



Great Lakes Fruit, Vegetable & Farm Market EXPO Michigan Greenhouse Growers EXPO

December 10-12, 2019

DeVos Place Convention Center, Grand Rapids, MI



Asparagus

Moderator: Ben Werling, Michigan State University Extension

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|----------|--|
| 9:00 am | Managing for Postharvest Quality in Asparagus <ul style="list-style-type: none">• Trevor Suslow, Produce Marketing Association |
| 9:30 am | Asparagus Pathology Update (OH 2B, 0.5 hrs) <ul style="list-style-type: none">• Mary Hausbeck, Michigan State University |
| 10:00 am | Asparagus Nitrogen Management Update <ul style="list-style-type: none">• Zack Hayden, Michigan State University Horticulture Department |
| 10:30 am | Impact of Rye Cover Crops and Asparagus Varieties on Timing of Spear Emergence <ul style="list-style-type: none">• Dan Brainard, Michigan State University Horticulture Department |

Asparagus Pathology Research Update

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Michigan State University, Department of Plant, Soil & Microbial Sciences

Asparagus is a perennial crop that should be in production for many years with proper horticultural and pest management. Michigan is ranked first nationally in asparagus production. Growers produced 13,513 tons of spears valued at \$23.3 million on 9,500 acres in 2018; these totals are similar to previous years. Asparagus-producing counties in Michigan include Mason and Oceana in the northwest and Berrien, Cass and Van Buren in the southwest. The goal of our 2018 and 2019 field research was to survey asparagus fields for a destructive soilborne pathogen and to determine its ability to cause disease in asparagus.

Fusarium crown and root rot (FCRR). *Fusarium* spp. cause stem, crown, and root rot and are a continual problem in perennial systems such as asparagus. These pathogens may infect asparagus seedlings in the nursery as well as crowns after establishment in production fields. Particularly in perennial systems, such as asparagus, FCRR may go unnoticed initially until disease symptoms become more severe. Adverse environmental conditions, causing drought and heat stress to the plant, may also weaken the plant, allowing it to become more susceptible to pathogen infection. Control of FCRR is challenging as *Fusarium* may persist in the soil for many years and cultural and chemical control options are limited. Treating crowns with fungicides before planting and fumigating crown nurseries and production fields have been used in recent years to improve crown health and enhance the longevity and productivity of asparagus plantings. Identifying the *Fusarium* species associated with FCRR in 1-year-old nursery crowns will aid in developing tests for detection as well as effective management strategies for this disease and has been the focus of our recent research.

Survey of *Fusarium* species in Michigan asparagus fields. In 2018, 1-year-old asparagus crowns were sampled from three different growers in Berrien and Oceana counties in the state of Michigan including: 100 crowns of 'Jersey Supreme' (Berrien), 127 crowns of 'Guelph Millennium' (Oceana 1), and 131 crowns of 'Guelph Millennium' and 133 crowns of 'Guelph Eclipse' (Oceana 2). All nursery fields were previously fumigated, with the exception of those from Oceana 1, which were not fumigated. These crowns were randomly sampled from bulk boxes which were to be planted in the production fields. In the lab, samples were taken from the asparagus roots and crown regardless of symptoms.

