2005 WINTER ELITE WHEAT TRIAL

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Introduction

Malheur Experiment Station provides one location for the Oregon State University Statewide Winter Elite Wheat variety testing program. This location compares cereal grain variety performance in a furrow-irrigated, high yield potential environment. Plant breeders can use information on variety performance to compare advanced lines with released cultivars. Growers can use this information to make decisions about which soft white winter wheat varieties may perform best in their fields.

Materials and Methods

The previous crop was sweet corn. After harvest, the corn stalks were flailed, the field was disked, and the soil was sampled and analyzed. The analysis showed 40 lb nitrogen (N)/acre in the top 2 ft of soil, and in the top foot of soil, 79 lb available phosphate (P_2O_5), 1,267 lb soluble potash (K_2O), and 51 lb sulfate (SO_4)/acre, with 3,025 ppm calcium (Ca), 521 ppm magnesium (Mg), 175 ppm sodium (Na), 1.7 ppm zinc (Zn), 9 ppm iron (Fe), 8 ppm manganese (Mn), 0.6 ppm copper (Cu), 0.5 ppm boron (B), pH 7.7, and 3.5 percent organic matter. Preplant fertilizer was broadcast in October, 2004 to apply 50 lb N/acre, 80 lb elemental S/acre, 2 lb Cu/acre, and 2 lb B/acre. The soil was deep ripped, plowed, and groundhogged to prepare the seedbed. The field was corrugated into 30-inch rows.

The Winter Elite Wheat Trial was comprised of 38 soft white winter (SWW) wheat cultivars or lines, 4 of which were club types, and 5 with resistance to imazamox herbicide for use in the BASF Clearfield® system (designated SWW-CF). One ultra-soft white wheat and one hard white wheat were also included in the trial. Seed of all entries was treated with fungicide and insecticide seed treatment prior to planting. Grain was planted at 30 live seed/ft^2, corresponding to a seeding rate of approximately 110 lb/acre. The experimental design was a randomized complete block with three replications. Grain was planted on October 19, 2004, with a small plot grain drill, into plots 5 by 20 ft, and the field was recorrugated. Rainfall on October 19 totaled 0.15 inch, and through the end of October an additional 2.02 inch of rain fell. Emergence was seen on November 11.

The trial was irrigated on May 2 for 30 hours. Broadleaf weeds were controlled with Bronate® herbicide at 1qt/acre applied on May 20. Urea prills fertilizer to supply 50 lb N/acre was broadcast over the trial on May 24, and the trial was furrow irrigated for 8 hours on May 25.The trial was irrigated for 24 hours on June 8 and again on June 21. Observations of heading date were made from May 21 through May 31. Alleys were cut with a sickle bar mower on June 8. Plant height at maturity was measured in the trial on July 19. The alleys were recut with a Hege plot combine on July 20 and the resulting length of each plot was measured and recorded. The plots were harvested on July 20 with a Hege plot combine. Yield and test weight differences were compared using ANOVA and least significant differences at the 5 percent probability level, LSD (0.05). Differences in yield or test weight between varieties should be equal to or greater than the corresponding LSD (0.05) value before any variety is considered different from another in this trial.

Results and Discussion

The plants in the Winter Elite Wheat Trial grew well, with grain heads developing in these varieties from May 20 to May 31. Height at maturity ranged from 34 to 42 inches tall. Lodging was observed in only three plots in the first replicate; one plot of 'IDO620' lodged 80 percent, one plot of 'OR9801757' lodged 30 percent, and one plot of 'OR9901619' lodged 10 percent. Test weights in this trial ranged from 60 to 65 lb/bushel.

