



## The Effects of Feeding C4 Blend on Turkey Performance During a Coccidia Challenge<sup>1</sup>

### Abstract

The objective of this study was to evaluate the effects of the C4 blend on performance under conditions of a coccidiosis challenge for a 42-day (d) period. Performance and oocyst per gram of feces were used as key variables. Day old turkey poults were randomly assigned to 1 of 4 treatments (12 pens/treatment; 40 birds/pen): 1. Control, non-infected; 2. Infected control; 3. T2 + C4 blend, 0.75 lb./ton; and 4. T2 + Zoamix<sup>®</sup>, 125ppm. On d14 all birds (except T1) received the coccidial inoculum consisting of a mixture of field isolates of *Eimeria meleagrimitis* (50,000 oocysts/bird), *E. gallopavonis* (25,000 oocysts/bird) and *E. adenoides* (50,000 oocysts/bird). On d20 and d28, fresh fecal samples were collected from each pen to determine the degree of oocyst shedding/cycling. Oocysts per gram (OPG) were determined for each sample. Body weight gain (BWG) and mortality adjusted feed conversion ratio (FCR) were determined at d14 and 42 of age. Mortality was determined at d42. No statistical differences were found at d14 FCR or BWG between the challenged groups ( $P>0.05$ ). During the challenge period (d14-42), BWG was significantly improved by the C4 blend when compared to the infected control ( $P<0.05$ ; 4.71 lb vs. 4.60 lb). Poults in the C4 blend group had similar BWG to poults in the Zoamix group ( $P>0.05$ ; 4.71 lb vs. 4.81 lb). Feeding the C4 blend significantly improved FCR during the challenge period (d14-42) when compared to the infected control group ( $P<0.05$ ; 1.73 vs. 1.77). Adding the C4 blend significantly improved FCR at d42 when compared to the infected control ( $P<0.05$ ; 1.66 vs. 1.70). Over the d0-42 period, BWG was significantly improved by the C4 blend when compared to the infected control ( $P<0.05$ ; 5.43 lb vs. 5.28 lb). Zoamix had statistically similar BWG to the C4 blend ( $P>0.05$ ; 5.50 lb vs. 5.43 lb). Zoamix significantly decreased OPG at d20 compared to the infected control; whereas, the C4 blend was intermediate ( $P<0.05$ ). No differences on OPG at d28 were seen by any of the additives when compared to the infected control ( $P=0.1$ ). The C4 blend significantly improved mortality at the d0-42 period when compared to the infected control ( $P<0.05$ ; 1.7% vs. 4.4%). Overall, these results provide evidence that the C4 blend was able to improve performance of turkeys challenged with coccidia.

### Introduction

Enteric diseases represent a substantial challenge for poultry producers because they negatively affect poultry performance, thereby diminishing producer profits. Coccidia species are found ubiquitously in relation to poultry rearing, and coccidiosis outbreaks in turkeys are commonly seen in commercial production. However, there are limited therapeutic treatments available to treat coccidiosis in turkeys and as a consequence the infected birds suffer from intestinal damage resulting in reduced gain weight.<sup>2</sup>

Previous studies have demonstrated that tannic acid extract (TAE) can improve the performance of coccidiosis vaccinated broilers.<sup>3</sup> Additionally, recent studies have indicated that C4 blend – a proprietary formulation of TAE, *Bacillus subtilis* PB6, phytogetic molecules and beta glucans – can improve performance of coccidia-vaccinated poultry challenged with *Clostridium perfringens*.<sup>4</sup> While the C4 blend has consistently been shown to improve vaccinated broiler performance, its impact on turkeys challenged with coccidia has not been evaluated. The aim of the present study was to evaluate the impact of the C4 blend on performance of turkeys challenged with coccidia.

