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Title: Effect of Irrigation Level on Root Rot in Sweet Corn

Project Leader

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Project I Summary

- Reducing the irrigation level during the first 6 weeks after planting reduced root rot and firing of Jubilee sweet corn but did not affect corn yield. The lowest rate of irrigation may have reduced corn yield in 2004.
- Pre-irrigating the soil before planting improved crop emergence and growth throughout the season, but also caused more root rot than when corn was 'irrigated up'.
- Soil-applied herbicides had very little effect on root rot.
- The rating used to quantify lesions on the radicle was a reasonable predictor of root rot when corn was harvested.
- Severity of disease on roots and firing in the previous year had no discernible effect on root disease the following year.

Project II Summary

- The higher irrigation levels during the first half of the season increased root rot in sweet corn.
- Root rot in Coho and Jubilee was greater than for Super Sweet Jubilee.
- Coho yield increased linearly with irrigation level during the first half of the season until a maximum of 14 t/A. In contrast, Jubilee yield increased a maximum of only 0.5 t/A when receiving more than 4.5 in. of water until midseason.
- Coho was more tolerant to root rot and yielded more than Jubilee.
- Crown discoloration was correlated with moisture stress, but not consistent among Jubilee, Coho and Super Sweet Jubilee.

Project I. Effect of Irrigation Timing and Amount on Root Rot of Sweet Corn.

Methods

The experiment was conducted at the exact site as in 2003 at the Vegetable Research Farm near Corvallis on a silt loam soil. Treatments were randomized and assigned to different plots than in 2003. Corn was planted in early May and allowed to grow to 18 inches prior to establishment of the plots. The corn was killed with glyphosate and disked into the soil. Radicle evaluation of the corn before it was destroyed found no relationship between root lesions and treatments of the previous year.

The experiment was identical to the experiment in 2003. The plots were 15 ft wide (10 rows) but only the two middle rows were used for ratings and harvest. One of the two middle rows was the variety Jubilee and the other was Coho, and all remaining rows were Jubilee. Both were seeded at approximately 2 seeds/ft on a 30 inch row spacing on June 28.

Four irrigation levels were applied to plots. Main plots of the split plot design were either pre-irrigated before sweet corn was planted ('plant-to-moisture' treatment), or the corn was planted into dry soil and irrigated ('irrigated-up' treatment). These two initial irrigation levels were followed by either a low or high irrigation rates applied to subplots until midseason. After the midseason evaluation (August 10 or 804 DD after planting), irrigation rates were the same for all treatments (see Figure 1.1).

Herbicide treatments were applied to subplots 25 ft long by 10 ft wide and included Dual Magnum (16 oz/A), Outlook (24 oz/A), and Atrazine (1 qt/A) on June 29, 1 day after the corn was planted. Irrigation (0.8 in) was given to all plots on June 30 to incorporate the herbicides. Weed emergence and crop emergence was determined at 4 WAP, then Atrazine and Basagran applied to kill surviving weeds. Hand hoeing augmented herbicides to minimize weed competition.

Irrigation water was collected to determine the amount of water applied (Fig. 1.1). Water was collected with 4 inch PVC caps placed on stands that were raised to the level of the corn canopy at each irrigation. A time domain reflectometer (TDR) was used to monitor soil moisture before and after each irrigation event (Figure 1.2).

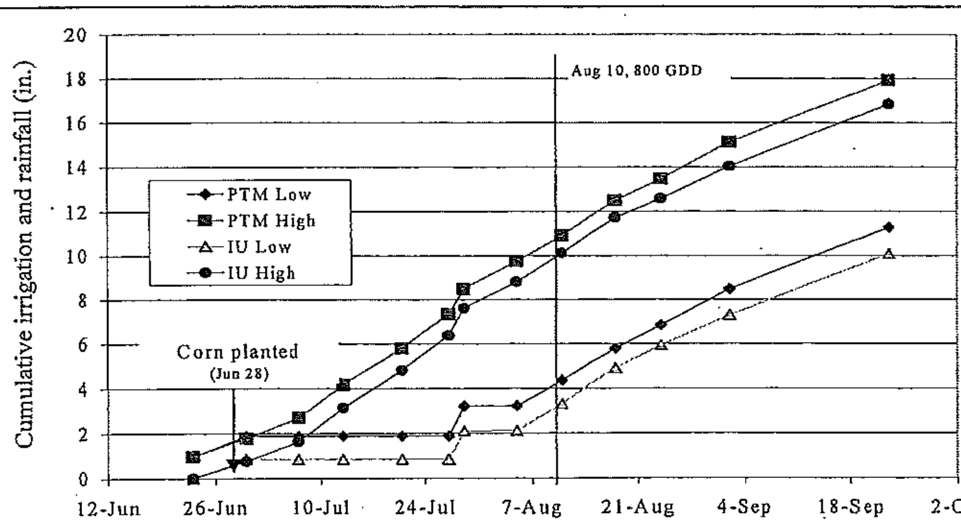

Figure 1.1. Cumulative irrigation and rainfall.

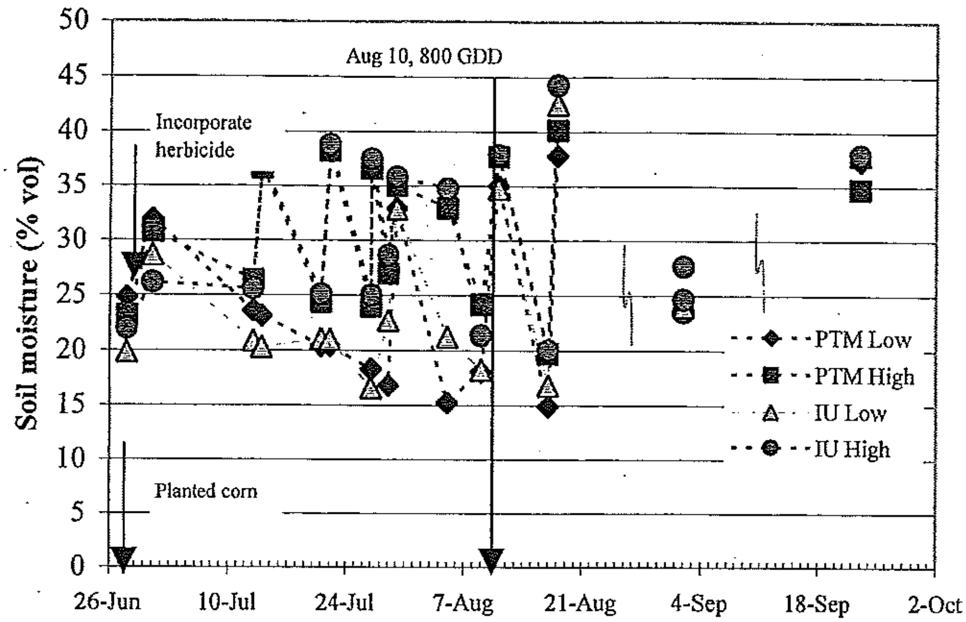

Figure 1.2. TDR soil moisture measurements of the top 6 inches of soil.

Three corn roots were dug from each plot at midseason, roots washed, and radicles evaluated for disease. At harvest, corn ears were pulled from 16 ft. of the two middle rows and weighed. Ten ears were shucked and ear diameter, tip fill, and ear weight determined. Kernels were cut from three ears of each plot and dried to determine moisture level. Three roots were dug from each plot and evaluated for percent rot at harvest.

Results

Weed emergence was primarily determined by herbicide level, although irrigation practice influenced weed emergence in the check plots (Table 1.1). The lowest level of irrigation (irrigating the corn up and applying a low irrigation amount until midseason) significantly reduced weed emergence (Fig 1.3). Hairy nightshade emergence was much greater when the corn was irrigated-up and followed by a high level of irrigation, contrary to the result for total weeds.

Corn emergence was greater for the Jubilee variety than Coho, assuming that the planter delivered the same number of seeds. Plots with the higher irrigation level after planting had greater emergence than plot with the low level of irrigation (Table 1.2 and 1.3). Corn height was lowest in the irrigate-up + high irrigation treatment and greatest in the plant-to-moisture + high irrigation treatment for both varieties (Table 1.2 and 1.3).

