

EFFECT OF SEVERAL MYCOTOXINS AND TWO COMMERCIAL ANTI-MYCOTOXIN ADDITIVES ON PERFORMANCE, EGG QUALITY, AND LIVER INTEGRITY OF BROWN LAYERS

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INTRODUCTION

Recent reports have shown an increase in the presence of multiple mycotoxins at relative high levels in feedstuffs worldwide. Toxicity of some mycotoxins may increase in a synergistic or additive fashion when they are combined in the diet. The most practical approach to ameliorate the damages of mycotoxins in animals consists on using dietary adsorbent materials to reduce their absorption from the GIT (7). The dietary use of 2.5 kg of MYCOAD per tonne of feed has been proven to effectively prevent the toxic effects of aflatoxin (AFB), T-2 toxin (T-2) and fumonisin (FUM) in broilers (1, 2, 4, 5). On the other hand, low doses of MYCOAD AZ have been highly effective in reducing the toxicity of T-2 (3). The effects of simultaneous feed contamination of AFB, T-2 and FUM has not been reported on laying hens; therefore an experiment was conducted to evaluate the damages produced by this combination of mycotoxins and the preventing efficacy of MYCOAD plus MYCOAD AZ 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 Maria, 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 + 10 ppm FUM + 1 ppm T-2 and 3. Control + 3 ppm AFB + 10 ppm FUM + 1 ppm T-2 + 0.25% MYCOAD + 0.1% MYCOAD AZ. All ingredients were tested free of mycotoxins contamination and the mycotoxins were 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 (6). 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 + FUM + T-2 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 + FUM + T-2 presented significantly decreased egg production (37%), reduced egg mass (38%), poorer feed conversion (48%), reduced yolk: albumen ratio (5%), increased incidence of blood-meat spots (32%), heavier relative liver weight (41%), and greater severity of microscopic liver damage (78%) than layers fed the control diet. The dietary addition of the combination of 0.25% MYCOAD and 0.1% MYCOAD AZ significantly improved egg production (33%), egg mass (32%), feed conversion (22%) and the yolk: albumen ratio (5%); with a significant reduction in the incidence of blood-meat spots (16%), relative liver size (15%) and the severity of microscopic liver damage (27%) observed in layers fed AFB + FUM + T-2 (Table 3). The addition of 0.25% MYCOAD + 0.1% MYCOAD AZ to the feed significantly diminished the adverse effects of the combination of AFB + FUM + T-2 in brown layers, which is in agreement with previous reports (1, 2, 3, 4, 5) indicating the efficacy of MYCOAD and MYCOAD AZ, separately, in reducing the toxicity of each individual mycotoxin in broilers.

CONCLUSIONS

1. The simultaneous contamination of AFB + FUM + T-2 caused a serious 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) + MYCOAD AZ (1 kg/mt) significantly improved egg production, egg weight, egg mass, yolk:albumen ratio 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

A study was conducted to evaluate the combined toxic effects of aflatoxin (AFB) + fumonisin (FUM) + T-2 toxin (T2) and the preventing efficacy of MYCOAD + MYCOAD AZ 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. 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 + 10 ppm FUM + 1 ppm T2 and (3) control + 3 ppm AFB + 10 ppm FUM + 1 ppm T-2 + 0.25% MYCOAD + 0.1% MYCOAD AZ. All mycotoxins were produced by LAMIC. Liver tissues were evaluated histopathologically in the US. Significant ($P < 0.05$) deleterious effects of AFB + FUM + T2 on performance were observed only after 21 days of consuming the contaminated diet. Results after 41 days of exposure indicated that layers fed AFB + FUM + T-2 presented significantly ($P < 0.05$) decreased egg production (37%), reduced egg mass (38%), poorer feed conversion (48%), increased incidence of blood-meat spots (32%), heavier relative liver weight (41%), and greater severity of microscopic liver damage (78%) than layers fed the control diet. The addition of 0.25% MYCOAD + 0.1% MYCOAD AZ significantly ($P < 0.05$) improved egg production (33%), egg mass (32%), feed conversion (22%); with a significant reduction in the incidence of blood-meat spots (16%), relative liver weight (15%) and the severity of microscopic liver damage (27%) observed in layers fed AFB + FUM + T-2. These results indicated that 0.25% MYCOAD + 0.1% MYCOAD AZ were effective in preventing the combined toxic effects of AFB + FUM + T2 in brown layers.

Table 1. Effect of AFB + FUM + T2 and MYCOAD + MYCOAD AZ 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 + 10 ppm FUM + 1 ppm T-2	47.14 c	1.17 c	3.87 c	0
AFB + FUM + T-2 + 0.25% MYCOAD + 0.1% MYCOAD AZ	62.78 b	1.54 b	3.01 b	2.5

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

Table 2. Effect of AFB + FUM + T2 and MYCOAD + MYCOAD AZ on egg quality and relative liver weight of brown layer 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 + 10 ppm FUM + 1 ppm T-2	60.2 b	0.452 b	0.79 c	3.25 c	4.5 c
AFB + FUM + T-2 + 0.25% MYCOAD + 0.1% MYCOAD AZ	59.8 b	0.478 a	0.68 b	2.90 b	3.3 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 AFLA + FUM + T2 and MYCOAD + MYCOAD AZ on performance and egg weight of brown layer fed contaminated diets from 40 to 46 week of age.

