Original article

The Effect of Dietary Aflatoxin on Local Domestic Ducks

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Abstract
This study was conducted to determine the effects of feed contaminated with aflatoxin B1 (AFB1) on growth performance in ducks. Thirty, ducks randomly divided into two groups of 3 replicates and were fed commercial feed uncontaminated or contaminated AFB1 at level 250 µg/kg. AFB1 contaminated feed significantly decreased the body weight, feed intake and increased feed conversion rate ($p<0.05$). The results revealed that the growth performance of the contaminated diet compared to controls diet, a significant weight loss was observed 12.95%, 6.9% and 4.97% in the third week. Feed intake was significantly decreased ($p<0.05$) with the group fed AFB1 compared with the control. The overall, decrease was 1.4% and 3.8% for the second and third week respectively. The feed conversion was increased significantly ($P<0.05$) in the second and third week with an average of 2.5% and 4.9% over the control group. The results therefore, ducks performance was negatively affected by AFB1 contamination in feed. This will confirm that AFB1 contamination in poultry feed causes heavy economic losses by lowering body weight gain and feed conversion. Therefore, lower levels of Aflatoxin in the poultry feeds should be required if all acceptable risk is to be avoided.

Keywords: Probiotic, Aflatoxin, Digestibility, Performance

Introduction

Aflatoxins are secondary metabolites of certain strains of *Aspergillus flavus*. Aflatoxin ingestion by chicken result in many different symptoms such as reduced growth, increased susceptibility to infectious agents etc. (Edds and Osuna 1976, Jones *et al.* 1982). Feeding AFB1 contaminated diets decreased average daily gain and average daily feed intake linearly and quadratically during the whole experimented period (He *et al.* 2013). Fei Shi et,al. (2013) investigated the effects of feeding corn contaminated with aflatoxin B1 concluded that AFB1 contaminated diet significantly decreased the body weight gain, feed intake and feed conversion rate. A study on the effects of increasing aflatoxin B1 concentrations from contaminated corn fed to young ducklings conducted by Wan et al. (2013) stated that the average daily gain and relative weighs of liver, spleen, thymus and bursa of fabricius decreased linearly. A linear relationship was observed in broilers between the level of toxin and reduction in growth (Madden *et al.* 1999). The growth of chicks was not affected by concentration of aflatoxin below 250 µg / kg (Santurio *et al.* 1999). A significant decrease in body weight at level as low as 75 µg/kg was noted although the treated chicken showed no morbidity, mortality or significant pathology on necropsy (Chang and Hamilton 1982, Gabal and Azzam 1998, Oguz *et al.* 2000). Growth inhibition due to aflatoxins had also been reported by other researchers (Santurio *et al.* 1999) and varying susceptibility to aflatoxicosis in different breeds of chicken had been demonstrated by research workers in different countries (Bryden et al. 1980, Bryden and Cumming1980, Azzam and Gabal 1998).

Aflatoxicosis in commercial poultry is a serious problem in places with high humidity as it favors growth of aflatoxin producing fungi in the feed. Tripoli, the coastal city of Libya and a major area of poultry husbandry in the country, has high levels of humidity for most part of the year and therefore, fraught with the danger of aflatoxicosis. Since ducks are likely to differ considerably in susceptibility to aflatoxicosis (Arafa *et al.* 1981), experiments were conducted to study the effect of aflatoxin on the growth performance during three weeks of age. It was also in our attention to set practical procedures in our laboratory for aflatoxin analyses and investigation in order to carry out research studies and to offer the possibility for postgraduate studies on aflatoxicosis in poultry.

Materials and Methods

A healthy unvaccinated baby Local ducks were obtained from a local commercial market in Tripoli. Thirty local breed ducks, each weighing 300 to 400 gm, were randomly divided into two treatment groups, with 3 replicate groups for each. The ducks were housed on litter based floor pens under continuous illumination throughout the experiment. The experiment lasted for 3 weeks all ducks were allowed ad libitum access to feed and water during the 21 days experiment.

The dietary treatments consisted of a control diet obtained from a commercial feed mill Al Tahadi (Table 1). The contaminated diet was prepared by addition of moldy rice at 1% and was adjusted in the feed formulation. Moldy rice powder was obtained by inoculating known amount of broken rice with *A. flavus*

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Table 1. Feed composition (Al tahadi Factory, Tripoli)

Item	%
Corn	60
Soy bean	27
Fish meal	6
Vegetable Oil	2
Methionine	0.035
Dicalcium phosphate	2
Salt	1.62
Limestone	1
Premix	0.3
Determined Analysis	
Moisture	9.5
Crude protein	20.57
Ash	9.77
Ether extract	3.23
Crude fiber	2.67
Nitrogen free extract	50.73
Calcium	1.00
Phosphrous	0.40

supplied by Agriculture Research Center, Tripoli. AFB1 production was carried out in accordance with the method based on that reported by Shotwell et al. (1966). Quantified by comparisons of standards on a TLC plate.

The control diet was free from aflatoxin B1, within detectable limits, while the test ration contained AFB1, 250 µg/kg. The average weight gain, feed intake and feed conversion rate of each replicate were measured at the end of each week. The ducks were weighed on every 7th, 14th and 21st day. All ducks from the control and treated group were sacrificed on day 21 to determine serum protein lipids, hemoglobin and organs morphology weight. The results on these will be reported elsewhere. Using Students "t" test, difference in means were compared between the control and the treated ducks.

