Research report to the

Agricultural Research Foundation

and the

Oregon Processed Vegetable Commission

2002

Title: Pest Management in Sweet Corn

1. *Efficacy of Vapam for control of weeds, insects and diseases in sweet corn*
2. *Impact of irrigation level on corn and disease*

Project Leader

Ed Peachey, Horticulture Dept., Sr. Res. Assistant, 541-737-3152, Peacheye@bcc.orst.edu

Cooperators

Dwight Ediger, Dayton farmer
Glenn Fisher, Entomology
Robin Ludy, Botany and Plant Pathology
Bill Haglund, Emeritus, Washington State University
Hendriks Farms, Stayton
Beth Hoinaki, Botany and Plant Pathology
Carol Mallory-Smith, Crop and Soil Science
Jim Myers, Horticulture
Cindy Ocamb, Botany and Plant Pathology
Mary Powelson, Botany and Plant Pathology
Joe Shoemaker, West Scio Farmer
Alex Stone, Horticulture
Jon Umble, Entomology
Ray William, Horticulture
Dave Withey, Wheatland farmer

Summary

- Vapam applied in a 12 inch band at 4 and 12 inches below the soil controlled weeds relatively well at application rates of 37.5 to 50 GPA.
- Suppression of root rot was noted in some of the strip fumigation trials, but generally did not improve yield.
- Vapam was not as effective as methyl bromide in reducing root rot.
- Vapam had no effect on symphylans or other soil borne insect pests, and may have actually increased root feeding of the twelve spot beetle larvae.
- Reducing irrigation by approximately 20% did not reduce yield of Jubilee sweet corn, and may have increased yield by as much as ½ ton/A
- Reducing the irrigation rate by 20% caused less 'firing' in Jubilee corn.

I. Efficacy of Vapam for control of weeds, insects, and diseases in sweet corn

Metam sodium (Vapam) has long been used as a fumigant for many crops. Aside from cost, the primary drawback is keeping it in the soil long enough to kill the target organism. Vapam quickly breaks down to methylisothiocyanate (MITC), which is very volatile. Tarping is the most effective method for MITC retention, but other techniques are used with varying degrees of success, such as irrigation immediately after application and rolling the soil with a reverse action roller. We demonstrated in 1995 and 1996 that metam can be used to control small-seeded weeds if metam is incorporated with a rototiller and then followed by heavy irrigation. Some weed seeds near the soil surface escaped, probably because of loss of the fumigant in the soil surface layer. The cost of fumigation in sweet corn prohibits broadcast use of fumigation. A strip fumigation applicator developed by Dr. Haglund (emeritus, Washington State University) has been used to reduce application rates in vegetable crops while maintaining weed and disease control in the planted row.

The objective of this study was to determine the potential of using strip Vapam applications to control weeds, insects, and to reduce root rot of sweet corn. Field trials were located at 6 sites to test efficacy in different soil types with a variety of pest organisms. The site characteristics and objectives are listed in Table 1. Vapam was applied as a 1:1.3 (v/v) mixture of Vapam and water with a strip applicator that placed the fumigant at 4 and 12 inches deep. Vapam was applied at the Scio site broadcast by a commercial applicator.

Table 1. Study sites and objectives.

Site	Objective	Fumigation type
1. West Scio, 1861	Disease control	Broadcast Vapam and Methyl bromide + chloropicrin
2. Vegetable Research Farm, Corvallis Golden Jubilee, silt loam	Domestic millet, summer annual weed control	Strip applicator (Vapam)
3. Stayton, Golden Jubilee, very rocky soil	Weed and disease control	Used a grower designed applicator for very rocky soil (Vapam)
4. Dayton, Golden Jubilee, river loam	Weed and disease control	Strip applicator (Vapam)
5. Wheatland, Golden Jubilee, clay loam	Disease control	Strip applicator (Vapam)
6. Kiger Island, Golden Jubilee, sandy loam	Symphylan suppression	Strip applicator (Vapam)

West Scio

The objective of this trial was to determine the potential of Vapam to control weeds and reduce root disease in sweet corn. The primary use of this site was a variety trial conducted by Dr. Myers. However, small areas adjacent to the variety trial in each block were used to assess fumigation impacts on weed control and root rot in sweet corn.

