Joliet Junior College

Agriculture

Demonstration & Research Guide

2008

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 2008. Resources donated range from the time donated by drivers for our field day, to equipment, pesticides and seed. All are listed in the paragraphs below and 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. Mark Pawlowski helped for the entire growing season as a student intern. He is responsible for collecting much of the data throughout the growing season, and we are in his debt.

We would also like to thank a number of people who have so generously donated crop protection products. Matt Foes with Monsanto, Rich Porter with AMVAC, Jeremy Borms with Hintzsche Fertilizer, and Alan Hopkins with Dupont.

The Tordai family volunteered their time, a combine, grain cart, and semi's for an entire day to help harvest our corn hybrid demonstration and the remaining acreage at the John H. Weitendorf Agriculture Education Center. Our field day speakers were; Dr. Carl Bradley, Russel Higgins, and Dr. Aaron Hager, all associated with the University of Illinois.

Acknowledgements

List of people and companies they represent that donated seed and crop protection products to Joliet Junior College in 2008.

Last	First	Organization
Doty	Daryl	Dekalb
Foes	Matt	Monsanto
Fugate	Bill	Burrus
Hopkins	Alan	Dupont
Lobdell	Kelly	Trelay
Moore	Craig	Becks
Orns	Merrill	Sun Prairie
Porter	Rich	AMVAC
Reeves	Doug	Pioneer
Robran	Todd	Dupont
Schneider	Dan	LG
Skonetski	Bill	Dairyland Seed
Stork	Harold	Kruger
Thomas	Dave	Syngenta
Thumma	Todd	Garst
Twait	Mike	Crows
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.

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Lisa Perkins	Turf Management
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Walter Stein	Veterinary Technology
Donna Theimer	Floral Design/Interior Plantscaping
Jeff Wessel	Farm Manager

Introduction

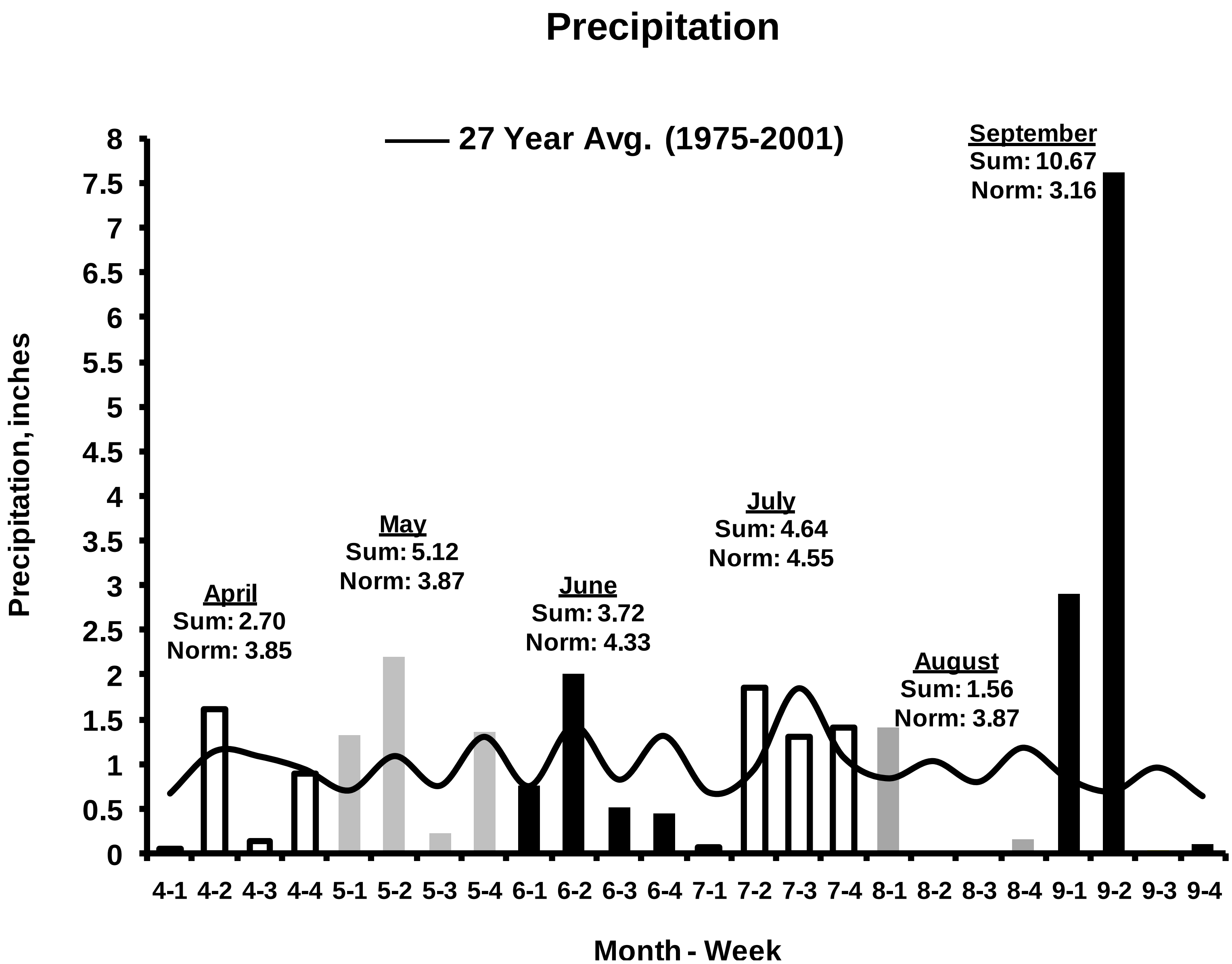
The Joliet Junior College J. F. Richards Demonstration and Research Farm was founded in 1983 with the expressed purpose of being an educational resource for agricultural students and their instructors. There are three major objectives of the Demonstration and Research Farm. They are: 1) Provide an instructional 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 108 cropped acres with 58 acres of corn and 50 of soybean in 2008. 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.

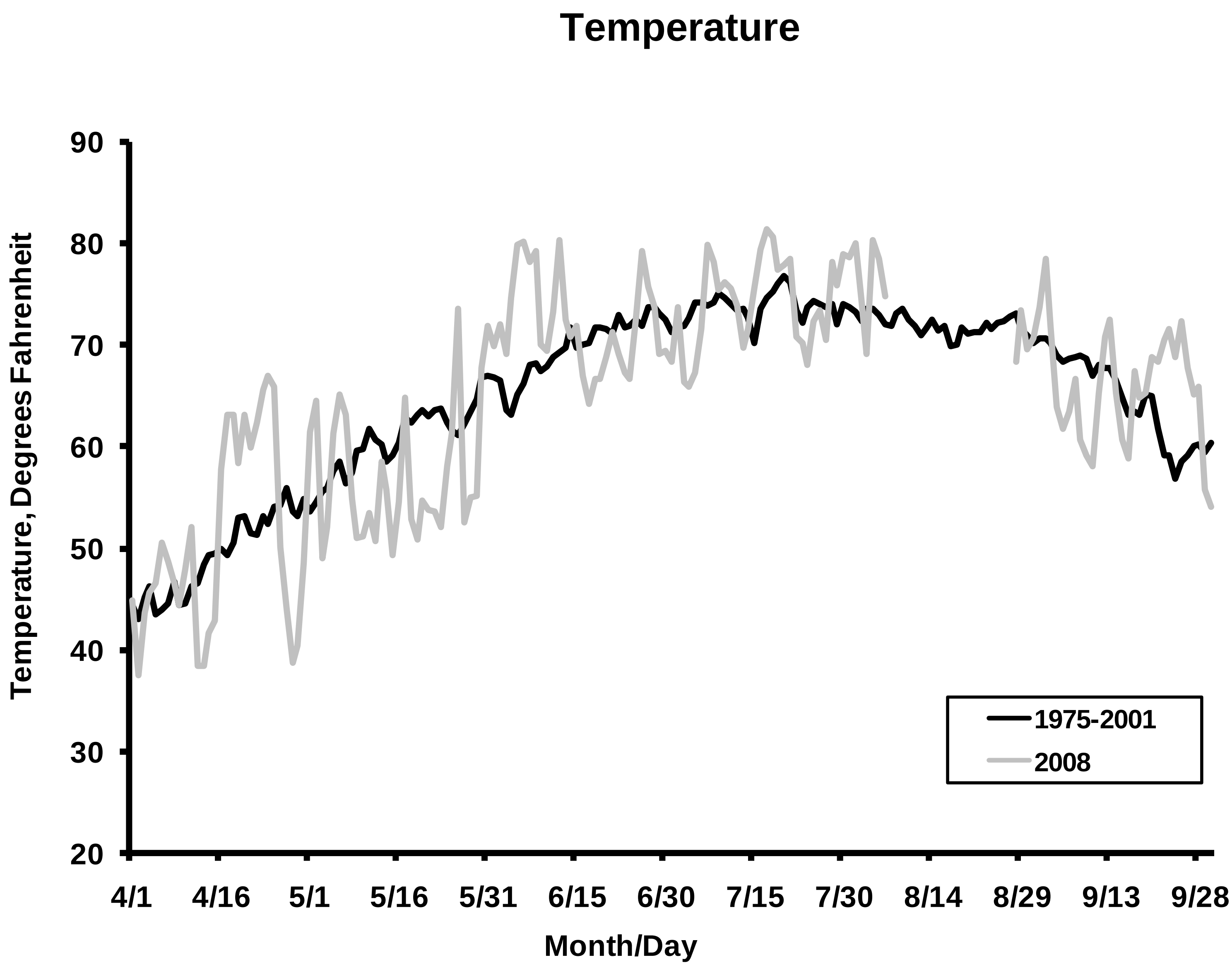
Our Demonstration and Research Farm is situated in Joliet, Illinois (North Eastern Illinois) a region dominated by soils with low phosphorous (P) supplying power and high cation exchange capacity. Soil fertility levels at the Demonstration and Research Farm are within acceptable ranges for row crop production. 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 fall, spring preplant, or spring preemerge “burndown” herbicides are used to kill existing vegetation. Fall preplant burndown herbicides were applied in November of 2007 where soybean was to be planted in 2008 and included CanopyEX + 2,4-D. For corn, spring 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 34,000 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. Most soybean was planted the first half of May. Crops were harvested the second half of October. The average corn yield was 179 bushels per acre, while soybean averaged 44.



Weekly precipitation at Joliet Junior College during the 2008 growing season (bars), and a 27 year average (black curve) from a nearby weather station.



Average daily temperature at Joliet Junior College during the 2008 (gray curve) growing season, and a 27 year average (black curve, 1975-2001) from a nearby weather station.

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 1 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 (seed treatment & granular) and transgenic Bt-RW corn, and to determine the relationship between root injury ratings and corn grain yield.

Corn Rootworm Larval Control Products

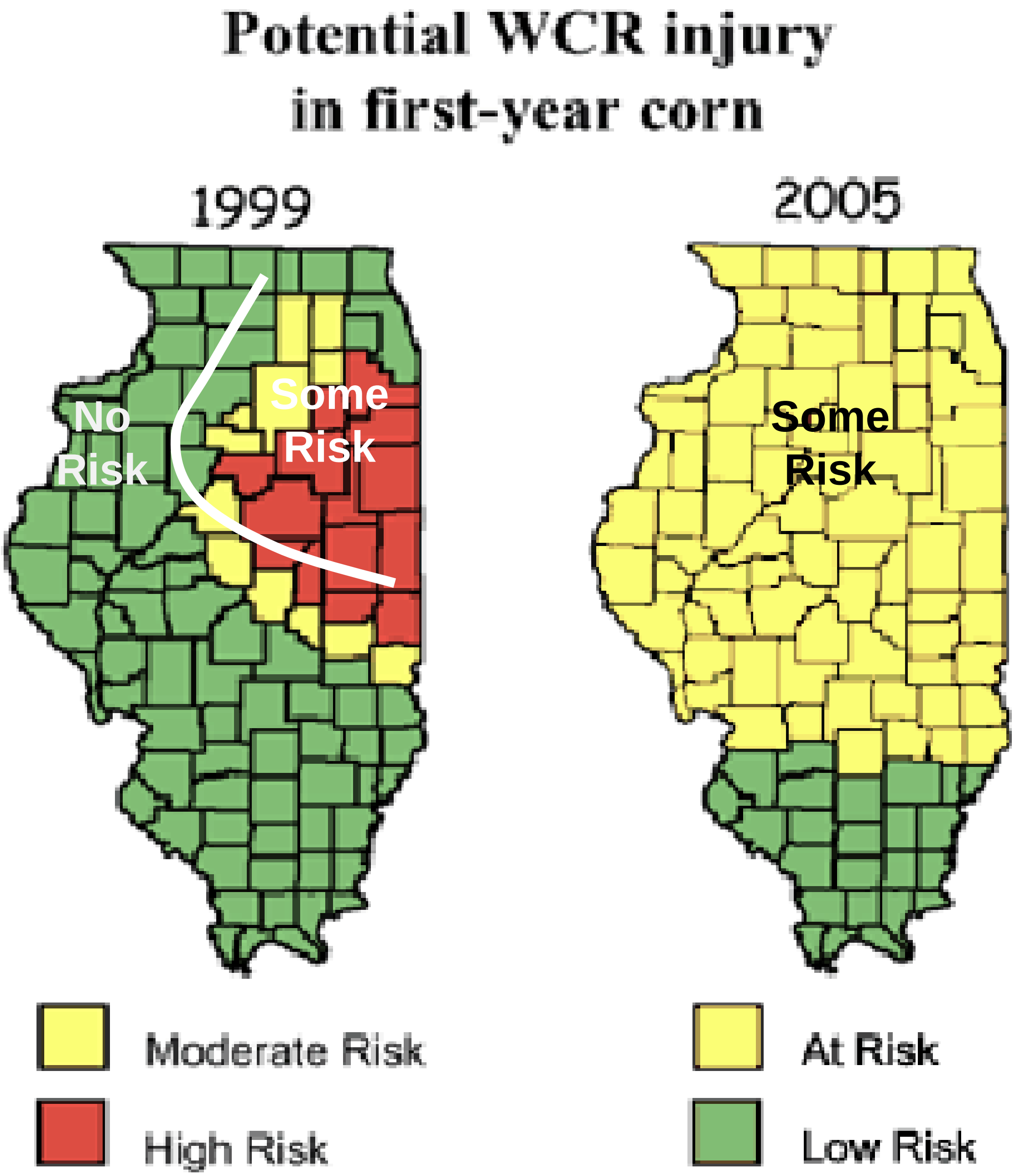


Figure 1. Possible injury from Western corn rootworm larvae in first-year corn fields in 1999 and 2005.

