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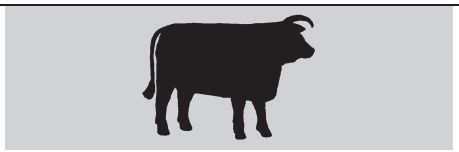

Effects of functional oils and monensin on cattle finishing programs[1]

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ABSTRACT

The use of functional oils (FO; Essential) and ionophores on cattle feedlot performance, carcass characteristics, and economic analysis was evaluated. Angus and Angus crossbred steers were assigned to 5 treatments: control (CON); monensin (MON); monensin + FO low dosage (MON+FL); FO low dosage (FL); and FO high dosage (FH; n = 48/treatment; 6/rep). Daily DMI was not affected (P > 0.05) by FO, and MON improved ADG and G:F when compared with FL and FH (P < 0.05). Dressing percentage for the FH treatment was larger than for MON and FL (P < 0.05). Longissimus muscle area of FH cattle was the largest of all treatments and differed from that of MON (P < 0.05). Backfat thickness was not different (P > 0.05) among treatments. Cattle on the MON+FL treatment yielded the best cutability and differed from MON (P < 0.05). Quality grade was not different (P > 0.05) among treatments. Diets with FO increased the percentage of Choice and Prime carcasses, and FH yielded the largest percentage of Prime grade carcasses, differing from CON and MON+FL (P < 0.05) but not from MON and FL (P > 0.05). Sensory panel evaluations were unaffected by treatments (P > 0.05). Using actual costs and prices, profitability was numerically highest for MON+FL. In annual and seasonal price scenarios, profitability favored FH. Carcass price provided the greatest effect on profitability. Thus, the use of FO may provide a viable alternative to ionophores in feedlot cattle.

Key words: feedlot cattle, functional oil, ionophore, performance, profit

INTRODUCTION

Public concern over routine use of antibiotics in livestock nutrition has resulted in certain countries banning their use in animal feeds. Consequently, a considerable amount of effort has been devoted toward developing alternatives to antibiotics that modulate ruminal fermentation. These alternatives include the use of yeasts, organic acids, plant extracts and oils, probiotics, and antibodies.

Research on the use of essential oils, as feed additives to improve the efficiency of ruminal fermentation, decrease methane production, reduce nutritional stress, and improve animal health and productivity, has been published extensively (Wallace, 2004; Benchaar et al., 2007; Calsamiglia et al., 2007). However, some plant oils and extracts cannot be classified as essential oils because they are not derived either from essences or from spices. These products have been previously defined as functional oils (**FO**; Murakami et al., 2009) because they have activities beyond their energy value. Cashew nut shell liquid and castor oil are examples of FO. Cashew nut shell liquid activities include antitumor, antimicrobial, and antioxidant activities (Himejima and Kubo, 1991) as well as decreases in in vitro methane production (Watanabe et al., 2010). Ricinoleic acid, the main fatty acid found in castor oil, has been shown to be active against some gram-positive bacteria and fungi (Novak et al., 1961) and to decrease methane production in vitro (Van Nevel et al., 1971). Unfortunately, castor oil is a laxative when used orally, thereby precluding its oral use. However, when combined with cashew nut shell liquid, castor oil is biologically active at dosages below the level at which it acts as a laxative, making it safe for oral use.

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The overall objective of this experiment is to evaluate the effects of a commercial mix of castor oil and cashew nut shell liquid called Essential (Patent Pending, Oligo Basics Agroindustrial Ltd., Cascavel, PR, Brazil), with and without ionophores, on feedlot finishing programs and to compare feeder cattle live performance, carcass characteristics, blood parameters, and production economics.

MATERIALS AND METHODS

Animals and Dietary Treatments

All procedures involving animals were approved by the Institutional Animal Care and Use Committee at Iowa State University. Two blocks using 120 spring-born steers (Angus and Angus crossbred) per block (322 and 344 ± 10 kg of initial BW, respectively) were obtained from a common source and used in a completely randomized design feeding experiment. Approximately 48 h after arrival, steers were given an individually numbered ear tag, implanted with Compudose E-S growth implants (VetLife Inc., Overland Park, KS), injected with Dectomax (Pfizer Inc., New York, NY), treated with Cydectin pour-on (Fort Dodge Animal Health, Fort Dodge, IA) to control external and internal parasites, and provided with a second insecticide and miticide ear tag (Cutter Blue, Bayer Health Care LLC, Shawnee Mission, KS), which was replaced at d 56.

