Joliet Junior College

Agriculture

Demonstration & Research Guide

2009

Prepared by: Jeff Wessel

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Acknowledgements

Numerous people have contributed in many ways to the J.F. Richards Land Laboratory, Demonstration & Research Farm during 2009. Resources donated range from the time donated by drivers for our field day, to equipment, pesticides and seed. All are listed in the table on the following page. Please take some time to review these people and their supporting employers and offer them thanks for their support of Joliet Junior College.

A few individuals I would like to mention here are John Cronin and Andy Rousonelos for assisting in the planting of our corn hybrid demonstration, harvest, and other assistance throughout the season. Brian Vollmer helped the entire growing season as a student intern. He is responsible for collecting much of the data throughout the growing season and maintaining the farm appearance, and we are in his debt.

Acknowledgements

List of people and companies they represent that donated seed, crop protection products, and time to the Joliet Junior College Demonstration & Research Farm in 2009.

Last	First	Organization
Bleuer	Bob	
Cronin	John	
Davis	Vince	U of I
Doty	Daryl	Dekalb
Foes	Matt	Monsanto
Friedlund	Mike	Syngenta
Rink	Nate	Burrus
Higgins	Russel	U of I
Hopkins	Alan	Dupont
Lagger	Scott	Elburn Coop
Lobdell	Kelly	Trelay
Porter	Rich	AMVAC
Rousonelos	Andy	Joliet Junior College
Schneider	Dan	LG
Skonetski	Bill	Dairyland Seed
Thomas	Dave	Syngenta
Thumma	Todd	Garst
Tomlinson	Pat	Pioneer
Vollmer	Brian	Joliet Junior College
Walz	Wayne	Pioneer
Woodall	Kent	Rosens

Faculty and Staff of the Agriculture and Horticulture Sciences Department

The agriculture and horticulture faculty and staff at Joliet Junior College are always willing to answer questions and discuss the information contained within this document. As an institution of higher learning we value the discussion of the contents of our demonstration and research guide, and welcome input from the public concerning our farm. Below is a complete list of all faculty and staff in the Agriculture and Horticulture Sciences, and Veterinary Technology Department. For more information or additional copies of the JJC Demonstration and Research Guide 2008, contact: Jeff Wessel, Joliet Junior College, 1215 Houbolt Road, Joliet, Illinois 60431. Phone: (815)280-6602 e-mail: jwessel@jjc.edu. To contact faculty and other staff members call (815)280-2320, or fax at (815)280-6650.

Brad Angus	Agronomy/Business/Livestock Judging
Jim Ethridge	Dept. Chair/Greenhouse
Doug Foss	Mechanics
Caryn Genens	Horticulture Lab Manager
Dale Hummel	Animal Science
Bill Johnson	Agriculture Economics/Marketing
Scott Keller	Veterinary Technology
Mark Kuster	Lanscape Design
Karen Magno	Veterinary Technology Secretary
Eileen McKee	Veterinary Technology
Fredric Miller	Nursery Management
Tammy Miller	Soils/Fertilizers
Roxanne Olson	Veterinary Technology
Lisa Perkins	Turf Management
Lynda Scerine	Department Secretary
Walter Stein	Veterinary Technology
Donna Theimer	Floral Design/Interior Plantscaping
Jeff Wessel	Farm Manager

Introduction

The Joliet Junior College J. F. Richards Demonstration and Research Farm was founded in 1983 with the expressed purpose of being an educational resource for agricultural students and their instructors. There are three major objectives of the Demonstration and Research Farm. They are: 1) Provide an instructional setting for crops and soils analysis, this allows students to put into practice skills they have learned in the classroom. 2) Demonstrate crop response to various agronomic practices, this provides an environment for students to observe firsthand the impact of various agronomic practices on crop growth and development. 3) Provide unbiased, sound agronomic information to crop producers.

The Demonstration and Research Farm consists of 100 cropped acres with 68 acres of corn and 32 of soybean in 2009. Fifteen agronomic studies and two demonstrations were implemented; they included the evaluation of corn and soybean herbicides and insecticides, tillage systems, row spacing and plant populations, and planting dates in both corn and soybean. Nitrogen (N) fertilizer rates and corn root protection were among other replicated studies. Demonstrations (unreplicated) of corn and soybean varieties were also included.

Our Demonstration and Research Farm is situated in Joliet, Illinois (North Eastern Illinois) a region dominated by soils with low phosphorous (P) supplying power and high cation exchange capacity. Soil fertility levels at the Demonstration and Research Farm are within acceptable ranges for row crop production. P soil levels range from 50 to 140 with a median of 69 lb available P per acre, and exchangeable K^+ ranges from 277 to 502 with a median of 360 lb per acre. Soil pH ranges from 5.6 to 7.4 with an average of 6.7. Given these soil fertility levels, maintenance fertilizer P and K are applied annually at a rate of 50 lb P_2O_5 and K_2O per acre. The five year moving average yield for corn and soybean is 172 and 49 bushels per acre respectively.

Zero tillage is the primary tillage system used, thus spring pre-plant or spring preemerge “burndown” herbicides are used to kill existing vegetation. For soybean Roundup WeatherMax + 2,4-D were applied pre-plant. For corn, spring

Introduction

applied preemerge burndown herbicides consisted of Roundup Weather Max + 2,4-D. In addition to the burndown, weed control in corn was accomplished by preemerge applications of HarnessXtra followed by postemerge applications of Roundup Weather Max or Impact. Weed control for soybean, in addition to the fall burndown, was accomplished with a V4 application of Roundup Weather Max.

Both corn and soybean were planted using a Kinze model 3000 pull-type planter manufactured in 2002 and equipped with a coulter and residue remover combination for zero-till planting. Corn was planted in 30 inch rows at a rate of 36,000 seeds per acre and planting dates for most corn was mid to late April. Soybean was seeded at a rate of 150,000 seeds per acre in either 15 or 30 inch rows. Soybean was planted the first week of June. Crops were harvested the second half of October and early November. The average corn yield was 186 bushels per acre, while soybean averaged 58.

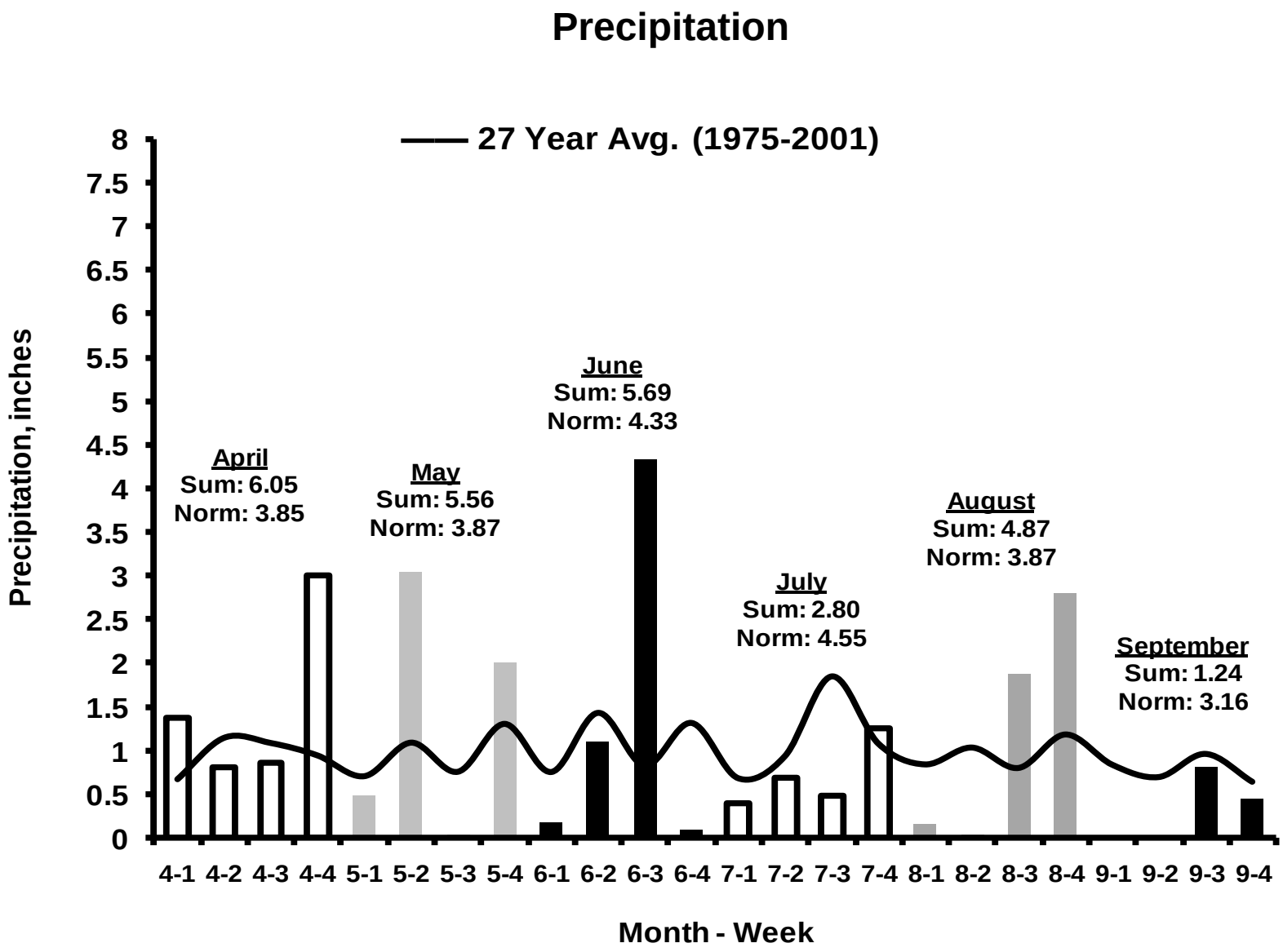

Figure 1. Weekly precipitation at Joliet Junior College during the 2009 growing season (bars), and a 27 year average (black curve) from a nearby weather station.

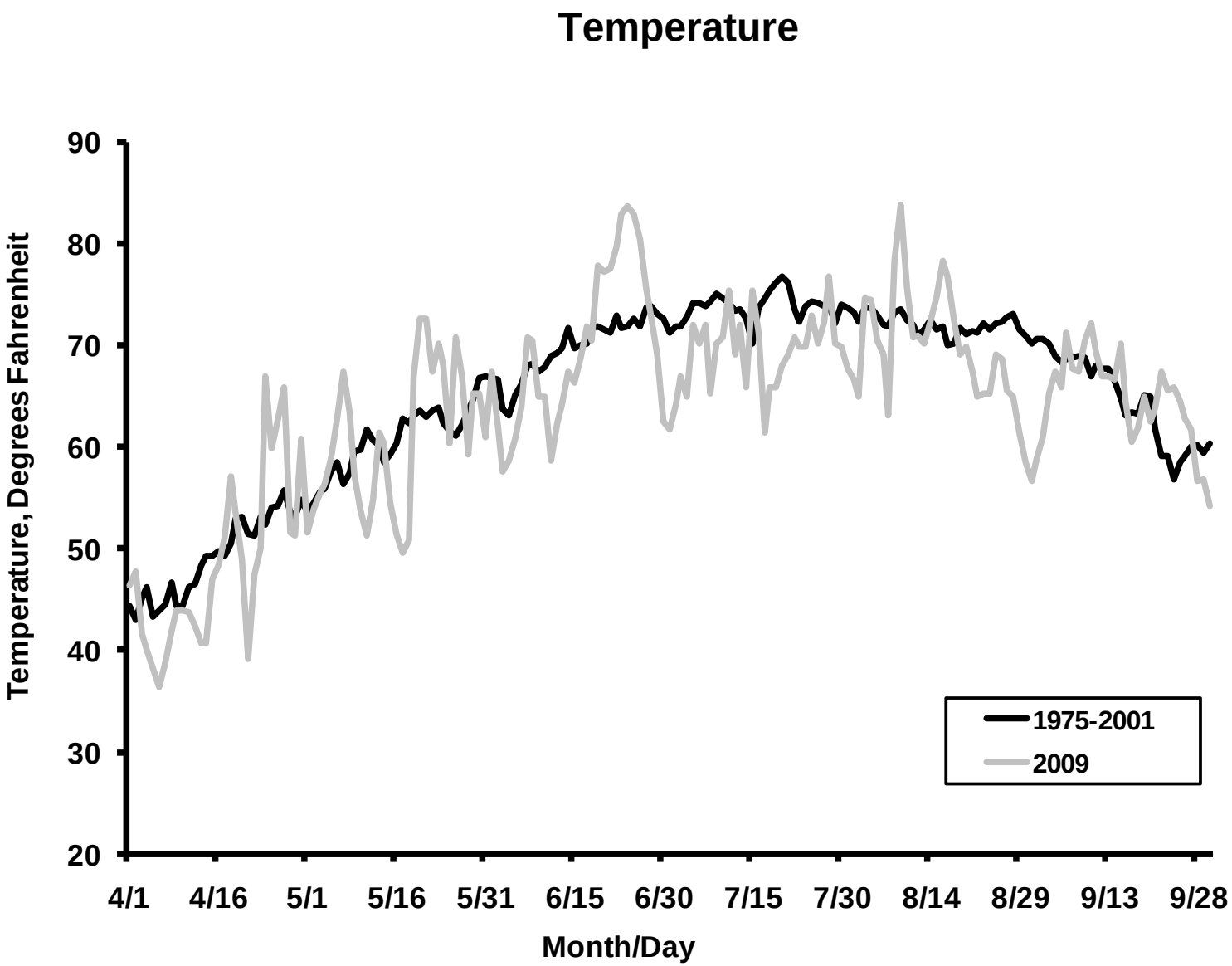

Figure 2. Average daily temperature at Joliet Junior College during the 2009 (gray curve) growing season, and a 27 year average (black curve, 1975-2001) from a nearby weather station.

Crop Growth Stages

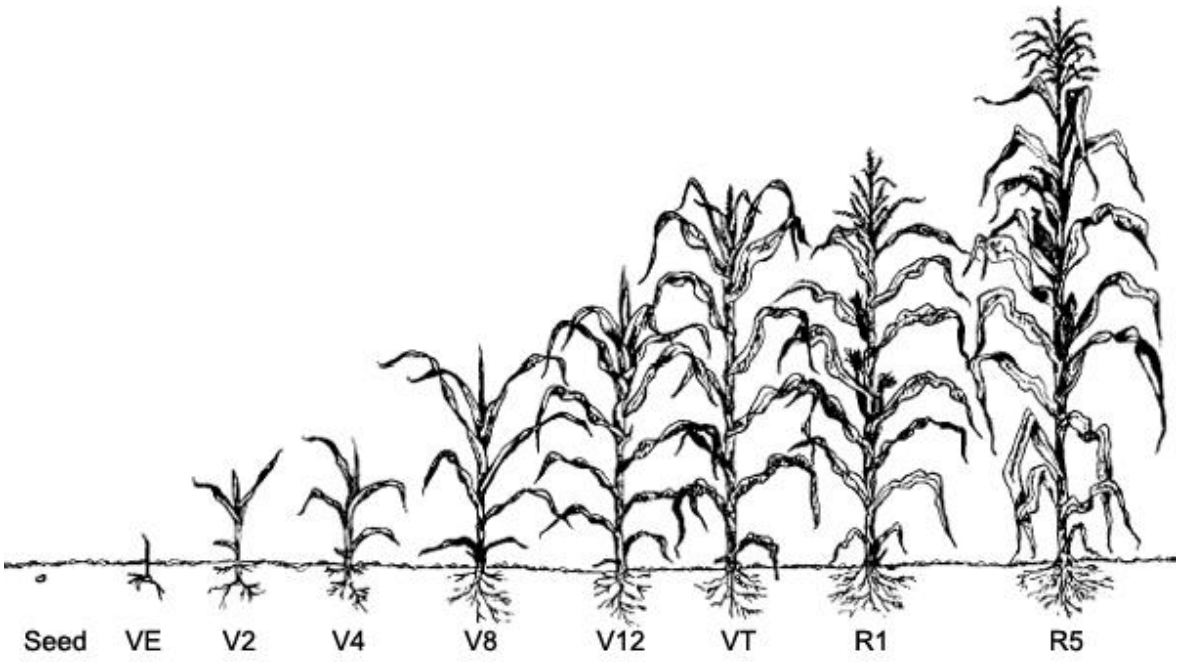

Figure 3. "How A Corn Plant Develops", Special Report No. 48, Iowa State University, reprinted February, 1996.