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

Methods

Five granular insecticides, one seed treatment, two Bt-RW events, and an untreated control were evaluated for their impact on corn root injury from corn rootworm larvae and grain yield. The two Bt-RW events were; Monsanto's VT Triple (Cry3Bb1) and DuPont's Herculex RW (Cry34Ab1/Cry35Ab1). The two transgenic RW events were "stacked" with european corn borer resistance and herbicide tolerance. The VT triple and Herculex RW events were contained in hybrids Dekalb 61-69 (VT3) and Pioneer 33H29 (HXX). The isoline of Pioneer 33H29 (HXX), 33H27 (HX1) was used for all six insecticides and the untreated control. The product rate of granular insecticides was (oz per 1000ft. of row); Lorsban15G (8), Fortress2.5G (7.35), Force3G (4), Counter15G (8), and Aztec2.1G (6.7). The seed treatment insecticide Poncho 1250 was applied at 1.25mg active ingredient (clothianidin) per kernel. Both Pioneer and Dekalb hybrids had similar maturities (111-112 day).

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 April 23rd, seeded at 34,000 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 60 oz/acre preemerge, followed by Roundup WeatherMax at 21 oz/acre postemerge (V3). At V5 the crop was sidedressed with 100 lb N/acre of urea ammonium nitrate. On July 14th (V18), 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

Results

The untreated control had 1.5 nodes of roots destroyed (Figure). The seed treatment insecticide Poncho 1250 had a similar level of injury to that observed in the control treatment. The five granular insecticides tended to reduce root injury compared the control treatment, but all had injury considerable greater than any of the Bt-RW treatments. Both Bt-RW products (HXRW and VT3) had numerically lower injury ratings when compared to any insecticide alone, or the untreated control. The addition of Counter or Fortress to either of the Bt-RW technologies had little or no impact on root injury, the same finding as 2007.

Figure three depicts both root injury rating and grain yield of four selected treatments from 2003 through 2008. Root injury rating was very high ($\geq$ 2.4) in the untreated control during the five year span from 2003 through 2007. In 2008 however, the untreated crop had nearly one entire node of injury less than it had suffered in any of the previous five years. Two possibly related circumstances changed for the 2008 crop versus the previous years. First, we have observed large decreases in adult WCR populations beginning in the summer of 2007. Although we haven't quantified the adult decline, it is apparent. Secondly, 2008 is the only season the untreated control had an insecticidal seed treatment (Poncho 250).

Grain yields in Figure three also indicate a lack of yield reducing root injury in 2008, which differed from previous years. It's worth noting the untreated control produced a significantly lower yield compared the Bt-RW treatment every year, except 2008. In contrast, the granular insecticide Force produced the same yield as Bt-RW every year, and Lorsban in three of the six years. The six year average root ratings indicate distinct differences for each of the control products, while grain yield differences are less abrupt. Force resulted in numerically higher injury every year compared to Bt-RW, despite this however, yields were similar.

Corn Rootworm Larval Control Products

Figure four depicts a relationship between root injury and grain yield. A plateau-quadratic curve was fit to the data, the curve indicates maximum yield can be expected up to a root injury rating of 0.68. A root rating of 1.5 would produce a mere 5% yield loss. With root ratings between 0 and 1.5, such as that of the Force treated plots, little or no yield loss would be expected. Therefore it should not be surprising that Force treated plots always produced the same yield as Bt-RW.

Mark Pawlowski and Wyatt Wessel prepare to dig corn roots for evaluation (July 2008).

Corn Rootworm Larval Control Products

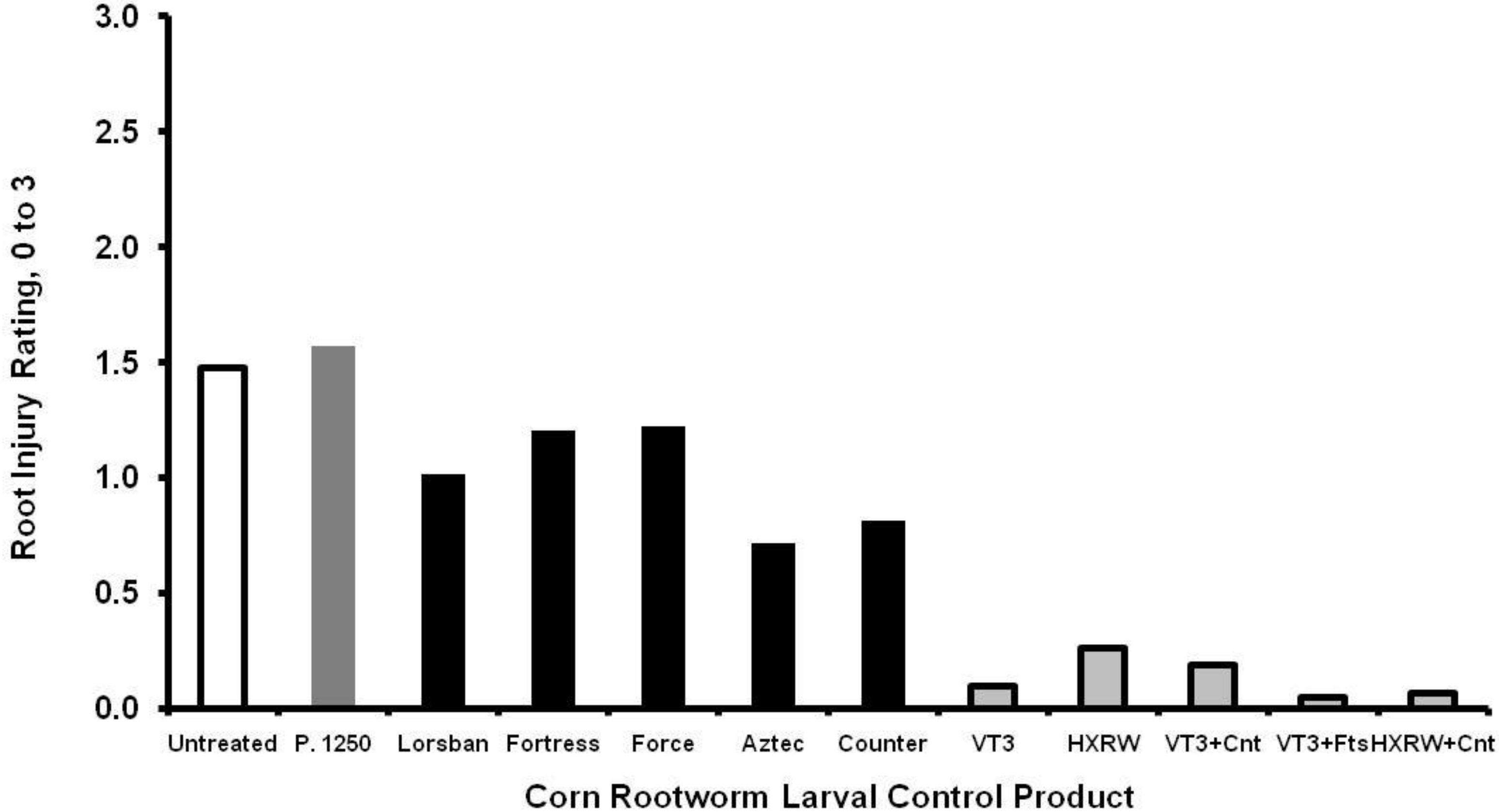
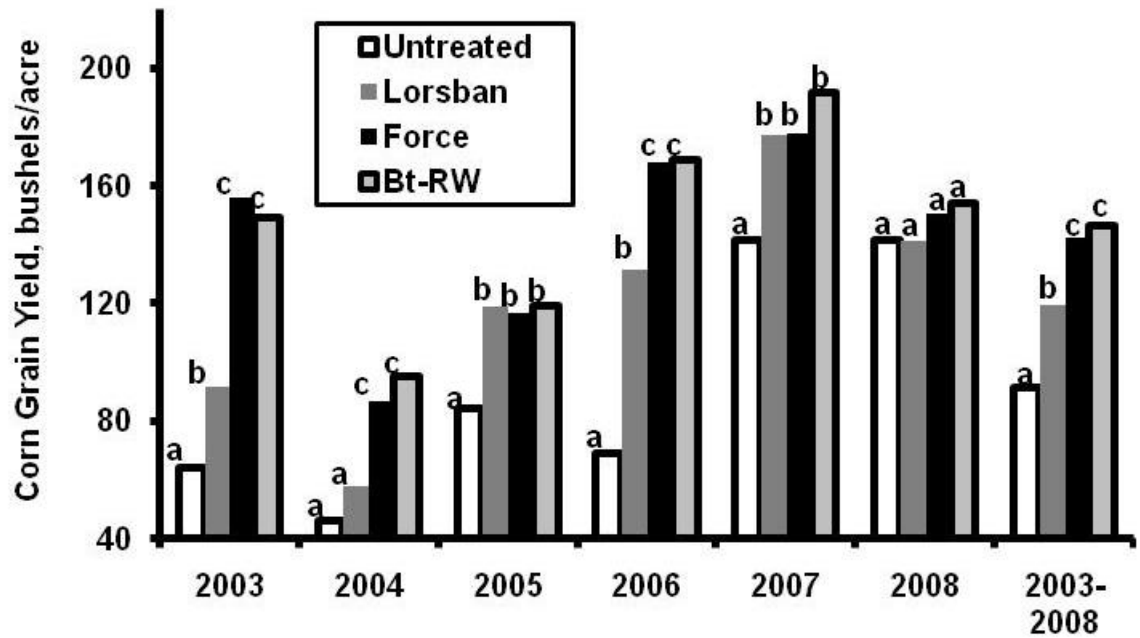


Figure 2. Influence of corn rootworm larval control product on the root injury ratings (0 to 3) of corn grown at Joliet Junior College in 2008. The corn hybrids are; Pioneer 33H27 (HX1) used for all non-Bt rootworm treatments (insecticides), Pioneer 33H29 (HXX) used for both Herculex rootworm treatments (HXRW), and Dekalb 61-69 (VT3) used for the three VT3 treatments. The two Pioneer hybrids are isogenic lines. Granular insecticide abbreviations; Fts= Fortress, Cnt= Counter.

Corn Rootworm Larval Control Products



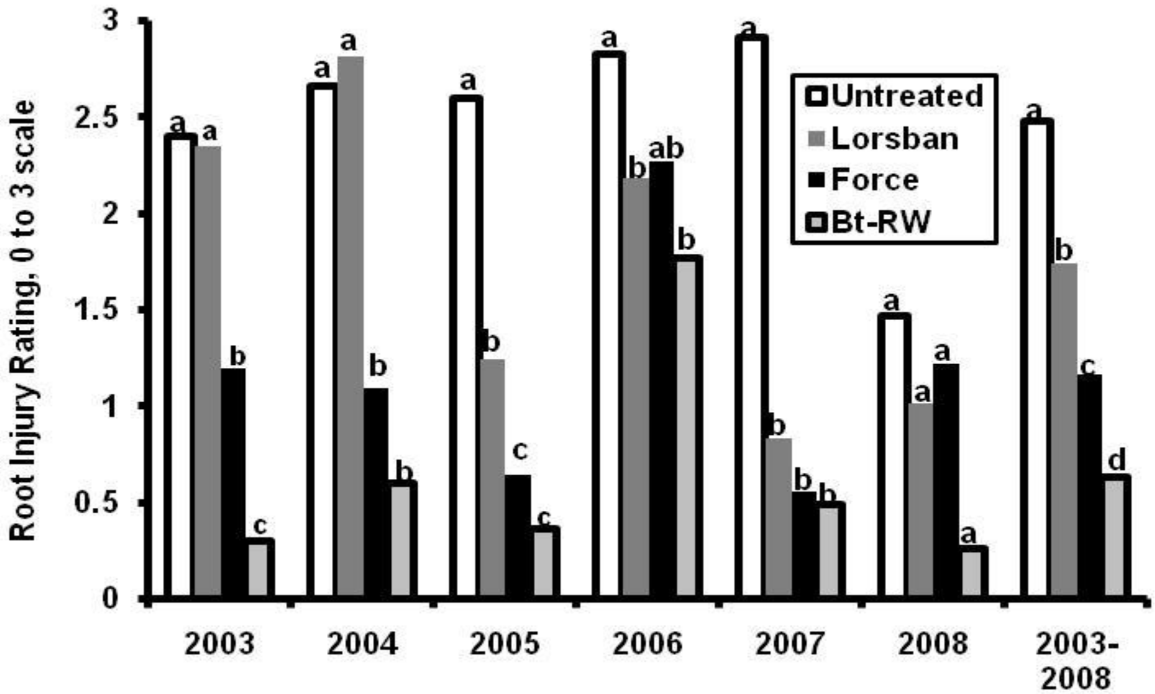


Figure 3. Influence of year and corn rootworm larval control product on the grain yield (top) and root injury rating (bottom) of corn grown after corn from 2003 through 2008. Treatments followed by the same letter within a year are not significantly (α= 0.10) different.

