melons (r=-0.61, P<0.01) and total melons (r=-0.56, P<0.01), but not diseased melons. Treatments had higher yields of healthy melon than the untreated check, but treatment effects were not significant for yield of diseased and total melons. Phytotoxicity symptoms were not observed for any of the treatments.

| Treatment and rate/A (timing)[Z] | Anthracnose (%)[Y] | Defoliation (%)[X] | Yield (cwt/A)[W] | | |
|---|---|---|---|---|---|
| | | | Healthy | Diseased | Total |
| Bravo 6F 2 pt (1,3,5)<br>Inspire Super 2.82F 20 fl oz (2,4,6) | 27.1 b[V] | 9.2 b | 150.7 b | 224.8 a | 375.5 a |
| Bravo 6F 2 pt (1,3,5)<br>Inspire Super 2.82F 14 fl oz (2,4,6) | 27.5 b | 8.7 b | 175.6 b | 169.7 a | 345.3 a |
| Bravo 6F 2 pt (1,3,5)<br>Quadris Top 2.72F 14 fl oz (2,4,6) | 8.1 c | 1.2 b | 306.5 a | 113.7 a | 420.2 a |
| Bravo 6F 2 pt (1,3,5)<br>Revus Top 4.16F 7 fl oz (2,4,6) | 32.9 b | 14.6 b | 228.7 ab | 190.7 a | 419.4 a |
| Penncozeb 75 DF 3 lb (1-6) | 8.7 c | 1.2 b | 226.3 ab | 205.2 a | 431.5 a |
| Check | 79.1 a | 59.2 a | 22.4 c | 239.8 a | 262.3 a |
| LSD (P=0.05)[U] | 14.1 | 19.9 | 122.3 | NS | NS |

[Z] Timings (1-6) are spray dates 1=10 Aug, 2=20 Aug, 3=25 Aug, 4=31 Aug, 5=7 Sep, and 6=14 Sep.
[Y] Plot foliage with anthracnose (including defoliation).
[X] Leaves defoliated from anthracnose.
[W] Marketable watermelons weighing ≥12 lb with (diseased) and without (healthy) anthracnose lesions, and the total of diseased and healthy melons.
[V] Values in a column followed by the same letter are not statistically different.
[U] Least significant difference, NS=treatment effect not significant at P=0.05.

# Weed Management

# Cilantro Preemergence Weed Control

### Spring 2010-Bixby, OK

**Lynn Brandenberger, Lynda Carrier, Robert Havener, Bobby Adams**

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

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

**Results:** Emergence did not vary between the different treatments (Table 1). Levels of emergence ranged from 83 to 91% on 4/30/10. Crop injury ratings were recorded on 5/04/10 and there were no differences between treatments with all ratings ranging between 1 and 8%. Control of weedy species did vary between treatments. Observations for Palmer amaranth (*Amaranthus palmeri*) were recorded as actual counts of the number of this species in plots. Prefar 4.0 PPI averaged 20 Palmer amaranth per plot, compared to 0 for Prefar 4.0 PPI + Lorox 0.5 pre and Prefar 6.0 PPI + Lorox 0.5 Pre. The four Prefar PPI treatments + Dual Magnum also provided good control of Palmer amaranth with an average of 1 Palmer amaranth per plot. Carpetweed (*Mollugo verticillata* L.) control varied between several treatments in the study. Prefar 4.0 PPI had 54% control of this species while Prefar 4.0 PPI + Lorox 0.5 Pre, Prefar 6.0 PPI + Lorox 0.5 Pre, and Prefar 6.0 PPI + Prowl $H_2O$ 0.25 had control ratings of 96, 99, and 95%, respectively, for carpetweed. Yields did not vary between treatments. Yield ranged from 2784 to 4728 lbs per acre with Prefar 6.0 PPI, Prefar 4.0 PPI + Lorox 0.5 Pre, and Prefar 6.0 PPI + Lorox 0.5 Pre having yields of 4728, 4202, and 4347 lbs/acre, respectively.

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

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

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

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

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

# Cilantro Pre-Postemergence Weed Control

### Spring 2010-Bixby, OK

**Lynn Brandenberger, Lynda Carrier, Robert Havener, Bobby Adams**

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

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

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

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

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

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

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

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

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

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

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

# Preemergence Weed Control on Cucumber

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

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

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

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

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

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

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

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

[y] Plant stand=number of plants/plot, plots 6' x 20'
[z] Numbers in a column followed by the same letter exhibited no significant differences based on Duncan's Multiple Range Test where P=0.05.

# Grape Herbicide Screening 2010

**Bixby, Oklahoma**

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

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

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

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

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

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

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

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

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

# Preemergence Weed Control on Pepper

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

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

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

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

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

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

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

# June Postemergence Weed Control in Pepper

### Hydro, OK-2010

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

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

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

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

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

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

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

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

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

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

# July Postemergence Weed Control in Pepper

### Hydro, OK 2010

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

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

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

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

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

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

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

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

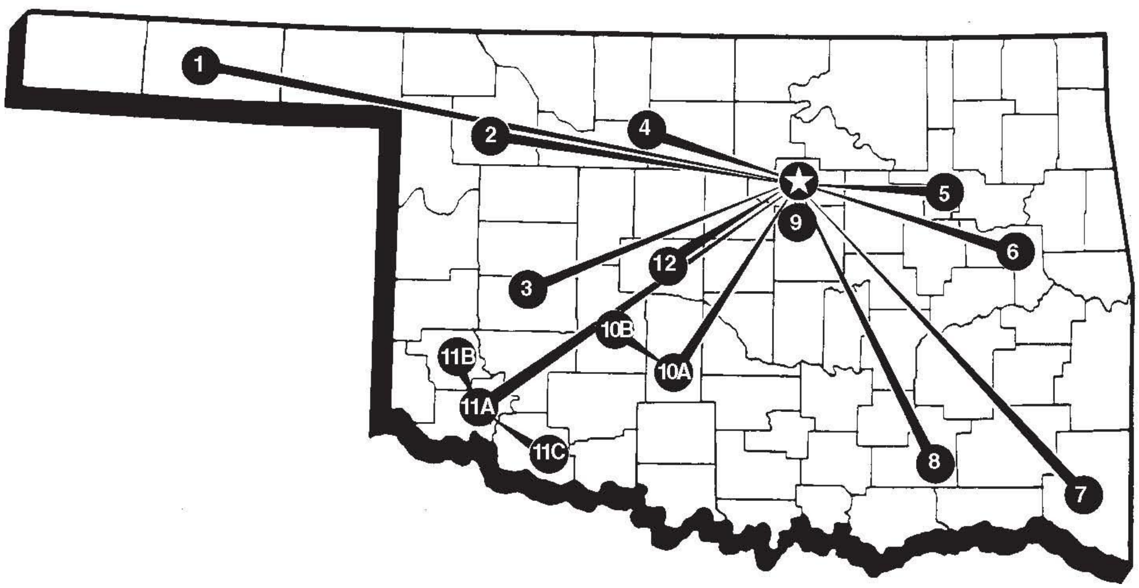
[y] Fresh weight = weight of 3 whole plants in lbs.

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

## SI (METRIC) CONVERSION FACTORS

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

# THE OKLAHOMA AGRICULTURAL EXPERIMENT STATION
## SYSTEM COVERS THE STATE




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