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EFFECTS OF GAINPRO (BAMBERMYCINS) AND AMAFERM (ASPERGILLUS ORYZAE) FED TO GROWING HEIFER CALVES IN NORTH DAKOTA

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RESEARCH SUMMARY

Eighty-four Charolais crossbred heifers (571.4 ± 5.4 lb) were used to determine the effects of bambermycins (Gainpro) and Aspergillus oryzae (Amaferm) on calf performance when fed in high forage grower diets. Heifers were fed in 12 pens for 84 days at the Dickinson Research and Extension Center, Manning Ranch, from December 6, 1994, to March 1, 1995. Assigned treatment combinations were as follows: 1) no bambermycins + no Aspergillus oryzae (CONT); 2) 20 milligrams/head/day of bambermycins (GAIN); 3) 2 grams/head/day Aspergillus oryzae (AMA); or 4) AMA + GAIN (AMAGAIN). Treatments were formulated and delivered in a protein supplement comprised of soybean oil meal and sunflower meal fed daily (.86 lb/hd). Heifers were fed a corn-silage and oat hay based growing ration (63% of diet, DM basis) formulated for 2 lb ADG. An interaction between treatments for heifer DM intake was detected (P =.03). This can be interpreted to mean that intake responses due to Amaferm depended if the heifers received, or did not receive Gainpro. There were no treatment interactions (P >.30) for heifer performance measurements. Total ADG was improved (P <.02) by 5.1% for Amaferm and 6.0% for Gainpro compared to heifers that did not receive these feed additives. Feed efficiency was also improved by 6.0% for Amaferm and 6.2% for Gainpro (P <.03) fed heifers. Heifers that were fed both feed additives had higher daily gains and were the most efficient in feed conversion (P <.10) when compared to all other treatment combinations. Results indicate that both Amaferm and Gainpro have a positive effect on heifer growth when fed with high forage-based growing diets. When both feed additives were combined, heifer gain and feed conversions were further increased.

Performance benefits in the current study would have easily paid for the feed additives and increased producer returns. Dietary additions of Direct Fed Microbials in conjunction with ionophores or antibiotics may warrant further investigations for improving calf performance and economic returns to feedlot cattle.

INTRODUCTION

Many types of feed additives exist from which producers can choose. Feed additives for growing cattle can assist producers by improving feed efficiency, calf performance and maintaining calf health. Bambermycins (Gainpro, Hoechst Roussel) has recently received FDA approval for increased rate of weight gain and improved feed efficiency in confined feedlot cattle and increased daily gain in pasture cattle. Although Gainpro is classified as an antibiotic and not an ionophore (such as Rumensin or Bovatec), it competes directly with these products. Hoechst Roussel has been targeting the use of Gainpro with high fiber diets typical of grazing stock cattle and backgrounding programs that contain low levels of grain. The latter example can often be found on North Dakota ranches during the fall and winter months. Recent data indicated a growth response to Gainpro when compared to ionophores supplemented to grazing stock steers (Keith et al, 1995).

Direct Fed Microbials (DFM) is a name given to a class of feed additives by the FDA in 1989, that contain a source of live (viable) naturally occurring microorganisms. This definition includes bacteria, fungi and yeasts. Although FDA has classified these products, they do not currently regulate their use. Commercial products available to producers at the present time will fall into both viable and non-viable categories. Aspergillus oryzae (Amaferm, Biozyme, Inc.) is a fermentation extract produced from a selected strain of enzyme-producing aspergillus. Responses observed when feeding DFM's have been variable and therefore, scientists have found it difficult to prove how they work. Primary actions of DFM's are proposed to be: Minimizing the growth of pathogenic bacteria; Increasing desirable microbial populations in the gut; Facilitating fiber digestion; and Inactivating toxins.

Much of the prior work with DFM's has focused on improving milk production in dairy cattle. Fewer studies have investigated the effects of DFM's when used in grower diets and in particular, when fed in combination with an ionophore. Diamond V Mills Inc. (Personal Communication) reported positive responses in feedlot cattle when DFM's were fed in combination with an ionophore (Laidlomycin propionate; Cattlyst).

The objectives of this study were to evaluate the effects of bambermycin (Gainpro) and Aspergillus oryzae (Amaferm) in growing diets fed to weaned heifer calves in North Dakota.