Corn Rootworm Larval Control Products

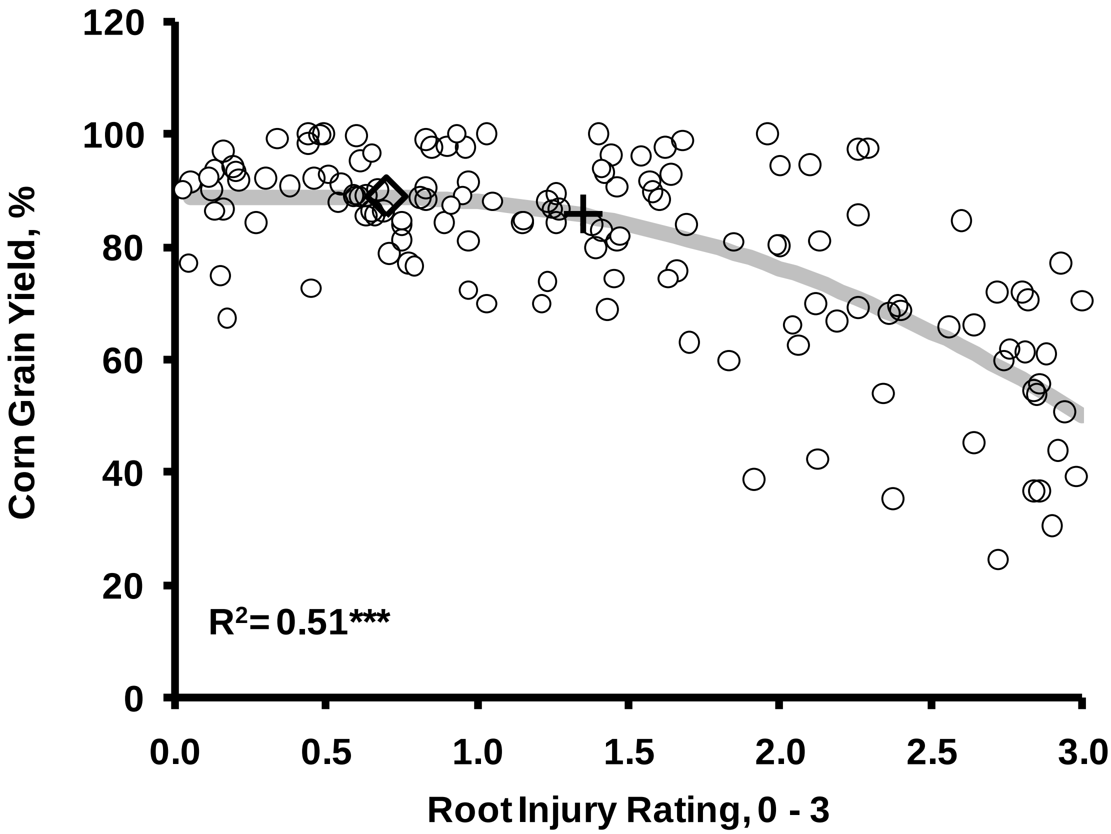


Figure 4. Influence of root injury (0 - 3, node-injury scale) on the grain yield of corn grown (%) at Joliet Junior College from 2003 to 2008. The large diamond shape indicates a plateau yield of 88.97%, which occurs at a root injury rating of 0.68. The large plus shape indicates where economic injury 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 5). 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 where the previous crop was soybean on April 18th at 34,000 seeds per acre with the Pioneer Hybrid 33W84. 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 during four separate growth stages alone (V2, V4, V6, V8, and V2+V6), or in combination with Harness Xtra at V2. Harness Xtra was also applied alone, and at the same rate (60 oz/acre) as when used as part of a system with glyphosate. A no herbicide control was also included in the experiment. 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 by 340 feet long, the center 10 feet of each plot was harvested. Weed efficacy was assessed visually and measured post maturity in early October. As a reference for the visual ratings, we believe that most producers would find the 90% or above rating an acceptable level of weed control.

Corn Herbicides

Results

All seven herbicide treatments provided moderate to excellent weed control (Figure 6, top). Within that range, the poorest control (80%) occurred with the V2 glyphosate application. Such an early application allows too much time for weed emergence prior to canopy closure. As Roundup application was delayed, weed control improved and reached a maximum at V6. Both the V8 and V2+V6 applications were similar to V6. Harness Xtra with or without Roundup reduced control slightly from the plateau.

All herbicide treatments significantly (α= 0.10) increased grain yield compared to the no herbicide control (Figure 6, bottom). Roundup applied at V2+V6 produced the numerically highest yield and significantly increased yield compared to the V2 application. Note however with single Roundup applications that yield tended to decline as application time was delayed from V4 to V8. Despite nearly perfect weed control at V8, 11 bushels per acre of yield was lost compared to V4.

Untreated control plot with severe lambsquarter infestation.

Corn Herbicides

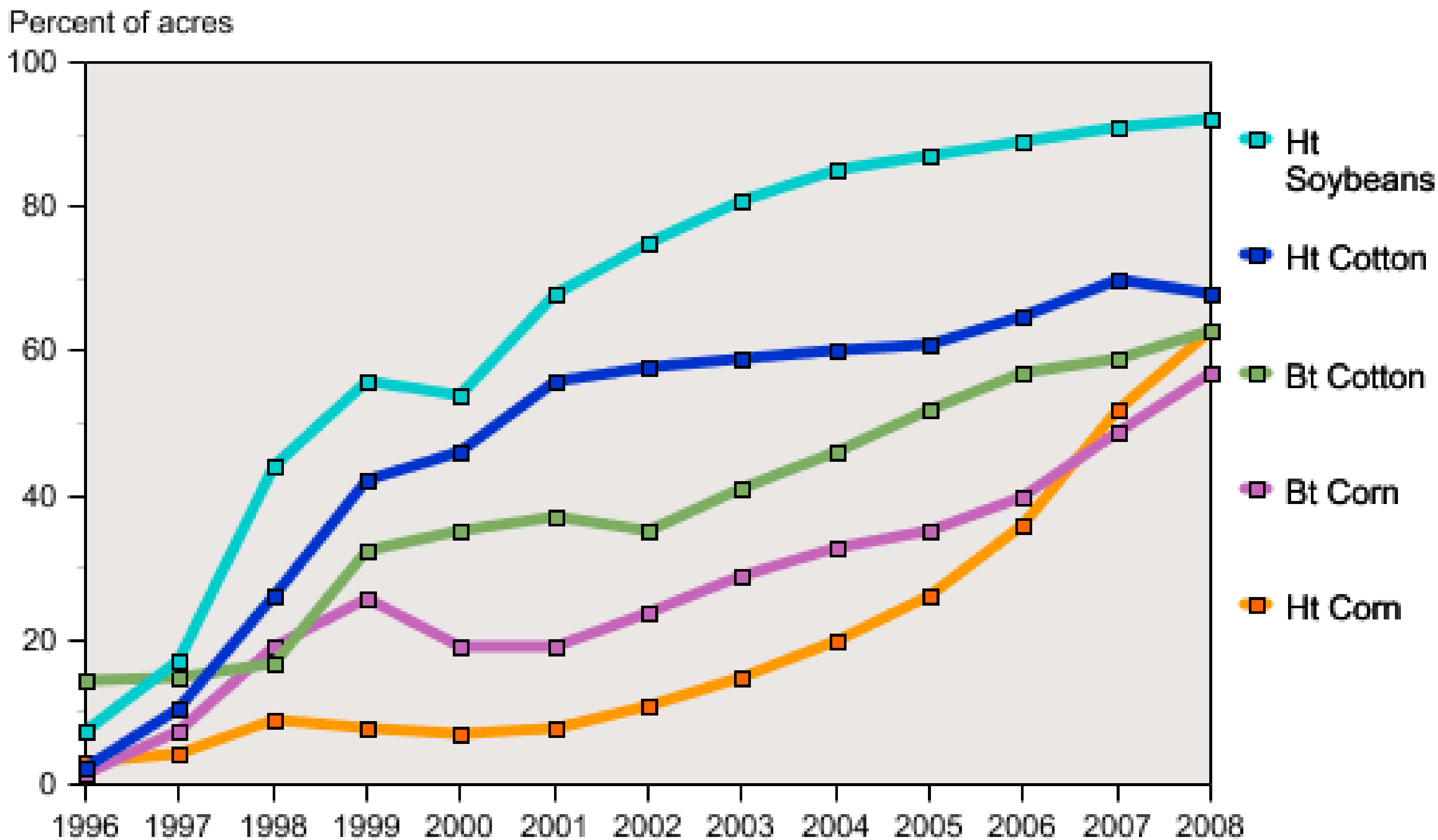


Figure 5. Adoption of genetically engineered crop in the U.S.
Source: USDA-ERS. 2008. http://www.ers.usda.gov/data/biotechcrops/.

Corn Herbicides

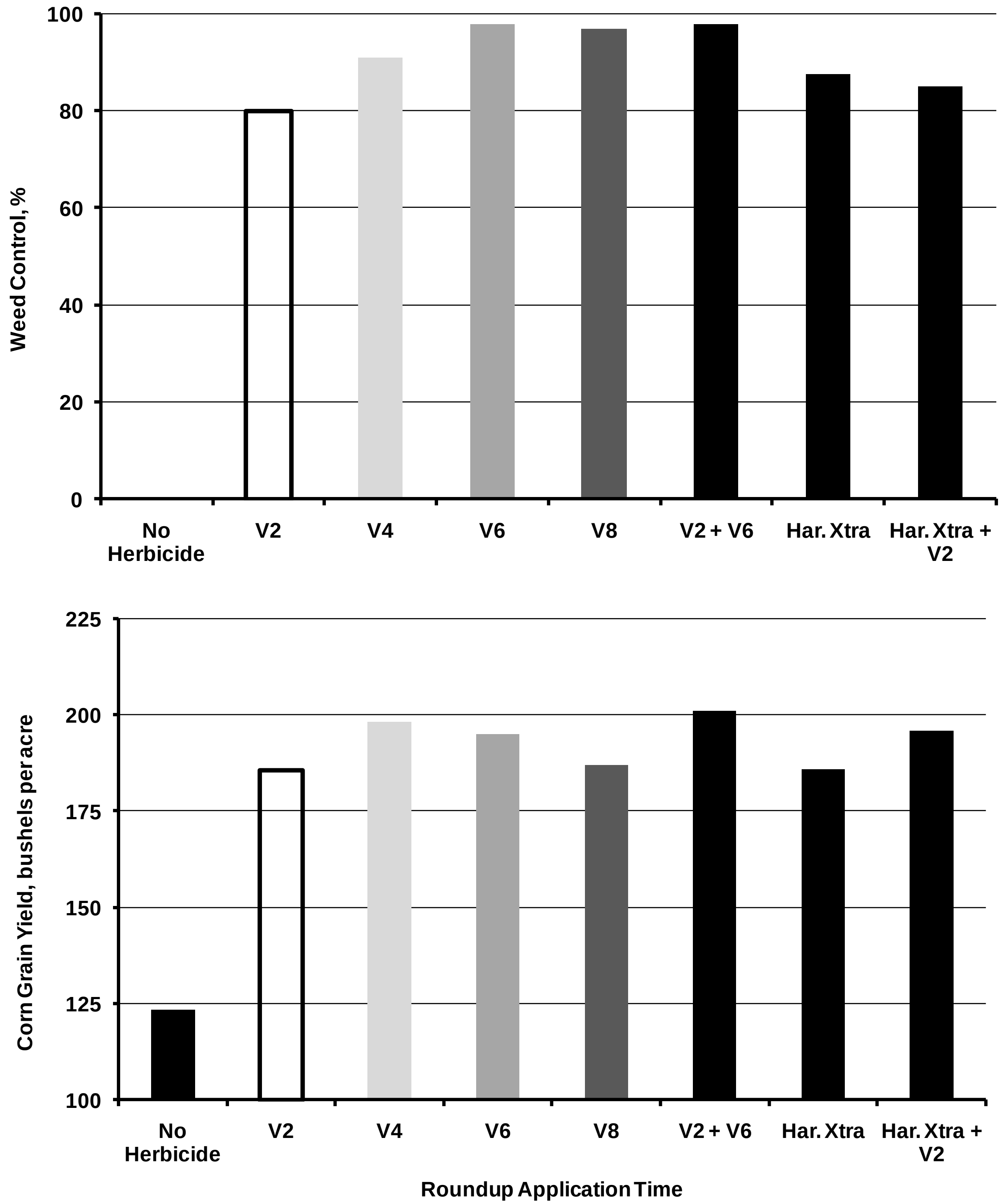


Figure 6. Effect of Roundup WeatherMax (glyphosate) application time with and without Harness Xtra (acetochlor and atrazine) on the weed efficacy (top panel) and grain yield (bottom panel) of corn grown at Joliet Junior College in 2008.

Root Injury 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 root injury caused by corn rootworm. In one of two years with plentiful soil moisture Spike and Tollefson (1991) observed higher corn N requirements with increasing root injury, and yield reductions were overcome with higher fertilizer N rates. Alternatively, N requirements have been shown to be reduced with increasing root injury (Spike and Tollefson, 1989). Over-compensatory root regrowth (growth after larval injury) has commonly been observed when low to moderate levels of root injury occur (Riedell, 1989; Kahler et al., 1985; Spike and Tollefson, 1988). Extensive root regrowth, in addition to yield reductions, may partly explain the reduced N requirements observed in some studies. Our objective was to determine the impact of corn root injury from corn rootworm larvae on nitrogen requirement.

Root Injury and Nitrogen Requirement

Methods

Experiments were carried out over four years (2005-2008) at Joliet Junior College to produce N-rate response curves for corn grown under various levels of root injury. Five nitrogen fertilizer rates (40-200 lb N/acre in 40 lb increments) and an unfertilized control were applied to three variations of corn rootworm larval management practices. The three management practices were; no-insecticide, a granular planter applied insecticide (Fortress), a combination of Fortress with Monsanto's Bt-RW event (YGRW+Fortress). Forty lb N/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 (early 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 rootworm control product as the main plots and N rate the sub plots. Each year two isogenic lines of a modern corn hybrid were grown, a Bt-RW and its non Bt-RW isoline. The Bt-RW was used in the YGRW+Fortress treatment, while the non Bt-RW isoline was planted for the Fortress and no insecticide plots. Corn was seeded at 34,000 seeds per acre in mid to late April. Fortress 2.5G was applied in the seed furrow, and weed control was achieved by preplant burndown and residual herbicides, followed by postemerge applications. Corn was zero-tilled into soybean stubble each year. Roots were dug, washed, and rated in mid-July, and the crop was harvested in mid-October.