Among the highest yielding wheat varieties were 'BZ6W93-901a' with 152 bu/acre, 'ID92-16004A' with 151, 'Dune' with 149, 'Tubbs' with 147, 'ORH010920' with 147, 'ORH010917' with 147, 'WestBred528' with 146, 'Simon' with 143, 'Mohler' with 143, 'ORH010918' with 143, 'OR941611' with 143, 'Finch' with 142, 'OR2010007-05C' with 141, 'OR9901887' with 140, and 'ID92-22407A' with 140 bu/acre (Table 1). 'Stephens' wheat produced 133 bu/acre.

Information on previous wheat trials at Malheur Experiment Station is available on the web at http://cropinfo.net. Information on the performance of the varieties in this trial at other Oregon locations is available on the web at http://cropandsoil.oregonstate.edu/wheat/state_performance_data.htm.

Table 1. Winter Elite Wheat Trial market class, 50 percent heading date, height at maturity, and yield, Malheur Experiment Station, Oregon State University, Ontario, OR, 2005.

Entry	Origin / developer	Class / traits*	50% heading	Height at maturity	Yield	Test weight
			date	inch	bu/acre†	lb/bu
BZ6W93-901a	WestBred	SWW	5/26	40	152.2	64.1
ID92-16004A	U of I	SWW	5/27	39	151.0	62.1
Dune	U of I	SWW	5/23	36	149.4	64.1
Tubbs	OSU	SWW	5/26	40	147.0	62.3
ORH010920	OSU	SWW	5/21	35	146.9	62.6
ORH010917	OSU	SWW	5/23	37	146.7	61.8
WestBred528	WestBred	SWW	5/22	37	145.5	62.8
Simon	U of I	SWW	5/27	39	143.4	62.9
Mohler	WestBred	SWW	5/25	39	143.4	62.9
ORH010918	OSU	SWW	5/23	35	143.2	63.1
OR941611	OSU	SWW	5/26	40	142.7	63.0
Finch	ARS-WSU	Club	5/30	42	141.5	64.7
OR2010007-05C	OSU	SWW-CF	5/27	40	141.1	61.8
OR9901887	OSU	SWW	5/27	40	140.4	63.2
ID92-22407A	U of I	SWW	5/28	37	140.1	62.8
ORSS-1757‡	OSU	SWW	5/26	39	138.3	63.7
IDO587CL	U of I	SWW-CF	5/24	38	138.2	N/A§
ORI202183C	OSU	SWW-CF	5/27	39	138.2	62.2
ORH011481	OSU	SWW	5/20	34	137.5	62.1
ORCF-102	OSU	SWW-CF	5/28	40	135.6	63.3
ORH010085	OSU	SWW	5/26	37	134.5	N/A
ORH012183	OSU	SWW	5/24	36	134.4	64.5
Coda	ARS-WSU	Club	5/30	42	133.9	63.5
ORH010083	OSU	SWW	5/26	38	133.8	62.9
OR3970965	OSU	SWW	5/29	41	133.6	62.2
OR2010239	OSU	SWW	5/26	39	133.2	62.5
Stephens	OSU	SWW	5/25	38	133.1	62.3
OR9900553	OSU	SWW	5/28	38	132.6	63.6
Masami	WSU	SWW	5/31	42	132.5	62.6
OR2010241	OSU	SWW	5/27	39	131.8	62.7
OR9901619	OSU	SWW	5/30	42	130.9	61.0
Madsen	ARS-WSU	SWW	5/27	39	129.9	62.8
ORCF-101	OSU	SWW-CF	5/27	38	129.1	62.8
Brundage96	U of I	SWW	5/26	37	129.0	62.0
Gene	OSU	SWW	5/26	34	128.2	60.0
Rod	WSU	SWW	5/26	41	127.5	62.6
Weatherford	OSU	SWW	5/29	39	127.0	62.7
ARS99123	ARS-WSU	Club	5/22	40	120.1	62.1
Chukar	ARS-WSU	Club	5/30	42	116.6	61.9
IDO620	U of I	HWW	5/30	42	107.1	63.1
Mean			5/26	39	136.0	62.7
LSD¶ (0.05)					12.7	2.0

*SWW = Soft White Winter, SWW-CF = Soft White Winter with resistance to imazamox herbicide.
†60-lb bushel.
‡Ultra-soft white winter wheat.
§ N/A = Test weights were not available.
¶Least Significant Difference at *alpha* P ≤ 0.05.