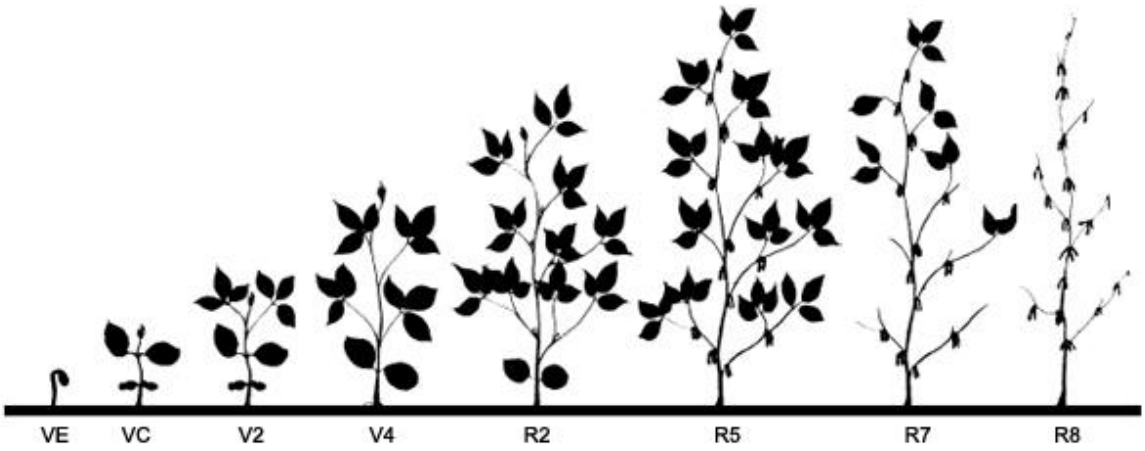

Figure 4. "How a Soybean Plant Develops", Special Report No. 53, Iowa State University,reprinted March, 1994.

Corn Rootworm Larval Control Products

Rationale

Corn rootworm (CRW) is the most damaging insect pest of mono-cropped corn in the Midwest (Levine and Oloumi-Sadeghi, 1996), and as such has the potential to inflict heavy economic losses (Gray et al., 1993). Beginning in the 1980's, this pest has inflicted an estimated one billion dollars of annul losses to U.S. corn producers through yield reductions and the cost of control measures, and hence has earned the nickname "the billion dollar pest" (Metcalf, 1986). Prior to 1995, rotated corn in Illinois was not vulnerable to root injury from Western Corn Rootworm (Spencer et al., 1997). Since 1995 however, a variant western corn rootworm exhibiting a behavioral shift to oviposition in crops other than corn has resulted in a failure of crop rotation to control WCR in first year corn fields (Levine et al., 2002).

Figure depicts a dramatic increase in first-year corn acres at risk from corn rootworm larval injury in 2005 compared to 1999. In 2005 all Illinois corn producers were at some risk of seeing first-year corn injured from corn rootworm larvae, compared to only about ¼ in 1999. The latest development has been the expansion of the variant into Southern Illinois (South of I-70) as reported by Steffey (2005). Our objectives were to evaluate the efficacy of corn rootworm larval insecticides and transgenic Bt-RW corn, and to determine the relationship between root injury ratings and corn grain yield.

Corn Rootworm Larval Control Products

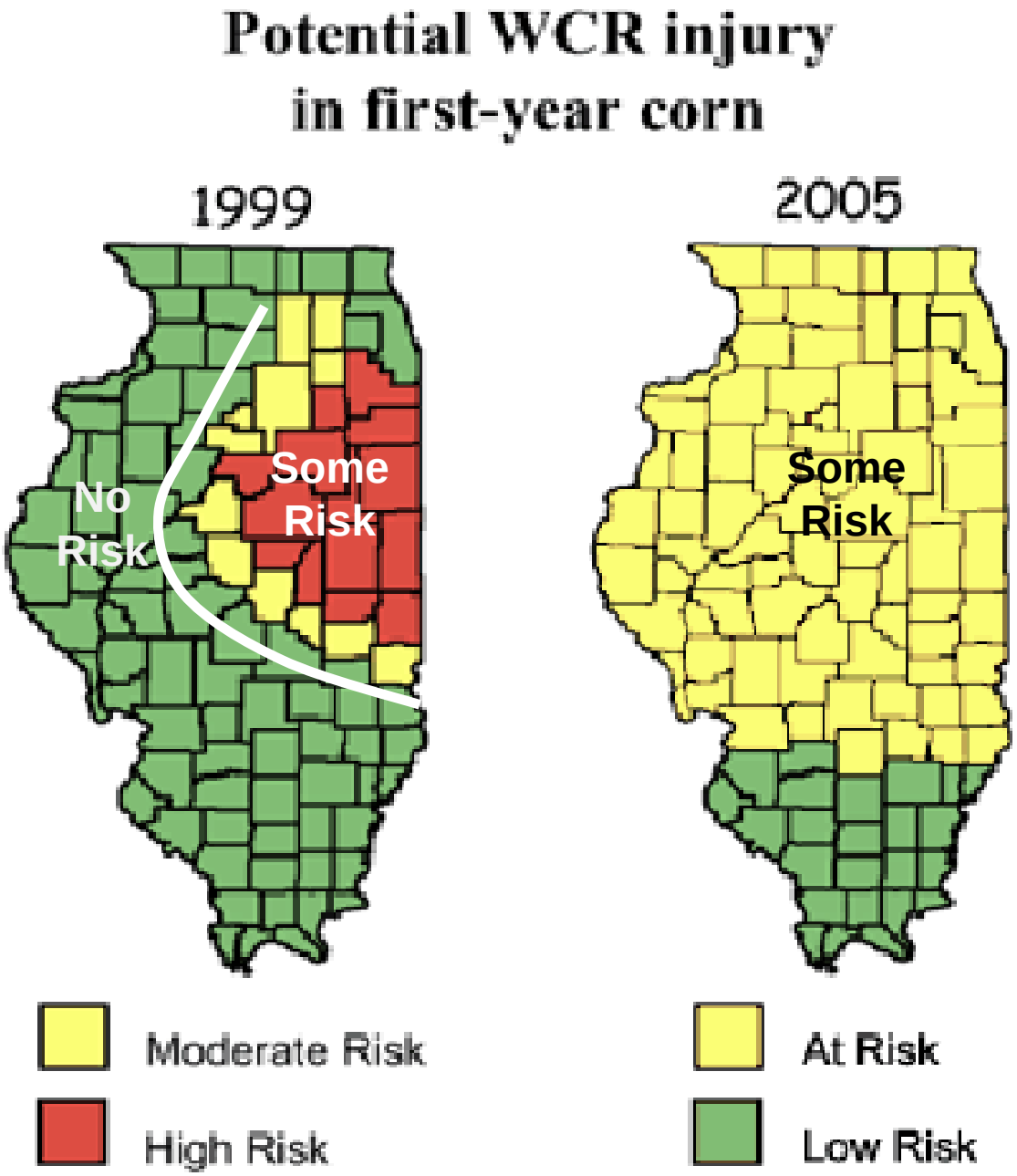

Figure 5. Possible injury from Western corn rootworm larvae in first-year corn fields in 1999 and 2005.

Source: University of Illinois Extension, IPM Field Crops. [Online] available at: http://ipm.uiuc.edu/fieldcrops/insects/western_corn_rootworm/index.html.

Corn Rootworm Larval Control Products

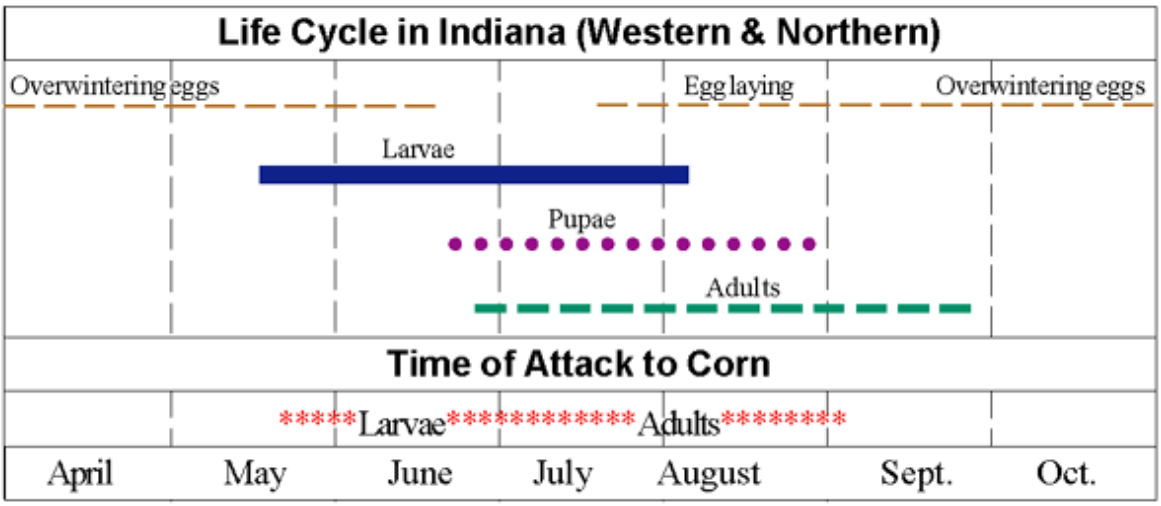

Figure 6. Corn Rootworm lifecycle.

Source: Purdue University Field Crops IPM.

http://extension.entm.purdue.edu/fieldcropsipm/insects/corn-rootworms.php

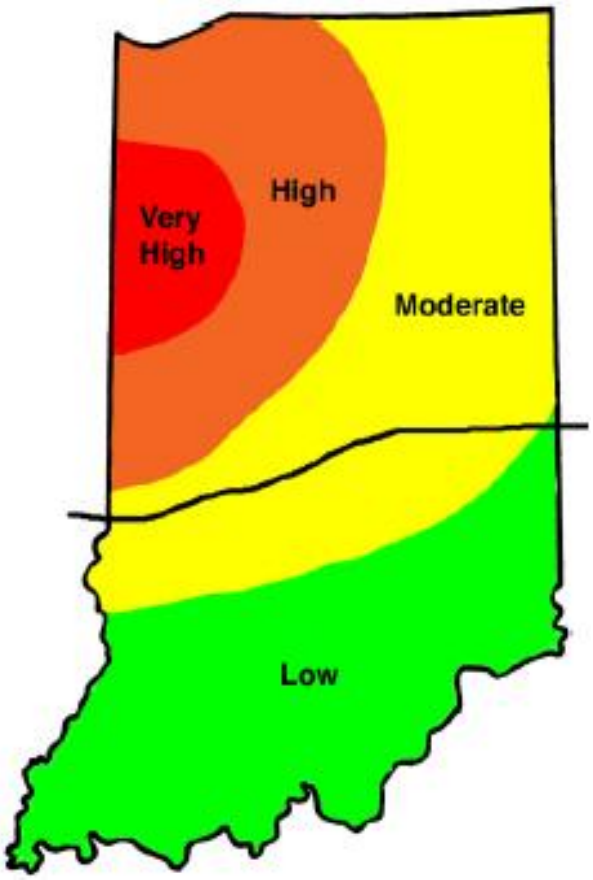

Figure 7. Risk of injury from Western corn rootworm larvae in first-year corn fields in Indiana.

Source: Larry W. Bledsoe and John L. Obermeyer,

Managing Corn Rootworms-2008

http://extension.entm.purdue.edu/publications/E-49.pdf

Corn Rootworm Larval Control Products

Methods

Two granular insecticides, two Bt-RW events, combined Bt-RW and Counter, and an untreated control were evaluated for their impact on corn root injury and grain yield. The two Bt-RW events were; Monsanto's VT3 (Cry3Bb1) and DuPont's Herculex RW (Cry34Ab1/Cry35Ab1). The two transgenic RW events were "stacked" with european corn borer resistance and herbicide tolerance. The VT3 and Herculex RW events were contained in hybrids Dekalb 61-69 (VT3) and Pioneer 33F88 (HXX). The isoline of Pioneer 33F88 (HXX), 33F87 (HX1) was used with both granular insecticides (Force and Counter) and the untreated control. The product rate of granular insecticides was 4 and 8 oz per 1000ft. of row for Force3G and Counter15G.

The previous crop was late planted corn (early June), in an effort to increase adult egg laying and hopefully larval populations the following season. The experimental area was moldboard plowed in the fall of the year, and shallowly disked in the spring. The crop was planted on May 21st, seeded at 36,000 seeds per acre, and 40 lb N/acre urea ammonium nitrate applied two inches to the side and two inches below the seed furrow. All granular insecticides were applied in the seed furrow through a planter-box attachment. Harness Xtra was applied at 43 oz/acre preemerge, followed by Impact at 0.67 oz/acre postemerge (V3). At V5 the crop was sidedressed with 100 lb N/acre of urea ammonium nitrate. On July 13th (V10), five randomly selected plants from each plot were dug from the soil, washed, and rated for root injury on the 0 – 3 node-injury scale (Oleson et al., 2005).

Corn Rootworm Larval Control Products

Table 1. Iowa State 0 to 3 node-injury scale (Oleson et al., 2005).

Value	Damage Description
0.00	No feeding damage (lowest rating that can be given)
1.00	One node (circle of roots), or the eqivelant of an entire node, eaten back to within approximately two inches of the stalk (soil line of the 7th node)
2.00	Two complete nodes eaten
3.00	Three complete nodes eaten

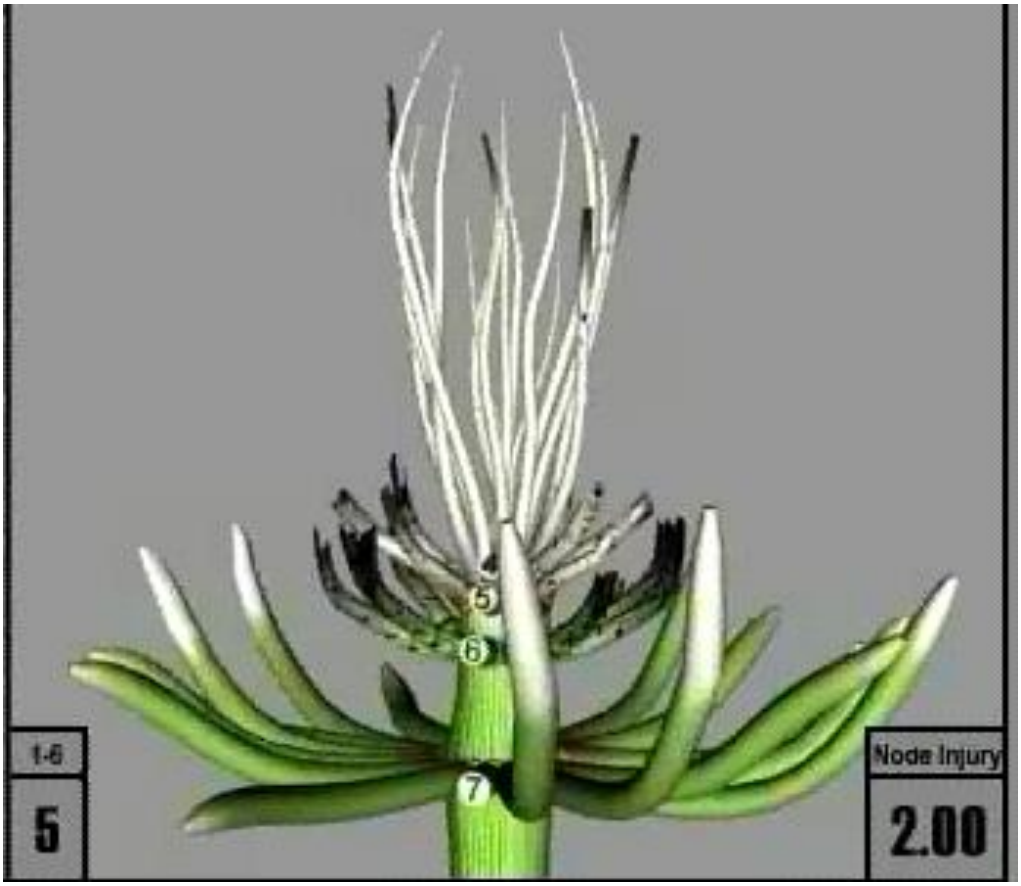

Figure 8. A corn nodal root system with two nodes of roots cut off, representing a two on the 0 to 3 node-injury scale.