Results

Root injury level in the untreated control declined sharply from 2005 to 2007, and remained low in 2008 (Table 1). In 2005 and 2006 both insecticidal treatments (Fortress, Fortress+YGRW) significantly (α= 0.10) reduced root injury compared to the untreated control. In 2007 and 2008 however, the magnitude of differences would not have resulted in any biologically important differences in response to N fertilizer. In all four years, both insecticidal treatments kept root injury well below levels known to cause yield loss. N response curves for each of the four years also indicate similar yield responses for the Fortress and Fortress+YGRW treatments. Similarly, the untreated control differed from the insecticide treatments in 2005 and 2006 only.

Figure 7 represents all four seasons averaged together. All three corn rootworm larval protection methods increased yield with increasing N fertilizerFigure . Where fertilizer N was applied, the untreated control reduced yield compared to the insecticide treatments. It is worth noting though, that the Bt-RW treatment has a similar yield to the untreated at zero N-rate. This is an indicator of a beneficial effect of low to moderate CRW injury. The Fortress treatment having neither heavy, nor exceptionally low root injury, produces a higher yield than the much more heavily injured untreated plots. With a low to moderate amount of root injury however, regrowth is stimulated by larval feeding (Wessel, 2007; Riedell, 1989), resulting in an increased root compared to the Bt-RW+Fortress.

Economic optimum N rates were (lb N/acre): Untreated= 113, Fortress= 133, and YGRW+Fortress= 122. The reduced N requirement of the lower yielding untreated crop is expected. A decrease in N needed by YGRW+Fortress compared to Fortress is also expected, because greater root protection that results in a more voluminous rooted crop will increase N availability. The higher yielding Fortress at zero N-rate is surprising, but seems logical given the potential for regrowth and increased root, which would become obvious under a mineral nutrient lacking scenario.

Root Injury and Nitrogen Requirement

A question that could be raised though, is why YGRW+Fortress has a reduced N requirement without the benefit of root regrowth? The answer may be a temporal one. The greatest rate of N absorption coincides with the maximum pace of root feeding (V8-R1), thus the high level of root protection afforded with YGRW would enable the Bt crop to acquire the most N. While the abundant regrowth occurring with Fortress treated plots (R2-R4), occurs after most N has been absorbed. For zero N plots though, the maximum rate of N absorption occurs later than fertilized plots. The separation of maximum N absorption rate allows the crop to utilize regenerated roots during the process.

Table 1. Influence of root protection method and year on the root injury rating of corn grown after soybean at Joliet Junior College. Roots were rated from plots with 120 lb N/acre.

Root Protection Method	Year			
	2005	2006	2007	2008
	0 - 3 scale†			
Untreated	1.77	1.28	0.19	0.18
Fortress	0.40	0.31	0.16	0.13
YGRW+Fortress	0.21	0.07	0.06	0.04
LSD(0.10)‡	0.62	0.56	NS	0.09

† 0 - 3 node-injury scale: A 1 is equal to one node (circle) of roots pruned off to within 1.5 inches of the plant stem.
‡ LSD applies to root protection method within years.

Root Injury and Nitrogen Requirement

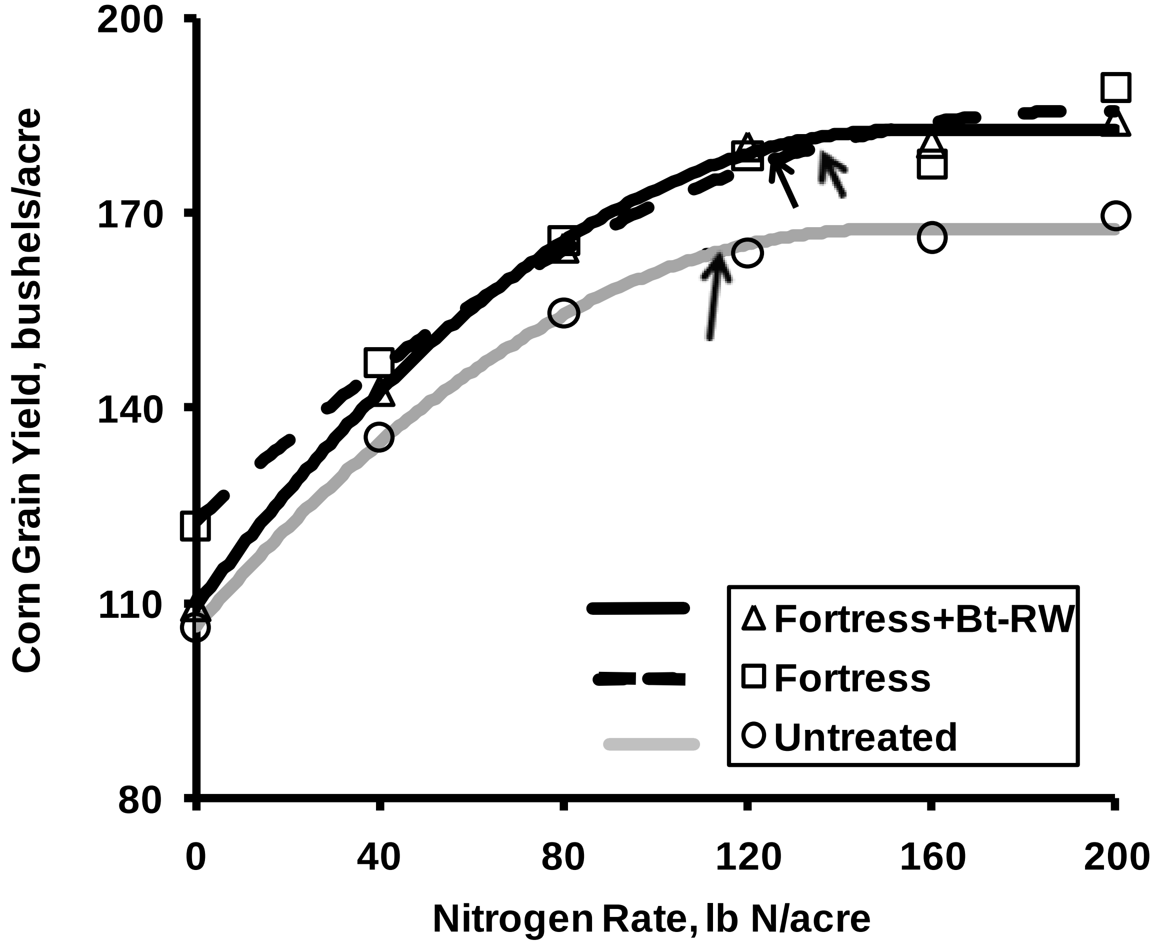


Figure 7. Influence of nitrogen rate and corn rootworm larval root protection methods on the grain yield of corn grown at Joliet Junior College from 2005 through 2008. Economic optimum N rates are (lb N/acre): Untreated= 113, Fortress= 133, YGRW+Fortress= 122. Nitrogen fertilizer to corn price ratio is 0.20 ($/lb N : $/bushel). All three quadratic plus plateau functions fit their respective data with p values < 0.001.

Tillage and Planting Date

Rationale

Optimum corn planting dates are well documented in Illinois, planting within the two week window between April 20th and May 4th usually produces optimum corn grain yields in most of Illinois (Nafziger, 2002). Tillage often produces small yield increases, although interactions with previous crop and soil water holding capacity have been noted (Hoeft et al., 2000). Corn zero-tilled after soybean and in droughty soils can produce yields similar to tilled soils, however, monocropped corn and corn grown in soils with relatively high water holding capacity often produce higher yields with tillage. The influence tillage has on optimum corn planting date is not well known. Observations made by researchers at Purdue from long-term tillage comparisons have been that a response to tillage is more likely when planting is done in late April compared to late May (Vyn et al., 2002). In Minnesota, Randall and Vetsch (2002) found no interaction between planting date and tillage. Our objective was to determine if tillage influences optimum corn planting date.

Methods

Three planting dates and tillage systems (9 treatments) were replicated three times to determine whether tillage influences optimum corn planting date. 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 any time, and the previous crop was soybean.

The study was conducted over a five year period from 2004 to 2008, each year planting occurred in the 1st week of April for the early treatment, the last week of April for the normal planting time, and the third week of May for the late date. During the first three years the corn hybrid Burrus 644RWR was seeded at 32,000 seeds/acre, in 2007 a newer hybrid was selected (Burrus 572RWR) and 34,000 seeds/acre were planted. Weed control was achieved with preplant tillage and 60 oz per/acre HarnessXtra applied preemerge for tilled plots, and 16 oz/acre 2,4-D with HarnessXtra applied preemerge in strip and zero tillage plots. The entire experimental area was treated with Roundup Weather Max postemerge (V3) at 21 oz/acre. The nitrogen source was urea ammonium nitrate (32% UAN), 40 lbs N per acre applied 2X2 during planting and 80 lbs N per acre soil injected at V3.

Results

Planting date effects which tillage system produces the highest grain yield (figure 8). Our data indicate that when corn is seeded in April, some tillage does increase yield. When seeded in mid to late May however, tillage does not influence yield. So while producers may normally expect about a five bushel yield increase with tillage when compared to zero-tillage, when planting unexpectedly late, the management focus should be on planting and not performing tillage operations. When averaged over planting dates, either strip or chisel tillage increased yield four bushels per acre. When planting date is averaged over tillage, the normal planting date increased yield about 16 bushels per acre, while the early planting increased yield by 20 bushels per acre compared to late planted corn. Although tillage apparently does influence yield of rotated corn, its impact is of relatively low magnitude when considering planting date.

Tillage and Planting Date

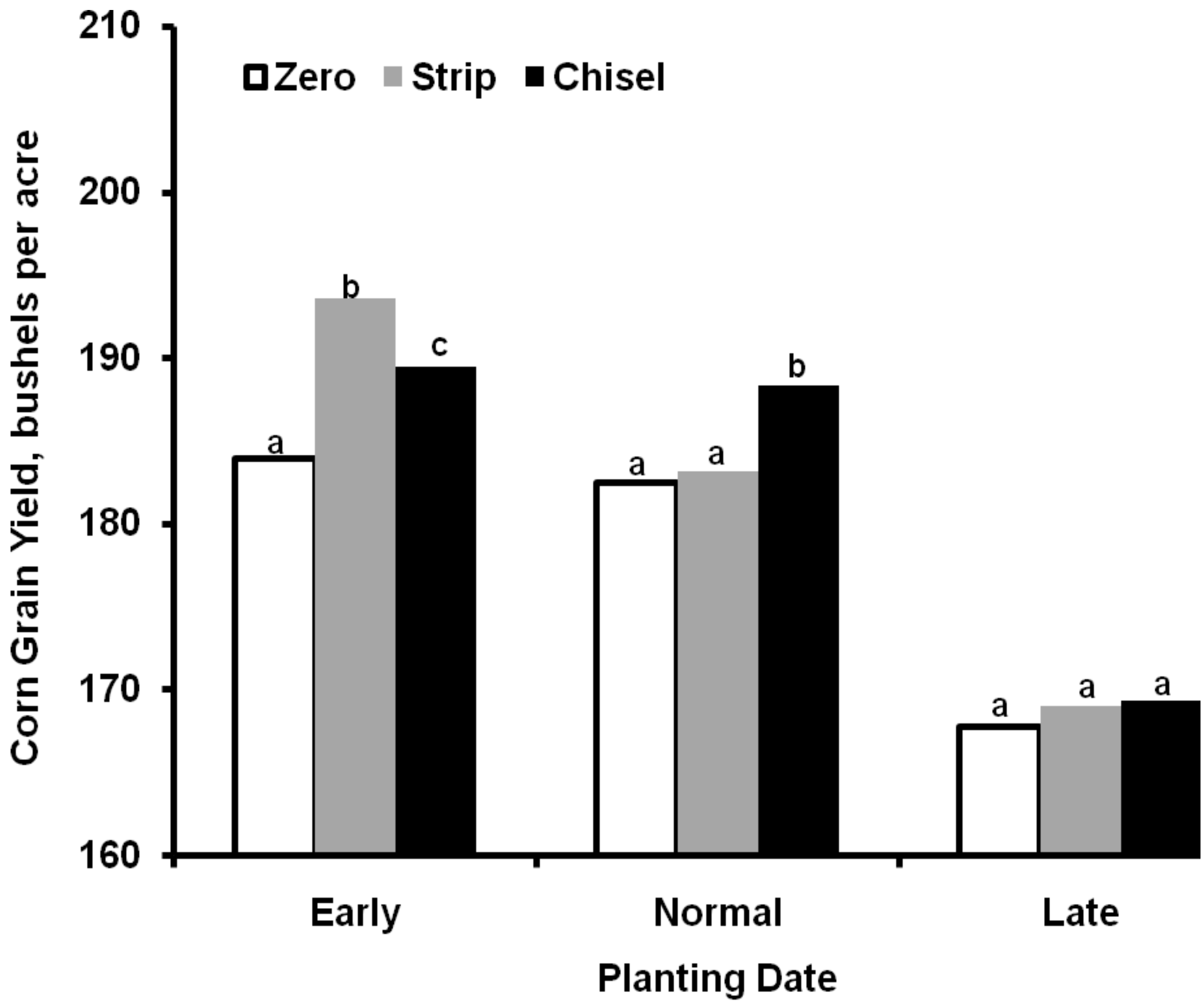


Figure 8. Influence of tillage system and planting date on the grain yield of corn grown after soybean at Joliet Junior College over five years (2004-2008). Early planting is the first half of April, normal the second half of April, and Late the second half of May. Columns within the same planting date and followed by the same letter are not significantly different ($\alpha = 0.10$).

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. 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.

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

No treatment interactions with grain yield occurred. Figure 9 depicts the main effects (each of the four main treatment levels averaged over all other treatments); none were statistically significant ($p < 0.10$). Chisel-tillage produced a six bushel per acre numerical advantage compared to strip-tillage. All other main effect treatments produced nearly identical yields. Although we cannot be too confident chisel-till increased yield compared to strip-till, the chisel-till advantage is similar to 2007. A significant yield increase also occurred with a fungicide in 2007, and the crop canopy had considerably more disease than in 2008.