Midseason ratings of radicle root quality did not differ between Coho and Jubilee. Radicle rot at midseason was significantly greater under the high irrigation regimes (Table 1.2 and 1.3, Figure 1.4). Plant-to-moisture followed by high irrigation until midseason caused necrosis of 64% of the radicle but only 40% at the low irrigation level. There was very little indication statistically that herbicide applied influenced radicle quality. Root rot evaluation at harvest indicated similar trends; root rot was greatest in treatments with higher irrigation rates through mid-season (Table 1.4). Additionally, radicle rot ratings taken at mid-season were partially correlated with the root rot ratings and firing ratings taken at harvest (Figure 1.5) demonstrating the utility of radicle evaluation to predict root rot potential.

Significant firing of Jubilee of corn at harvest was observed in treatments with the higher irrigation levels at harvest (Table 1.2). Coho exhibited little firing. Firing also was observed in the low irrigation plots, but at much lower levels.

Yield of Coho was much greater than Jubilee at the high irrigation levels (Table 1.2, Figure 1.6). Yield of Coho increased with increasing irrigation level and was greatest where corn was planted-to-moisture and then followed by a high irrigation rate until midseason. Jubilee did not respond to irrigation the same as Coho. Yield was lowest when corn was irrigated up followed by a low rate of irrigation until midseason. The highest rate of irrigation only yielded 10.2 t/A (plant-to moisture plus high irrigation until midseason), slightly lower than the yield of corn that was irrigated up and followed by a high rate of irrigation. Radicle root rot was greatest when corn was planted-to-moisture and followed by a high rate of irrigation, an indication that root rot was reducing yield. Root rot at harvest was partially correlated with Jubilee yield (Figure 1.7), particularly when under the high irrigation level ($R = -0.95$, $P<0.001$). The lowest yielding treatment for both corn varieties occurred when the corn was irrigated up and was followed by a low irrigation level until midseason. Jubilee yield averaged less than 9 t/A. Percent kernel moisture for this treatment indicated that a delay in maturity offset any potential yield advantage due to reduced root rot.

Comparison to results in 2003

The effect of irrigation on radicle quality and root rot in Jubilee was similar in both years. Increasing moisture early in the season resulted in more diseased root and eventually resulted in more firing. The primary effect was the amount of water applied after planting. The high rate of irrigation after planting caused 54% necrosis of the radicle (56% in 2003 and 52% in 2004), but the low rate of irrigation after planting only had 29% necrosis at mid-season.

The impact on crop yield differed, however, between the two years. In 2003, planting to moisture followed with a high level of irrigation caused a slightly lower yield than if the crops were irrigated up and followed with a low level of irrigation. In 2004, plots with less irrigation early in the season tended to yield less. Correlations of root disease data with corn yields indicated that the higher irrigation levels in 2004 were restricting yields, although not to the level that occurred in 2003.

It appears from the two years of the study that irrigation management may be a good tool to reduce the severity of root rot in sweet corn. The results from 2004 indicate, however, the risk involved in using this strategy. Severely stressing corn for the first half of the season reduced corn yield, even though root rot was much less.

Table 1.1. Effect of irrigation on weed emergence, 2004.

Irrigation level: At planting (AP)	Irrigation level: First six weeks after planting (AFT)	Herbicide	Obs	Lambsquarters	Pigweed	Nightshade	Purselane	Grass	Total weeds
				------	------	No/m sq	------	------	
IU	High	Atrazine	3	0	0	29	0	0	29
IU	High	Dual Magnum	3	0	0	3	1	0	3
IU	High	Outlook	3	0	0	1	1	0	2
IU	High	Check	3	4	2	103	16	0	125
IU	Low	Atrazine	3	0	0	11	0	0	11
IU	Low	Dual Magnum	3	1	0	7	0	0	9
IU	Low	Outlook	3	0	0	2	0	0	2
IU	Low	Check	3	2	1	4	8	0	15
PTM	High	Atrazine	3	0	0	0	0	0	0
PTM	High	Dual Magnum	3	0	0	3	4	0	8
PTM	High	Outlook	3	0	0	0	2	0	2
PTM	High	Check	3	35	4	22	79	1	140
PTM	Low	Atrazine	3	0	0	0	0	0	0
PTM	Low	Dual Magnum	3	0	0	3	8	0	11
PTM	Low	Outlook	3	0	0	1	2	0	3
PTM	Low	Check	3	3	4	31	60	1	99
ANOVA									
AP				ns	ns	*	*	ns	ns
AFT				ns	ns	*	ns	ns	*
AP x AFT				ns	ns	*	ns	ns	ns
H				ns	*	****	****	ns	****
AP x H				ns	ns	ns	**	ns	*
AFT x H				ns	ns	*	ns	ns	**

AP, At Planting; AFT, After Planting; H, Herbicide.
ns, not significant; *, $P<0.05$, ** $P<0.01$; *** $P<0.001$; **** $P<0.0001$.

Table 1.2a. Effect of irrigation timing and level on *Coho* corn growth and yield, 2004.

Variety	Irrigation level		Herbicide	Obs	Emergence	Height	Midseason root rot		Corn harvest (marketable ears)								
	At planting	First six weeks after planting					Radicle	Primary roots	Ear number	Fresh wt yield	Ear wt.	Husked ear wt.	Ear dia.	Ear length	Tip fill	Firing rating	Root rot at harvest
					10 ft	In.	% diseased		no./A	t/A	lbs	lbs	in	in	%	1-10	%
Coho	IU	High	Atrazine	3	14	23	46	1	32900	12.2	0.68	0.61	2.0	7.2	95	1	-
Coho	IU	High	Check	3	14	23	57	4	32900	12.7	0.77	0.60	1.9	7.3	95	2	55.7
Coho	IU	High	DualMag	3	14	21	48	0	30800	12.0	0.76	0.51	2.0	7.3	98	1	61.0
Coho	IU	High	Outlook	3	15	19	41	0	32900	11.6	0.94	0.63	2.0	7.3	96	1	-
Coho	IU	Low	Atrazine	3	15	16	23	0	32600	10.5	0.89	0.55	1.9	7.0	95	0	-
Coho	IU	Low	Check	3	11	16	21	0	31900	9.8	0.94	0.54	1.8	7.1	96	0	48.3
Coho	IU	Low	DualMag	3	11	15	14	1	27300	9.3	0.89	0.56	1.9	7.0	98	0	50.0
Coho	IU	Low	Outlook	3	12	15	17	1	30800	10.4	0.79	0.56	1.9	7.0	96	0	-
Coho	PTM	High	Atrazine	3	16	29	63	2	32600	13.6	0.81	0.71	2.1	7.3	98	2	-
Coho	PTM	High	Check	3	15	28	69	3	33300	13.4	0.80	0.73	2.1	7.3	99	2	62.7
Coho	PTM	High	DualMag	3	14	27	71	0	31500	13.3	0.87	0.67	2.1	7.2	97	1	62.7
Coho	PTM	High	Outlook	3	14	25	65	0	37500	15.2	0.81	0.66	2.0	7.2	97	2	-
Coho	PTM	Low	Atrazine	3	15	20	31	0	31900	11.3	0.84	0.64	2.1	7.2	96	0	-
Coho	PTM	Low	Check	3	13	20	54	0	33600	12.2	0.76	0.63	2.0	7.2	95	0	63.3
Coho	PTM	Low	DualMag	3	15	19	35	4	34700	12.3	0.78	0.61	2.0	7.0	95	0	41.3
Coho	PTM	Low	Outlook	3	14	19	46	4	34000	13.4	0.60	0.62	2.0	7.1	97	0	-

IU, irrigate up; PTM, plant to moisture;

Table 1.2b. Effect of irrigation timing and level on *Jubilee* corn growth and yield, 2004.