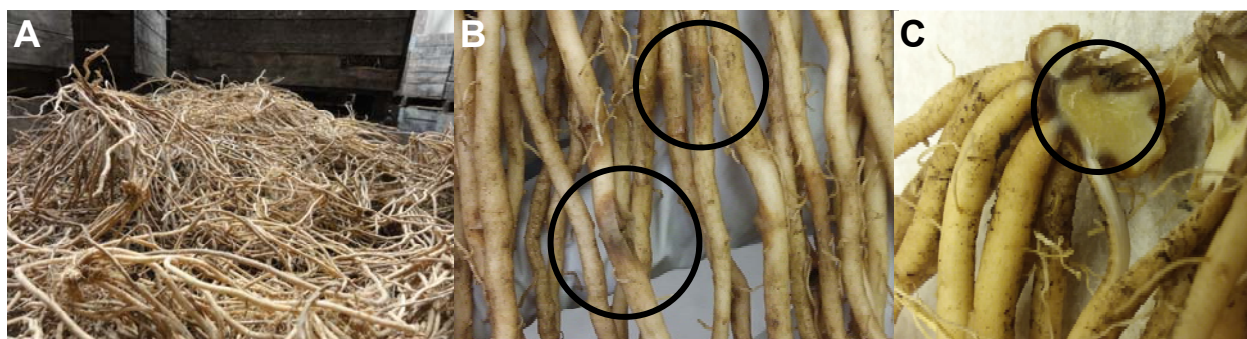


Figure 1. (A) One-year-old asparagus crowns sampled from bulk boxes awaiting transplanting, (B) reddish-brown lesions along the roots caused by FCRR, (C) dark discoloration along the crown margin and yellow discoloration of the interior tissue.

Isolates were grown on potato dextrose agar, DNA was extracted and sequenced to obtain species identification. Seven *Fusarium* spp. were recovered, including *F. oxysporum* (92%), *F. solani* (5%), *F. proliferatum* (2%), *F. acuminatum* (1%), *F. avenaceum* (less than 1%), *F. graminearum* (less than 1%), and *F. incarnatum-equiseti* (less than 1%). *F. oxysporum* was the most prevalent species found across

growers, cultivars, and tissue types (Figure 2). Our results indicate that neither cultivar nor fumigation appeared to have any effect on *Fusarium* spp. recovery.

Fifty-two *F. oxysporum* isolates collected from the survey were chosen and tested for pathogenicity using asparagus seedlings grown in test tubes. Four seedlings per isolate were used for this test and all plants were rated every 7 to 10 days following inoculation with *Fusarium*. At the conclusion of the experiment, average ratings per isolate as well as the Area Under the Disease Progress Curve, which describes development over the evaluation period, were calculated. Plants were removed from the test tubes and lesion severity viewed under a dissecting microscope. The pathogenicity experiment was replicated twice using the same isolates and testing conditions.