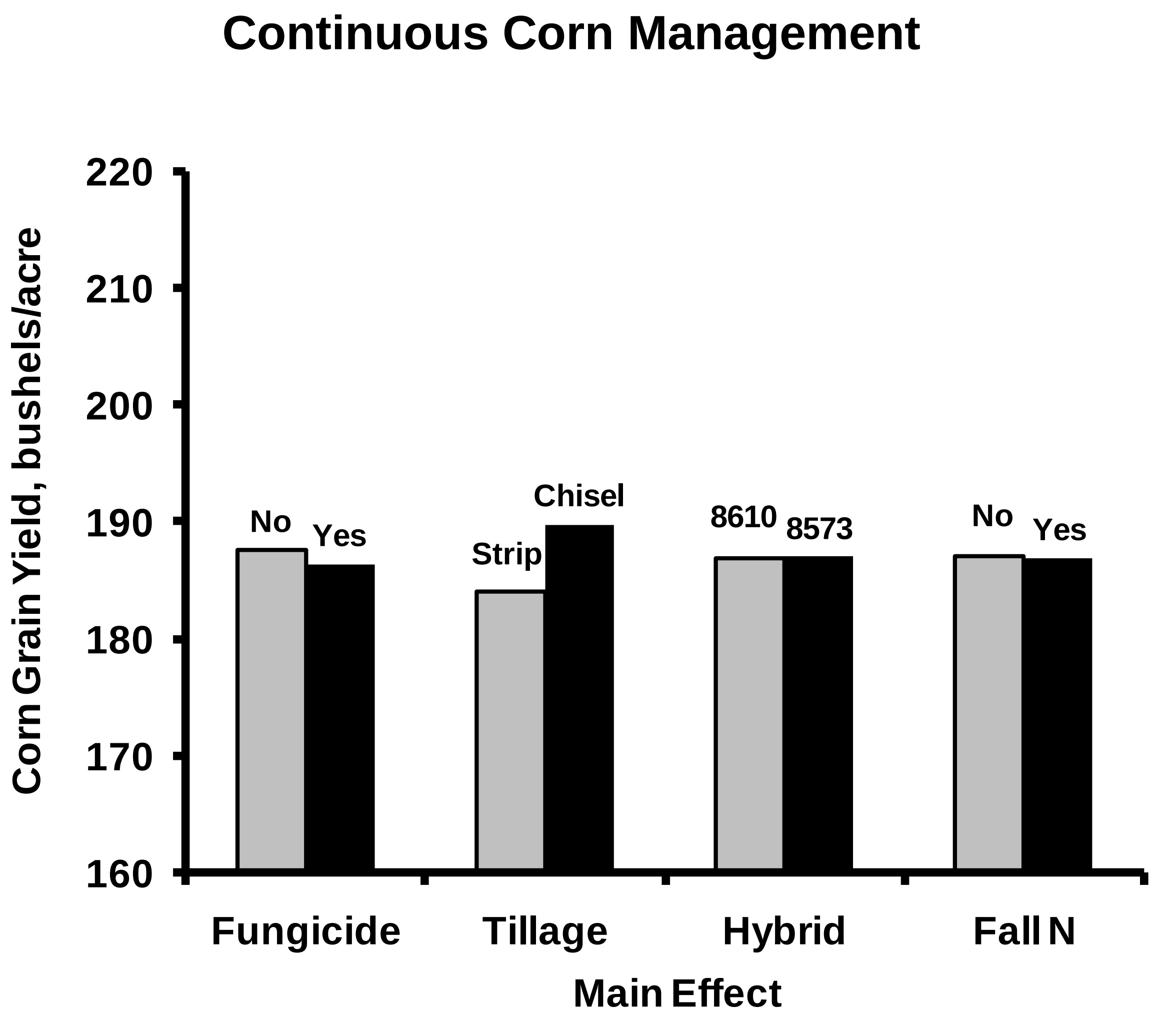


Figure 9. Influence of the main effects of four treatment types on the grain yield of corn grown after corn at Joliet Junior College in 2008. The fungicide Quilt was applied at R1, strip and chisel tillage was performed in the fall, and two Garst hybrids (CB/LL/RW) were planted in early May. A total of 160 lb N/acre was applied to the entire experimental area, and half of plots received 40 lb of their total in the fall. There are no significant (p< 0.10) differences.

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 trashwhipper style attachment that removes most of the crop stover in the row during planting.

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 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.

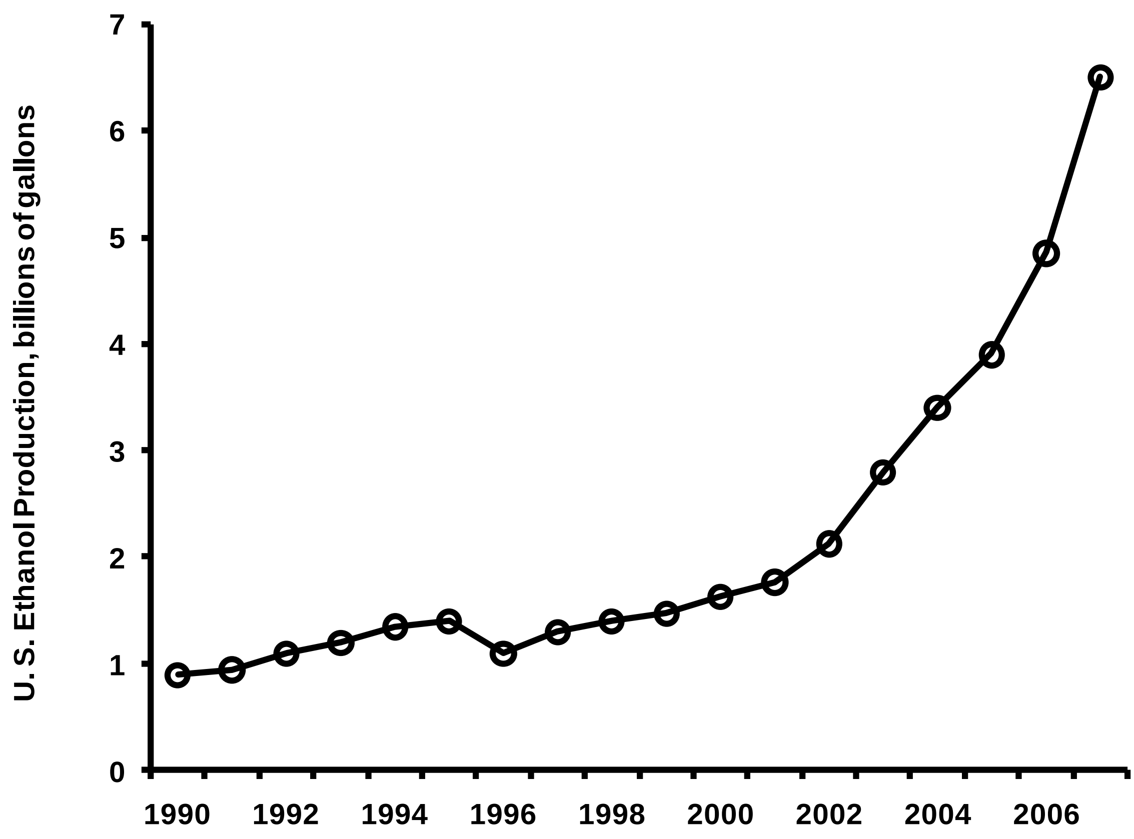


Figure 10. Production of U. S. ethanol from 1990 through 2007. Source: Renewable Fuels Association. http://www.ethanolrfa.org/industry/statistics/

Crop Rotation

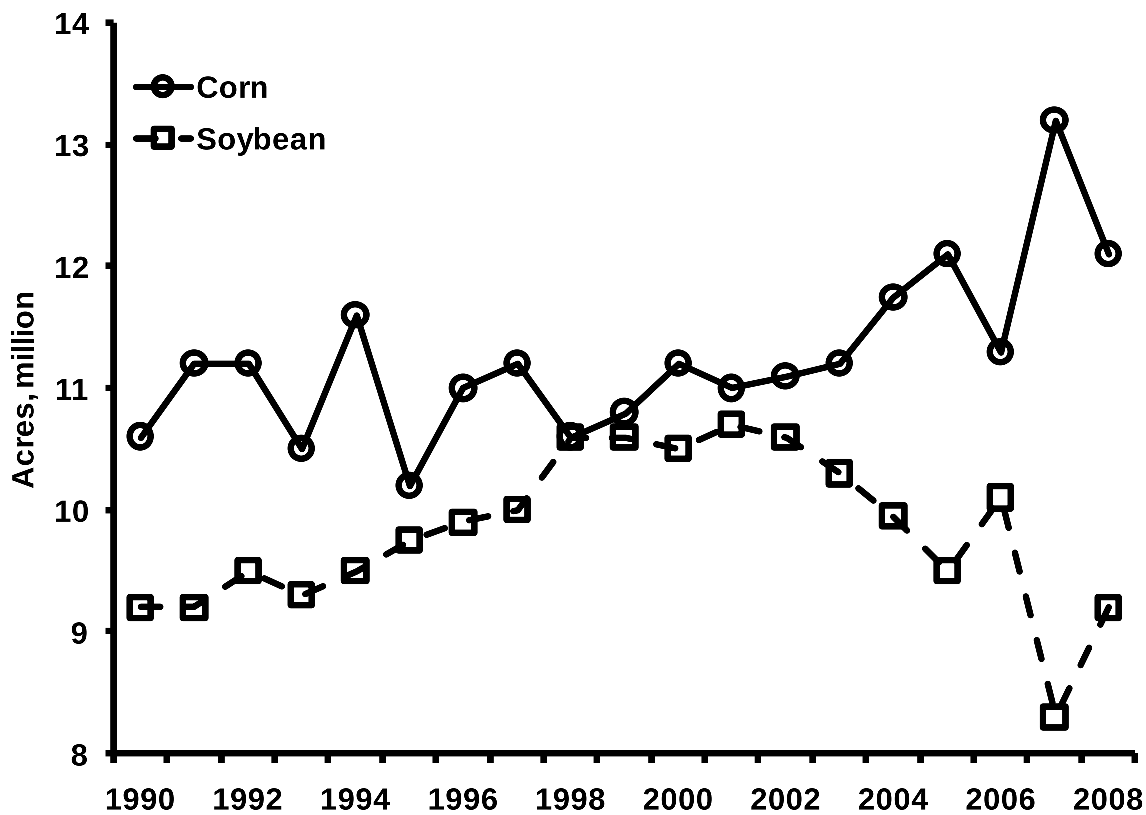


Figure 11. Illinois planted corn and soybean acres from 1990 through 2008. Source: Illinois Agriculture Statistical Service. http://www.nass.usda.gov/QuickStats/PullData_US.jsp

Results

There was no crop rotation by fungicide interaction, and fungicide did not significantly ($p< 0.10$) increase yield. The main effect of crop rotation however, did influence yield, with the soybean-corn rotation increasing yield about 5% compared to the corn-corn rotation (figure 12).

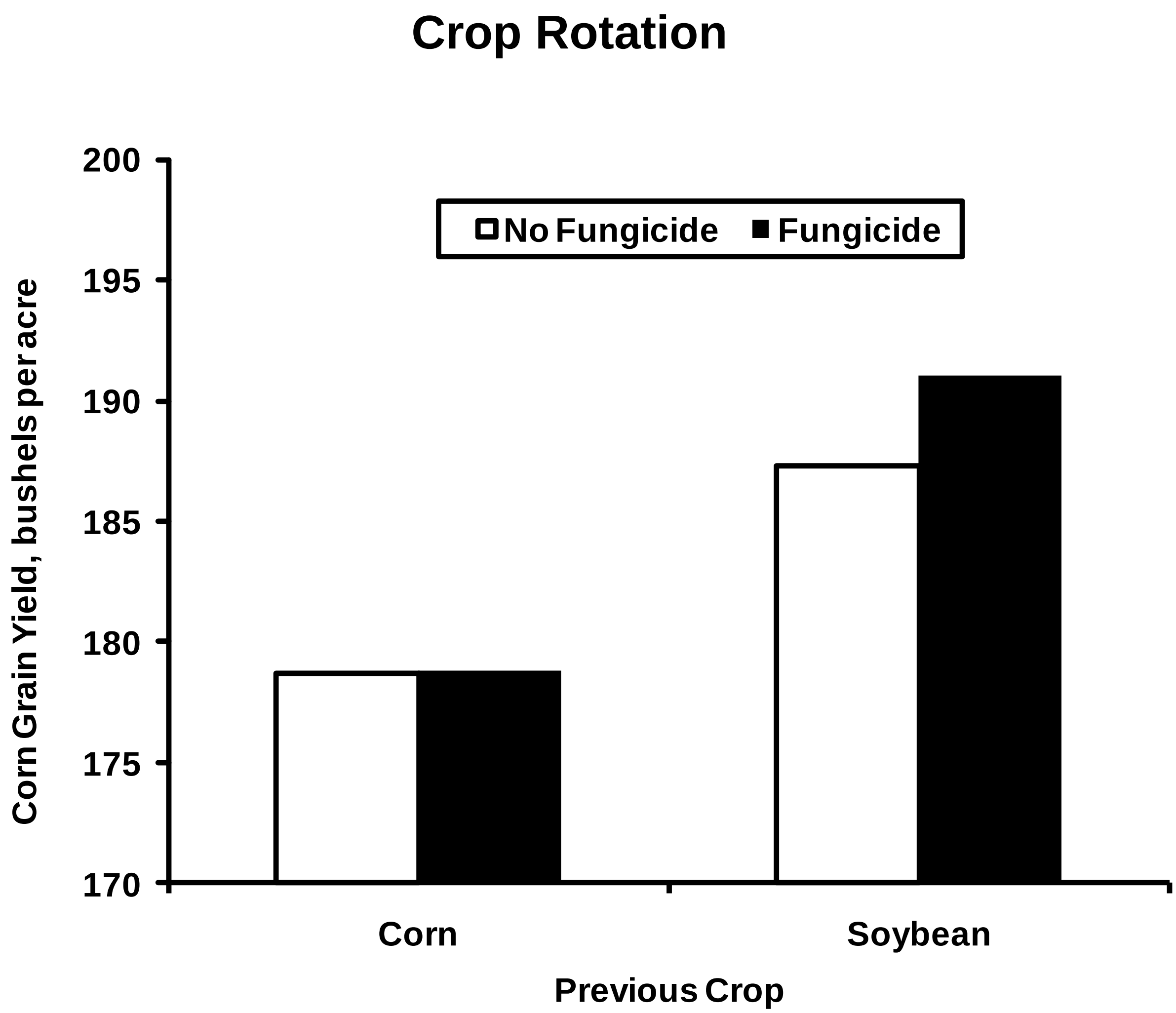


Figure 12. Influence of previous crop and fungicide on the grain yield of corn grown at Joliet Junior College in 2008. Fungicide did not significantly ($p < 0.10$) increase yield for either crop rotation, previous crop however did.

