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EFFECT OF AFLATOXIN AND A COMMERCIAL ANTI-MYCOTOXIN ADDITIVE ON PERFORMANCE, EGG QUALITY, AND LIVER INTEGRITY OF BROWN LAYERS

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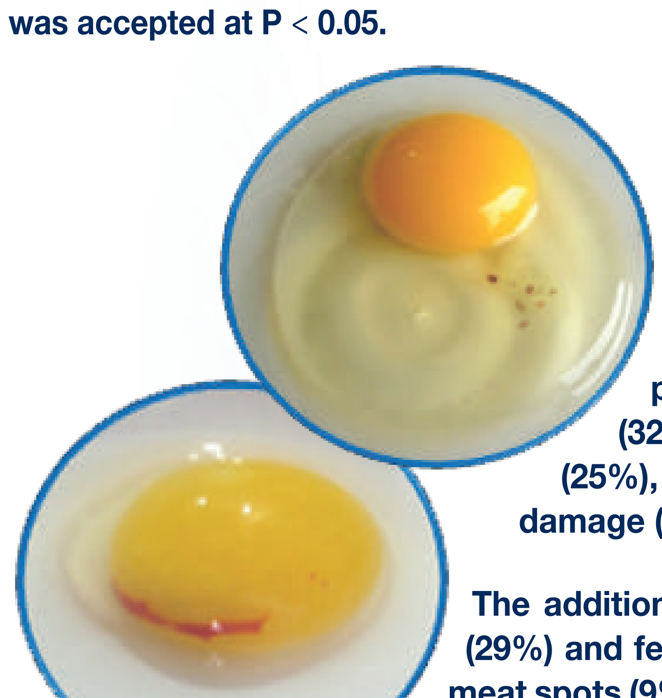
INTRODUCTION

The presence of aflatoxins in feedstuffs and their toxic effects have been recognized worldwide for many years. Aflatoxin (AFB) is the most toxic of all mycotoxins in poultry; being the liver its principal target organ (2). The most practical approach to ameliorate the deleterious effects of mycotoxins in animals consists on using adsorbent materials in the diet to reduce their absorption from the gastrointestinal tract. The efficacy of a mycotoxin adsorbent must be evaluated by conducting scientific *in vivo* experiments, measuring its beneficial effect on target organ protection and animal performance. Studies *in vitro* have no complete correlation with results obtained with animals (6). The dietary use of 2.5 kg of MYCOAD per tonne of feed has been proven to effectively prevent the toxic effects of AFB in broilers and ducks (1,3,4). The deleterious effects of AFB have been reported in layers but the efficacy of anti-mycotoxin additives have not been evaluated thoroughly; therefore an experiment was conducted to evaluate AFB damages and the preventing efficacy of MYCOAD in brown layers.

MATERIALS AND METHODS

One hundred and twenty 39 week-old ISA Brown layers already in production were transferred from a commercial farm to the experimental facilities of Samitec Institute in Santa María, RS, Brazil and distributed using a complete randomized design into 3 treatments with 4 replicates of 10 layers each in communitarian cages with slatted floor. After a one-week adaptation period, layers were fed the experimental corn-soy diets at a fixed intake (120 g/bird). Treatments were: 1. Control diet; 2. Control + 3 ppm AFB and 3. Control + 3 ppm AFB + 0.25% MYCOAD. All ingredients were tested free of mycotoxins contamination and AFB was produced by LAMIC. Water was supplied *ad libitum* and the experimental diets fed for 41 days. Performance parameters and egg characteristics were evaluated weekly. Liver tissues were evaluated histopathologically in the US by Dr. Frederic Hoerr. Data were evaluated with ANOVA for a complete randomized design, using Statgraphics Centurion XV 15.1 software (5). When the ANOVA showed significance, Duncan's significant-difference test was applied. Statistical significance was accepted at P < 0.05.