The five irrigation treatments consisted of three water application rates for the microsprinkler-irrigated plots and two water application rates for the drip-irrigated plots (Table 2). From 2000 through 2002, all plots in the 3 microsprinkler-irrigated treatments were irrigated whenever the SWP at 8-inch depth, averaged over all plots in treatment 1, reached -50 kPa. The plots in each drip-irrigated treatment were irrigated whenever the SWP at 8-inch depth, averaged over all plots in the respective treatment, reached -50 kPa. Irrigation treatments were terminated on September 30 each year.

Soil water content was measured with a neutron probe. Two access tubes were installed in each plot along the middle tree row on each side of the fourth tree between the sprinklers and the tree. Soil water content readings were made twice weekly at the same depths as the GMS. The neutron probe was calibrated by taking soil samples and probe readings at 8-inch, 20-inch, and 32-inch depth during installation of the access tubes. The soil water content was determined gravimetrically from the soil samples and regressed against the neutron probe readings, separately for each soil depth. The regression equations were then used to transform the neutron probe readings during the season into volumetric soil water content. Coefficients of determination (r^2) for the regression equations were 0.89, 0.88, and 0.81 at $P = 0.001$ for the 8-inch, 20-inch, and 32-inch depths, respectively.

The heights and diameter at breast height (DBH, 4.5 ft from ground) of the central three trees in the two middle rows in each plot were measured monthly from May through September. Tree heights were measured with a clinometer (model PM-5, Suunto, Espoo, Finland) and DBH was measured with a diameter tape. Stem volumes (excluding bark and including stump and top) were calculated for each of the central six trees in each plot using an equation developed for poplars that uses tree height and DBH (Browne 1962). Growth increments for height, DBH, and stem volume were calculated as the difference in the respective parameter between October of the current year and October of the previous year. Curves of current annual increment (CAI) and mean annual increment (MAI) of stem volume over the 8 years for the treatment 1 microsprinkler-irrigated trees and for the 2 drip tape configurations were used to assess the growth stage of the plantation. The MAI is CAI divided by the tree age.

2000 Procedures

The side branches on the bottom 6 ft of the tree trunk had been pruned from all trees in February 1999. In March of 2000, another 3 ft of trunk was pruned, resulting in 9 ft of pruned trunk. The pruned branches were flailed on the ground and the ground between the tree rows was lightly disked on April 12. On April 24, Prowl® at 3.3 lb ai/acre was broadcast for weed control. The microsprinkler-irrigated plots received 0.7 inch of water to incorporate the Prowl. To control the alfalfa and weeds remaining from the previous years' groundcover trial in the top half of the field, Stinger® at 0.19 lb ai/acre was broadcast between the tree rows on May 19, and Poast® at 0.23 lb ai/acre was broadcast between the tree rows on June 1. On June 14, Stinger at 0.19 lb ai/acre and Roundup® at 3 lb ai/acre were broadcast between the tree rows on the whole field.

On May 19 the trees received 50 lb nitrogen (N)/acre as urea-ammonium nitrate solution injected through the microsprinkler system. Due to deficient levels of leaf nutrients in early July, the field had the following nutrients in lb/acre injected in the irrigation systems: 0.4 lb boron (B), 0.6 lb copper (Cu), 0.4 lb iron (Fe), 5 lb magnesium (Mg), 0.25 lb zinc (Zn), and 3 lb phosphorus (P). The field was sprayed aerially for leafhopper control with Diazinon AG500® at 1 lb ai/acre on May 27 and with Warrior® at 0.03 lb ai/acre on July 10.

