

Southeast Milk, Inc. Dairy Check-Off Report
Effect of Rust Infestation on Silage Quality

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Southern rust is an aggressive disease caused by *Puccinia polysora* fungi that can destroy a corn field in a few days. It is dispersed by airborne spores that form orange, circular pustules mainly on the upper leaf surface. The fungus diverts nutrients away from the plant causing leaf death. Few corn hybrids are resistant to southern rust and some of such varieties lack the combination of agronomic and nutritional traits desirable for silage production. Certain fungicides can control the disease, but their effectiveness is limited when applied late in the season, particularly under hot, humid conditions (Raid and Kucharek, 2005). In addition to causing crop losses, this disease can predispose the plant to mold growth and mycotoxin infestation. Little is known about the effect of the disease on the nutritional value of corn silage. Less is known about whether microbial inoculants that inhibit the growth of spoilage-causing yeasts and molds can improve the quality of rust-infested corn silage. This project aimed to determine the effect of the level of southern rust infestation of a corn hybrid on silage fermentation, nutritive value and bunk life, and to determine how inoculant application affects these measures of forage quality. A corn hybrid (Pioneer 33V16) grown on a 130-acre field on July 6, 2007 at the Dairy Research Unit was infested by southern rust after tasselling. Aerial application of a fungicide resulted in areas with different levels of infestation in the field. Representative samples (220 lb each) were taken from areas classified as having no rust (clean), medium rust (all leaves in the bottom half of the plant were infested), and high rust (all leaves were infested). Each of these was ensiled without treatment (Control) or after applying Buchneri 500 inoculant (Lallemand Animal Nutrition, Milwaukee, WI) at a rate that supplied 4.99×10^{10} colony forming units of *Pediococcus pentosaceus* and *Lactobacillus buchneri* in each gram of forage. Each treatment was ensiled in four replicate 5-gallon mini silos for 97 days. Concentrations of dry matter (DM) and fiber fractions increased with the level of rust infestation, whereas DM digestibility decreased by up to 13%. These results indicate that the rust dried the silages and reduced their nutritive value. The DM concentration of the high-rust corn silage (58%) was high enough to reduce the effectiveness of packing in a farm-scale silo. High rust silages also had lower neutral detergent fiber digestibility (NDF) than medium rust or clean silages. This effect was greater in inoculated silages because inoculation increased the NDF digestibility of clean and medium-rust silages. Silage pH increased with rust infestation, however, all pH values were below 4. Concentrations of lactate, total volatile fatty acids, and most individual volatile fatty acids decreased with increasing rust infestation in control silages, but such trends were largely absent in inoculated silages. This shows that rust infestation reduced the fermentation but inoculant application reduced this negative effect. Only, high-rust silages contained butyric acid, which is an indicator of undesirable clostridial secondary fermentation.

Mold counts of clean and medium-rust silages were relatively high, but high-rust silages had fewer molds, perhaps because they were drier. Aerobic stability was greater in high-rust silages than silages with less rust infestation. Inoculant treatment reduced mold counts in high rust silages 80-fold and increased their aerobic stability by about 75%. Aflatoxin was only detected in uninoculated, high-rust silages and the levels exceeded the FDA action level (20 ppb), indicating that this silage should not be fed due to the risk of aflatoxin transmission to milk. Surprisingly, zearalenone was only detected in silages with no rust infestation and the levels exceeded those that have caused reproductive problems in dairy cows. In conclusion, rust infestation reduced the nutritive value and fermentation of corn silage, and resulted in high levels of aflatoxin that made the silage unsafe to feed. Inoculant application reduced adverse effects of rust infestation on the fermentation and increased NDF digestibility of clean and medium rust silages. In high-rust silages, inoculant application also decreased mold growth, increased aerobic stability, and prevented aflatoxin production. Silages with no rust infestation had high levels of zearalenone, suggesting that mycotoxin binders may be needed when late-harvested summer corn silages are fed to dairy cows in Florida.

Reference

Raid, R. and Kucharek, T. 2005 Florida Plant Disease Management Guide: Sweet Corn. Report no. PDMG-V3-48, Department of Plant Pathology, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida. Accessed at <http://edis.ifas.ufl.edu/PG054>

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