Variety	Irrigation level: At planting	Irrigation level: First six weeks after planting	Herbicide	Obs	Emergence	Height	Midseason root rot: Radicle	Midseason root rot: Primary roots	Corn harvest (marketable ears): Ear number	Fresh wt yield	Ear wt.	Husked ear wt.	Ear dia.	Ear length	Tip fill	Firing rating	Root rot at harvest
Jubilee	IU	High	Atrazine	3	16	23	58	3	29400	12.2	0.68	0.61	1.9	7.3	89	4	77.8
Jubilee	IU	High	Check	3	17	24	33	5	28700	12.7	0.77	0.60	2.0	7.4	93	5	71.1
Jubilee	IU	High	DualMag	3	16	23	50	0	30100	12.0	0.76	0.51	1.9	7.5	90	5	75.6
Jubilee	IU	High	Outlook	3	18	23	46	0	29000	11.6	0.94	0.63	1.9	7.3	92	4	74.4
Jubilee	IU	Low	Atrazine	3	19	17	24	0	31200	10.5	0.89	0.55	1.8	7.3	91	0	41.7
Jubilee	IU	Low	Check	3	19	19	50	0	29000	9.8	0.94	0.54	1.8	7.5	91	1	41.7
Jubilee	IU	Low	DualMag	3	17	17	28	1	28700	9.3	0.89	0.56	1.8	7.3	92	2	55.3
Jubilee	IU	Low	Outlook	3	17	17	27	4	29400	10.4	0.79	0.56	1.8	7.2	91	2	47.2
Jubilee	PTM	High	Atrazine	3	18	28	52	0	31200	13.6	0.81	0.71	2.0	7.2	89	6	70.0
Jubilee	PTM	High	Check	3	18	29	53	0	31200	13.4	0.80	0.73	2.0	7.3	93	5	75.8
Jubilee	PTM	High	DualMag	3	18	26	58	0	26200	13.3	0.87	0.67	2.0	7.3	92	5	71.7
Jubilee	PTM	High	Outlook	3	15	27	73	0	28700	15.2	0.81	0.66	2.0	7.2	92	4	76.4
Jubilee	PTM	Low	Atrazine	3	18	21	31	1	30500	11.3	0.84	0.64	1.8	7.3	92	3	47.2
Jubilee	PTM	Low	Check	3	15	21	35	1	29400	12.2	0.76	0.63	1.9	7.2	95	3	41.7
Jubilee	PTM	Low	DualMag	3	18	21	46	2	29000	12.3	0.78	0.61	1.8	7.1	92	2	47.5
Jubilee	PTM	Low	Outlook	3	17	22	50	3	27600	13.4	0.60	0.62	1.9	7.5	91	2	40.3

IU, irrigate up; PTM, plant to moisture;

Table 1.3. Analysis of variance for effects of irrigation timing and level on corn growth and yield, 2004.

Effect	Emerg-ence	Plant height	Midseason root rating		Corn harvest (marketable ears)								
			Radicle	Roots	Ear number	Fresh wt yield	Ear wt	Husked ear wt	Ear dia.	Ear length	Tip fill	Firing rating	Root rot at harvest
V	****	****	ns	*	**	****	****	**	****	***	****	****	ns
AP	ns	****	ns	ns	ns	ns	*	*	**	ns	ns	ns	ns
AFT	*	****	*	ns	ns	**	*	*	**	**	ns	*	**
H	ns	ns	ns	*	ns	*	ns	ns	ns	ns	ns	ns	ns
AP*AFT	ns	ns	ns	ns	ns	*	ns	ns	ns	ns	ns	ns	ns
AP*H	ns	ns	ns	ns	ns	ns	ns	ns	ns	*	ns	ns	ns
AFT*H	ns	ns	ns	*	ns	ns	ns	ns	ns	ns	ns	ns	ns
V*AP	ns	ns	ns	ns	ns	**	ns	ns	ns	ns	ns	ns	ns
V*AFT	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
V*AP*AFT	ns	ns	**	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
V*H	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
V*AP*H	ns	ns	**	ns	ns	*	ns	ns	ns	ns	ns	ns	ns
V*AFT*H	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns

V= Variety; AP=Irrigation level At Planting, AFT=Irrigation level After Planting; H=Herbicide.
ns, not significant; *, $P<0.05$, ** $P< 0.01$; *** $P< 0.001$; **** $P < 0.0001$.

Table 1.4. Effect of irrigation level on kernel moisture at harvest, 2004.

Irrigation level		Obs	Kernel moisture	
At planting	First 6 weeks after planting		Mean	SE
			%	
Irrigate up	Hi	7	72	1.4
Irrigate up	Low	6	76	1.3
Plant-to-moisture	Hi	7	73	1.0
Plant-to-moisture	Low	6	73	0.9

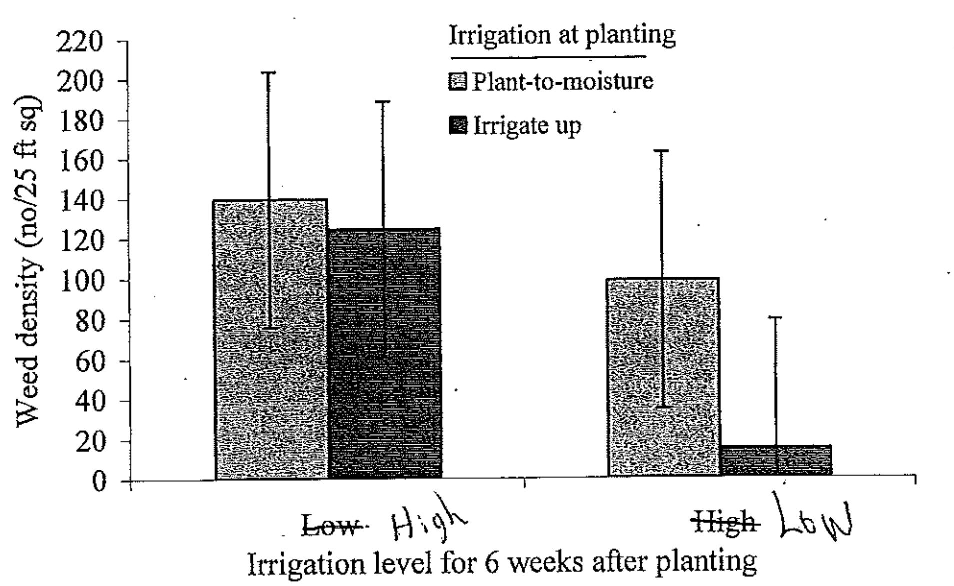

Figure 1.3. Effect of irrigation practice and intensity on total weed density, 2004 (vertical bars are 95% CI).

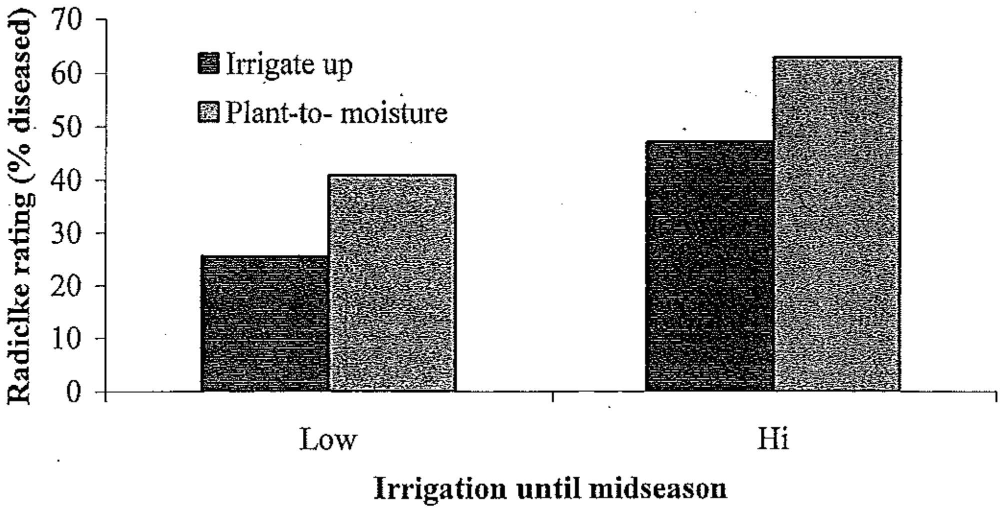

Figure 1.4. Effect of irrigation practice at planting and through midseason on radicle disease rating. Data are averaged over both varieties and all herbicides. P= 0.02 for effect of low and high irrigation.

