SOUTH CENTRAL AGRICULTURAL LABORATORY

Institute of Agriculture and Natural Resources

Field Day * Aug. 29, 2018

WE GRATEFULLY ACKNOWLEDGE SUPPORT PROVIDED BY:

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LANDMARK IMPLEMENT

NEBRASKA SOYBEAN CHECKOFF

Nebraska CornBoard

EASTERN NEBRASKA RESEARCH AND EXTENSION CENTER

FAIRFIELD COOP
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Clay County
Corn Growers

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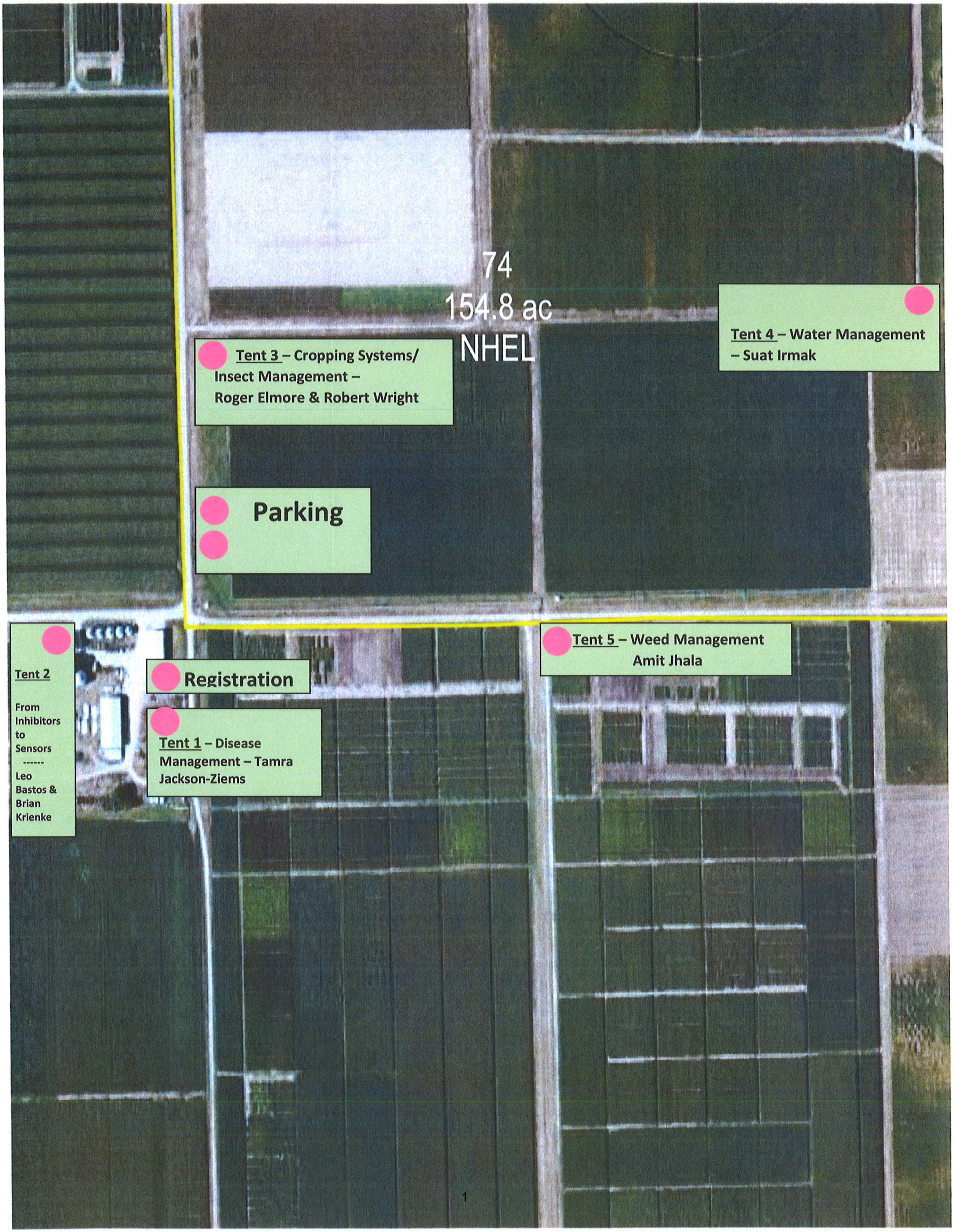


74
154.8 ac
NHEL
Tent 3 – Cropping Systems/ Insect Management – Roger Elmore & Robert Wright
Tent 4 – Water Management – Suat Irmak
Parking
Tent 2
From Inhibitors to Sensors

Leo Bastos & Brian Krienke
Registration
Tent 1 – Disease Management – Tamra Jackson-Ziems
Tent 5 – Weed Management Amit Jhala

Gleanings from Cropping Systems Work

@ South Central Agricultural Laboratory

A Partial Listing: 1981-2005; 2014-2018

Roger W. Elmore et al.[1]

