2100 Maury Street • Des Moines, Iowa, USA 50317 • tel: 515.559.5100 • www.kemin.com

Improvement in Coccidiosis Vaccinated Broiler Performance with Tannic Acid Extract and *Bacillus coagulans*[1]

Abstract

The aim of the present study was to evaluate the effects of tannic acid extract (TAE) alone or in combination with a direct-fed microbial, *Bacillus coagulans* (TAE + BC), to positively impact the performance of coccidiosis vaccinated broilers. The trial measured vaccinated broiler performance from d0 through d49. On d21, TAE, ionophore and a chemical improved weight gain compared to untreated control. Improvement in feed conversion ratio (FCR) was observed with all the treatments compared to the vaccinated, untreated birds on d21 and d49. The results of the study indicate that TAE + BC and TAE were efficacious alternatives to positively impact the performance of coccidiosis vaccinated broilers.

Introduction

Coccidiosis, caused by the protozoan parasite Eimeria, is estimated to cause worldwide economic losses of over $11 billion in the poultry industry.[2] Of these losses, a significant portion is due to subclinical coccidiosis, which not only reduces broiler performance but can also predispose birds to necrotic enteritis.[3-6] Controlling necrotic enteritis without antibiotics is a global challenge in the poultry industry; therefore, preventing subclinical coccidiosis through the use of alternative products is critical to the profitability of ABF poultry producers.

Natural molecules extracted from plants, like polyphenols, are generally involved in plant defenses to environmental threats. Tannic acid is a large polyphenolic compound that has antioxidant,[7,8] anti-inflammatory,[9] astringent[10,11] and antimicrobial[11,12] properties. Kemin has evaluated processes which may improve the bioactivity of tannic acid. Tannic acid extract (TAE) has previously been shown in coccidiosis battery challenge studies to effectively reduce intestinal lesion scores[13-15] and oocyst shedding[14,15] in broilers challenged with mixed Eimeria. Products such as direct-fed microbials (DFMs) have also been identified as positive influencers of early gut microflora balance, which may benefit gut health and improve performance of vaccinated broilers. *B. coagulans* (BC) has a unique mode of action where it can produce both acetic and lactic acids, which may prevent pathogen colonization in the intestine.[16] The combination of *B. coagulans* with TAE may provide a product to improve gut microbial balance.

The objective of this study was to assess whether TAE and TAE+BC could be used in conjunction with vaccination for coccidiosis management to improve efficiency of poultry raised without antibiotics.

Methods and Materials

A non-medicated (no antibiotic and no anticoccidial) corn-soybean based commercial type basal diet chicken ration was formulated. The growth period was divided into three phases: starter (0-21 days), grower (21-35 days) and finisher (35-49 days). The diets and water were provided ad libitum throughout the experimental period.

The coccidiosis vaccination trial was conducted at Southern Poultry Research (SPR) in Athens, Georgia, USA. On day of hatch, all Cobb x Cobb 500 chicks were spray vaccinated with ADVENT®, a live coccidiosis vaccine, and randomly assigned to 5 treatment groups (Table 1; 15 reps/trt; 40 birds/pen). Two anti-coccidial products, an ionophore and a chemical, were used as positive controls compared to TAE and TAE+BC for their ability to improve performance of coccidiosis vaccinated broilers. Means for pen feed consumption (FC), body weight gain (WG), feed conversion ratio (FCR) and mortality were measured.

2100 Maury Street • Des Moines, Iowa, USA 50317 • tel: 515.559.5100 • www.kemin.com

Table 1. Treatments used in the coccidiosis vaccination trial.

Groups	Diet
Trt 1	Basal diet + no treatment
Trt 2*	Basal diet + ionophore
Trt 3*	Basal diet + chemical
Trt 4	Basal diet + TAE
Trt 5	Basal diet + TAE+BC

*Used at the recommended dosage.

Results

On d21, TAE, ionophore and chemical improved weight gain (WG) and FCR compared to untreated control (Table 2). Over the trial duration (0-49d), weight gain of control birds was significantly lower than ionophore and chemical birds, while birds fed TAE or TAE+BC were intermediate (Table 3). FCR of TAE, TAE+BC, ionophore and chemical birds was significanlty improved compared to control.

