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Fungicide application methods and corn variety effect on corn silage Deoxynivalenol levels

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Abstract.

Mycotoxin contamination is a major challenge for dairy producers. Deoxynivalenol, (DON) a mycotoxin produced by the fungus Fusarium Graminearum, can infect both the corn stalk and ear. Deoxynivalenol causes major issues in the dairy industry causing decreased milk production, lower components, higher SCC, and decreased reproductive performance. Plots were four rows wide by 35 feet long with the center two rows manually inoculated with Fusarium Graminearum during wet silk before fungicide application. Fungicide application methods included, no fungicide, boom application at tassel with 20 gallons per acre, drop application at 20 gallons per acre at tassel, drone application at tassel, and boom application at V5 at 20 gallons per acre. The corn hybrids were a BMR hybrid with high resistance to other fungal diseases, an older BMR hybrid with low disease resistance, and a silage/grain hybrid. Both hybrid and fungicide applications had a significant effect on corn silage DON levels and fiber digestibility. While DON may not have effects on fiber digestibility the fungicide application also reduces other foliar diseases. The 3 varieties used in 2023 without fungicide application had varietal average DON levels from 0.95-2.55 ppm DON. While the 3 varieties used in 2022 have a variety average DON range of 1.15-9.42 ppm on the non-fungicide treated plots. Year has a significant effect on fungicide application methods reduction in DON levels but both years tassel fungicide applications across all methods reduced DON levels.

Keywords.

Corn Silage, Deoxynivalenol, Fusarium Graminearum,, Fungicide

Materials and methods

This study was conducted at The Ohio State University Northwest research station near Custar Ohio during the 2022 and 2023 cropping seasons. A randomized complete block split-plot design was used with the fungicide application method as the main effect and hybrid as the secondary effect. Each main effect had a 10-foot buffer to control for fungicide drift.

Three silage-type corn hybrids, two BMR, and one non-BMR from Brevant Seed in the 105-106 day maturity range were used. All hybrids were planted at 34,000 seeds per acre in 3 meters by 10.6 meters plots with the center two rows harvested.

Fungicide was applied using 5 different application methods using Miravis Neo at 13.7 ounces of fungicide per acre including a control. Treatments include a ground application over the top at V5, ground application over the top at VT, ground application using 360 undercover drops at VT, and in 2023 drone application at VT. All ground applications used 20 gallons of carrier and fungicide per acre using a Hagie high clearance sprayer. The drone application used 2.5 gallons of carrier and fungicide total per acre using a Hylion drone. Plots were inoculated after fungicide application with by spraying the silks with *Fusarium Graminearum* spores while the silks were still green.

Silage was harvested at approximately 65 percent moisture. Silage samples were collected and vacuum-sealed for fermentation for 30 days before lab submission for quality analysis. Quality analysis was done using wet chemistry after the 30-day fermentation period and mycotoxin analysis was done using Liquid Gas chromatography.

Results/ Discussion

The Fungicide application of Miravis Neo at VT reduced DON levels in both 2022 and 2023 compared to the no fungicide control. In 2022 the V5 application also reduced DON levels but not in 2023. While we only test whole plant DON levels, DON can be in both the stalk and the ear but levels between the two are not correlated (Webster, 2021). Push test stalk rot rating in 2022 were significant difference between the no fungicide treatment and all fungicide applications but not between fungicide applications. The VT fungicide applications both years increased digestibility and milk per ton of the corn silage. In 2023 we placed water-sensitive paper on the ear in the drone plots to be sure that we had fungicide penetrating the canopy at ear height. Both years corn hybrid also had a significant effect on DON levels but there was not an interaction between hybrids and fungicide application methods. Fungicide application of Miravis Neo can lower DON levels when applied at VT and improve corn silage digestibility.

Table 1. DON results in ppm by application method and year. DON levels with different letters are significantly different at $\alpha=0.05$.

Application Method	Year	
	2023	2022
No Fungicide	1.81 b	3.245 b
VT Drops	1.2 a	1.877 a
VT over-top boom	1.15 a	0.5 a
VT Drone	1.15 a	
V5 over top boom	1.78 b	1.2 a

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References

Webster R., Chibuogwu M., Reed H., Mueller B., Groves C., Tenuta A., Chilvers M., Wise K., Smith D., Disease Development and Deoxynivalenol Accumulation in Silage Corn (2021) Crop Protection Network DOI: doi.org/10.31274/cpn-20211130-000