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Evaluation of VANNIX™ C4 on Performance, Oocyst Shedding and Lesion Scores of Coccidia-Vaccinated Broilers[1,2]

Abstract

This floor pen study was conducted to evaluate the effects of a novel phytogenic feed additive, VANNIX™ C4, on performance and oocyst shedding during a coccidia vaccination program. On day (d) of hatch, male Cobb 500 broiler chicks (n = 3,000) were vaccinated with COCCIVAC®-B52 and then randomly assigned to one of five treatments (50 birds/pen; 12 pens/treatment): 1) No vaccine control, 2) vaccine control, 3) vaccine + VANNIX C4 (all feeds), 4) vaccine + VANNIX C4 (only grower and finisher, (G/F)) and 5) vaccine + Zoamix® (G/F). Performance was monitored over the d35 trial. In addition, coccidial and necrotic lesion scores and *E. maxima* microscopic counts were measured on d16, d22 and d28. Oocyst shedding was monitored every three days starting from d10 up to d31. At the end of the trial (d35), there was a numerical increase in gain of VANNIX C4 (all feeds) and Zoamix compared to vaccine control. VANNIX C4 treatments improved ($P<0.05$) adjusted FCR compared to vaccine control (6-7 points), and Zoamix had 3-4 points improvement compared to VANNIX C4 treatments ($P<0.05$). VANNIX C4 did not affect oocyst shedding for *E. acervulina* or *E. maxima*; however, there was a significant decrease with *E. tenella* compared to vaccine control ($P<0.05$). Zoamix significantly decreased oocyst shedding of all *Eimeria* species compared to vaccine control ($P<0.05$). Necrotic lesions, coccidial lesions and microscopic lesion scores were negligible across all treatments. Overall, VANNIX C4 improved performance and did not interfere with coccidial shedding in vaccinated broilers.

Introduction

Enteric diseases represent a substantial challenge for poultry producers because their negative effects on intestinal health reduce poultry performance, thereby diminishing producer profits. For example, the global poultry industry is projected to lose more than two billion USD each year because of performance declines tied to enteritic disease.[3]

Poultry producers believe combination strategies towards modulating intestinal health and immune development are necessary for managing poultry enteric diseases without antibiotics.[4,5,6] Specifically, coccidiosis and necrotic enteritis are two main challenges that producers face, and one way they combat these challenges is by using live or attenuated oocysts to allow acquisition of protective immunity towards *Eimeria*.[7] However, the use of these tools can result in mild subclinical infections, predisposing birds to other enteric challenges. Application of in-feed alternative products – like phytogenics and/or probiotics – in combination with vaccines may reduce broiler susceptibility to enteric pathogens and thereby improve performance.

Previous studies have demonstrated that tannic acid extract (TAE) can enhance performance of coccidiosis vaccinated broilers.[8] Additionally, recent studies have indicated VANNIX™ C4 – a proprietary formulation of TAE, *Bacillus subtillis* PB6, phytogenic molecules and beta glucans – can improve performance of coccidia-vaccinated poultry challenged with *Clostridium perfringens*.[9] While VANNIX C4 has consistently improved vaccinated broiler performance, its impact on oocyst cycling has not been evaluated. The aim of the present study was to evaluate the impact of VANNIX C4 on performance and oocyst shedding of coccidia-vaccinated broilers.

Materials and Methods

Day old male Cobb 500 broiler chicks were randomly assigned to one of five treatments (50 birds/pen; 12 pens/treatment; 600 birds/treatment; Table 1). All birds, except treatment one (no vaccine, control), were spray vaccinated with a 1X dose of COCCIVAC®-B52, then allowed to preen. Birds did not receive any additional anti-coccidial drugs or antibiotics outside of the assigned treatments. Corn-soybean-based, pelleted diets were fed in three phases: starter (d0-14), grower (d14-28) and finisher (d28-35). Food and water were provided *ad libitum* throughout the trial.

Table 1. Treatments used in the coccidia vaccination trial.

Treatments	Diet Description	Vaccination	Diet Phases*
Control	Basal diet	No	S, G, F
Vaccine	Basal diet	Yes	S, G, F
VANNIX C4	Basal diet + VANNIX™ C4 (0.5 lb./ton)	Yes	S, G, F
VANNIX C4	Basal diet + VANNIX™ C4 (0.5 lb./ton)	Yes	G, F
Zoamix	Basal diet + Zoamix® (125 ppm)	Yes	G, F

*Diet phases used in the study included: starter (S), grower (G) and finisher (F).

