Impact of Inoculum Rate on Diplodia Ear Rot Development

Investigators

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Summary

Diplodia ear rot is a disease, caused by the fungus *Stenocarpella maydis*, that directly impacts the grain quality and yield of corn. Field research is being completed to find the best in-season management techniques for this disease. To ensure accurate results, inoculum must be inserted in the ear to develop Diplodia ear rot. We worked to determine the minimum concentration to cause disease. The trial contained five replications, a non-treated control, and four different concentrations of inoculum. All inoculations were performed using the silk injection method with a hydration backpack equipped with a syringe at R1 growth stage. The ears were monitored for visible symptoms of Diplodia ear rot. At growth stage R4, ears were collected from the research rows of each treatment. The husks were removed, and ears were rated for signs, and percent ear rot.

Rationale

Diplodia ear rot (DER) is a commonly occurring disease in corn that can result in white mold on the ear and brown kernels (Fig. 1), dying leaf sheaths and ear leaves (Fig. 2), and black fungal reproductive structures, known as pycnidia, in the kernels (Fig. 3). The disease is mainly caused by the fungus *Stenocarpella maydis*, which is only found on corn. The spores of this fungus can infect the corn through natural openings, insect wounds, and by the silk channels. The disease can reduce grain quality and the fungus can survive on corn residue in the field for at least two years. Plants become more susceptible around the silking growth stage (R1), especially if wet weather is present.

There are currently several management techniques recommended, such as resistant hybrids, crop rotation, and harvest methods. There is ongoing research to find in-season management strategies to help control Diplodia ear rot. To replicate the natural process of the fungal infection in the corn, inoculum is distributed by grain, spray, wound injection, or silk channel injections. The most common rate of inoculation is 5,000 spores/ml, which can overwhelm the plant with disease in some environments. If the plant is overwhelmed, it makes it difficult to get accurate results on in-season research treatments. A better understanding of the optimal inoculum rate will improve research needed to understand management of Diplodia ear rot.

Figure 1: DER symptom of gray mold and browning of kernels on ears.

Figure 2: Dying leaf sheath and ear leaves symptoms of DER.

Figure 3: Pycnidia found on corn as a symptom of diplodia ear rot.

Methodology

The trial was placed in Princeton, Kentucky at the University of Kentucky Research and Education Center in the summer of 2019. Treatments were inoculated in a random complete block design with five replications. The corn used was hybrid P1555CHR; it was planted in 30-inch rows at 30,000 seeds/A on May 5, 2019. This hybrid is susceptible to Diplodia ear rot. Plots consisted of four rows, with the two center rows used for the experimental treatments. Pure cultures of *Stenocarpella maydis* were grown on natural oatmeal agar. Conidia (Fig. 4) was harvested off the plates by flooding it, gently scraping the plate, and pouring the liquid into a beaker. The concentration of conidia was calculated using a hemocytometer, and then diluted to the desired concentrations. The treatments consisted of a control, 5,000 spores/ml, 2,000 spores/ml, 1,000 spores/ml, and 250 spores/ml. Inoculation was inserted into the ear using a 2-liter hydration backpack equipped with a 5ml, tube fed, auto-filling syringe with a blunt end 18-guage, 3.8 cm long needle (Fig. 5). A total of 5-ml of each concentration was administered to each primary ear in the two research rows at growth stage R1 on July 12, 2019. Ears were examined at growth stage R3 for any symptoms and signs. At growth stage R4, 10 ears were chosen at random per plot. Husks were removed and the ears were rated for signs. Percent Diplodia ear rot will be recorded and averaged for each treatment. The treatments were then compared to each other to determine the optimum inoculum concentration.

Figure 4 (left): *Stenocarpella maydis* conidia viewed under a microscope

Figure 5 (right): Silk injection method of inserting the inoculum into an ear

Results and Discussion

Weather conditions favored Diplodia ear rot in 2020. Despite varying concentrations of inoculum, all treatments except the non-treated control resulted in 100% disease incidence and high disease severity. This indicates that low levels of inoculum can result in yield limiting disease when conditions are favorable.

Acknowledgments and References

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