Source: Interactive Node-Injury Scale.

http://www.ent.iastate.edu/pest/rootworm/nodeinjury/nodeinjury.html

Corn Rootworm Larval Control Products

Results

The untreated control had 2.8 nodes of roots destroyed, of the three nodes evaluated (Figure 8). All six corn rootworm larval control products provided excellent root protection. The level of root protection provided by all control products in 2009 are considered well below the level at which economic injury may occur (1.0). The addition of a granular corn rootworm larval insecticide Counter (Terbufos), to either Bt-RW events (HXRW or VT3) provided no additional root protection.

The stark contrast in injury between the untreated control compared to Force or Bt-RW in 2009 has not been observed in our studies previously (Table 2). We can only speculate that the very late planting date of May 21st produced greater availability of both the granular insecticide active ingredient and the insecticidal protein associated with Bt-RW. Historically, planting of this study has ranged from April 15th to April 26th. Soil insecticides do degrade in the soil, and timing between maximum insecticidal protein production in transgenic plants and larval feeding may rarely be optimal.

Similar to 2009, four of the previous six years produced statistically similar ($p > 0.10$) root injury ratings between Force and Bt-RW. Table 3 indicates a type of consistency rating calculated for three treatments over the previous seven years. Treatments were rated as to whether or not individual plots had injury ratings below either 1.00 or 0.25 on the 0 to 3 scale. Plants in untreated plots never had roots below 0.25, and only 5% of these plants had injury ratings less than 1.00. Force treated plots however, had 18% of plants less than 0.25 and Bt-RW 41%. Both Force and Bt-RW had an overwhelming majority of roots with less than 1.00.

When averaged over all seven years, grain yields for Force versus Bt-RW protected roots produced nearly identical yields (Table 4). In two instances though, Bt-RW produced significantly ($p < 0.10$) greater grain yield. Figure 9 depicts the relationship between root injury rating and relative grain yield. A plateau-quadratic regression curve was fit to the data, it indicates yield loss begins with a 0.68 injury rating, while economic losses begin at 1.35.

Corn Rootworm Larval Control Products

Our group prepares to dig roots for 2009 season. Back to front: Wyatt Wessel, Andy Rousonelos, Andy Rousonelos, Brian Vollmer, and Jeff Wessel.

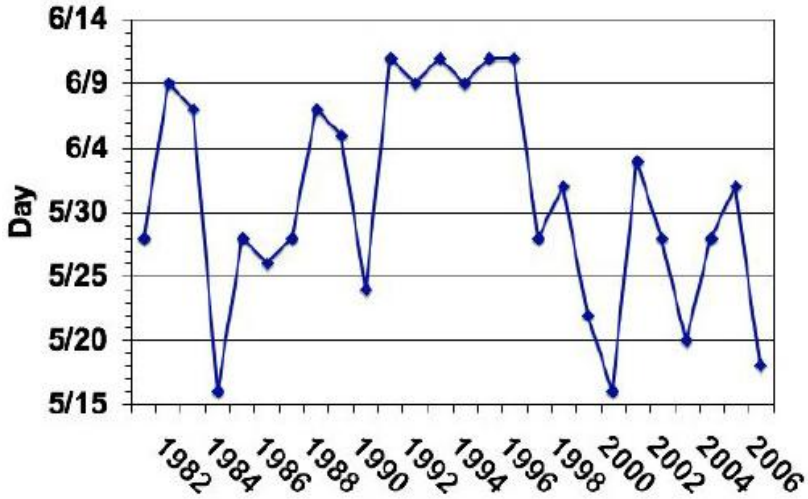

Figure 9. First observation of Rootworm Larvae in Corn Roots, Tippecanoe County, Indiana, 1982-2007. Source: Larry W. Bledsoe and John L. Obermeyer. 2008. *In* Managing Corn Rootworms – 2008.

Corn Rootworm Larval Control Products

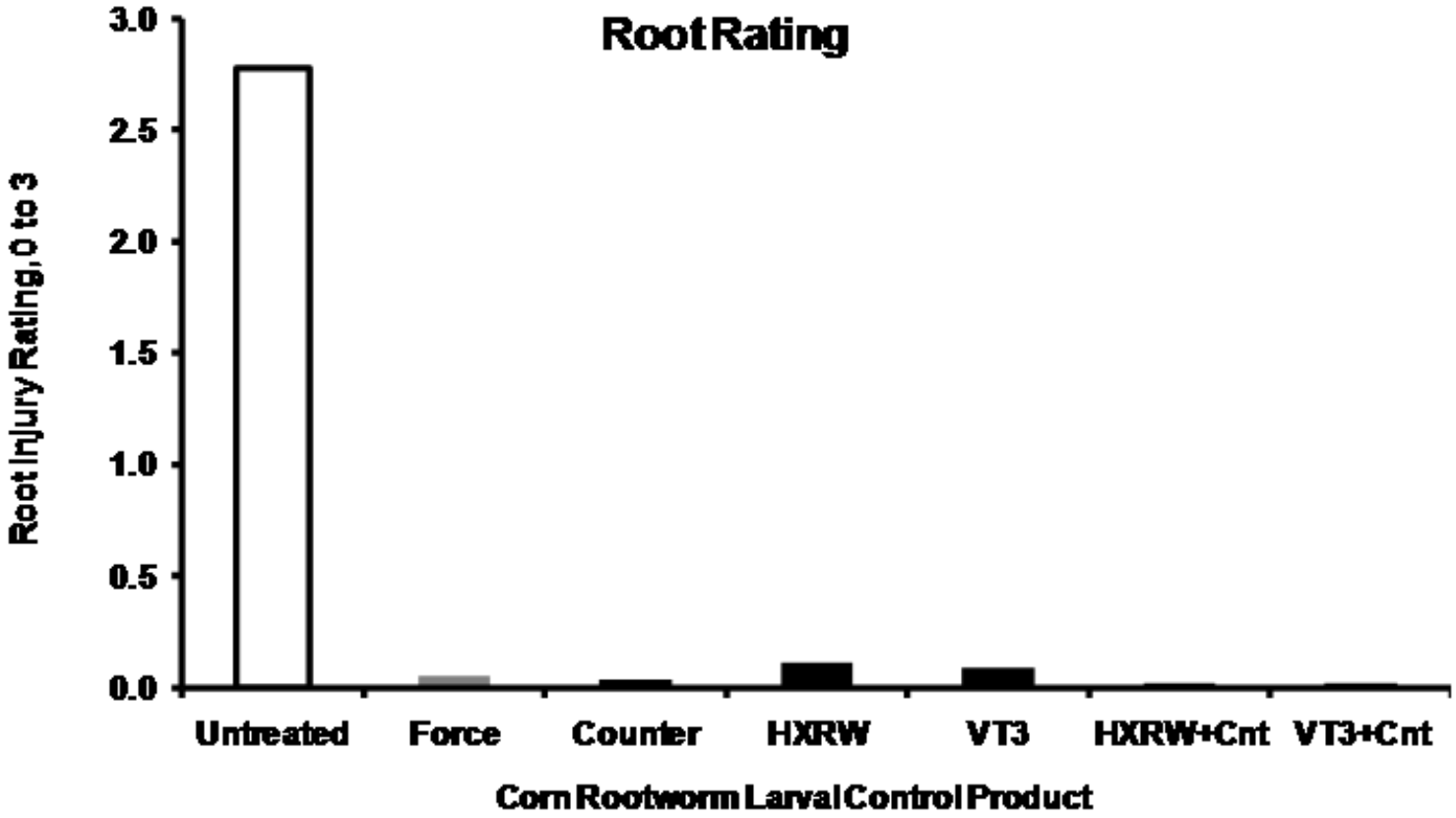

Figure 10. Influence of corn rootworm larval control product on the root injury ratings (0 to 3) of corn grown at Joliet Junior College in 2009. The corn hybrids are; Pioneer 33F87 (HX1) used for all non-Bt rootworm treatments, Pioneer 33F88 (HXX) used for both Herculex rootworm treatments (HXRW), and Dekalb 61-69 (VT3) used for both VT3 treatments. The two Pioneer hybrids are isogenic lines. Granular insecticide abbreviations; Cnt= Counter. Control products are not significantly different ($p > 0.10$), while the untreated control is > all control products.

Corn Rootworm Larval Control Products

Table 2. Influence of year and Corn Rootworm larval control product on the root injury rating of corn grown at Joliet Junior College from 2003 through 2009.

	CRW Larval Control Product			
Year	Untreated	Force	Bt-RW†	LSD (0.10)
	root rating, 0 to 3			
2003	2.43	1.18	0.29	0.52
2004	2.66	1.10	0.60	0.40
2005	2.6	0.65	0.36	0.55
2006	2.83	2.27	1.77	0.53
2007	2.91	0.56	0.86	0.48
2008	1.47	1.22	0.26	1.4
2009	2.78	0.06	0.12	0.09
Average	2.53	1.01	0.61	0.43

† Bt-RW is YGRW, VT3, or HXRW.

Table 3. Portion of plots with node-injury ratings less than 1.0 or 0.25 for corn grown at Joliet Junior College over a seven year period (2003 – 2009).

Control	Node-Injury	
Product	<1.00	<0.25
	%	
Untreated	5	0
Force	59	18
Bt-RW†	77	41

† Bt-RW is YGRW, VT3, or HXRW.

Corn Rootworm Larval Control Products

Table 4. Influence of year and Corn Rootworm larval control product on the grain yield of corn grown at Joliet Junior College from 2003 through 2009.

	CRW Larval Control Product			
Year	Untreated	Force	Bt-RW†	LSD (0.10)
	bushels per acre			
2003	64	156	149	14
2004	46	87	95	5
2005	84	117	119	7
2006	69	168	169	27
2007	142	178	193	13
2008	142	151	154	17
2009	133	161	160	7
Average	97	145	148	17

† Bt-RW is YGRW, VT3, or HXRW.

Corn Rootworm Larval Control Products

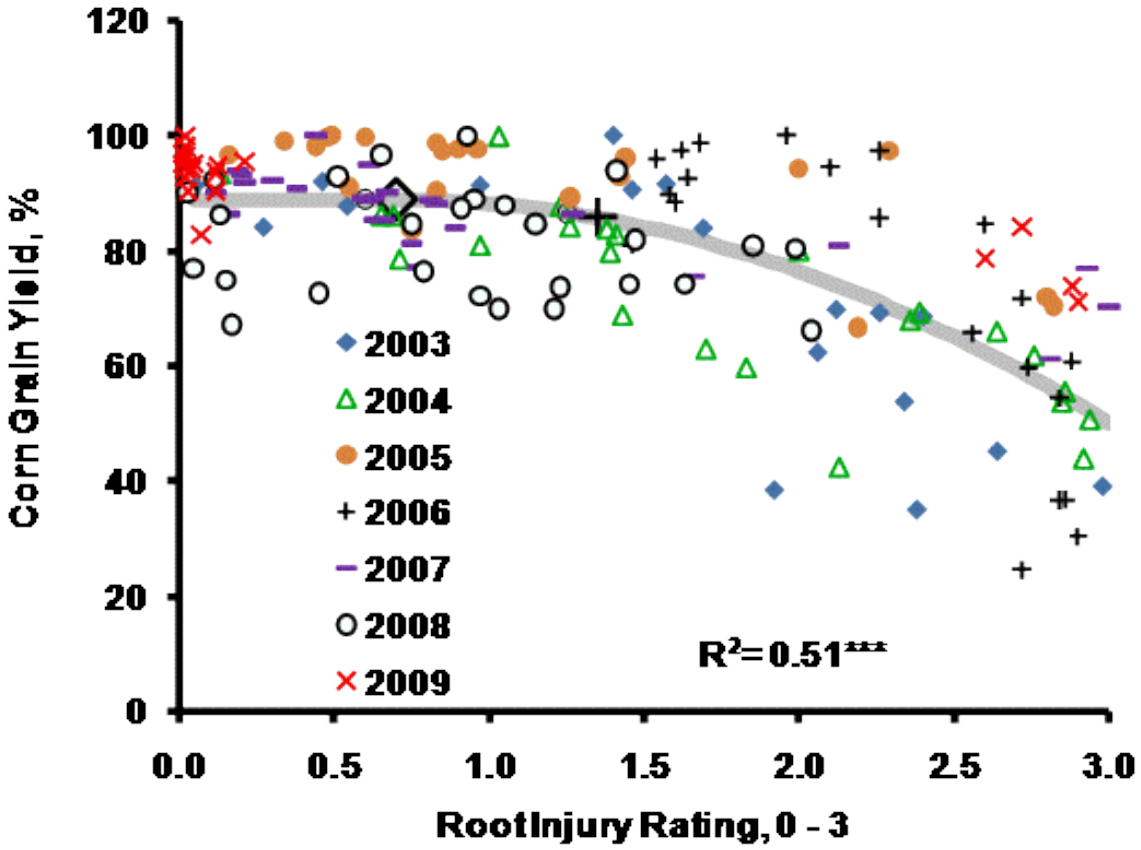

Figure 11. Influence of root injury rating (0-3, node-injury scale) on the relative grain yield of corn grown at Joliet Junior College from 2003 through 2009. The large diamond shape indicates a plateau yield of 88.97%, which occurs at a root injury ratings of 0.68. The large plus shape indicates where economic injury occurs, it begins with a root injury rating of 1.35 and yield of 85.77%. Economic injury level was calculated using 180 bushels/acre yield, $3.50/bushel price, and $20.00/acre treatment cost. "***" indicates a model p-value less than 0.001.

Corn Herbicides

Rationale

The adoption rate of herbicide tolerant corn in the U.S. has risen considerably since 2000 (Figure 13). Recently, for the first time in the history of genetically engineered crops, herbicide tolerant corn was grown on more acres than Bt corn. Herbicide tolerant corn is currently grown on about 60% of U.S. acres. Because the herbicides used in this system (glyphosate and glufosinate) are post applied and have no soil residual activity, there is considerable interest regarding optimum application time, and the combined use of herbicides with soil residual activity.

Methods

Corn was zero-till planted in mid April over four growing seasons (2004, 2006, 2007, 2008), in 2009 however, planting was delayed until May 6th. The previous crop was soybean, and seeding rates were about 34,000 seeds per acre. Before planting the entire experimental area was sprayed with Roundup WeatherMax at 11oz per acre and 2,4-D at 16oz per acre. Two adjuvants were also included in the tank mix, crop oil concentrate at 1% by volume, and ammonium sulfate at 17lb per 100 gallons of water.

Roundup WeatherMax (glyphosate) was applied at 21oz (0.75lb a.e.) per acre at specific growth stages, which ranged from V2 to V8. A no herbicide control was also included in the experiments. Herbicide applications were made with a Hardy pull-type sprayer using Teejet XR11004 spray nozzles operating at 25psi and 20 gallons per acre application rate. Plots and spray boom width were 15 feet wide, the center 10 feet of each plot was harvested. Weed efficacy was assessed visually and measured post maturity in early October.

Corn Herbicides

Results

The no herbicide control always produced lower yields when compared to any of the three Roundup application times, indicating some weed pressure every year (Figure 14). Differences in weed pressure in the experimental areas changed considerably from year to year however. Figure 12 is two photos of the no herbicide control from different years. As might be expected, increases in yield from Roundup applications also varied considerably. A 70 bushel per acre increase was observed in 2008, while only a 10 bushel increase occurred in 2009.

Despite heavy weed pressure in some years, delaying Roundup application time never decreased yield, and in one year (2006) yield increased when Roundup was applied at V4 or V8 compared to V2. While two applications tended to produce the highest numerical yield, a significant increase ($p < 0.10$) compared to a single Roundup application occurred in 2009 only.

A plot heavily infested with lambsquarter in October.

Corn Herbicides

Figure 12. Untreated control plots from different years at Joliet Junior College. Note the large difference in weed pressure from year to year.

