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EFFECTS OF FEEDING TWO MICROBIAL ADDITIVES IN SEQUENCE ON GROWTH PERFORMANCE AND CARCASS CHARACTERISTICS OF FINISHING HEIFERS

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Summary

Four hundred fifty heifers (846 lb) were used in a 126-day experiment to investigate the effects of feeding two microbial additives, *Lactobacillus acidophilus* BG2FO4 (MicroCell) and *Propionibacterium freudenreichii* P-63 (MicroCell PB), alone or in sequence, on feedlot growth performance and carcass characteristics. A 21-day step-up period preceded heifers being placed on a final finishing diet containing 10% corn silage, 42% steam-flaked corn, 42% high-moisture corn, 3% soybean meal, and 3% mineral supplement. Premeasured amounts of microbial additive were mixed with water before being mixed directly with the total ration. Treatments consisted of 1) no microbial additive; 2) MicroCell for the entire period; 3) MicroCell PB for the entire period; 4) MicroCell for 28 days then MicroCell PB for the remainder of the period; and 5) MicroCell PB for 28 days then MicroCell for the remainder of the period.

Feeding MicroCell for 28 days and then MicroCell PB for the remainder of the feeding period resulted in significant improvements (P<.10) in daily gain and feed efficiency.

(Key Words: *Lactobacillus acidophilus*, *Propionibacterium freudenreichii* , Microbial Feed Additives, Finishing, Carcass.)

Introduction

Research on the microbial feed additive *L. acidophilus* in feedlot diets has been conducted since the mid-1980's. In controlled studies, improvements in daily gain and feed efficiency are reported to be 2 to 3%. Its proposed mode of action is competitive exclusion in the lower gut. That is, *L. acidophilus* competes for attachment sites with pathogenic bacteria, thereby improving nutrient absorption and overall health.

Because feedlot cattle consume rapidly fermentable feeds like steam-flaked and high-moisture corn, they are inclined to develop ruminal acidosis. Acidotic conditions in the rumen occur when lactate is produced faster than the rumen environment can remove it. Because *P. freudenreichii* utilizes lactate, it might prevent these periodic bouts of lactic acidosis. Our objective was to determine during which phase of the finishing period these microbial feed additives would be most effective.

Experimental Procedures

This study was conducted at the Southwest Research and Extension Center in Garden City from September 9, 1998 to January 13, 1999. Prior to the experiment, heifers were fed a corn silage-based diet for approximately 7 months. Four hundred fifty heifers (846 lb) were allotted to 50 pens in a completely random manner, then blocked by location. Initial weight was based on the

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average of two consecutive daily weights. Each pen within a block was allotted randomly to one of five treatments, defined by microbial additive or microbial additive sequence. Treatments were: 1) Control, no additive fed; 2) MicroCell during the entire period; 3) MicroCell PB during the entire period; 4) MicroCell for 28 days then MicroCell PB for the remainder; and 5) MicroCell PB for 28 days then MicroCell for the remainder of the feeding period. Cattle were stepped up in 21 days by feeding a diet containing (dry basis) 60% corn silage for 7 days, 40% corn silage for 7 days, and 20% corn silage for 7 days. The final diet contained 10% corn silage, 42% steam-flaked corn, 42% high-moisture corn, 3% soybean meal, and 3% mineral supplement. The diet was balanced to contain 12.5% crude protein (2.5% from urea), 30 grams/ton monensin, and 10 grams/ton tylosin. Heifers were implanted initially with Component E-H and reimplanted with Component E-H plus Component T-H on day 58.

Each microbial additive was mixed with about 2 gallons of tap water and added to the total mixed ration. Then each load was mixed for approximately 2 minutes longer. The microbial additive feeding levels were 5×10^8 colony forming units per head per day for MicroCell and 1×10^9 for MicroCell PB. At the end of the feeding period, all heifers were transported to Monfort, Inc. in Garden City for processing. Hot carcass weight, backfat thickness, and marbling score were collected at the processing plant. Final weight was determined by dividing hot carcass weight by the average dressing percent (62.6%).

Results and Discussion

The change in microbial additives occurred on day 29. Therefore, day 1 through 28 data reported in Table 1 reflect growth performance of heifers fed either no additive, MicroCell, or MicroCell PB. Although no significant differences in growth performance occurred during day 1 through 28, heifers fed MicroCell PB were out-performed numerically by control heifers and those fed MicroCell. This agrees with previous research conducted at Oklahoma State University. Heifers fed MicroCell had the lowest numerical intakes during the first 28 days, but they also had numerically better feed efficiency than heifers in other treatments.

Growth performance data for the entire feeding period also are shown in Table 1. Daily feed intake did not differ among treatments. Feeding either MicroCell or MicroCell PB alone throughout the entire period did not affect daily intake, daily gain, or feed efficiency. Feeding MicroCell PB followed by MicroCell significantly improved average daily gain ($P<.10$) but not feed efficiency, compared to controls. Heifers fed MicroCell followed by MicroCell PB did not differ from controls for daily feed intake, but gain was improved by 5.0% ($P<.10$) and feed efficiency was improved by 5.1% ($P<.10$).

An improvement ($P<.10$) in the percentage of carcasses grading U.S.D.A. Choice and Prime was observed when MicroCell PB was fed throughout the entire trial (Table 1). Because we did not observe a similar effect in heifers fed MicroCell PB for only 28 fewer days (MicroCell followed by MicroCell PB), this difference is difficult to explain.

This study indicates that growth performance of finishing cattle can be improved by targeting the appropriate microbial feed additive to a particular phase of production.

Table 1. Effects of Microbial Additive Treatment on Heifer Growth Performance and Carcass Characteristics

	Microbial Additive Treatment[a]					
Day 1 to 28:	None	MC	MC PB	MC	MC PB	
Item Day 29 to 126:	None	MC	MC PB	MC PB	MC	SEM
No. of heifers	90	90	90	90	90	
Performance, day 1 to 28						
Initial weight, lb	844	847	850	856	831	7.8
Final weight, lb	923	929	924	934	907	8.3
Dry matter intake, lb/day	19.6	19.2	19.9	19.0	19.5	.31
Average daily gain, lb	2.84	2.93	2.69	2.82	2.76	.13
Gain:feed	.144	.152	.135	.149	.142	.007
Performance, day 1 to 126						
Initial weight, lb	844	847	850	856	831	7.8
Adj. Final weight, lb	1176	1179	1176	1205	1178	8.7
Dry matter intake, lb/day	18.6	18.5	18.5	18.5	18.8	.22
Adj. average daily gain, lb	2.64	2.67	2.60	2.78[b]	2.76[b]	.04
Adj. gain:feed	.142	.144	.141	.150[b]	.147	.003
Hot carcass weight, lb	736	738	737	754	737	5.5
Dressing percentage	62.7	62.5	62.6	62.9	62.6	.2
Fat thickness, in	.45	.48	.46	.43	.45	.017
Yield grade 1, %	22	17	19	29	21	4.7
Yield grade 2, %	55	67	55	54	62	5.1
Yield grade 3, %	23	12	26	17	15	4.3
Yield grade 4 & 5, %	0	4	0	0	1	1.0
USDA Choice + Prime, %	64	60	77[b]	66	68	4.6
USDA Select, %	32	34	20	31	29	4.5
USDA Standard, %	4	6	3	3	3	2.1
Liver abscess, %	7.0	2.7	2.5	8.0	6.6	2.3

[a]MC=MicroCell (*Lactobacillus acidophilus* BG2FO4); MC PB=MicroCell PB (*Propionibacterium freudenreichii* P-63).

[b]Different from control (P<.10).