PROGRESS REPORT

PROJECT TITLE: Enhancement of Survey Efforts for Corn Pests in Minnesota
PROJECT NUMBER: 4134-17SP
REPORTING PERIOD: 3rd quarter (October 1- Dec 30, 2018)
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1.) PROJECT ACTIVITIES COMPLETED DURING THE REPORTING PERIOD. (*Describe project progress specific to goals, objectives, and deliverables identified in the project workplan.*

Objective I. Improve and expand the current trapping networks for corn insect pests

a) Black light trap network operating (Hutchison)
Efforts continue for contract construction of additional black light traps.

b) Pheromone trap network (Hutchison/Potter)
No activity this quarter.

c) Corn rootworm sticky trap (Ostlie)
Sticky trap data from the summer of 2018 are being collected from industry collaborators and observations collated by the Ostlie lab.

Objective II: Develop a network of sentinel and on-farm survey plots for corn insect pests and corn diseases

a) Corn disease monitoring at U of M ROCs (Malvick/Potter)

i. Develop and use sentinel plots for determination of the annual prevalence of key corn pathogens and insects.
Incorporated observations into interpretation of yield results.

ii. Evaluate yield loss corn foliar fungal pathogen losses by comparing fungicide applications with untreated controls at multiple locations.
Initial 2-18 data analyses completed and initially presented at Nov-Dec Extension winter meetings.

b) On-farm corn insect and pathogen monitoring (Fall survey for European corn borer and corn pathogens)

i. Conduct a statewide fall survey for overwintering larval corn borer populations to estimate on annual geographic populations and project following year's risk
2018 data presented at Nov-Dec Extension winter meetings.

ii. Use larvae collected during the statewide fall survey to determine geographic differences in corn borer voltinism biotypes.

Larvae in diapause in the Hutchison lab.

iii. Conduct a statewide survey for corn foliar diseases to determine annual prevalence of key species.

Incidence of stalk rots during the fall corn borer survey. In SW and portions of SC and WC Minnesota, data on several additional corn diseases recorded.

2.) IDENTIFY ANY SIGNIFICANT FINDINGS AND RESULTS OF THE PROJECT TO DATE.

Some of the year to date activities were summarized in a display presentation for MN AG Expo (PDF file attachment included with this report).

I a) 2018 results previously reported

I b) 2018 results previously reported

I c) In process

II a)

i. At the southern research locations, the indicator varieties provided observations of disease at low incidence. Most diseases were at very low severity. Stalk rots at Lamberton and Waseca were the exception. For the most part, initial observations of disease signs or symptoms only observed after pollination. Eyespot was the most prevalent foliar fungal disease in southern locations. Bacterial leaf streak was unusually severe at the Waseca location where the study was located adjacent to sweet corn.

ii. 2019 fungicide study yields were analyzed (See Appendix A1-A4, and Attachment).

- *The Lamberton location showed a small yield response to fungicide application. No yield differences, but some moisture differences, were observed at the other study sites.*
- *Stalk rot incidence was initially lower in fungicide treated plots but these differences were reduced with delayed harvest. This may be related to maturity or other physiological differences resulting from fungicide applications. The potential for yield differences related to factors other than disease should be part of discussions with growers observing yield differences.*
- *Manuscript prepared for data at the Crookston location. This site followed a modified protocol and unique varieties. A three-year compilation of southern location data is planned for submission in 2020.*

II b)

i. Fall surveys for damage caused by European corn borer (Fig 6) and population density of overwintering larvae (Fig 7) were completed in early 3rd quarter. A MN Crop News article discussing these results was published in December.

ii. *In process*

iii. *Disease data collected during corn borer survey was analyzed and mapped.. Stalk rot observations, based on push tests, were recorded for most of the fields surveyed (Fig 10). Observations of several corn diseases: Stalk rot (physiological and fungal combined), northern corn leaf blight, eyespot and bacterial leaf streak are shown in Appendix B. Bacterial leaf steak appears to be most prevalent in SC MN as does Physoderma brown spot.*

3.) CHALLENGES ENCOUNTERED. (*Describe any challenges that you encountered related to project progress specific to goals, objectives, and deliverables identified in the project workplan.*)

Timing of disease assessments is problematic. Foliar diseases are best assessed while leaf tissue is still green and the window to assess maximum severity of foliar diseases is relatively short (approximately 2-3 weeks). Additionally, stalk rot severities increase as corn senesces and remains unharvested. Cooperators can be helpful in improving the timeliness of disease assessement.

