LOW DOSAGE EFFICACY OF A COMMERCIAL PURIFIED PHYLOSILICATE TO REDUCE THE TOXICITY OF T-2 TOXIN IN BROILERS

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INTRODUCTION

T-2 toxin (T-2) is a naturally occurring mycotoxin from the group of the trichothecenes, produced by *Fusarium* spp. mainly before harvesting. T-2 has been characterized by oral lesions and reduced growth in chickens, as well as the inhibition of protein synthesis, responsible for the negative effects on rapidly dividing cells such as those of the oral cavity, gastrointestinal tract, and lymphoid tissues. (4)

At present, the most practical approach to ameliorate the deleterious effects of mycotoxins in animals consist on using adsorbent materials in the diet to reduce the absorption of mycotoxins from the gastrointestinal tract. Few products have been effective in preventing the toxic effects of T-2. Myco-Ad has been the only smectite that effectively prevented the toxic effect of T-2 when added at 0.25% in broiler feed. (1) Two other types of products have been reported adequate in reducing the toxicity of T-2 in broilers. (5,9) Myco-Ad A-Z, a purified phylosilicate, was also efficacious in preventing the T-2 toxicity in broilers when used at 0.1% of the diet. (2)

The objectives of this research were to confirm previous results and evaluate the efficacy of a lower dose of Myco-Ad A-Z in reducing the toxic effects of T-2 in broiler.

MATERIALS AND METHODS

This experiment was conducted at the Instituto Internacional de Investigacion Animal, Queretaro, Mexico. Feed was experimentally contaminated with synthetic T-2 toxin from Sigma Chemical Company, St. Louis, MO, USA. The product used was a commercial modified phylosilicate, Myco-Ad A-Z, produced in Texas (Special Nutrients, Miami, FL, USA).

A total of 90 ten-day-old Ross 308 male broiler chicks from a commercial hatchery were used in this experiment for 29 days. Chicks were individually caged and reared under uniform management conditions, with feed and water provided *ad libitum*. Birds were fed a corn-soybean meal based mash diets that met or exceeded the levels of nutrients recommended by the NRC (6).

The chicks were randomly distributed into five treatments with 18 replications each. Dietary treatments were as follows: 1) control diet; 2) control diet + 0.1% Myco-Ad A-Z; 3) control diet + 1.25 ppm of T-2; 4) control diet + 1.25 ppm T-2 + 0.05% Myco-Ad A-Z; and 5) control diet + 1.25 ppm T-2+ 0.1% Myco-Ad A-Z.

Chickens were weighed individually, total feed consumption recorded, and scored for incidence and severity of oral lesions at 39 days of age. Oral lesion score consisted of a four point scoring system ranging from 0 to 3, including lesions detected at several sites within the mouth, mainly on the upper and lower mandibles, the corners of the mouth, and on the tongue. A lesion score 0 indicates no visible lesions; score 1 was seen as one mild mouth lesion; score 2 was seen as up to two moderate lesions; and a lesion scored as 3 indicated more than two severe lesions.

Data were evaluated with ANOVA for a complete randomized design, using the general linear models procedure of SAS software; SAS Institute (8). When the ANOVA showed significance, Duncan's significant-difference test was applied. Statistical significance was accepted at $P \leq 0.05$.

RESULTS

The effects of dietary treatments on chick performance from day 10 to 39 as well as oral lesions at 39 days of age are presented in Table 1 and Figures 1, 2, 3, and 4. Consumption of T-2 contaminated feed resulted in significant reduction in body weight gain (13.4%), poorer feed efficiency (11%), and increased amount and severity of oral lesions. Supplementation of 0.05% or 0.1% Myco-Ad A-Z to the diet contaminated with 1.25 ppm T-2 significantly improved gain, feed efficiency and reduced the incidence of oral lesions. Body weight gain, efficiency of feed utilization, and oral lesion (Table 1) were not significantly influenced by the adsorbent in the absence of added T-2.

DISCUSSION

The addition of 0.5 kg of Myco-Ad A-Z per metric ton of feed significantly diminished the adverse effects of T-2 in broiler chicks. This is the first report showing the *in vivo* effectiveness of an adsorbent against T-2 at such a low inclusion level. All products previously reported adequate in reducing the toxicity of T-2 in broilers have been used at a dosage of 0.1% or higher in the diet (1,2,5,9) and the trials reported by Medina *et al* (5) and Starkl and Forat (9) were conducted simultaneously with this study. The protective action of this modified phylosilicate appears to involve sequestration of T-2, similar to aflatoxin, as suggested by Phillips *et al*. (7)

In spite of the effectiveness of Myco-Ad A-Z in preventing the decreased broiler performance and organs damage produced by the addition of T-2, mild oral lesions were observed in few chickens fed the adsorbent in the contaminated diet. Probably, they are a consequence of the direct T-2 caustic effect in the mouth (3), where lack of appropriate conditions, especially liquid medium and low pH, prevents the action of the adsorbent.

