Dept. of Animal Hygiene,
Fac. of Vet. Med., Assiut University,
Head of Dept. Prof. Dr. Nabila Gazia.

CHEMICAL TREATMENTS OF MYCOTOXIN CONTAMINATED RATIONS AND POSSIBILITY OF ITS SAFETY USE FOR CHICKS

(With 4 Tables and One Figure)

By

NABILA GAZIA; A.M. ABD-ELLAH and A.N. SAYED

(Received at 6/1/1991)

معالجة العلائق الملوثة بسموم الفطريات كيميائيا
وسلامة استخدامها في تغذية الكتاكيت

نبيلة جازيه ، عبدالستار عبدالله ، عبدالباسط سيد

أجريت أربع تجارب نمو على أربع مجموعات من كتاكيت الدجاج (Arber Acer) لدراسة تأثير معالجة العلائق الملوثة بسموم الفطريات كيميائياً، وقد تم تغذية كتاكيت المجموعة الأولى على عليقة سليمة خالية من هذه السموم ، بينما غذيت كتاكيت المجموعة الثانية على عليقة ملوثة بهذه السموم ، وأما المجموعتان الثالثة والرابعة فقد تم تغذيتها على العليقة الملوثة بسموم الفطريات بعد معالجتها بحمض الخليك وهيدروكسيد الأمونيا. وقد وجد أن تغذية الكتاكيت على عليقة ملوثة بسموم الفطريات أدى الى انخفاض كبير في معدلات النمو المطلق والنسبي ، وأيضا في كفاءة التحويل الغذائي . بينما أدت المعالجة الكيميائية بحمض الخليك والأمونيا الى تحسن كبير في هذه المعايير مع تفوق أثر إضافة الأمونيا في ازالة هذه السموم.

SUMMARY

Seventy-eight Arber Acer chicks were experimented on. The birds were randomly divided into four groups to study the possibility and safety use of the decontaminated rations for chicks, and also its effect on the growth performance and the feed conversion efficiency of the four groups.

The chicks of the first group were fed on mycotoxin-free ration, while that of the second group were fed on a ration contaminated with mycotoxins. the third and the fourth groups were fed the contaminated ration after being treated with acetic and ammonium hyroxide as detoxifying agents.

The weight gain, relative growth rate, and the feed conversion efficiency were considered as the criteria for comparison among the four groups.

The weight gain, relative growth rate, and feed conversion efficiency were highly depressed with chick fed contaminated diet, while its treatment with acetic acid and ammonium hydroxide gradually and progressively improved these parameters. Ammonium hydroxide treatment proved to be a promising agent in this aspect.

INTRODUCTION

The control of fungal activity in animal and poultry feed or ingredients is a subject that has attracted much attention in the last few years as a result of increasing awareness of hazards presented by mycotoxins (STEWART et al., 1977). Control can be achieved at least partly in several ways including the obtaining of feed and ingredients that are free of mycotoxins (SMITH and HAMILTON, 1970), the reduction of the mean residence time of feed-handling system (GOOD and HAMILTON, 1981), by cleaning and disinfecting the feed-handling equipments (HAMILTON, 1975), by reducing the moisture content of the feed (TABIB et al., 1981), and by improving management (HAMILTON, 1975 and TABIB et al., 1981). Perhaps the easiest and most economically efficient way of controlling fungal activity is by use of mold inhibitors. Many and different chemicals have been tested and used for mold inhibitory properties (STEWART et al., 1977).

A wide number of reagents have been examined for their ability to reduce the aflatoxin levels in contaminated agricultural commodities. The most prevalent in use are strong acids, bases and oxidizing agents (MANN et al., 1970; CIEGLER, 1978 and MARTH & DAYLE, 1979). The most useful detoxifying agent has been ammonia (GARDNER et al., 1971 and BREKKE et al., 1977). Moreover, the acids has a beneficial detoxifying agents for reducing the mycotoxins-contaminated ration (CIEGLER et al., 1966; CIEGLER and PETERSON, 1968 and PONS et al., 1972).

The purpose of the present work was to confirm and extend the observations of the safety use of detoxifying agents for mycotoxin contaminated rations on the performance of chicks.

MATERIAL and METHODS

As the use of chemicals to detoxify aflatoxin has been extensively studied, further testing and feeding trials are necessary to evaluate these detoxifying agents. so this work was designed to ensure safety use of decontaminated rations taking the performance of chick as a criterion for this aspect.

Seventy eight Arber Acer chicks aging 15 days were classified into three groups, each of 20 chicks in addition to a control group of 18 chicks. The birds were housed in brooders and provided with a source of heat and light.

The chicks were vaccinated with a prophylactic dose against Newcastle disease and supplied with doses of furaltone, erythromycin and amprole as prophylactic treatments against bacterial and parasitic diseases. In addition, premix (Pfizer) was added to the diet as a supplement for (0.25%).

TREATMENTS OF MYCOTOXIN CONTAMINATED RATIONS

The four groups of chicks were fed as follows:

1- **Group I:** was fed on ration obtained from Agriculture sector, Assiut Province.

2- **Group II:** was fed on a ration obtained from El-Minea governrate with a history of high mortalities reffered to the effect of fungi and mycotoxins and not to other causes of infections. Birds of this group were considered as control for comparison.

