FEEDLOT
RESEARCH
GROUP

23 December 2008

FINAL REPORT TO: MORINDA AGRICULTURE

A B S T R A C T

Effects of MorindaMax on growth performance and health of high-risk calves [1]

Authored by:

Michael Brown

Bill Coufal

Justin Spradley

Casey Maxwell

Christian Ponce

Justin Wallace

Crossbred male calves (n = 139, initial weight = 490 lb) were purchased at auction barns in the Southeast US and used in a 45-day receiving study to evaluate the influence of a product containing *Morinda citrifolia* extract (MorindaMax, Morinda Agriculture) on growth performance and health. Treatments included a basal 65% concentrate diet supplemented with a top dress of 0 or 25 g of MorindaMax/100 lb of BW from days 1 through 10 and days 28 through 32. Calves fed MorindaMax during the first 28 days consumed more feed (P = 0.01; 10.2%) and gained weight more rapidly (P=0.09; 22.9%) than calves fed the control treatment, but feed efficiency did not differ (P = 0.32). The improvement in performance was associated with a tendency (P = 0.14) for fewer calves to be treated at least once for respiratory disease during that time. Overall DMI was also greater (P = 0.03; 6.1%) for calves fed MorindaMax than for calves fed the control treatment. However, overall ADG and feed efficiency were not influenced by treatment (P > 0.31). Over the entire trial, the number of calves treated once and the total number treated for respiratory disease did not differ (P > 0.66) among treatments. Feeding MorindaMax tended (P = 0.17) to reduce mortality over the entire trial, perhaps due to the numeric reduction in the number of cattle retreated for respiratory disease. MorindaMax fed at 25 g/100 lb of BW for days 1 through 10 and days 28 through 32 increased feed intake and tended to reduce death loss in high-risk calves.

---

[1]The authors gratefully acknowledge assistance with animal care provided by J. Johnson, J. Hodgekinson, K. Hutto, C. Whitfield, and E. Davis. Appreciation is expressed to MicroBeef Technologies, Agri-Chem, Inc., and Ferrell-Ross for providing feedmill equipment, and to Intervet for supplying vaccine and anthelmintic.

West Texas A&M University
Department of Agricultural Sciences
WTAMU Box 60998
Canyon, Texas 79016
(806) 651-2564
http://www.wtamu.edu/research/feedlot/

Introduction

Respiratory disease has long been the primary health challenge for feedlot cattle. Data from the NAHMS (1999) survey suggest that approximately 15% of all cattle placed were treated for respiratory disease at a cost of approximately $13/animal treated. Since that time, a number of long-acting antimicrobials have become commercially available and have seen widespread use because of efficacy and labor savings. Developing technologies that further reduce the incidence of clinical respiratory disease and associated direct and indirect costs are needed.

Previous data (Yancey et al., 2008) suggest that the pulp from the *Morinda citrifolia* tree may increase ADG and/or improve feed efficiency by individually-fed beef cattle through a reduction in immune system stimulation. The objective of this pilot study was to assess the influence of MorindaMax on growth performance and health of high-risk calves.

Materials and Methods

General. Cattle were purchased from auction barns in the Southeast U.S. and were transported 905 miles from the order buyer facility in West Point, MS. The first load of 96 calves arrived on the afternoon of 17 October and the remaining 43 calves arrived the following morning. Calves experienced a shrink of 6.1% from a pay weight of 522 lb. Each shipment of cattle was processed on the day of arrival before access to feed or water.

Cattle processing included metaphylaxis with Excede (1.5 mL/cwt), castration by knife (91% bulls on arrival), individual identification, weighing, vaccination against IBR, PI3, BRSV, and BVD type I and II (Vista Once), vaccination against clostridial toxoids (Vision 7), and treatment for internal and external parasites (Ivomec Plus and Safeguard). Castrated bulls and calves arriving as steers were segregated after processing. Steers were randomized to study pens by allocating one steer at a time to study pens; then castrated bulls were randomized by allocating two to three animals to each study pen until all cattle were assigned and steer and castrated bulls were balanced equally across treatments. Calves were revaccinated with Vista 3 the morning of 27 October 2008 (day 11 for 96 animals and day 10 for 43 animals).

Calves were housed in 10 pens containing 13 to 14 animals each. Pens were soil-surfaced (20 ft x 90 ft), contained a concrete fenceline bunk (10 ft/pen), and were equipped with one automatic water tank each. Water tanks were cleaned each week throughout the study.

