



MinnesotaCorn

RESEARCH & PROMOTION COUNCIL

PROGRESS REPORT

PROJECT TITLE: Enhancement of Survey Efforts for Corn Pests in Minnesota
PROJECT NUMBER: 4134-17SP
REPORTING PERIOD: 2018-19 4th quarter (January 1- March 31, 2018)
PRINCIPAL INVESTIGATOR: Bruce Potter
ORGANIZATION: University of Minnesota
PHONE NUMBER: (507) 276-1184
EMAIL: bpotter@umn.edu

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)
2019 trapping season cooperators were solicited
Efforts continue for contract construction of additional black light traps to fill gaps in coverage.
In addition to previously reported extension newsletters and meetings, the 2018 data were included in Jan – March 2019 Extension presentations
- b) Pheromone trap network (Hutchison/Potter)
Black cutworm pheromone traps ordered and 2019 collaborators solicited. Additional locations for true armyworm pheromome traps identified.
- c) Corn rootworm sticky trap (Ostlie)
During February and March, Potter and Hutchison began to re-establish contacts with potential industry rootworm trapping cooperators for 2019 and collect industry data generated during 2017-18.

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.
2019 corn hybrids planned for sentinel varieties ordered were not all available for delivery and adjustments made.
 - ii. Evaluate yield loss from corn foliar fungal pathogen losses by comparing fungicide applications with untreated controls at multiple locations.
Initial 2018 data analyses was completed and presented at January – March Extension meetings.

Analyses of 2017-2018 yield by moisture correlations are in process. Moisture and harvestability differences may help explain reports of yield responses in the absence of severe foliar disease.

Analysis across site-years will be completed after 2019 yields are obtained

A MN Crop News article on the use of fungicides in corn, planned for publication June 2019, is in prep for a planned 1st quarter 2019 release.

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

Development of a prototype spreadsheet for collecting and collating crop pest information generated outside the University of Minnesota (e.g. growers and ag-professionals).

- 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 were presented at January and February Extension winter meetings.
- ii. Use larvae collected during the statewide fall survey to determine geographic differences in corn borer voltinism biotypes.
Environmental conditions for larvae in diapause set to break diapause in the Hutchison lab. Collection of data on the timing of pupation and adult eclosion are underway. Data on the proportion and type of parasitism will be collected.
- iii. Conduct a statewide survey for corn foliar diseases to determine annual prevalence of key species.
2017-18 survey results were included in preparation of a 2019 Annual APS meeting presentation.

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

I a) 2018 results previously reported

I b) 2018 results previously reported

I c) None to report at this time

II a)

i. 2018 data previously reported

ii. 2018 yield data was previously reported. For the five 2018 Minnesota rotated corn sites, only the Lamberton site showed a small yield benefit. When combined with 2017 data, the probability of yield response to early reproductive stage foliar fungicide applications appears to be relatively low. Some reported yield benefits might be a result of improved harvestability rather than physiological yield.

II b)

i. 2018 results were previously reported

- ii. *This project is ongoing in the Hutchison lab. ECB larvae collected the fall of 2018 survey were placed on general lepidopteran diet in individual 1oz cups and held in a Percival at 7C, with no light, for 112 days. On 2/27/19, the temperature was increased to 30C (accumulating 20 DDs per day) and 16:8 L:D to break diapause and encourage pupation. Humidity was maintained at 50-60%. Larvae were checked regularly during the week to assess date of pupation and adult eclosion. As of 4/10/19, 70/112 larvae have pupated with a range of 19-42 days (380-840 DDs). Of those pupae, 35/70 have emerged and emergence has been generally within 7 days. However, there have been issues with emergence, likely humidity related, and incomplete emergence has occurred or some pupae have made no progress towards eclosion in over 2 weeks and are likely dead. Of the 35 moths that have emerged 22/35 were male 13/35 were female. All of these moths would likely be considered univoltine based on Hoard and Weiss (1995) estimates of 50% pupation for biovoltine at ~218DD and for univoltine ~298DD.*

Of the remaining 42 larvae, there are still 34 larvae that appear to be alive but have not pupated, 7 that died, and 1 that was parasitized. The 3 larvae from SW MN (Rock, Nobles, Redwood Co.) have not pupated yet but appear to be alive. All other larvae are from northern MN counties with a latitude greater than 46.6.

- iii. *Abstract submitted for 2019 APS presentation: Bacterial leaf streak (BLS) is an invasive disease of corn caused by *Xanthomonas vasicola* (XV). This disease was first confirmed in the USA, including two counties in Minnesota, in 2016. The goal of this project is to understand the distribution and characteristics of this pathogen in Minnesota field corn and sweet corn production fields. Corn leaves with typical symptoms of BLS, i.e., brown to yellow narrow leaf lesions, were collected from multiple fields and counties across southern Minnesota. Leaf samples were tested for bacterial streaming and for the presence of XV directly with a specific PCR assay and via isolations on media. BLS and XV have been confirmed in eight counties, and BLS has been reported based on symptoms in at least 10 additional counties in southern and central Minnesota. Virulence of 3 isolates was tested on field corn and sweet corn in greenhouse experiments this winter with four inoculation methods. Isolates of XV differed significantly in virulence on field and sweet corn and the method of inoculation significantly influenced development of BLS.*

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

Disease susceptible sentinel plot hybrids continue to be an issue and changes within the seed industry have reduced access to these type of hybrids. Sentinel hybrids will be included during 2019. However, investigators will develop recommendations for alternatives for future studies.

The collection, interpretation and dissemination of data from corn rootworms has been less than anticipated or desired. The project has taken steps to

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

This project was extended to allow the completion of work begun in 2018.

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

During the 2018-19 period of this project, more than 1000 meeting attendees were exposed to these MN Corn Research and Promotion Council funded studies and initial results.

Presentations and publications made during 4th quarter 2018-19 are:

Extension presentations including these data January –March 2019

Malvick - Multi-site fungicide study

(6 locations)

340 Ag Professionals

Potter – Fall ECB survey, Multi-site fungicide

(3 locations for SW, WC, S ROC research update)

133 Farmers and Ag Professionals.

2019 Ag Expo Display presentation

Unknown number of attendees

Reviewed Publications

Peltier, A.J., Potter, B.D. and Malvick, D.M. 2019. Effects of foliar fungicides and hybrids on yield and lodging of corn in Crookston, Minnesota in 2018. Plant Dis. Mgmt. Rep. 13:CF032.

Extension publications

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.