

# Report on Variety Trials of Tomatoes, Peppers, Beets, and Carrots Specialty Crop Research for Wyoming

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## Objectives of Grant Project

The overall goal of this project was to develop and promote sustainable specialty horticultural practices for Wyoming. More specific objectives were to:

- Evaluate several vegetable crops for yield and nutritional content using different fertilization levels
- Evaluate three production methods, including two season-extension systems, for yield and nutritional content using several vegetable crops
- Manage weeds using different mulches and control strategies
- Evaluate insect orders on vegetables grown under different fertilization schemes.

## Activities Performed and Outcomes: Variety Trials

Trials of several varieties of tomatoes, peppers, beets, and carrots were grown to compare general performance, yield, and nutritional content under different fertilization schemes. Vegetables were planted at the University of Wyoming (UW) Sheridan Research & Extension Center (SREC), seven miles east of Sheridan, Wyoming, in May 2009 and May 2010. Transplants of tomatoes and peppers were used and carrots and beets were direct-seeded into the plots.

In 2009, three replications of three plants of each cultivar of tomatoes and peppers and seeded rows of carrots and beets were treated with zero,  $\frac{1}{2}$  rate, or full rate of typical fertilizer available to homeowners (Miracle-Gro 24-8-16), corresponding to zero,  $\frac{1}{2}$  tablespoon per gallon, or 1 tablespoon per gallon of water, applied June 5 and July 17. Plants were irrigated as needed. Tomatoes and peppers were planted at 3 foot spacings. Carrots and beets were initially seeded thickly. After emergence, carrots were thinned to 2 inches between plants and beets were thinned to 4 inches. All carrot and beet varieties were in 3 foot rows, corresponding to 18 carrots per variety row and 9 beets per variety row.

In 2010, tomatoes, peppers, beets, and carrots were treated with zero,  $\frac{1}{2}$  rate, or full rate of Miracle-Gro 24-8-16 or organic Kelp Plus fertilizer. Miracle-Gro was supplied as per 2009. The organic kelp fertilizer was applied at 1 tablespoon per gallon for  $\frac{1}{2}$  rate treatments and 2 tablespoons per gallon for full rate treatments. Fertilizers were applied on June 22 and July 20. Beets and carrots were fertilized additionally on July 12 and tomatoes and peppers were given an additional fertilization on August 20. Plants were irrigated as needed.

Data collected for both years included yields and nutritional content of each cultivar. Analysis of produce for total phenols, total flavonoids, and oxygen radical absorbance capacity (ORAC, a measure of antioxidants) was completed in December 2009 and October 2010 at the University of Nebraska – Lincoln Small Molecule Analysis Lab.

## 2009

Varieties of crops grown were:

Tomatoes: 'Paragon', 'Early Red Chief', 'Bush Ace'

Peppers: 'Orion', 'Lipstick', 'Chocolate', 'California Orange', 'California Wonder'

Beets: 'Kestral', 'Cylindra', 'Lutz'

Carrots: 'Little Finger', 'Danvers', 'Atomic Red'

Tomatoes and peppers were started from seed in the greenhouse at Sheridan College. They were transplanted to the field on May 20. Carrots and beets were sown in the field the same day.

## 2009 Variety Trial Yields

Tomato yields:

Tomatoes 2009						
	Total yield (g)			Plants w/zero yield		
Cultivar	controls	1/2 rate	full rate	controls	1/2 rate	full rate
Paragon	1087	1383	1172	22%	22%	44%
Bush Ace	546	140	276	67%	89%	89%
Early Red Chief	473	740	469	67%	67%	67%

'Paragon' showed the highest total yields and lowest zero-production plants. 'Bush Ace' had the highest number of plants yielding no fruit and the most overall yield was in the unfertilized controls. 'Early Red Chief' showed highest yields under the 1/2 rate of fertilization and 2/3 of the plants yielded no fruit.

Pepper yields:

Peppers 2009						
	Total yield (g)			Plants w/zero yield (g)		
Cultivar	controls	1/2 rate	full rate	controls	1/2 rate	full rate
Lipstick	558	189	371	11%	56%	22%
Orion	688	431	192	33%	33%	56%
Sweet California Wonder	253	310	178	56%	56%	67%
Sweet Chocolate	692	327	281	11%	22%	33%
Sweet Cal Wonder Orange	737	578	543	11%	11%	44%

The unfertilized controls of 'Lipstick', 'Orion', 'Sweet Chocolate', and 'Sweet California Wonder Orange' produced the highest yields, while the 1/2 rate 'Sweet California Wonder' was the highest yielding treatment. The latter was also the variety with the highest level of non-yielding plants.

Beet yields:

Beets 2009			
	Total fresh weights (g)		
Cultivar	controls	1/2 rate	full rate
Kestrel	130	87	145
Cylindra	205	161	315
Lutz	220	143	180

Each beet variety showed different responses to fertilization levels. 'Kestrel' and 'Cylindra' showed highest fresh weights with full rate of fertilization while unfertilized 'Lutz' had the most total fresh weight.

Carrot yields:

Carrots 2009			
	Total fresh weights (g)		
Cultivar	controls	1/2 rate	full rate
Danvers Half Long	60	45	48
Little Finger	125	42	136
Atomic Red	60	10	85

'Little Finger' and 'Atomic Red' showed highest fresh weights when fertilized at the full rate, while 'Danvers Half Long' showed highest fresh weights in the unfertilized controls.

## 2010

In 2010, seeds of the same varieties used in 2009 were again sown in the greenhouse at Sheridan College. However, a severe infestation of aphids the plants were not usable. Replacements of the same varieties were not available at the local garden center, so the varieties purchased and used were: Tomatoes: 'Husky Red', 'Super Fantastic', 'Yellow Perfection'

Peppers: 'Better Belle', 'Mandarin', 'Golden Wonder', 'Red Beauty'.

Seeds of the same varieties of carrots and beets were also available in 2010:

Carrots: 'Danvers Half Long', 'Little Finger', 'Atomic Red'

Beets: 'Kestral', 'Cylindra', 'Lutz'.

Tomatoes and peppers were planted in the field June 1 and 2. Carrots and beets were sown in the field April 20.

## 2010 Variety Trial Yields

Tomato yields:

Tomatoes 2010					
		Total yield Miracle-Gro (g)		Total yield Kelp Plus (g)	
Cultivar	controls	1/2 rate	full rate	1/2 rate	full rate
Husky Red	239	278	261	65	280
Super Fantastic	309	370	412	284	616
Yellow Perfection	353	393	376	310	440

Tomato yields were lowest in the variety 'Husky Red' with 1/2 rate traditional and full rates of both types of fertilizers showing slightly higher production than controls. Both 'Super Fantastic' and 'Yellow Perfection' showed highest yields in the full rate Kelp Plus fertilizer treatment.

Pepper yields:

Peppers 2010					
		Total yield Miracle-Gro (g)		Total yield Kelp Plus (g)	
Cultivar	controls	1/2 rate	full rate	1/2 rate	full rate
Better Belle	1179	4067	1011	3364	1209
Mandarin	2047	1020	1862	1360	1627
Golden Wonder	1083	1054	689	793	446
Red Beauty	1886	926	265	1660	924

Pepper yields were highest in the unfertilized controls of ‘Mandarin’, ‘Golden Wonder’, and ‘Red Beauty’. ‘Better Belle’ produced most fruit in both ½ rate treatments.

Beet yields:

Beets 2010					
		Total yield Miracle-Gro (g)		Total yield Kelp Plus (g)	
Cultivar	controls	1/2 rate	full rate	1/2 rate	full rate
Kestral	4901	1370	1297	3058	8407
Cylindra	3860	4610	5981	4194	2072
Lutz	7611	1985	2033	3057	1818

Control, unfertilized plants of ‘Lutz’ showed the highest yield in that variety; full rate organically fertilized plants had the lowest yields. ‘Cylindra’ and ‘Kestral’ showed mixed results. ‘Cylindra’ fertilized with both rates of Miracle-Gro and ½ rate Kelp Plus yielded higher numbers than the control, but the full rate Kelp Plus was lowest in that variety. With ‘Kestral’, the only treatment with higher yields than the controls was full rate Kelp Plus; the other three treatments had lower yields than the controls.

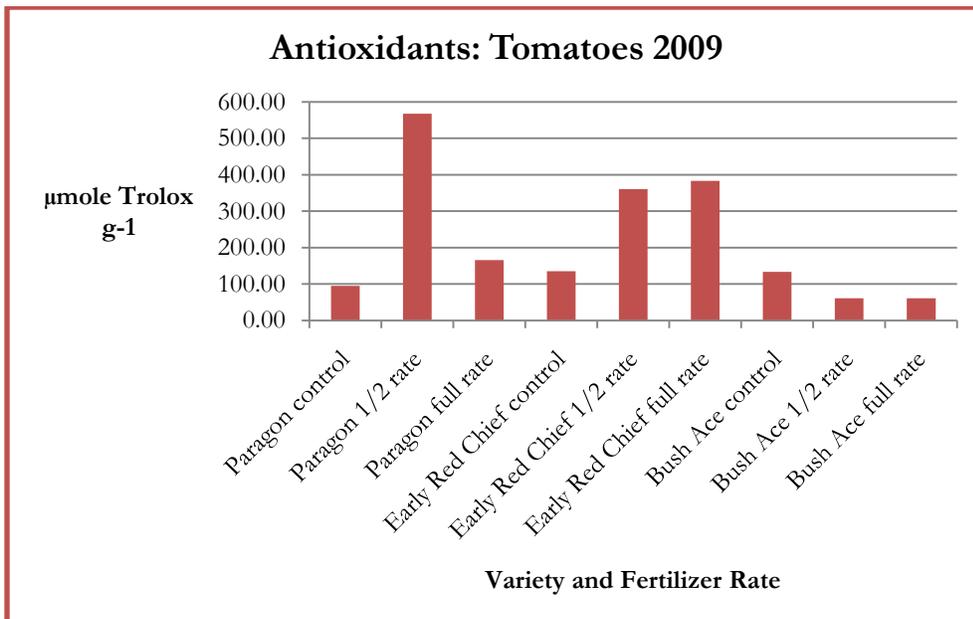
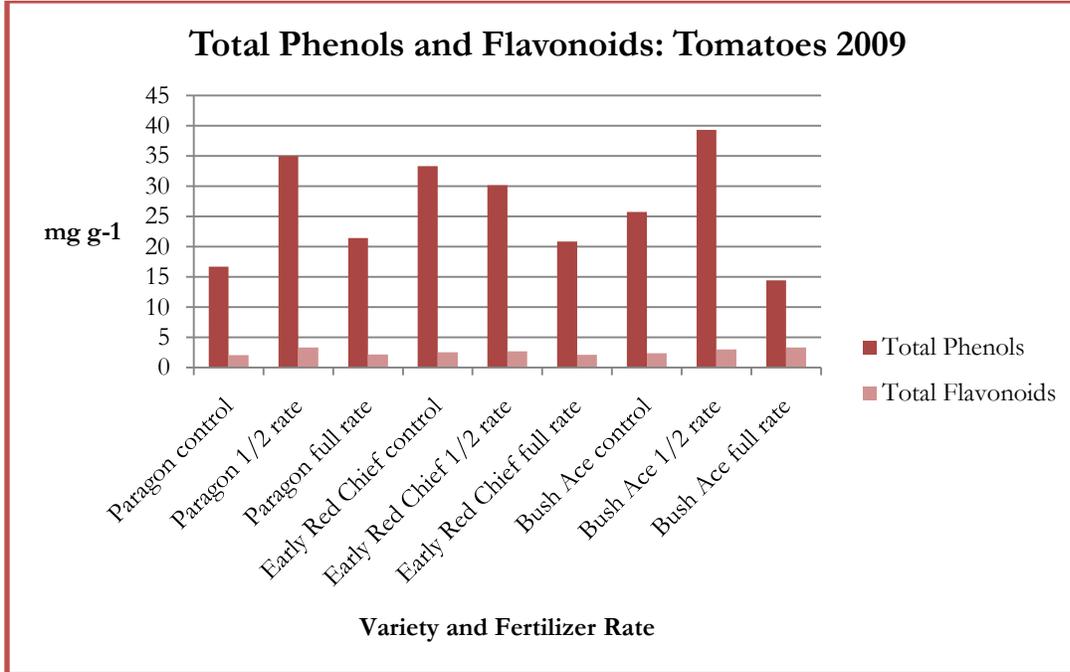
Carrot yields:

Carrots 2010					
		Total yield Miracle-Gro (g)		Total yield Kelp Plus (g)	
Cultivar	controls	1/2 rate	full rate	1/2 rate	full rate
Danvers	2073	1205	604	975	214
Little Finger	1013	987	391	232	56
Atomic Red	183	34	550	43	207

‘Danvers’ and ‘Little Finger’ carrots in the unfertilized control treatments had higher yields than any of the fertilizer treatments. ‘Atomic Red’ showed higher yields than controls only in both full rate fertilization treatments.