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 soybean residue at 34,000 seeds per acre on April 23rd, with the DeKalb hybrid 61-69(VT3). Fungicides were applied 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.

Results

None of the fungicides significantly ($p < 0.10$) increased grain yield when compared to the untreated control (figure 13). The unresponsiveness of corn to fungicide application in 2008 was common at Joliet Junior College. Field notes indicate that that extremely low levels of disease were present in the crop canopy at the time of fungicide application. Similarly, canopy observations made from R3 to maturity also depict a very healthy canopy.

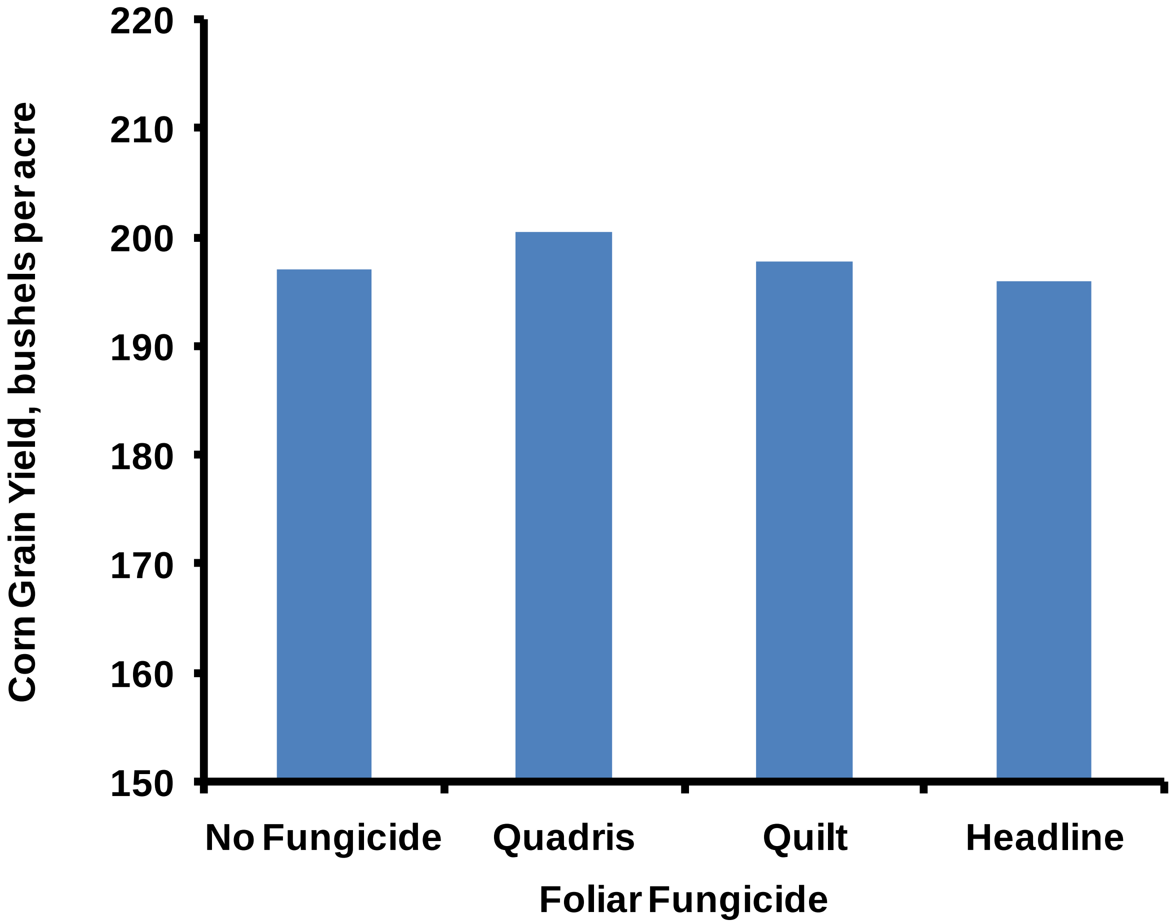


Figure 13. Influence of foliar fungicides on the grain yield of corn grown at Joliet Junior College in 2008. Fungicide treatments do not significantly differ ($p < 0.10$) from the no-fungicide treatment.

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 2008 crop is the seventh 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 30 instances (figure 14). The two pH effecting treatments (Basic and Acidic) reduced yield in only 2 of 12 instances, while the three fertilizer treatments (No-P, No-K, and No-P and K) reduced yield in 12 of 18 instances. The No-P and No-K treatments decreased yield in 3 of 6 and 4 of six instances respectively. However, plots treated without either P and K decreased yield five of the six years. The year when No-P or K plots did not reduce yield was 2005, a semi droughty year with an average yield of 134 bushels per acre, 23 bushels per acre less than the lowest of the remaining five.

Despite consistent yield loss for the No-P or K treatment, when averaged over the six year period that fertility regime produced 95% of the normal fertility practice yield. Assuming a 180 bushel per acre yield and a $4.00 price, the losses ($36 per acre annually) are far less than the current cost of that fertilizer.

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 15). 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.

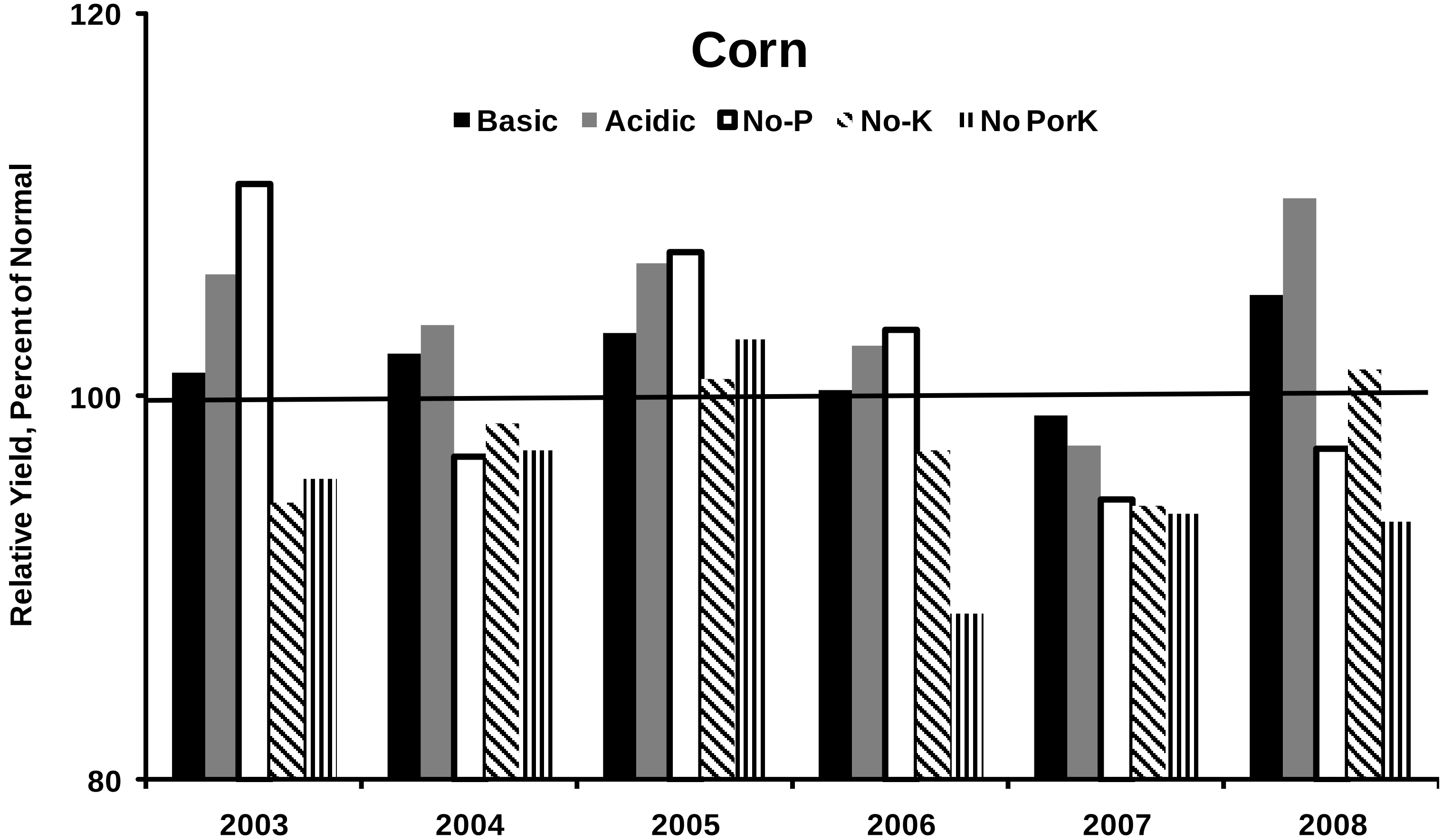


Figure 14. Influence of soil fertility practices and year on the relative grain yield of corn grown at Joliet Junior College from 2003 through 2008. Yields of all five fertility practices are depicted as a percentage of the normal treatment, which is 100. The normal treatment consisted of 50 lb/acre P_2O_5 and K_2O, and pH maintained between 6.0 and 6.5.

Soil Fertility

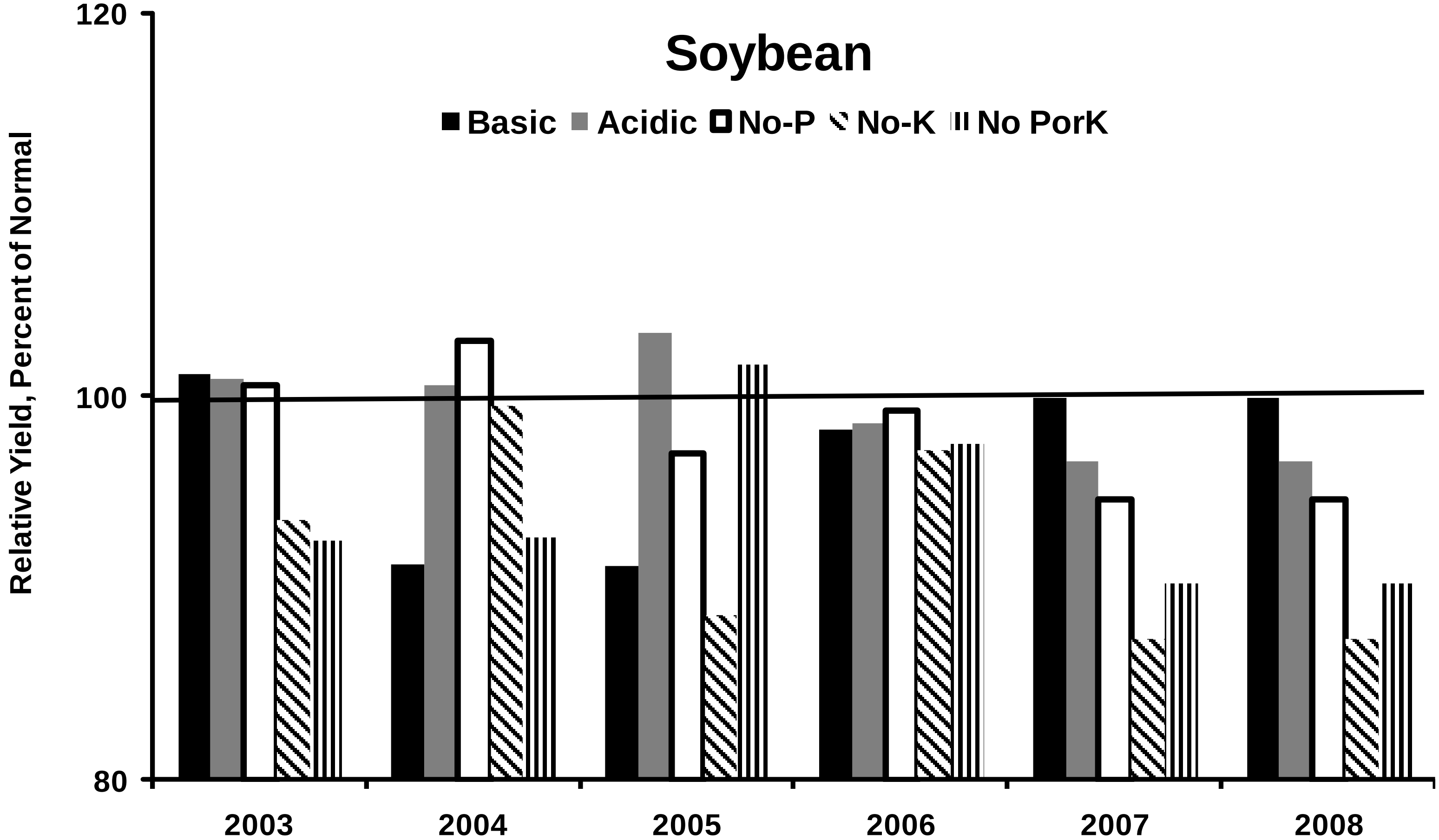


Figure 15. Influence of soil fertility practices and year on the relative seed yield of soybean grown at Joliet Junior College from 2003 through 2008. The yield of all five fertility practices is depicted as a percentage of the normal treatment, which is 100. The normal treatment consisted of 50 lb/acre P_2O_5 and K_2O, and pH maintained between 6.0 and 6.5.