Birds and feed were weighed by pen at d0, 14, 28 and 35. Means for pen body weight gain (BWG), feed intake (FI) and mortality adjusted feed conversion ratio (FCR) were then calculated. Results were determined for d0-14, d0-28 and d0-35.

On d16, 22 and 28, two birds from each pen (24 birds/treatment) were humanely euthanized, and the intestines were scored for coccidiosis lesions (0 to 4) according to the method of Johnson and Reid, 1970. The same intestinal samples were also micro scored for *E. maxima* (0 to 4) as well as scored for necrotic enteritis (NE). NE lesions were scored on a 0 to 3 scale, with 0 being no lesions, 1 being mild lesions, 2 being moderate lesions and 3 being severe lesions.[10]

On d10, 13, 16, 19, 22, 25, 28 and 31 fresh fecal samples were collected from each pen to determine the degree of oocyst shedding/cycling. A sale fecal floatation method was utilized in which feces collected from each pen were pooled, thoroughly mixed, and *Eimeria* oocysts per gram (OPG) were microscopically counted using a McMaster counting chamber. *Eimeria* OPG counts were provided by species (*E. acervulina, E. maxima,* and *E. tenella*), as well as total OPG for each pen.

Results and Discussion

At the end of the trial (d35), there was a numerical increase in BWG of VANNIX C4 (all feeds) and Zoamix compared to the control vaccine treatment (Fig. 1A). Both VANNIX C4 treatments significantly improved FCR compared to vaccine control (6-7 points), and Zoamix had 3-4 points improvement compared to VANNIX C4 treatments (P<0.05; Fig 1B). Mortality averaged 3-5% but did not differ among treatments (P>0.05).

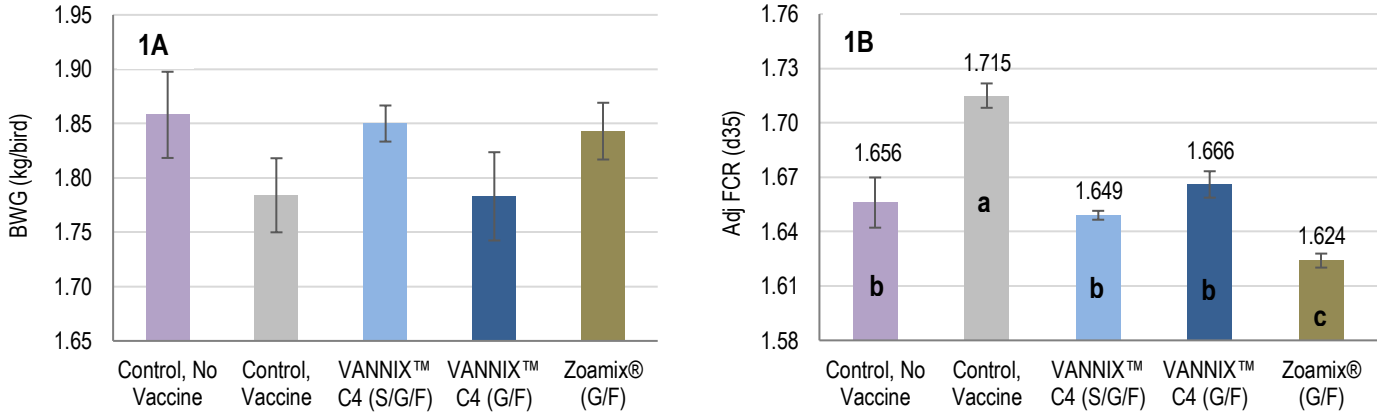

Figure 1. Effect of VANNIX C4 on body weight gain (BWG; 1A) and mortality adjusted feed conversion ratio (FCR; 1B) at d35 of birds vaccinated for coccidiosis. All birds were vaccinated at d0 with a cocci vaccine except for the control, no vaccine treatment. Values are expressed as mean ± SEM. [a-c]Differing superscripts indicate significant difference at P<0.05. S/G/F = treatment in starter, grower and finished rations, G/F = treatment only in grower and finisher rations.