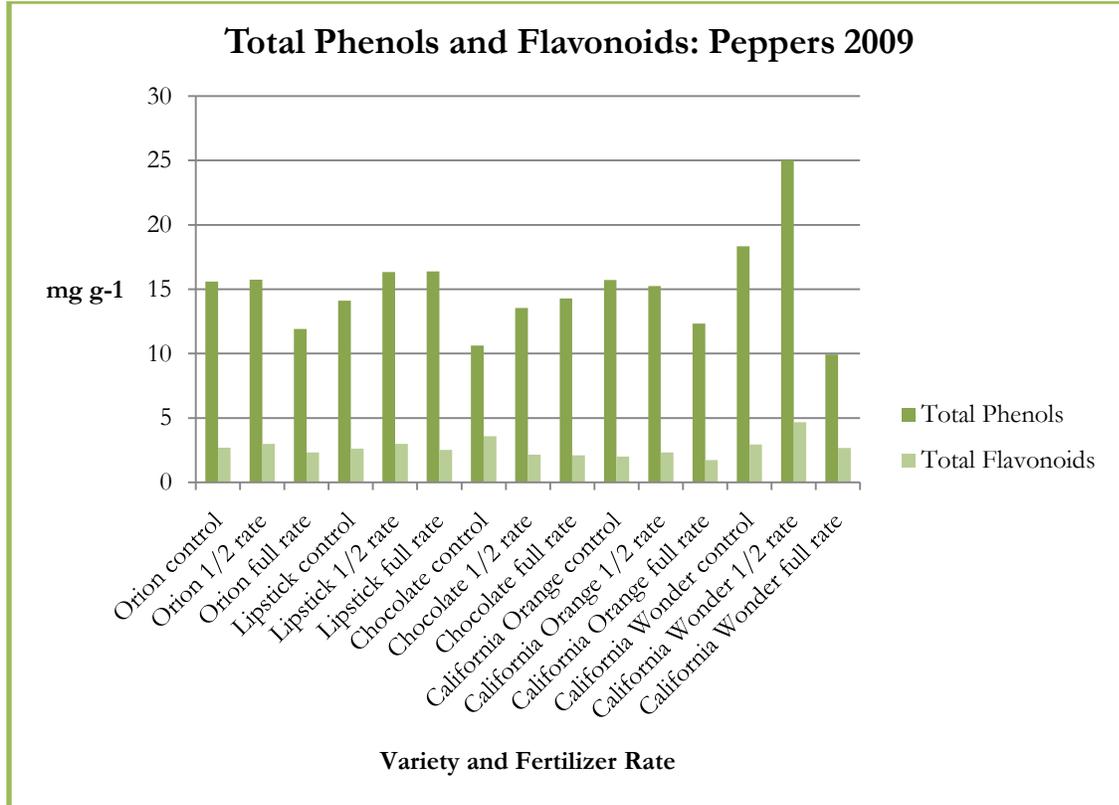
## 2009 Variety Trial Nutritional Analyses

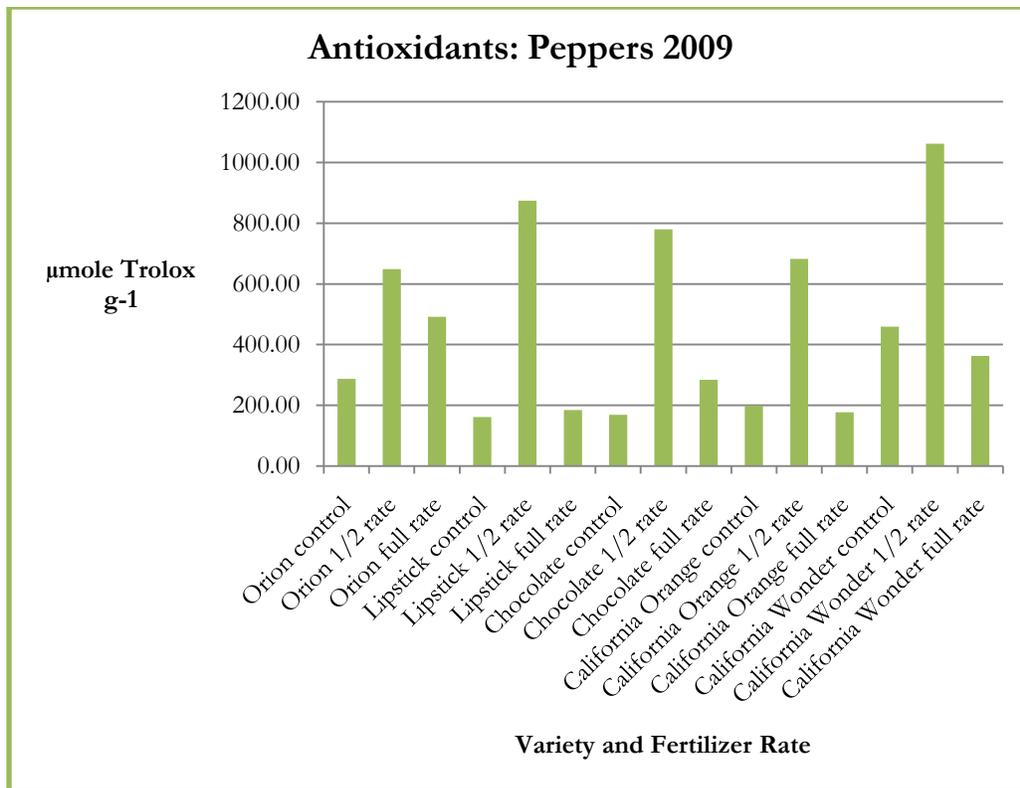
Tomato nutritional analyses:



Total phenols were highest in 1/2 rate plants of 'Paragon' and 'Bush Ace' and unfertilized 'Early Chief'. Differences among varieties in total flavonoids were small but were slightly higher in 1/2 rate fertilized 'Paragon' and 'Early Red Chief' and full rate 'Bush Ace'. Antioxidants varied widely depending on cultivar with the highest levels in unfertilized 'Bush Ace', 1/2 rate fertilized 'Paragon', and full rate fertilized 'Early Red Chief'.

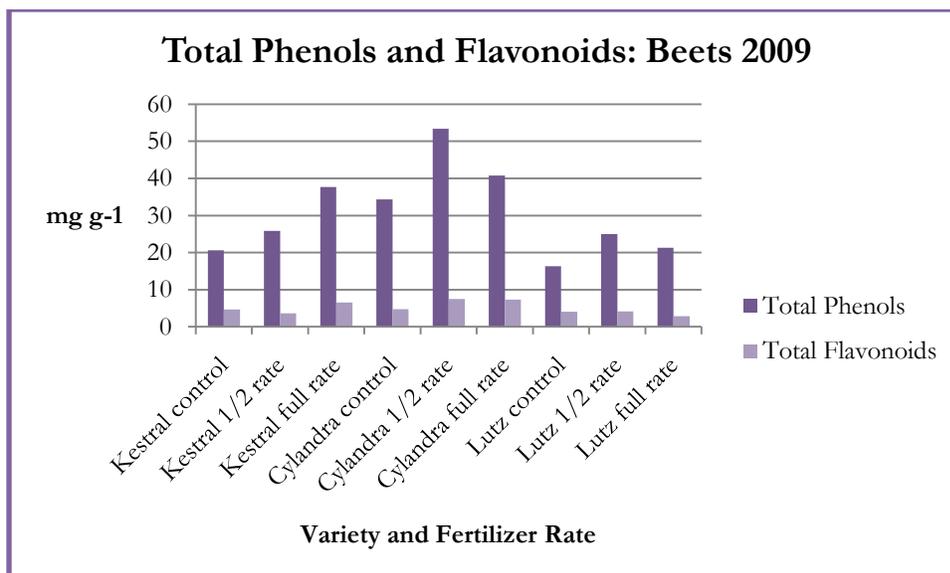
Pepper nutritional analyses:

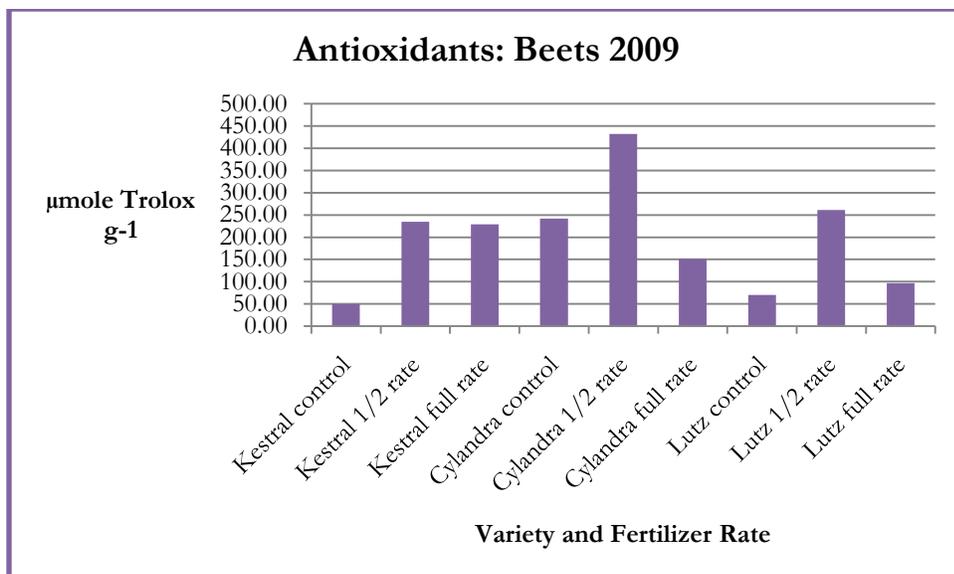




Total phenols were highest in ‘Orion’ fertilized at half rate and ‘Lipstick’ and ‘Chocolate’ at the full rate. Both ‘California Orange’ and ‘California Wonder’ showed highest phenols with either no fertilizer or 1/2 rate. Total flavonoids were highest in 1/2 rate fertilized ‘Orion’, ‘Lipstick’, ‘California Orange’, and ‘California Wonder’ but was highest in unfertilized ‘Chocolate’. Antioxidants were highest in the 1/2 rate fertilized treatment of all five varieties.

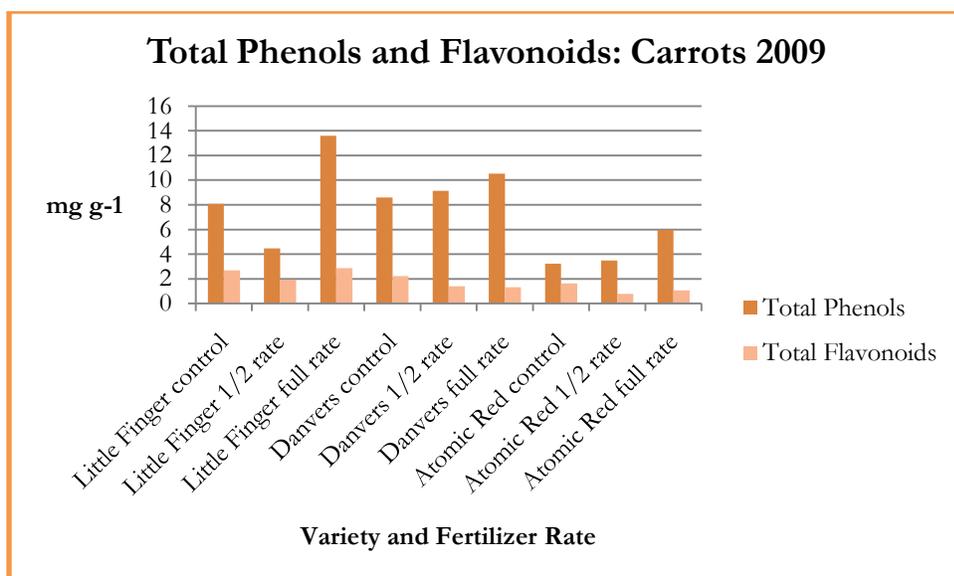
Beet nutritional analyses:

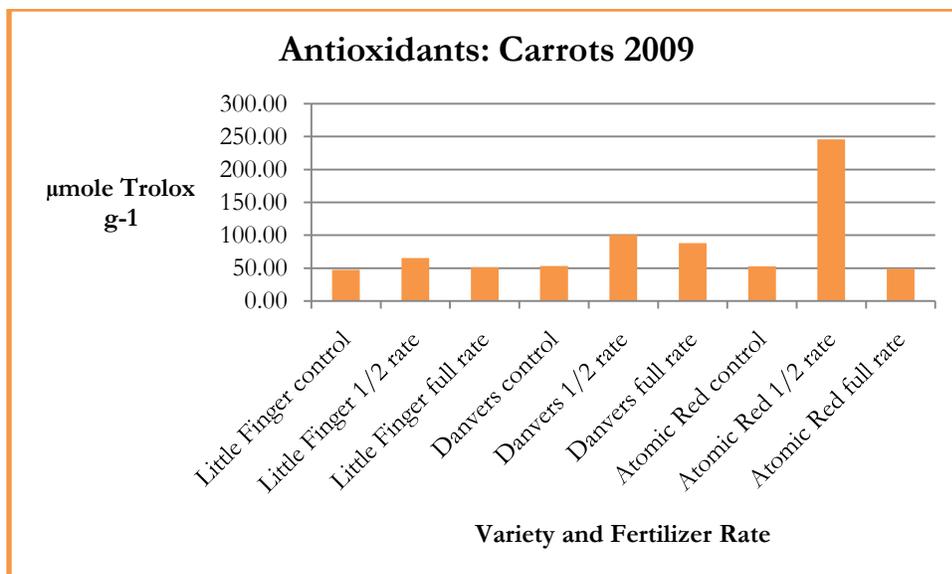




Total phenols and total flavonoids were highest in 'Kestral' at the full fertilizer rate and the 1/2 rate of both 'Cylandra' and 'Lutz'. Antioxidants were highest in all three varieties at the 1/2 rate of fertilization.