### Materials and Methods

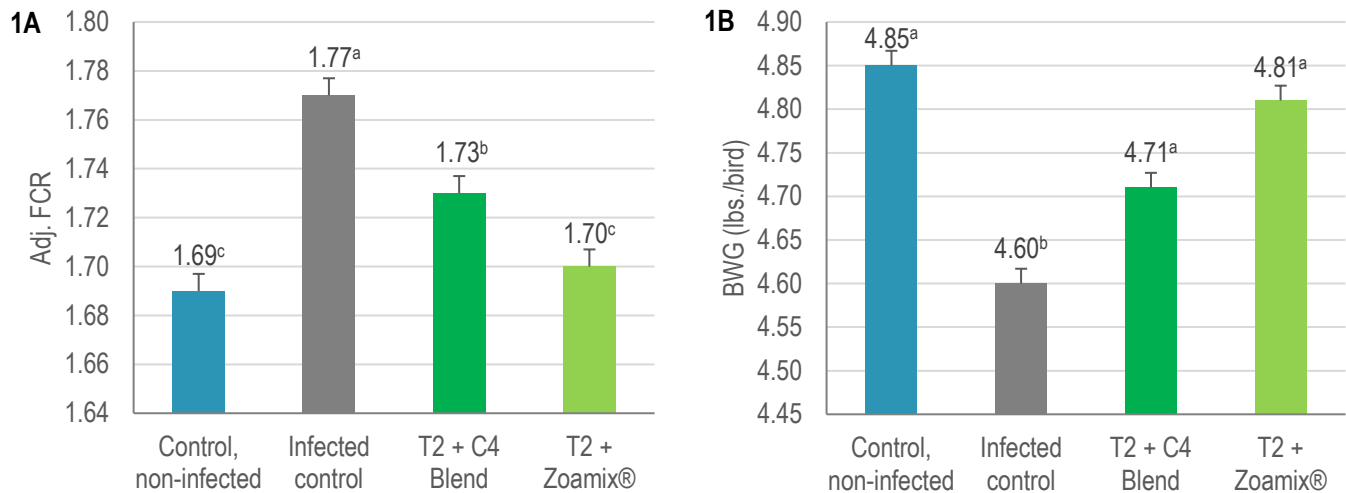
Day old turkey poults were randomly assigned to 1 of 4 treatments (12 pens/treatment; 40 birds/pen): T1. Control, non-infected; T2. Infected control; T3. T2 + C4 blend, 0.75 lb./ton; and T4. T2 + Zoamix<sup>®</sup>, 125 ppm. On d14 of the study all birds (except T1) received the coccidial inoculum diluted to a 1 mL volume. The inoculum contained a mixture of field isolates of *Eimeria meleagrimitis* (50,000 oocysts/bird), *E. gallopavonis* (25,000 oocysts/bird) and *E. adenoides* (50,000 oocysts/bird). Corn, soybean meal and meat and bone meal-based diets were administered *ad libitum* as crumbled pellets throughout the 42-day trial.

Birds and feed were weighed by pen at d0, 14 and 42 of age. Means for pen body weight gain (BWG), feed intake (FI) and mortality adjusted feed conversion ratio (FCR) were then determined at d14 and 42 of age. Mortality for the trial was determined at d42.

On d20 and 28, fresh fecal samples were collected from each pen and oocysts per gram (OPG) was determined. Total *Eimeria* OPG counts for each pen were provided. This study was conducted on used litter immediately after another turkey coccidiosis challenge study providing a natural as well as a manual challenge.

