

Effects of *Morinda citrifolia* on Growth Performance and Health of High-Risk Calves

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Introduction

Bovine respiratory disease continues to be the most costly disease affecting productivity and profitability in the stocker segment. Long-acting injectable antimicrobials are presently used to reduce the incidence and severity of bovine respiratory disease. However, future use of antimicrobial treatment may be significantly curtailed in light of an increasing negative perception of antibiotic usage in food animals by consumers and governmental agencies. Consequently, preconditioning and enhanced nutrition programs that may include nutraceuticals could become more prevalent. MorindaMax (Morinda International, Provo, UT) is a natural product manufactured from the *Morinda citrifolia* fruit (i.e., Noni). Published literature suggests this plant extract has a broad range of immune-enhancing effects, including antibacterial, anti-inflammatory, analgesic, antioxidant, and anti-tumor effects.

Experimental Procedures

A 42-day receiving study was conducted at the Kansas State University Beef Stocker Unit during March 2009 to evaluate dry matter intake and health parameters of high-risk stocker calves receiving *Morinda citrifolia*. All cattle were sourced from an order buyer in Tennessee, and cattle were received over 3 consecutive days (one load per day). Upon arrival, all calves were weighed, tagged, mass medicated with Excede (Pfizer Animal Health, New York, NY) at 1.5 mL/100 lb body weight and palpated for gender (bull or steer). Calves were then given ad libitum access to long-stem prairie hay and water overnight. The following day, calves were vaccinated against clostridial and respiratory diseases and dewormed, and bulls were surgically castrated. Each load was blocked by arrival date and randomly assigned to one of three treatments for a total of 24 pens. Castrated bulls were equally distributed among the eight pens within each load. Cattle were weighed and revaccinated 14 days after initial processing and weighed again following the 42-day feeding period. Calves were stepped up using three sequential growing diets ranging from 29% to 36.5% concentrate. Diets were fed twice daily, and one of the following treatments was top-dressed on the delivered feed for 10 days starting on day 2 after arrival: water at 4 oz/head per day (control), MorindaMax at 2 oz/head per day (low), or MorindaMax at 4 oz/head per day (high).

Cattle were observed daily for symptoms of bovine respiratory disease and injury (scrotal infections, lameness, etc.) by personnel blinded to treatments. Following a moratorium of 3 days post-metaphylaxis, calves were pulled and treated for respiratory disease as needed. Calves determined to need treatment were given Baytril (Bayer Animal Health, Shawnee Mission, KS) at 5 mL/100 lb body weight as a first treatment, Nuflor (Intervet/Schering-Plough Animal Health, Millsboro, DE) at 6 mL/100 lb body weight as a second treatment, and Bio-Mycin 200 (Boehringer Ingelheim, Ridgefield, CT) at 4.5 mL/100 lb body weight as a third treatment, if needed.

Bunks were checked twice daily, and feed was delivered in amounts sufficient to result in slick bunks both morning and afternoon. Calves were fed their respective diets at approximately 7:00 a.m. and 3:00 p.m. daily for 55 days.

Daily dry matter intake, gains, and feed efficiencies were determined for each pen of calves. Health records were used to determine the number of animals treated and percentage of death loss.

Performance and health data were analyzed by using the random effects MIXED model procedure of SAS (SAS Institute, Inc., Cary, NC). Data were arranged in a randomized incomplete block design; pen served as the experimental unit for growth and health outcomes as affected by treatment. In the model, fixed effects were treatment, load, and gender, and random effects were load × treatment, pen, and animal ID. Percentages of bovine respiratory disease morbidity and mortality were tested by using the Chi Square test, and differences were declared significant at $P < 0.05$.

Results and Discussion

Performance and health results are presented in Table 1. Overall, all cattle performed exceedingly well, and there was little to no health challenge from bovine respiratory disease. There were no significant differences between treatments in the percentage of steers treated once, twice, or three times for bovine respiratory disease ($P > 0.05$). There were no significant differences in daily gain ($P = 0.81$), daily dry matter intake ($P = 0.34$), or feed efficiency ($P = 0.80$) between the three treatments. Although there was a slight numerical increase in daily feed intake for MorindaMax treatment groups (low and high) relative to the control treatment, there were only subtle numerical differences in average daily gain and feed efficiency between the three treatment groups.

Implications

The low level of bovine respiratory disease (as revealed by morbidity and mortality rates) was likely not sufficient to adequately test this feed additive.

Table 1. Effect of MorindaMax on growth performance and health of calves

Item	Control ¹	Low	High	SEM ²	P-value
Pens	8	8	8	---	---
Animals on trial	92	94	94	---	---
Days on feed	42	42	42	---	---
Initial weight, lb	488	486	486	---	---
Final shrunk weight, lb	617	610	614	---	---
Day 1 to 13					
Dry matter intake, lb/day	10.3	10.2	10.5	0.29	0.56
Daily gain, lb/day	3.11	3.12	3.23	0.14	0.81
Feed efficiency	3.21	3.22	3.12	0.13	0.86
Day 1 to 27					
Dry matter intake, lb/day	13.2	13.2	13.6	0.29	0.48
Daily gain, lb/day	3.35	3.35	3.43	0.14	0.79
Feed efficiency	3.78	3.79	3.79	0.12	0.99
Day 1 to 42					
Dry matter intake, lb/day	15.2	15.0	15.7	0.32	0.34
Daily gain, lb/day	3.52	3.39	3.48	0.14	0.81
Feed efficiency	4.18	4.26	4.25	0.10	0.80
Health status					
Morbidity by treatment group, % of experimental treatment ³					
First treatment, %	10.64	12.77	8.51	---	0.68
Second treatment, %	3.19	8.51	3.19	---	0.19
Third treatment, %	1.06	3.19	0	---	0.33
Miscellaneous morbidity, % of experimental treatment	5.32	3.19	2.13	---	0.62
Miscellaneous morbidity, retreatment, %	0	2.13	0	---	0.33
Mortality, %	0	0	0	---	---

¹ Control, basal diet with 4 oz water per day applied for each animal; Low, MorindaMax at 2 oz/head per day top-dressed on feed; High, MorindaMax at 4 oz/head per day top-dressed on feed. All treatments applied on days 1 to 10.

² Standard errors of the least squares mean, n = 11 or 12.

³ Morbidity data reflect respiratory data only. Miscellaneous morbidity data reflects infected scrotums, pink eye, skeletal problems, or any other medical issue needing treatment. No mortality was observed.