Vapam was applied broadcast at 75 GPA and methyl bromide + chloropicrin at 320 GPA followed by tarping to plots 22 ft wide by 120 long on June 4. There were 4 replications of each treatment. The replicated check plots of the same dimensions were not tarped. The tarp was sliced open on June 10 and removed on June 11. The grower reworked the plots with a disk and harrow just before planting. Sweet corn (var 1861) was planted on June 20. Corn was harvested from 2- 16 ft section of row in each plot on October 3.

Table 2. Effect of broadcast fumigation on sweet corn (var. 1861) yield and root disease at harvest, West Scio, 2002.

	Yield	Ears	Avg. ear wt	Disease severity[a]
	t/A	No./A	lbs	% of infected roots
Check	12.8	24100	1.06	25.4
Methyl Bromide	12.7	24300	1.05	3.4
Vapam	13.6	23400	1.16	9.3
LSD	0.9	ns	0.09	3.5

[a] data provided by Dr. Myers' project, Horticulture Dept, OSU

Weed control was not evaluated because the weed population at this site was very low. The variety 1861 yielded very well at this site and yields were unaffected by any of the fumigation treatments. There was an indication that root feeding by Diabrotica larvae (12 spot beetle) increased in the fumigated plots, the cause of which is unclear.

Vegetable Research Farm

This site was in sweet corn for the last two years. The field was ripped on May 16 to 20 inches, then plowed, disked and rototilled with a vertical tine tiller. Rainfall settled the soil before planting and it was ripped again to 20 inches and rototilled once. Millet seed was broadcast before the field was rototilled. Vapam treatments were applied with a one row applicator to rows that were 40 inches apart. There were three rows per plot and plots were 50 ft in length. Each treatment was replicated four times in a randomized complete block design. The hills created by the strip fumigator were leveled on June 5. Fertilizer (480 lbs 12-29-10) was shanked into the fumigated areas and rows marked with a Gaspardo planter. Sweet corn was planted with a belt planter on June 10 at approx 50 seeds per 40 ft. The plots were cultivated twice to control weeds between the rows, leaving a 12 inch strip uncultivated in the corn row.

Soil was extracted for nematode sampling just before the hills were leveled. Weed control was visually estimated within the 12 inch band over the corn row on July 7 (4 WAP). Sweet corn seedling emergence and survival was counted on July 1 from 8 ft in each row (three rows/plot) and corn harvested on September 19. Shucked weight of the corn was estimated by shucking 20 ears of the total harvested from each plot. Corn roots were evaluated for disease by pulling two plants of the center row in each plot. Plots were evaluated for firing at harvest.

Vapam controlled millet, pigweed, and nightshade, nearly eliminated nematodes in some treatments, and increased yield by as much as 20 percent compared to the untreated checks. Firing was noted in some plots but was highly variable across the site, and only slightly related to Vapam treatment (P=0.15). Root rot was not greatly affected by Vapam treatments. Vapam did not control purslane. Corn emergence was highly variable across the field and related primarily to location of the plots within the field rather than Vapam treatment. Crow damage also was severe on one side of the field.

Table 3. Effect of Vapam application rate, placement, and soil treatment following application on weed control in Jubilee sweet corn, Veg. Res. Farm, Corvallis, 2002.