Results obtained in this experiment demonstrate that 1.25 mg of T-2 per kg of feed can produce the typical signs of an acute T-2 toxicosis in broilers, similar to those reported in the literature (3) when using levels of T-2 greater than 2 mg/kg. According to Hoerr (3), it is the severe ulcerative stomatitis produced by T-2 that leads to decreased feed intake, reduced gain and decreased feed efficiency.

CONCLUSIONS

1. The effectiveness of Myco-Ad A-Z at 0.1% inclusion in preventing the toxic effects of T-2 in broilers chickens was confirmed.

2. Myco-Ad A-Z at the low dosage of 0.5 kg per metric ton of feed was effective in preventing the deleterious effects caused by T-2 in broiler chickens.

3. The addition of 1.0 kg of Myco-Ad A-Z per metric ton of feed did not show any statistical difference in overall performance compared to the control diet, demonstrating its lack of interference with nutrients absorption.

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ABSTRACT

Performance and health are both affected when poultry consume feed contaminated with T-2 toxin. (T-2) The dietary use of 0.1% of a commercial purified phylosilicate (Myco-Ad A-Z) has been demonstrated to effectively prevent the toxic effect of T-2 in broilers. An experiment was conducted to confirm previous results and evaluate the efficiency of a lower dose of Myco-Ad A-Z in reducing the deleterious effects of T-2 in broilers. Ninety 10-day-old Ross 308 male broiler chicks individually caged were randomly distributed into five dietary treatments with 18 replications of one chick each. Birds were fed a corn-soybean meal based mash diet containing or exceeding NRC recommended nutrients levels. The feed was experimentally contaminated with synthetic T-2 from Sigma Chemical Company, USA. Treatments were: (1) control diet; (2) control + 1.0 kg/mt Myco-Ad A-Z; (3) control + 1.25 ppm T-2; (4) control + 1.25 ppm T-2 + 0.5 kg/mt Myco-Ad A-Z and (5) control + 1.25 ppm T-2 + 1.0 kg/mt Myco-Ad A-Z. Results at 39 days of age indicated that broilers fed 1.25 ppm T-2 contaminated diet presented significant ($P \leq 0.05$) lower body weight, poorer feed conversion, and greater incidence/severity of macroscopic oral lesions than chickens fed the control diet. The highest mortality occurred in broilers fed the T-2 contaminated diet. The addition of either 0.5 or 1.0 kg/mt of Myco-Ad A-Z to the contaminated diet resulted in broilers with statistically significant ($P \leq 0.05$) heavier body weight gain (1972 and 1946 v 1746 g); more efficient feed conversion (1.75 and 1.76 v 1.94) and reduced oral lesions incidence/severity than those fed 1.25 ppm T-2. The addition of 1.0 kg/mt of Myco-Ad A-Z to the diets did not show any statistical ($P \leq 0.05$) difference in overall performance compared to the control diet, demonstrating its lack of interference with nutrients absorption. These results indicated that Myco-Ad A-Z at the low dosage of 0.5 kg/mt was effective in preventing the toxic effects of T-2 in broilers.

Key Words: Myco-Ad A-Z, T-2 toxin, broilers

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Table 1. Effects of different levels of Myco-Ad A-Z on performance and oral lesions of broilers fed T-2 toxin from 10 to 39 days of aged.

TREATMENT	Body weight gain g	FCR	Number of birds with oral lesions	Incidence of oral lesions*
Control	2016 a	1.75 a	1/18	0.50 a
1 kg Myco-Ad A-Z	2018 a	1.71 a	2/18	0.25 a
1.25 ppm T-2 toxin	1746 b	1.94 b	15/18	28.50 c
1.25 ppm T-2 toxin + 0.5 kg Myco-Ad A-Z	1972 a	1.75 a	5/18	7.50 b
1.25 ppm T-2 toxin + 1 kg Myco-Ad A-Z	1946 a	1.76 a	5/18	5.00 b

a, b, c Means within columns with no common superscripts differ significantly ($P \leq 0.05$)

* Number of birds with oral lesions x severity of lesions (score 0-3)

Oral lesions in broiler chickens exposed to 1.25 ppm of t-2 from 10 to 39 days of age

Figure 1. Effect of different levels of Myco-Ad A-Z on body weight gain of 39 day-old broilers exposed to T-2 for 29 days.