Results and Discussion

The ducks, which received 250 µg/kg of aflatoxin in the feed for three weeks, generally showed no signs of morbidity or feed refusals, however, in some cases feathers, were ruffled. A few birds were not able to stand on their feet. There was no mortality due to aflatoxicosis. Growth rate of treated ducks compared to controls and between the ages in weeks is given in Table 2. The body weight in all treated ducks after one week showed an increase of 3.4%, 1% and 1.4% over the controls. The similar average fed intake among the two treatments of ducklings in this study indicated that consumption of diets naturally contaminated with AFB1, exerts no detrimental effects on feed intake. This combined with the observation that ducklings did not sort the diet according to theAFB1-contaminated feed supplementation; this observation comes in agreement with Matur et al. (2010) who suggested that ducklings within a treatment group likely consumed a similar amount of AFB1 and that differences obtained among treatments were likely ascribed to the different concentrations of AFB1 in the diets. At the end of the second week, the treated ducks suffered a greater weight loss, 7%, 0.96% and 3.12% respectively. However, there was no significant difference in ducks receiving control feed and aflatoxin containing. The average weights in control groups were 728.4294, 691.53 and 712.89 gm, respectively. Those receiving contaminated feed, respectively it was 634.125, 643.38, and 677.423 gm. The weight loss was significant ($p<0.01$) in third week i.e. 12.9%, 6.9 and 4.97% respectively (Figure 1). The overall average loss in body weight due to aflatoxin in the second and third week was 3.9% and 8.4%. The decrease in feed intake was significant in the third week i.e 8.5%, 2% and 0.8% respectively. The overall, average decrease in feed intake due to AFB1 contamination was in the second and third weeks 1.4% and 3.8% respectively. Accordingly, the feed conversion (feed/body weight) was increased as well in the second and third week where the overall average was 2.5% and 4.9% respectively. Body weight was depressed in mycotoxin fed group which confirm the conclusion of Yunus *et.al.* (2011) that the dietary aflatoxin reduces weight gain, feed intake and increase feed conversion ratio. For levels of AFB1 of 1mg/Kg diet, 10% reduction in weight gain was noted by Zhao *et al.* (2010) at 21 days of exposure while 15% a reduction in weight gain was noted by Denli *et al.* (2009). The increased growth depression observed with the simultaneous feeding mycotoxin for a longer time than in the first week and that's may be due to additive toxic effects of individual toxins (Zaghini *et al.* 2005). The mechanism for this effect includes inhibition of RNA, DNA synthesis as well as RNA polymerase activity (Arafa *et al.* 1981). Consequence of RNA, DNA synthesis involves reduced protein synthesis which ultimately would reduce growth.

Figure.1 Showing the effect of aflatoxin on body weight, left duck was exposed to aflatoxin B1

Generally, all ducklings in this study had similar feed intake and feed conversion rate (Table 2). However, ducklings fed AFB1 diet had lower ($P<0.05$) body weight compared with control diet. Body weight and feed consumption compared with control, the body

weight gain and feed consumption of ducks, which were fed diets contaminated with 250µg/kg of AFB1, significantly decreased (P<0.05) from second week. The feed: gain ratio significantly increased (P<0.05) when the ducks were fed diets contaminated with AFB1 (Table 2). The ducks consumed diets contaminated with AFB1 showed a significant reduction in feed intake. When the ducks were administered feed contaminated with AFB1, our results prove that some economically significant effects occurred in the ducks, including reduced body weight gain, feed consumption, and feed conversion rate.

Table 2. Performance of ducks in three weeks of age fed uncontaminated and contaminated diet with AFB1

Weeks	Bird No.	BW Control±Se (g)	BW Treatment±Se (g)	F I control±Se (g)	FI treatment±Se (g)	FC control±SE (FI/BW)	FC treatment±SE (FI/BW)
1	5	345.0 ± 17.5	357.1 ±10.3	545.1 ±27.2	571.3 ±28.5	1.58 ±0.08	1.60 ±0.81
1	5	352.0 ±17.6	355.6 ±10.3	563.2 ±28.1	572.6 ± 28.6	1.60 ±0.08	1.61 ±0.79
1	5	336.5 ±16.8	341.3 ±9.8	528.3 ±26.1	542.6 ±7.1	1.57 ±0.07	1.59 ±0.70
2	5	545.4 ±21.8	503.9 ±10.5	872.6 ±34.9	821.5 ±32.8	1.60 ±0.06	1.63 ±0.05
2	5	517.8 ±20.2	512.8 ±10.7	833.6 ±33.3	841.1 ±33.6	1.61 ±0.06	1.64 ±0.06
2	5	551.8 ±22.0	534.6 ±11.2	877.6 ±35.0	882.1 ±35.3	1.59 ±0.60	1.65 ±0.71
3	5	728.4 ±1.85	634.1 ±15.8	1150.9 ±34.5	1052.7 ±31.6	1.58 ±0.04	1.66 ±0.04
3	5	691.5 ±20.7	643.3 ±16.1	1102.9 ±33.0	1080.9 ±32.4	1.59 ±0.05	1.68 ±0.05
3	5	712.8 ±21.3	677.4 ±16.9	1140.6 ±34.2	1131.3 ±33.9	1.60 ±0.051	1.67 ±0.06

BW body weight, FI feed intake, FCR feed conversion rate, SE standard error

Conclusion

Aflatoxin contamination in ducks feed may cause economic losses by lowering growth performance. Therefore, lower levels of aflatoxin B1 in the poultry feeds should be required if all acceptable risk is to be avoided. Additionally, the risk of aflatoxins in poultry as a food appears to remain very low, although the levels of aflatoxins in human foods should be kept as low as possible to reduce the incidence of hepatic cancer.

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