3- **Group III:** chicks of this group were fed on the ration of the control group after being treated with acetic acid 0.2 N (10 ml/100 gm ration), stored for 7 days, then roasted at 100°C for one hour (MASHALY et al., 1983).

4- **Group IV:** chicks of this group were fed on the ration of group II after being treated with ammonium hydroxide 0.2 N (10 ml/100 gm ration), stored for 7 days then roasted at 100°C for one hour (MASHALY et al., 1983). The treted ration was left to be air dried for 24 hours to be sure that it became ammonia free before being fed to chicks.

The birds of all groups were fed ad libitum. Along the experimental period (4 weeks), food consumed and body weight were recorded weekly. Growth rates and the feed conversion efficiency also were calculated. Samples of the rations experimented on were chemically analysed for determination of moisture, crude protein, ether-extract, crude fiber and ash according to the AOAC (1984).

RESULTS

The average chemical composition of the non-contaminated and contaminated control rations is presented in table (1), while the data of the body weight gain in the four groups during the 4 weeks experimental period are shown in table (2).

The rate of growth expressed in relation to the weights at the beqinning and end of each period is shown in table (3) in order to clarify the effect of the rations on the gain in weight considering the body weights of the chicks.

The relation between feed intake and gain in weight is illustrated in table (4) in which the feed conversion index in the four groups are presented.

DISCUSSION

Aflatoxin infected diets could be decontaminated either physically or chemically. Sunlight and heat as physical agents were found to be less efficient while chemical methods proved to be more efficient.

As a comparison between group II (fed the contaminated ration) and group I (fed the non-contaminated rtion), table (2) shows that the body weight gain was highly depressed reached to 200 grams during the duration of experiment, while treatment of the contaminated ration with both acetic acid and ammonium hydroxide grad-

ually and progressively improved the body gain (about 140 gm and 141 gm, respectively). The diet treated with ammonia was supeerior to that treated with acetic acid, however the data obtained by the two treatments fail to reach tht of group I, which fed the non-contaminated ration (Fig. 1).

Regarding the relative growth rate, the highest values were recorded during the first two weeks, thereafter a great decline was recorded in the other two weeks, as the toxic effect of the contaminated ration needs about two weeks for its appearance. The chemical treatment of the contaminated ration with acetic acid and ammonium hydroxide gradually improved the growth rate in the groups III & IV (table 3).

Table (4) shows that the chicks of the control group consumed more feed for one kiloram increase in weight gain when compared with the group I, while treatment with ammonia and acetic acid decreased the ration required for kilogram gain, a matter which ensure the efficiency of the treatments.

Generally, the results concerning ammonia detoxification in this study referes as a successful applicable method for its satisfactory results and its facility in application. In addition, ammoniation of the aflatoxin contaminated rations approximately destructed the aflatoxins. These results were recommended by most national authorities searching for reduction of aflatoxin by ammoniation either under pressure or not with suitable moisture content. They also added that pressure decreased the time to few minutes instead of few weeks. Results of this trial confirmed that obtained by MASRI et al., 1969; CARDNER et al., 1971; GOLDBLATT, 1971; MANN et al., 1971; LANCESTER, 1972; LEE et al., 1974; BREKKE et al., 1977; GOLDBLATT & DOLLER, 1977; LEE & CUCULLU, 1978; LOUGH et al., 1979 and MASHALLY et al., 1983 who reported the effectiveness of ammoniation under elevated temperature together with high pressure in reducing total aflatoxin content.

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Table (1): The average chemical composition of the rations.

Diets	Average chemical composition (%)					
	Moisture	CP	EE	CF	NFE	Ash
Assiut ration (non-contaminated)	6.2	21.0	7.9	3.2	54.6	7.1
El-Minea ration (contaminated ration)	10.4	20.7	7.0	4.8	49.0	8.1

Table (2): The average body weight gain (gm) for the four groups.

Groups	Average body weight gain (gm)				
	1	2	3	4	Total
Non-contaminated	103.4 ±15.43*	177.4 ±15.88	343.9 ±24.75	412.9 ±24.75	1037.6
Contaminated	91.2 ±15.02	161.0 ±17.5	290.0 ±23.15	295.9 ±23.15	838.0
Acetic acid treatment	102.4 ±14.52	162.6 ±14.52	291.0 ±17.36	321.86 ±17.36	877.9
Ammonium hydroxide treatment	103.0 ±15.02	175.2 ±15.02	303.9 ±17.34	398.0 ±17.34	980.1

* SE : Standard error.

Table (3): The average relative growth rate for the four groups.

Groups	Average relative growth rate			
	1	2	3	4
Non-c-ntaminated	59.6	56.5	59.8	43.3
Contaminated	68.6	62.0	55.0	33.2
Acetic acid treatment	63.7	54.4	51.9	34.9
Ammonium hydroxide treatment	63.5	58.2	54.6	43.0

Table (4): The average feed conversion index for the four groups.

Groups	Average fed conversion index				
	1	2	3	4	Total
Non-contaminated	2.4	1.5	I.6	2.5	2.0
Contaminated	2.8	3.2	3.5	4.2	3.6
Acetic acid treatment	2.5	1.9	2.0	3.5	2.6
Ammonium hydroxide treatment	2.5	1.6	1.9	2.5	2.2

Fig.(1): The average weight gain of the four experimental groups.