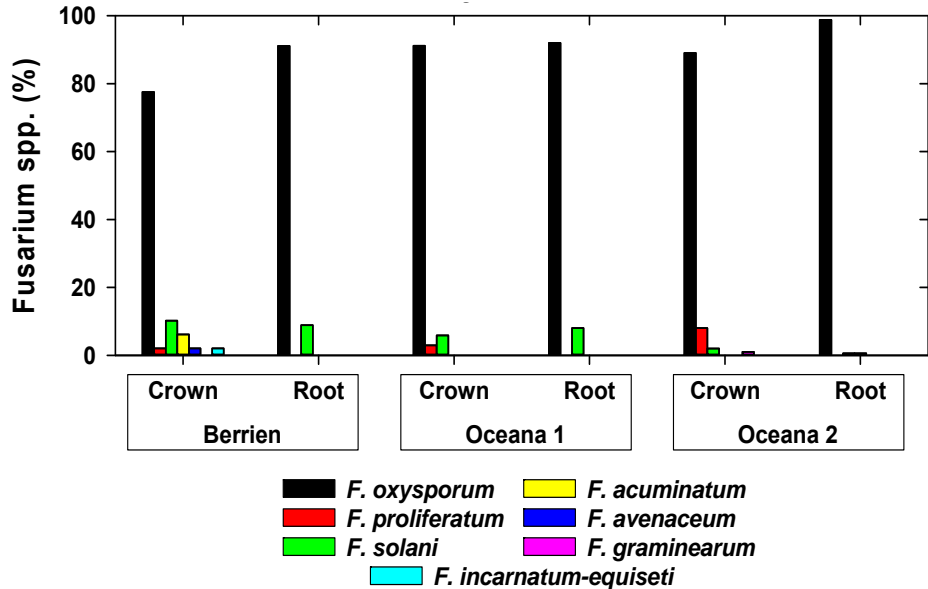


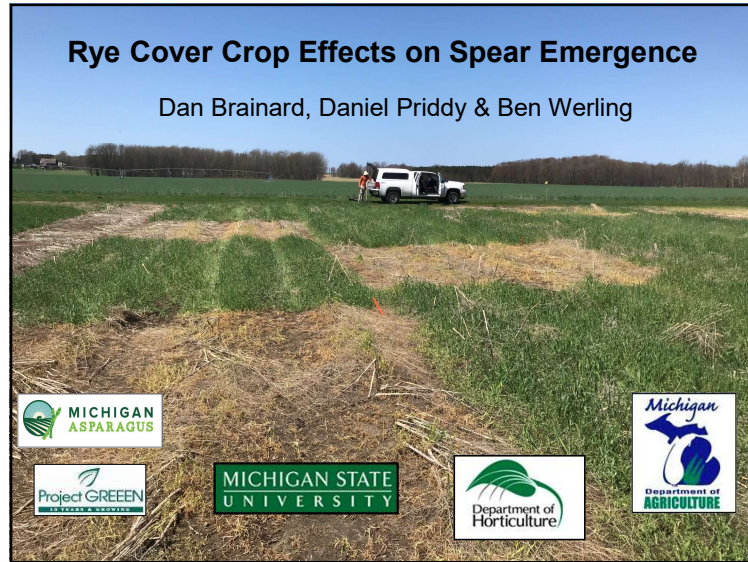
Figure 2. Number of isolates collected from each *Fusarium* spp. recovered by grower and plant tissue type (%).



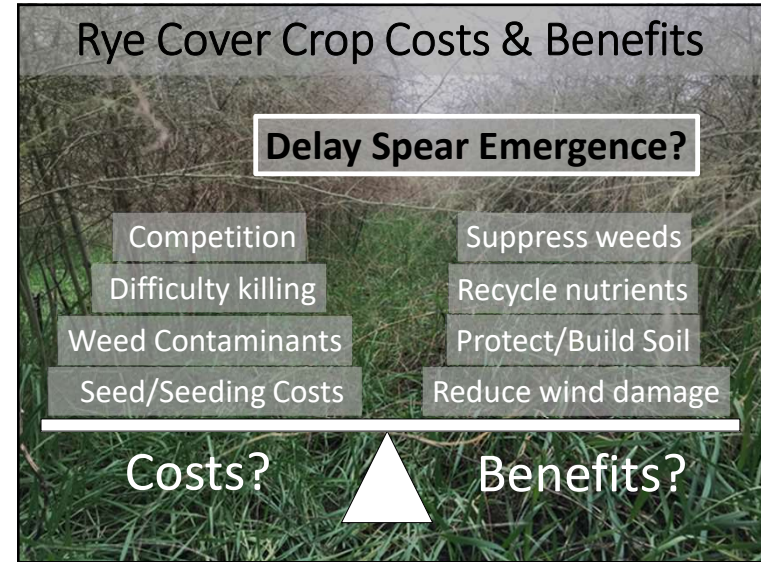
Figure 3. Red-brown lesions on asparagus seedlings caused by inoculation with *Fusarium* spp. recovered from one-year-old crowns during pathogenicity testing.

Results from the pathogenicity tests showed that, given the right conditions, all *F. oxysporum* isolates tested have the ability to cause disease regardless of cultivar or field (fumigated or non-fumigated) from which they were collected.