Corn

<u>Greensnap:</u> High, straight-line winds prior to tassel destroy corn. Corn responses are hybrid, row direction, wind direction, and plant orientation specific. Management that normally increases corn growth and thus yield, also increases greensnap. National Crop Insurance Services uses our data to formulate loss tables (1999a, 1999b, current research)[2]

<u>Frost or Hail:</u> Damage occurring before V6 typically does not affect plant survival. However, if weather conditions after the event are not conducive for plant recovery, plants may die – contrary to conventional thinking. Plant recovery depends on the extent of damage. (1995, and current research)

<u>'Mystery' dry matter loss after physiological maturity:</u> We didn't measure any loss after three years of research with up to 7 hybrids and multiple harvest days per year. Kernel dry weights were stable. There is no mystery loss – but as a scientist, Elmore doesn't really believe there are mysteries in the physical realm. (1999)

<u>Skip row corn - rainfed:</u> We're too far east for this to be practical. (Lyon, 2009)

<u>Leaf orientation:</u> Strong early-season winds early affects leaf orientations – we don't know if this affects productivity. (2005)

<u>Early-Mid Season:</u> Earlier corn may produce as well as 'full-season' hybrids. (Bastidas, Proctor, current research)

<u>Tillage and furrow irrigation</u>: Conservation tillage systems in continuous corn results in greater yields than conventional tillage. (Cahoon, 1999)

Soybean

<u>Yield drag & lag with Glyphosate Resistant (GR) Varieties</u>: GR varieties yielded five percent less than their non-GR sister lines and 10% less than high yield, non GR varieties. (published 2001)

<u>Responses to glyphosate:</u> Glyphosate applied to glyphosate resistant (GR) soybeans did not affect growth, development, or yield. (published 2001)

<u>Determinate & Indeteminate Varieties:</u> In both high-yielding and low yielding environments, planting both types minimize risk. (1987). Unfortunately, few if any determinate varieties are available in Nebraska now.

<u>Limited irrigation systems:</u> With minimum capacity irrigation systems (1.5 inches/week), delaying irrigation until R3-R4 reduced yields in dry years in comparison with irrigating beginning at R2. (1988, 1989)

Variety response to tillage systems: Responses of all varieties were similar across tillage systems and seeding rates. (1987, 1991)

Fungicide, N, P and Irrigation and Pod and Stem Blight (PSB): PSB reduced soybean yields; N and P additions did not increase yields. (Slater, 1991)

Narrow and twin rows with furrow irrigation: These practices enhanced yields with determinate varieties in the absence of other yield-limiting factors. (Graterol, 1996).

Row spacing and seeding rate – Irrigated and Rainfed: Indeterminate variety yields in both environments were greater in 20 inch rows than in either 10 or 30 inch rows. (1998)

Inoculation: Inoculation offers limited success for either a yield increase or improved economic return on soils where soybean has previously been grown in the upper Midwest (De Bruin, 2010)

Cover Crops & Sustainable Agriculture

Rainfed wheat-corn systems: Cereal rye drilled into wheat stubble preceding corn reduced pre-tassel growth and development (in all three years) but did not affect grain yields in either of two years to date (Borgmeier, research in progress)

Rye predominates in mixes: (Koehler-Cole, Research in progress)

Yield impacts: Yields of subsequent corn and soybeans were not affected about half the time. (Koehler-Cole, Research in progress)

Soil health: There is some indication of improved microbial biomass, AMF, and saprophytic fungi after 4 years of cover crop. We've measured increases in increased soil aggregate size and soil particulate organic matter but not total soil organic matter with cover crops. (Koehler-Cole, Elizondo, Research in progress)

Sustainable agriculture: True sustainability will only occur if we put God and others above ourselves and see ourselves as faithful stewards of the world around us. (1996)

Other

Hybrid & Variety trials: Wheat, Corn, White Corn, Soybean, and Milo. (Drier, Nelson; 1982-04)

Soybean & Wheat Variety releases: (Baenziger, Williams; various years)

*** Many of the projects mentioned here were supported from grants by the *Soybean Checkoff Board*, the *Corn Checkoff Board*, and the *USDA*. Support from the *Heuermann's* supplements much of the current research. *National Crop Insurance Services*, UNL IANR Extension and Agricultural Research Divisions also supported this work. Published research papers supporting nearly all of this work is available upon request. Some more recent findings have yet to be published.