Carrot nutritional analyses:

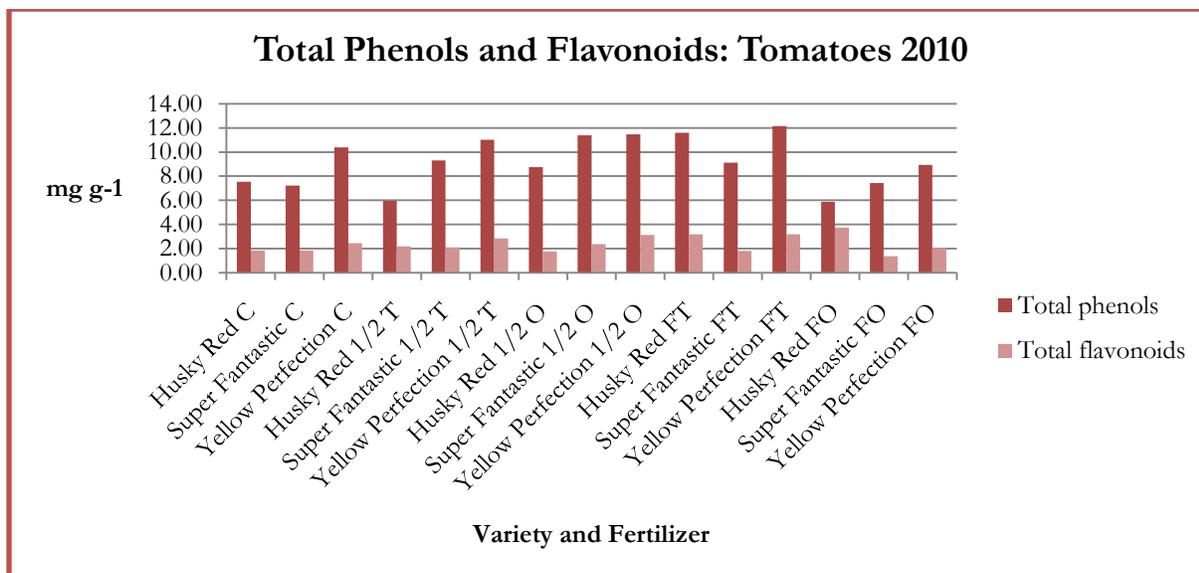


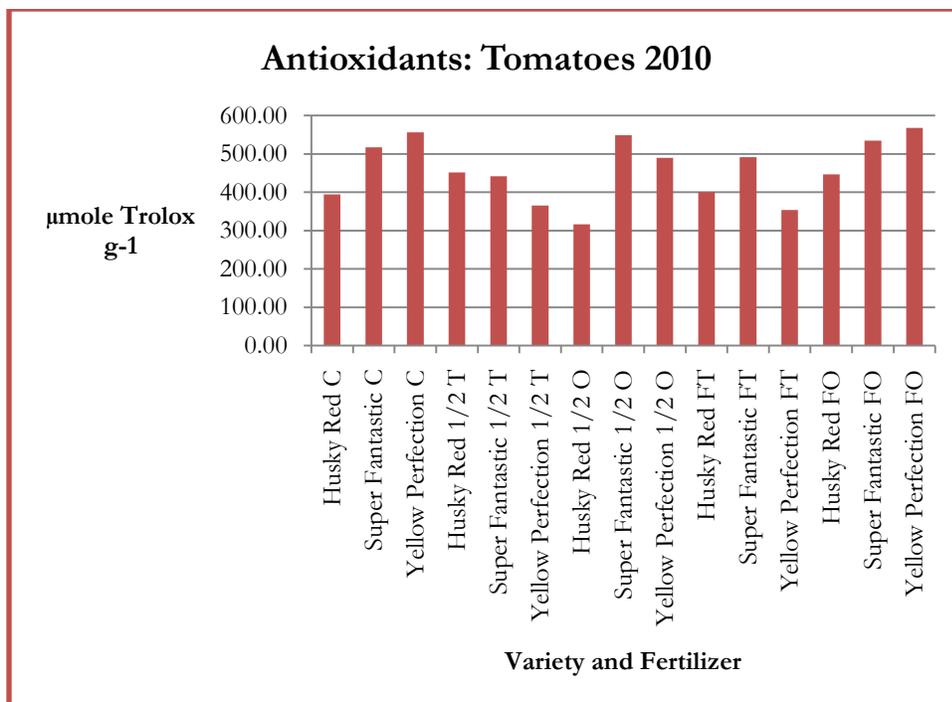


Total phenols were highest at the full rate of fertilization in all three varieties. Total flavonoids, however, were highest in unfertilized ‘Danvers’ and ‘Atomic Red’ and in ‘Little Finger’ fertilized at the full rate. Antioxidants were highest in the ½ rate fertilizer treatment for all varieties.

### 2010 Variety Trial Nutritional Analyses

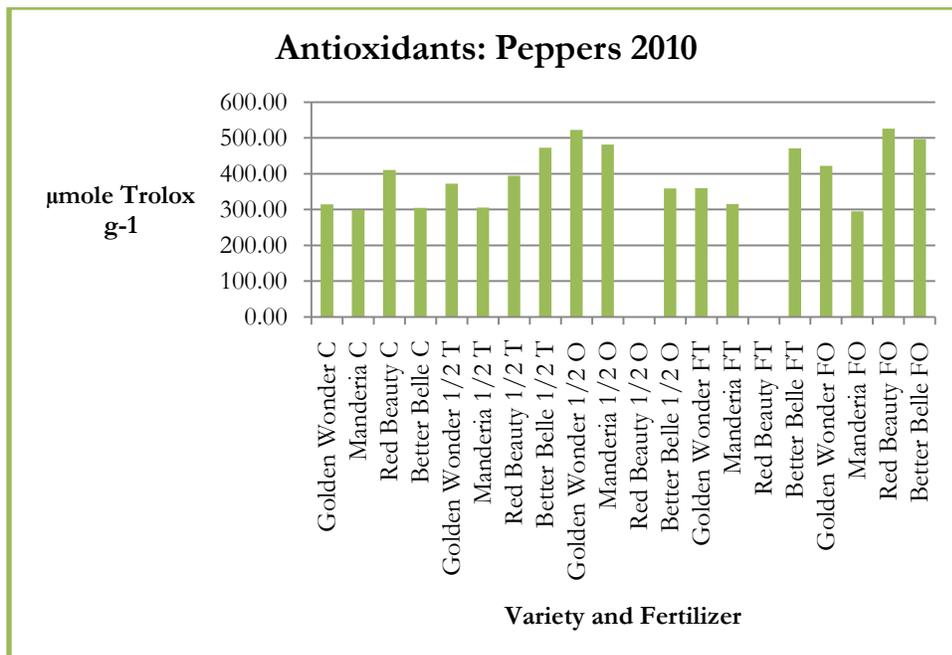
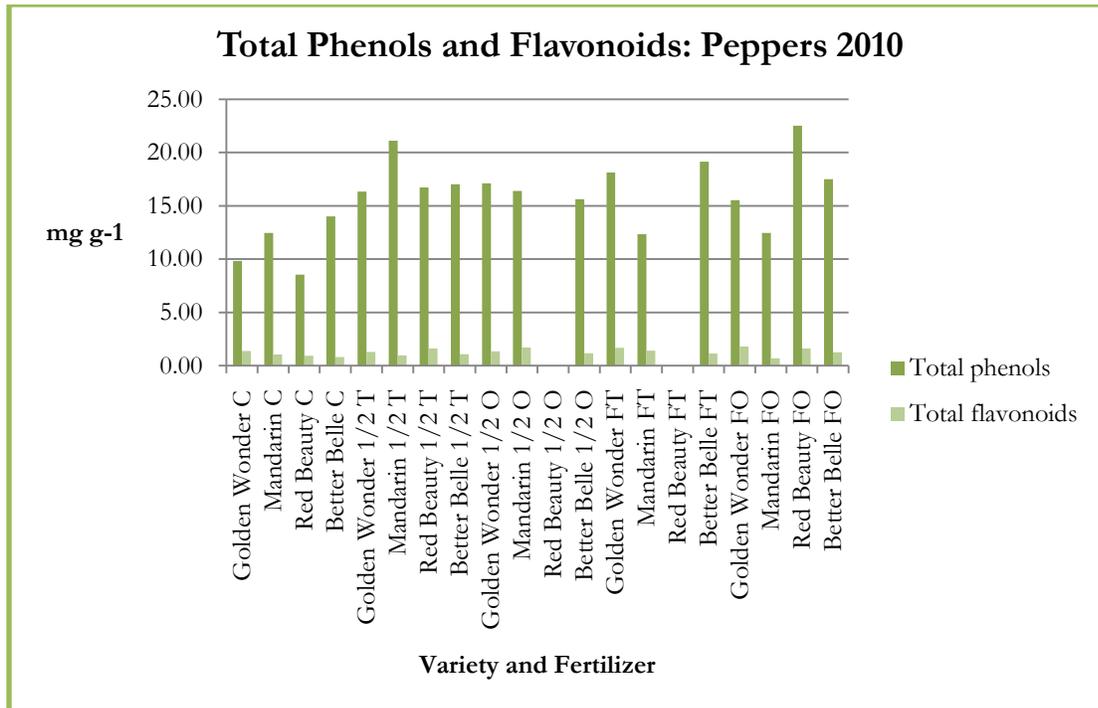
Tomato nutritional analyses:





