

Public Abstract

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Title:Essential oil effects on rumen fermentation, animal performance, and meat quality of beef steers

Efficiency in ruminants has historically been improved by using antibiotics and ionophores to alter rumen fermentation. Nutritionists, however, have begun searching for alternative rumen modifiers due to the negative attention received by non-therapeutic antibiotic use. Plant extracts, like essential oils, are being explored as a potential alternative to alter fermentation and improve growth and efficiency in ruminants. Essential oils are naturally occurring, secondary metabolites that can be distilled or extracted from most plants and possess antimicrobial properties. Next Enhance® (NE, Novus International Inc.) is comprised of garlic (diallyl disulfide) and cinnamon (cinnamaldehyde) extracts; both have demonstrated the ability to modify fermentation. A series of experiments was conducted to determine how feeding NE affects in vitro fermentation, site and extent of nutrient digestion, feedlot performance, carcass traits, meat quality, and consumer sensory characteristics of LM steaks from beef steers. The first experiment in this thesis examined how feedlot steer performance and carcass traits were affected by NE feeding. Average daily gain and efficiency were numerically improved early in the feeding period by 150 mg/hd/d targeted NE inclusion. Overall dry matter intake, gain, and efficiency were not affected by NE inclusion. All NE levels improved dressing percent, 12th rib backfat, LM area, and calculated USDA yield grade. Steers fed 150 mg/hd/d NE yielded carcasses worth nearly \$30 more than control steers. LM steaks were obtained from five head/treatment and used to evaluate meat quality and consumer sensory characteristics. Results showed NE had no negative effects on meat quality or consumer perception of steaks from steers fed NE. NE inclusion at 150 – 300 mg/hd/d improved beef steer carcass traits and total carcass value while achieving feedlot performance, meat quality, and consumer acceptance not different from non-supplemented steers. A continuous culture fermentation experiment and a cannulated steer study were conducted to see if observed animal performance and carcass improvements could be explained by NE effects on ruminal fermentation or site and extent of nutrient digestion. In vitro, NE inclusion at 15 – 120 mg/kg DM increased nutrient digestibility, microbial N flow, and microbial efficiency. VFA and nitrogen fermentation profiles were largely unaffected by NE inclusion. In cannulated steers, NE inclusion at 15 – 30 mg/kg increased nitrogen degradation and decreased fiber digestibility in the rumen, while all NE levels increased microbial N production. Increased protein degradation and microbial N flow during lean tissue growth could contribute to the increased calf performance early in the feeding trial. If consistent results can be achieved, NE could be an alternative to ionophores.