MICHIGAN STATE UNIVERSITY
Department of Plant, Soil and Microbial Sciences
Cropping Systems Agronomy

M-AAA Michigan Alliance for Animal Agriculture

MMPA

Project GREEEN

Mycotoxins in Michigan Corn Silage and its Management

Mycotoxins: What are they?

- Secondary metabolites that accumulate in plant biomass.
- Occur due to fungal ear and stalk rot infections and get intensified by ear damaging insect damage.
- Deteriorate silage quality and pose threat to livestock health and productivity.

Figure 1: Western Bean Cutworm (WBC) Larvae (left), Fusarium ear rot (Right)

Are there any in Michigan?

- Grower corn silage survey:
  - 2019: 34 samples from 11 counties
  - 2020: 49 samples from 20 counties
- Most frequently occurring toxins: DON, ZON and Fumonisins.
- Mycotoxins co-exist in corn silage.

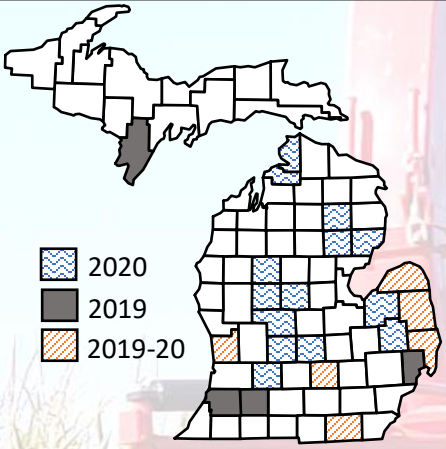

Figure 2: Counties submitting silage samples for analysis over years

What are we doing about it?

- Small plot trials across Michigan to explore role of insect protection, fungicide application, planting date and seed rate.

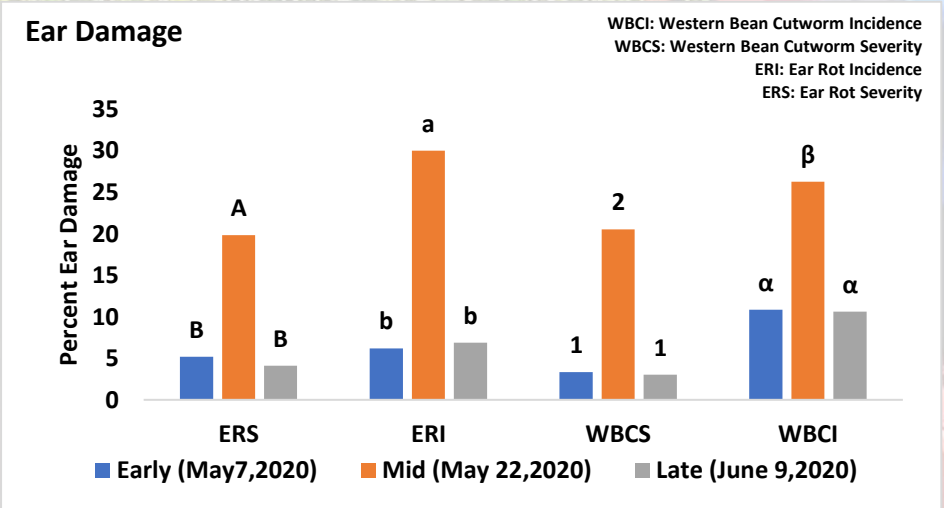

Figure 3: Ear Damage across three planting dates. Small plot trials conducted at MSU Farms 2020

Please Contact: Harkirat Kaur (510-356-7133) and Dr. Manni Singh (517-775-8174) for more details, questions and feedback.

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- Corn silage planted late May (mid planting) was found to be more prone to western bean cutworm and ear rot damage (Figure 3).
- Mycotoxin concentrations were consistently higher for mid planted crop.

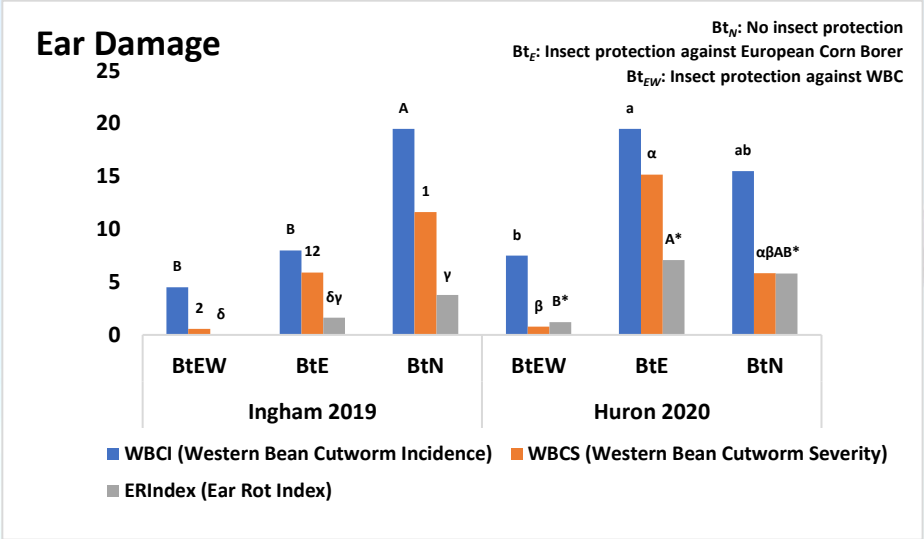

Figure 4: Ear Damage across three hybrid insect protection traits.

- Early planted silage had higher yield and NDFD.
- Another set of multilocation trials showed that presence of hybrid insect protection trait reduced WBC incidence and severity by 87 and 84% on average and ear rot severity by at least 65% (Figure 4).
- Mycotoxins especially DON concentrations were lower in hybrids with insect protection traits (Figure 5).
- Fungicides lowered disease and DON levels only when incidence was less than 20%.
- Yield and quality parameters were not impacted with insect protection and fungicide application except for Ingham 2019 (highest NDFD in Bt_{EW}).

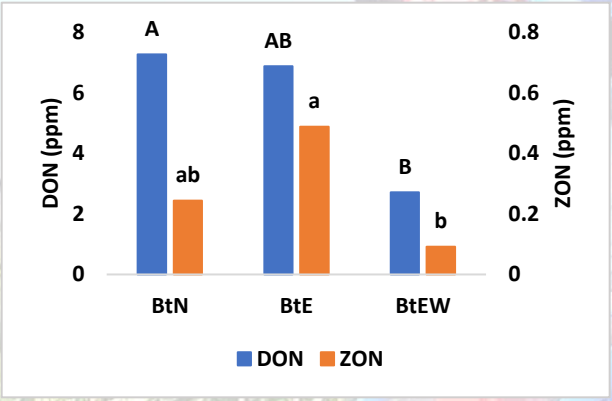

Figure 5: DON and ZON levels in ppm at Ingham 2019 across three hybrid insect

Going Forward: Considerations and Challenges

- Continuing our efforts to understand impact of various management practices on mycotoxins and silage quality.
- Understanding use of organic approaches of management.
- Evaluating impact of tar spot on silage quality.

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