4.) FINANCIAL INFORMATION (*Describe any budget challenges and provide specific reasons for deviations from the projected project spending.*)

In part due to a machine shop injury, the project has not yet obtained additional light traps. If a quote is not obtained by February, an alternative source will be used.

5.) EDUCATION AND OUTREACH ACTIVITES. *(Describe any conferences, workshops, field days, etc attended, number of contacts at each event, and/or publications developed to disseminate project results.)*

Presentations

November
Hutchison - Fall Corn borer survey data
Annual meeting of the Midwest Food Products Assoc.

Potter - Fall ECB Survey, Multi-site fungicide study information (estimated attendance)

Wyffels hybrid grower meeting	*50 Growers*
Renville County Corn and Soybean Grower meeting	*50 Growers, Ag prof*
Brown County Corn and Soybean Grower meeting	*50 Growers, Ag prof*
Nicollet County Corn and Soybean Grower meeting	*30 Growers, Ag prof*
McLeod County Crop input meeting	*80 Growers, Ag prof*

December
Potter - Fall ECB Survey, Multi-site fungicide study information

2018 UMN Extension Crop Pest Management Short Course *130 Ag professionals*
Crop Management Input Seminar (Hutchinson) *96 Growers, Ag prof*

January
Malvick - Multi-site fungicide study
2018 UMN Extension Ag Research Updates (5 locations) *300 Ag Professionals*

Extension publication

Corn borer populations
Potter, B., W. Hutchison, and K. Ostlie. Dec 18, 2018. Reducing Bt trait acres in the 2018 corn crop to cut production costs? Implications for European corn. https://blog-crop-news.extension.umn.edu/2018/12/reducing-bt-trait-acres-in-2019-mn-corn.html. MN Crop News article.

Appendix A1. 20i8 multi-site corn fungicide study

Table 1. Factorial analysis of variance

Source	COMBINED [a]	LAMBERTON	WASECA	ROSEMOUNT	MORRIS	CROOKSTON§
2017 YIELD @ 15.5% moisture and 56 lb./bu.						
Site	1.0000					
Hybrid	0.4189	0.5270	**0.0035** ****	0.5708	-	-
Fungicide	0.2433	0.3901	0.3514	0.5008	-	-
Hybrid x Fungicide	0.7797	0.6313	0.7895	0.9513	-	-
Site x Hybrid	0.4747					
Site x Fungicide	0.4539					
Site x Hybrid x Fungicide	0.8443					
2017 % MOISTURE						
Site	0.9790					
Hybrid	**0.0093** ****	0.5270	**0.0025** ****	0.7117	-	-
Fungicide	0.4133	0.3901	**0.0022** ****	0.0879 **	-	-
Hybrid x Fungicide	0.6904	0.6313	0.8761	0.1743 *	-	-
Site x Hybrid	**0.0037** ****					
Site x Fungicide	0.4204					
Site x Hybrid x Fungicide	0.8443					
2018 YIELD @ 15.5% moisture and 56 lb./bu.						
Site	0.8112					
Hybrid	0.8106	0.2792	**0.0031** ****	0.0827	0.6315	0.3845
Fungicide	0.4277	0.0592 **	0.3230	0.3228	0.9838	0.2200
Hybrid x Fungicide	0.5148	0.7425	0.5948	0.5062	0.2634	0.5707
Site x Hybrid	0.0193 ***					
Site x Fungicide	0.5646					
Site x Hybrid x Fungicide	0.6894					
2018 % MOISTURE						
Site	1.0000					
Hybrid	< 0.0001 ****	**<0.0001** ****	**0.0001** ****	0.0592 **	0.5662	**0.0143** ***
Fungicide	0.0283 ***	0.0655 **	0.2647	0.1787 *	0.5120	0.2588
Hybrid x Fungicide	0.7857	0.2614	0.6519	0.5075	0.5981	0.5482
Site x Hybrid	0.0005 ****					
Site x Fungicide	0.9641					
Site x Hybrid x Fungicide	0.6858					