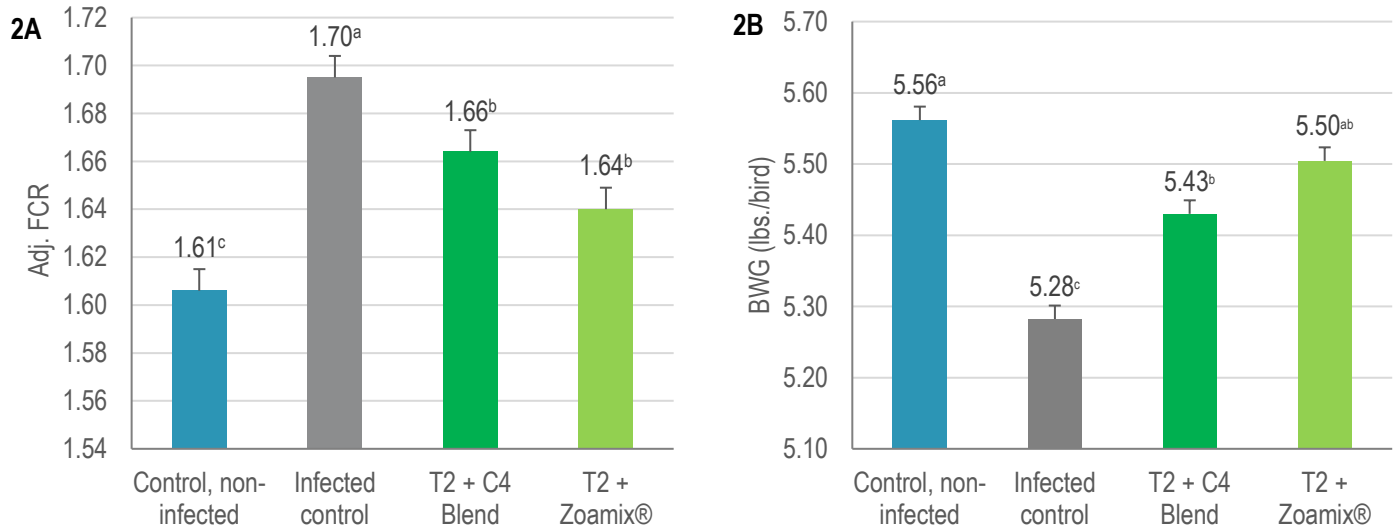
## Results and Discussion

No statistical differences in FCR or BWG were found at d14 between the challenged groups ( $P > 0.05$ ; data not shown). During the challenge period (d14-42), BWG was significantly improved by the C4 blend (0.11 lbs.) compared to the infected control (Fig. 1B;  $P < 0.05$ ). During this period the birds in the C4 blend group had similar BWG to the birds in the Zoamix group (Fig. 1B;  $P > 0.05$ ). Poult fed the C4 blend had significantly improved adjusted FCR (4 points) during the challenge period (d14-42) compared to the infected control group (Fig. 1A;  $P < 0.05$ ).



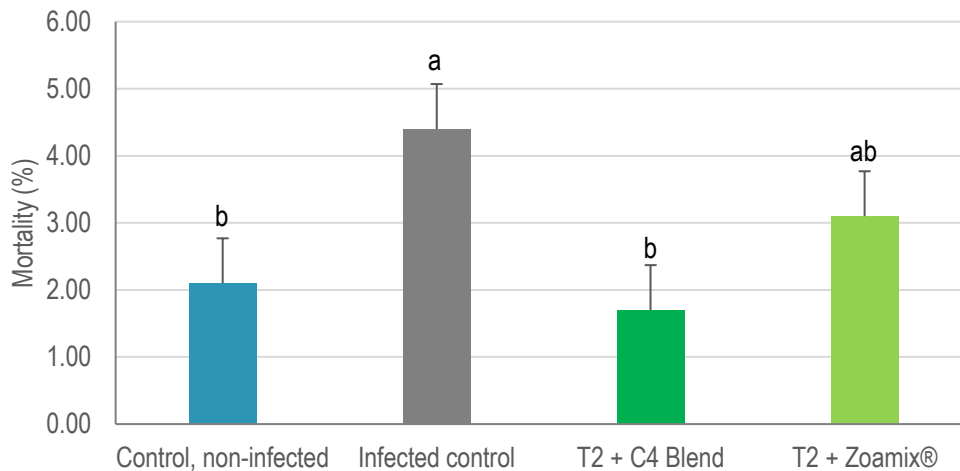
**Figure 1.** Effect of the C4 blend on mortality adjusted feed conversion ratio (Adj. FCR; 1A) and body weight gain (BWG; 1B) at d14-42 of poult challenged with coccidiosis. All birds were challenged with coccidia at d14 except for the control, non-infected treatment. Values are expressed as mean  $\pm$  standard error mean (SEM). <sup>a-c</sup>Differing superscripts indicate significant difference at  $P < 0.05$ ,  $n = 12$ .

Over the d0-42 period, adding the C4 blend significantly improved adjusted FCR (4 points) compared to the infected control (Fig. 2A;  $P < 0.05$ ). Zoamix had similar FCR to the C4 blend (Fig. 2A;  $P > 0.05$ ). Over this period, BWG was significantly improved by the C4 blend when compared to the infected control (0.15 lbs.) and was similar to Zoamix (Fig. 2B;  $P < 0.05$ ).