2001 Procedures

In March of 2001, another 3 ft of trunk was pruned, resulting in 12 ft of pruned trunk. The pruned branches were flailed on the ground on April 2. On April 4, Roundup at 1 lb ai/acre was broadcast for weed control. On April 10, 200 lb N/acre, 140 lb P/acre, 490 lb sulfur (S)/acre, and 14 lb Zn/acre (urea, monoammonium phosphate, zinc sulfate, and elemental sulfur) were broadcast. The ground between the tree rows was lightly disked on April 12. On April 13, Prowl at 3.3 lb ai/acre was broadcast for weed control. The microsprinkler-irrigated plots received 0.8 inch of water to incorporate the Prowl.

A leafhopper, willow sharpshooter (*Graphocephala confluens,* Uhler), was monitored by three yellow sticky traps attached to the lower trunk of selected trees. Traps were checked weekly. From mid-April to early June only adults were observed in the traps. A willow sharpshooter hatch was observed on June 6 as large numbers of nymphs were noted in the traps and on the lower trunk sprouts. The field was sprayed aerially with Warrior at 0.03 lb ai/acre on June 11 for leafhopper control.

2002 Procedures

In March of 2002, another 3 ft of trunk was pruned, resulting in 15 ft of pruned trunk. The pruned branches were flailed on the ground on April 12. On April 23, 80 lb N/acre, 40 lb potassium (K)/acre, 150 lb S/acre, 20 lb Mg/acre, 6 lb Zn/acre, 1 lb Cu/acre, and 1 lb B/acre (urea, potassium/magnesium sulfate, elemental sulfur, zinc sulfate, copper sulfate, and boric acid) were broadcast and the field was disked. On April 24, Prowl at 3.3 lb ai/acre was broadcast for weed control. The microsprinkler-irrigated plots received 0.7 inch of water to incorporate the Prowl.

The willow sharpshooter was monitored by three yellow sticky traps attached to the lower trunk of selected trees. Traps were checked weekly. The field was sprayed aerially with Warrior at 0.03 lb ai/acre on June 10 for leafhopper control.

2003 Procedures

In March of 2003, another 3 ft of trunk was pruned, resulting in 18 ft of pruned trunk. The pruned branches were flailed on the ground on March 31. On April 23, 80 lb N/acre as urea and 167 lb S/acre as elemental sulfur were broadcast and the field was disked. On April 16, Prowl at 3.3 lb ai/acre was broadcast for weed control. The microsprinkler-irrigated plots received 0.4 inch of water to incorporate the Prowl.

Starting in 2003 the irrigation criterion was changed to -25 kPa and the water applied at each irrigation was reduced accordingly (Table 2). All plots in the three microsprinkler-irrigated treatments were irrigated whenever the SWP at 8-inch depth, averaged over all plots in treatment 1, reached -25 kPa. The plots in each drip-irrigated treatment were irrigated whenever the SWP at 8-inch depth, averaged over all plots in the respective treatment, reached -25 kPa. Irrigation treatments were terminated on September 30.

The drip tape needed to be replaced because iron sulfide plugged the emitters. The drip tape was replaced with another brand (T-tape, T-systems International, San Diego, CA) in mid-April because Nelson Irrigation discontinued production of drip tape. The drip tape specifications were the same.

The willow sharpshooter was monitored by three yellow sticky traps attached to the lower trunk of selected trees. Traps were checked weekly. The field was sprayed aerially with Warrior at 0.03 lb ai/acre on June 5 for leafhopper control.

2004 Procedures
On March 31, 2004, N at 80 lb/acre, S at 250 lb/acre, P at 50 lb/acre, K at 50 lb/acre, Cu at 1 lb/acre, Zn at 4 lb/acre, and B at 1 lb/acre were broadcast. The field was lightly disked on April 1. On April 13, Prowl at 3.3 lb ai/acre was broadcast for weed control. The microsprinkler-irrigated plots received 0.4 inch of water to incorporate the Prowl. On June 12 the field was sprayed with Warrior at 0.03 lb ai/acre for leafhopper control. A leaf tissue sample taken on July 7 showed a P deficiency. On July 9, P at 10 lb/acre as phosphoric acid was injected through the sprinkler and drip systems.