Treat	Vapam application rate			Soil treatment following application		Weed control (4 WAP)		
No.	4 inch	12 inch	Surface spray	Hill	Packed hill	Red millet	Nightshade	Pigweed
	---------------- gpa -------------					------------- % --------------		
1	0	0	-	+	-	0	0	0
2	0	0	-	+	+	0	0	0
3	30	20	-	+	-	99	95	96
4	30	20	-	+	+	100	100	99
5	22.5	15	-	+	-	100	95	99
6	22.5	15	-	+	+	93	89	84
7	0	0	30	+	+	98	91	93
8	30	20	30	+	+	99	96	100
9	30	0	-	+	+	99	99	99
LSD $_{0.05}$						6	5	8

Table 4. Effect of Vapam on sweet corn emergence and root disease at 6-leaf growth stage, Veg. Res. Farm, Corvallis, 2002.

	Vapam application rate			Soil treatment following application		Obs.	Corn emergence	Root disease ratings (6 leaf growth stage)		
	4"	12"	Surface spray	Hill	Packed hill	N	4 WAP	Radicle	Meso-cotyl	Nodal roots
	-----------gpa----------						No/8 ft of row	--1-4 (4=very diseased) -		% diseased
1	0	0	-	+	-	4	6.8	2.9	0.6	0.9
2	0	0	-	+	+	4	8.3	1.8	1.5	1.0
3	30	20	-	+	-	4	9.2	1.1	1.0	0.9
4	30	20	-	+	+	4	8.6	1.8	1.3	1.0
5	22.5	15	-	+	-	4	10.2	1.5	1.4	0.9
6	22.5	15	-	+	+	4	8.5	1.8	1.0	0.6
7	0	0	30	+	+	4	8.3	3.4	0.5	1.3
8	30	20	30	+	+	4	7.0	1.5	1.4	0.8
9	30	0	-	+	+	4	7.5	1.9	1.0	0.6
FPLSD (0.050							ns	ns	2.2	ns

Table 5. Effect of Vapam application rate, placement, and soil treatment following application on nematode counts before planting of Jubilee sweet corn, Veg. Res. Farm, Corvallis, 2002.

Treatment	Vapam rate at each soil depth			Soil treatment after Vapam application		Depth of soil sample	Obs.	Nematode counts	
	4 inch	12 inch	Surface spray	Hill	Packed hill			Mean	SE
	------------ gpa --------------					inches		----- no./g of soil------	
1	0	0	-	+	-	0	4	236	42
						6	4	528	36
						12	4	575	115
2	0	0	-	+	+	0	4	206	25
						6	4	432	71
						12	4	266	65
3	30	20	-	+	-	0	4	9	3
						6	4	1	1
						12	4	6	5
4	30	20	-	+	+	0	4	6	3
						6	4	7	5
						12	4	8	6
5	22.5	15	-	+	-	0	4	43	25
						6	4	14	8
						12	4	40	37
6	22.5	15	-	+	+	0	4	4	4
						6	4	2	1
						12	4	19	14
7	0	0	30	+	+	0	4	27	11
						6	4	199	103
						12	4	456	99
8	30	20	30	+	+	0	4	2	2
						6	4	1	1
						12	4	0	0
9	30	0	-	+	+	0	4	12	8
						6	3	10	4
						12	4	183	136
$LSD_{0.05}$								183	

Table 6. Effect of Vapam on sweet corn yield, Veg. Res Farm, Corvallis, 2002.												
	Vapam application rate			Soil treatment following application		Obs.	Ears harvested	Fresh wt.	Shucked wt.	Avg. ear wt.	No value	Firing rating
	4"	12"	Surface spray	Hill	Packed hill	N						
	------------gpa----------						No./A	t/A	t/A	lbs	%	0-10 (10= total plant fired)
1	0	0	-	+	-	4	15400	7.7	4.5	0.85	3.6	0.9
2	0	0	-	+	+	4	17300	7.4	4.0	0.84	3.6	0.4
3	30	20	-	+	-	4	22200	10.1	4.5	0.90	1.8	0.1
4	30	20	-	+	+	4	18600	10.0	5.1	0.92	2.8	1.0
5	22.5	15	-	+	-	4	19100	9.8	4.8	0.89	5.2	0.5
6	22.5	15	-	+	+	4	22100	9.6	4.2	0.86	3.9	1.1
7	0	0	30	+	+	4	16600	7.1	4.0	0.85	2.5	2.0
8	30	20	30	+	+	4	20900	9.1	4.3	0.85	2.2	0.0
9	30	0	-	+	+	4	20600	9.8	4.6	0.89	1.8	1.0
$FPLSD_{0.05}$							ns	2.2	ns	ns	ns	1.3 P= 0.15