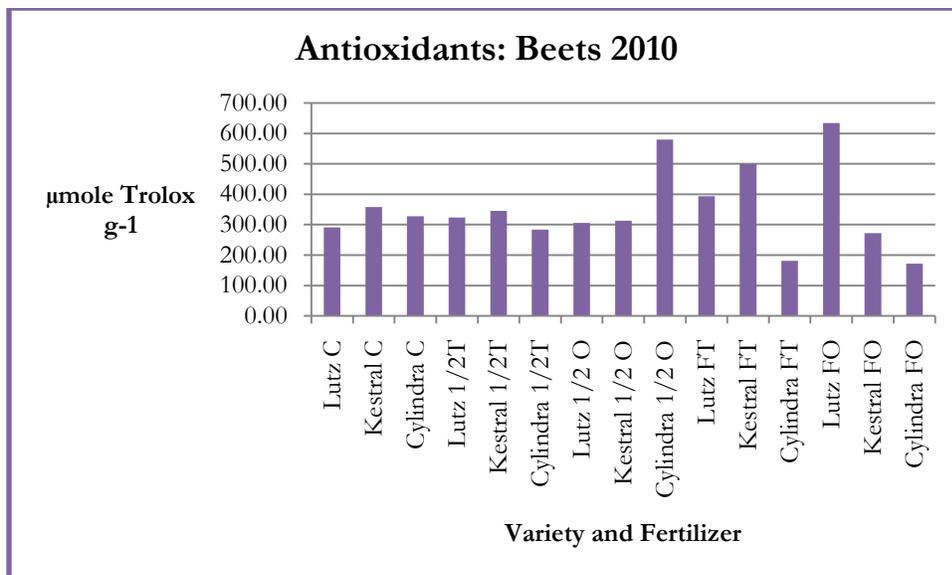
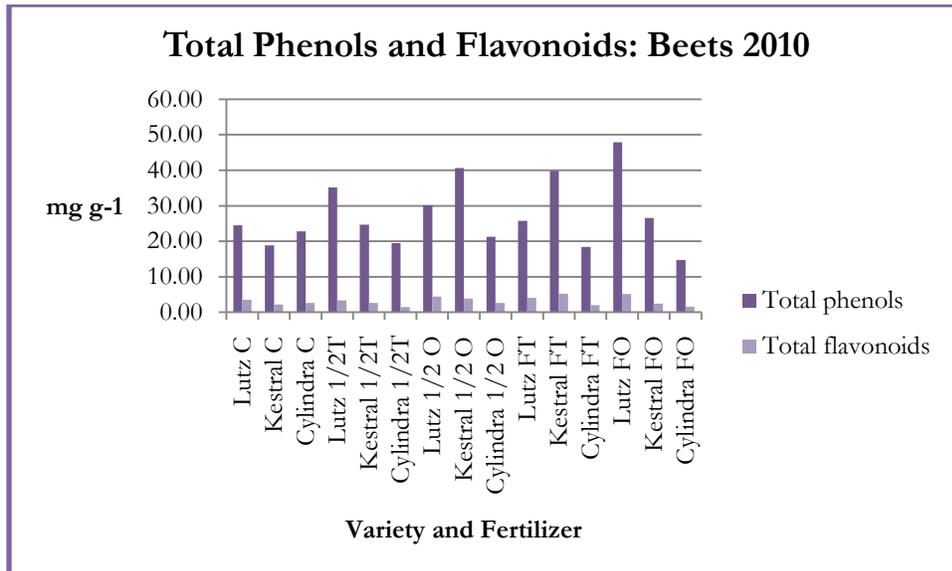
Total phenols were highest in the ‘Yellow Perfection’ cultivar, no matter which fertilizer/rate was used. Total flavonoids were highest in ‘Yellow Perfection’ in all but the full rate organic fertilizer treated plants; ‘Husky Red’ had the highest flavonoids level in this treatment. Highest flavonoids overall were in the 1/2 rate organic and full rate traditional fertilizer treatments. Antioxidant levels were variable with no particular trends as far as varieties or treatments were concerned.

Pepper nutritional analyses:



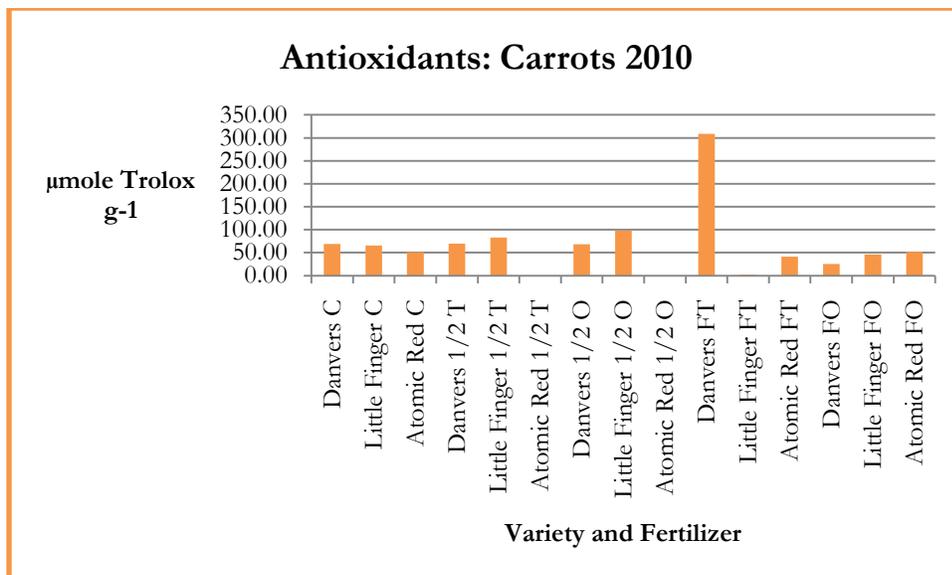
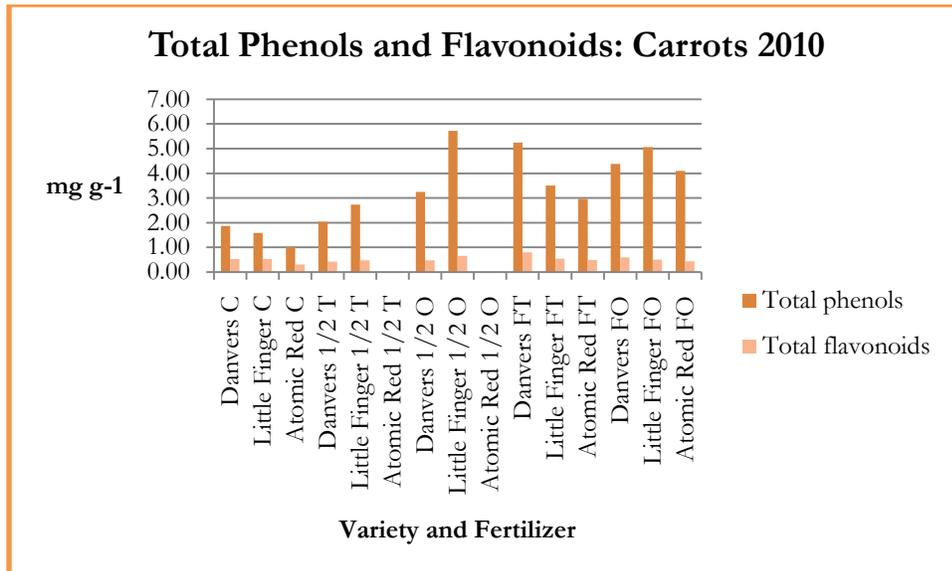
In two treatments, 1/2 rate organic and full rate traditional fertilizer, ‘Red Beauty’ produced no fruit. Cultivars varied in total phenols and flavonoids with no clear trends, although ‘Better Belle’ was among the highest under all treatments for total phenols. Antioxidants also showed no particular patterns across cultivars or treatments.

Beet nutritional analyses:



Among the beet cultivars, ‘Lutz’ showed highest phenols under control, ½ rate traditional, and full rate organic fertilizers. ‘Kestral’ was highest under ½ rate organic and full rate traditional treatments. ‘Lutz’ also showed highest flavonoids under all treatments except full rate traditional fertilizer, where ‘Kestral’ had the highest total. In antioxidants, ‘Kestral’ showed the highest amounts under all treatments except full rate organic fertilizer, where ‘Lutz’ was highest.

Carrot nutritional analyses:



No 'Atomic Red' carrots were produced under the 1/2 rate traditional and 1/2 rate organic fertilizer treatments. Total phenols were again quite variable depending on variety. The highest levels overall were in 'Little Finger' 1/2 rate organic and 'Danvers' full rate traditional fertilizer. Total phenols were highest overall in those varieties and treatments as well. As for antioxidant levels, 'Danvers' full rate traditional fertilizer was far higher than any other variety or treatment.

## Activities Performed and Outcomes: Season Extension Trials

### 2009 Season Extension Yields

Peppers, tomatoes, and eggplants were grown in a high tunnel, under row covers, or in the field during the summer of 2009. Five plants of each of these varieties were grown in each location:

Peppers: 'King of the North', 'Purple Beauty'

Tomatoes: 'Rutgers', 'Cosmonaut'

Eggplants: 'Black', 'Turkish Orange'.

Pepper yields:

Peppers (5 plants per location)			
	Total yield (kg)		
Cultivar	Field	High tunnel	Row cover
King North	2.863	2.638	4.853
Purple Beauty	1.508	1.69	1.944

Yields of both cultivars of peppers were highest under row covers. Lowest yields occurred in the high tunnel with 'King of the North' but in the field with 'Purple Beauty'.

Tomato yields:

Tomatoes (5 plants per location)			
	Total yield (kg)		
Cultivar	Field	High tunnel	Row cover
Rutgers	20.865	15.581	17.112
Cosmonaut	15.846	14.082	7.796

Yields of tomatoes depended on location. Both varieties produced the most fruit in the field but 'Rutgers' produced the least in the high tunnel. 'Cosmonaut' produced the least amount of fruit under the row cover.

Eggplant yields:

Eggplant (5 plants per location)			
	Total yield (kg)		
Cultivar	Field	High tunnel	Row cover
Black	1.595	2.465	0.972
Turkish Orange	0.21	0.281	0

Neither variety of eggplant produced much fruit with 'Turkish Orange' yielding zero under the row cover. Both yielded the most under the high tunnel.

### 2010 Season Extension Yields

As in 2009, five plants of varieties of peppers, tomatoes, and eggplants were grown either in the field, under row cover, or in a high tunnel. Varieties grown in 2010 were:

Peppers: 'King Crimson', 'California Wonder Orange'

Tomatoes: 'Rutgers', 'Cosmonaut'

Eggplant: 'Black', 'Turkish Orange'.

Pepper yields:

Peppers (5 plants per location)			
	Total yield (kg)		
Cultivar	Field	High tunnel	Row cover
King Crimson	0.201	0.195	.035
California Wonder Orange	0.116	1.326	0.182

'California Wonder Orange' had the highest yields in the high tunnel and lowest in the field. Yields of 'King Crimson' were similar in the field and in the high tunnel but lowest under the row cover.

Tomato yields:

Tomatoes (5 plants per location)			
	Total yield (kg)		
Cultivar	Field	High tunnel	Row cover
Rutgers	20.66	21.0	1.962
Cosmonaut	15.552	23.42	8.385

Both cultivars yielded most in the high tunnel, followed by the field. Plant under row covers produced far less than the other two locations.

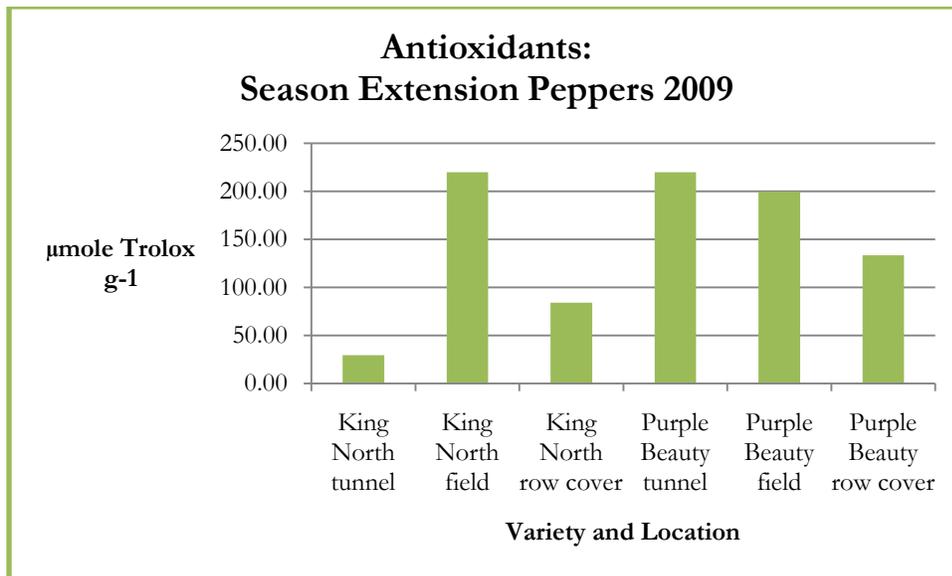
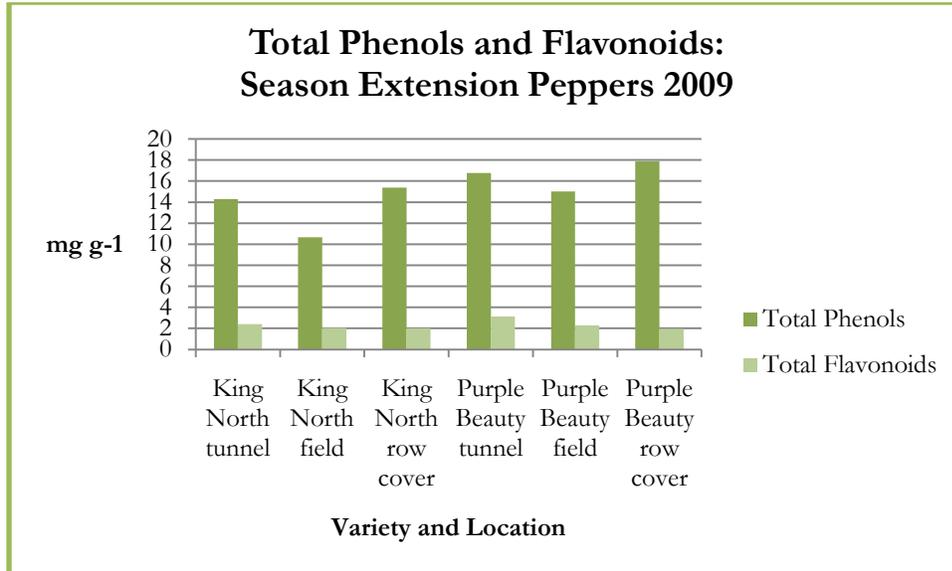
Eggplant yields:

Eggplant (5 plants per location)			
	Total yield (kg)		
Cultivar	Field	High tunnel	Row cover
Black	0.14	3.016	3.586
Turkish Orange	0	1.057	0.130

'Turkish Orange' did not yield much in any location. 'Black' grown under the row cover and in the high tunnel far out-produced those plants grown in the field.