Corn Herbicides

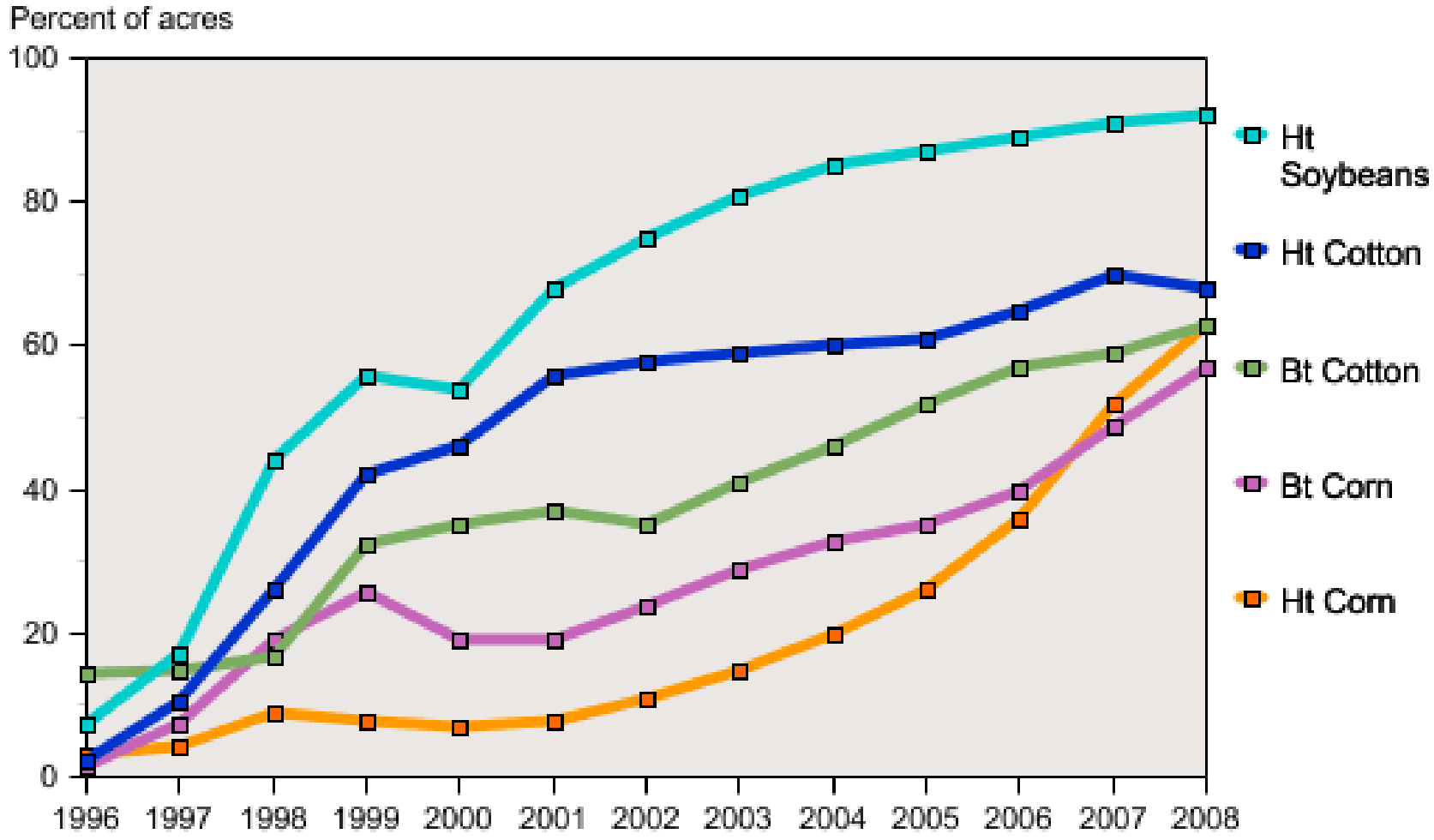

Figure 13. Adoption of genetically engineered crop in the U.S.

Source: USDA-ERS. 2008. http://www.ers.usda.gov/data/biotechcrops/.

Corn Herbicides

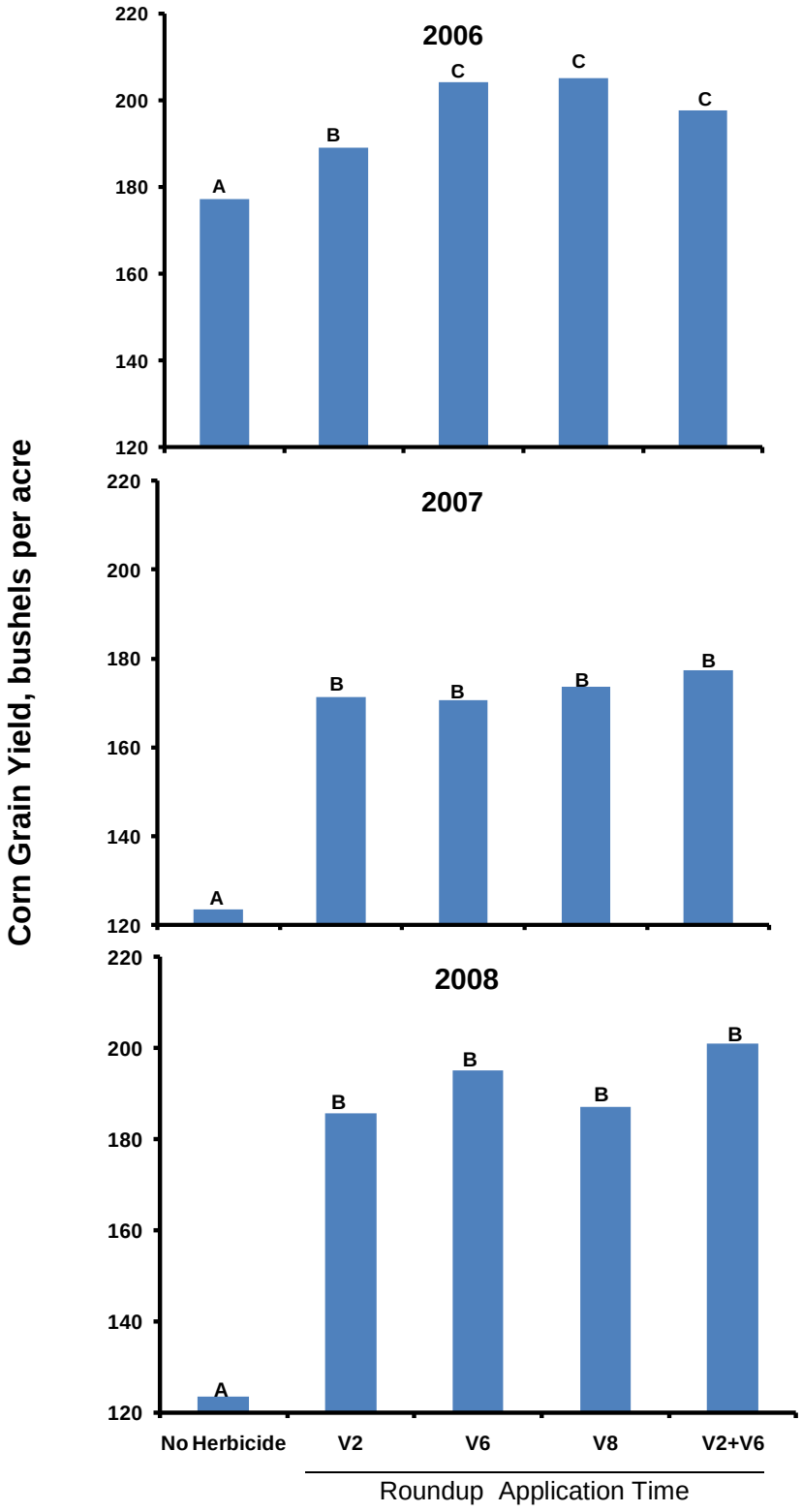

Figure 14. Continued on the following page.

Corn Herbicides

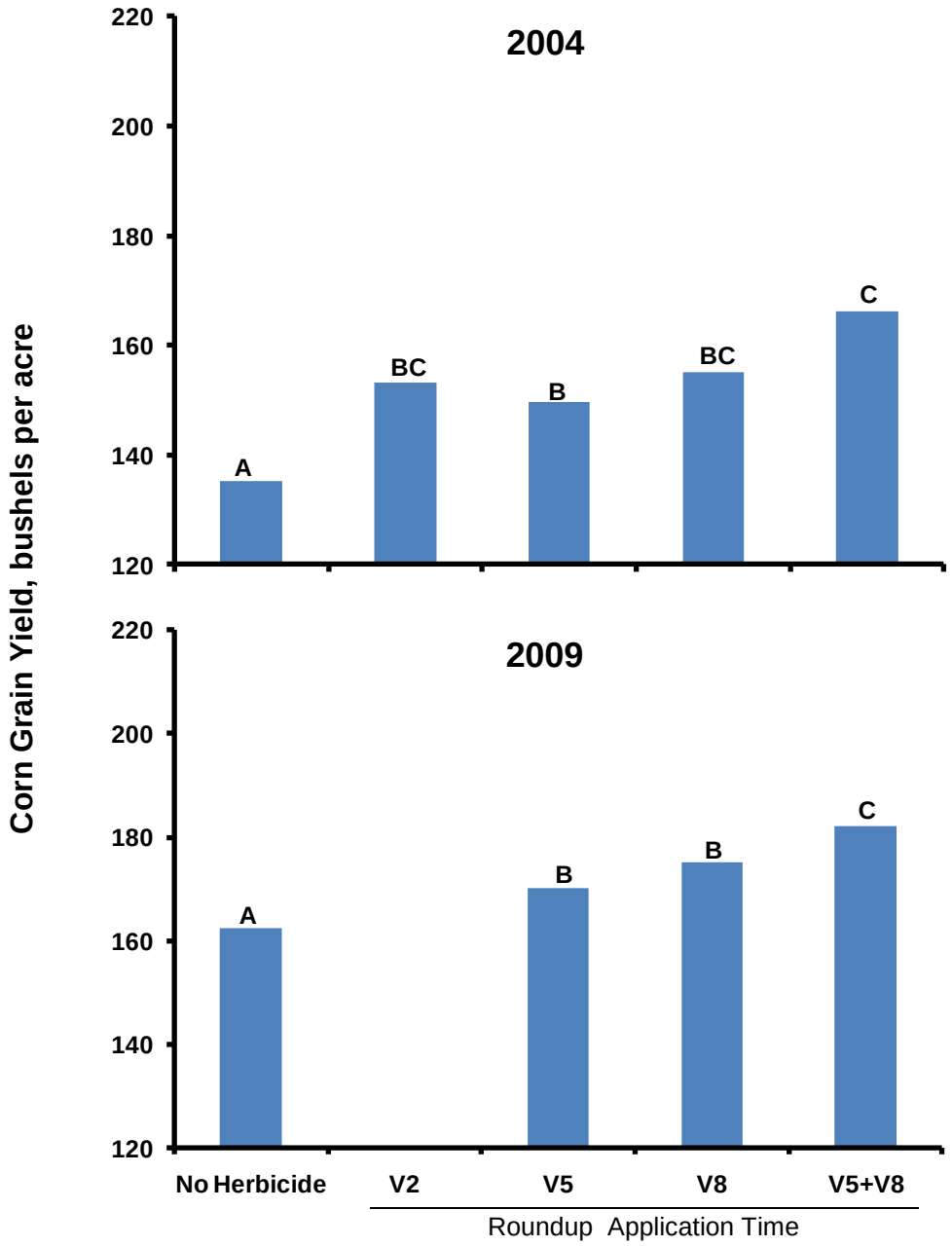

Figure 14. Influence of year and glyphosate application time on the grain yield of corn grown at Joliet Junior College in 2004, and 2006 through 2009. Treatments followed by the same letter are not significantly different ($p > 0.10$). The glyphosate source was Roundup WeatherMax, applied at 21oz per acre (0.75lb a.e. per acre).

Soil Compaction and Nitrogen Requirement

Rationale

Nitrogen (N) fertilizer is usually required by corn to maximize producer profitability. Numerous factors such as N application time (Welch, 1971), N placement (Roberts et al., 1995), use of nitrification inhibitors (Bundy, 1986), tillage (Stecker, 1993), grain yield and previous crop (Hoeft and Peck, 2002), soil N supply (Rehm et al., 1994), and soil N loss characteristics (Smith et al., 1983) can impact corn fertilizer N requirements. In many cases either one or a number of these factors vary from field to field with changes in management and soil characteristics.

Economics and environmental concerns are usually at the forefront of N fertilizer considerations. During the past decade there has been increasing interest over the efficiency by which N is used. The largest zone of oxygen depleted waters in the U.S., Northern Gulf of Mexico, is often the focal point of concerns over N fertilizer use efficiency. This hypoxic area is thought by some to be partially related to or caused by an increase in nitrogen loading in the Gulf, possibly due to N fertilizer loss from Mid-Western cropland (Rabalias, 1998).

One management factor not widely studied that may impact corn N requirements is soil compaction. Soil compaction is defined as a process of rearrangement of soil particles that result in a decrease of pore space and increased bulk density (Singer and Munns, 1987). The reduction in soil porosity is at the expense of macropores (large pores), creating a soil with a greater proportion of micropores (Wolkowski, 1990). Macropores are crucial for soil internal drainage (percolation), and when soil is compacted the remaining pore space has a higher percentage of water. The increase in water retention associated with compacted soils results in a more anaerobic environment which increases N losses through denitrification and reduces root growth. Soil compaction caused by heavy wheel traffic has been found to reduce corn grain yield (Wolkowski and Bundy, 1990). Our objective was to determine if compacted soil influences corn N requirement.

Soil Compaction and Nitrogen Requirement

Methods

An experiment was conducted at Joliet Junior College in 2009 to produce N-rate response curves for corn grown with compacted and non-compacted soil. Five nitrogen fertilizer rates (40-200 lb N/acre in 40 lb increments) and an unfertilized control were applied to both soil compaction treatments. Forty pounds of N per acre was applied during planting two inches to the side and two inches below each seed furrow to all treatments except the unfertilized control, and the balance of an N treatment was sidedressed at V5/6 (mid-June). The N source was urea ammonium nitrate (32% UAN) injected four inches deep into every other row middle (60" spacing) during the sidedressing operation.

All treatments were replicated four times and arranged in a split-plot design, with compaction treatment as the main plots and N rate the sub plots. The hybrid was DEKALB DKC61-69 seeded at 36,000 seeds per acre on May 6th into undisturbed soybean stubble. The soil was compacted before planting using a MXU 115 Case tractor weighing about 15,000lb carrying a three point-hitch implement weighing about 2500lb.

Soil Compaction and Nitrogen Requirement

Results

The bottom graph of figure 15 represents the typical response to N fertilizer for corn production at Joliet Junior College. The graphic depicts a 60 bushel per acre increase in yield at non-limiting N rates. The shape of this response is clearly curvilinear, where additional N at rates between 120 and 160lb N per acre have a minor effect on yield, and rates above 160lb N per acre are of no benefit to the crop. The response of corn to N in 2009 (top of figure 15) was quite different than we have observed in previous years.

The 2009 response was linear, N limited yield at even the highest rate, which increased yield by 110 bushels per acre above the unfertilized control. This linear response is an indication of high yields and or low N availability. Soil supplied N was likely reduced due to cooler and wetter than normal soils reducing microbial activity and N mineralization. Much greater amounts of denitrification due to wet soils would also have contributed to reduced N availability. Compared to our 2005-2008 average, 2009 produced a 30 bushel per acre higher grain yield. The increased N requirement due to a higher yield would not have been supplied by greater N mineralization, as typically occurs under higher yielding environments.

Figure 15 also depicts N response to varying management practices, such as soil compaction and root injury. The impact of altering corn rootworm larval protection methods on corn N response was not significant ($p > 0.10$). Both rootworm larval protection methods have similar economic optima, and maximum yield. The response of corn to N in compacted and non-compacted soil was also the same. As much as management practices are thought to interact with N fertilization, they have little to no impact as compared to yearly influences of weather on corn N requirement.