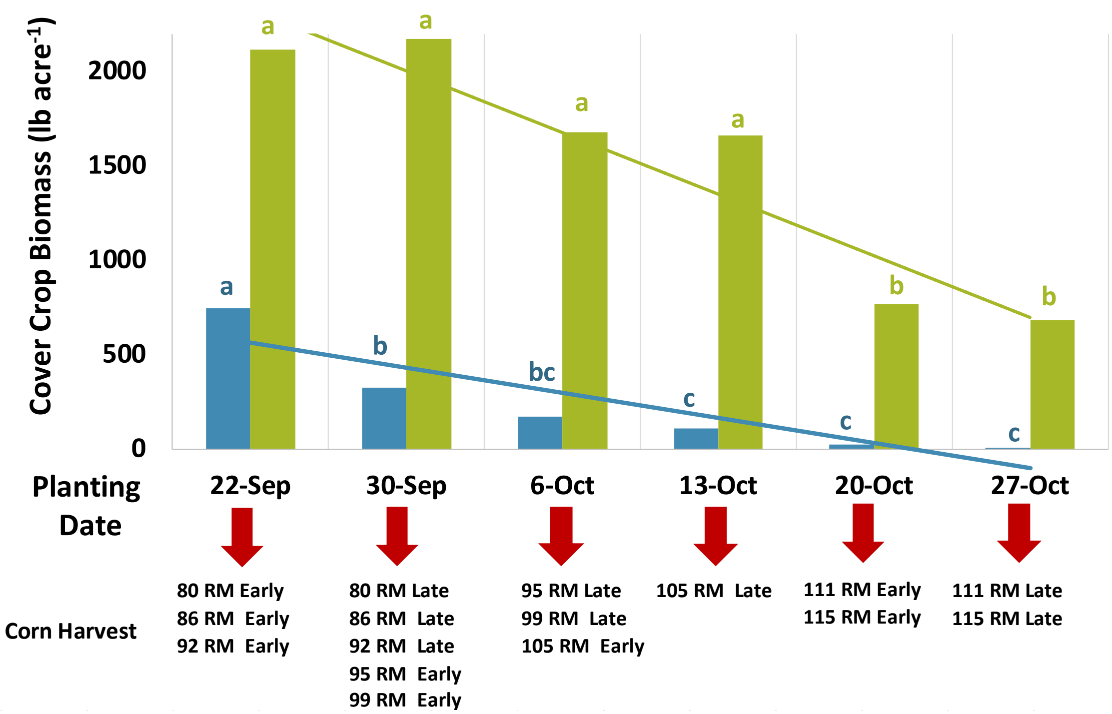
1) Colleagues and students too numerous to cite here have co-authored with Elmore over the years. Contact him for specific information about them and /or encouraging stories.

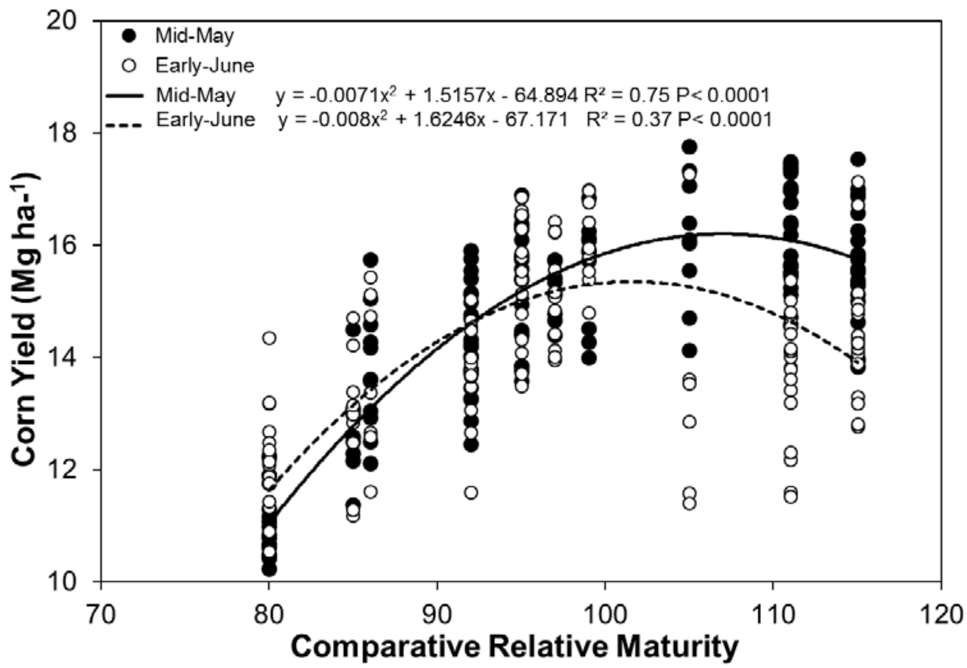
2) Names in brackets are the first author, otherwise, it was Elmore usually with multiple co-authors. The year in the brackets is the date of publication, not when the field work was done.

