Magni-Phi® in High Disease Challenge Environments: 2. Effects on Carcass Yield

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Abstract

A series of four floor pen trials was carried out to determine the effects of Magni-Phi® (MP) in high disease challenge environments. In each trial, used litter from farms known to have had outbreaks of necrotic enteritis and difficulties with *Salmonella* was utilized. Additions of coccidial oocysts at the start of each test increased the challenge. MP was included in feed at 0, 250 or 500 ppm and fed throughout the duration of the 42-day tests. At 42 days of age, performance, total mortality and carcass traits were determined. Results indicated that MP produced significant linear improvements ($P < 0.001$) in performance and mortality throughout the trial period. Pooled results of carcass evaluations demonstrated that birds fed MP produced significant linear improvements in carcass yield, percent breast yield and breast yield as a percent of hot carcass weight ($P < 0.001$). Because these data are consistent with previously reported improvements in nutrient digestibility following MP feeding, carcass yield responses may result from a healthier intestinal tract, since lower levels of coccidia, *Salmonella* and *Clostridium* were reported in prior studies.

Introduction

Previous work (1 – 5) has shown that saponins derived from yucca plants (*Yucca schidigera*) and quillaja trees (*Quillaja saponaria*) can be used to potentiate the anticoccidial properties of existing anticoccidials. As broiler producers have moved to the antibiotic free (ABF) and no antibiotics ever (NAE) environments, the unique combination of yucca and quillaja found in Magni-Phi has played a significant role in the maintenance that is needed in these challenging environments. Because field reports often indicate that birds fed MP exhibit improved intestinal health, which may lead to reduced mortality in high disease challenge situations, further investigation into the intestinal effects of MP was necessary. Consequently, the purpose of studies reported herein was to examine the effects of feeding MP in high challenge situations. The first segment of these trials, reported previously (5) focused on intestinal health by evaluating coccidial lesions, incidence of *Salmonella* and determining *Clostridium perfringens* counts in the lower intestinal tract. The current report addresses the effects of feeding MP to birds on 42-day carcass characteristics.

Materials and Methods

Methods employed were detailed in a previous trial summary (5: *Magni-Phi in High Disease Challenge Environments: 1. Alteration of Selected Bacterial Populations*). Briefly, four floor pen studies were conducted in a high disease challenge environment employing used litter supplemented with commercial litter known to contain *Clostridium perfringens* and a variety of *Salmonella* serotypes (*Enteritidis*, *Typhimurium*, *Kentucky*, *Indiana* and *Heidelberg*). Prior to the start of each trial, additional coccidial oocysts (primarily *Eimeria acervulina* and *E. maxima*) were added to each pen. All birds in all trials were vaccinated for coccidiosis with Coccivac B52®.

There were two objectives established for these trials: First, to determine the effects of feeding birds MP on selected bacterial pathogens (results in reference 5) and second, to establish whether carcass traits were influenced by feeding MP. Trials were conducted using increasing levels of MP (0, 250 or 500 ppm), and as described previously, bacterial pathogens and carcass traits were evaluated. The rationale for measuring carcass variables was based on results of previous studies demonstrating that feeding MP reduced intestinal disease challenge and improved gut health at 42-days. Coupled with other trial results that indicated improved nutrient digestibility during MP feeding, we hypothesized that feeding MP could positively influence carcass parameters over a 42-day growth period. Each MP treatment (0, 250 and 500 ppm) was replicated at least 10 times in each trial, and a total of 50 replicates of each treatment were compiled in the pooled data analysis. At the outset of each test, pens contained 55 Cobb 500 broilers.

Performance data were collected at 42 days of age; at the conclusion of each trial (day 42), 10 average birds per pen were selected for carcass evaluations. Whole carcass yield (%), percent breast yield and breast yield as a percent of hot carcass weight were considered primary response criteria in the four-trial analysis.

Data Analysis

For all variables, the pen mean was considered the observational unit. Data presented herein represent the pooled results of four trials. All data were analyzed by Analysis of Variance (ANOVA) procedures and the linear effects of MP feeding rates were determined for each variable. For all pooled data, treatment means were separated by Tukey's HSD, where $P < 0.05$ was considered significant.