About a week after arrival and following acclimation, the steers were gradually adapted to an 82% concentrate diet containing whole shelled corn, tall fescue hay, and wet distillers grain along with a vitamin and mineral supplementation (Table 1) that was delivered once daily at 0800 h. The steers were adapted during 2 wk to the pens before starting the experiment and randomly assigned to 1 of 5 treatments so that the BW, color, and temperament of the steers were uniformly distributed among the treatments (6 steers/pen, 8 pens/treatment). All treatments were fed the same diets, differing only in the type of additive supplemented. The 5 treatments were control (**CON**), no additive provided; monensin only (**MON**; 223 mg/steer per day of monensin; Rumensin, Elanco Animal Health, Indianapolis, IN); monensin + FO low (**MON+FL**; 223 mg/steer per day of monensin + 250 mg/kg of DMI of Essential; Oligo Basics USA LLC, Wilmington, DE); FO low (**FL**; 250 mg/kg of DMI of Essential); and FO high (**FH**; 500 mg/kg of DMI of Essential). All animals were reimplanted with Component TE-S (VetLife Inc.) approximately 60 d before slaughter.

The feed allotment was determined daily before the morning feeding. The amount of feed was increased when the bunks, in approximately one-half of the pens of a treatment, were completely empty at 0800 h before the morning feeding. Feed samples were collected once weekly for DM determination. The pens of steers were fed for an average of 169 and 161 d for the first and second blocks, respectively.

Steers were weighed individually at 28-d intervals before feeding to calculate ADG. The amount of daily DM fed to the steers was determined by obtaining ingredient samples, before being loaded onto the feed-wagon, approximately every 5 d. The samples were weighed, placed in a conventional oven (Campbell Scientific, Logan, UT) at 105°C for a minimum of 48 h, and reweighed. Feed samples were weekly analyzed by Dairyland Laboratories Inc. (Arcadia, WI) for feed quality, molds, and mycotoxins.

Table 1. Composition of diet fed to feedlot steers

Feed ingredient	% of dietary DM
Dry-rolled corn	60.4
Tall fescue	18.2
Wet distillers grain	18.4
Liquid molasses	0.4
Calcium carbonate	1.9
Salt	0.5
Vitamin A	0.1
Trace mineral premix[1]	0.1
Total	100.0

[1]Trace mineral premix analysis (air-dry basis): 11.84 to 14.21% Ca (calcium carbonate); >1.50% Cu (copper sulfate); >10.00% Fe (ferrous carbonate and ferrous sulfate); >8.0% Mn (manganous oxide); 12.0% Zn (zinc oxide); 1,000 mg/kg Co (cobalt carbonate); and 2,000 mg/kg I (ethylenediamine dihydroiodide).

Blood Samples and Carcass Data Collection

Blood samples were collected from 120 randomly selected steers (3 steers/pen) at the beginning and at the end of each block. Samples were collected via jugular venipuncture into 10-mL sodium heparinized BD Vacutainer tubes using a Vacutainer blood-collection needle (Becton Dickinson, Franklin Lakes, NJ) and placed on ice. Complete blood counts were performed using a new generation hematology analyzer Advia 120 (Bayer, Tarrytown, NY). The analyzer was calibrated and maintained according to the manufacturer's instructions.

The final BW was obtained in the morning, and pens of steers were loaded and transported by treatment groups to Tyson Fresh Meats Inc., a commercial abattoir located in Denison, Iowa, at a uniform end weight determined to optimize YG and QG. Carcass weights and liver abscess scores were determined by the USDA inspectors at the time of slaughter. After 24-h postmortem chilling, 12th-rib backfat thickness and longissimus muscle area (LM area) measurements were recorded by trained personnel at the same facility in Denison, Iowa. Estimated percentages of KPH were recorded for each carcass, and carcass DP were calculated by dividing HCW by final BW. The USDA Meat Grading Service graders at the packing plant determined the KPH, YG, and QG. The QG were estimated to the nearest one-third of a grade and were converted to numerical values for evaluation purposes.