EFFECT OF DIFFERENT LEVELS OF AFLATOXIN B1 ON EGG PRODUCTION OF BREEDER JAPANESE QUAILS (*Coturnix coturnix japonica*)

T.G. Soma[1], Binoj Chacko[2], P. Anitha[3], S. Sankaralingam[4] and K. Ally[5]

[1-4] Department of Poultry Science. [5] Department of Animal Nutrition, College of Veterinary and Animal Sciences, Mannuthy, Thrissur, Kerala - 680 651

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ABSTRACT

The present study was carried out to find the effect of different levels of aflatoxin B1 (AFB1) on egg production of breeder Japanese quails (*Coturnix coturnix japonica*). One hundred and sixty quail breeders at six weeks of age were distributed in completely randomized experimental design with five treatments and four replicates of eight birds each (3:1 female to male ratio). The five treatments diets containing <5 (control), 20, 40, 60 and 80 ppb AFB1 were applied during 7 to 26 weeks of age. The egg production was significantly ($P<0.05$) lower in all the treatment groups compared to control. Results suggested that long time exposure to aflatoxin B1 at 20 ppb level or more adversely affected the egg production.

Keywords: Breeder Japanese quails, aflatoxin B1, egg production

INTRODUCTION

Aflatoxins (AF) are metabolites of certain strains of fungi, chiefly *Aspergillus flavus* and *Aspergillus parasiticus*. Aflatoxin B1 is the most potential, toxic and carcinogenic metabolite found naturally in agricultural crops. All species of poultry are susceptible to aflatoxicosis. The susceptibility to aflatoxicosis varies depending on species, age, sex, dose, duration of exposure and nutrition. AF contamination causes reduced feed intake, lower growth rate, decreased egg production, suppression to natural immunity, increased mortality, hepatotoxicosis, haemorrhage and carcinogenesis in poultry. The potential impact of aflatoxin on egg production in Japanese quail is not well known. So the present study was planned to assess the effect of different levels of AFB1 in diet of breeder Japanese quails on production performance.

MATERIALS AND METHODS

Experimental layout

120 female and 40 male Japanese quails of six weeks of age belonging to a single hatch were selected from University Poultry and Duck Farm, Mannuthy, which formed the experimental subject for the study. They were uniformly distributed to five dietary treatments T1, T2, T3, T4 and T5 containing <5 (control), 20, 40, 60 and 80 ppb AFB1, respectively. Each having four replicates of eight quails each (3:1 female to male ratio) using completely randomized experimental design. Birds were fed with experimental diets from 7 to

26 weeks of age. All rations were prepared without toxin binder and made isocaloric and isonitrogenous (22 per cent CP and 2650 kcal ME/kg) using Bajra - Soyabean meal. The quails were offered *ad libitum* feed and water throughout the experimental period.

Aflatoxin production

Aspergillus flavus NRRL 6513 strain was used for the production of aflatoxin. Aflatoxin B1 was produced in maize as per the standard procedure (Shotwell *et al*., 1966). Aflatoxin concentration of the representative sample of ground mouldy maize powder was quantified by Enzyme Linked Immuno Sorbent Assay (Aflatoxin B1 ELISA kit Cod. MA222 Tecna) at Mycotoxin lab, Department of Poultry Science, College of Veterinary and Animal Sciences, Mannuthy, Thrissur.

Daily egg production

Daily egg production of birds from seven to twenty-six weeks of age in each replicate was recorded. Data on mean quail housed and quail day egg production in each 28-day period (I, II, III, IV and V) and cumulative mean egg production from 7 to 26 weeks of age in various dietary groups were calculated.

Statistical Analysis

Data on egg production was analysed statistically using SPSS version 21.0.

RESULTS AND DISCUSSION

The results of feeding different levels of aflatoxin B1 containing diets in breeder Japanese quails over five 28 - day periods on mean per cent quail housed and quail day egg production is presented in Table 1 and 2, respectively.

The statistical analysis of the data on quail housed and quail day per cent egg production from 7 to 26 weeks of age revealed significantly ($P<0.05$) lower egg production in all treatment groups fed with different levels of aflatoxin.

During period I and II of the experiment, there were no significant difference in egg production among birds given different dietary levels of aflatoxin B1. During third period, there was significant ($P<0.05$) reduction in quail housed production of Japanese quails given diet containing 20, 60 and 80 ppb AFB1. All levels of AFB1 studied, significantly ($P<0.05$) affected quail housed percent egg production during period IV and V. The statistical analysis of the data revealed that all levels of AFB1 significantly ($P<0.05$) affected quail housed percent egg production from 7 to 26 weeks of age in dose related manner. Birds fed with diet containing highest level of aflatoxin (80 ppb) had lowest egg production, whereas highest egg production was in control birds. The data also indicated that reduction in egg production among bird given feed containing different dietary levels of AFB1 was in dose related manner and the egg production in birds was affected significantly after 56 days of exposure to aflatoxin at the level of 20 ppb and above.