Cover Crops, Maturity Groups, and Weed Control

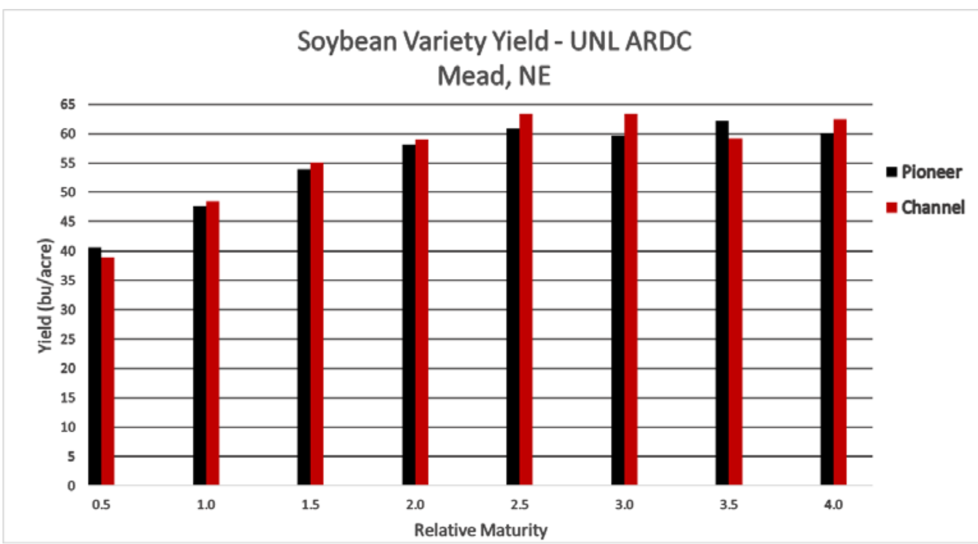
Chris Proctor, Ph.D., UNL Weed Management Extension Educator
Email: caproctor@unl.edu * Phone: 402.472.5411 * Twitter: @UNLWeedSc

The increased importance of sustainability in agronomic cropping systems has led to many innovative production practices. The use of cover crops in corn and soybean rotation has increased due to the potential benefits. However, there are also a number of challenges to incorporating cover crops into cropping systems, not the least of which is timely establishment following harvest. If cover crops can be planted early enough they have potential to be utilized for forage. Corn and soybean maturity groups are considered to have a relatively small region of adaption for maximum yield. As cropping systems adapt, the definition of an optimal system may need to broaden to include more than maximum yield as it criteria. Corn and soybean maturity groups may be grown outside their optimal region of adaption to achieve secondary objectives such as increasing the growing season in fall for cover crop establishment. One of the potential benefits from cover crops is increase weed control. Our research had noted that fall planted cover crops have resulted in reduced weed size, fewer weeds, a shift in the weed species present, and a delay in weed emergence when compared with no cover crop.

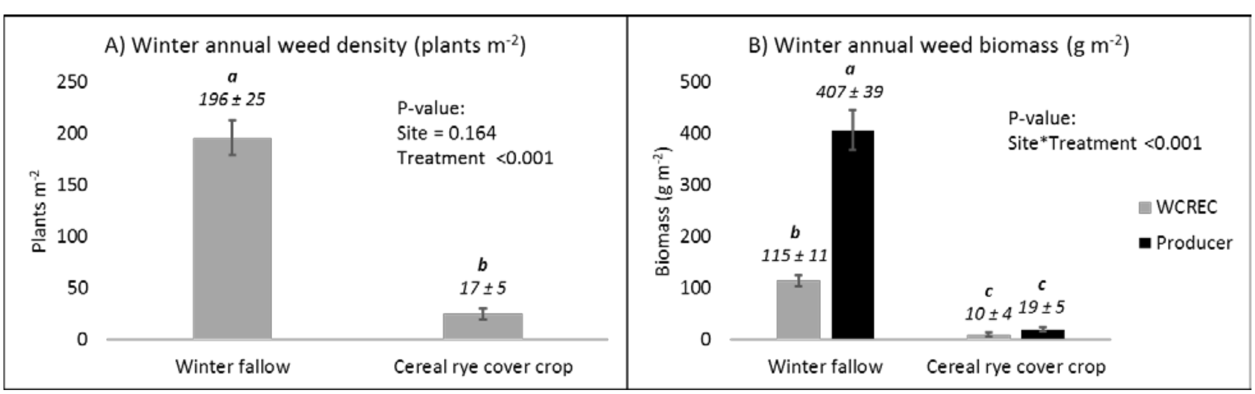




Mid-May
Early-June
Mid-May y = -0.0071x2 + 1.5157x - 64.894 R² = 0.75 P< 0.0001
Early-June y = -0.008x2 + 1.6246x - 67.171 R² = 0.37 P< 0.0001
Corn Yield (Mg ha-1)
Comparative Relative Maturity



Soybean Variety Yield - UNL ARDC
Mead, NE
Yield (bu/acre)
Relative Maturity
Pioneer
Channel



A) Winter annual weed density (plants m-2)
Plants m-2
a
196 ± 25
b
17 ± 5
P-value:
Site = 0.164
Treatment <0.001
Winter fallow
Cereal rye cover crop
B) Winter annual weed biomass (g m-2)
Biomass (g m-2)
a
407 ± 39
b
115 ± 11
c
10 ± 4
c
19 ± 5
P-value:
Site*Treatment <0.001
WCREC
Producer
Winter fallow
Cereal rye cover crop

SCAL Entomology Program

Robert Wright, Professor of Entomology and Extension Specialist, rwright2@unl.edu

Terry DeVries, Entomology Research Analyst, SCAL

Program accomplishments and impacts

Corn rootworm biology and management

Documented western corn rootworm adult and larval resistance to organophosphate, carbamate and pyrethroid insecticides.

Documented reduced efficacy of certain Bt corn hybrids to western corn rootworm.

Contributed to multistate research documenting the relative efficacy of Bt corn hybrids, granular, liquid and seed treatment insecticides against western corn rootworm larvae.