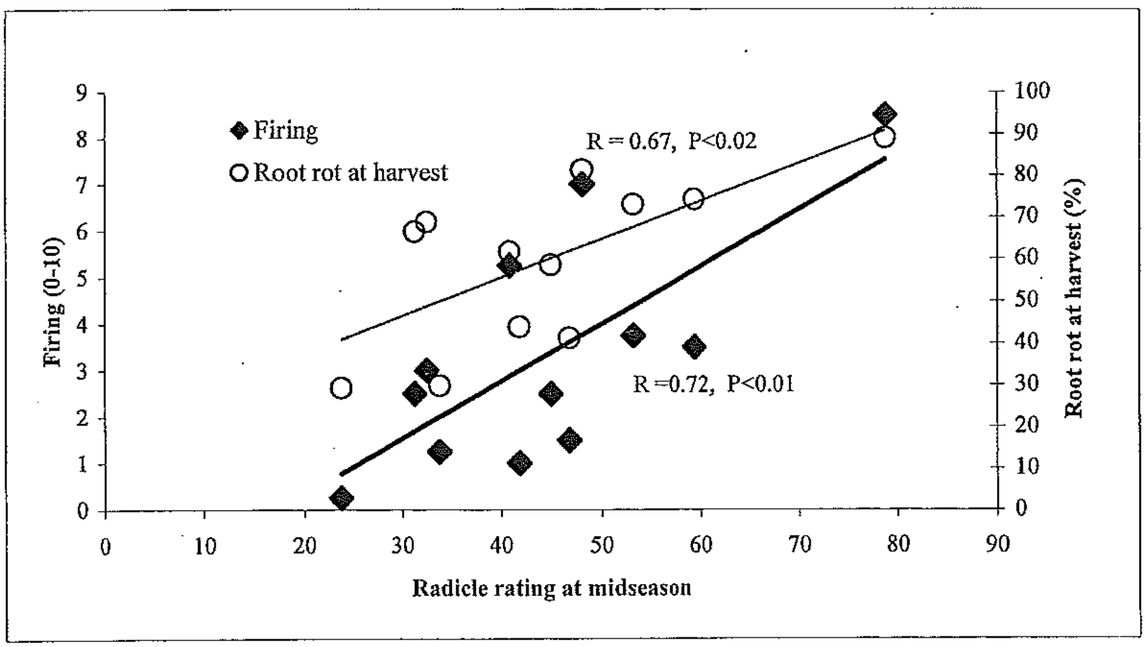

Figure 1.5. Correlation between radicle rating at midseason and firing and root rot at

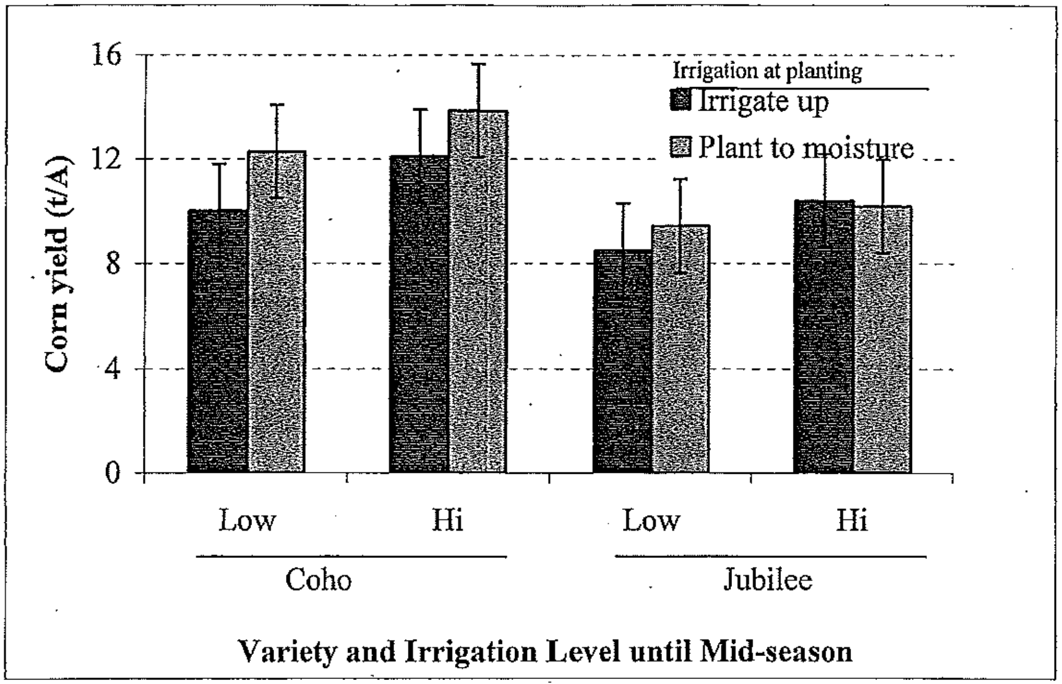

Figure 1.6. Effect of variety, irrigation level at planting, and irrigation level until midseason on yield in 2004. Data are averaged over all herbicide treatments. LSD (0.05) =1.8. P<0.01 for effect of variety and irrigation level (Var x After) on corn yield. Bars are 95% CI of the mean.

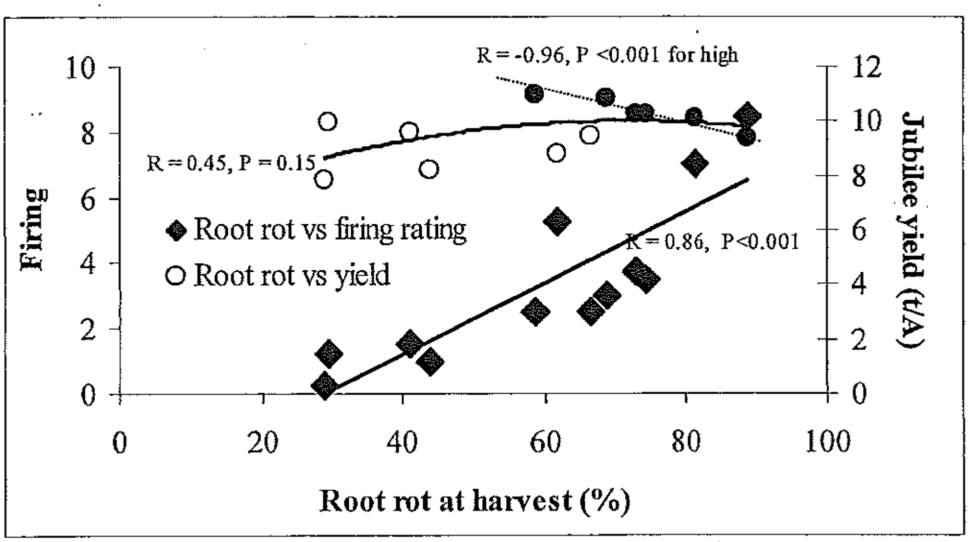

Figure 1.7. Effect of root rot at harvest on firing and yield of Jubilee when averaged across all herbicide treatments. Full circles for yield are high irrigation levels (n=4 for each point and includes Dual herbicide treatment).