Treatments and diets. Treatments were randomized to pens before cattle arrived. Treatments included 0 or 25 g of MorindaMax/100 lb of live weight for days 1 through 10 (17 to 26 October) and days 28 through 32 (14 to 18 November). A common 65% concentrate diet (Table 1) was fed to all cattle throughout the study.

Treatment material was applied as a top-dress immediately after feed delivery. Diets were prepared and delivered twice daily at 0800 and 1400 using a stationary paddle mixer (Model No. 84-8; Roto-Mix, Inc., Dodge City, KS) and supplements (meal form) were manufactured as needed using a stationary ribbon mixer (Model No.

S-3; H.C. Davis Sons Manufacturing Co., Bonner Springs, KS).

Steam-flaked corn was prepared approximately once/week. Corn was tempered to 18% moisture for at least 18 hours and was steamed for approximately 35 minutes before flaking to 27 lb/bu.

Dry matter of steam-flaked corn was determined 5 days/week and dry matter content of remaining ingredients was determined once/week. Samples of the basal diet were collected weekly from the bunk after feed delivery; samples were ground (2-mm screen) and composited gravimetrically over the entire study. Composite diet samples were assayed in duplicate for CP by combustion, non-protein nitrogen, neutral detergent fiber, acid detergent fiber, ether extract, and minerals by a commercial laboratory.

Diet as-fed composition was established at the beginning of the study and updated as needed. The weighted average as-fed composition during the study and weekly ingredient dry matter content were used to calculate actual diet composition on a dry matter basis at the end of the study.

Bunks were managed to contain a small amount of refused feed (5 lb/pen) each morning during the first 28 days, and to contain traces of feed (0.25 lb/pen) each morning thereafter. Bunks were cleaned as needed depending on inclement weather. Any refused feed collected during bunk cleaning was weighed, dry matter determined, and the dry quantity deducted from dry matter delivered.

Cattle management. All body weight measurements were acquired using a single-animal scale. The scale was validated before each use using 20 certified weights (50 lb each) and calibrated when the actual weight reading was > 0.5% above or below the certified weight.

Cattle health was visually evaluated twice daily for approximately 14 days and once daily thereafter for symptoms of bovine respiratory disease (anorexia, ocular and nasal discharge, lethargy) and other ailments. Cattle deemed unhealthy were pulled for further examination. Antibiotic treatment was given if rectal temperature exceeded approximately 103.5°F, and cattle were returned to home pen.

Antibiotic selection was under the advisement of a licensed veterinarian. The first course of therapy for respiratory disease included Baytril (Bayer Animal Health). If an animal was diagnosed with respiratory disease a second time, Nuflor (Schering-Plough Animal Health) was administered. Oxytetracycline was administered if an animal was diagnosed with respiratory disease on a third occasion. Cattle were not allowed to be treated more than the maximum of three treatments for respiratory disease. Cattle determined to be noncompetitive (marked weight loss in the absence of BRD) or experiencing chronic health problems were removed from the study.

Data analyses. Feedlot performance (ADG, DMI, DMI:ADG) data were analyzed as a completely randomized design with GLM procedures (SAS Inst., Cary, NC) using pen as the experimental unit. Morbidity data were analyzed using Glimmix procedures.

Results

Diet composition (Table 1) reflects the weighted average ration composition over the entire study. Diet CP content was lower than desired (target was 14% CP), and seemed to be attributable to a lower average CP in both corn gluten feed and grass hay than initially measured.

One pen (number 3, treatment = control) was omitted from the analysis for growth performance. Feed intake for this pen was dramatically decreased approximately 7 days before final animal weights were determined. Although 2 animals were treated for respiratory disease near that time (one on 11/17 and one on 11/23), we also experienced problems in

keeping the water tank free of ice formation in that pen during that time and cannot be certain that water availability was not a contributing factor to reduced feed intake. Feed intake for this pen had not returned to the previous plateau before cattle were weighed, and it is suspected that reduced fill had a substantial impact on final weight.

Overall DMI, ADG, and feed efficiency when pen 3 was included in the analysis for control and MorindaMax, respectively, were 12.46 and 13.62 $\pm$ 0.32 lb/day (P=0.03), 1.99 and 2.41 $\pm$ 0.22 lb/day (P=0.23), and 7.33 and 5.66 $\pm$ 1.23 (P=0.36). Remaining growth performance data presented include pen 3 through 28 days only.