Evaluated insecticide and Bt corn hybrid control options annually under local conditions in support of Nebraska Extension education programs.

European corn borer

Historical light trap data from SCAL contributed to multistate study which documented that ECB abundance declined as Bt corn hybrid acreage increased across the US Corn Belt.

Western bean cutworm

Historical light trap data from SCAL and other Nebraska locations contributed to a more accurate degree-day model to predict WBC moth flight.

Studies at SCAL contributed to development of more accurate WBC economic thresholds.

Studies at SCAL have documented reduced efficacy against WBC of Bt corn hybrids expressing Cry1F protein.

Soybean insects

Documented degree-day requirements and sampling recommendations for Dectes soybean stem borer

Contributed to multi-state studies documenting pollinators and stink bugs in soybeans.

Nebraska Extension resources

Western Bean Cutworm Speed Scouting Spreadsheet, 2012. Extension Circular 1585

http://extensionpubs.unl.edu/publication/9000016368530/western-bean-cutworm-speed-scouting-spreadsheet/

Second Generation European Corn Borer Scouting Spreadsheet, 2012.

Extension Circular 1584, http://extensionpubs.unl.edu/publication/9000016368340/second-generation-european-corn-borer-scouting-spreadsheet/

First Generation European Corn Borer Scouting And Treatment Decisions, 1998.

NebGuide G1782, http://extensionpubs.unl.edu/publication/9000016365138/first-generation-european-corn-borer-scouting-and-treatment-decisions/

Second Generation European Corn Borer Scouting And Treatment Decisions, 1998.

NebGuide G1783, http://extensionpubs.unl.edu/publication/9000016365143/second-generation-european-corn-borer-scouting-and-treatment-decisions/

First Generation European Corn Borer Spreadsheet, Extension Circular 3018, 2018. http://extensionpubs.unl.edu/publication/9000018708636/first-generation-european-corn-borer-spreadsheet-ec3018

Western bean cutworm speed scouting app https://play.google.com/store/apps/details?id=edu.unl.wbcss&hl=en

https://itunes.apple.com/us/app/western-bean-cutworm-speed/id543341625?mt=8

Ear Development Issues in Corn

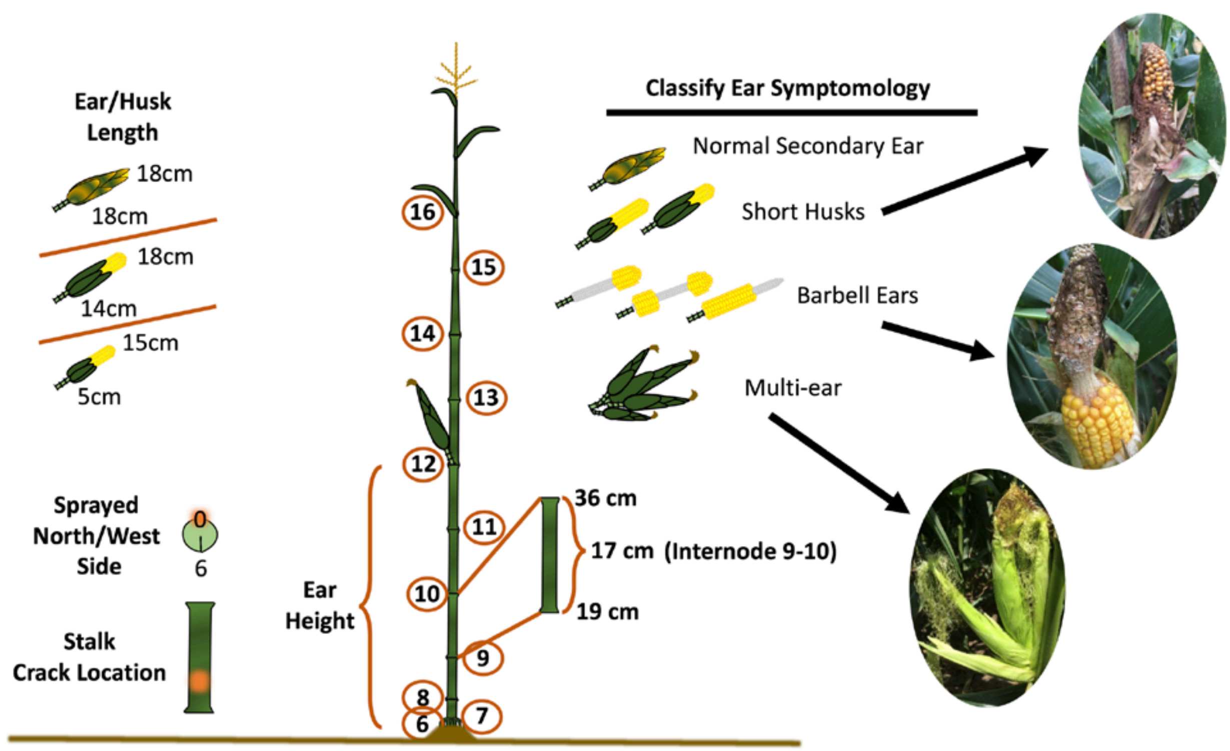
Osler Ortez, Roger Elmore, Justin McMechan, Tom Hoegemeyer,
Joe Keaschall, Tamra Jackson-Ziems and Jenny Rees