Overall, NE and coccidial lesion sores were negligible among treatment groups, which was expected based on the model used for this study. Microscopic lesion scoring for *E. maxima* also showed a trend for low lesions (Figure 2A), however, there were treatment differences detected at d16 (Fig. 2B), d22 (Fig. 2C), and d28 (Fig. 2D).

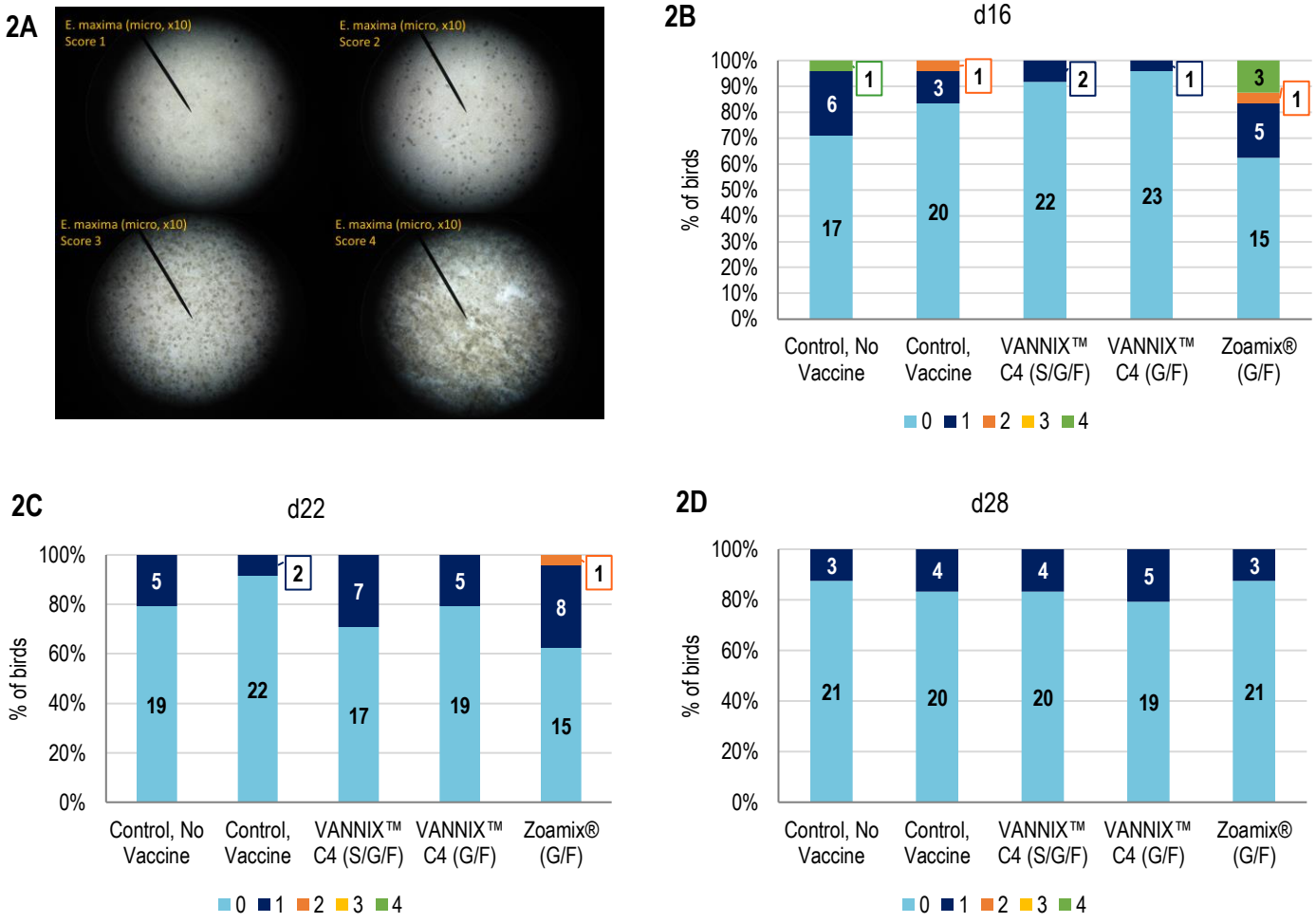

Figure 2. Effect of VANNIX C4 on *Eimeria maxima* microscopic lesion scores of birds vaccinated for coccidiosis. Example images of microscopic lesions with scores 1 to 4 (2A). Intestinal micro lesions were evaluated on d16 (2B), d22 (2C) and d28 (2D). The y-axis shows the percentage of birds, and numbers within each column represents the number of birds in each treatment (n = 24) with a given micro lesion score. All birds were vaccinated at d0 with a cocci vaccine except for the control, no vaccine treatment. S/G/F = treatment in starter, grower and finished rations, G/F = treatment only in grower and finisher rations.