3. Stayton

A cooperating grower built a Vapam applicator that was adapted to a two row sled to test efficacy of Vapam on root disease and wild proso millet in a very rocky soil. The soil was tilled two weeks before the Vapam application and Eradicane herbicide incorporated with the last tillage operation. The field was strip-tilled one day before the Vapam was applied to loosen the soil to a depth that would allow adequate penetration of the fumigator shanks. Vapam was applied on June 6 at 25 GPA for a material cost of $70/A. The operating depth of the shanks was estimated at 2 and 6 inches on average because of the difficulty of getting the shanks into the rocky soil. Vapam was applied to 6 rows of corn for the length of the field (approx. 1600 ft). Sweet corn was harvested from 7 randomly selected areas with the fumigated plots and in untreated rows next to the fumigated strip. Additionally, the fumigated strip and the 6 rows immediately adjacent to the strip on both sides were harvested by machine and weights recorded separately.

Sweet corn yield averaged higher in the Vapam strip when evaluated by both the hand picking and machine harvest. However, during the fumigation application a nozzle broke that caused a very high rate of application in one of the rows that subsequently killed the germinating corn. Therefore, there were only 5 rows of corn in a 6-row strip. Calculating yield for a 6-row strip through the field reduces the yield to 8.1 tons, rather than 9.2 in the machine harvested assessment, a modest yield improvement of 12% rather than 27%. The entire row was not missing so it is likely that actual yield falls somewhere between 8.1 and 9.2 t/A. Much of the yield gain in the Vapam treated strip may be attributed to improved wild proso millet control, although there was evidence that root mass in the Vapam treated rows was greater than in untreated rows.

Table 7. Effect of Vapam on corn yield at Stayton, 2002. Vapam cost approx. $70/A.

Treatment	Obs.	Yield	Number ears	Average ear wt	Yield (machine harvested)
		t/A	ears/A	lbs/ear	t/A
Check	12	7.2	20200	0.73	7.2
Strip Vapam (20 GPA)	10	9.3	22100	0.84	9.2
$FPLSD_{0.05}$		1.7	ns	0.03	-

Dayton

This site had a history of very poor corn yields and abundant wild proso millet. The field was tilled, then strip tilled before the Vapam was applied. Plots were 60 ft long and one planter width wide (15 ft). Vapam was applied on June 21 and the field rolled afterward to flatten the hills made by the fumigator. Jubilee was planted on July 1 without row clearing devices. Frontier and atrazine herbicides were applied after the plots were fumigated and then rolled, causing the corn to be planted through the herbicides. Corn roots were dug from each plot on Aug 19 and evaluated for disease. Corn was harvested on October 3 with a corn harvester. Corn ears were counted (approx. 300/plot) and weighed from each plot. A random sample was collected from the four replications of each treatment and composited to make four samples for the four treatments. These samples were taken to Norpac and cutoff and maturity determined.

The midseason root evaluations indicated that Vapam was reducing root rot in sweet corn as indicated by the lower rating on primary roots that corresponded to Vapam rate. However, there was no effect of Vapam on corn yield when the corn was harvested. This trial was executed better than any of the other because of the experience we gained during the summer, amenable soil type, and soil that was deeply tilled by the strip tillage shanks prior to fumigation. The trial was harvested about 10 days early so moisture content was higher than preferred. Two other possible explanations were the relatively low rates of Vapam applied in this and other sites (marginal effect on disease in all experiments) and the fact that the soil from the top of the fumigation hill was not removed before planting.

Table 8. Effect of Vapam on Golden Jubilee sweet corn yield, Dayton, 2002.