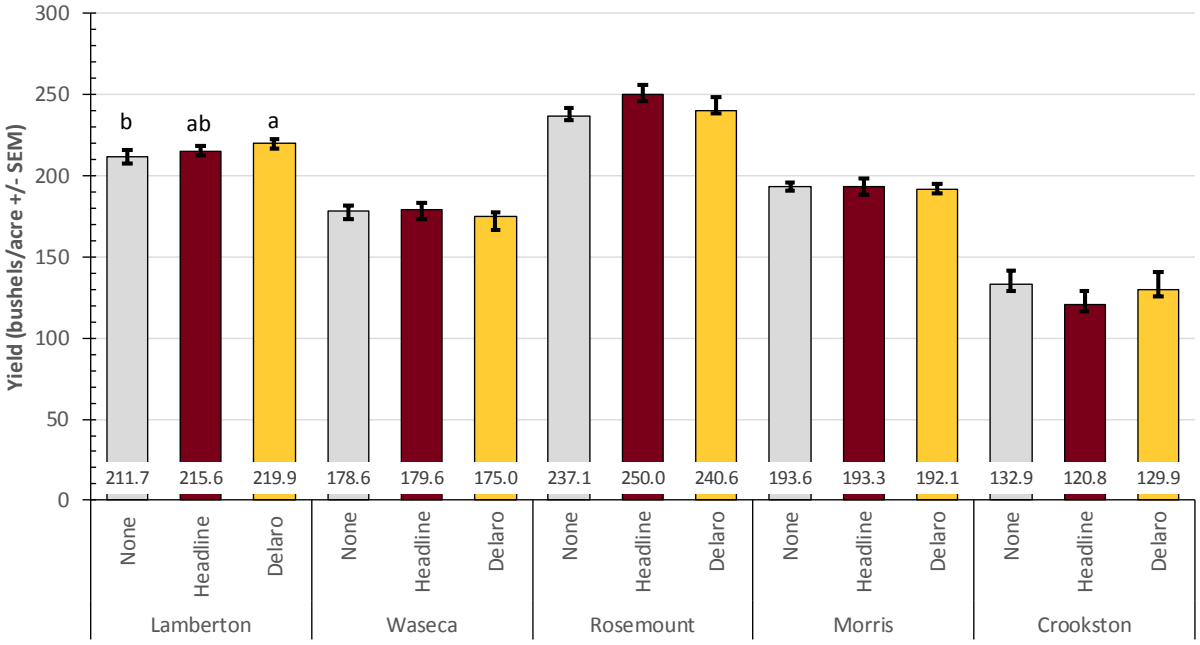
[a]Combined site Factorial analyisis of Variance (ANOVA) based on normalized yields (plot yield /site mean yield)