Soil Compaction and Nitrogen Requirement

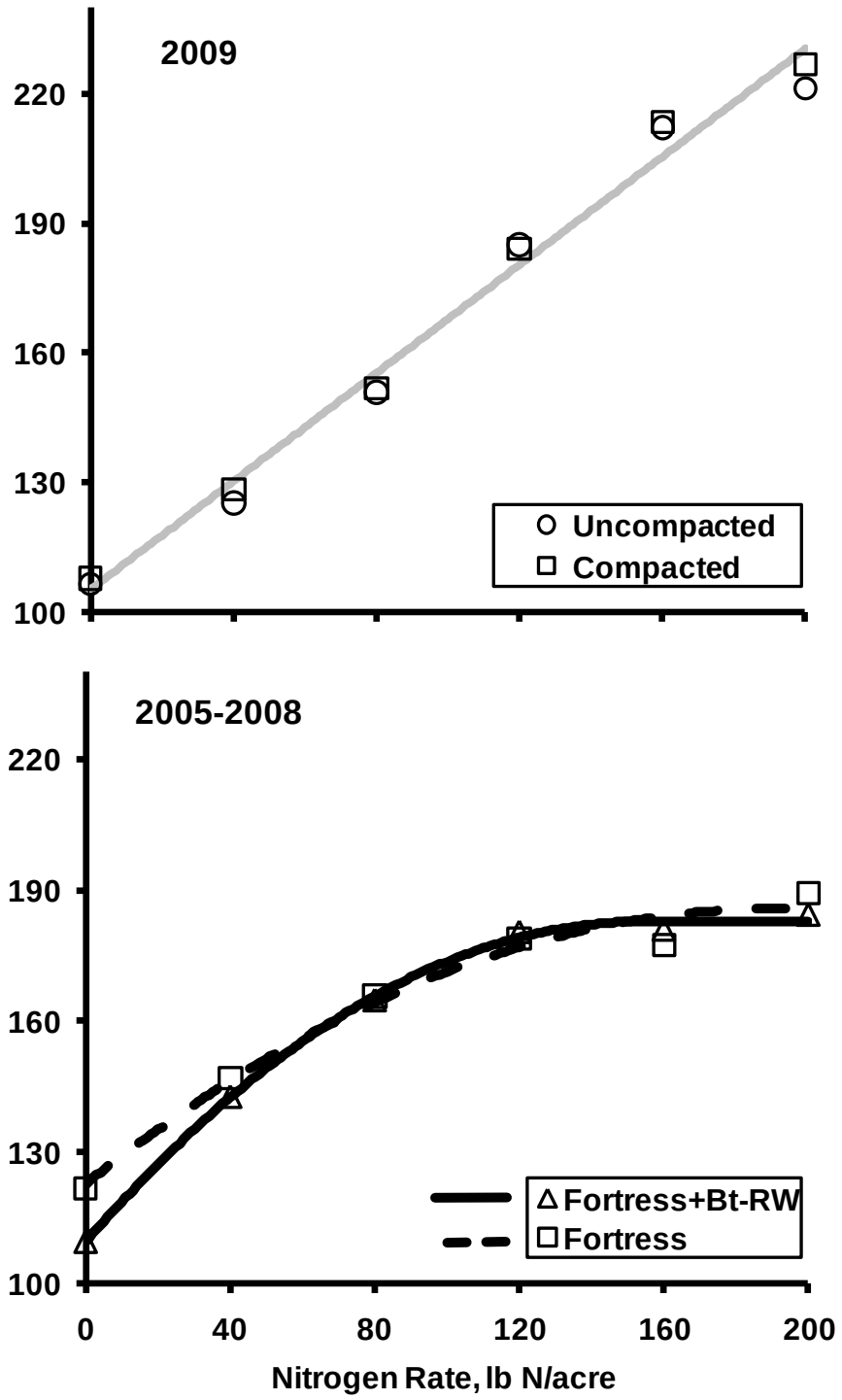

Figure 15. Effect of year, nitrogen rate, and cropping management practices on the grain yield of corn grown at Joliet Junior College in 2009 (top) compared to a four year average (bottom).

Tillage and Starter N

Rationale

Corn growers often go to great lengths to “spoon feed” their crop with N fertilizer. Typically producers using sidedress applications of N believe some fraction of the crops total N requirement needs to be applied at or before planting. This thinking of supplying the crop with N before sidedress application revolves around the idea that corn grain yield is largely determined during early vegetative growth. While the potential number of ovules per plant are determined at V5 and V12, cultural practices such as fertilizer N applications have little impact on the potential for ovules to develop. Hybrid genetics, however, are almost entirely responsible for potential ovule development (Below and Brandau, 1992).

Corn N requirements through the first five vegetative growth stages are no more than 5% of the crop total (Ritchie, 1993), usually less than 10 lbs N per acre. When N application time is the subject of experimentation, corn yields are unaffected by a lack of fertilizer N when applied within six weeks after planting (Reeves et al., 1993). Additionally, Scharf et al., (2002) found N applications could be delayed through V11 without reducing yield. The potential benefit of early season N fertilization practices such as planter-applied N has normally been conducted using some version of full-width tillage. Zero-tillage has been found to reduce N availability (Kwah-Mensah and Al-Kaisi, 2006; Halvorson and Keule 2006), and as such corn grown with zero and strip tillage systems may benefit from planter-applied N when full-width tillage does not.

Our objective was to determine if the use of planter-applied N would be more likely to increase yield in zero and strip tillage systems as compared to mulch-tillage.

Methods

Corn was grown either with or without planter-applied N in three tillage systems (6 treatments) with three replications. Tillage systems were zero, strip, and mulch tillage systems. Mulch tillage consisted of fall chisel-plowing followed

by one spring shallow tillage operation. Strip-tillage consisted of fall tilled bands(~8-inches wide) with the tilled centers spaced 30 inches apart, and corn was planted into the tilled strips the following spring. Zero-till had no tillage performed at anytime, and the previous crop was soybean.

Planter-applied N was applied at 40lb N per acre during planting using double disc openers to create a soil slit where liquid UAN (32% Urea Ammonium Nitrate) was dribbled two inches to the side of the paralleling the seed furrow. The corn hybrid Burrus 573T was seeded at 35,000 seeds per acre on May 6th. The entire experimental area received a total of 120lb N per acre regardless of N treatment. The no planter-N treatment received 120lb N per acre at V5, while the planter-N treatment had 80lb N per acre at V5. The sidedressed V5 N was also UAN, and was injected into every other row middle two inches deep.

Results

There were no significant interactions ($p > 0.10$) for either corn grain yield or moisture, and only main effects are shown (Table 5.). One reason why the zero-till was not more likely to have a yield increase due to planter applied N compared to chisel-till was the later planting date. Previous research at Joliet Junior College (Demonstration & Research Guide, 2008) has shown that corn planted in April will produce a higher yield in tilled versus zero tilled soil, however tillage had no effect on May planted corn. Those results demonstrate that warmer temperatures associated with May planting negate tillage benefits such as increased N availability.

Additionally, there were no significant differences in grain yield ($p > 0.10$) due to either tillage or planter-N main effects (Table 5). Main effects of both tillage and planter applied N did significantly ($p < 0.10$) effect grain moisture. The average grain moisture for the experiment was 23.5%. Performing either strip or zero tillage reduced moisture 1.1% when compared to zero-till. Similarly, using planter applied N reduced moisture by 1.1%.

Tillage and Starter N

Table 5. Influence of main effects (tillage or planter-N) on the grain yield and moisture of corn grown at Joliet Junior College in 2009. N/S means no significant difference (P> 0.10).

Main Effect	Grain Yield	Grain Moisture
	bushels/acre	——%——
Zero	174	24.2
Strip	173	23.1
Chisel	174	23.1
LSD(0.10)	N/S	0.5
No Planter-N	174	24.0
Planter-N†	174	22.9
LSD(0.10)	N/S	0.3

† Urea ammonium nitrate (UAN) was applied at 40lb N per acre two inches to the side and below the seed furrow during planting.

Knife and coulter combination designed for injecting liquid fertilizer in zero-till

Continuous Corn Management

Rationale

Increased use of U. S. corn grain, primarily through the starch-based production of ethanol, has driven Illinois corn producers to plant a record number of acres to the crop in 2007. Increasing corn acreage in Illinois and elsewhere in the U. S. Cornbelt means an increased number of monocropped corn acres. Producers are often advised to manage their continuous corn acres differently than when soybean is the previous crop.

Hybrid selection is one criteria often cited by industry agronomists, residue management, including the use of both tillage and fall N application are also discussed as beneficial to monocropped corn. The potential benefits of foliar fungicides have been consistently promoted since the Asian Soybean Rust scare of 2005, and corn producers responded in 2007 by spraying an estimated three million acres. Our objective was to determine the impact of hybrid selection, tillage, N application timing, and fungicides on productivity of corn in a continuous corn setting.

Methods

Two tillage systems, two fungicide treatments, two N application times, and two hybrids were arranged in a split split split-plot using a randomized complete block design with three replications over three years (2007-2009). The experiment consisted of 16 treatments. The two tillage systems were much or strip tillage. Strip tillage consisted of 8 inch wide strips of fall tillage running parallel to the crop rows. Mulch tillage consisted of fall discing followed by chisel-plowing with a three point hitch mounted chisel with three twisted shanks. Mulch tilled plots were also disked shallowly once the following spring. Tillage plots were split in half, with one half receiving the foliar fungicide Quilt at 14 oz per acre with non-ionic surfactant at 0.25% by volume on July 23rd (R1). The fungicide was applied with a high-clearance ground applicator using 10 gallons per acre carrier, and 20 lb per square inch nozzle tip pressure.

Continuous Corn Management

Each fungicide plot (with and without) was split in half, with one half receiving 40 lb N per acre of ammonium sulfate surface broadcast in November. Each fall N plot (with and without) was also split in half, and planted with either the Garst brand 8610, or 8573. Both hybrids contain the transgenic traits AgrisureRW, AgrisureCB, and tolerance to Liberty herbicide. The hybrid 8610 is not recommended for continuous corn production, while 8573 is promoted for monocropped corn. The previous crop was corn, and planting occurred on May 6th. A total of 160 lb N per acre was applied to the entire experimental area, and one quarter of that was applied during planting (2X2). The balance of N fertilizer, either 80 or 120 lb/acre with and without fall N respectively, was sidedressed on June 11th (V5) with 32% UAN injected into the soil.

Results

Of the 27 interactions only two were significant ($p < 0.10$), a hybrid X tillage X year and fungicide X year. In 2007 tillage increased grain yield for the hybrid thought to be well suited for continuous corn production, while the poorer hybrid choice was unaffected by tillage (figure 16). In 2008 small but similar yield increases occurred for both hybrid choices, while in 2009 tillage had no effect on either hybrid. The fungicide X year interaction occurred as a result of a six bushel per acre increase with fungicide use in 2007, and in 2008 and 2009 fungicide had no effect on yield (figure 17). Although many agronomists seem to promote the importance of particular cropping management practices such as hybrid selection, fall nitrogen, tillage, and fungicide use for monocropped corn, we did not find any of these practices to be of much importance.

Continuous Corn Management

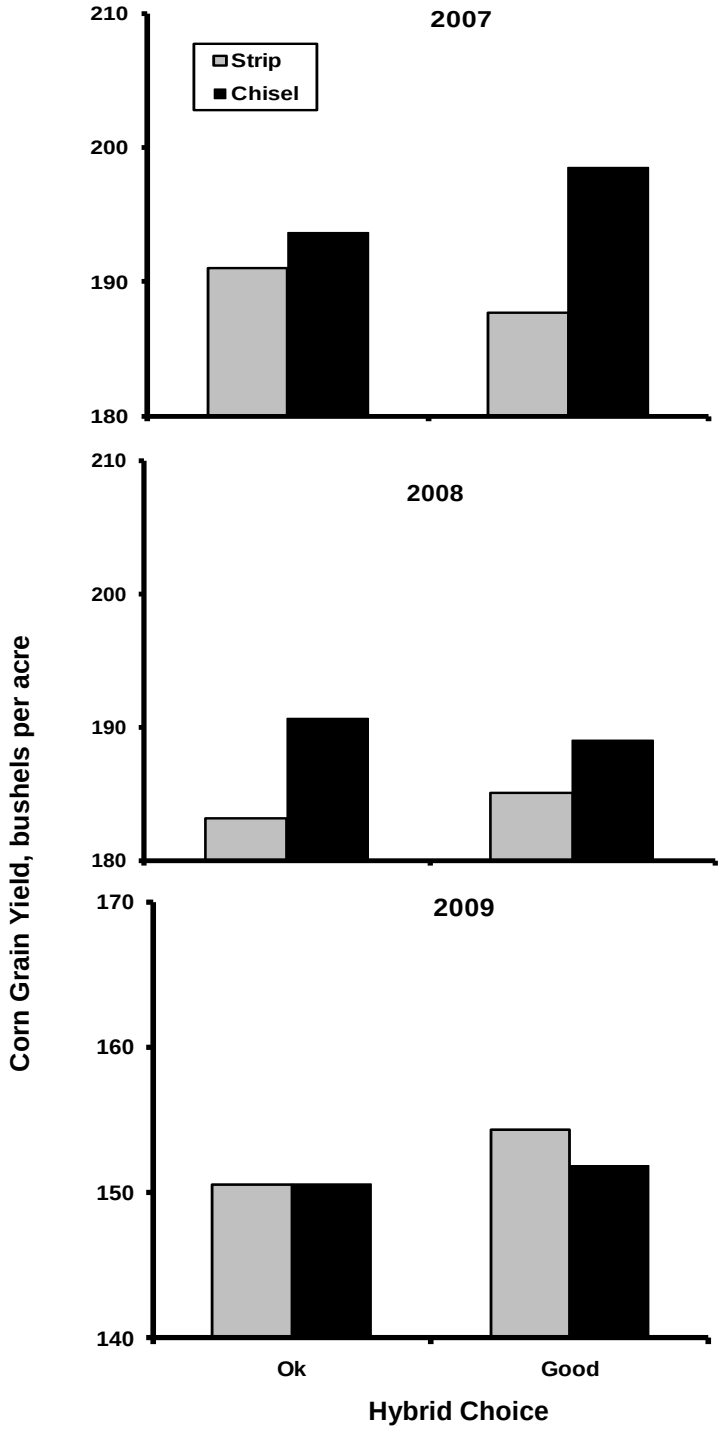

Figure 16. Influence of hybrid choice, tillage system, and year on the grain yield of corn grown after corn at Joliet Junior College. Hybrid choice refers to Garst seed company literature referencing a given hybrids suitability when the previous crop is corn.

Continuous Corn Management

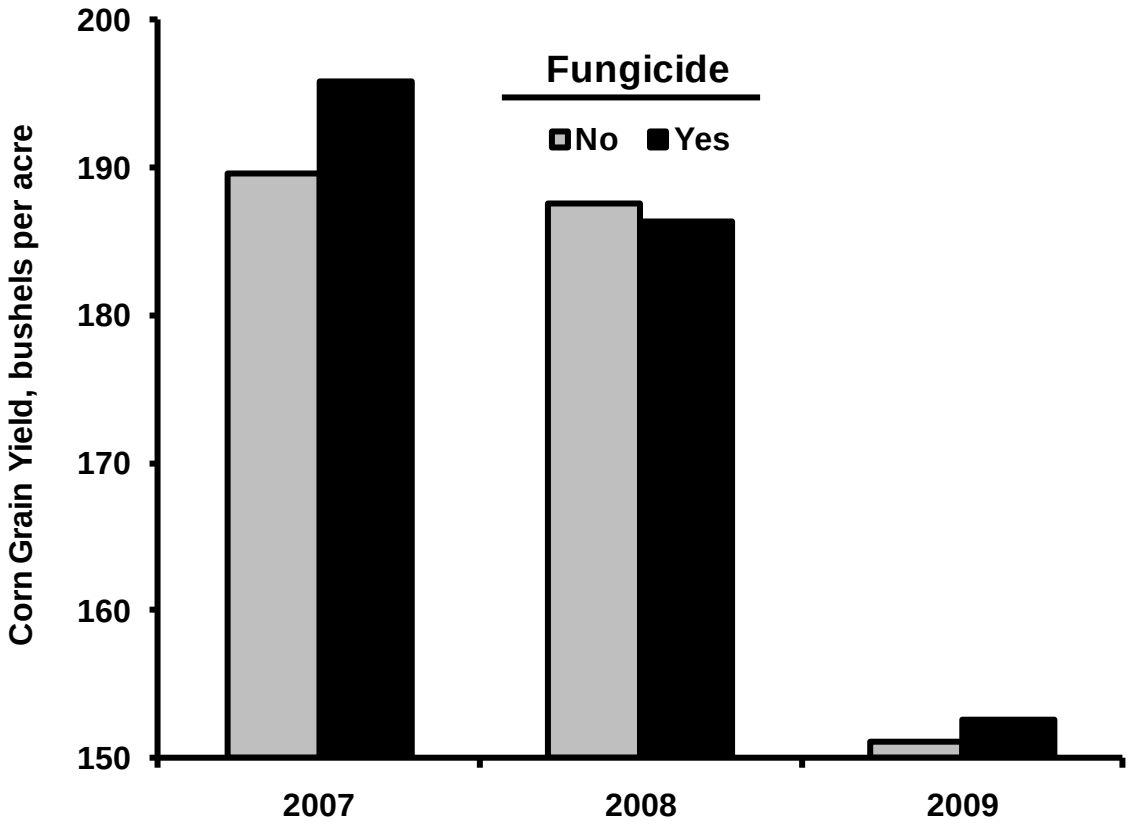

Figure 17. Influence of year and fungicide on the grain yield of corn grown at Joliet Junior College over three years (2007 – 2009).