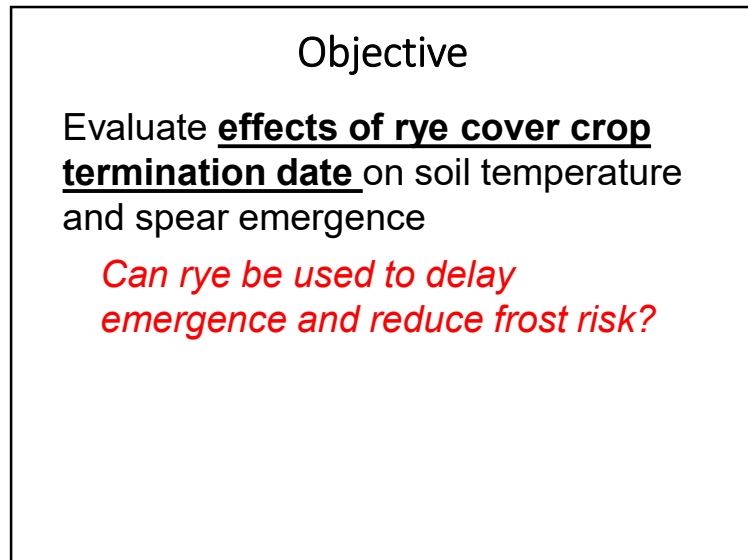
Acknowledgements. This research was supported by funding from the Michigan Asparagus Advisory Board and by a Michigan Specialty Crop Block Grant administered by the Michigan Asparagus Advisory Board.