RESULTS



The effects of dietary treatments on performance and on egg quality as well as the liver condition of brown layer from 40 to 46 week of age are presented in Table 1 and 2. Significant deleterious effects of AFB on performance were observed only after 21 days of consuming the contaminated diet (Figure 1). Results after 41 days of exposure indicated that layers fed AFB presented significantly decreased egg production (31%), reduced egg mass (32%), poorer feed conversion (44%), increased incidence of blood-meat spots (25%), heavier relative liver weight (29%), and greater severity of microscopic liver damage (83%) than layers fed the control diet.

The addition of 0.25% MYCOAD significantly improved egg production (28%), egg mass (29%) and feed conversion (29%); with a significant reduction in the incidence of blood-meat spots (9%), relative liver size (11%) and the severity of microscopic liver damage (53%) observed in layers fed AFB. (Table 3) The addition of 0.25 % MYCOAD to the feed significantly diminished the adverse effects of AFB in brown layers, which is in agreement with previous reports (1,3,4), indicating the efficacy of MYCOAD in reducing the toxicity of AFB in broilers and ducks.

CONCLUSIONS

1. Aflatoxin caused a significant damage in performance, liver condition (macro and microscopic), and egg quality (including blood and meat spots).
2. The addition of MYCOAD (2.5 kg/mt) significantly improved egg production, egg weight, egg mass, and feed conversion with a significant decrease in the liver size, microscopic liver damage and the presence of meat and blood spots in eggs.

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ABSTRACT

The deleterious effects of aflatoxin (AFB) have been reported in layers but its effect on blood-meat spots and the efficacy of anti-mycotoxin additives have not been evaluated thoroughly. A study was conducted to evaluate aflatoxin damages and the preventing efficacy of MYCOAD in brown layers. One hundred and twenty 39 week-old ISA Brown layers already in production were transported to the experimental facilities of Samitec and distributed using a complete randomized design into 3 treatments with 4 replicates of 10 layers each in communitarian cages with slatted floor. After a one-week adaptation period, layers were fed the experimental corn-soy diets at a fixed intake (120 g/bird), following the genetic guide. All ingredients used were tested free of mycotoxins. Treatments were: (1) control diet; (2) control + 3 ppm AFB and (3) control + 3 ppm AFB + 0.25% MYCOAD (mycotoxin binder). AFB was produced by LAMIC. Liver tissues were evaluated histopathologically in the US. Significant (P< 0.05) deleterious effects of AFB on performance were observed only after 21 days of consuming the contaminated diet. Results after 41 days of exposure indicated that layers fed AFB presented significantly (P< 0.05) decreased egg production (31%), reduced egg mass (32%), poorer feed conversion (44%), increased incidence of blood-meat spots (25%), heavier relative liver weight (29%), and greater severity of microscopic liver damage (83%) than layers fed the control diet. The addition of 0.25% MYCOAD significantly (P< 0.05) improved egg production (28%), egg mass (29%) and feed conversion (29%); with a significant reduction in the incidence of blood-meat spots (9%), relative liver size (11%) and the severity of microscopic liver damage (53%) observed in layers fed AFB. These results indicated that 0.25% MYCOAD was effective in preventing the toxic effects of AFB in brown layers.

Table 1. Effect of Aflatoxin and MYCOAD on performance of brown layer after 41 days of consuming the contaminated diets (40 to 46 week of age).

Treatment	Egg production %	Egg Mass kg	Feed Conversion kg/kg	Mortality %
Control	74.54 a	1.88 a	2.61 a	0
3 ppm AFB	51.84 b	1.28 b	3.76 b	5.0
3 ppm AFB + 0.25% MYCOAD	71.87 a	1.80 a	2.70 a	2.5

a, b Values within each column with different letters are significantly different (P<0.05)

Table 2. Effect of Aflatoxin and MYCOAD on egg quality and liver condition of brown layers after 41 days of consuming the contaminated diets (40 to 46 week of age).