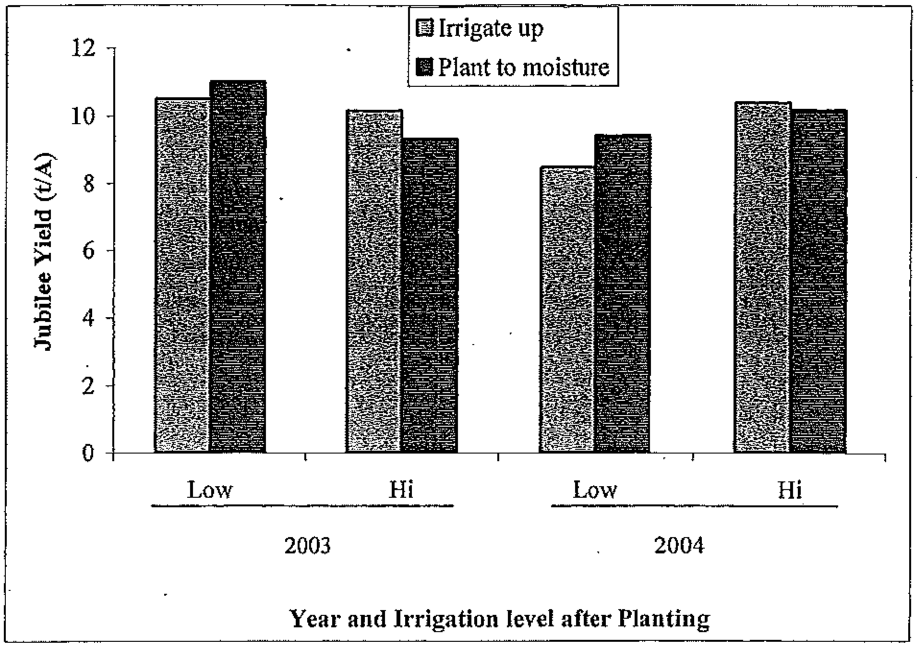

Figure 1.8. Effect of irrigation level at planting and 6 weeks after planting on root rot at harvest in 2003 and 2004.

Project II. Effect of Irrigation Level until Midseason on Disease Development and Yield in Sweet Corn.

Irrigation of sweet corn is typically scheduled with estimates of evapo-transpiration based on climate or soil water depletion methods. Corn yields may *not* suffer even when deficit irrigation is maintained the entire season (Braunworth and Mack, 1987). Deficit irrigation for the first half of the season may be particularly prudent considering the effect that root rot can have on crop yields, and the reduced incidence of root rot found last year when irrigation was minimal until 6 weeks after planting. The objective of the following experiments was to determine the impact of early season irrigation level on root rot in sweet corn.

Methods

A line source experimental design was used so that a continuum of irrigation water could be applied to corn. Randomized complete block experimental designs are robust when evaluating irrigation, but require a large amount of space to keep plots isolated. Line source experiments can be used without sacrificing information (Braunworth and Mack, 1989). Line source experiments significantly reduce the area needed, an important consideration when trying to locate plots in fields with a previous history of root rot.

Experiments were conducted at three sites on the vegetable research farm. The crop rotation at the first site (LS I) only had one year of corn during the last 10 years and root rot was not expected to have a significant effect on corn yield. The second site (LS II) had a 7 year history of snap beans, sweet corn, and wheat. Previous corn root evaluation in 2003 indicated a moderate level of root rot. A third site (LS III) had a mixed history of snap beans, squash, broccoli, and corn over the last 10 years.

At all sites, irrigation was applied with two irrigation lines that were set side by side through the middle of the plot, and 25 to 30 rows of corn planted on both sides of the irrigation lines on a 30-inch row spacing. The amount of water reaching the corn declined as the distance from the center irrigation line increased (Figs 2.1 and 2.4). The double line provided sprinkler heads on 20 ft. centers rather than 40 ft. and greatly improved the uniformity of coverage. Irrigation was applied with these two center lines until midseason (~800 growing degree days). At midseason, the entire pot was solid set with single irrigation lines spaced 40 ft apart so that the entire plot received the same amount of irrigation until harvest.

Irrigation data from the first experiment (LSI) were used to calibrate the irrigation systems at all sites, and to predict where plots should be located so that the amount of water each plot received would decline linearly as the distance from the irrigation line increased. The amount of water applied at each site was measured after each irrigation event by collecting water from 32 - 4 inch PVC caps placed throughout the field. The collection caps were placed on the soil between corn rows during the first part of the season, but later were put on adjustable risers so that the collection caps could be raised along with corn growth.

Soil compaction treatments were applied in LSII and LSIII before planting in addition to the irrigation level. A tractor was driven over the plot so that wheel tracks covered the entire plot. A roterra and roller was then used to loosen the surface so that row coverage was possible during planting.

Jubilee, Super Sweet Jubilee, and Coho sweet corn varieties were planted at all sites. Corn emergence, height, root rot at 6-7 weeks after planting (800 growing degree days) and at harvest, firing if present at harvest, and yield (including fresh and husked wt., ear length, tip fill, and net yield) were measured. Crown discoloration was also rated at midseason. This purplish darkening of the pith tissue has been observed early in the season, but it is unclear whether this is a disease or a physiological response to environmental conditions.

Results

LSI

Radicle and root evaluation at mid-season indicated very low levels of root rot at this site with no effect on the radical or roots (Table 2.1). Additionally, irrigation level (which included one rainfall event) during the first 7 weeks of the growing season had very little impact on crop yield at the end of the season (Table 2.2, Figs. 2.1 and 2.2). Jubilee yielded approximately 12 t/A at all irrigation levels except Level 4, which provided less than 2 inches of water to the crop during the first 6 weeks after planting. Coho yielded more than 14 t/A at all three irrigation levels. An important finding was that crown discoloration in Jubilee was correlated with moisture stress, and that the effect of moisture stress on crown discoloration was not consistent among varieties. Coho did not exhibit the same level of crown discoloration as Jubilee across the four irrigation levels.

LSII

The potential of root rot at the second site was much greater than at the first site. The plots with the highest irrigation level had the most severe disease ratings for both the radicle and other roots at mid-season (Table 2.3). There also was an indication that Super Sweet Jubilee was less affected by root rot than Jubilee or Coho. Even though there was no statically significant effect of compaction on corn roots, the data suggest that root rot was less in compacted soils. Crown discoloration was greater at the low irrigation level as was noted in LSI, and again inconsistent among the three varieties (Table 2.3).

Coho yield declined linearly in both compacted and uncompacted soil as the amount of irrigation water applied during the first 6 weeks declined (Table 2.4). Jubilee yield did not follow the same trend (Table 2.4, Figure 2.4). The maximum yield of Jubilee was 11.2 t/A at the high irrigation rate, but was reduced by only 0.6 t/A as irrigation during the first 6 weeks declined from 7.6 (Level 1) to 4.5 inches of water. Jubilee plots that received only 2 inches of water during the first 6 weeks after planting produced only 7.7 t/A.

Even though root rot was present in this plot, it was not severe enough to cause firing of the corn. Root rot ratings at harvest tended to be greater for Coho than Jubilee but the trend was not statistically significant. Yield of Jubilee declined as the root rot rating exceeded 50% (Figure 2.5). Crown discoloration was caused by very dry soil conditions during the first half of the season and persisted until harvest, and was more visible in Jubilee than in Coho.

LSIII

Radicle rot rating at midseason were lower at this site than in LSII, but greater than LSI (Table 2.5). Unlike data from LSII, radicle ratings of Jubilee were greater than Coho. SS Jubilee ratings were lower than both Coho and Jubilee. Crown discoloration ratings again were greater for corn at the lowest irrigation levels, and soil compaction may have decreased root rot ratings. Net corn yield was constant through the first three irrigation levels.

Summary

The higher irrigation levels during the first half of the season increased root rot in sweet corn. Root rot in Coho and Jubilee was greater than for Super Sweet Jubilee. Coho yielded the most and was probably the most tolerant to root rot. Super Sweet Jubilee yield was measured in these plots but not presented because of slower and more erratic emergence than Coho or Jubilee. Crown discoloration was greater at low irrigation levels.

Table 2.1. Effect of irrigation level on root rot in sweet corn at midseason, LSI, 2004.

Variety	Irrigation level (1=high, 4=low)	Obs	Percent root rot		Crown discoloration
			Radicle	Primary roots	
			----------------%------------		0-4
Coho	1	8	0.21	0.00	1.4
Coho	2	8	0.31	0.00	1.1
Coho	3	8	0.04	0.00	1.6
Jubilee	1	7	0.29	0.08	1.4
Jubilee	2	8	0.24	0.00	1.7
Jubilee	3	7	0.33	0.00	2.3
Jubilee	4	8	0.24	0.00	2.9
SS Jubilee	1	4	0.35	0.00	1.2
SS Jubilee	2	8	0.00	0.00	1.5
SS Jubilee	3	8	0.11	0.00	2.4
LSD (0.05)			ns	ns	0.4

Table 2.2. Effect of irrigation level on sweet corn yield, LSI, 2004.