Corn Hybrids

Methods

Thirty-three corn hybrids were planted on June 2nd at a rate of 34,000 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. The corn rootworm larval insecticide Fortress15G was applied in-furrow during planting to all hybrids not transgenic with Bacillus thuringiensis (Bt) for corn rootworm (Bt-RW). The check hybrid (DeKalb DKC61-69) was entered five 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 Case IH model 1660 combine, and yield determined with two weigh wagons at either end of the demonstration and calibrated to match weights. Grain moisture for each entry was measured with a single hand-held moisture meter. The demonstration area was zero-tilled into a previous crop of corn. At V5, 120 lb N per acre was sidedressed, and followed 40 lb N/acre at planting. The crop flowered in late July, and was harvested in mid-November.

Results

The crop averaged 131 bushels per acre, and grain moisture averaged 19.0% (Table 2). Grain yield ranged from 97 to 159 bushels per acre, while relative yield ranged from 80 to 109 percent. The highest relative yield was Trelay 6T510.

Corn Hybrids

Table 2. Demonstration of the grain moisture and yield for 31 corn hybrids grown at Joliet Junior College (Laraway Road) in 2008.

Company	Nomen-clature	Grain Yield	Grain Moisture	Relative Yield‡
		bu/acre	—%—	—%—
LG	2614	122	18.4	102
Crows	4688	117	19.4	98
Pioneer	34A20	97	21.0	82
Dekalb	**61-69**	**119**	**14.0**	**100**
Dairyland	9615	101	24.4	85
Kruger	K-6010	124	18.8	104
Trelay	6T510	130	17.1	109
Burrus	573T	128	22.4	80
Becks	5444	141	20.0	89
Sun Praire	530	137	19.2	86
Dekalb	**61-69**	**159**	**17.2**	**100**
Dekalb	63-42	145	22.1	91
Becks	5244	149	19.6	94
Dairyland	6208	123	17.3	78
Dekalb	61-19	151	19.1	101
Burrus	5M17	152	18.1	101
Trelay	7T231	132	21.4	88
Dekalb	**61-69**	**150**	**17.0**	**100**
Crows	4617	135	22.0	90
Dairyland	4114	132	21.9	88
Pioneer	33H27	120	19.5	80
Crows	4354	122	21.4	94
LG	2620	132	21.0	102
Burrus	X4J63	132	18.1	101
Dekalb	**61-69**	**130**	**16.1**	**100**
Dekalb	DKC 64-24	136	17.8	105
Dairyland	9010	114	21.8	88
Kruger	K-6413	122	19.2	93
Sun Prairie	377	125	19.5	92
Trelay	7T202	129	17.6	95
Dekalb	RX785	137	17.6	101
Dekalb	**DKC 61-69**	**136**	**15.9**	**100**
Becks	5555	135	18.1	99
Dekalb	RX674	138	17.8	101
Average		131	19	96

Row Spacing and Population

Rationale

During the mid to late 1990's Illinois soybean planted in row spacing between 10 to 19 inches was increasing while spacing between 29 to 35 inches were declining (Adee and Pepper, 2000). By 1998 soybean acreages in both categories were similar and combined to make up nearly half of the Illinois soybean crop. Soybean row spacing influences canopy light interception which becomes critical in determining seed yield during seed set (R3 - R5) (Andrade et al., 2002). Generally there are small increases in soybean yield as row spacing narrows below that of the traditional 30 inch spacing, and the benefit from reduced row spacing is maximized at row widths of 15 to 20 inches wide (Pepper, 2000).

Since light interception during the R3 through R5 growth stages is critical for maximum seed yield, cultural practices that enhance canopy closure before seed set generally increase yield. Practices that enhance canopy closure are; early to normal planting dates, planting late season cultivars, and avoiding double cropping. Soybean plant densities greater than 150,000 plants per acre rarely increase seed yield in Illinois (Nafziger, 2002a). However, practices that delay canopy closure during early reproductive growth are scenarios likely to respond to populations greater than 150,000 plants per acre. Our objectives were to determine the impact of row spacing and harvest populations on the seed yield of soybean.

Methods

Soybean was planted in early May over a six year period (2002 – 2008) in narrow (15 inch) and wide (30 inch) row spacing at seeding rates to obtain four target harvest populations (75, 125, 175, and 225 thousand seeds per acre). To obtain the target populations, seeding rates were increased 20%. Planting was completed with a Kinze model 3000 planter using wavy coulters for residue cutting in the zero-till environment where the previous crop was corn. Weed control was accomplished with a fall burndown that included herbicides with soil residual activity, followed by a postemerge application of glyphosate.

Results

Optimum harvest population was not affected by row spacing; therefore the data were averaged over row spacing to determine optimum population (Figure 6). In most years (5 of 7) increasing harvest population above 75 thousand plants per acre had no effect on soybean seed yield, in those instances optimum population is 75,000 plants per acre. The interaction of harvest population with year is very subtle. In 2003 a slight decrease in yield can be seen with increasing population, although in 2004 yield increased with increasing population up to 93,000 plants per acre.

The narrow-row spacing (15-inch) consistently produced the highest seed yield when compared to wide (30-inch) rows (17). The consistent yearly narrow-row advantage also occurred irrespective of harvest population. When averaged over seven years of the experiment, the narrow row advantage was three bushels per acre.

While our work indicates an optimum population of 75,000 plants per acre, it's important to recognize this is a harvest population, and not an optimum seeding rate. For this experiment we assume a seeding efficiency of 0.80, and so would seed our 75,000 population at 93,750 seeds per acre (75,000/.80). A seeding efficiency of 0.80 may be a reasonable average, but we have noted efficiencies as low as 0.60. An additional concern is for late germinating weeds. Using herbicides without any soil residual activity will result in some late germinators (Waterhemp, Fall panicum) producing seed. Many producers can realize large seed savings by reducing seeding rates from their current practice.

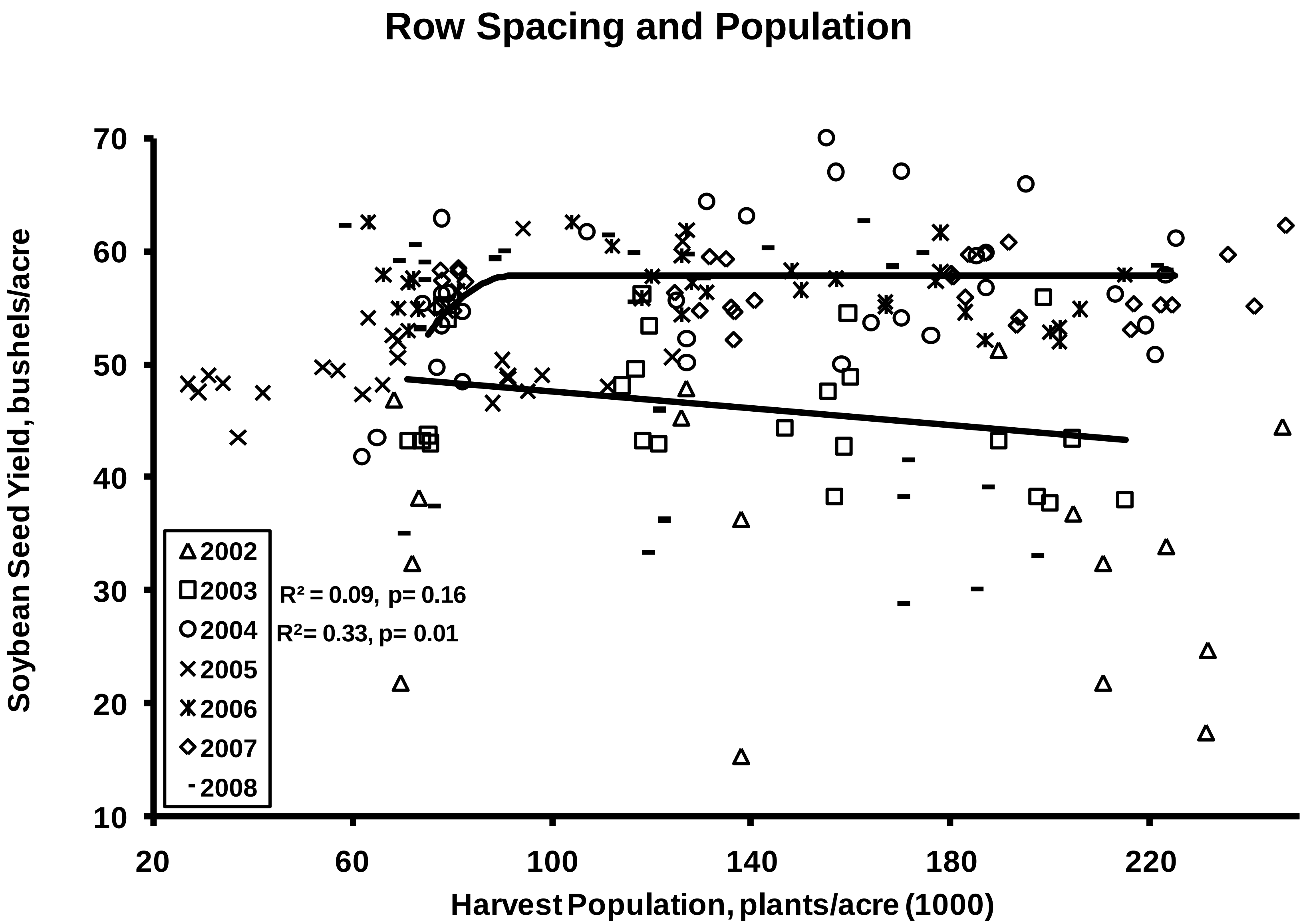


Figure 16. Influence of harvest population and year on the seed yield of soybean grown at Joliet Junior College over seven years (2002 to 2008). The linear curve represents 2003, while the quadratic + plateau is 2004.

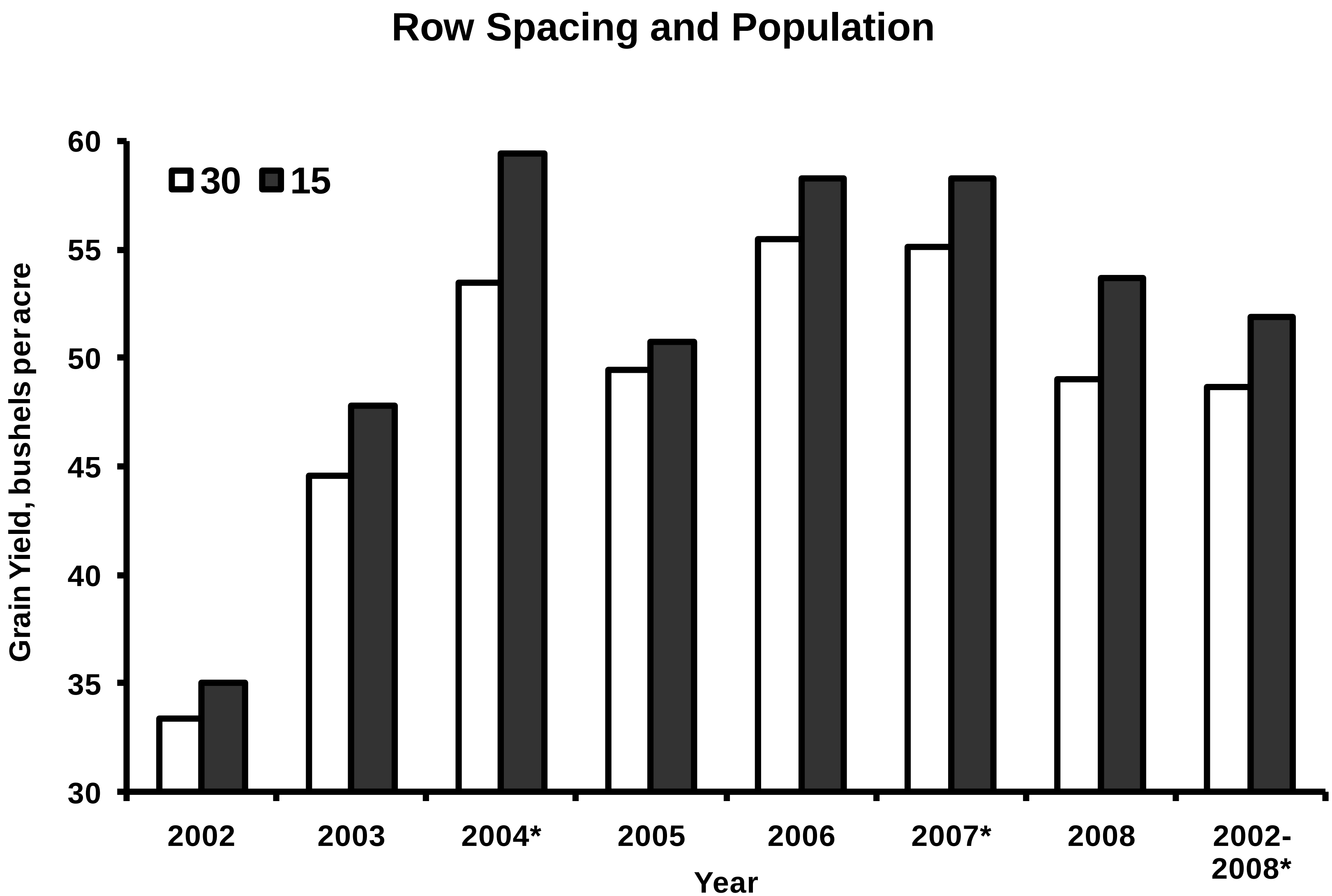


Figure 17. Influence of row spacing (30 and 15 inches) and year on the seed yield of soybean grown at Joliet Junior College over seven years (2002 to 2008). Row spacing is averaged over four harvest populations. Asterisks indicate significant differences (p< 0.10) between row spacing within a year, and the seven year average.

Tillage and Planting Date

Rationale

With modern farm equipment, numerous tillage systems are available for successful soybean production. Tillage types range from zero to clean tillage with varying degrees of full-width tillage that varies by amount of crop residue remaining on the soil surface after planting. Ridge and Strip tillage systems both require soybean to be planted in 30 inch rows to take advantage of tillage and drainage benefits of these within-row tillage systems. The Conservation Technology Information Center (CTIC) reports that soybean is zero-tilled on 37%, mulch-tilled on 27%, and conventionally tilled (moldboard plow) on 17% of Midwestern soybean acres (CTIC, 2004). The three tillage systems listed above represent 71% of Midwestern soybean, with much of the balance considered reduced tillage (15 to 30% residue cover after planting.