MATERIALS AND METHODS

Eighty-four Charolais crossbred heifers, arranged in 2 X 2 treatment factorial, were used in a randomized complete block design to determine the effects of bambermycins and Aspergillus oryzae fed in high roughage grower diets. The experiment was conducted at the Dickinson Research and Extension Center, Manning Ranch, from December 6, 1994, to March 1, 1995. Heifers were stratified by body weight across 12 pens (7 calves/pen) and pens randomly assigned to treatment within one of three blocked locations in the feedyard. Heifers were assigned to receive one of the following treatments: 1) no bambermycins + no Aspergillus oryzae (CONT); 2) 20 milligrams/head/day of bambermycins (GAIN); 3) 2 grams/head/day Aspergillus oryzae (AMA); or 4) AMA + GAIN (AMAGAIN). Treatments were formulated and delivered in a protein supplement comprised of soybean meal and sunflower meal fed daily (.86 lb/hd). Heifers were fed a corn-silage and oat hay based growing ration (63% of diet, DM basis) formulated for 2 lb ADG. Assay results from Barrow-Agee Laboratories, Inc., Memphis, Tennessee, confirmed bambermycins concentrations of 25.47 and 16.70 milligrams/lb for GAIN and AMAGAIN supplements, respectively. Feed nutrient compositions are given in Table 1. Diet formulations and nutrient compositions are reported in Table 2. Approximately 4 wk prior to weaning, and again at weaning, heifers were vaccinated for IBR, BVD, BRSV and PI_3. Heifers were also treated for internal parasites with fenbendazole (Safe-Guard) according to label directions at the beginning of the experiment. Experimental protocol was approved by the NDSU Animal Care and Use Committee.

Heifer body weight measurements were collected on day -1, 0, 29, 56, 84 and 85 of the experiment. Initial and ending weights used for analyses were derived from the average of two 12 hour shrunk weights collected at the same time of the day, on two successive days. Feed intake was measured on a pen-basis and used to calculate feed efficiency. All heifers remained in good health throughout the study with no observed incidence of morbidity.

Pen was used as the experimental unit for data analyses. Treatment effects and their interactions were tested by analysis of variance using general linear models of SAS (1989). Analysis of covariance (SAS, 1989) with initial heifer weight as a covariate was used to test for the following variables: final weight, weight gain from day 0 to day 28, day 29 to day 56 and day 57 to day 84, ADG, and total weight gain.

RESULTS AND DISCUSSION

There were no differences (P >.38) in initial body weight (571.4 ± 5.4 lb) at the start of the study for heifers assigned to Amaferm or Gainpro treatments. Furthermore, there were no treatment interactions (P >.30) for heifer performance measurements, although an Amaferm x Gainpro interaction was found for DM intake (P =.03; Table 3). When Amaferm or Gainpro were fed alone, DM intake was similar (P >.16) to control heifers. However, DM intake was lower (P <.05) when Amaferm and Gainpro were fed together compared to either Amaferm or Gainpro fed alone (Table 3).

No Amaferm x Gainpro interactions were noted in gain and efficiency. Therefore, main effects of either Amaferm or Gainpro are presented in Table 4. In the first 28 days heifers fed Amaferm had greater (P <.03; Table 4) weight gains than controls. However, during the next 28 day period these control heifers compensated, and gained more weight (P <.09; Table 4) than heifers fed Amaferm. This may partially be explained by differences in gut fill early in the experiment resulting from more variable intakes. Corn silage dry matter was also noted to be more variable early in the study. Moreover, interim weights were single day measurements which are much more variable than consecutive day weighing.

Total ADG was improved (P <.02; Table 4) for both Amaferm (5.1%) and Gainpro (6.0%) compared to control heifers. Feed efficiency was improved by 6.0% for Amaferm and 6.2% for Gainpro (P <.03) fed heifers compared to controls.