Fungicide being applied to corn at Joliet Junior College.

Crop Rotation

Rationale

Increasing interest in the domestic production of energy for the U. S. economy has lead to greater use of alternative energy sources. One source, ethanol has risen exponentially over the last two decades (figure 10). Since the primary feed-stock for U. S. ethanol is corn grain, price increased 61% for Illinois producers from 1990 to 2008 (IASS). Since 2001 Illinois corn acres have trended upward, while soybean has declined (figure 11). The acreage shift from 2006 to 2007 was dramatic, with nearly a two million acre corn increase and soybean decrease. Roughly half of that change was reversed with the 2008 season, however corn acres remain at their highest with the exception of 2007.

Increasing acres of monocropped corn has lead to additional questions regarding the yield loss due to that cropping system. Recent producer observations suggest that monocropping yield loss is minimal to non-existent. Some have suggested the resiliency of grain yield under such an environment is due to improvements in genetics and management, primarily fungicide use. Our objective was to determine yield differences due to crop rotation, and weather fungicide use interacts with rotation.

Methods

The experiment consisted of four treatments replicated four times, treatments were; corn grown after corn or soybean, and each previous crop treated with or without a fungicide. Treatments were positioned in a split-plot arrangement, with previous crop as the main-plots and fungicide use the sub-plots. Establishment of the experimental location began in 2007, where side by side strips of 30 inch row corn and soybean were zero-till planted. In 2008 corn was seeded zero-till into the previous year crop stover at 34,000 seeds per acre on April 24th. Our planter, a Kinze model 3000, is equipped with a coulter trash-whipper style attachment that removes most of the crop stover in the row during planting. Corn was planted at 36,000 seeds per acre on May 12th in 2009, planting

into corn or soybean stover from 2008. The two years of experiments were adjacent to one another.

Nitrogen fertilizer (32% UAN) was applied at 40 lb per acre during planting, and an additional sidedress application of 80 or 120 lb per acre where the previous crop was soybean or corn. The hybrid was Burrus 5M17(HXX/RR), a hybrid recommended for either rotation. The fungicide Quilt was applied at R1 on July 23rd in 2008 and July 28th in 2009 at 14oz per acre with a non-ionic surfactant at 0.25% by volume. Flat fan nozzles applying 10 gallons per acre and operating at 20 psi were used on a ground application rig.

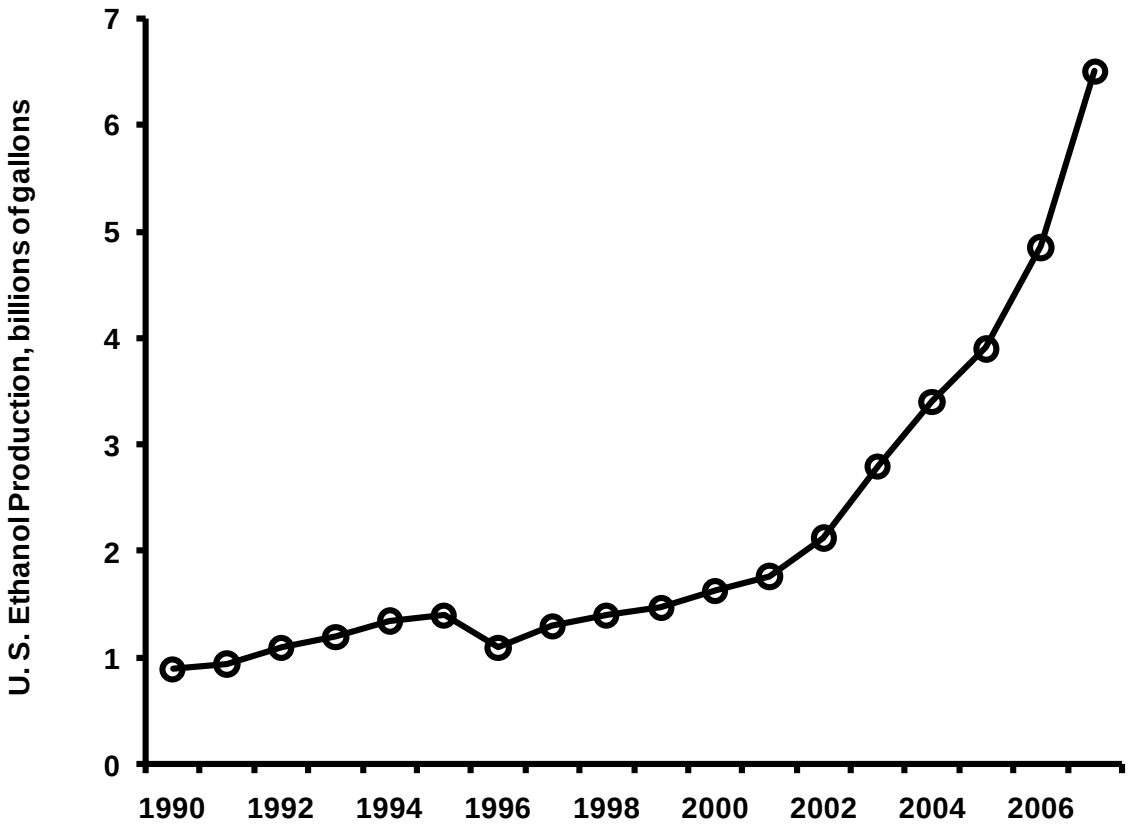

Figure 18. Production of U. S. ethanol from 1990 through 2007. Source: Renewable Fuels Association. http://www.ethanolrfa.org/industry/statistics/

Crop Rotation

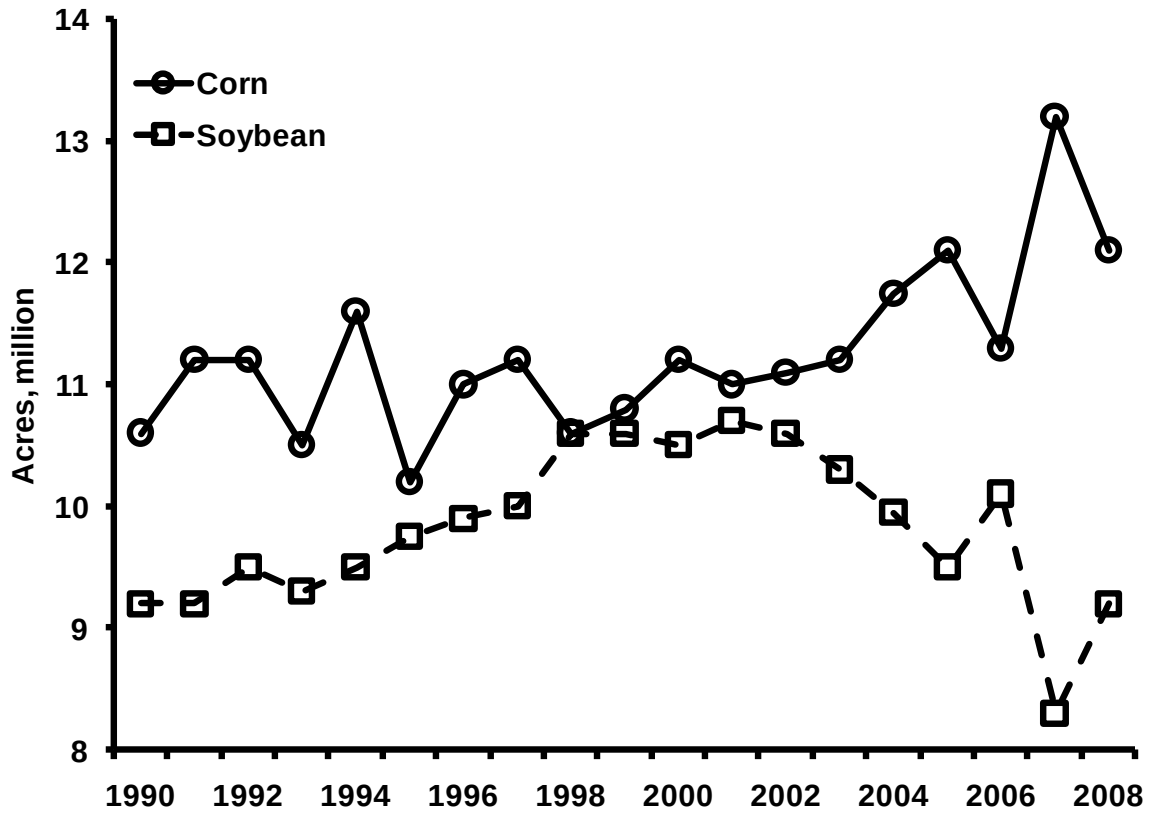

Figure 19. Illinois planted corn and soybean acres from 1990 through 2008. Source: Illinois Agriculture Statistical Service. http://www.nass.usda.gov/QuickStats/PullData_US.jsp

Results

There were no significant ($p > 0.10$) interactions, and the main effect of fungicide had no impact on grain yield (figure 20). When crop rotation was averaged over fungicide treatments and years (crop rotation main effect) however, the yield of corn grown after soybean increased significantly ($p < 0.10$) as compared to corn grown after corn. Grain moisture was significantly ($p < 0.10$) affected by both crop rotation and fungicide main effects (data not shown). Monocropped corn and fungicide use both increased grain moisture.

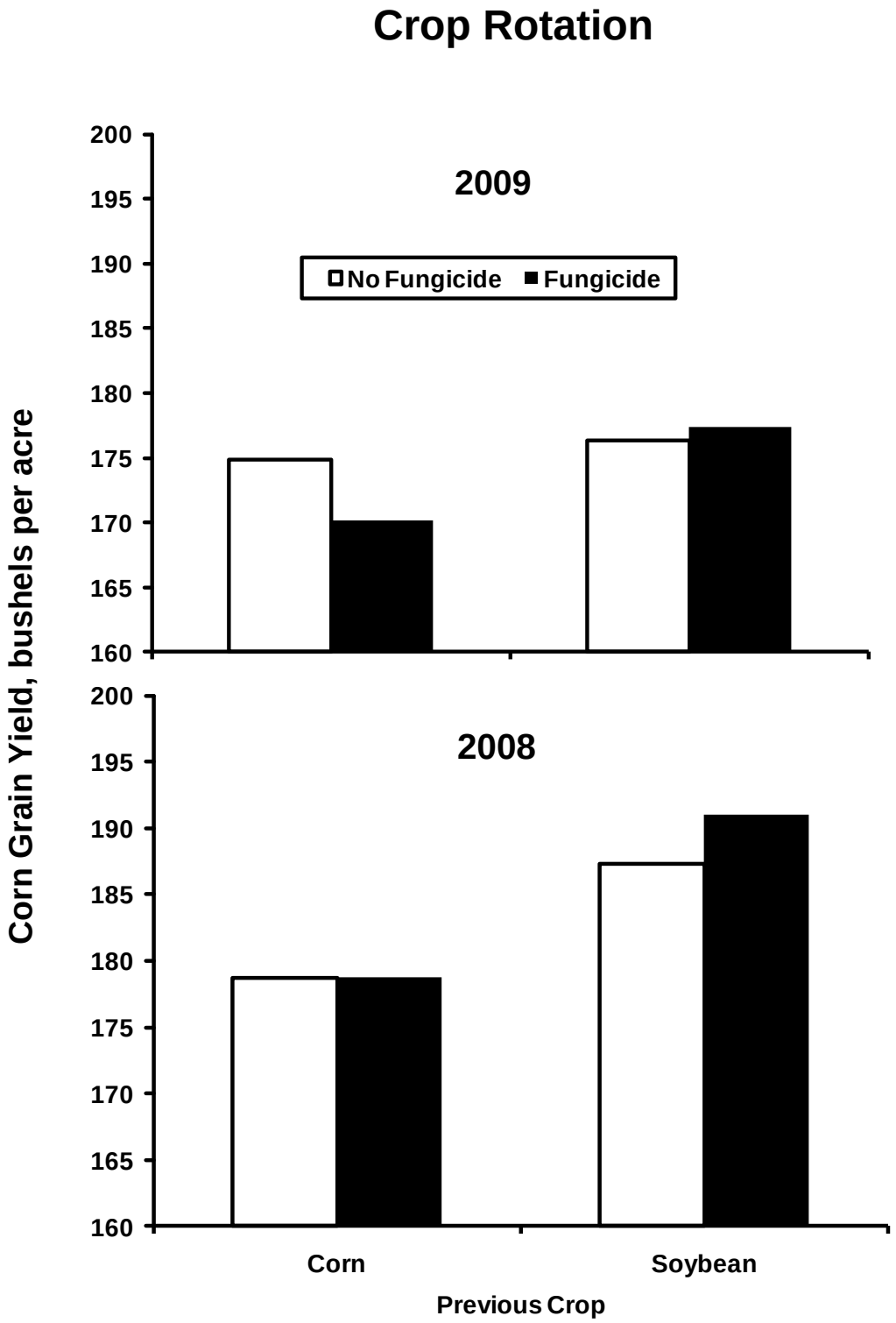

Figure 20. Influence of previous crop, fungicide, and year on the grain yield of corn grown at Joliet Junior College in 2008 and 2009.

Fungicide Evaluation

Rationale

In 2007 an estimated three million acres of Illinois corn was sprayed with a fungicide. Before 2007 fungicides were rarely applied to corn grown in the MidWestern U. S. The wide availability of fungicides for commercial application was in all likelihood due to the soybean rust scare of 2005. Additionally, the recent high gross revenue and increasing acreage have made the use of fungicides for corn production relatively common. Our objective was determine whether widely used fungicides would yield increase yield, and to demonstrate the crop response to fungicides for students at Joliet Junior College.

Methods

The fungicide control product study consisted of four treatments; an untreated control, Quadris at 7oz, Quilt at 14 oz, and Headline at 6 oz per acre applied at R1 on July 22nd. Each treatment was replicated four times, and corn was zero-till planted into corn residue at 36,000 seeds per acre on May 26th, with the Garst hybrid 86X11. The hybrid was chosen for its early maturity given the late planting date, and because it is purported to be of moderate to high disease susceptibility. Fungicides were applied at R1 on August 4th with a ground rig at 10 gallons per acre, 20 psi nozzle tip pressure, and non-ionic surfactant at 0.25% by volume. Spray tips were TeeJet XR110015vs, which are an overlapping flat fan type nozzle. The crop was fertilized with 160lb N per acre 32%UAN applied at V4. Weeds were controlled with Harness Xtra and 2,4-D applied preemerge, followed by glyphosate postemerge.

Results

None of the fungicides significantly ($p > 0.10$) increased grain yield or moisture when compared to the untreated control (figure 21). The unresponsiveness of corn to fungicide application in 2009 was common at Joliet Junior College. Identical results were recorded in 2008. Field notes indicate that extremely low levels of disease were present in the crop canopy during reproductive growth in both seasons.