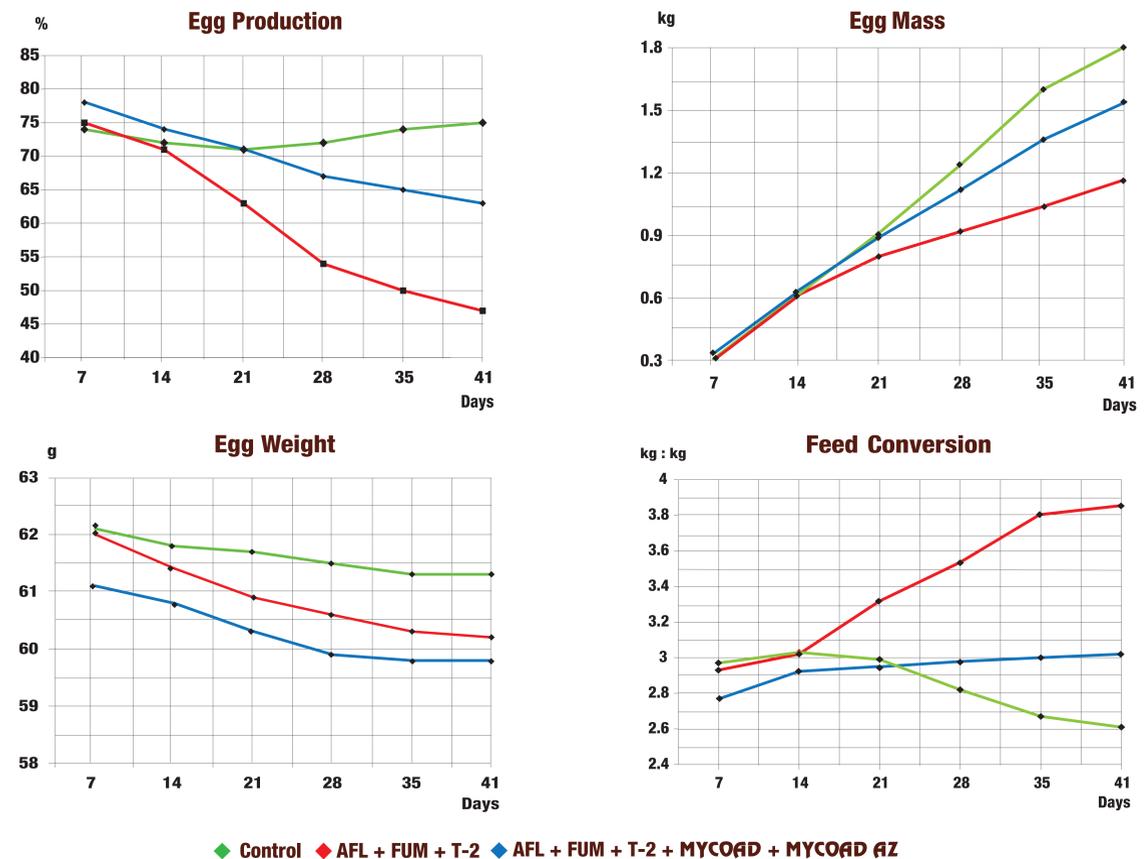


Figure 2. Size and color of representative livers from brown layers fed the experimental diets for 41 days (40 to 46 week of age).

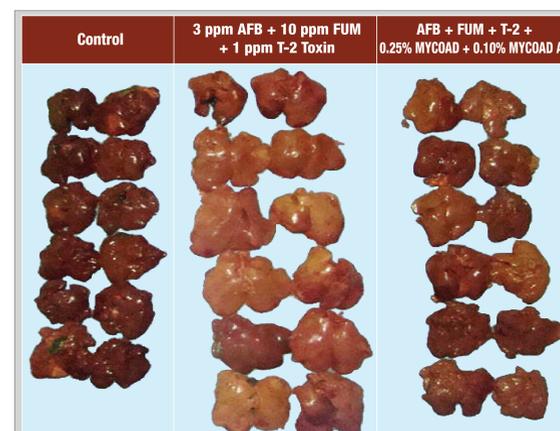


Table 3. Effect of MYCOAD and MYCOAD AZ on the recovery of layers fed with 3 ppm AFL + 10 ppm FUM + 1 ppm T-2 for 41 days (40 to 46 week of age).

Parameter	3 ppm Aflatoxin + 10 ppm Fumonisin + 1 ppm T-2 toxin	AFB + FUM + T-2 + 0.25% MYCOAD + 0.10% MYCOAD AZ
Egg production	- 36.8 %	+ 33.3 %
Egg mass	- 37.8 %	+ 31.6 %
Feed conversion	+ 48.3 %	- 22.2 %
Blood and meat spots	+ 31.7 %	- 16.2 %
Relative liver weight	+ 40.7 %	- 15.2 %
Microscopic liver damage	+ 77.8 %	- 26.7 %