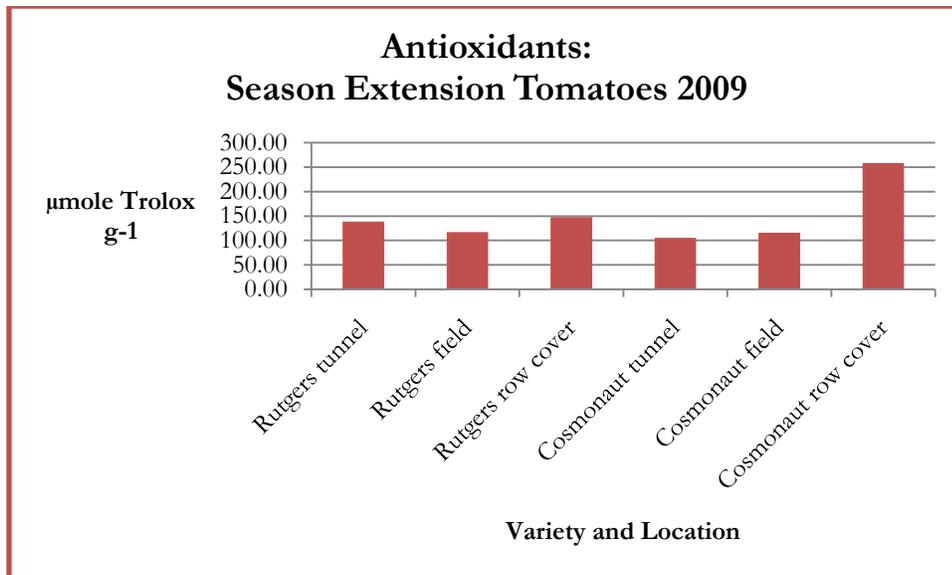
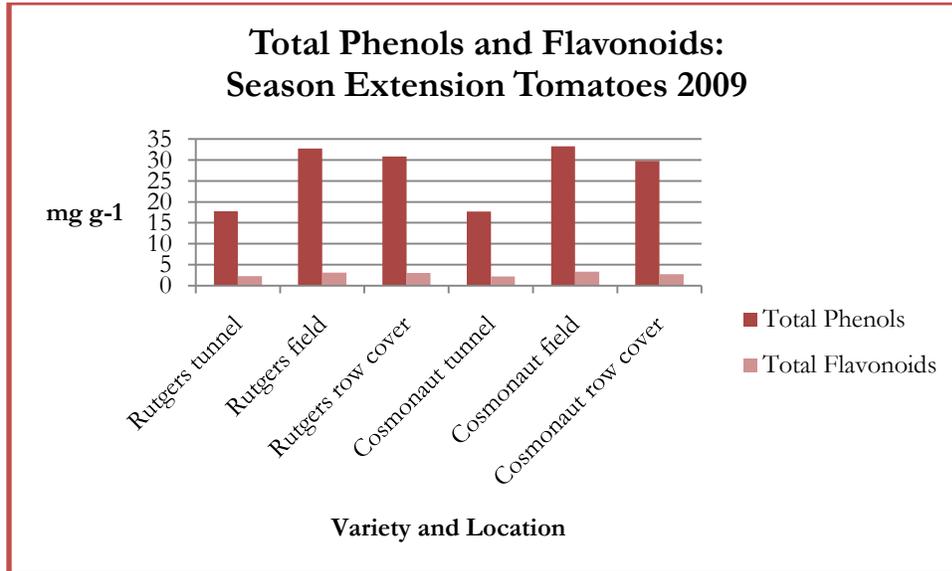
## 2009 Season Extension Nutritional Analyses

Pepper nutritional analyses:



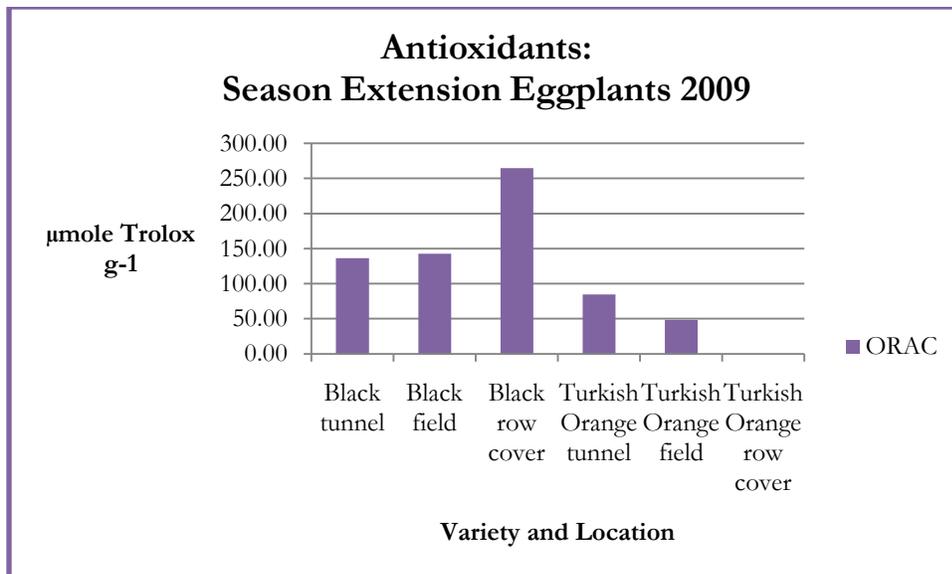
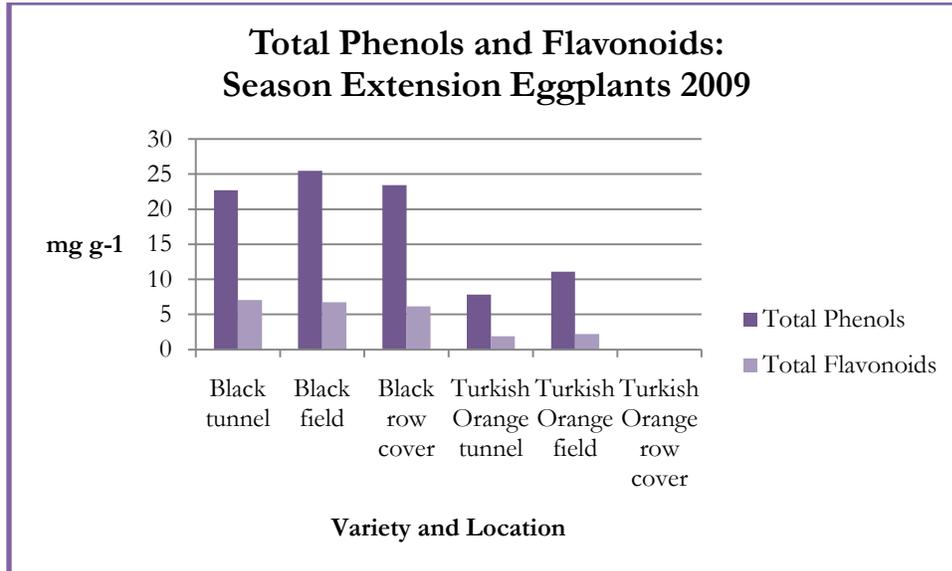
Total phenols were highest in both varieties under row covers while total flavonoids were highest when grown in the high tunnel. Antioxidant values were highest in the field for 'King North' and in the high tunnel for 'Purple Beauty'.

Tomato nutritional analyses:



Total phenols and total flavonoids were highest for both cultivars when grown in the field while highest antioxidant values were found when plants were grown under row covers.

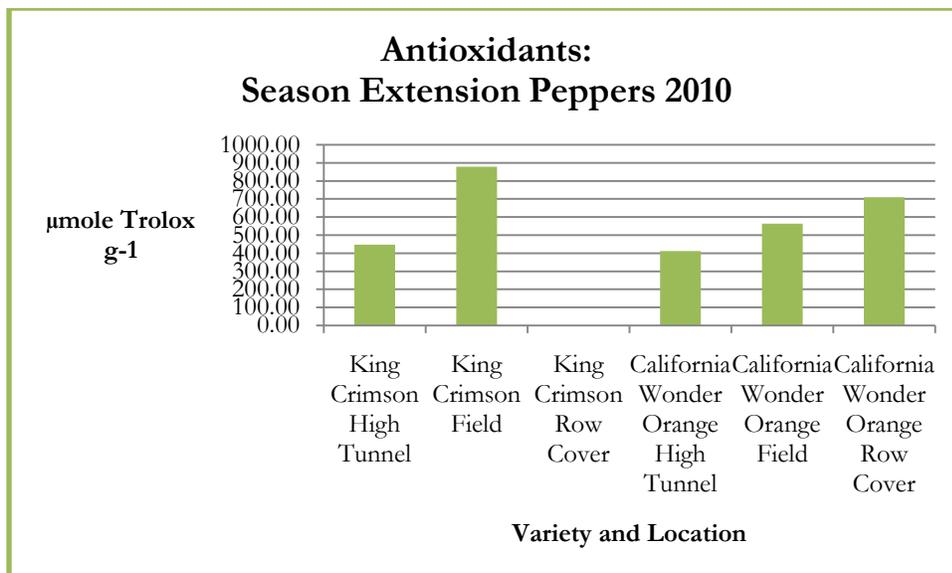
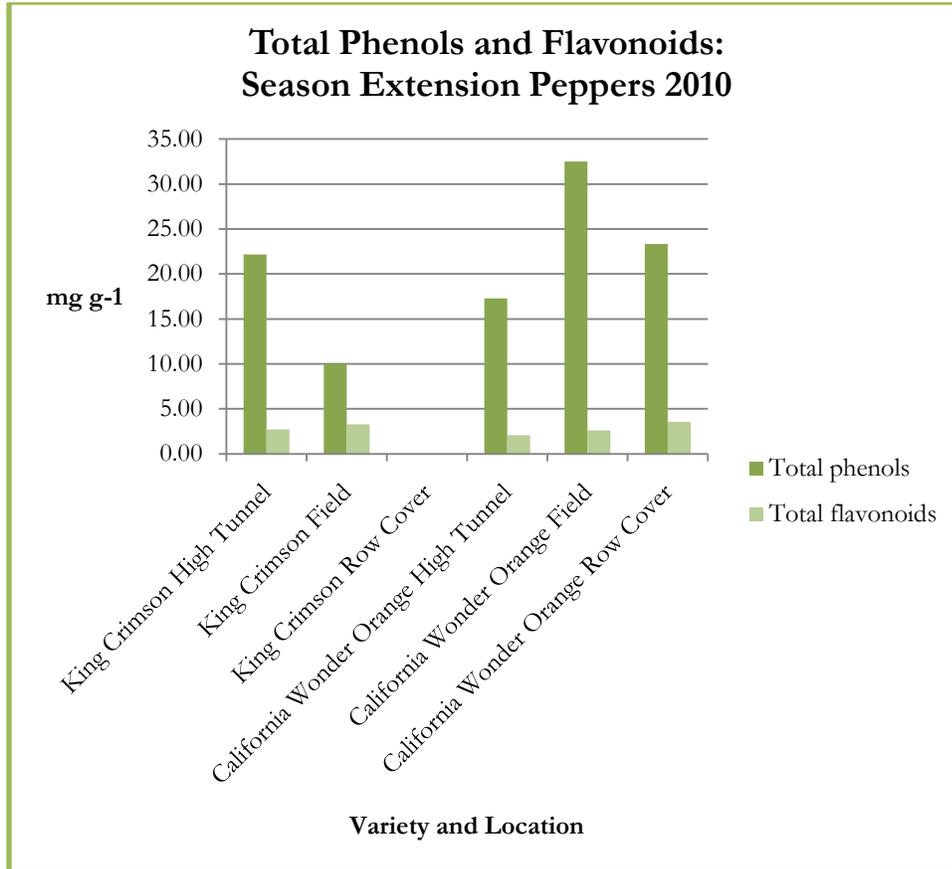
Eggplant nutritional analyses:



'Turkish Orange' did not produce any fruit under the row covers so no nutritional data are available. Total phenols were highest for both varieties when grown in the field. Total flavonoids were highest in 'Black' when grown under the high tunnel and in 'Turkish Orange' in the field. ORAC was highest when 'Black' was grown under row cover and in 'Turkish Orange' in the high tunnel.