Zero-till is defined as no tillage operations prior to planting, mulch-till is full width tillage with $\geq$ 30% residue cover after planting, and conventional tillage or moldboard plowing having little or no crop residue on the surface after planting. On average, tillage probably has little effect on soybean seed yield, however, soil productivity (water holding capacity) has been shown to be a good indicator of whether zero or full width tillage will produce a higher yield (Hoeft et al., 2000a). Optimum soybean planting date in Illinois has been found to range over a four week period that begins in late April and ends in late May (Nafziger, 2002a). Our objective was to determine the influence of tillage on optimum soybean planting date.

Methods

Three tillage systems (zero, chisel, and plow) and three planting dates were selected to determine if tillage affects optimum soybean planting date. Experiments were carried out in 2004, 2006, 2007, and 2008, the 2005 study was abandoned when a mid-May hailstorm destroyed many seedlings emerged from the first two planting dates. Moldboard and chisel plowing were completed in the fall, and followed by two shallow spring tillage passes. Zero-till had no tillage performed at any time, so preplant weed control was accomplished with CanopyEX and 2,4-D fall applied. The NK brand soybean cultivar S29-J6 was planted in 15 inch rows at a rate of 150,000 seeds per acre either early (2nd week of April), normal (1st week of May), or late (last week of May) in each of the three tillage systems. The entire experimental area was sprayed with Roundup WeatherMax at 21 oz per acre at about V3.

Results

Tillage did not influence optimum planting date, and when tillage was averaged over planting date (table 3), no significant differences (LSD 0.10) were observed. Optimum planting date was effected by year (figure 18). The highest numerical yield occurred with the early-May planting date every year. In three of the four years (2004, 2006, 2007) early-May planting produced significantly (α= 0.10) greater yield than the late-May planting date, and two years (2004 and 2007) mid-April produced higher yields than late-May. Yield was considerable lower in 2008 compared to the previous three years, most likely due to a heavy infestation of Anthracnose (*Colletotrichum truncatum*). Disease symptoms were readily apparent at harvest, and the overall reduced yield may have subdued the magnitude of planting date effects.

Tillage and Planting Date

Table 3. Influence of tillage on soybean seed yield grown at Joliet Junior College over four years (2004, 2006, 2007, and 2008).

Tillage	Seed Yield
	bushels/acre
Zero	51.7
Chisel	50.0
Plow	50.2
LSD a(0.10)	N/S

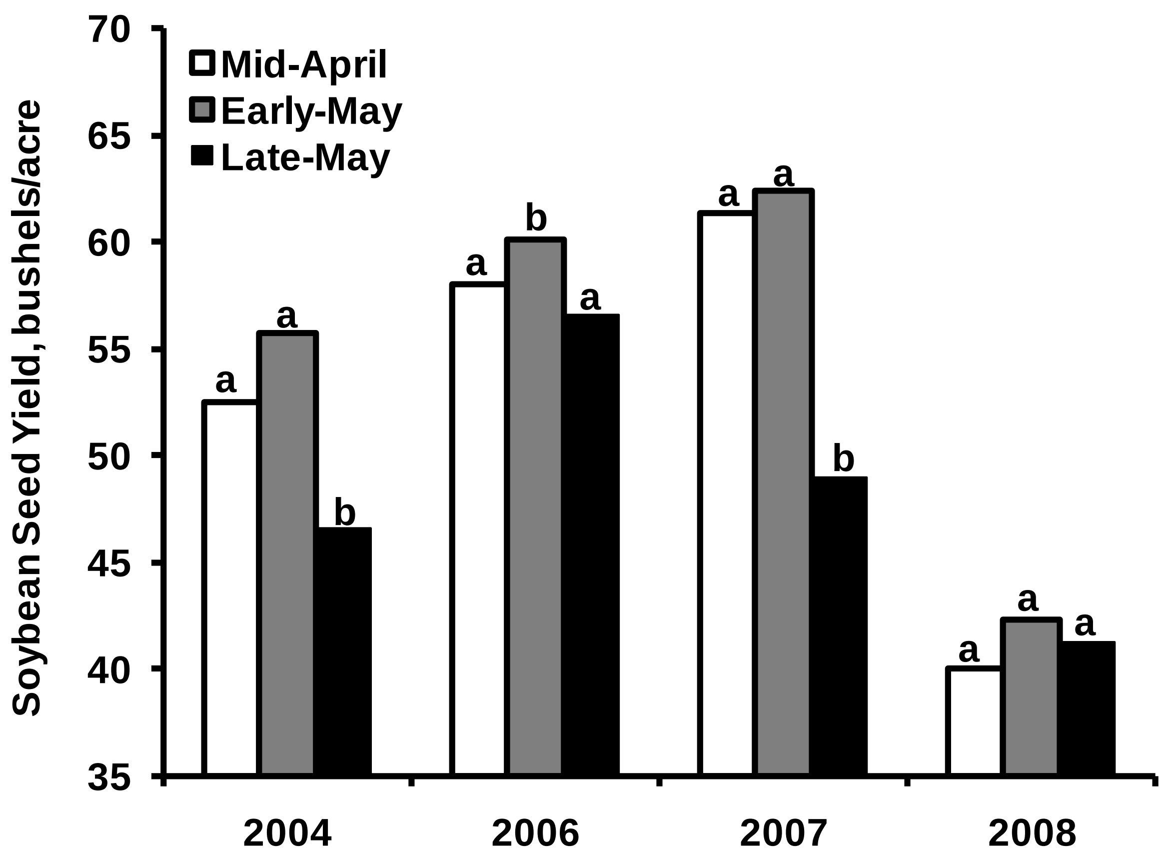


Figure 2. Influence of year and planting date on the seed yield of soybean grown at Joliet Junior College in 2004, 2006, 2007, and 2008. Planting dates followed by the same letter within a year are not significantly different (LSD(0.10)).

Seed and Foliar Pesticides

Rationale

The observation of soybean rust in the continental U.S. in recent years has spurred the use of foliar applied fungicides. 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. Soybean seed treatment fungicides have been fairly common over the past decade, however with the advent of the neonicotinoid insecticidal seed treatments used in conjunction with Bt-Rootworm corn, there has been interest in also using these compounds on soybean.

Zero till has recently been reported to be used on the majority of Illinois soybean acres, a system often thought to be more responsive to managing fungal disease with pesticides than chisel or plow tillage systems. Additionally, in recent years many soybean producers have noted relatively stagnant soybean yields when compared to corn. Because of the potential for increased pest injury, and the perception of relatively low yields, soybean producers and agronomists have been increasingly interested in both fungal and insect pest protection. Two common means of supplying fungicidal and insecticidal compounds are through seed treatments, and foliar applications. Our objective was to determine the impact of seed and foliar applied fungicides and insecticides on soybean seed yield.

Methods

The experiment was composed of 12 treatments arranged as a split-plot with four replications. Main plots were four levels of foliar pesticides that consisted of; no pesticide, fungicide, insecticide, and fungicide + insecticide. Sub-plots

(plots within main-plots) consisted of three levels of seed applied pesticides, they were; no pesticide, fungicide, and fungicide + insecticide. The fungicidal seed treatment consisted of using the product ApronMaxx, which includes the fungicidal compounds fludioxonil, and mefenoxam. The fungicidal and insecticidal seed treatment product was Cruiser Maxx, which includes the aforementioned (ApronMaxx), and the neonicotinoid Cruiser, an insecticide (Thiomethoxam).

The foliar fungicide was Warrior applied at 2 oz per acre, while the foliar insecticide was Quadris applied at 7 oz per acre. The foliar fungicide + insecticide treatment combined Warrior and Quadris. Foliar treatments were applied in mid July at the R3 growth stage. The Asgrow soybean cultivar 3101 was seeded in 30-inch rows at 150,000 seeds per acre the first half of May.

Results

Yield affects of pesticide treatments applied to the soybean foliage were not influenced by pesticide treatments applied to the seed. When seed treatments were averaged over foliar treatments (Table 4), yield did not differ from the untreated control. Similar to the seed treatments, foliar pesticide treatments had little impact on yield (figure 19). There was a significant (α= 0.10) yield increase for fungicide+insecticide when compared to a fungicide treatment. When compared to the control treatment however, yield was not improved.

Over the three years of this study, there has not been any interaction of either main effect (foliar or seed treatment) with year, nor has year interacted with any of the 12 treatment combinations of foliar and seed pesticide. Despite widespread Anthracnose (*Colletotrichum truncatum*) in 2008, using a fungicide as either a seed treatment or a foliar application, or a combination of both, had no impact on yield.

Seed and Foliar Pesticides

Table 4. Influence of seed treatments on soybean yield over three years (2006-2008).

Seed Treatment	Seed Yield
	bushels/acre
None	56.1
Fungicide	56.3
Fungicide+Insecticide	56.6
LSD (0.10)	N/S

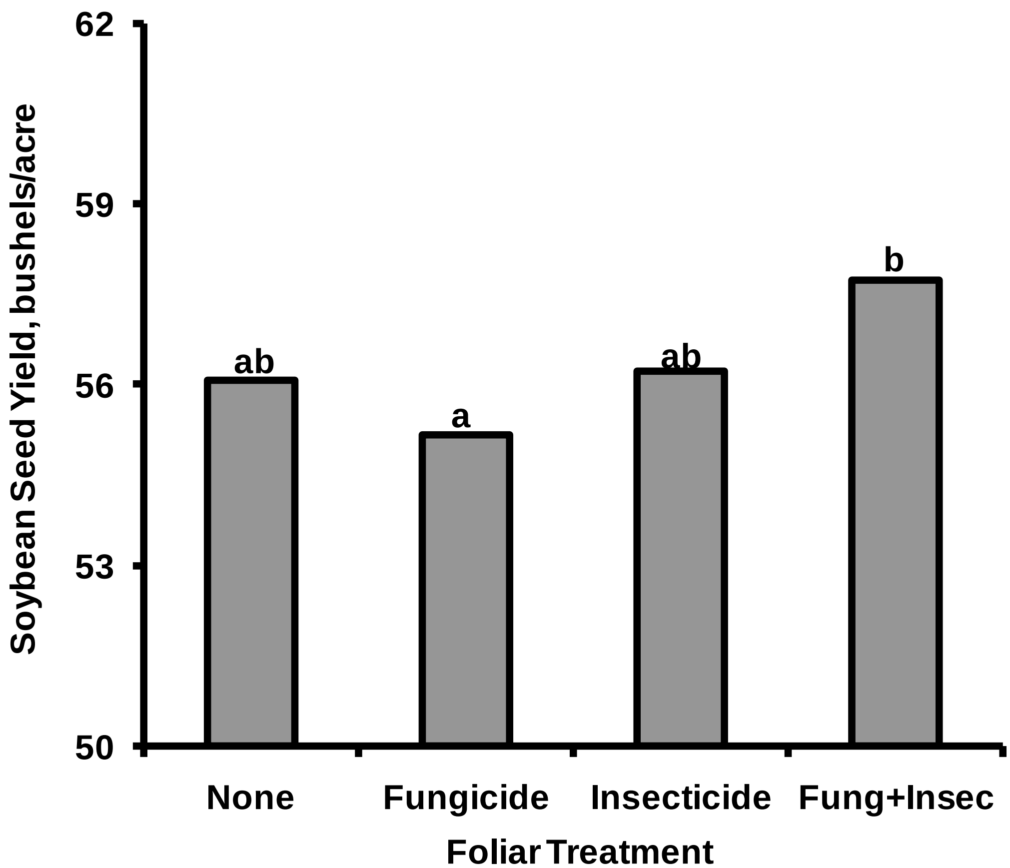


Figure19. Influence of foliar pesticide treatment on the seed yield of soybean grown at Joliet Junior College over three years (2006 - 2008). Treatments followed by the same letter are not significantly different (α= 0.10).

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 May 19th and seeded at 150,000 seeds per acre in 30-inch rows. Twenty-three cultivars were entered in this unreplicated varietal demonstration. The check variety (NK, S29J6) 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 PF3000 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 RoundupWM.

Soybean Varieties

Table 5. Demonstration of the grain moisture, yield, and relative yield of 23 soybean varieties grown at Joliet Junior College in 2008. The check variety is emboldened and was entered five times in the demonstration area. The variety with the highest relative and absolute yield is underlined.

Company	Nomen-clature	Grain Moisture	Grain Yield	Relative Yield†
		—%—	bu / acre	—%—
Pioneer	92M70	11.8	57.3	96.6
Crows	CRX291-7	11.7	59.3	100.0
Asgrow	AG3203	11.9	59.1	99.7
NK	**S29-J6**	**11.6**	**59.3**	**100.0**
Dairyland	3320-RR	11.7	57.7	97.3
NK	S30-J8	11.9	62.9	106.1
MWS	MWS3128CRR	12.0	58.5	98.7
<u>DeKalb</u>	<u>DKB27-52</u>	<u>11.9</u>	<u>64.8</u>	<u>109.8</u>
Asgrow	AG2921V	12.0	58.3	98.8
NK	**S29-J6**	**11.6**	**59.0**	**100.0**
Sun Praire	2765NRR	11.7	57.1	96.8
NK	S28-G1	11.7	60.0	101.7
Asgrow	AG2606	11.6	59.6	101.0
NK	H-2752RR	11.5	59.9	106.2
Sun Praire	2904NRR	11.6	56.4	100.0
NK	**S29-J6**	**11.4**	**56.4**	**100.0**
Asgrow	AG3006	11.4	58.7	104.1
Dairyland	3003RRSTS	11.6	51.6	91.5
NK	S32-E2	11.7	57.3	101.6
Asgrow	AG2802	11.5	57.1	99.8
Crows	CRX281-7	11.5	58.2	101.7
NK	**S29-J6**	**11.5**	**57.2**	**100.0**
Asgrow	AG2406	11.4	59.5	104.0
NK	S24-J1	11.5	49.4	86.4
Dairyland	2600RR	11.5	56.3	103.5
NK	**S29-J6**	**11.4**	**54.4**	**100.0**
MWS	MWS2667CRR	11.6	52.3	96.1
	Average	11.6	57.7	100.1

†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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