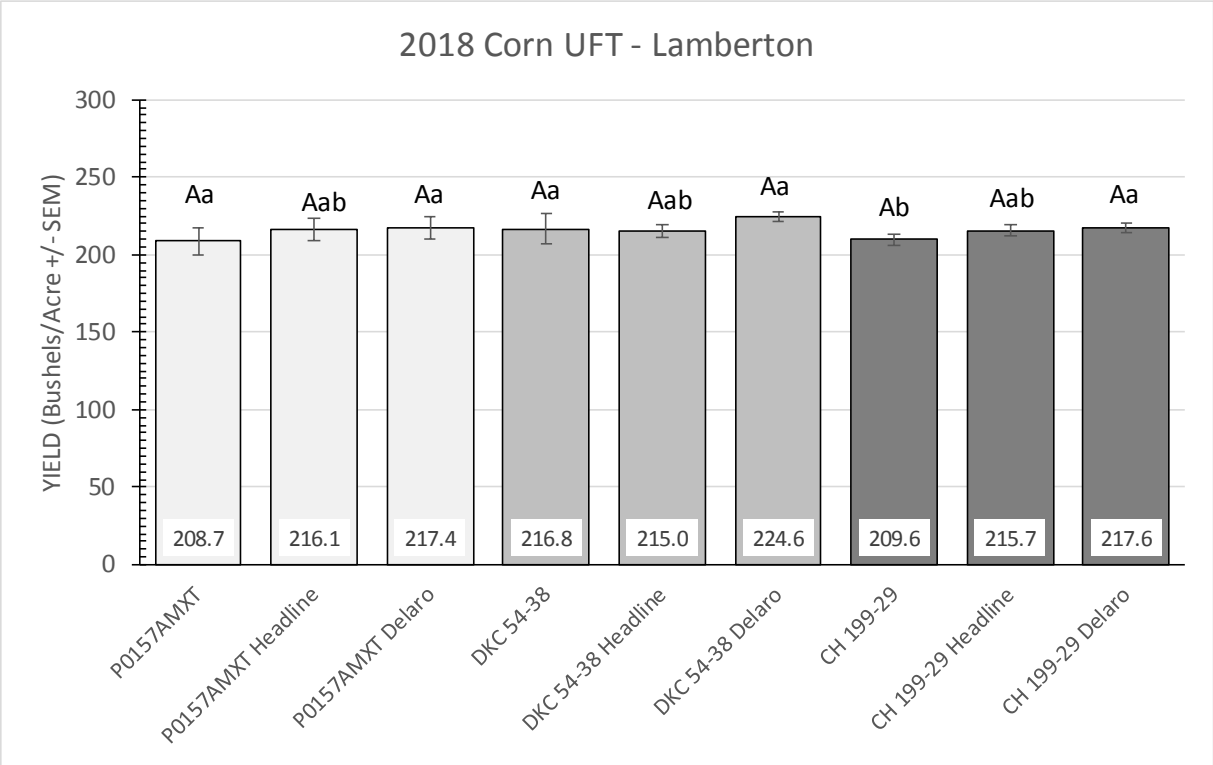
§The 2018 Crookston site was not included in combined site FANOVA due to unique hybrids and row spacing

Significant at alpha: * 0.20, ** 0.10, ***0.05 ,****0.01

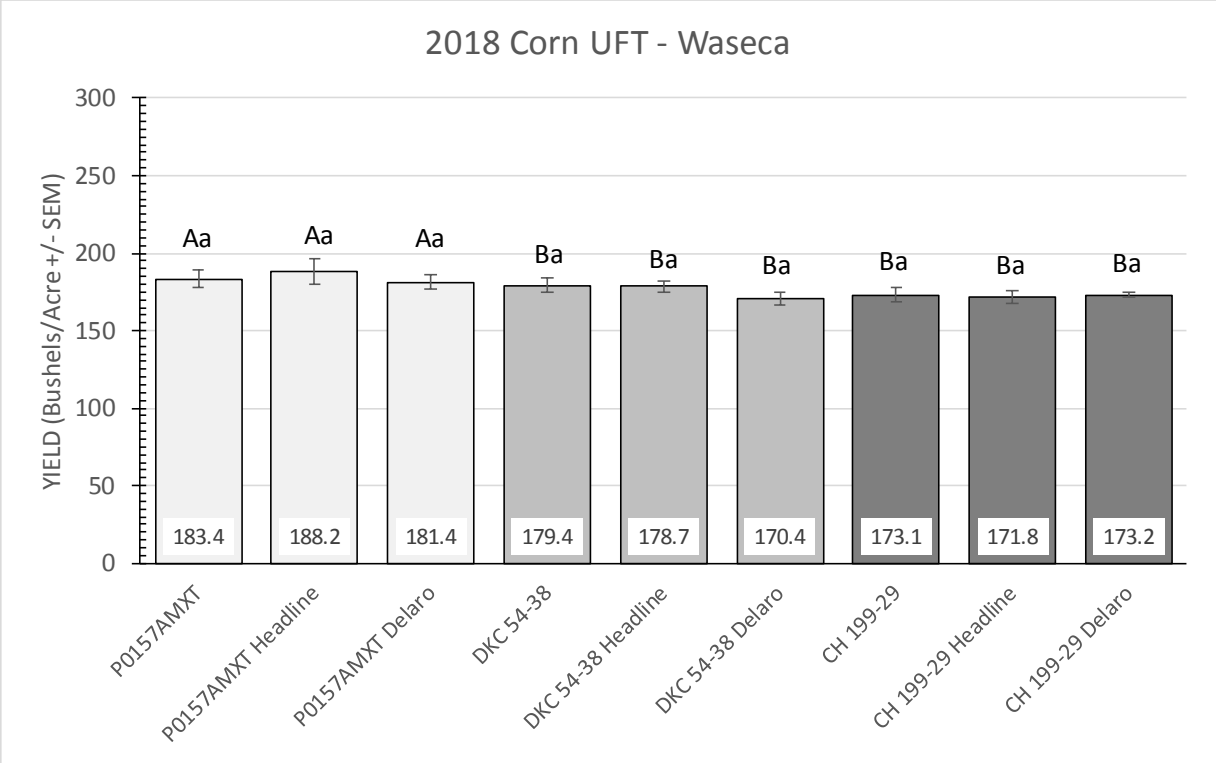
Appendix A2. Fungicide effect on corn yield (2018)