Shortly after pollination in July 2016, we observed and received reports of ear formation issues occurring in Nebraska corn fields. The symptoms - barbell, short husks, and multiple ears - were observed from Gothenburg, NE to Saunders County, NE with numerous reports in Clay and Thayer counties, Nebraska, and south to the Kansas border. Upon releasing an Extension newsletter article in http://cropwatch.unl.edu, additional reports were obtained from the Texas Panhandle to eastern Colorado and east through Nebraska, Iowa and Illinois. These symptoms were observed to a lesser extent in 2017. The widespread nature of this problem indicates a genetic (racehorse hybrids) X environment response. Hypotheses for these ear issues include primary ear abortion, ethylene production, and leaf sheath restriction.

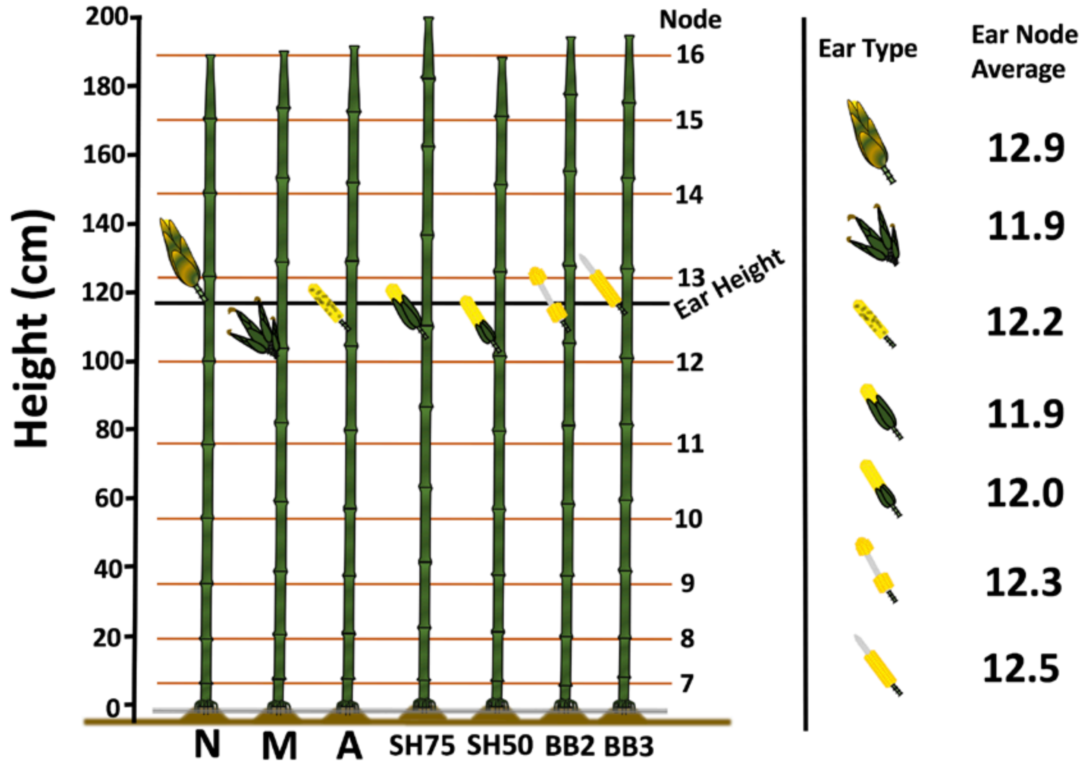
A field survey conducted during the 2016 and 2017 growing season implicated several factors that might be responsible for the extent and severity of ear issues.

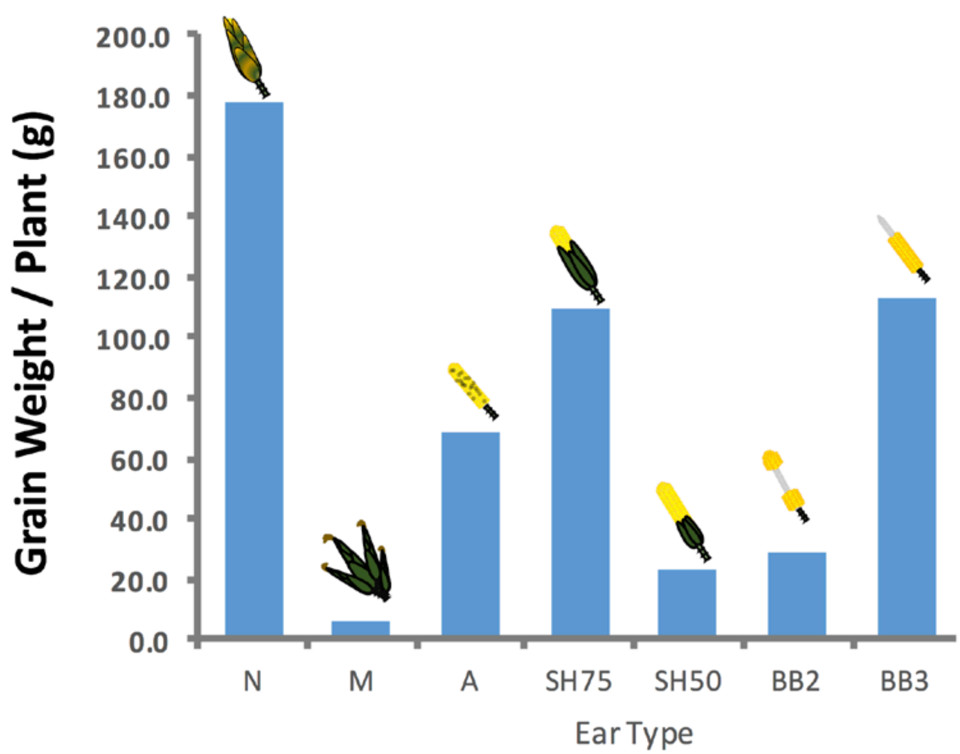
- Planting date, population, condition and spacing
- Environmental conditions during the season (temperature, wind, precipitation, and solar radiation)
- Management practices such as fertilizers, row direction, irrigation, tillage, and pesticide applications