There were clearly additive effects when Gainpro and Amaferm were fed together for both ADG (Figure 1) and feed efficiency (Figure 2). Figures 1 and 2 presents all of the various treatment combinations (CONT, AMA, GAIN and AMAGAIN) and their effects on total ADG and feed efficiency, respectively. When heifers were fed both feed additives they had significantly higher daily gains and were the most efficient in feed conversion (P <.10) of all treatments. Numeric ranking of the data indicates that CONT heifers were the lowest in ADG and poorest in feed efficiency, with AMA and GAIN intermediate to the significantly higher performing AMAGAIN fed heifers. These data indicate that there were synergistic effects between the two feed additives and that they may be acting positively on separate digestive or metabolic functions to improve gains and feed conversions. Approximate cost of Gainpro additions to a supplement would be $.015 and Amaferm $.02 per daily animal dosage. Performance benefits in the

current study would have easily paid for the feed additives and increased returns to the producer.

From these research results, it appears that both Amaferm and Gainpro have a positive effect on heifer growth when fed high forage-based growing diets. When both feed additives were combined, gain responses were further increased in addition to improved feed efficiencies. Additions of DFM's with ionophores or antibiotics may warrant further investigations for improving calf performance and economic returns to feedlot cattle.

LITERATURE CITED

Keith, E. A., D. B. Faulkner, I. G. Rush, F. T. McCollum, W. A. Phillips, M. I. Wray, and N. K. Keith. 1995. Comparison of bambermycins, monensin, lasalocid and control diets for stocker cattle grazing summer pasture. J. Anim. Sci. 73(Suppl. 1):236.

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Table 1. Nutrient composition of feeds (DM basis) used in experimental diets evaluating Amaferm and Gainpro.

	DM	CP	ADF	Ca	P	NEg
	%					Mcal/lb
Corn Silage	50.0	7.80	24.90	.09	.20	.47
Barley	91.3	12.80	6.49	.08	.30	.64
Oat Hay	89.1	10.25	30.94	.32	.19	.40
Protein Supplement[a]	88.6	42.31	15.26	.30	.89	.53
Mineral/Vitamin Premix[b]	----	----	----	23.50	6.10	----

[a] Supplements (n = 4) were formulated to contain: no bambermycins + no Aspergillus oryzae (CONT), bambermycins (20 mg/hd/d; GAIN), Aspergillus oryzae (2 g/hd/d; AMA) or GAIN + AMA

(AMAGAIN).

[b] Mineral/Vitamin Premix contained: 350,000 IU/lb Vitamin A, 20,000 IU/lb Vitamin D, 50 IU/lb Vitamin E, 270 ppm Cu, 18 ppm Se and 720 ppm Zn.

Table 2. Ration formulations and nutrient analysis (DM basis) of heifers fed Amaferm or Gainpro.

	CONT	AMA	GAIN	AMAGAIN
Corn Silage, %	38.43	37.90	38.52	38.29
Oat Hay, %	24.48	24.89	25.17	24.71
Barley, %	30.53	30.80	29.98	30.56
Protein Supplement, %	5.55	5.47	5.40	5.50
Mineral/Vitamin, %	.69	.63	.61	.63
Trace Mineral Salt, %	.32	.32	.32	.32
DM Intake, lb	15.81	15.78	15.95	15.56
Nutrient Composition				
Crude Protein, %	11.76	11.76	11.71	11.76
Calcium, %	.32	.30	.30	.30
Phosphorus, %	.31	.30	.30	.30
NEg, Mcal/lb	.50	.50	.51	.50

Table 3. Amaferm x Gainpro interaction (P = .03) effects on DM intake for beef heifers fed forage based diets[a].

	Gainpro	
Lbs.	Control	Gainpro
Amaferm		
Control	15.81[b]	15.95[b]
Amaferm	15.78[b]	15.56[c]

[a] SE = .063, n = 3.