Fungicide Evaluation

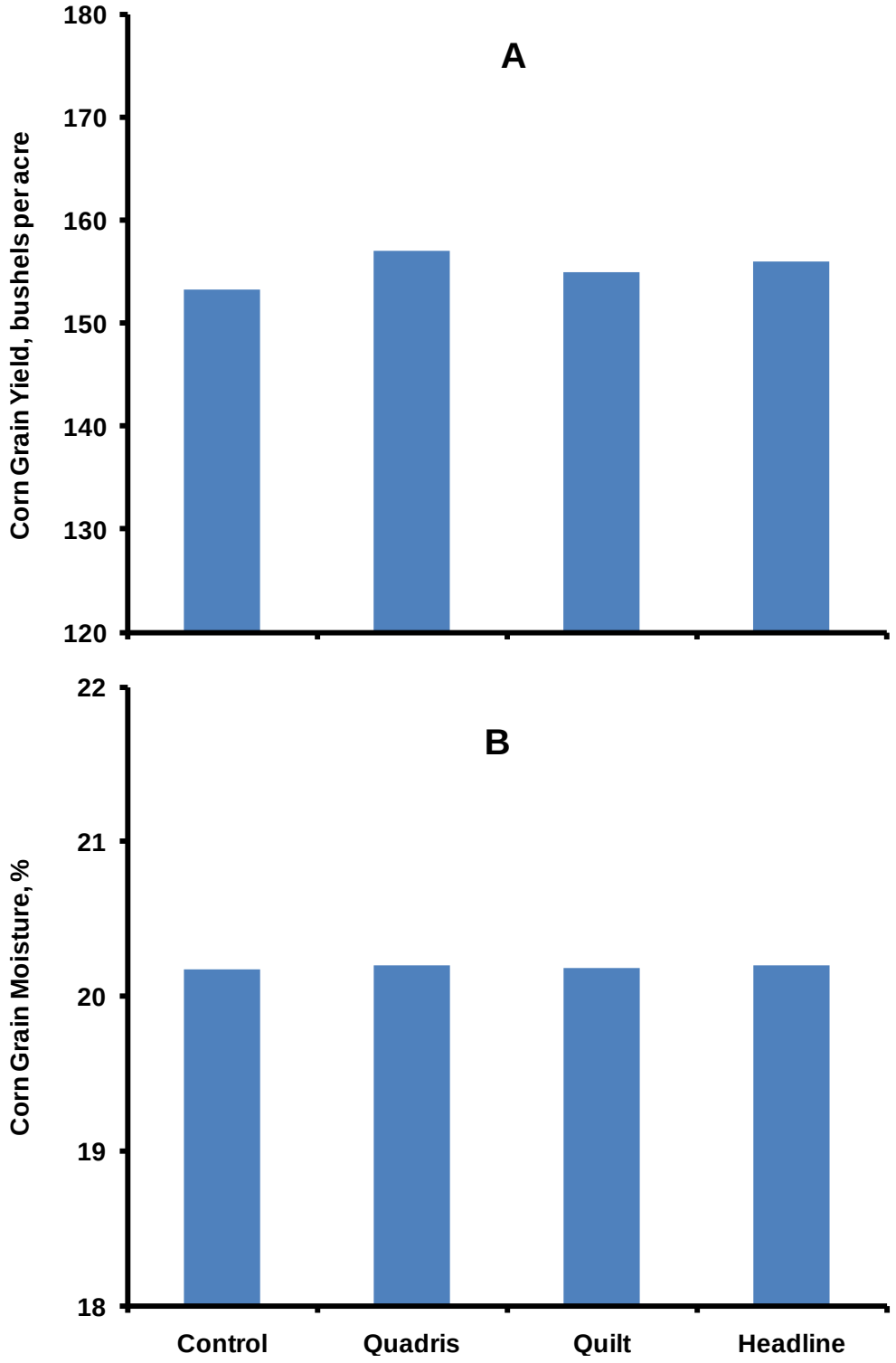

Figure 21. Influence of fungicides on the grain yield (A) and moisture (B) of corn grown at Joliet Junior College in 2009.

Soil Fertility

Rationale

Optimum soil phosphorous (P), potassium (K), and acidity levels are critical for corn and soybean production in the Mid-Western United States. Soil P and K, and pH levels for crop production in Illinois are well established (Hoeft and Peck, 2002). There is a tendency however, for some Illinois crop producers maintain soil fertility above levels considered sufficient. Corn grain yields in Illinois from 1998-2002 averaged 144, and soybean 43 bushels per acre (University of Illinois, 2003). Average annual removal of P_2O_5 and K_2O given current yields in a corn soybean rotation is 49 and 48 lbs per acre P_2O_5 and K_2O, however, additions of fertilizer P and K over a similar time period (1998 - 2001) was 76 (lbsP_2O_5) and 112 (lbsK_2O) per acre per year (Illinois Agricultural Statistical Service, 2002).

Excessive applications of any fertilizer represent a misallocation of resources. Our objectives were two-fold. First, as an educational tool we will demonstrate production of corn and soybean with fertilizer applications equal to crop removal, and without fertilizer P and K. Finally we will provide information to crop producers demonstrating crop production with fertilizer applications similar to crop removal.

Methods

Six soil fertility treatments were implemented in the Fall of 2001 with the intention of maintaining them for long-term evaluation. The 2009 crop is the eighth harvested since the study was implemented. The normal treatment consists of a typical soil fertility program for corn and soybean production which includes soil pH maintained between 6.0 to 6.5 and annual applications of maintenance fertilizer P and K (50 lb/acre P_2O_5 and K_2O). Two additional treatments are similar to the normal but are missing either the maintenance P or maintenance K, and a fourth treatment has no P or K applications. The fifth and sixth treatments were included with the intention of reducing and increasing soil pH. The acidic treatment receives no liming material while the basic receives threefold the recommended

lime. All fertilizers and liming materials are broadcast on the soil surface, and the crop zero tilled.

Soil samples were taken and analyzed in the Fall of 2001. Soil K levels (363 lbs/acre exchangeable K+), are considered sufficient for row crops in North Eastern Illinois, requiring only maintenance K (Hoeft and Peck, 2000). Soil P levels (44 lbs/acre available P) are slightly below the point at which only maintenance P would be necessary. Soil pH ranges from 5.9 to 7.4, somewhat high because of the calcareous nature of the parent material which is a loamy gravel with rock fragments of dolomitic limestone (Wascher et al., 1962). The depth to the parent material is fairly shallow (2 to 3.5 feet) and in a few areas may only be covered with 15 inches of solum. The course textured and shallow parent material reduces the soil water holding capacity and makes the crop very susceptible to water stress when less than normal rainfall occurs.

Results (Corn)

The five variations from the normal fertility treatment resulted in a yield less than the normal 14 of 35 instances (figure 22). The two pH effecting treatments (Basic and Acidic) reduced yield in only 2 of 14 instances, while the three fertilizer treatments (No-P, No-K, and No-P and K) reduced yield in 12 of 21 instances. The No-P and No-K treatments decreased yield in 3 of 7 and 4 of 7 instances respectively. However, plots treated without P and K combined decreased yield 5 of the 7 years. The two years not suffering yield loss from a soil fertility treatment were 2005 and 2009. Both years had fairly abnormal weather, drought for 2005 and flooding in 2009. These abnormal environments produced the two lowest yielding years, 134 bushels per acre in 2005, and 153 in 2009.

Despite consistent yield loss for the No-P and K treatment, when averaged over the seven year period the fertility regime produced 96% of the normal fertility practice yield. Assuming a 170 bushel per acre yield and a $3.50 price, the losses ($23.80 per acre) are far less than the current cost of that fertilizer ($40 per acre).

Soil Fertility

Results (Soybean)

Soybean tended to be more yield sensitive to the five fertility treatments than corn. The five regimes varying from the normal treatment resulted in a yield less than the normal in 22 of 30 instances (figure 23). Similar to the corn however, is the more frequent yield loss of the three fertilizer treatments (No-K, No-P, and No-P and K) when compared to the two pH treatments (Basic and Acidic). Also consistent with corn, is the six year average yield (94%) of the No-P and K treatment. Assuming a 50 bushel per acre yield and a $9.00 price, the losses ($27 per acre annually) are less than the cost of the annual fertilizer P and K applied to the normal treatment.

Soil Fertility

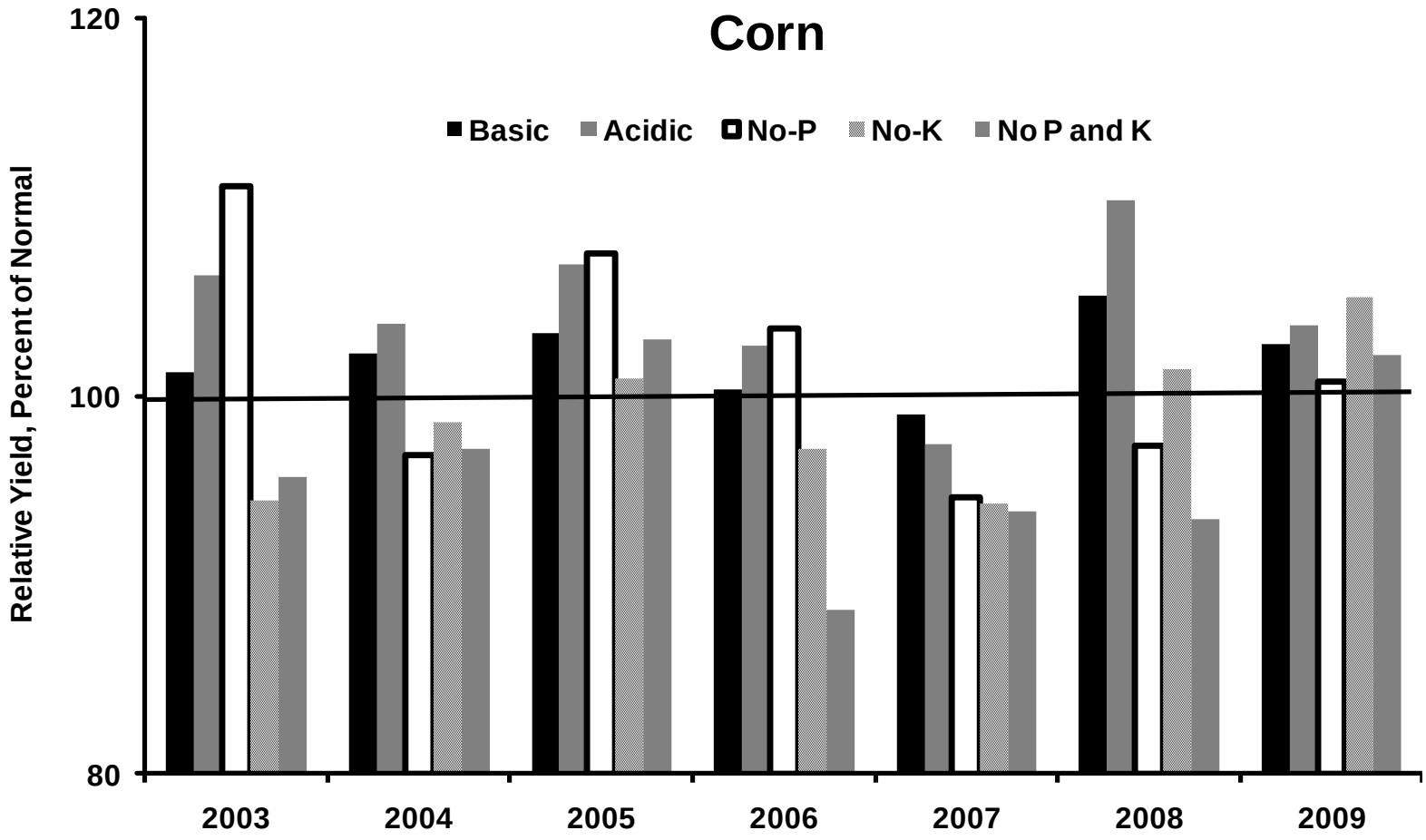

Figure 22. Influence of soil fertility practices and year on the relative grain yield of corn grown at Joliet Junior College from 2003 through 2009. Yields of all five fertility practices are depicted as a percentage of the normal treatment, which is 100. The normal treatment consisted of 50 lb/acre P_2O_5 and K_2O, and pH maintained between 6.0 and 6.5.

Soil Fertility

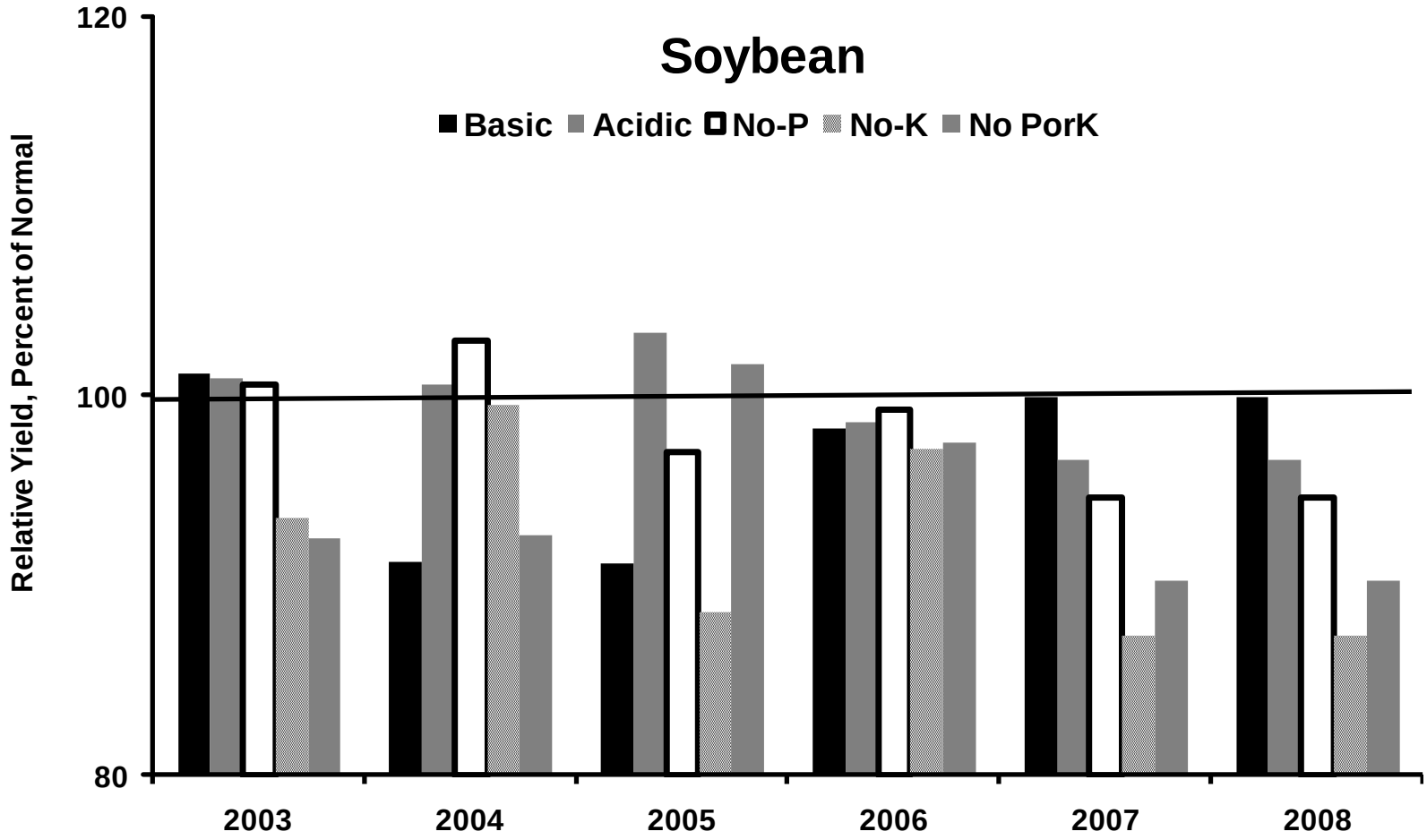

Figure 23. Influence of soil fertility practices and year on the relative seed yield of soybean grown at Joliet Junior College from 2003 through 2008. The yield of all five fertility practices is depicted as a percentage of the normal treatment, which is 100. The normal treatment consisted of 50 lb/acre P_2O_5 and K_2O, and pH maintained between 6.0 and 6.5.