2005 Procedures
A soil sample taken on April 4, 2005, showed the need for N at 50 lb/acre, and S at 400 lb/acre, which were broadcast on April 7. On April 8, Prowl at 3.3 lb ai/acre was broadcast for weed control. On June 22, the field was fertilized with N at 50 lb/acre as urea ammonium nitrate solution injected through the drip and sprinkler systems. On June 24 the field was sprayed with Warrior at 0.03 lb ai/acre for leafhopper control.

Results and Discussion

In 2005, the microsprinkler-irrigated treatment with 1 inch of water applied at each irrigation received 51.5 acre-inch/acre of water in 55 irrigations (Table 1). The drip treatment with 1 inch of water applied with 2 tapes received 56.1 acre-inch/acre applied in 38 irrigations. The drip treatment with 0.5 inch of water applied with 1 tape received 34.4 acre-inch/acre in 37 irrigations. The large discrepancies between the number of irrigations applied and the actual amount of water applied can be explained by inefficiencies in the irrigation system, such as leaks caused by rodent damage. The tree squirrel population in an adjacent walnut orchard was inadvertently allowed to increase in the past, resulting in damage to the drip and microsprinkler irrigation systems.

In November 2005 (ninth year), trees in the two-drip-tape configuration had the highest stem volume (Table 2). In November 2005, trees in the wettest sprinkler-irrigated treatment averaged 63 ft in height, 9.5 inch in DBH, and 2,515 ft^3/acre in stem volume (Table 2). In November 2005, trees in the drip-irrigated treatment with 2 drip tapes per tree row averaged 76.8 ft in height, 10.3 inch in DBH, and 3372 ft^3/acre in stem volume. Trees in the two-drip-tape configuration had the highest tree growth increment in 2005 and had the highest accumulated tree growth from 2000 through 2005.

Although tree growth increased with increasing applied water up to the highest amount tested, tree growth was not maximized in this study (Fig. 1). There were similar linear relationships, with similar slopes, between total water applied and stem volume growth for the drip and microsprinkler systems in 2005 ($Y = -61.86 + 11.70X$, $R^2 = 0.99$, $P = 0.05$ for the drip and $Y = 52.25 + 3.38X$, $R^2 = 0.92$, $P = 0.05$ for the sprinkler).

For 2000 through 2005, there were distinctively different linear relationships, with similar slopes, between total water applied and the accumulated stem volume growth for the drip and microsprinkler systems (Fig. 2). The greater stem volume growth for the drip system reflected the higher water use efficiency of the drip system.

The SWP at 8-inch depth was maintained above the criterion of -25 kPa, except for brief periods during the season for microsprinkler irrigation with 1 inch of water applied and for drip irrigation with 2 tapes (Fig. 3). The SWP at 8-inch depth was reduced, as expected, with the reductions in the water application rate in the sprinkler treatments (Fig. 3, Table 3). During irrigations the SWP at 8-inch depth in the drip treatments was greater than in the sprinkler treatments, as expected, since the wetted area was smaller with drip irrigation (Fig. 3). It was difficult to maintain the irrigation criterion with the one-drip-tape configuration because of the smaller amount of water applied at each irrigation. With 1 drip tape, it takes 33 hours to apply 0.5 inch of water at each irrigation and usually about 30 hours later (the second morning after) the SWP would be equal to or considerably drier than -25 kPa.