Results and Discussion

As shown in Table 1, feeding MP for 42-days produced significant improvements in both BWG and FCR. In each case, the pooled results of these studies demonstrated significant ($P < 0.001$) linear improvements in these performance criteria. Significant linear reductions in mortality were also observed ($P < 0.001$).

Table 2 illustrates the effects of feeding MP when carcass characteristics were evaluated. Birds fed MP showed improved carcass yield, percent breast yield and breast yield as a percent of body weight with each increase in level (linear effect $P < 0.001$ in each case).

Prior work has illustrated the effects of MP feeding on the health status of the broiler intestinal tract. Bafundo et al. (1 – 5) demonstrated that, when fed to birds, the saponins in MP helped reduce the effects of coccidial infection and these reports indicated that a 40 to 60% reduction in numbers of fecal oocysts occurred following a mixed species *Eimeria* challenge. These test responses are generally indicative of the effects seen by feeding MP in commercial environments and have contributed to broad product usage in ABF/NAE production. In addition, observations of lower field mortality have been made, and these suggest that feeding MP could affect intestinal bacteria. In fact, the first part of this project (*5*) confirmed that feeding MP helped reduce Clostridial numbers and the incidence of *Salmonella* positive broilers. More importantly, these bacterial changes occurred concurrently with lower levels of coccidial exposure; all were correlated with linear reductions in total mortality.

It seems reasonable to assume that in the presence of fewer pathogens, a healthier intestine would result. In turn, a healthier gut would likely allow nutrients to be absorbed more efficiently. In fact, recent studies, designed to assess nutrient digestibility during MP feeding indicate that 250 and 500 ppm MP in the diet improved apparent protein digestibility by 18 and 22%, respectively. Apparent fat and mineral digestibility were improved by similar percentages. Thus, the results of MP feeding suggest that improved digestibility occurs as a result of a healthier intestinal environment. These intestinal changes and enhanced nutrient utilization could be a plausible explanation for the improved carcass traits that were produced in these studies.

Literature Cited

(1) Bafundo, K.W., G.F. Mathis and B. Lumpkins. The effects of Nutrafito Plus and virginiamycin on the performance and anticoccidial responses of broilers vaccinated for coccidiosis. Poultry Sci. 93: (E-Suppl. 1) p. 41. 2014.

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(4) Bafundo, K.W., M. Blakley and G. F. Mathis. The Effects of Magni-Phi in Floor Pen- and Commercially-Raised Turkeys. International Poultry Scientific Forum, Atlanta, GA. 2018.

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Table 1. Forty-two day pooled performance and total mortality recorded for Cobb broilers fed graded levels of Magni-Phi in four floor pen trials.

	FCR (g:g)	BWG (kg)	Mortality (%) at 42 d
Magni-Phi (ppm)*			
0	1.920[a]	2.784[a]	10.5[a]
250	1.844[b]	2.881[b]	3.1[b]
500	1.810[c]	2.894[b]	2.2[b]

Results represent pooled data from four trials involving graded levels of Magni-Phi, where each treatment was replicated at least 10 times per trial. In total, 50 replications per treatment comprised the pooled analysis.
*Magni-Phi linear effect was significant ($P < 0.001$) for all variables presented. [a-c] Different superscripts in each column denote statistical differences ($P < 0.05$) determined by Tukey's HSD.

Table 2. Forty-two day pooled carcass characteristics for Cobb broilers fed graded levels of Magni-Phi in four floor pen trials.

	Percent Carcass Yield	Percent Breast Yield	Breast as Percent of Hot Carcass Weight
Magni-Phi (ppm)*			
0	67.3[a]	14.28[a]	21.3[a]
250	68.3[b]	15.07[b]	22.1[b]
500	69.5[c]	15.84[b]	22.8[b]

Results represent pooled data from four trials involving graded levels of Magni-Phi, where each treatment was replicated at least 10 times per trial. In total, 50 replications per treatment comprised the pooled analysis. At the termination of each trial, 10 birds per pen were selected for yield analyses.
*Magni-Phi linear effect was significant ($P < 0.001$) for all variables presented. [a-c] Different superscripts in each column denote statistical differences ($P < 0.05$) determined by Tukey's HSD.