Corn Ear Classification and Data Collection



Results from Field Survey



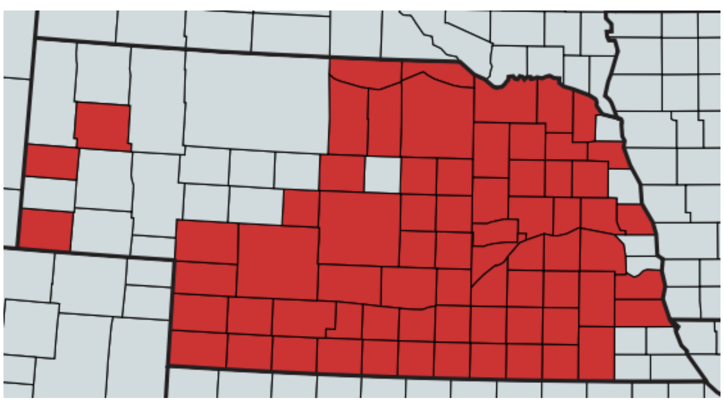


DISEASE MANAGEMENT

<u>BACTERIAL LEAF STREAK OF CORN</u> – *Terra Hartman, Graduate Research Assistant,*
Tamra Jackson-Ziems, Professor

Bacterial leaf streak (caused by *Xanthomonas vasicola* pv. *vasculorum*) was first reported in the United States on Nebraska corn in 2016. It has since been reported in eight other corn growing states, including Colorado, Iowa, Illinois, Kansas, Minnesota, Oklahoma, South Dakota, and Texas. This pathogen has been confirmed in 70 Nebraska counties, spanning from the panhandle to the extreme eastern portion of the state. Symptoms include tan to dark brown streaks between the leaf veins. These streaks will typically have wavy margins, can be short or long, and may be concentrated around the midrib. These symptoms typically occur in the lower canopy and move up the plant, however in some cases, especially after heavy rain or severe weather, symptoms have been observed beginning in the mid or upper canopy. Because the symptoms of this disease include streaks that tend to initially appear in the lower canopy and move up the plant, bacterial leaf streak is often confused with the fungal pathogen gray leaf spot, which looks and behaves in a similar way. One way to distinguish between the two diseases is to look at the lesion margins. Wavy margins are characteristic of bacterial leaf streak, whereas lesions that are shapes like nearly perfect rectangles with smooth margins are characteristic of gray leaf spot. It is important to correctly identify the disease, as fungicides, which can be used to control gray leaf spot, cannot control a bacterial disease such as bacterial leaf streak.

Research at the University of Nebraska-Lincoln has shown that *X. vasicola* pv. *vasculorum*, the causal agent of bacterial leaf streak in corn, is also capable of infecting several other plants found in the United States. This includes oat, rice, orchardgrass, indiangrass, big bluestem, little bluestem, timothy, sand bluestem, green foxtail, bristly foxtail, yellow nutsedge, tall fescue, western wheatgrass, and downy brome. All plants were infected in a greenhouse setting, however when the same plants were tested in a natural field setting only bristly foxtail and big bluestem were infected by the pathogen, and at very low incidence. This indicates that while it is possible for *X. vasicola* pv. *vasculorum* to infect these hosts, it is not likely to happen in a natural setting.



August 2018 Confirmed distribution of bacterial leaf streak in Nebraska. Red color indicates that at least one sample received from that county tested positive for bacterial leaf streak in a *X. vasicola* pv. *vasculorum* specific PCR test.

SOYBEAN DISEASE UPDATE – *John Wilson, Nebraska Extension Educator, Burt County*

Frogeye Leaf Spot *(Cercospora sojina)* - https://go.unl.edu/frogeye

- Favored by warm moist weather
- Infection at any growth stage (usually after flowering) on newer leaves in upper canopy
- Lesions: small dark spot enlarging to ¼", tan center with reddish purple margins
- Can coalesce forming irregular patterns and areas on leaf
- Management: varieties vary in resistance; manage residue (rotation & tillage – if practical)
- Management: no good threshold, R3 strobilurin fungicide application - if warranted (possible resistance?)

