

Occurrence of the mycotoxin Zearalenone related to maize ensilage practices

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Introduction When ensilage practices and silo management are not adequate, fungal contamination and mycotoxin formation can occur. Mycotoxins are secondary metabolites produced by a variety of filamentous fungi. Zearalenone is one of the most important mycotoxins in animal production due to its reproduction-related effects (Whitlow and Hagler Jr., 2005). Lack of information hinders the adoption of strategies to prevent and control the contamination of animals and their products by mycotoxins. The objective of this work was to undertake an assessment of the occurrence of Zearalenone in corn silages under farm conditions, and its relationships with ensiling practices, milk production and control.

Materials and Methods In 2011, silages were evaluated belonging to 108 silos in properties located in the state of Paraná, Brazil. Information was collected on silo type (bunker or surface), color of the tarp used to cover the silo (black, white, black and white, black and gray), tarp cover (dirt, none, others), form of silage removal (manually with pitchfork, tractor hopper, mill silage loader, silage block cutter), harvest (self or outsourced) and forage harvester type (self-propelled or tractor-pulled). Silage density (DE) was determined according to the methodology proposed by D'Amours and Savoie (2005). The following levels were determined: dry matter (DM), crude protein (CP), acid detergent fiber (ADF), neutral detergent fiber (NDF), total digestible nutrients (TDN), relative nutritional value (RNV), in vitro dry matter digestibility (IVDMD), starch, hydrogenionic potential (pH) and mean particle size (MPS) using Penn State particle separators. Occurrence of the mycotoxin Zearalenone was determined by thin layer chromatography (TLC) according to Scott (1997).

Results and Discussion Of the total 108 evaluated silos, 88 samples were contaminated with Zearalenone (81% of total), being that 54 samples (50% of total) had values over the acceptable limit of 285 ppb (Schmidt et al., 2011). The mean rate of this mycotoxin in the silages was 309 ppb, with a standard deviation of 241 ppb and a range of 0 to 1000 ppb. There was no significant difference between Zearalenone concentrations and variables harvest, machine type, hybrid cycle, silo type, tarp color, silo cover, form of removal and inoculant use. Among the studied variables, there was an effect only of corn hybrid (conventional or *Bt*). There was a reduction in Zearalenone levels with the use of corn containing the gene *Bt*. This technology can reduce mycotoxin levels due to lower insect infestation in corn grains, blocking fungal development. The occurrence of Zearalenone in silages of *Bt* hybrids was 240.9 ppb, and 355.0 ppb in conventional corn silages. There was no correlation between Zearalenone levels and silage chemical quality (DM, CP, ADF, NDF, TDN, RNV, IVDMD and pH), nor with mean particle size of the silage. No correlation was found between Zearalenone levels in the silages and milk

production and composition in the evaluated properties (Figure 1). This result differs from the work by Whitlow and Hagler Jr. (2005), who reported lower milk production in diets including approximately 660 ppb of Zearalenone and 440 of Deoxynivalenol. Although no correlation was observed between Zearalenone and milk production, reproductive problems may be occurring as observed by Whitlow and Hagler Jr. (2005), but were not evaluated in this work.

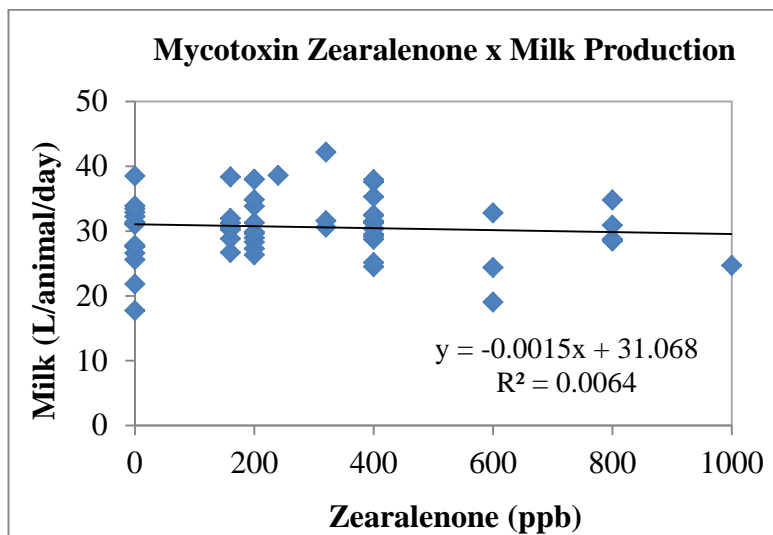


Figure 1 Correlation between levels of the mycotoxin Zearalenone in silage and milk production.

Conclusion Silages of *Bt* corn hybrids had lower contamination by the mycotoxin Zearalenone. There was no correlation between Zearalenone levels in the silages with regard to silage nutritional composition and milk production and quality.

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