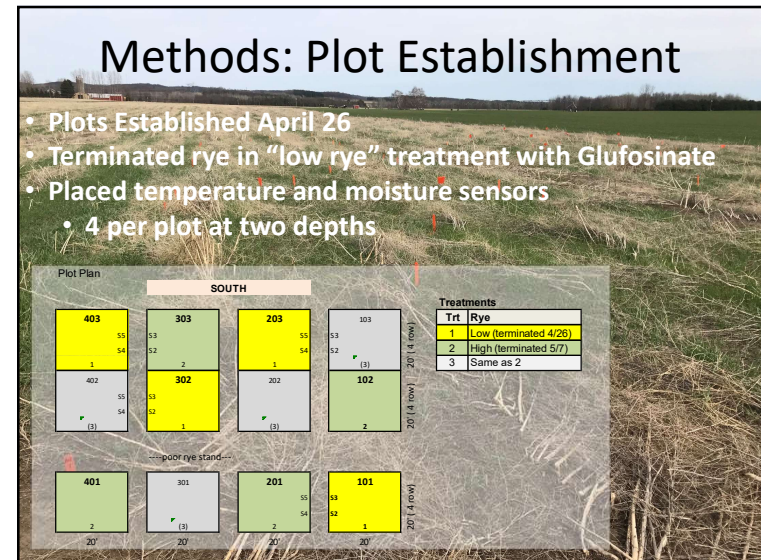
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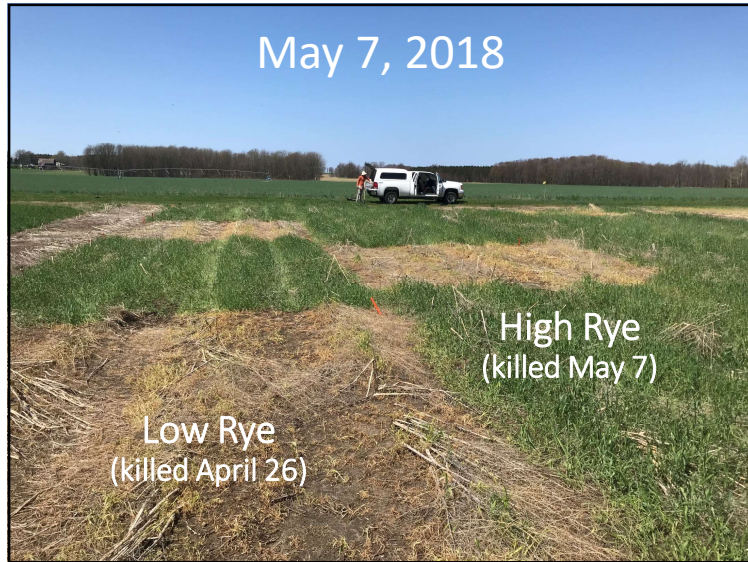
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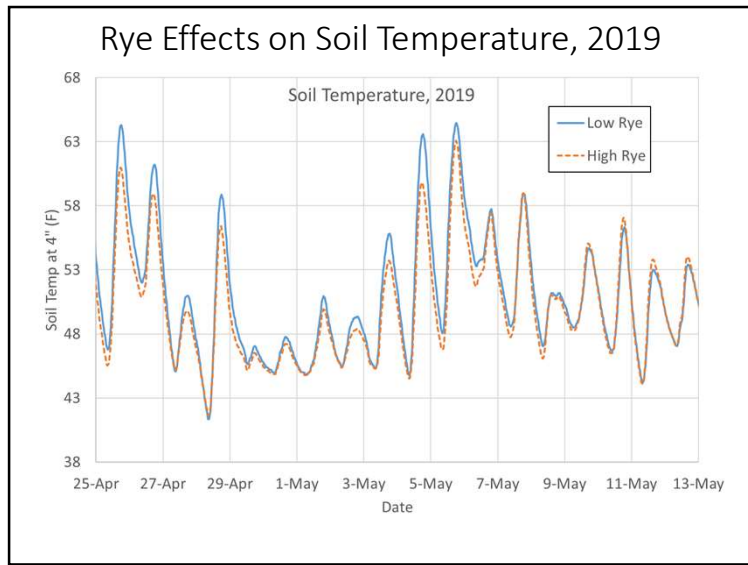
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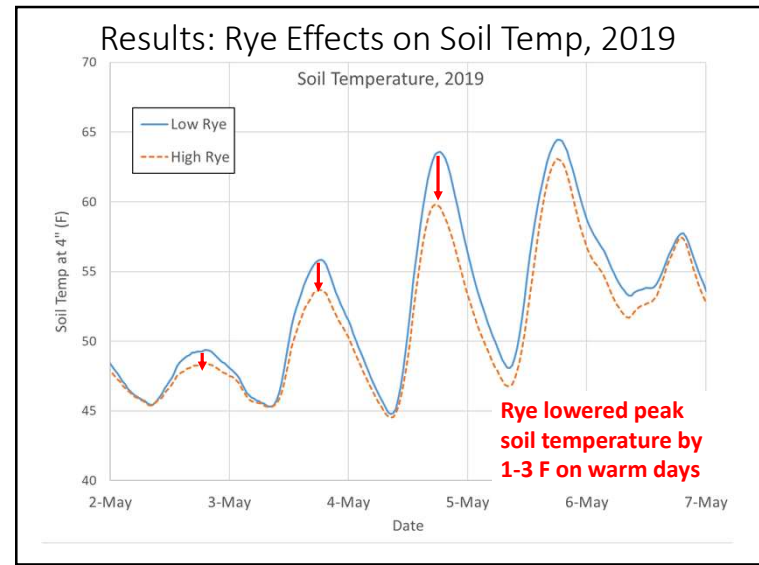
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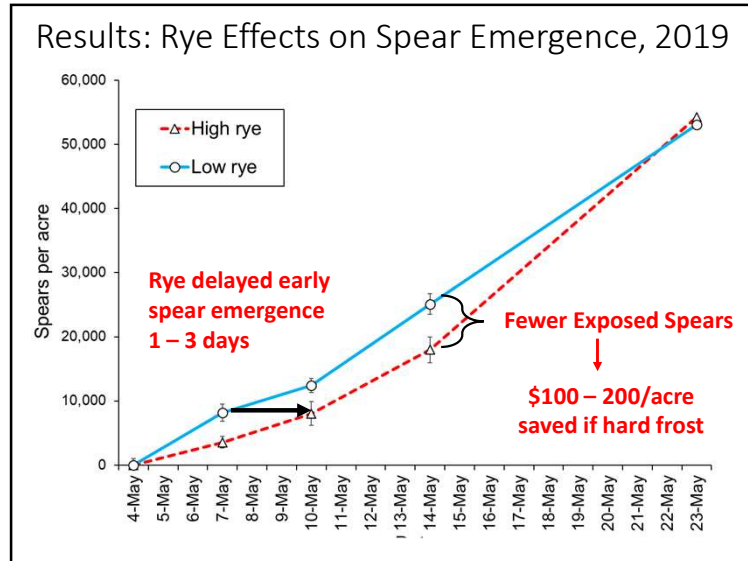
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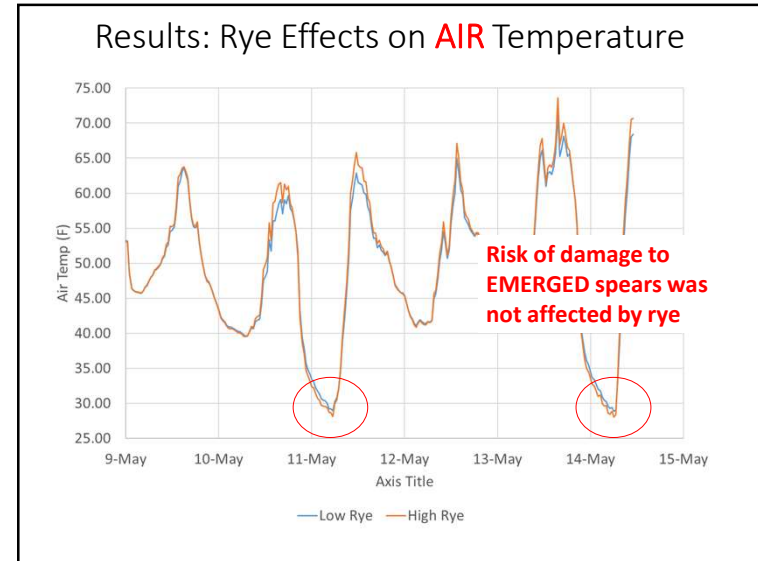