	Vapam rate			Corn harvest			Corn cutoff						
	Total rate	4 inch depth	12 inch depth	Fresh wt (machine harvested)	Ears harvested	Avg. ear wt.	Husked wt	Kernel wt	Cob wt	Cob and husk	Kernel	No value	Moisture
		gpa		t/A	no/A	lbs/ear	lbs	lbs	lbs	%	%	%	%
1	0	0	0	5.2	16215	0.64	19.1	9.4	9.7	65%	35%	0.2	82.6
2	50	30	20	5.9	18005	0.66	16.9	7.6	9.3	69%	31%	0.7	82.0
3	37.5	22.5	15	6.6	17424	0.66	16.6	7.8	8.8	65%	35%	0.9	81.0
4	30	30	0	6.0	14766	0.68	19.5	9.3	10.2	66%	34%	0.1	81.6
FPLSD$_{(0.15)}$				0.6	ns	ns	-------	-------	-------	-------	-------	-------	-------

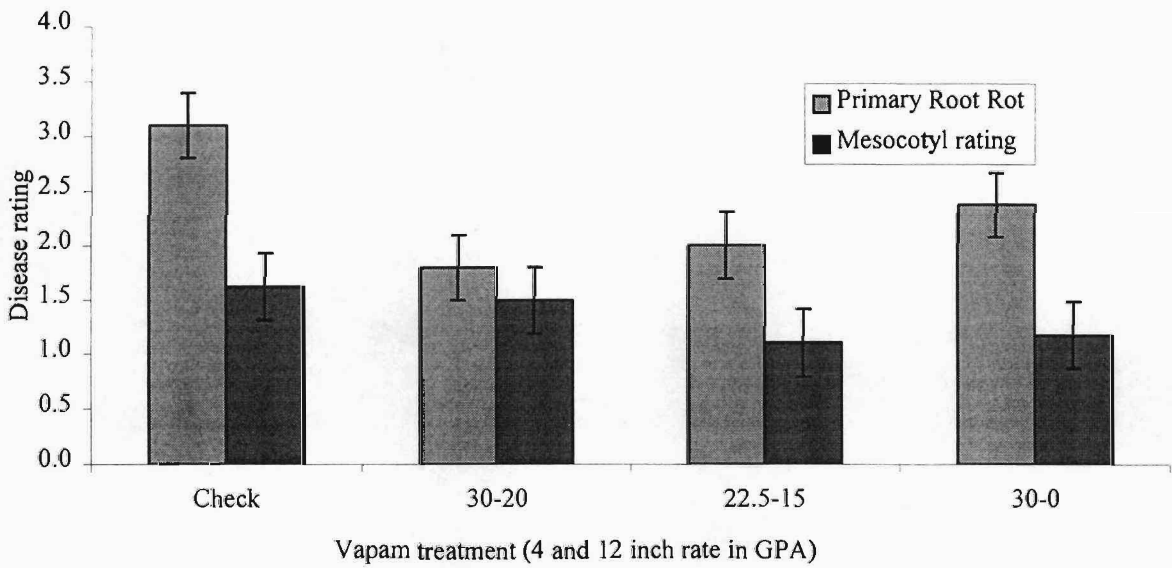

Figure 1. Effect of Vapam on disease severity in sweet corn at the 6 leaf stage in Golden Jubilee sweet corn. Bars are ± 95% confidence intervals.

Wheatland

Vapam was applied with the strip applicator to a field that had been strip tilled. Treatments were the same as at the Dayton site. Corn was planted approx 12 days after the Vapam was applied. Lorsban was applied at planting.

The seed bed was very rugged when the corn was planted. No effects on emergence or corn growth were noted. There was a moderate reduction in firing at harvest, but no apparent increase in yield.