Variety	Irrigation level	Obs.	Ears	Net yield	Ear wt.	Ear width	Ear length	Tip fill
	1=high, 4=low		no/A	t/A	lbs	in	in	%
Coho	1	8	33300	13.8	0.69	2.04	7.7	94.9
Coho	2	8	30700	14.3	0.72	2.08	7.6	97.3
Coho	3	8	33300	14.5	0.70	2.10	7.4	97.3
Jubilee	1	8	30700	12.6	0.72	2.11	7.7	95.4
Jubilee	2	8	28700	11.8	0.70	2.08	7.7	95.6
Jubilee	3	8	29800	12.2	0.67	2.05	7.6	97.3
Jubilee	4	8	28500	11.6	0.67	2.02	7.6	95.8
LSD (0.05)			2400	0.9	ns	ns	ns	1.6

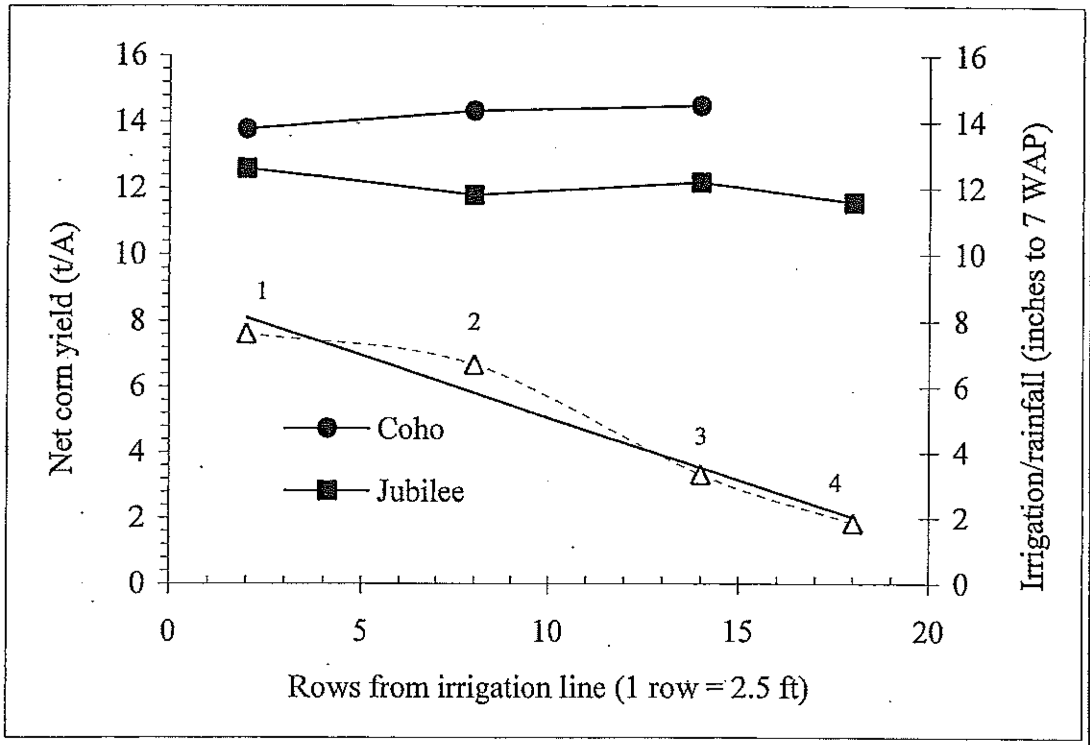

Figure 2.1. Effect of irrigation level (7 WAP after planting) on sweet corn yield.

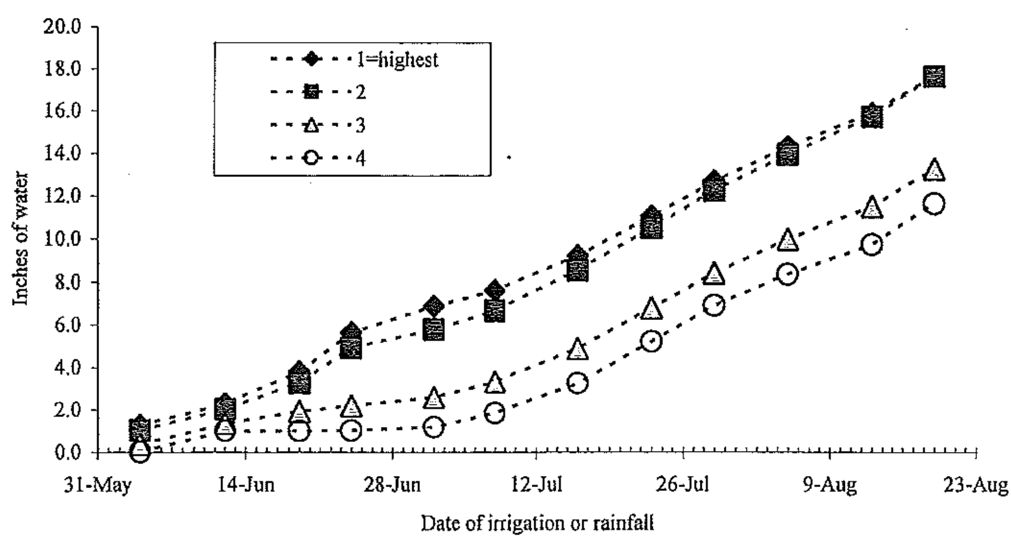

Figure 2.2. Cumulative irrigation in LSI experiment.

Table 2.3. Effect of irrigation level during the first half of the season on root rot in Coho, Jubilee and SS. Jubilee in LS II experiment, 2004.

Variety	Soil compaction treatment	Irrigation for first 6.5 weeks	Obs.	Percent root rot				Crown discoloration	
				Radicle		Primary roots			
		(1=high; 4=low)	N	Mean	SD	Mean	SD	Mean	SD
				%				0-4; 4=high	
Coho	Compacted	1	6	63	9	1.5	2.4	1.3	0.2
Coho	Compacted	2	6	41	19	1.9	2.3	1.5	0.3
Coho	Compacted	3	6	19	24	0.2	0.3	1.9	0.6
Coho	Compacted	4	6	20	24	0.1	0.2	2.2	0.7
Coho	Uncompacted	1	8	66	7	2.8	2.0	1.4	0.3
Coho	Uncompacted	2	8	66	12	2.1	3.3	1.3	0.4
Coho	Uncompacted	3	8	28	20	0.1	0.2	1.9	0.4
Coho	Uncompacted	4	8	33	14	0.2	0.2	2.2	0.2
Jubilee	Compacted	1	6	32	23	0.9	1.0	2.1	0.5
Jubilee	Compacted	2	6	52	14	0.7	1.1	1.8	0.5
Jubilee	Compacted	3	5	6	7	0.0	0.1	3.0	0.1
Jubilee	Compacted	4	6	5	8	0.1	0.2	3.0	0.1
Jubilee	Uncompacted	1	7	69	17	0.6	0.6	1.8	0.3
Jubilee	Uncompacted	2	8	61	16	1.8	2.3	2.2	0.5
Jubilee	Uncompacted	3	7	23	18	0.3	0.4	3.0	0.0
Jubilee	Uncompacted	4	7	27	20	0.1	0.1	2.9	0.1
SS Jubilee	Compacted	1	8	36	23	0.8	0.9	2.0	0.3
SS Jubilee	Compacted	2	8	21	18	0.1	0.1	2.6	0.4
SS Jubilee	Compacted	3	8	7	8	0.1	0.1	2.8	0.3
SS Jubilee	Compacted	4	4	12	11	0.4	0.8	2.8	0.4
SS Jubilee	Uncompacted	1	5	36	8	1.9	1.8	1.9	0.3
SS Jubilee	Uncompacted	2	6	41	25	1.0	1.1	3.7	2.8
SS Jubilee	Uncompacted	3	6	12	11	0.2	0.4	3.0	0.1
SS Jubilee	Uncompacted	4	3	5	5	0.0	0.1	2.9	0.1
Analysis of significant effects [a]									
Variety				****		ns		****	
Compaction				ns		ns		ns	
Variety x Compaction				ns		ns		ns	
Irrigation level				****		****		****	
Variety x Irrigation level				ns		ns		**	
Compaction x Irrigation level				ns		*		ns	
Variety x Compaction x Irrigation Level				ns		ns		ns	

[a] ****, $P \leq 0.0001$; ***, $P \leq 0.001$; **, $P \leq 0.01$; *, $P \leq 0.05$; ns, not significant.