## 2010 Season Extension Nutritional Analyses

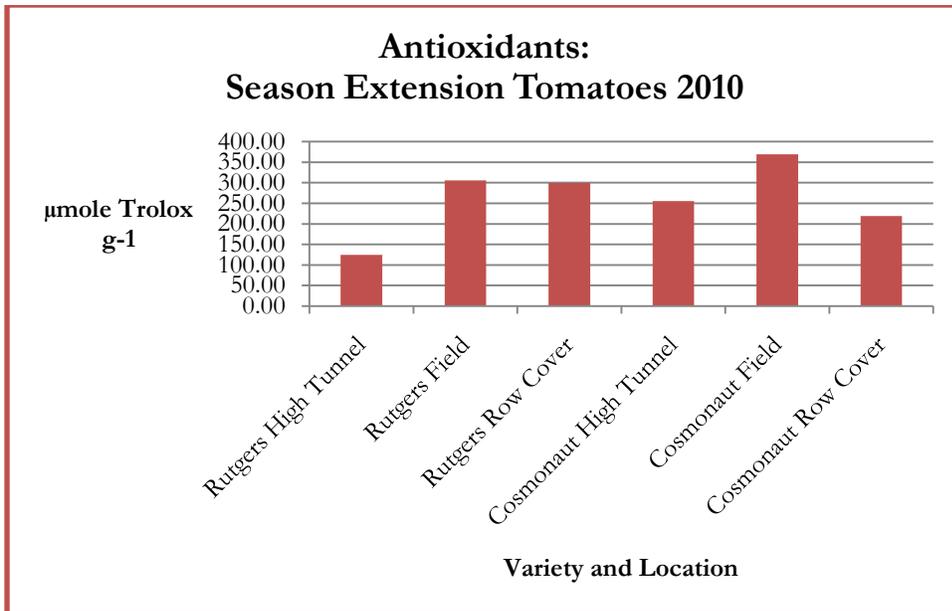
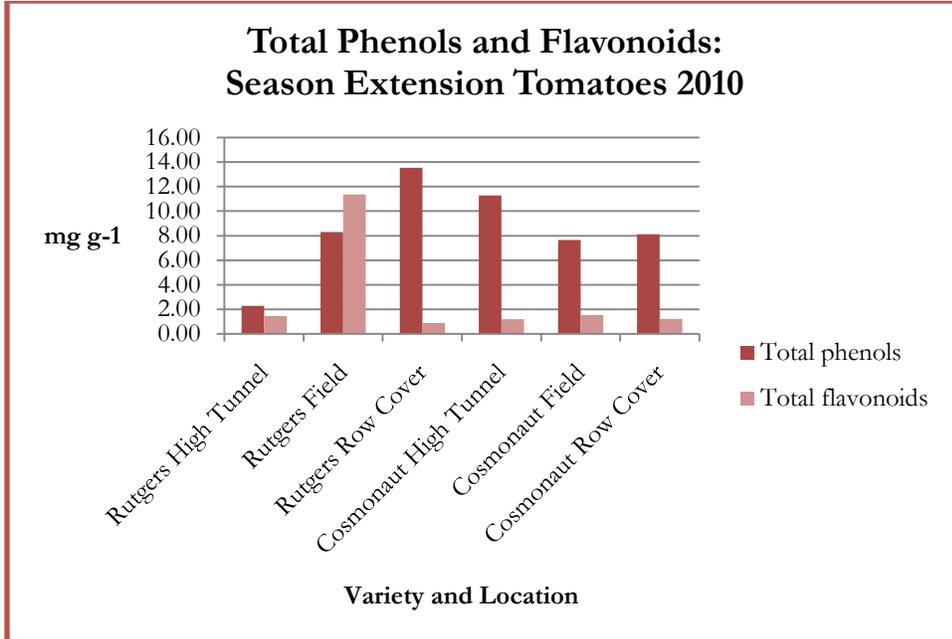
Pepper nutritional analyses:



'King Crimson' produced no pepper fruit under row covers but showed highest total phenols under the high tunnel. Field-grown 'California Wonder Orange' had the highest total phenols of the three

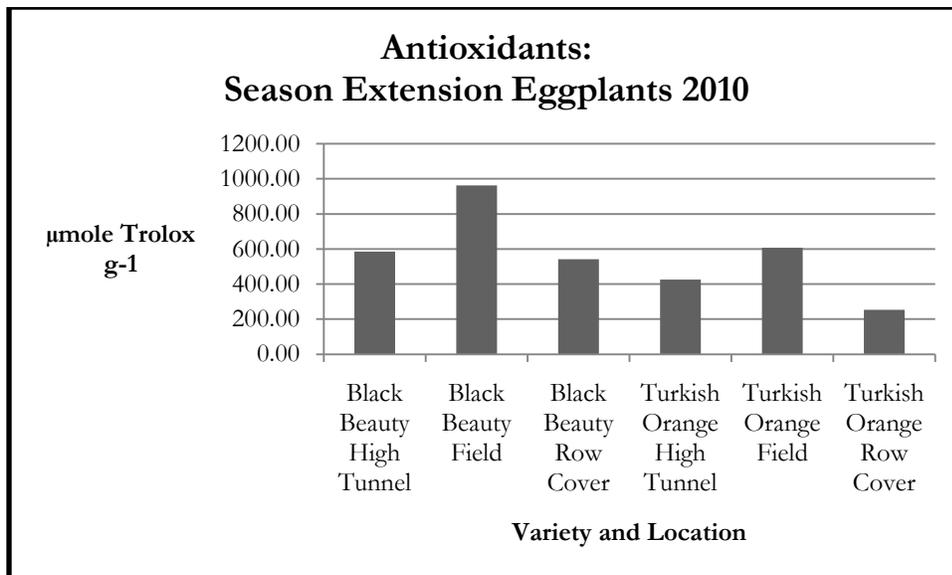
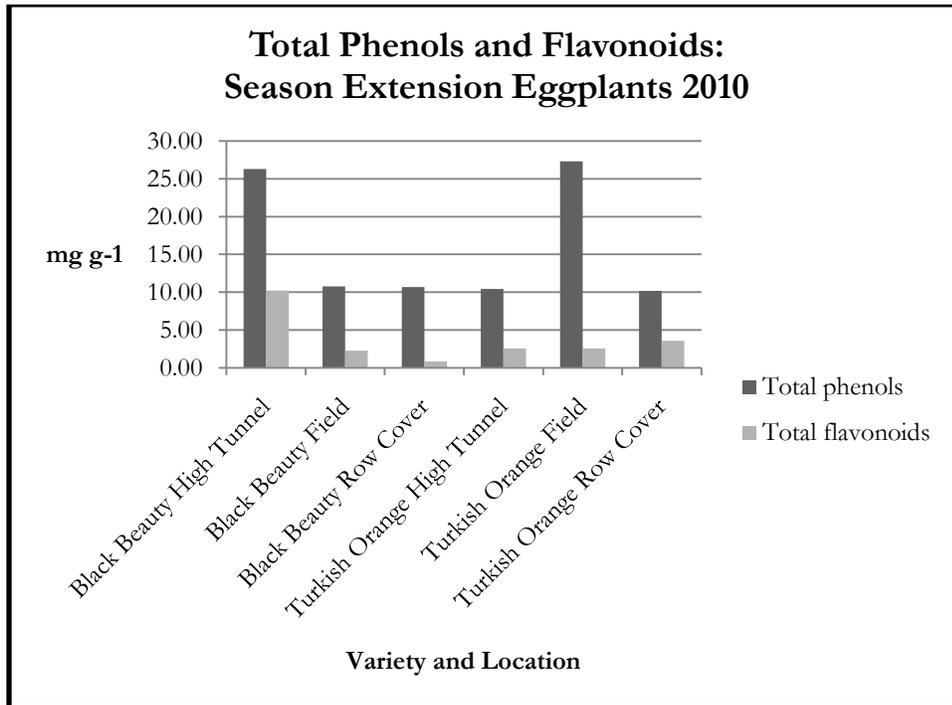
growing locations. Total flavonoids were highest with 'King Crimson' in the field and 'California Wonder Orange' under the row cover.

Tomato nutritional analyses:



Highest total phenols appeared in row cover grown 'Rutgers' and high tunnel grown 'Cosmonaut'. Total flavonoids were highest in the field with both cultivars. Antioxidants were also highest in field grown plants of both cultivars.

Eggplant nutritional analyses:



Total phenols and flavonoids varied by cultivar. Highest total phenols were found in high tunnel grown 'Black Beauty' and field grown 'King Crimson'. Total flavonoids were found in high tunnel grown 'Black Beauty' and 'Turkish Orange' under row cover. Field grown plants of both varieties had the highest antioxidant levels.

## Activities Performed and Outcomes: Weed Control Trials

### 2009 Weed Control Trials

In 2009, the weed control plots were set up on July 6 in an area planted to winter wheat. Seven treatments were set up, each replicated three times, in 4 ft x 4 ft square plots. The treatments were:

1. No weed control
2. Clear plastic solarization
3. Black plastic mulch
4. Polyethylene fabric mulch
5. Wood chip mulch
6. Hand weeding
7. Flame weeding

Field soil was used to hold edges of plastic and fabric mulches in place. Unfortunately, few data were recorded as the plots were almost totally eaten to the ground by grasshoppers. Hand weeded plot data are in the following table.

Hand weeded plot	July 20	August 12
South	3.4 min	1.24 min
Center	none	none
North	5.2 min	1.38 min

### 2010 Weed Control Trials

In 2010, weed control trials were set up in the same way they were in 2009. Treatments were placed July 7. No weeds were present as tillage had recently been done.

Data were recorded on types of weeds present once during the growing season, on September 14. Then, manual and flame weed controls were administered in those plots, and time needed for those treatments was recorded. Observations on the plots noted presence of field bindweed, green foxtail, prostrate pigweed, and kochia.