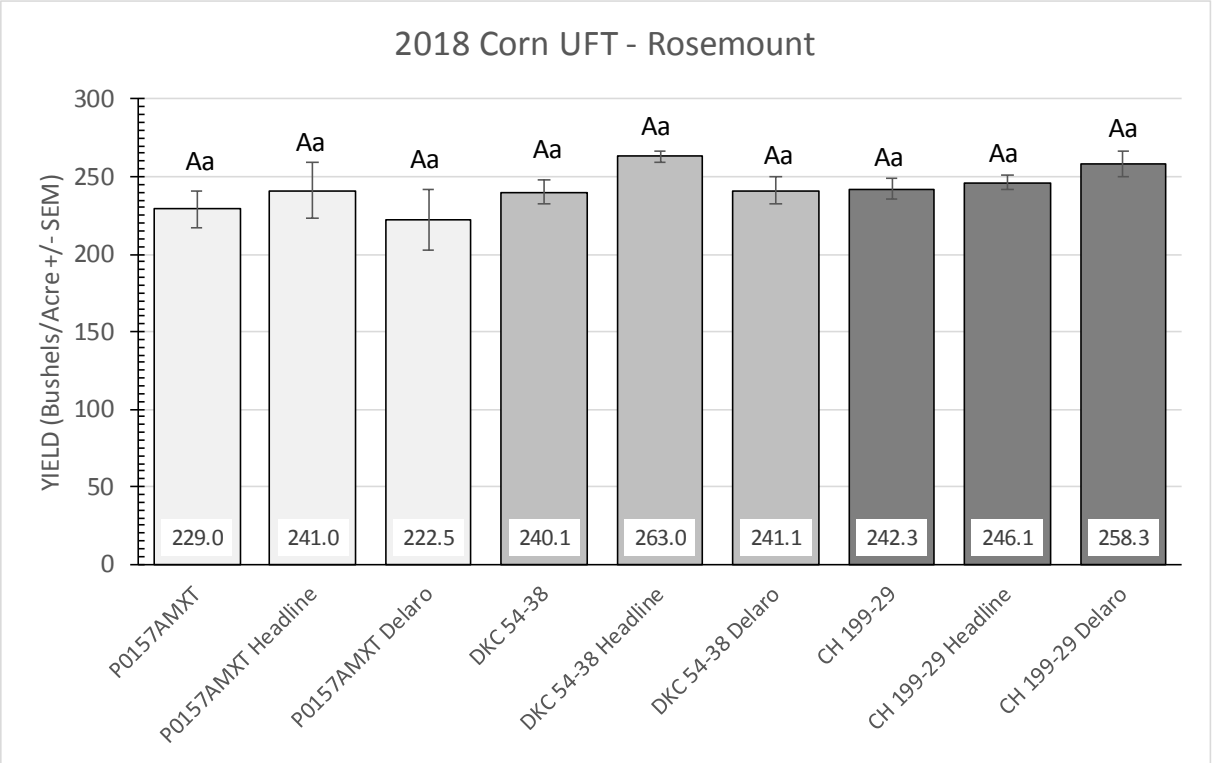
Figure 5. Corn Fungicide Impacts on Yield 2018