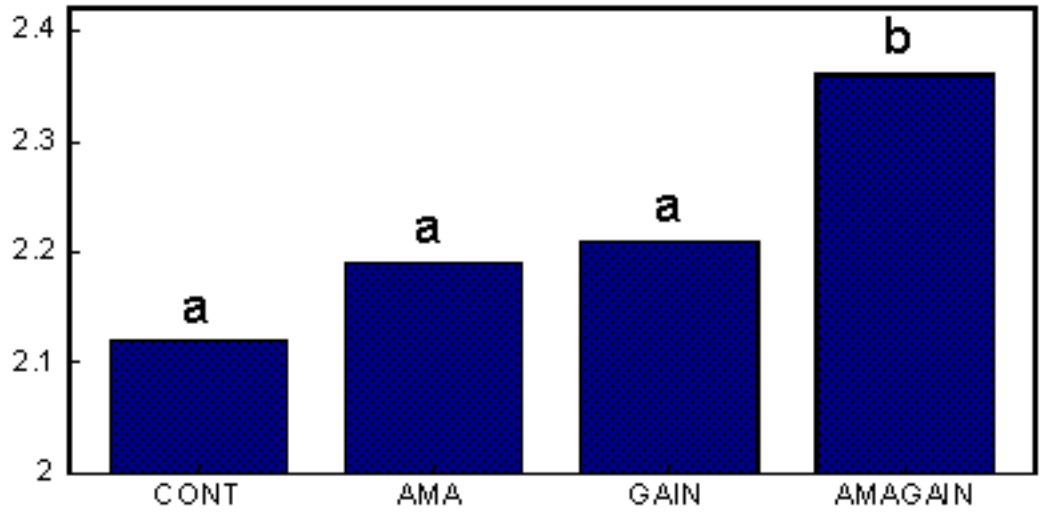
[b, c] Row and column means with uncommon superscripts differ (P<.05).

Table 4. Influence of Amaferm and Gainpro on gain (lbs) and feed efficiency of heifers fed forage based diets.

	Amaferm		Gainpro		
Item	Control	Amaferm	Control	Gainpro	SE
Ending Wt	753.00[a]	762.00[b]	752.00[a]	763.00[b]	1.93
Gain, day 0-28	70.00[a]	92.00[b]	78.00	85.00	5.28
Gain, day 29-56	59.70[a]	42.70[b]	51.80	50.50	5.80

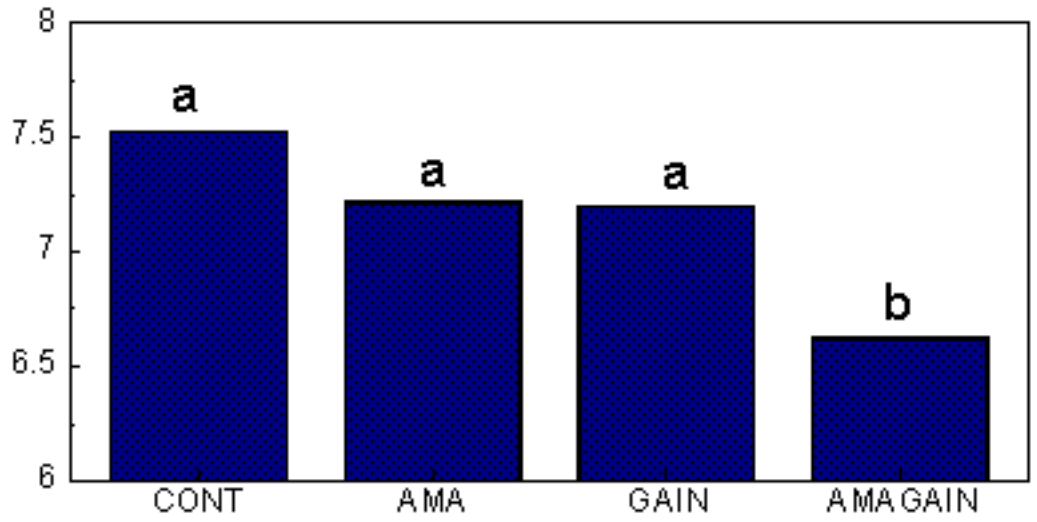
Gain, day 57-84	52.00	56.00	51.70	56.30	2.20
Total Gain	182.00[a]	191.00[b]	181.00[a]	192.00[b]	1.93
Total ADG	2.16[a]	2.27[b]	2.15[a]	2.28[b]	.023
Feed efficiency, lb/gain	7.36[a]	6.92[b]	7.37[a]	6.91[b]	.102
[a, b] Row means within Amaferm or Gainpro having differing superscripts differ (P<.10).					

Figure 1. Effects of Gainpro and Amaferm on beef heifer average daily gain (lbs).



Bars with unlike letters differ (P <.10)

Figure 2. Effects of Gainpro and Amaferm on beef heifer feed efficiency.



Bars with unlike letters differ (P < .10)

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