The rate of increase in annual stem volume growth increased (growth approximately doubled every year) up to 2001, when the stem volume growth for the microsprinkler-irrigated trees started to decline (Table 4, Fig. 4). In 2002 the stem volume growth for the drip-irrigated trees started to decline. The decline in annual growth was not expected until later, when the trees approach harvest size. The reduction of SWP from -25 to -50 kPa in 2000 might be associated with the decline in annual stem volume growth. Tree growth was substantially greater in 2003 and was approximately double the growth in 2002; this could have been due to the change to a wetter irrigation threshold, from -50 to -25 kPa. In 2005, tree growth for the drip-irrigated trees was less than in 2003, but higher than in 2004, for unknown reasons. In 2005, tree growth for the microsprinkler-irrigated trees was lower than in 2004 or 2003. The lower tree growth in 2005 compared to 2003 and 2004 could be related to the cooler weather in 2005.

Since the trees were planted in 1997, 2005 had the fewest growing degree days (50-86°F) from April through October (Table 4).

The trees in the microsprinkler irrigated plots started exhibiting leaf chlorosis around mid-July, whereas the trees in the drip-irrigated plots did not exhibit leaf chlorosis. Leaf analyses of the chlorotic leaves in the microsprinkler-irrigated plots and the green leaves in the drip-irrigated plots showed only minor differences on July 20. The analysis for the microsprinkler trees showed deficiencies of N, P, and K and for the drip trees deficiencies of P and K. The microsprinkler trees had 2.3 ppm N, 0.18 ppm P, and 1.63 ppm K. The drip trees had 2.5 ppm N, 0.17 ppm P, and 1.2 ppm K. The minimum sufficiency points for poplar are 2.3 ppm N, 0.25 ppm P, and 1.7 ppm K. The deficiencies were inadvertently not corrected. The foliar ratio of K to Mg was substantially below the optimum: it was 1.3 to 1 in the drip plots and 1.6 for the sprinkler plots, the ideal is 8 to 1.

The leaf analyses also showed that both the microsprinkler and drip trees had excesses of both Ca and B, with the excesses being slightly higher for the microsprinkler trees. The upper sufficiency point for Ca is 2.4 ppm and for B is 65 ppm. The microsprinkler trees had 3.6 ppm Ca and 144 ppm B. The drip trees had 2.9 ppm Ca and 132 ppm B. These excessively high leaf B concentrations could result in B toxicity. Boron toxicity symptoms include leaf chlorosis. The leaf chlorosis in the microsprinkler trees could be related to the N and K deficiencies and/or to the B excess, and could be related to the decline in growth in 2005. As yet unexplained is the lack of chlorosis in the drip trees, despite the similar nutrient profile to the microsprinkler trees. The excessive B in the leaf tissue could be related to the increase in B concentration in the soil over the years. The soil in the top foot initially had 0.5 ppm B in 1997, increasing to 0.9 ppm in 2001, 2.7 ppm in the spring of 2005, and 4 ppm in the fall of 2005. The increase in B levels could be due to high B in the irrigation water. Up until 2005 all plots were irrigated with the same well. In 2005, the drip plots started being irrigated with a different well, possibly reducing the B uptake by the drip-irrigated trees. Analyses of the irrigation waters as well as the soil and leaf tissue in 2006 might determine causes of these nutrient problems.

Both the CAI and the MAI continue to increase over time for the trees in the two-drip-tape configuration (Fig. 4). However, the microsprinkler trees showed a substantial decline in CAI in 2005, which could be related to the nutrition problems discussed in the previous paragraph. Typically, both the CAI and MAI initially increase, reach a culmination point and then decline. The CAI will culminate before the MAI. The intersection of the two curves is termed the economic rotation and indicates the harvest stage of the plantation.

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Table 1. Irrigation rates, amounts, and water use efficiency for hybrid poplar submitted to five irrigation regimes in 2005, Malheur Experiment Station, Oregon State University, Ontario, OR.