Data recorded on September 14 included:

- Control with no weed management: Rep 1: 30% bindweed, 1% pigweed  
Rep 2: 2% pigweed, 1% bindweed  
Rep 3: 1% foxtail.
- Clear plastic mulch/solarization: No weeds grew through the plastic but the plastic was cracked and disintegrating.
- Black plastic mulch: No weeds grew through, plastic intact.
- Polyethylene fabric: No weeds grew through, beginning to rip.
- Wood chip mulch: Bindweed grew through particularly around the edges.
- Hand weeding: Rep 1: 40% bindweed took 9 minutes 30 seconds to weed

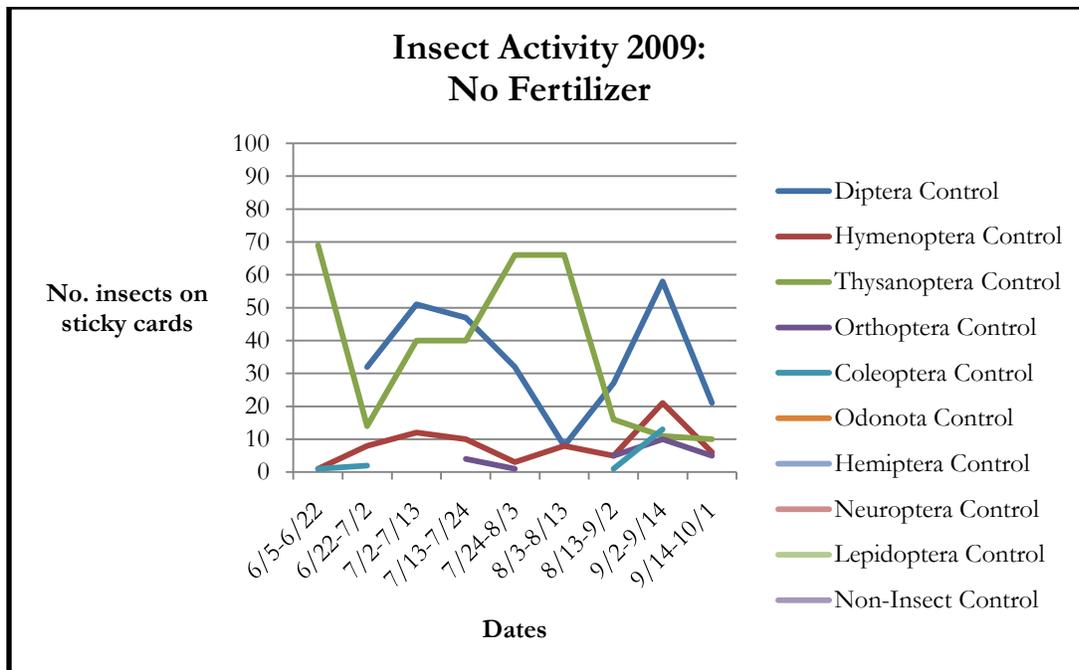
Flame weeding:

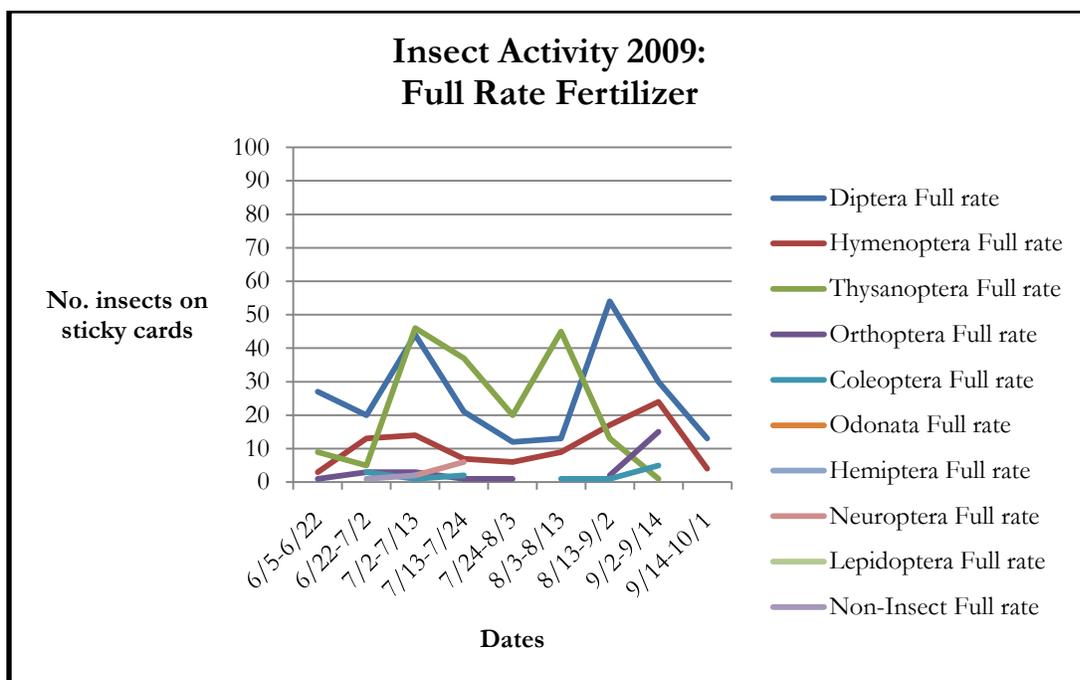
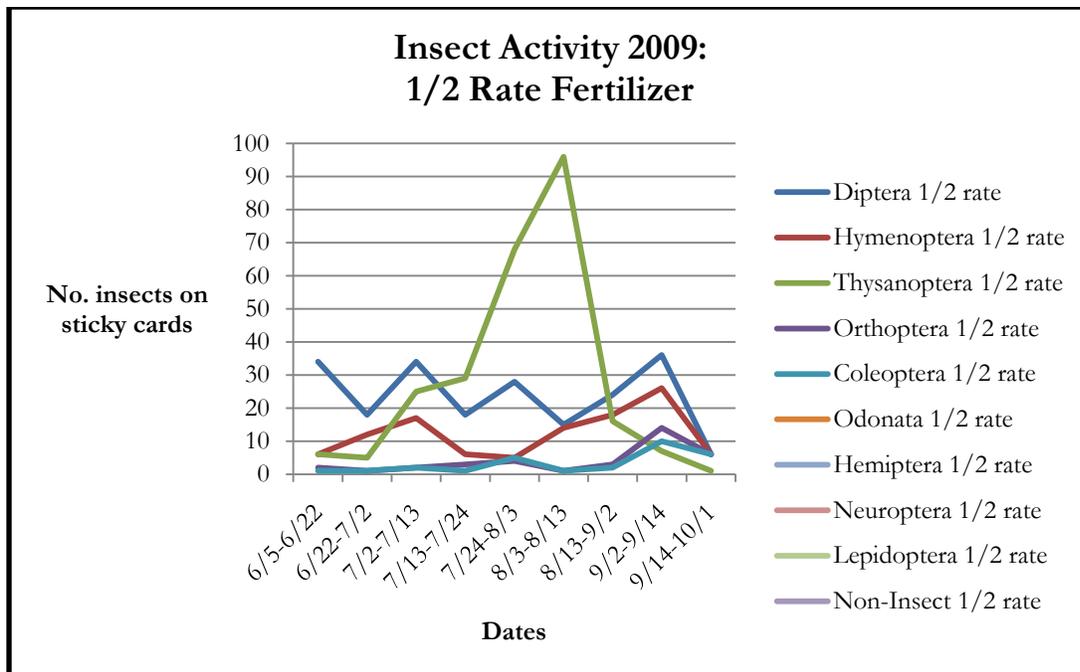
Rep 2: 2% pigweed, 1% bindweed took 51 seconds to weed  
Rep 3: 1% foxtail took 20 seconds to weed  
Rep 1: 25% bindweed, 1% kochia took 6 minutes 33 seconds to weed  
Rep 2: 20% bindweed, 1% kochia took 11 minutes 30 seconds to weed  
Rep 3: 1% bindweed, 4% pigweed took 3 minutes 16 seconds to weed.

## Activities Performed and Outcomes: Insect Activity Trials

### 2009 Insect Activity

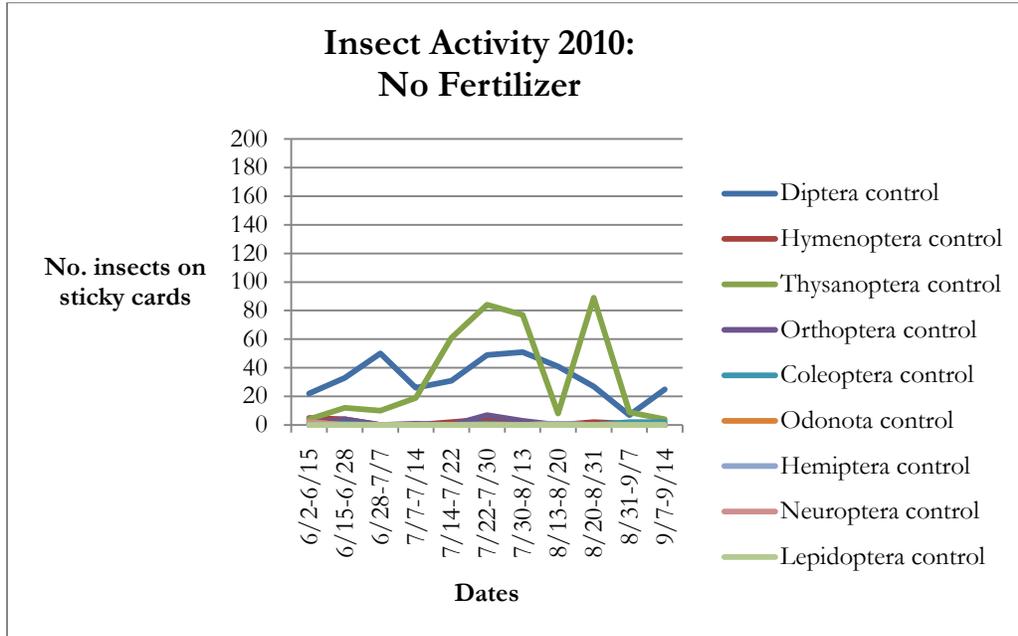
Yellow sticky cards were set out in the variety trials fertilization plots, one sticky trap per plot. Cards were changed every two to three weeks during the growing season. Cards were read on each side in 3 cm square blocks and the numbers of insects in the orders Diptera (true flies), Hymenoptera (ants, bees, etc.), Thysanoptera (thrips), Orthoptera (crickets, grasshoppers, etc.), Coleoptera (beetles), Odonata (dragonflies, damselflies, etc.), Hemiptera (whiteflies, aphids, leafhoppers, etc.), Neuroptera (lacewings, etc.), and Lepidoptera (moths, butterflies, etc.) were recorded.



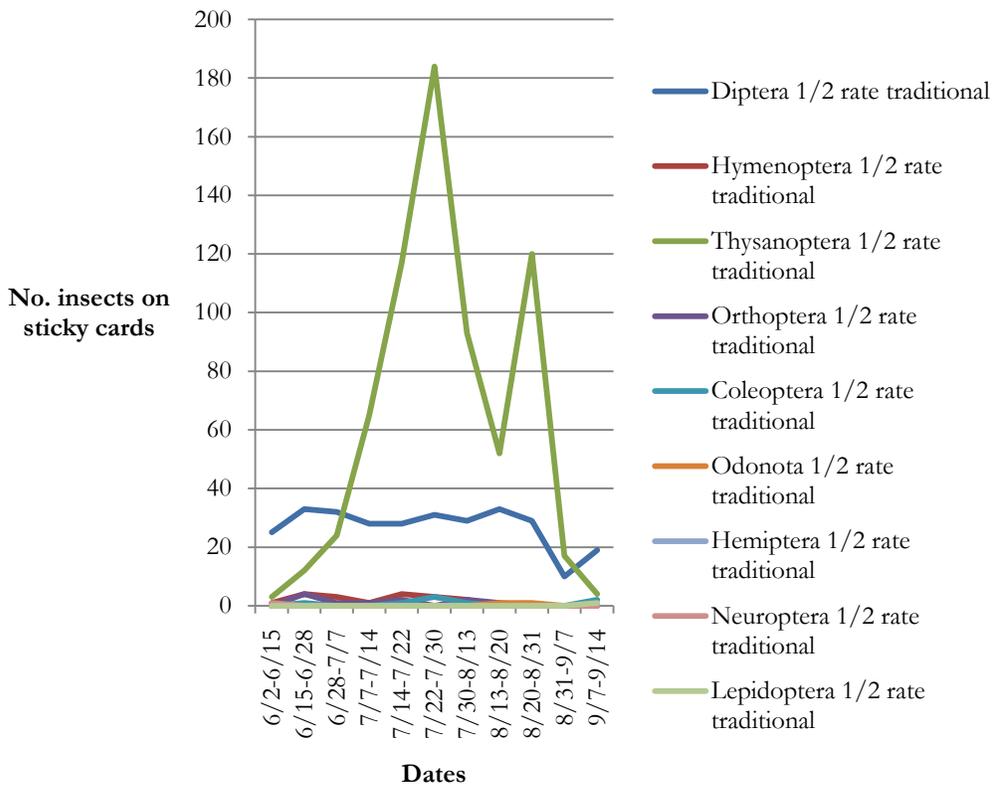


The y-axis on each of the above graphs is set at 100 for each fertilizer treatment to make it easier to compare treatments. It seems that thrips (Thysanoptera) and flies (Diptera) comprised the largest insect populations in the plots. Grasshoppers (Orthoptera) were present but not in large numbers on the sticky cards. This is not surprising, however, due to the larger size of these types of insects; they don't get blown around as much as the smaller insects. There do not appear to be any discernible differences among the three fertilizer treatments in insect populations during the growing season, other than higher thrips (Thysanoptera) populations in the 1/2 rate fertilized plot.