Kiger Island, Corvallis

The field had a history of severe symphylan injury to crops. The field was deep ripped and rototilled to prepare a seedbed two weeks before the Vapam was applied. However, rainfall between tillage and the Vapam application settled the soil and restricted penetration of the fumigation shank when the Vapam was applied. The final depth of Vapam application was approximately 2 and 10 inches deep rather than the preferred 4 and 12 inches. Vapam was applied with the one row applicator to single row plots 40 ft in length. Insecticides were applied in the corn furrow or over the seed row as noted in the table below. Corn was planted with a belt planter on June 5 at 1 seed per foot of row. Dual herbicide was broadcast (2 pts/A) and the plots hand weeded thereafter to reduce weed competition. Symphylans abundance was monitored weekly with potato pieces placed under a white pot at two locations in each row. Corn was harvested on Sept 18.

More symphylans were found on potato traps in Vapam treatments than the same tillage treatments without Vapam. Corn growth was also stunted and yield severely reduced in the Vapam treatments. The deep penetration of the fumigation shank probably opened up the soil and allowed symphylans to move to the surface. The Lorsban treatment had the lowest number of symphylans found on potato traps. Aztec, Lorsban, and Capture treatments all had greater yields than the check.

Table 9. Effect of Vapam and insecticides on symphylans in sweet corn.

Treatments				Symphylans	Corn growth reduction	Corn Yield		
VAPAM TREATMENTS								
	Total Vapam	4 inch depth	12 inch depth	Average of 4 samplings (to July 8) and 2 locations in each row	4 weeks after planting	Ears harvested	Fresh wt	Avg. ear wt
	------------------ GPA ------------------			No./trap	%	No/A	t/A	Lbs.
1	0	0	0	10.1	29	15100	6.1	0.80
2	50	30	20	10.6	45	10900	4.0	0.77
3	30	30	0	19.5	38	15100	6.4	0.83
4	0	0	20	12.7	48	12700	4.9	0.79
INSECTICIDE TREATMENTS								
5	Capture	64 g/45 ft		1.6	10	19900	9.0	0.89
6	Mocap	41 g/45 ft		0.6	80	2900	1.3	0.89
7	Aztec	8.5 g/45 ft of row		1.6	6	24200	10.6	0.89
8	Lorsban	7.1 mls/45 ft + 67 gpa H_20 in 12 inch band		0.1	10	22300	10.3	0.92
9	Platinum	0.6 mls/45 ft + 67 gpa H_20 in 12 inch band		3.1	13	22500	9.9	0.90
10	Capture	64 g/45 ft of row, incorporated with rake		0.7	13	25500	11.5	0.90
11	Check			2.1	8	22600	9.9	0.88
$FPLSD_{(0.05)}$				8.5		8400	3.8	0.11

2. Impact of irrigation level on corn growth and root health.

The objective of this project was to determine the impact of irrigation level on sweet corn growth (particularly sweet corn root health) and the influence that herbicides may have on root health at different irrigation levels and herbicide rates.

The experiment was set in a rock-laden field near Stayton with a history of poor corn yields. The field was irrigated with stationary risers on 200 ft centers. Corn was planted on June 14. The row or irrigation risers split the field in half with conventional tillage on one side and strip tillage on the West side. Two irrigation treatment levels were assigned to randomly chosen risers in the gun row. Treatments were 'normal' irrigation and a schedule that had approximately 20 percent less water applied. Next to each of the risers in both the conventional tillage and strip tillage sides, herbicide subplots were created in single 40-foot rows. Herbicide treatments of Dual

Magnum (2.6 lbs ai/A), Dual Magnum II (2.6 lbs ai/A),, Frontier (1.5 lbs ai/A), and Atrazine (2 lbs ai/A) were applied in bands over the single row plots on June 19 followed by irrigation. A check row without herbicide remained untreated between each herbicide row. Eradicane (3.5 lbs ai/A) was applied to the remainder of the field by the grower. Accent herbicide and Atrazine were used to control the abundant emergence of wild proso millet on July 8, as Eradicane was not applied to plots to avoid confounding herbicide effects. Corn roots (2 per plot) were pulled from each treatment row at the 6-leaf stage and evaluated for root rot. Corn was harvested from 16 ft in each treatment row. Soil moisture was monitored with Hobo data loggers rewired to record data from Echo soil moisture monitors. Infrared photos were taken of the plots in flyovers on Sept 9 (at tassel) and on October 3, just before harvest. Firing was estimated in the Eradicane treated areas of the field in three consecutive rows immediately adjacent the other herbicide rows by counting the number of leaves above the brace roots that had fired.