Table 2.4. Effect of irrigation level during the first half of the season on yield and root rot in Coho, Jubilee and Super Sweet Jubilee in LS II, 2004.

Variety	Soil compaction treatment	Irrigation for first 6.5 weeks	Obs	Net yield	Net ears	Avg. ear wt	Ear dia.	Ear length	Tip fill	Root rot
		(1=high; 4=low)		t/A	no./A	lbs	in.	in.	%	%
Coho	Compacted	1	6	12.8	26100	0.99	2.02	7.42	98	56
Coho	Compacted	2	6	12.1	24700	0.98	2.00	7.42	98	42
Coho	Compacted	3	6	11.7	26700	0.87	1.93	7.35	98	37
Coho	Compacted	4	6	8.7	23500	0.73	1.78	7.07	98	29
Coho	Uncompacted	1	8	14.3	29000	0.99	2.05	7.50	98	53
Coho	Uncompacted	2	8	13.1	26400	0.99	2.06	7.46	98	50
Coho	Uncompacted	3	8	11.3	24600	0.92	1.99	7.48	98	35
Coho	Uncompacted	4	8	9.4	24000	0.79	1.91	7.26	99	26
Jubilee	Compacted	1	6	10.5	22400	0.94	2.03	7.83	97	44
Jubilee	Compacted	2	6	10.7	22400	0.96	2.02	7.85	98	53
Jubilee	Compacted	3	6	8.0	21800	0.73	1.83	7.58	95	28
Jubilee	Compacted	4	6	7.1	22400	0.63	1.65	7.72	94	24
Jubilee	Uncompacted	1	8	11.2	24200	0.93	2.00	7.76	95	45
Jubilee	Uncompacted	2	8	10.6	23100	0.92	2.01	7.88	86	64
Jubilee	Uncompacted	3	8	10.6	22900	0.92	1.99	7.80	97	44
Jubilee	Uncompacted	4	8	9.0	23700	0.76	1.88	7.71	96	31
Jubilee	Uncompacted	5	8	7.7	22700	0.68	1.78	7.65	95	35
LSD (0.05)				1.8	3900	0.07	0.10	0.22	10	22

Analysis of effects [a]

	Net yield	Net ears	Avg. ear wt	Ear dia.	Ear length	Tip fill	Root rot
Variety	****	****	****	*	****	*	ns
Compaction	***	ns	***	****	*	ns	ns
Variety x Compaction	ns	ns	ns	ns	ns	ns	ns
Irrigation level	****	ns	****	****	***	ns	****
Variety * Irrigation Level	ns	n	ns	ns	ns	ns	ns
Compaction x Irrigation Level	ns	ns	****	***	ns	ns	ns
Variety x Compaction x Irrigation Level	ns	ns	*	ns	ns	ns	ns

[a] ****, P≤0.0001; ***, P≤0.001; **, P≤0.01; *, P≤0.05; ns, not significant.

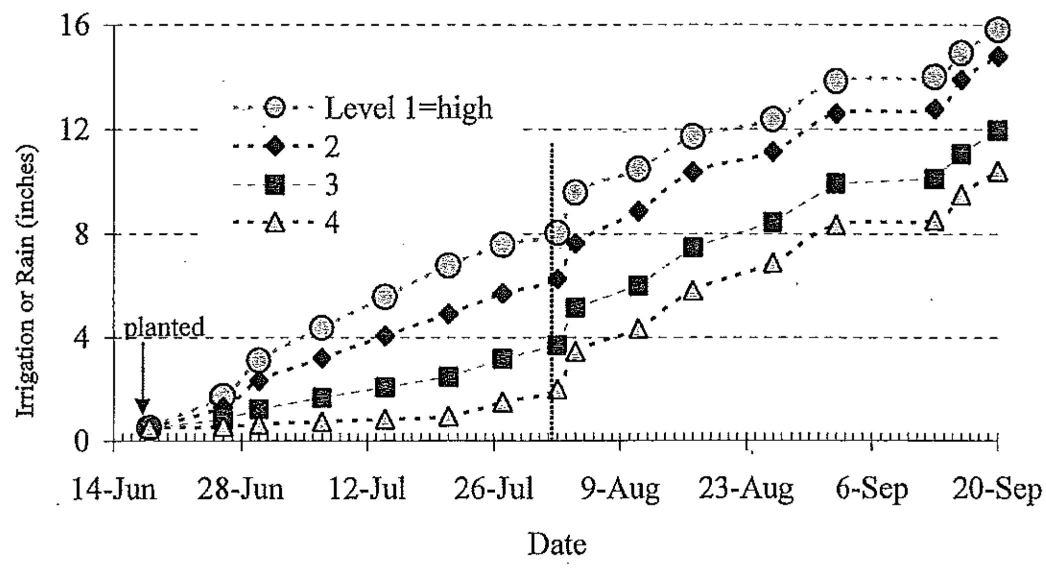

Figure 2.3. Cumulative irrigation for LSII experiment.

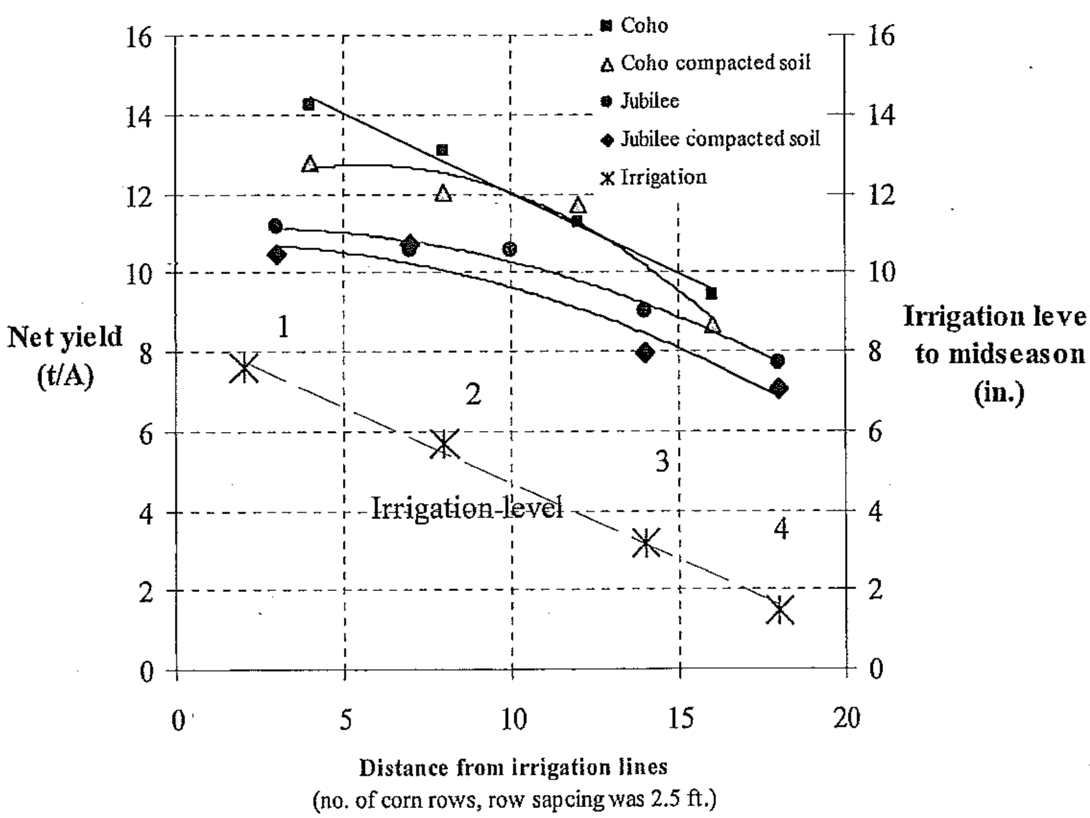

Figure 2.4. Effect of irrigation level to mid-season (800 GDD, 6.5 weeks) on corn yield in normal and compacted soils, LSII 2004.