For both *E. acervulina* and *E. maxima*, Zoamix significantly reduced oocyst counts when contrasted to vaccine, control between 19d-25d (*P*<0.05; data not shown). There were no differences with either VANNIX C4 treatment in reducing oocyst counts or shifting the oocyst peak during this time period. There was a significant reduction in *E. tenella* oocyst shedding with both VANNIX C4 treatments when contrasted to vaccine, control at d19 (peak of oocyst cycling; Figure 3A) and d25. Zoamix also reduced *E. tenella* oocyst shedding between d19-d28 compared to control, vaccine (P<0.05). Overall, VANNIX C4 treatment reduced total oocyst shedding at d19 compared to vaccine control, and Zoamix reduced oocyst shedding from d19-d28 (P<0.05, Figure 3B).

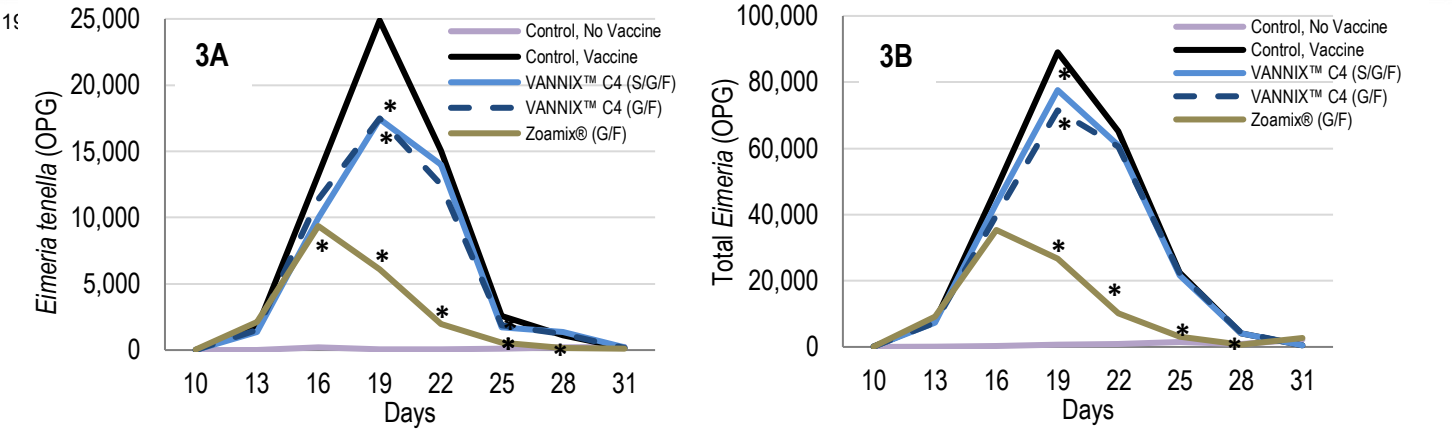

Figure 3. Effect of VANNIX C4 on *Eimeria tenella* oocyst shedding (3A) and total *Eimeria* oocyst shedding (3B) of birds vaccinated for coccidiosis. Oocyst shedding was determined at d10, 13, 16, 19, 22, 25, 28 and 31. All birds were vaccinated at d0 with a cocci vaccine except for the control, no vaccine treatment. Values are expressed as mean. *Indicate significant differences from control, vaccine, P<0.05. S/G/F = treatment in starter, grower and finished rations, G/F = treatment only in grower and finisher rations. OPG = oocysts per gram of feces.

Conclusion

The results of the study indicate that VANNIX C4 treatment significantly improved FCR of coccidiosis-vaccinated broilers. VANNIX C4 did not increase or shift the oocyst shedding peak compared to the vaccine control. The coccidial, NE and microscopic lesion scores showed negligible damage to the intestinal structure even though there were no changes to oocyst shedding with the VANNIX C4 treatments. Overall, these results indicate that VANNIX C4 can be used in combination with coccidiosis vaccination programs to improve broiler performance without impacting oocysts cycling.

References

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