There was a slight indication that herbicide treatment was influencing root health of the radicle. The root rot rating was lower for Dual than the other herbicide treatments including the check. Dual II gave a higher rot rating than Dual in all treatments except where there was a low irrigation rate in conventional tillage.

Corn yield was not significantly influenced by any of the main factors (tillage system, irrigation level, or herbicide treatment). This may have been due to several factors including Accent herbicide injury to some of the plots. This was apparently caused when Accent was applied to corn near two risers that had just been irrigated. Corn that was dry when the Accent was applied did not show injury symptoms. Irrigation level had no effect on yield statistically, but it is important to note that a decrease in irrigation of nearly 20% early in the season may have actually increased yield. Firing ratings taken in the Eradicane treated rows in conventional tillage indicated a 30% reduction in firing by reducing irrigation 20% (reduced from 3.2 to 2.2 leaves, $P < 0.0001$).

Aerial infrared images were used in an attempt to quantity the effect of irrigation quantity on corn growth and to locate areas of the field where corn growth was suppressed or the corn plants stressed. Corn growing under suboptimal conditions has a different reflected light 'signature' than normally growing plants. Resampling of the infrared image indicated that there was a slightly higher index of plant growth under risers that received less irrigation water early in the season than when grown under risers that had normal irrigation applied. However, it is clear for the IR image that corn was much more stressed on the south end of the field than the north end. The combination of yield, root rot, and infrared image data indicate that less irrigation did not translate to lower yield.

Table 10. Effect of tillage, irrigation level, and herbicide on root rot and sweet corn yield, Stayton, 2002. ST = Strip till; CT= conventional tillage.

Tillage	Irrigation level	Herbicide	Root rot evaluation				Obs.	Ears harvested	Fresh wt.
			Radicle	Meso-cotyl	Nodal roots	Crown			
							No.	No./A	t/A
CONVENTIONAL TILLAGE (CT)									
CT[a]	Less	Dual	1.8	0.8	0.2	1.7	3	20540	7.9
CT	Less	Dual II	1.7	0.3	4.6	1.2	3	23020	7.6
CT	Less	Atrazine	3.3	0.7	2.9	1.5	3	18415	6.3
CT	Less	Frontier	2.5	0.5	4.3	1.3	3	24436	7.7
CT	Less	Eradicane	3.2	0.8	4.5	2.0	9	21100	7.3
CT	Less	Check	2.2	0.8	0.4	1.7	7	22159	7.0
CT	Normal	Dual	1.3	0.6	1.7	1.8	4	18593	5.8
CT	Normal	Dual II	3.1	0.8	4.3	1.8	4	22843	7.9
CT	Normal	Atrazine	2.4	0.4	0.4	1.5	4	19124	6.7
CT	Normal	Frontier	1.9	0.3	5.2	1.8	4	15937	5.9
CT	Normal	Eradicane	2.8	0.4	0.4	1.1	12	19744	6.6
CT	Normal	Check	2.9	0.4	2.5	3.9	10	23055	7.2
STRIP TILLAGE (ST)									
ST	Less	Dual	1.3	0.3	1.9	1.5	3	19478	6.7
ST	Less	Dual II	2.5	0.5	2.0	1.5	3	20895	7.3
ST	Less	Atrazine	2.3	0.3	1.5	1.0	3	22311	7.6
ST	Less	Frontier	3.5	0.8	10.5	1.3	3	16999	5.6
ST	Less	Eradicane	2.8	0.5	6.2	1.5	9	19950	7.4
ST	Less	Check	2.8	0.2	0.3	2.0	6	21426	7.0
ST	Normal	Dual	2.8	0.4	6.4	1.6	4	16999	5.8
ST	Normal	Dual II	3.0	0.5	0.3	1.5	4	20718	7.2
ST	Normal	Atrazine	2.6	1.0	2.4	4.1	4	18593	6.5
ST	Normal	Frontier	2.0	0.3	3.9	1.4	4	18858	7.2
ST	Normal	Eradicane	2.9	0.6	0.5	1.4	12	19800	7.3
ST	Normal	Check	2.9	0.7	1.6	1.8	9	19714	7.1