Treatment	Irrigation threshold	Water application	Irrigation system	Total number of irrigations	Total water applied*	Water use efficiency
	kPa†	inch			acre-inch/ acre	ft³ of wood/acre-inch of water
1	-25	1	Microsprinkler	55	51.5	6.0
2	coincide with trt 1	0.77	Microsprinkler	55	39.7	5.9
3	coincide with trt 1	0.39	Microsprinkler	55	22.6	5.3
4	-25	1	Drip, 2 tapes	38	56.1	13.1
5	-25	0.5	Drip, 1 tape	37	34.4	9.9
LSD (0.05)				1	14.9	NS

*Includes 2.39 inches of precipitation from May through September.

†Soil water potential at 8-inch depth.

Table 2. Height, diameter at breast height (DBH), and stem volume in early November 2005, and 2005 growth in height, DBH, and stem volume for hybrid poplar submitted to five irrigation treatments, Malheur Experiment Station, Oregon State University, Ontario, OR.

	November 2005 measurements			2005 growth increment			2000-2005 growth increment
Treatment	Height	DBH	Stem volume	Height	DBH	Stem volume	Stem volume
	ft	inch	ft³/acre	ft	inch	ft³/acre	ft³/acre
1	63.0	9.5	2,515.5	2.0	0.45	306.4	2,284.3
2	52.7	8.3	1,612.6	2.5	0.43	231.5	1,412.5
3	41.2	5.8	614.1	3.2	0.37	120.6	537.3
4	76.8	10.3	3,371.8	6.8	0.71	719.3	3,199.0
5	58.2	8.8	2,035.6	3.0	0.52	339.7	1,849.8
LSD (0.05)	NS	0.8	767.2	NS	NS	178.4	793.1

Table 3. Average soil water potential and volumetric soil water content for hybrid poplar submitted to five irrigation treatments, Malheur Experiment Station, Oregon State University, Ontario, OR.

Treatment	Average soil water potential		
	1st ft	2nd ft	3rd ft
	kPa		
1	25.9	28.8	26.4
2	57.8	49.1	42.2
3	150.1	75.2	80.8
4	24	31.5	25.5
5	26.6	22.4	28.9
LSD (0.05)	23.1	21.5*	19.8

*significant at P = 0.10.

Table 4. Annual stem volume growth, seasonal average soil water potential at 8-inch depth, and growing degree days for the drip and microsprinkler treatments receiving the most water, Malheur Experiment Station, Oregon State University, Ontario, OR.

Year	Annual stem volume growth		Seasonal average soil water potential at 8-inch depth		Water applied plus precipitation		ET_c	April - Oct. Growing degree days (50-86°F)
	Drip	Microsprinkler	Drip	Microsprinkler	Drip	Microsprinkler		
	---- ft^3/acre ----		---- kPa ----		----------- inches ------------			
1997		1.3		-21.4		27.2		3,049
1998		78.5		-20.0		45.0	37.1	2,968
1999		177.7		-22.2		51.0	45.5	2,846
2000	387.9	401.5	-24.2	-37.9	35.2	42.1	47.1	3,067
2001	479.9	354.7	-26.4	-33.9	35.8	34.3	44.7	3,118
2002	440.1	256.8	-31.3	-35.8	30.6	38.1	44.4	3,023
2003	737.9	450.7	-21.8	-26.9	54.8	47.1	45.9	3,354
2004	679.4	512.3	-20.2	-22.2	56.3	51.7	44.1	3,106
2005	719.3	306.4	-24.0	-25.9	56.1	51.5	45.3	2,829

Results and Discussion

At the wheat field site, only 3 to 8 shoots/yd^2 emerged by November 9 and there were no significant differences among treatments. Treatments were evidently initiated too late in the season. At this point, disking alone was probably able to prevent additional tubers from being produced. However, yellow nutsedge growth during the period following wheat harvest and prior to treatment initiation was probably long enough to allow significant tuber production to occur. This research demonstrated that in order for idle-land treatments with Eptam to be of benefit, they need to be applied as soon after wheat harvest as possible. Practices such as disking alone may also be effective for reducing yellow nutsedge growth and tuber production.