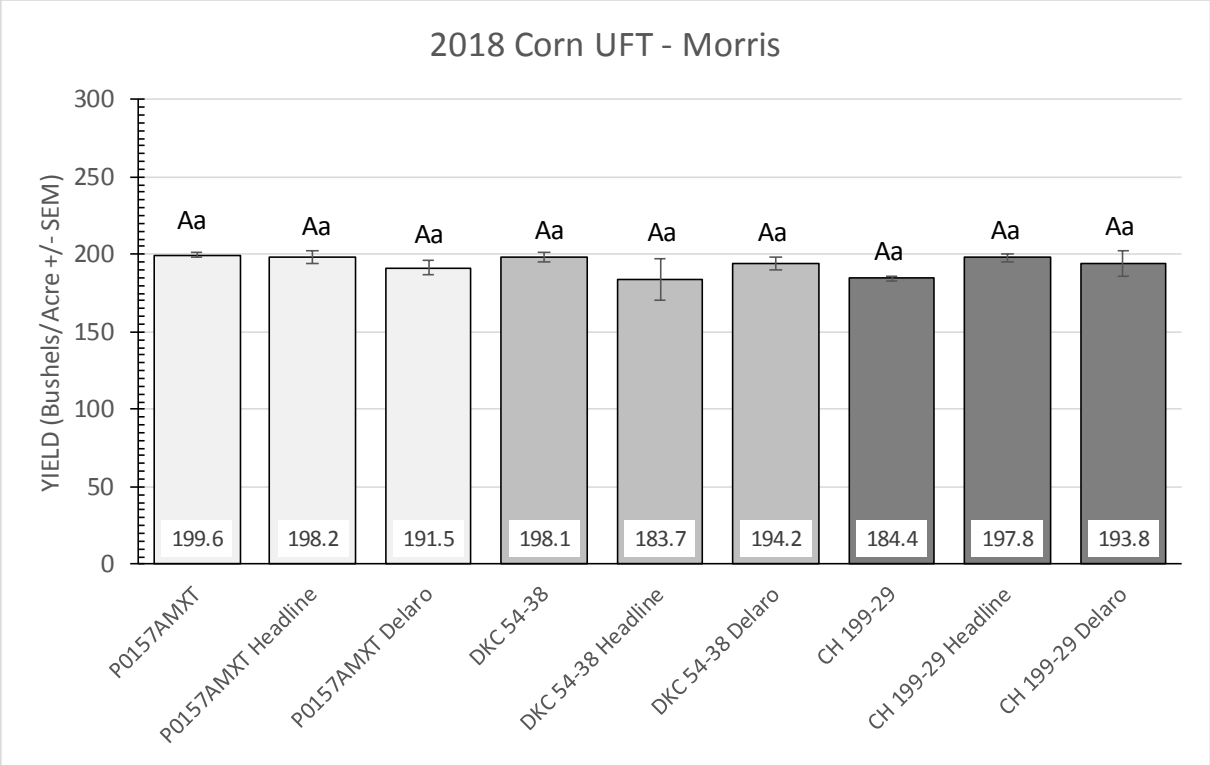


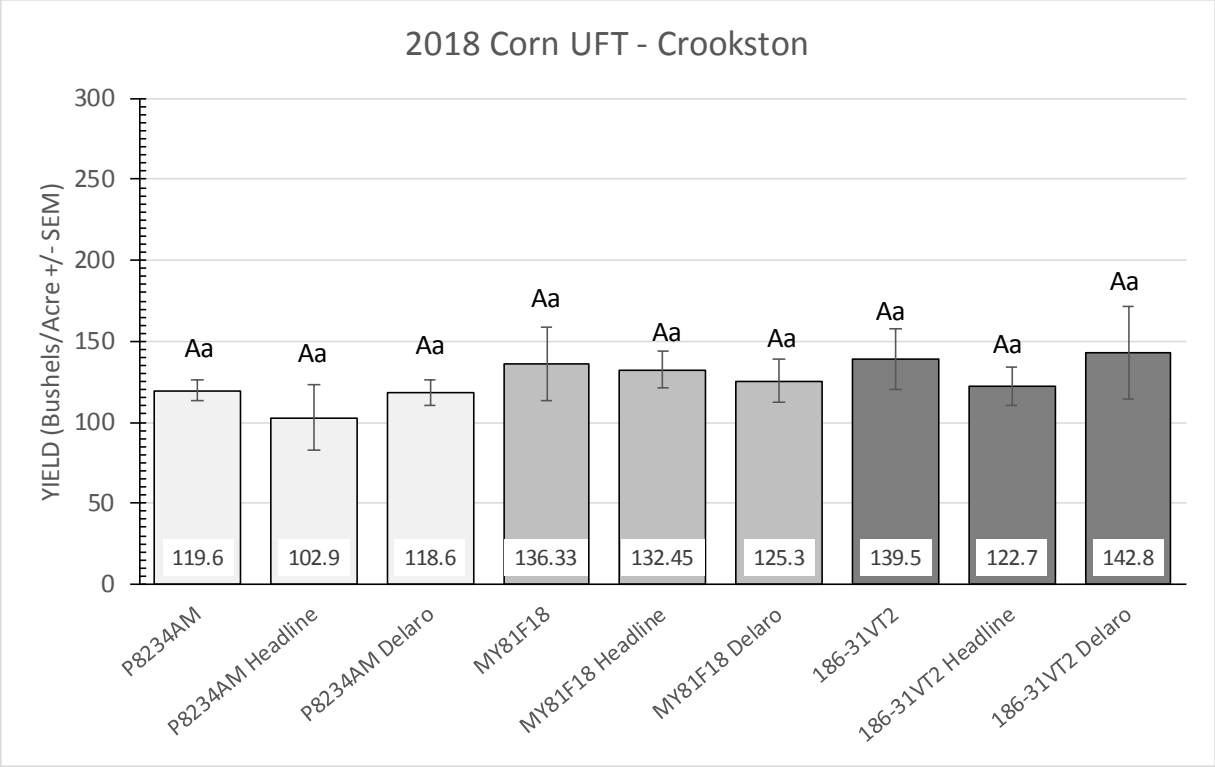
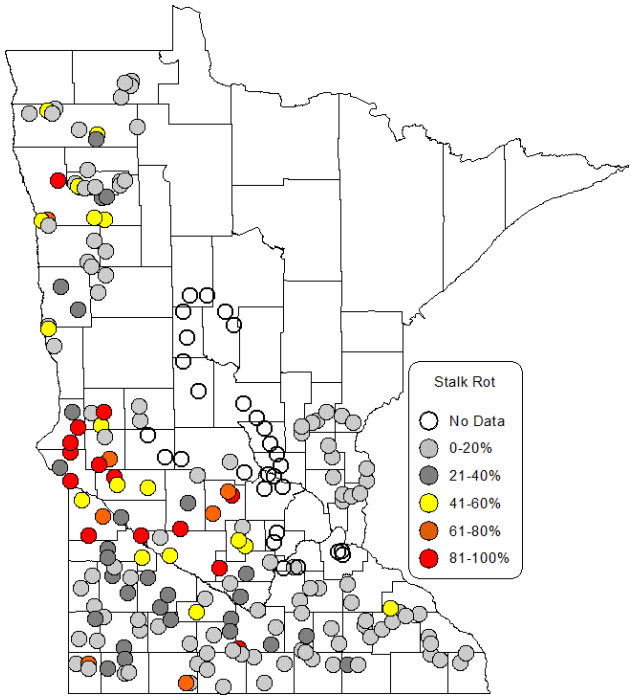
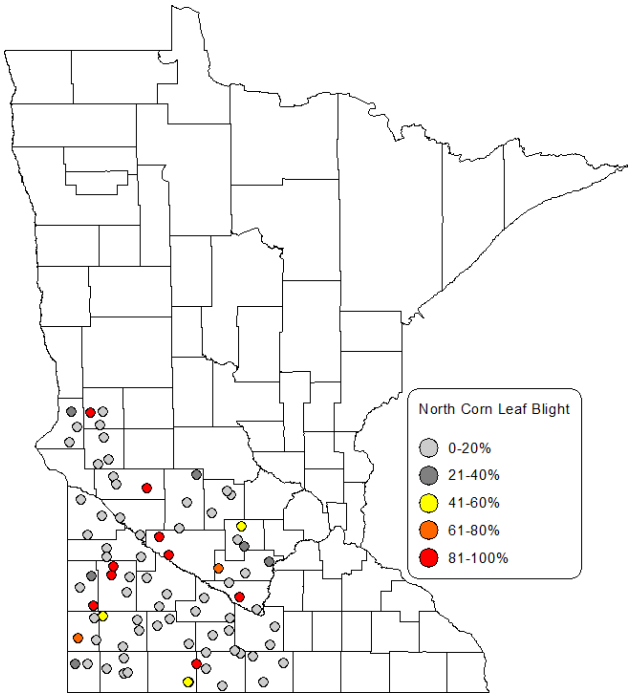