Treatment	Egg weight g	Yolk: albumen ratio	Blood meat spots %	Relative liver weight %	Cumulative microscopic liver damage *
Control	61.3 a	0.474 a	0.60 a	2.31 a	1.0 a
3 ppm AFB	59.8 c	0.450 b	0.75 c	2.97 c	6.0 c
3 ppm AFB + 0.25% MYCOAD	60.5 b	0.461 ab	0.69 b	2.67 b	2.8 b

a, b, c Values within each column with different letters are significantly different (P<0.05)
* Bile duct hyperplasia + hepatocellular vacuolar change + lipidosis + hepatic necrosis
Damage score: 0 = Absent, 1 = Minimal, 2 = Mild, 3 = Moderate, 4 = Marked, 5 = Severe.

Figure 1. Weekly effect of Aflatoxin and MYCOAD on performance and egg weight of brown layer fed contaminated diets from 40 to 46 week of age.

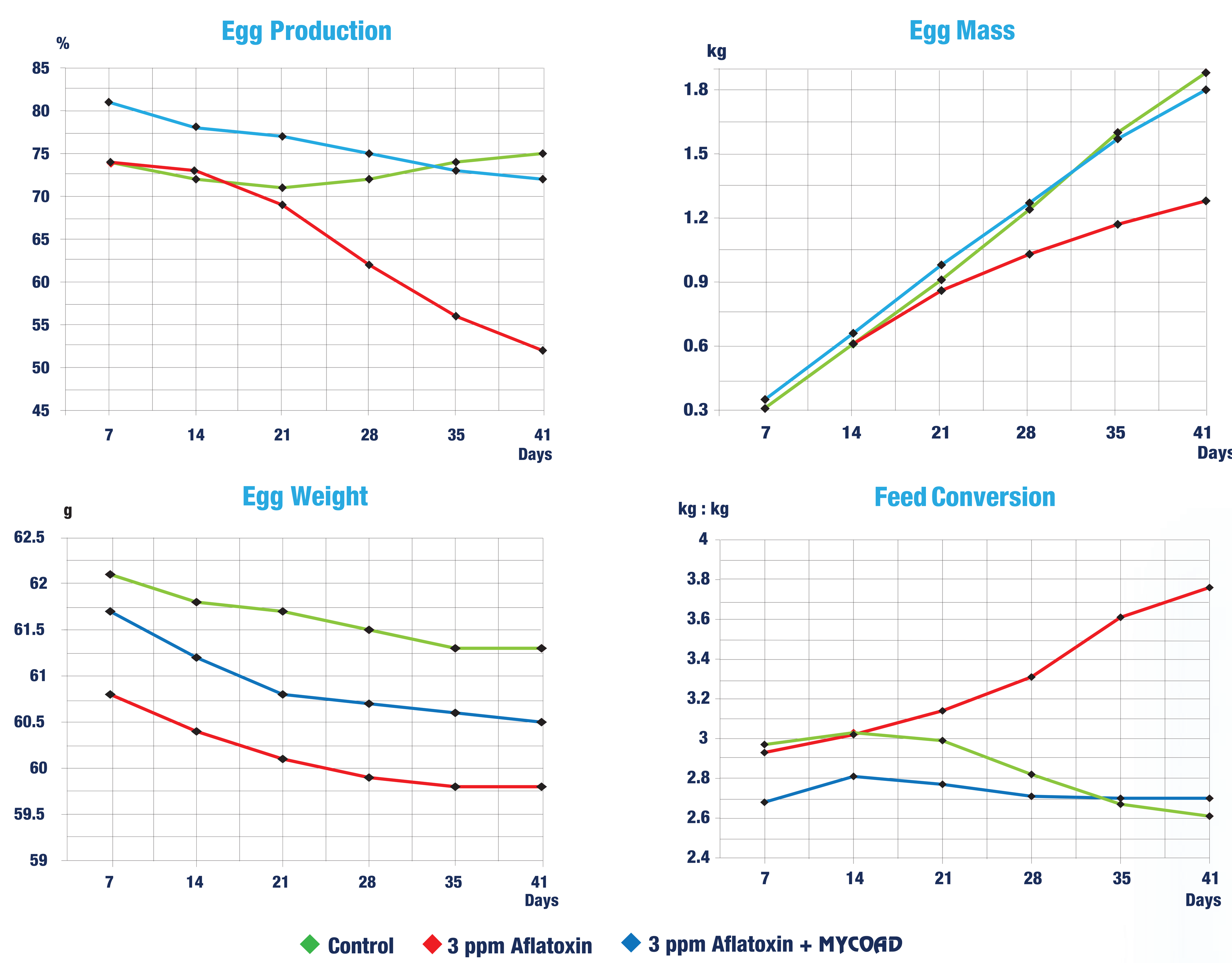

Figure 2. Size and color of representative livers from layers fed the experimental diets for 41 days (40 to 46 week of age).

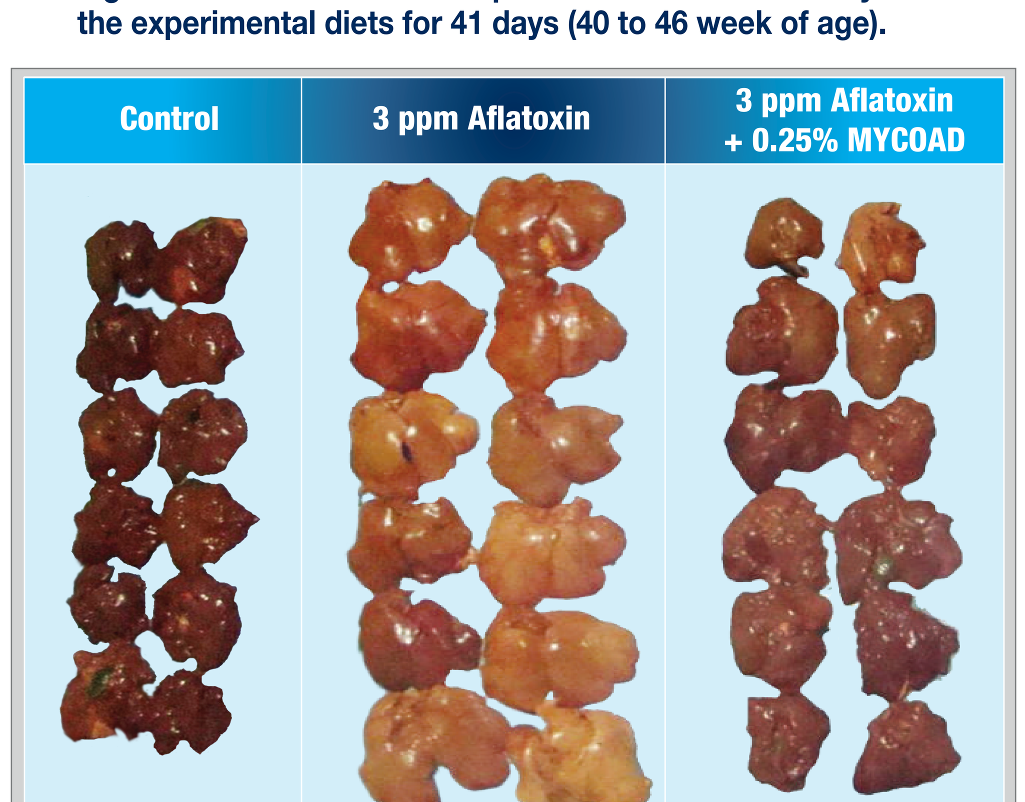

Table 3. Effect of MYCOAD on the recovery of layers fed with 3 ppm Aflatoxin for 41 days (40 to 46 week of age).

Parameter	3 ppm Aflatoxin	3 ppm Aflatoxin + 0.25% MYCOAD
Egg production	- 30.5 %	+ 28.0 %
Egg mass	- 31.9 %	+ 28.9 %
Feed conversion	+ 44.1 %	- 28.6 %
Blood and meat spots	+ 25.0 %	- 8.7 %
Relative liver weight	+ 28.6 %	- 11.2 %
Microscopic liver damage	+ 83.3 %	- 53.3 %