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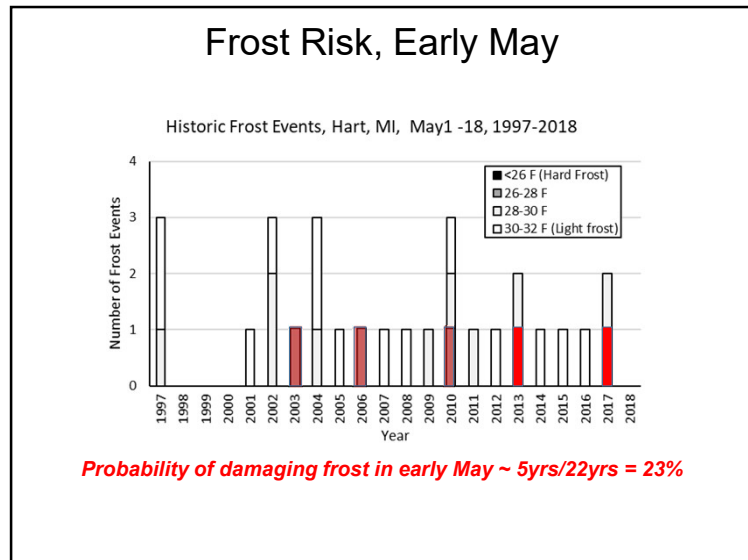
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Summary

- Rye Effects:
 - lowered soil temperature and delayed spear emergence by 1-3° F
 - 3,000 – 5,000 fewer exposed spears per acre in early May
 - Same number of total spears by late May
 - No detectable effects on air temperature at spear level

→ Rye provides protection from frost risk with potential benefits of \$100-200/acre

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