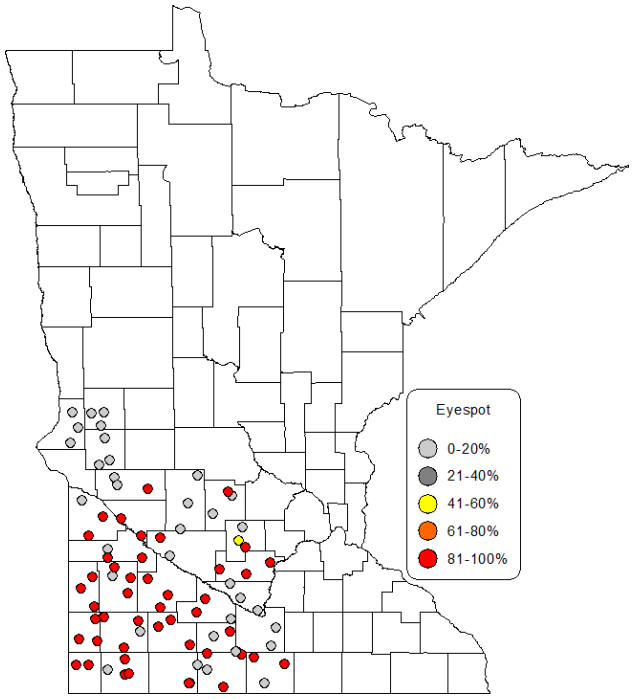
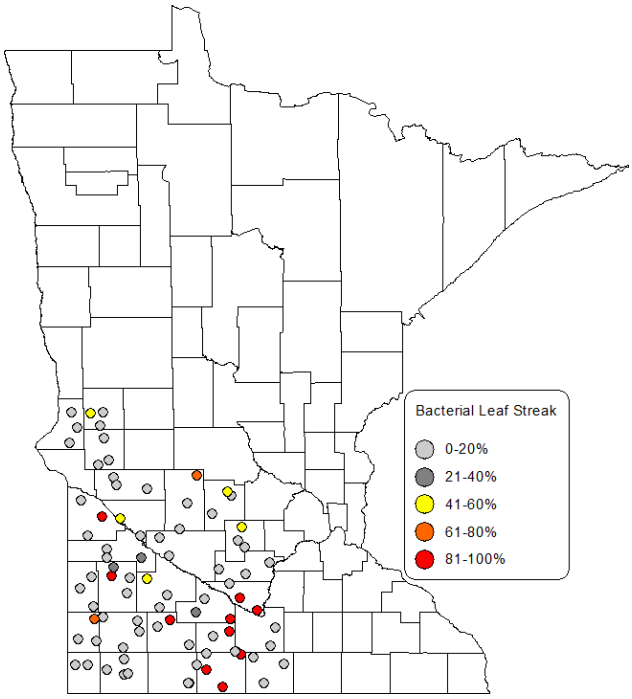
Appendix A3. Fungicide effect on corn yield (2018)





Appendix A4. Fungicide effect on corn yield (2018)





Appendix B. Corn disease observations during the 2018 fall European corn borer survey.