Corn Hybrids

Methods

Thirty-one corn hybrids were planted on May 22nd at a rate of 35,000 seeds per acre with a model 3000 Kinze planter using a finger-type seed pickup and drop mechanism. After each hybrid was planted, leftover seeds were vacuumed out of the seed box and finger pickup mechanism. All hybrids had in-plant protection via Bt-transgenes producing proteins with activity on both European Corn borer and Corn Rootworm. Nearly all hybrids were Roundup Ready, because one hybrid was not the herbicide Impact (topramezone) was applied post-emerge for the control of broadleaf weeds. The check hybrid (DeKalb DKC61-69) was entered four times and separated by six hybrid entries (60 feet) throughout the entire demonstration area.

Each hybrid was evaluated on a relative scale by comparing it to the nearest check, which was never more than three entries (30 feet) away. Corn was harvested with a John Deere model 6600 combine, and grain yield and moisture determined with a PF2000 Ag Leader yield monitor. The demonstration area was zero-till and the previous crop soybean. Harness Xtra and 2,4-D were applied pre-emerge for “burn-down” of existing vegetation and residual weed activity. At V5, 100 lb N per acre was sidedressed, which followed 40 lb N/acre at planting. The crop flowered in late July, and was harvested in mid-November.

Results

The crop averaged 186 bushels per acre, and grain moisture averaged 24.0% (Table). Grain yield ranged from 173 to 208 bushels per acre, while relative yield ranged from 89 to 105 percent. The highest relative yield was Dekalb 59-64.

Corn Hybrids

Table 6. Demonstration of grain moisture and yield for 31 corn hybrids grown at Joliet Junior College in 2009.

Company	Nomen-clature	Grain Yield	Grain Moisture	Relative Yield‡
		bu/acre	—%—	—%—
Garst	86X11	176	20.2	90
Burrus	573T	177	24.2	91
Pioneer	35K04	176	22.7	90
Dekalb	**61-69**	**195**	**22.2**	100
Dekalb	61-19	182	23.1	93
Dairyland Seed	9208	182	22.3	93
Trelay	7T630	190	23.1	98
Garst	83X61	184	24.6	98
Burrus	4J63	183	24.1	98
Dairyland Seed	9114	173	23.2	92
Dekalb	**61-69**	**187**	**22.8**	100
Dekalb	59-64	196	23.2	105
Trelay	8T468	193	25.3	103
Garst	86T68	184	22.0	99
Dekalb	57-66	191	22.3	102
Dairyland Seed	9009	172	24.6	91
Dekalb	**61-69**	**188**	**23.4**	100
Garst	84Q55	177	25.6	94
Dekalb	63-42	177	25.7	94
Pioneer	33F88	187	26.4	99
Trelay	6T510	195	22.9	94
Burrus	477T	187	24.7	90
Dekalb	62-54	202	23.6	97
Dekalb	**61-69**	**208**	**23.9**	100
Dairyland Seed	9010	189	24.8	91
Burrus	5566	191	26.1	92
LG	2555	196	25.8	94
LG	2620	186.5	25	90
Burrus	3A65	185	25.0	89
Average		186	24	95

‡ **Relative yield** was calculated by dividing the grain yield of a given hybrid (numerator) with the grain yield of the nearest check (denominator) and multiplying by 100.

Alternative Weed Management

Rationale

Glyphosate (Roundup) use for United States soybean production is nearly monolithic among producers (U.S. Department of Agriculture, 2007). The widespread and long-term use of glyphosate has caused a number of weed species to become resistant to the herbicide (Hagar, 2006). Certain species, such as Waterhemp, have also become resistant to herbicides with alternative modes of action. The agriculture department at JJC would like to perform research to test the hypothesis that a more sustainable approach to weed management is the inclusion of multiple cultural control tactics.

Cultural control tactics such as a tillage system have been observed to greatly influence weed populations (Hendrix et al., 2004). Similarly, soybean row spacing impacts the crops ability to compete with weeds (Knezevic et al., 2003). Due to the highly efficacious nature of glyphosate as a herbicide, little attention has been given to alternative weed management strategies. We believe this type of work needs to be done to educate producers and their consultants as glyphosate weed control management becomes increasingly difficult.

Methods

The soybean cultivar Pioneer 93Y11 was planted on June 1st into mulch tilled soil at either 113 or 225 thousand seeds per acre, with a target harvest population of 90 or 180 thousand plants per acre. Both seeding rates were used with 15 or 30 inch row spacing, and regardless of row spacing or row crop cultivation plant population was very near the target (Table 7). The 30 inch row spacing was either row crop cultivated or not. The experiment was arranged as a split, split-plot. Main plots were row spacing and row crop cultivation, sub-plots were plant population, and sub sub-plots were with or without a V3 Roundup application. The entire experiment was replicated three times.

Alternative Weed Management

Results

There were two significant ($p < 0.10$) interactions, row spacing X Roundup use and plant population X Roundup use. Table 8 depicts the large impact row spacing has on soybean yield when Roundup is not used. Planting soybean in 15 versus 30 inch row spacing increased yield 8 bushels per acre, and row crop cultivation of the 30 inch rows improved yield an additional 4.4 bushels. Interestingly, when 30 inch row soybean was row-crop cultivated and no Roundup was used, the yield was not different from that of 15 inch row soybean with Roundup. When Roundup was used, neither row spacing nor row crop cultivation affected yield.

Weed control was perfect for all plots receiving Roundup, without Roundup however, weed control was poor and would have been unacceptable to most producers (Table 9). Row crop cultivating 30 inch row soybean without Roundup greatly improved weed efficacy over the other non Roundup treatments. Although the weed efficacy of row-crop cultivation was much poorer than using Roundup, that level of weed control (79%) was apparently enough to produce a yield similar to that of a Roundup treatment. Utilizing high plant populations greatly increased yield when no Roundup was used (9.8 bushels per acre), with Roundup though, yield was unaffected by population (Table 10). Despite the yield increase with high population when Roundup was not used, there was not a similar interaction of population and Roundup use with regards to weed efficacy (data not shown). There was however, a significant ($p < 0.10$) main effect of high population increasing weed efficacy from 79% to 84%.

We have shown that using a cultural practice such as row-crop cultivation and plant population, yield can be greatly increased and even maintained at levels similar to Roundup use. Unlike yield however, row-crop cultivation cannot provide a similar level of weed efficacy when compared to Roundup.

Alternative Weed Management

Table 7.Effect of row spacing and seeding rate on plant population in the alternative weed management study in 2009.

Row Space	Seeding Rate	
	Low	High
	—plants per acre—	
15	94b	178a
30	92b	178a
30+RC	88c	181a

Table 8. Effect of row spacing and Roundup use on soybean seed yield in the alternative cultural weed management study in 2009.

Row Space	Roundup	
	No	Yes
	—bushels per acre—	
15	44.4d	50.1ab
30	36.4c	52.1a
30+RC	48.8b	52.3a

Table 9. Effect of row spacing and Roundup use on weed efficacy in the alternative cultural weed management study in 2009.

Row Space	Roundup	
	No	Yes
	——— % ———	
15	58c	98a
30	54c	99a
30+RC	79b	100a

Alternative Weed Management

Figure 24. Brian Vollmer stands in a plot not treated with glyphosate, planted in 30 inch rows, and using a low population. Note the dense stand of Lambsquarter, the predominant weed species in our study.

Table 10. Effect of plant population and Roundup on soybean seed yield in the alternative cultural weed management study in 2009.

Plant Population	Roundup	
	No	Yes
	—bushels per acre—	
Low	38.3c	51.3a
High	48.1b	51.7a

Foliar Pesticides for Soybean

Rationale

The observation of soybean rust in the continental U.S. in the past decade has spurred the use of foliar applied fungicides in soybean. Similarly, the outbreak of soybean aphid during the summer of 2003 incited the application of many foliar insecticides. Whether perceived or real, the additional threat of insect pests previously thought to be of secondary importance, such as bean leaf beetle and Japanese beetle, injury from these pests have also stimulated greater interest in foliar pesticide applications in soybean production.

In recent years many soybean producers have noted relatively stagnant soybean yields when compared to corn. The perception of low yields has soybean producers and agronomists increasingly on the lookout for suspect pests. Fungi and insects are both known to have species potentially injurious to soybean. A common means of supplying fungicidal and insecticidal compounds are through foliar applications. Our objective was to determine the impact of foliar applied fungicides and insecticides on soybean seed yield.

Methods

This study spans the four year period from 2006 through 2009, and was composed of 4 treatments arranged in a randomized complete block design with four replications. The treatments consisted of an untreated control and three foliar pesticide applications applied at R3 (beginning pod development). The pesticide applications consisted of a fungicide (Quadris) applied at 7oz per acre, an insecticide (Warrior) applied at 2oz per acre, and a combination of the fungicide and insecticide. Foliar treatments were applied in mid to late July at the R3 growth stage. The Asgrow soybean cultivar 3101 was seeded in 30-inch rows at 150,000 seeds per acre in May. Each year the crop was planted into standing cornstalks that had been treated pre-plant with 2,4-D and a crop oil concentrate to kill existing vegetation.

Foliar Pesticides for Soybean

Results

There were no significant differences ($p < 0.10$) among any of the four foliar pesticide treatments when averaged over the four year period of 2006 – 2009 (figure 25). There was also no significant year by foliar pesticide treatment interaction. While many producers seem to be enticed by the use of foliar pesticides for soybean, we have not observed any yield benefit from such applications.

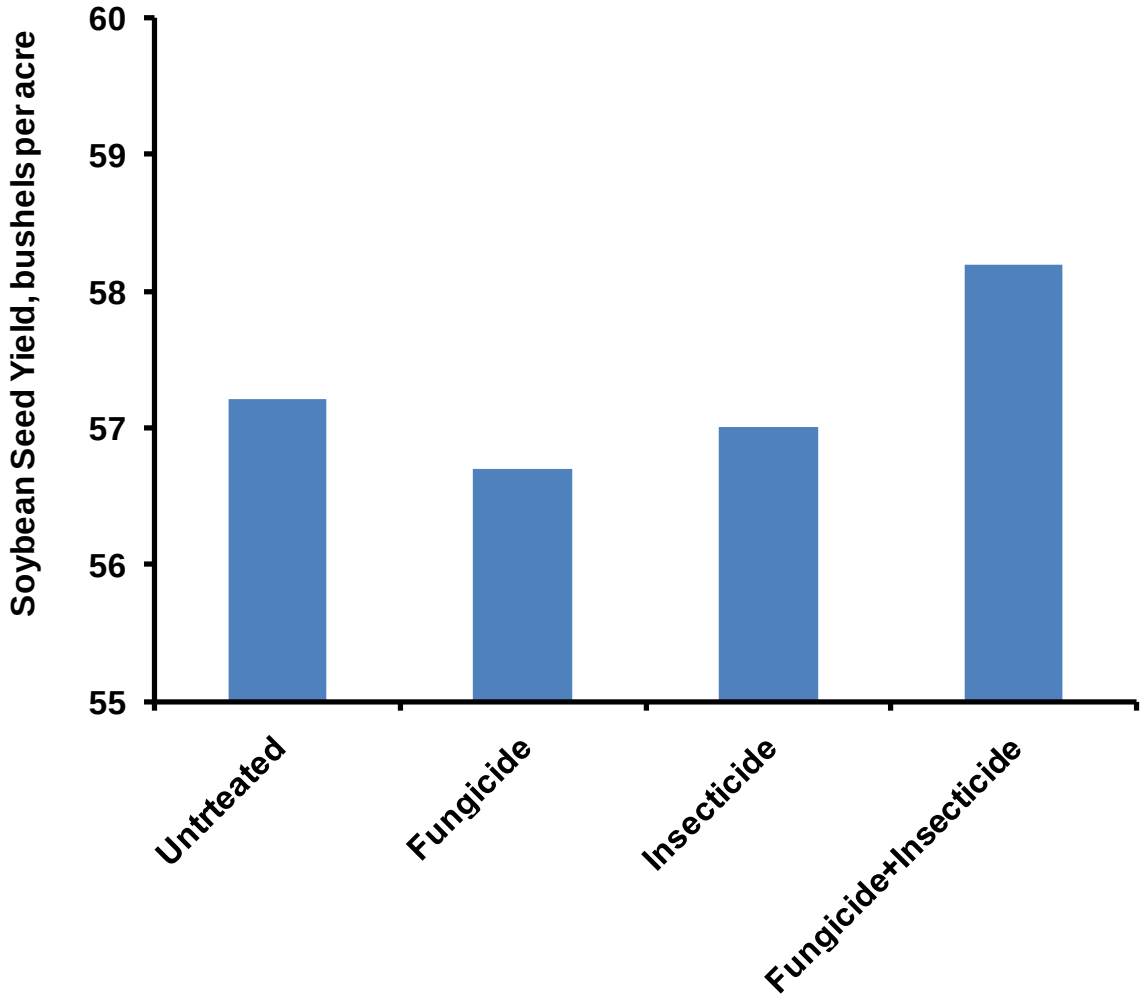

Figure25. Influence of foliar pesticide treatment (R3) on the seed yield of soybean grown at Joliet Junior College over four years (2006 - 2009). Treatments are not significantly different ($\alpha = 0.10$).

Soybean Varieties

Rationale

Numerous soybean cultivated varieties (cultivars) are available to Mid-Western soybean producers. In Illinois soybean growers spend $19 per acre acquiring soybean seed from dozens of seed supplying companies (University of Illinois, Dept. of Agriculture and Consumer Economics, 2002). Our objective is to aid Mid-Western soybean growers in choosing cultivars most profitable in their operations, and to demonstrate to students different morphological characteristics of various soybean cultivars.

Methods

Soybean was planted on June 1st and seeded at 150,000 seeds per acre in 30-inch rows. Twenty-five cultivars were entered in this unreplicated varietal demonstration. The check variety is Asgrow 3101 and was entered four times in the demonstration, and each entry consisted of 4 rows 380 feet in length. The check entries were separated by six varieties, as such any given variety was never more than three entries (30 feet) from a check. Each variety was evaluated on a relative scale by comparing it to the nearest check. Soybean was harvested with a John Deere 6600 combine and yield was measured using an Ag Leader PF2000 yield monitor to estimate mass and moisture. The demonstration area was zero-tilled and weeds were controlled with a Fall applied preplant burndown followed by a postemerge application of Roundup Weather Max.

Soybean Varieties

Table 11. Demonstration of grain moisture, yield, and relative yield of 23 soybean varieties grown at Joliet Junior College in 2009. The check variety is emboldened and was entered four times in the demonstration area. The varieties with the highest relative yield is underlined.

Company	Nomen-clature	Grain Moisture	Grain Yield	Relative Yield†
		—%—	bu / acre	—%—
NK	S21-N6	14.5	50.1	84
Asgrow	AG3239	14.6	59.2	99
NK	S25-T7	14.5	56.5	95
Asgrow	**3101**	**14.6**	**59.5**	**100**
Burrus - Power +	34B9	14.6	56.7	95
NK	S24-J1	14.5	58.7	99
Asgrow	DKB27-52	14.4	59.2	99
Burrus - Power +	34B9	14.7	58.1	102
NK	S27-C4	14.6	56.7	99
Dairyland Seed	3155	14.4	58.5	103
Asgrow	**3101**	**14.5**	**57.0**	**100**
Burrus - Power +	28J0	14.4	58.3	102
NK	S28-B4	14.4	59.3	104
Dairyland Seed	2770	14.2	59.1	104
Burrus - Power +	32KO	14.4	54.2	93
NK	S20-P3	14.3	53.2	91
Dairyland Seed	3003	14.4	57.2	98
Asgrow	**3101**	**14.4**	**58.4**	**100**
NK	S19-A6	14.2	61.0	104
Asgrow	AG2839	14.3	55.2	95
NK	S30-F5	14.4	57.9	99
Pioneer	93Y11	14.5	52.9	87
Asgrow	3139	14.3	60.8	100
NK	S25-R3	14.5	59.6	99
Asgrow	**3101**	**14.3**	**60.5**	**100**
Dairyland Seed	2929	14.6	58.4	97
Asgrow	2939	14.4	60.1	99
NK	S21-B1	14.2	61.7	102
	Average	14.4	57.8	

†Relative yield was calculated by dividing the grain yield of a given variety (numerator) with the grain yield of the nearest check (denominator), and multiplying by 100.

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