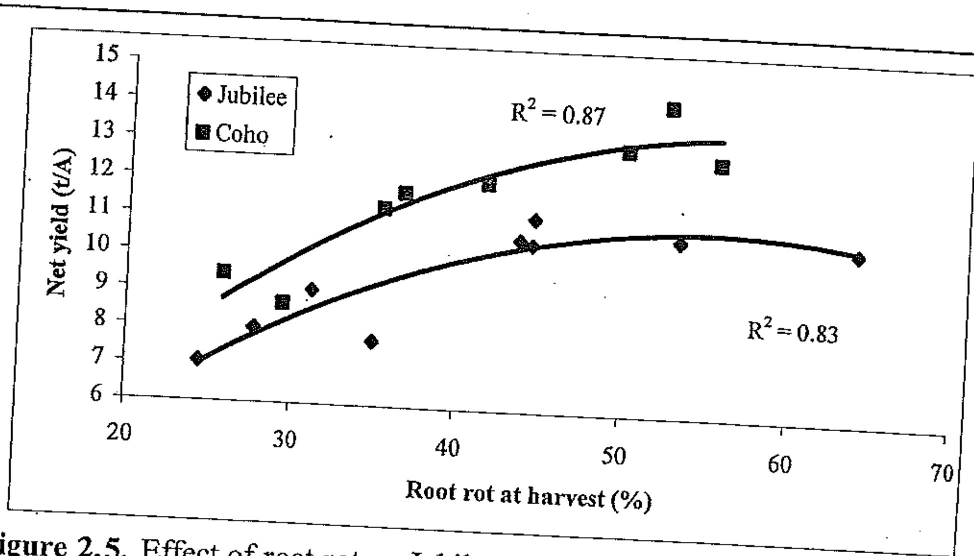

Figure 2.5. Effect of root rot on Jubilee and Coho yields. Yields are average of compacted and uncompacted soil treatments. N= 6 for Coho and 8 for Jubilee.

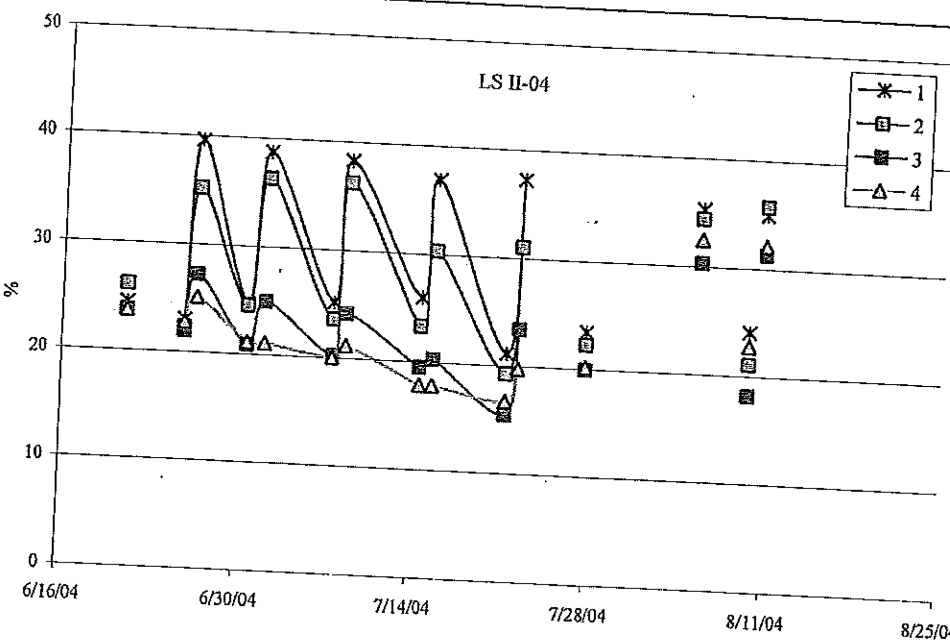

Figure 2.6. Effect of irrigation level on soil moisture to 6 inches in LS II experiment.

Table 2.5. Effect of variety, soil compaction and irrigation level on radicle and root rot at midseason in LSIII, 2004.

Variety	Soil compaction treatment	Irrigation Level	Obs	Percent root rot				Crown discoloration	
				Radicle		Primary roots			
			N	Mean	SD	Mean	SD	Mean	SD
				%				0-4	
Coho	Compacted	1	8	30	22	0.8	0.7	1.2	0.2
Coho	Compacted	2	8	16	13	0.6	0.7	1.2	0.1
Coho	Compacted	3	8	16	15	0.2	0.2	1.1	0.2
Coho	Compacted	4	8	8	14	0.0	0.0	1.7	0.2
Coho	Uncompacted	1	8	34	22	1.3	1.0	1.3	0.1
Coho	Uncompacted	2	7	26	14	1.1	0.8	1.2	0.1
Coho	Uncompacted	3	8	22	12	0.2	0.3	1.2	0.1
Coho	Uncompacted	4	8	10	6	0.0	0.0	1.7	0.2
Jubilee	Compacted	1	8	43	16	0.7	0.7	1.5	0.2
Jubilee	Compacted	2	8	29	13	0.3	0.3	1.6	0.2
Jubilee	Compacted	3	7	29	25	0.0	0.1	2.2	0.5
Jubilee	Compacted	4	8	2	3	0.0	0.0	3.2	0.6
Jubilee	Uncompacted	1	8	57	17	1.1	0.8	1.5	0.3
Jubilee	Uncompacted	2	8	38	22	0.5	0.7	1.7	0.8
Jubilee	Uncompacted	3	7	27	17	0.1	0.3	2.3	0.3
Jubilee	Uncompacted	4	8	15	11	0.0	0.0	2.9	0.2
SS Jubilee	Compacted	1	8	15	20	0.1	0.2	2.2	0.9
SS Jubilee	Compacted	2	8	23	22	0.5	0.6	1.7	0.4
SS Jubilee	Compacted	3	8	16	16	0.1	0.1	1.7	0.4
SS Jubilee	Compacted	4	7	18	20	0.1	0.1	2.4	0.5
SS Jubilee	Uncompacted	1	7	25	24	0.3	0.4	2.2	0.6
SS Jubilee	Uncompacted	2	7	34	18	0.5	0.4	1.6	0.3
SS Jubilee	Uncompacted	3	7	16	8	0.1	0.1	1.8	0.4
SS Jubilee	Uncompacted	4	7	24	27	0.0	0.1	2.4	0.7
LSD (0.05)				12		0.4		0.4	

Analysis of effects [a]

	Radicle	Primary roots	Crown discoloration
Variety	**	**	****
Compaction	**	*	ns
Variety x Compaction	ns	ns	ns
Irrigation Level	****	****	****
Variety x Irrigation Level	***	**	****
Compaction x Irrigation Level	ns	ns	ns
Variety x Compaction x Irrigation Level	ns	ns	ns

[a] ****, P≤0.0001; ***, P≤0.001; **, P≤0.01; *, P≤0.05; ns, not significant.

Table 2.6. Effect of irrigation level on Jubilee Sweet corn yield and root rot, LSIII, 2004.

Irrigation level 1st 6 WAP	Obs.	Ears	Net yield	Avg. ear wt.	Root rot	Crown discoloration
		no/A	t/A	lbs	%	0-4
1=high	4	34400	13.5	0.78	50	1.3
2	4	32700	12.7	0.77	48	1.5
3	4	33500	13.1	0.78	38	1.7
4	4	33500	12.3	0.73	12	2.0
5	4	32200	10.7	0.66	19	2.6
LSD (0.05)		ns	1.7	0.07	25	0.6