Table 2. Growth performance of vaccinated broilers during the starter period d0-21.

Treatment	Description	WG (kg/bird)	FCR	Mortality (%)
1	Control	0.597^{b}	1.554^{a}	0.8
2	Ionophore	0.637^{a}	1.486^{b}	0.3
3	Chemical	0.630^{a}	1.484^{b}	0.2
4	TAE	0.624^{a}	1.502^{b}	0.2
5	TAE+BC	0.557^{b}	1.510^{b}	0.2

$^{a-b}$ different superscript letters within same column are statistically significant ($P < 0.05$)

Table 3. Growth performance of vaccinated broilers during the trial duration d0-49.

Treatment	Description	WG (kg/bird)	FCR	Mortality (%)
1	Control	2.842^{c}	1.869^{a}	4.6
2	Ionophore	3.032^{a}	1.786^{c}	3.9
3	Chemical	2.993^{ab}	1.792^{c}	3.6
4	TAE	2.909^{abc}	1.829^{b}	3.6
5	TAE+BC	2.884^{bc}	1.836^{b}	5.2

$^{a-c}$ different superscript letters within same column are statistically significant ($P < 0.05$)

2100 Maury Street • Des Moines, Iowa, USA 50317 • tel: 515.559.5100 • www.kemin.com

Conclusion

The results of the study indicate both TAE and TAE+BC can be used in broiler diets to improve broiler performance during cocci vaccination. TAE and TAE+BC showed improved FCR and gain improvements compared to vaccination. This result indicates the addition of *B. coagulans* to TAE provide the additional gut health benefits observed.

References

1. Kemin Internal Document, 15-00094.
2. World Poultry – Managing Coccidiosis 2014, http://www.worldpoultry.net/Home/General/2014/9/Coccidiosis-a-major-threat-to-the-chicken-gut-1568808W/?dossier=35765&widgetid=1. Accessed June 16, 2015.
3. Intestinal Health Center for Poultry – Coccidiosis, https://www.ihc-poultry.com/pages.aspx?id=35. Accessed June 16, 2015.
4. Williams, R.B. (2005). Intercurrent coccidiosis and necrotic enteritis of chickens: Rational, integrated disease management by maintenance of gut integrity. Avian Pathology, 34(3): 159-180.
5. Dahiya, J.P., Wilkie, D.C., Van Kessel, A.G., and Drew, M.D. (2006). Potential strategies for controlling necrotic enteritis in broiler chickens in post-antibiotic era. Animal Feed Science and Technology, 129: 60-88.
6. Intestinal Health Center for Poultry – Coccidiosis vaccination: Making a good thing even better, https://www.ihc-poultry.com/pages.aspx?id=689. Accessed June 16, 2015.
7. Pandey, K.B. et al. (2009). Plant polyphenols as dietary antioxidants in human health and disease. Oxidative Medicine and Cellular Longevity 2:5,270-278.
8. Hamiza, O.O. et al. (2012). Amelioration of 1,2 dimethylhydrazine (DMH) induced colon oxidative stress, inflammation and tumor promotion response by tannic acid in wistar rats. Asian Pacific J. Cancer Prev, 13(9), 4393-4402.
9. Kaleem, Q.M. et al. (2014). Studies on emblica officinalis derived tannins for their immunostimulatory and protective activities against coccidiosis in industrial broiler chickens. The scientific world journal Vol. 2014, Art. ID 378473.
10. Dharmananda, S. (2003). Gallnuts and the uses of tannins in Chinese medicine. A paper Delivered at the Institute for Traditional Medicine, Portland, Oregon.
11. Redondo, L.M. et al. (2014). Perspectives in the use of tannins as alternative to antimicrobial growth promoter factors in poultry. Frontiers in microbiology.
12. Chung, K.T. et al. (1998). Mechanism of inhibition of tannic acid and related compounds on the growth of intestinal bacteria. Food and chemical toxicology 36 1053-1060.
13. Kemin Internal Document, 14-00071.
14. Kemin Internal Document, 15-00050.
15. Kemin Internal Document, 15-00085.
16. Kemin Internal Document, 14-00038.

ADVENT® is a registered trademark of Viridus Animal Health, LLC.