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Effects of a Phytogenic Feed additive on Growth performance, Feed intake, and Carcass Traits of Beef Steers

The ionophore, monensin, is commonly fed to feedlot cattle to increase feed efficiency typically by decreasing dry matter intake (DMI). A 2016 survey of consulting feedlot nutritionists showed that 92.3% of their clients fed an ionophore in receiving cattle diets (77.3% fed monensin and 22.7% fed laslaocid) and 97.3% of their clients used ionophores in finishing cattle diets (100% fed monensin).[1] Increasing concerns over the use of antimicrobial growth promoters in animal production has prompted the need to develop natural alternatives to antimicrobial growth promoters. Antimicrobial growth promoters such as ionophores have been commonly used in livestock feeding over the last 50 years. Some of these products are banned in some countries due to concern over the development of bacterial resistance to antibiotics in humans.[2, 3]

Phytogenic compounds are a group of natural and nonantibiotic growth promoters used as feed additives, derived from herbs, spices, or other plants. Supplementation of animal diets with these compounds has been reported to confer antimicrobial, antioxidant, anti-inflammatory, and antistress properties.[4] Recent Canadian research evaluated the effects of a commercial phytogenic feed additive (PFA) on growth performance, feed efficiency, carcass traits, liver abscesses, and the immune response of growing and finishing steers.[5] The hypotheses of this study were that the inclusion of a commercial phytogenic compound in growing and finishing feedlot cattle diets would result in similar or improved overall feedlot performance and carcass characteristics when compared with monensin.

In this study, 45 crossbred Angus steers (initial weight = 600 lb) housed in individual pens were used in a randomized complete block design in a 110-day growing and 120-day finishing experiment. Steers were blocked by body weight (BW) and allocated to 1 of 3 treatments: control diet (without addition of PFA or monensin), control diet supplemented with PFA at 250 mg/steer per day, or monensin at 300 mg/steer per day. The commercial PFA (Digestarom, DSM Nutritional Products) is a proprietary blend consisting primarily of licorice, vanilla, maltol, clove oil, cinnamon, caraway oil, sodium chloride, and silicon dioxide. During the growing phase, steers were fed a corn silage based ration formulated to meet the nutrient requirements of beef cattle with a targeted gain of 2.65 lb/day. The monensin and PFA were pelleted with vitamins and minerals and mixed in the diet before feeding. The inclusion rate of monensin or PFA in the supplement was adjusted monthly based on changes in feed intake to ensure the desired supplementation rate. At the end of the growing phase, the steers were maintained on the same treatments and adapted to the final dry-rolled corn based finishing ration over a 4-week period by gradually replacing forage with concentrate. Steers were individually fed the ration ad libitum once daily and had free access to clean water over the entire experiment.

The effects of a phytogenic feed additive on feed intake and growth performance of growing and finishing steers are shown in Table 1. Dry matter intake (DMI) did not differ ($P \geq 0.41$) among treatments over the entire growing period. Final body weight (BW, 915 vs. 889 lb, trend, $P = 0.10$) and average daily gain (ADG, 2.89 vs. 2.65 lb/day, numerically, $P = 0.12$) were greater with PFA than control but did not differ from monensin (BW = 931 lb and ADG = 3.04 lb/d) during the growing period. Cattle fed monensin had greater final BW and ADG than control cattle ($P \leq 0.05$) during the growing period. Gain efficiency (Gain:Feed ratio) was greater with monensin (0.173) than with PFA (0.161) and for the controls (0.156). These researchers noted that the greater final BW, ADG, and improved efficiency of the steers supplemented with monensin compared with the control group confirms its efficacy in growing beef cattle fed a high-forage diet. The results also suggested that responses in growth performance are similar in PFA- and monensin-fed cattle.

During the finishing phase, ADG and gain efficiency did not differ between treatments. Whereas DMI was significantly lower with monensin than controls (21.61 vs. 23.81 lb/day, $P \leq 0.05$) and tended to be lower than PFA (22.49 lb/day) than controls. No differences in carcass characteristics between treatments were observed.

Table 1. Effects of a phytogenic feed additive (PFA) on feed intake and growth performance of growing and finishing steers.

		Treatment[1]		
Item	Control	PFA	Monensin	P-value
Growing phase, 110 days				
Initial BW, lb	602	598	595	0.92
Day 110 BW, lb	889^{b}	915^{ab}	931^{a}	0.05
DMI, lb/day	17.40	18.28	17.77	0.41
ADG, lb/day	2.65^{b}	2.89^{ab}	3.04^{a}	0.05
Gain:Feed	0.156^{b}	0.161^{b}	0.173^{a}	0.04
Finishing Phase, 120 days				
Initial BW, lb	953	981	994	0.32
Final BW, lb	1462	1469	1477	0.90
DMI, lb/day	23.81^{a}	22.49^{ab}	21.61^{b}	0.05
ADG, lb/day	3.20	3.06	3.02	0.37
Gain:Feed	0.135	0.137	0.137	0.84

^{a,b}Means within a row with different superscripts differ ($P < 0.05$).

[1]Daily doses of PFA and monensin were, respectively, 250 and 300 mg per head.

Adapted from DeBord et al., 2023.

In conclusion, feeding growing steers PFA numerically increased final BW and ADG and did not differ from feeding steers monensin, whereas efficiency was lesser with PFA than monensin. Supplementation of a finishing diet with PFA resulted in growth performance, Gain:Feed, carcass traits, and liver-abscess responses that were similar to control and monensin treatments. These authors noted that “although phytogenic feed additives can result in some responses that are similar to current antimicrobials such as monensin, further refinement of formulations may be required to reach full equivalency”.

[1] Samuelson, K. L., M. E. Hubbert, M. L. Galyean, and C. A. Löest. 2016. Nutritional recommendations of feedlot consulting nutritionists: The 2015 New Mexico State and Texas Tech University survey. J. Anim. Sci. 94: 2648-2663.

[2] European Union. 2003. Regulation 1831/2003/EC on additives for use in animal nutrition, replacing Directive 70/524/EEC on additives in feeding-stuffs. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32003R1831.

[3] Government of Canada. 2018. Responsible Use of Medically Important Antimicrobials in Animals. Available at: https://www.canada.ca/en/public-health/services/antibiotic-antimicrobial-resistance/animals/actions/responsible-use-antimicrobials.html.

[4] Oh, J., E. H. Wall, D. M. Bravo, and A. N. Hristov. 2017. Host-mediated effects of phytonutrients in ruminants: A review. J. Dairy Sci.100:5974–5983.

[5] Yang, W. Z., P.M.T. Lima, S. Ramirez, E. Schwandt, and T.A. McAllister. 2023. Effects of a phytogenic feed additive on growth performance, feed intake, and carcass traits of beef steers. Appl. Anim. Sci. 39: 423-432. Available at: https://doi.org/10.15232/aas.2023-02421.