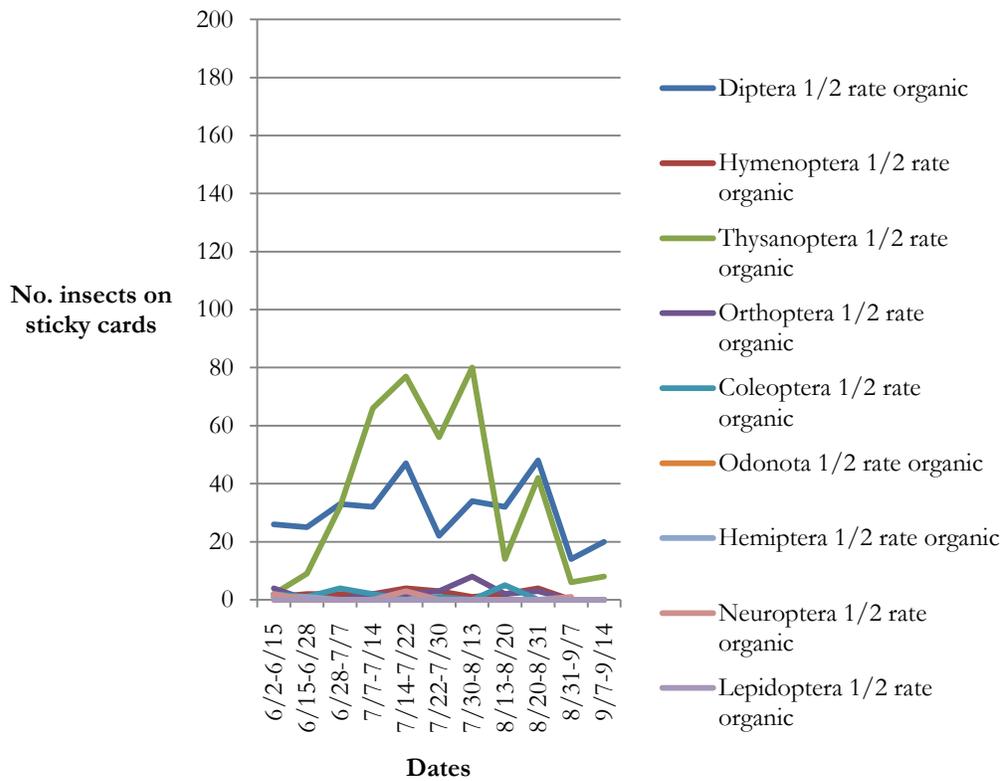
## 2010 Insect Activity



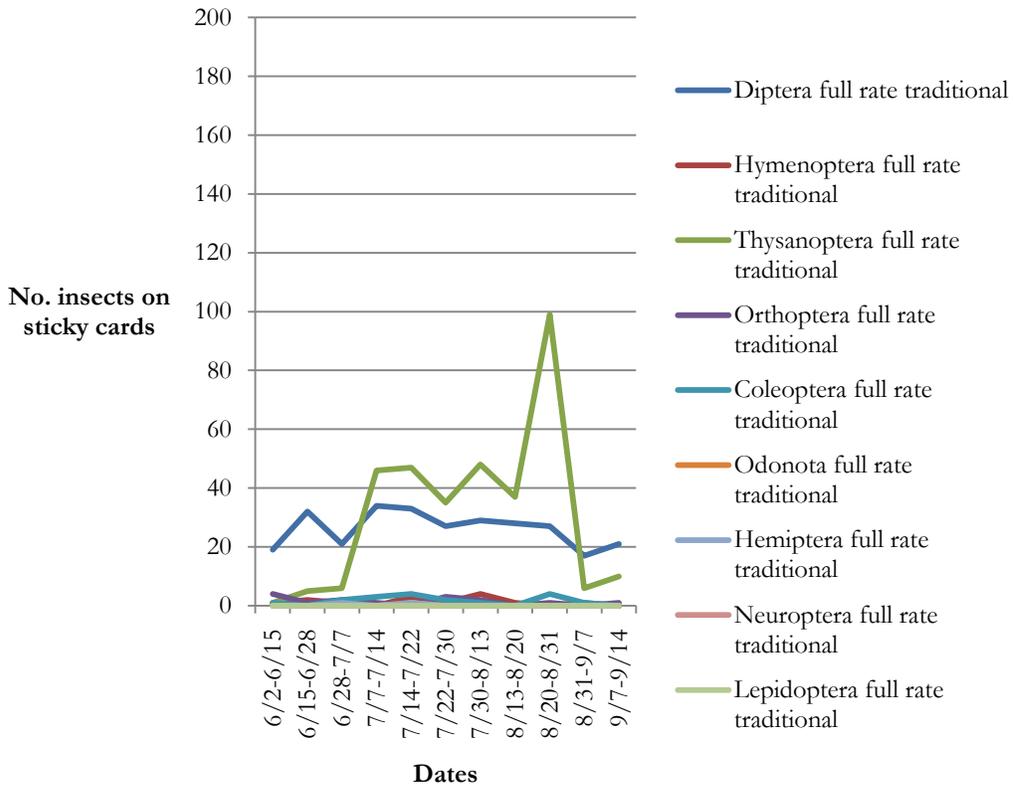
### Insect Activity 2010: 1/2 Rate Traditional Fertilizer

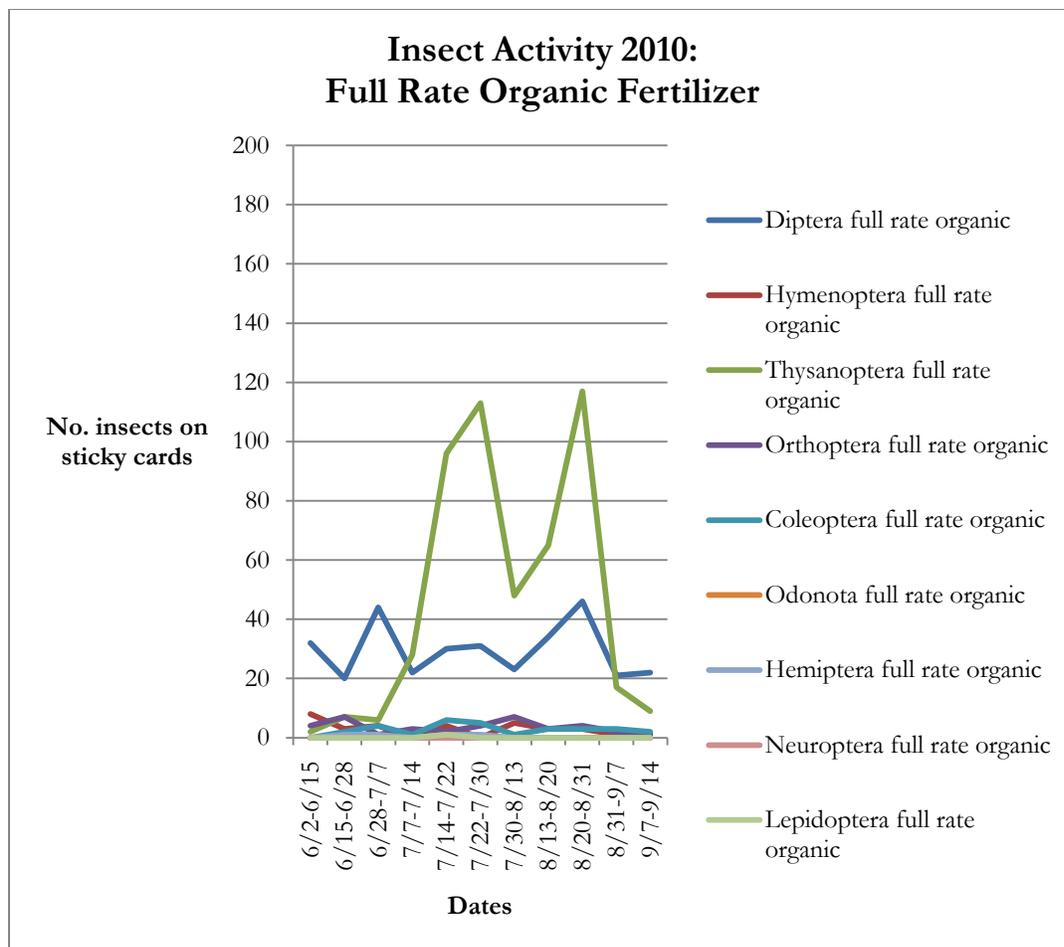


## Insect Activity 2010: 1/2 Rate Organic Fertilizer



### Insect Activity 2010: Full Rate Traditional Fertilizer





The y-axis on each of the above graphs is set at 200 for each fertilizer treatment to make it easier to compare treatments. Results are similar to 2009 in that it seems that thrips (Thysanoptera) and flies (Diptera) comprised the largest insect populations in the plots. The difference between the two years is the high number found; in 2009 it was less than 100 per sticky card but in 2010 thrips numbers edged up to almost 200. Results were not consistent across treatments although trends were similar.

### Impacts

Since the fertilization studies were conducted in two different ways in 2009 and 2010, comparisons cannot be made. Varieties of tomatoes and peppers grown in the two years were different due to greenhouse production problems in 2010. Plants sown from seed were heavily infested with aphids and other insects in the greenhouse and were not usable. Plants from a local garden center were subsequently purchased for use in the second-year fertilization trials. However, the basic yields as well as nutritional information gained from laboratory analyses of total phenols, total flavonoids, and antioxidant activity will be valuable to vegetable producers and consumers alike.

As far as production goes, we can recommend 'Paragon', 'Super Fantastic', and 'Yellow Perfection' tomatoes; 'Sweet Chocolate' and 'Better Belle' peppers; 'Cylindra' and 'Kestral' beets; and 'Little Finger' and 'Danvers' carrots as good producers under a variety of fertilization schemes. For producers wanting to grow under season extension conditions, either under row covers or in a

high tunnel, varieties suggested would be 'King of the North' and 'California Wonder Orange' peppers; 'Rutgers' and 'Cosmonaut' tomatoes; and 'Black' eggplant (though eggplant as a rule did not produce well either year in Sheridan).

Nutritionally-speaking in 2009, 'Early Red Chief' tomato, 'California Wonder' pepper (although none stood out dramatically from the other varieties), 'Cylindra' beet, and 'Danvers' carrot (again, none stood out) showed moderate to high total phenols, total flavonoids, and antioxidant activity (2009). In 2010, 'Yellow Perfection' tomato, 'Better Belle' pepper, 'Lutz' beet, and 'Little Finger' carrot showed highest levels of nutritional qualities tested. From the 2009 season extension studies, those somewhat nutritionally superior that would be recommended are 'Purple Beauty' pepper, either 'Rutgers' or 'Cosmonaut' tomato (almost the same under row cover and high tunnel), and 'Black' eggplant. From 2010 data, 'California Orange' pepper, 'Cosmonaut' tomato, and 'Black' eggplant would be suggested.

The weed management segment of this project did not fare well either season due to huge numbers of grasshoppers. These insects ate everything, crops and weeds, making it difficult to gauge weed management due to treatments applied. We cannot recommend a weed manage strategy from this project as detrimental insects like grasshoppers would have to be controlled first.

Insect populations vary according to time of the growing season, as expected. From the information gathered in 2009 and 2010 from sticky trap counts, growers and consumers can be warned about what types of insects to expect and can plan management strategies in advance. We can say thrips populations will be very high during July and August, the warmer months of the growing season. This is important because not only do thrips cause plant damage, but they are also vectors of viruses which have economic impacts on several hundred species of plants, rendering them unsalable. Interestingly, some of the most economically-damaging insects, like aphids and whiteflies, occurred at low levels on the sticky cards.

### **Future Implications**

Studies like these should be continued in Wyoming for future use by commercial growers and consumers alike. The recent emphasis on local production makes this information even more valuable.

## Budget

Funds for this project were 100% spent, with additional \$2,311.76 in-kind expenditures over and above the \$20,000 grant required to cover high costs of nutritional analyses and an additional trip to Sheridan in July 2010. The breakdown of expenditures follows.

Budget Expenditures				
Item	2008	2009	2010	Total
Growing supplies	\$ 2,265.31	\$ 503.15	\$ 338.75	\$ 3,107.21
Labor	\$ 0	\$ 5,153.81	\$ 0	\$ 5,153.81
Travel	\$ 0	\$ 353.99	\$ 0	\$ 353.99
Nutritional/soil analyses	\$ 0	\$ 5,800.00	\$ 5416.99	\$ 11,216.99
Miscellaneous costs	\$ 168.00	\$ 0	\$ 0	\$ 168.00
Totals	\$ 2,433.31	\$ 11,810.95	\$ 5,755.74	\$ 20,000.00
In-kind				
Travel/Panther 7/10	\$ 0	\$ 0	\$ 218.75	\$ 218.75
Nutritional analyses	\$ 0	\$ 0	\$ 2,093.01	\$ 2,093.01
Total in-kind			\$ 2,311.76	\$ 2,311.76
Total project cost			\$ 22,311.76	\$ 22,311.76