Calves fed MorindaMax during the first 28 days (Table 2) consumed more feed (P = 0.01; 10.2%) and gained weight more rapidly (P=0.09; 22.9%) than calves fed the control treatment, but feed efficiency did not differ (P = 0.32). The improvement in performance was associated with a tendency (P = 0.14) for fewer calves to be treated for respiratory disease (Table 2).

Overall DMI was also greater (P = 0.03; 6.1%) for calves fed MorindaMax than for calves fed the control treatment. However, overall ADG and feed efficiency were not influenced by treatment (P > 0.31). Over the entire trial, the number of calves treated once and the total number treated for respiratory disease did not differ (P > 0.66) among treatments. Feeding MorindaMax tended (P = 0.17) to reduce mortality over the entire trial, perhaps due to the numeric reduction in the number of cattle retreated for respiratory disease.

Conclusions

MorindaMax fed at 25 g/100 lb of BW for days 1 through 10 and days 28 through 32 increased feed intake and tended to reduce death loss in high-risk calves.

Literature Cited

Yancey, J., W. S., J. K. Apple, and E. B. Kegley. 2008. Effects of Morinda citrifolia (Noni) pulp on growth performance and stress responses of growing cattle. A final report to Tahitian Noni Corporation.

Table 1. Ingredient and chemical composition of the diet fed

Item	Diet concentration
Ingredient composition	
Steam-flaked corn, % of DM	30.16
Dry supplement, % of DM[a]	2.97
Steep:molasses (70:30), % of DM	4.18
Dry corn gluten feed	30.66
Yellow grease, % of DM	1.98
Grass hay, % of DM	30.05
Chemical composition[b]	
CP, % of diet DM	12.5
NPN, % of DM	1.9
ADF, % of DM	19.9
NDF, % of DM	34.3
Ether extract, % of DM	5.0
NEm, Mcal/lb	0.80
NEg, Mcal/lb	0.52
K, % of diet DM	1.12
Ca, % of diet DM	0.71
P, % of DM	0.45
Mg, % of DM	0.26
S, % of DM	0.25
Na, % of DM	0.24
Cu, ppm	34
Fe, ppm	235
Mn, ppm	85
Zn, ppm	124

[a]Formulated to contain (DM basis): 16.67% urea, 58.82% limestone, 10.0% KCl, 2.96% MgO, 6.91% salt, 0.0029% cobalt carbonate, 0.2619% copper sulfate, 0.0763% iron sulfate, 0.0042% EDDI, 0.3443% MnO, 0.50% selenium premix (0.2% Se), 0.9684% $ZnSO_4$, 0.50% vitamin A (30 IU/mg), 0.60% vitamin E (500 IU/g), 0.375% Rumensin 80, and 1% mineral oil.

[b]All values except NEm and NEg were determined analytically from composite diet samples collected weekly from the bunk.

Table 2. Effect of MorindaMax on growth performance and health of calves

Item	Treatment[a]		SE[b]	P-value
	Control	MorindaMax		
Pens	5	5	-	-
Animals enrolled	69	70	-	-
Days on feed	45	45	-	-
Initial weight, lb	492	487	6.6	-
Final shrunk weight, lb[c]	595	596	8.3	-
				-
Day 1 to 28				
Dry matter intake, lb/d	10.60	11.68	0.22	0.01
Daily gain, lb/d	1.88	2.31	0.16	0.09
Feed efficiency	5.76	5.17	0.39	0.32
Day 1 to 45				
Dry matter intake, lb/d	12.84	13.62	0.21	0.03
Daily gain, lb/d	2.30	2.41	0.08	0.32
Feed efficiency	5.61	5.66	0.20	0.86
Health status, day 1 to 28[d]				
One treatment, % of pen	16.1	10.0	-	0.33
Retreatments, % of one treatment	35.0	0	-	0.97
Total treated, % of pen	20.5	10.0	-	0.14
Mortality, % of pen	5.8	0	-	0.98
Health status, day 1 to 45[d]				
One treatment, % of pen	21.9	21.4	-	0.95
Retreatments, % of one treatment	35.0	4.0	-	0.33
Total treated, % of pen	26.3	22.8	-	0.67
Mortality, % of pen	7.4	1.4	-	0.17

[a]Control = basal diet only, MorindaMax = 25 g of product/100 lb BW from days 1 through 10 and days 28 through 32.
[b]Standard error of the least squares mean, n = 4 or 5.
[c]A 4% pencil shrink was applied to live weight.
[d]Morbidity data reflect only respiratory disease. Mortality data reflect death from any cause because a post-mortem examination was not conducted on dead cattle.