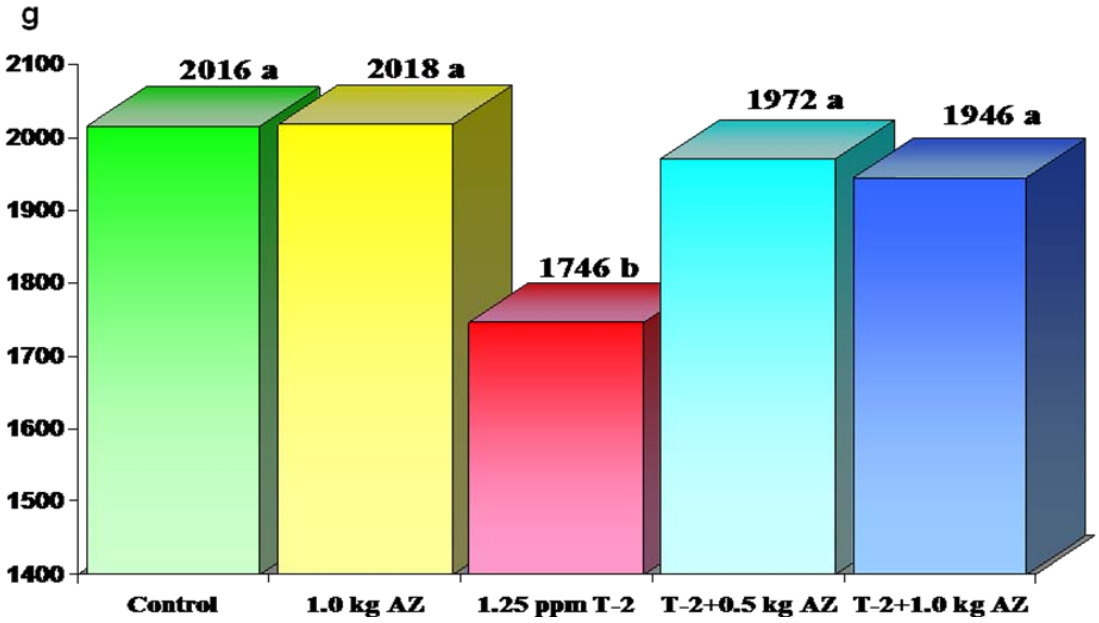
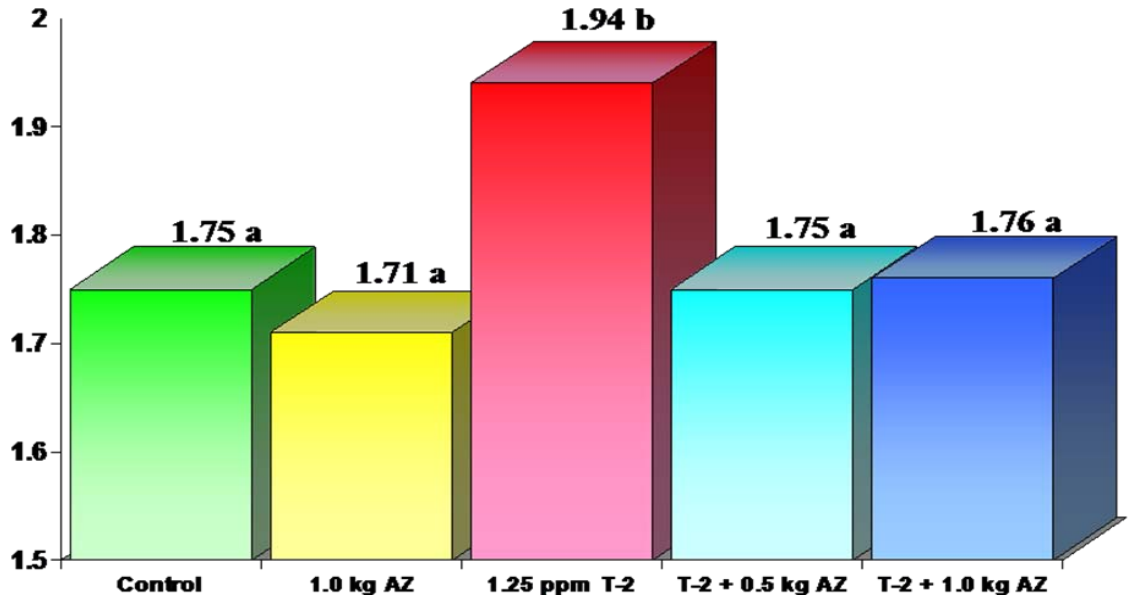


Figure 2. Effect of different levels of Myco-Ad A-Z on feed conversion ratio of 39 day-old broilers exposed to T-2 for 29 days.



a, b, c Means within columns with no common superscripts differ significantly (P 0.05)

Figure 3. Effect of different levels of Myco-Ad A-Z on the number of birds with oral lesions at 39 days of age and exposed to T-2 for 29 days.