Table 11. Tillage system, irrigation level, and herbicide effects on root disease and sweet corn yield. Values are average of all plots within the specified category.

Main effects	Root rot ratings				Sweet corn yield		
	Radicle	Meso-cotyl	Nodal roots	Crown	Ear count	Fresh wt.	Average ear wt
	------ 1- 4-------		% diseased		No./A	t/A	Lbs
Tillage system							
Conventional (CT)	2.4	0.56	2.6	1.8	20900	7.0	0.67
Strip-tillage (ST)	2.6	0.53	3.0	1.8	19700	7.0	0.71
P value	0.23	0.53	0.63	0.91	0.18	0.70	0.21
Irrigation level							
Less	2.5	0.56	3.3	1.5	20900	7.2	0.69
Normal	2.5	0.53	2.5	2.0	19900	6.9	0.69
P value	0.86	0.79	0.46	0.27	0.12	0.24	0.62
Soil applied herbicides							
Dual	1.8	0.54	2.8	1.6	18700	6.5	0.69
Dual II	2.6	0.54	2.7	1.5	21900	7.5	0.69
Atrazine	2.6	0.61	1.7	2.1	19500	6.7	0.69
Frontier	2.4	0.50	5.8	1.5	18800	6.6	0.71
Eradicane (grower applied)	2.9	0.57	2.6	1.5	20100	7.1	0.71
Check	2.7	0.50	1.3	2.4	21600	7.1	0.66
P value	0.01	0.94	0.18	0.25	0.07	0.41	0.23

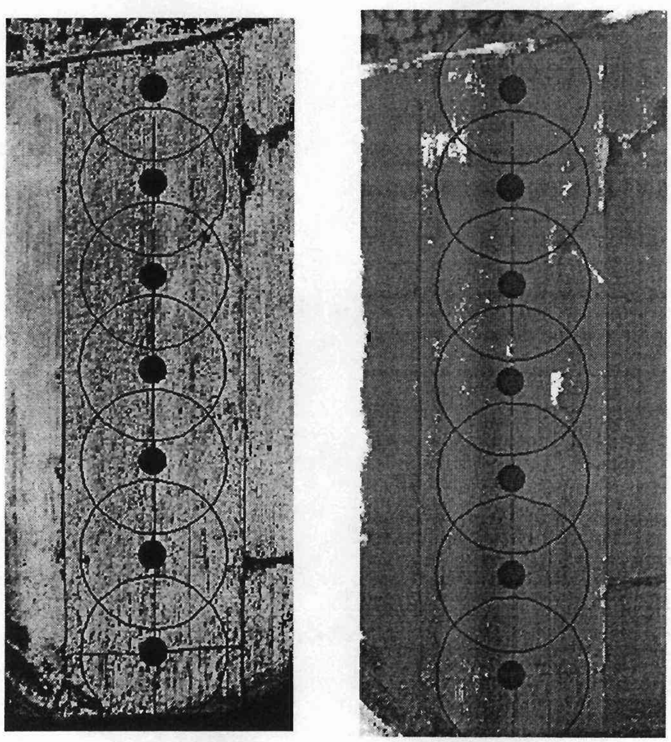

Figure 2. Infrared resampled and composite images from aerial photos taken one week before harvest. Circles are the irrigation patterns of each of the risers.