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Using bacterial inoculants to control the growth of *E. coli* O157:H7 in maize silages under anaerobic and aerobic conditions.

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ABSTRACT

The aim was to determine if bacterial inoculants could eliminate *E. coli* O157:H7 (ECOL) in contaminated corn silages and if inoculants transferred antibacterial activity to silages. Chopped corn forage was ensiled in triplicate after treatment with:1) distilled water (control); 2) 5 x 10^5 cfu/g of ECOL (EC); 3) EC and 1 x 10^6 cfu/g of *Pediococcus pentosaceus* and *Propionibacterium freudenreichii* (EC+BII); 4) EC and 1 x 10^6 cfu/g of *Lactobacillus buchneri* (LB; EC+LB); 5) EC and 1 x 10^6 cfu/g of LB and *P. pentosaceus* (EC+B500). Silos were opened after 3, 7, 31, and 82 d and analyzed for pH and ECOL counts as well as VFA, lactate, and aerobic stability on d 82. By d 3, all silages had pH was <4 (SE=0.33; p=1) and pH did not increase subsequently; therefore ECOL was not detected in any silage. The Kirby-Bauer disc diffusion test showed that all pure cultures of inoculants had pH-independent antibacterial activity against ECOL but inoculated silages did not, suggesting that ECOL elimination was mediated by pH reduction. Inoculation with LB resulted in less lactate (SE=0.31; p<0.05), more acetate (SE=0.35; p<0.05), and greater aerobic stability (SE=7.1; p<0.05) versus control. Day-82 silages were reinoculated with EC at silo opening (immediate) or after 144 h of exposure (delay) and ECOL were enumerated 24 h later. All immediately reinoculated silages had low pH values (<4) and no ECOL 24 h later. Control, EC, and EC+BII silages reinoculated after the delay had relatively high pH values (4.71, 5.67, and 6.03) (SE=0.74; p<0.05) and ECOL counts (2.87, 6.73, and 6.87 log cfu/g) (SE=1.4; p<0.05), whereas those treated with LB had low pH values (<4) and undetectable (EC+B500) or low ECOL counts (1.96, cfu/g; EC+LB). Inoculants did not enhance elimination of ECOL during ensiling, but *L. buchneri inoculants* increased stability and eliminated or inhibited ECOL in aerobically exposed silages.

Key words: *E. coli* O157:H7, inoculant, silage, antibacterial activity