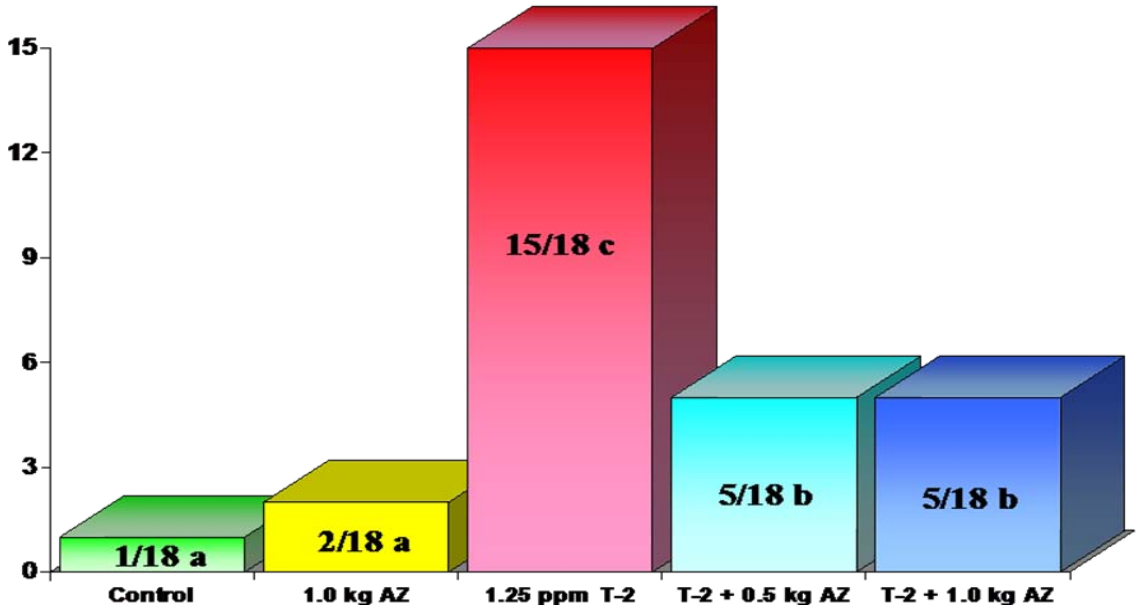
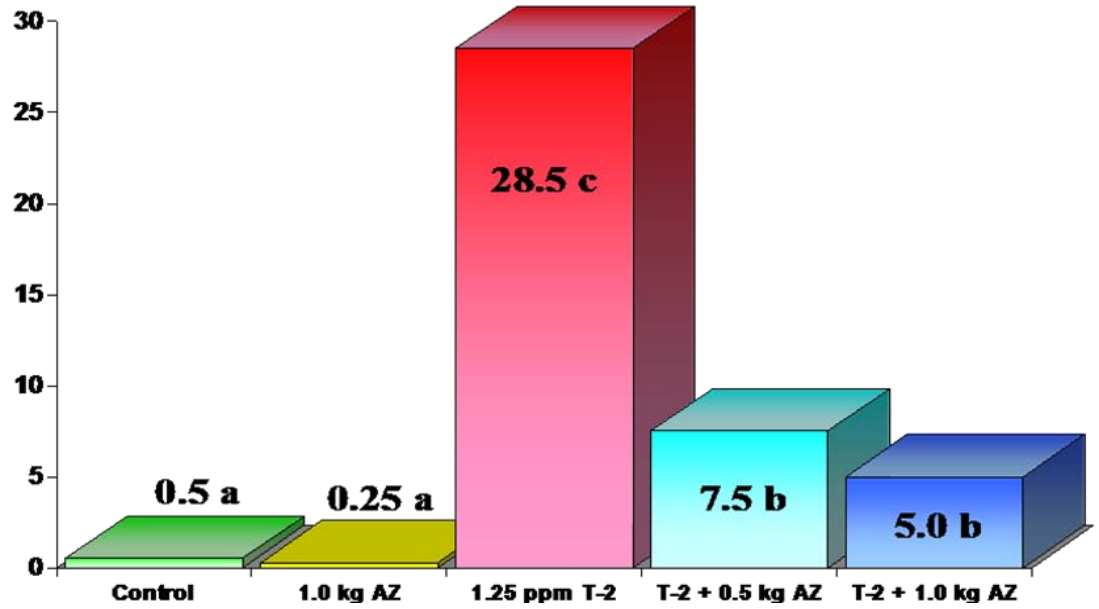


Figure 4. Effect of different levels of Myco-Ad A-Z on incidence x severity of oral lesions score of 39 day-old broilers exposed to T-2 for 29 days.



a, b, c Means within columns with no common superscripts differ significantly ($P \leq 0.05$)