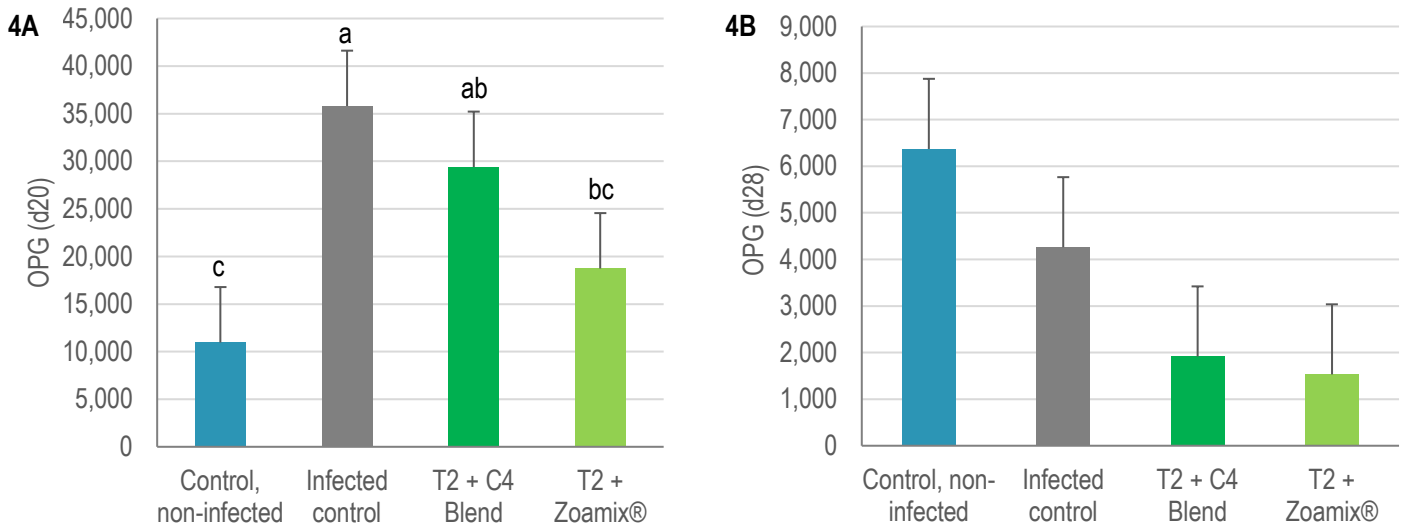
**Figure 2.** Effect of the C4 blend on adjusted to mortality feed conversion ratio (FCR; 2A) and body weight gain (BWG; 2B) at d0-42 of poult challenged with coccidiosis. All birds were challenged with coccidia at d14 except for the control non infected treatment. Values are expressed as mean ± standard error mean (SEM). <sup>a-c</sup>Differing superscripts indicate significant difference at P<0.05. n=12.

The C4 blend significantly reduced mortality at d42 compared to the infected control group (Fig. 3; P<0.05; 1.7% vs. 4.4%). Mortality of poult fed the C4 blend did not differ from the control, non-infected group (P>0.05).



**Figure 3.** Effect of the C4 blend on mortality of poult challenged coccidiosis at 0-42d. All birds were challenged with coccidia at d14 except for the control non infected treatment. Values are expressed as mean ± standard error mean (SEM). <sup>a-b</sup>Differing superscripts indicate significant difference at P<0.05. n=12

Zoamix significantly decreased OPG at d20 when compared to the infected control (Fig. 4A; P<0.05); the C4 blend was intermediate. Detection of OPGs in the control, non-infected treatment at d20 and d28 is likely due to the fact that this trial was performed on used litter immediately after another turkey coccidiosis challenge study. No differences on OPG at d28 were seen by any of the additives when compared to the infected control (Fig. 4B; P=0.10).



**Figure 4.** Effect of the C4 blend on oocysts per gram (OPG) on d20 (4A) and d28 (4B) of poult challenged coccidiosis. All birds were challenged with coccidia at d14 except for the control, non-infected treatment. Values are expressed as mean ± standard error mean (SEM). <sup>a-c</sup>Differing superscripts indicate significant difference at P<0.05

### Conclusion

The results of the study indicate the C4 blend was able to improve performance of turkeys challenged with coccidia at 14 days of age. Over both d14-24 and d0-42, poult challenged with coccidia and fed the C4 blend had significantly improved BWG and adjusted FCR compared to the infected, control poult. The C4 blend also showed significant reduction in poult mortality at d42. Overall, these results indicate that the C4 blend can be used to help support performance of turkeys exposed to a coccidia challenge.

### References

1. The effect of VANNIX™ C4 and Zoamix® on turkey performance fed during a coccidia challenge, TD-19-5987
2. Chapman, H. D. (2008). Coccidiosis in the turkey. *Avian Pathology*, 37(3):205-223.
3. Tonda, RM, Rubach, JK, Lumpkins, BS, Mathis, GF, and Poss, MJ. (2018). Effects of tannic acid extract on performance and intestinal health of broiler chickens following coccidiosis vaccination and/or a mixed-species *Eimeria* challenge. *Poult. Sci.*, B97:3031-3042.
4. Evaluation of C4 Blend to reduce the effects of necrotic enteritis in broilers raised on litter, TD-19-5106.

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