Phytophthora Root & Stem Rot *(Phytophthora sojae)* - https://go.unl.edu/phytophthora

- Genetically diverse, many races, makes management very difficult
- Favored by high soil moisture (water mold) and soil temperatures above 60^{O}F
- Most common in poorly drained soils, compacted soils, soils with high clay content
- Early: seed rots, pre & post emergence damping off; Later: any vegetative/reproductive stage
- Management: genetic resistance (Rps genes); field tolerance/partial resistance (not genetic); improve drainage
- Seed treatments (mefenoxam, metalaxy, ethaboxam) recommended in fields with history of phytophthora

Soybean Cyst Nematodes *(Heterodera glycines)* - https://go.unl.edu/soybeancystnematode

- Greatest yield loss for soybean growers in Nebraska ($45 million) and across U.S. ($2 billion)
- Microscopic roundworm attacks roots, only visible life stage is cyst (smaller than pinhead)
- Reduces yields up to 30% - no visible signs on plant, often first sign is unexplained low yields
- Anything that moves soil can spread SCN (flooding, runoff, tillage, equipment, wildlife, etc.)
- Management: Rotate with non-host crops; plant resistant soybean varieties (know source of resistance)
- Sample fields about every 6 years to determine if infested or what egg counts are doing if field is infested

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DISEASE IDENTIFICATION – *Anthony Muhle and Lindsay Overmyer, Graduate Research Assistants*

Bacterial Leaf Streak (BLS)

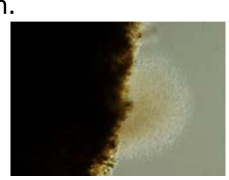
Xanthomonas vasicola pv. vasculorum

Symptoms:

- Interveinal leaf streaks
- Brown, tan, or yellow that vary in size
- Strikingly yellow when backlit
- Develops on lower leaves first

Signs:

- Bacterial streaming from freshly cut lesion.



Gray Leaf Spot (GLS)

Cercospora zeae-maydis

Symptoms:

- Interveinal leaf lesions
- Brown or tan
- Lesions coalesce to form rectangular gray/brown lesions with smooth margins
- Develops on lower leaves first

Signs:

- Fungal spores from mature lesion

Opportunities and Challenges for Weed Control in Soybean

Amit Jhala, Extension Weed Management Specialist

E mail: Amit.Jhala@unl.edu; Tel: 402-472-1534

Herbicide-resistant weeds have become one of the most pressing issues facing Nebraska growers and land managers. This problem has received wide-spread attention with the evolution of glyphosate-resistant weeds in glyphosate-resistant crops. However, this problem far predates glyphosate resistance. In fact, the commercialization of glyphosate-resistant crops in 1996 was initially seen as a solution to weed resistance to other herbicide families, such as the acetolactate synthese (ALS) inhibitors (Pursuit, Raptor, Classic) and photosystem- II inhibitors (Atrazine). However, over reliance on glyphosate for weed control in glyphosate-resistant corn and soybean for several years resulted in evolution of glyphosate-resistant weeds.

Herbicide-Resistant Weeds in Nebraska

Nine weed species of agronomic importance have evolved resistance to several group of herbicides in Nebraska. As of 2018, six weed species including common waterhemp, common ragweed, marestail, kochia, giant ragweed, and Palmer amaranth have been confirmed resistant to glyphosate in Nebraska. Control of herbicide-resistant weeds is one of the greatest challenges for crop producers not only in Nebraska but in several states. Preserving the efficacy of herbicides and herbicide-resistant crop technology depends on awareness of the increasing resistance of weeds to herbicides and coordinated action to address the problem by individuals at the farm level and beyond.

Multiple Herbicide-Resistant Soybean

- Multiple herbicide-resistant soybean such as dicamba/glyphosate-resistant soybean came to the market in 2017 growing season and has provided good control of glyphosate-resistant weeds; however, off-target injury issues of dicamba on sensitive soybean and several other annual and perennial plant species is challenging.
- Balance Bean/Liberty Link soybean will be available in 2019 growing season. Enlist soybean has been developed and will be available in the near future.

Weed Science Research/Extension Activities

- Weed Science Research and Extension Team at the UNL is actively involved with educating growers, crop consultants, and educators about herbicide-resistant weeds and their control.
- Herbicide-Resistance Weed Management Field Days have been organized at several locations across Nebraska in last few years for on-site demonstration of options for control of glyphosate-resistant common waterhemp, giant ragweed, and kochia.
- Resistance Management Workshops have been organized at four locations to educate growers in a small group, hands-on-setting to develop effective management strategy based on selection of herbicides with different site-of-action and using alternate options in an integrated weed management program.
- Several field based experiments have been conducted across Nebraska and the results are being disseminated during the Crop Production Clinics, Field Days, and through Crop Watch articles and in the Guide for Weed, Disease and Insect Management in Nebraska (EC 130).