Hamilton and Garlich (1972) and Garlich *et al.* (1973) reported that the egg production did not decrease rapidly after introduction of aflatoxin into the diet but rather occurs after a 10 to 14 day lag period. Similar to this finding, Howarth and Wyatt (1976) reported significant reduction in egg production during third and fourth week after initiation of toxin feeding in mature broiler breeder hens fed with 5000

and 10000 ppb aflatoxin in feed. Wolzak *et al.* (1985) also found that egg production was decreased by third week of treatment in White Leghorn pullets fed with of 3310 ppb AFB1 in diet. According to Garlich *et al.* (1973) drop in egg production is preceded several days by a drop in serum proteins and lipids which are the precursors of egg constituents.

Dose dependent reduction in per cent quail housed and quail day egg production was evident in breeder Japanese quails fed with low levels of dietary aflatoxin from 7 to 26 weeks of age. Birds fed diet containing highest level of aflatoxin (80 ppb) had lower egg production whereas highest egg production was in control birds. Similarly, Huff *et al.* (1975) reported that dose dependent decrease in egg production was noticed in thirty week old laying hen fed with graded levels of aflatoxin at 1250, 2500, 5000 and 10000 ppb levels in feed.

The adverse effect of dietary aflatoxin on egg production was also reported by Pandey and Chauhan (2007) in White Leghorn chicken. Reduced egg production was also reported by Sudhakar (1990) for AFB1 concentrations higher than 600 ppb in White Leghorn chicken. Siloto *et al.* (2011) reported lowest percentage of lay in layers fed with 1000 ppb aflatoxin for eight weeks. On contrary, Oliveira *et al.* (2002) reported no adverse effect on egg production in laying Japanese quail exposed to 50 and 100 ppb AFB1 in feed for a period of 24 weeks.

In general, quail housed and quail day per cent egg production was adversely affected in breeder Japanese quails fed with different dietary levels of aflatoxin B1 (20, 40, 60 and 80 ppb AFB1) and reduction in egg production was in dose dependent manner.

SUMMARY

Results of the present study indicated that aflatoxin B1 at level 20 ppb and above affected the egg production, emphasizing the importance of controlling aflatoxin contamination in quail feeds by adding toxin binder in the feed.

Table 1. Mean (±SE) quail housed per cent egg production of breeder Japanese quails influenced by different levels of aflatoxin B1 in diet

Age in weeks	Treatment Groups (Aflatoxin B1 level)				
	T1 - < 5ppb	**T2 -** 20 ppb	**T3 -** 40 ppb	**T4 -** 60 ppb	**T5 -** 80 ppb
7-10	58.03 ±2.58	56.69 ±3.81	56.70 ±3.35	56.25 ±0.98	55.65 ±0.52
11-14	89.58 ±0.38	88.24±0.51	88.09±0.24	87.50±0.49	86.31 ±2.43
15-18	94.94^{a} ±1.38	89.88^{bc}±1.67	92.11^{ab}±0.70	88.69^{bc}±0.72	86.46^{c} ±0.82
19-22	91.82^{a}±0.51	85.71^{b}±0.88	76.49^{c} ±2.41	75.59^{c} ±0.88	67.71^{d} ±3.19
23-26	89.58^{a}±1.39	77.98^{b}±2.68	69.94^{c}±1.30	68.89^{c} ±2.81	59.67^{d}±2.74
Overall mean (7-26)	84.79^{a}±0.55	79.70^{b}±1.34	76.67^{c}±1.25	75.39^{c}±0.50	71.16^{d}±0.79

Table 2. Mean (±SE) quail day percent egg production of breeder Japanese quails as influenced by different levels of aflatoxin B1 in diet

Age in weeks	Treatment Groups (Aflatoxin B1 level)				
	T1 - < 5ppb	**T2 -** 20 ppb	**T3 -** 40 ppb	**T4 -** 60 ppb	**T5 -** 80 ppb
7-10	58.03± 2.58	57.96± 2.99	56.70± 3.35	56.25± 0.98	55.65± 0.52
11-14	89.58±0.38	90.56± 2.32	88.09± 0.24	87.50± 0.49	86.31± 2.43
15-18	94.94^{a}± 1.39	89.88^{bc}± 1.67	92.11^{ab}±0.70	88.69^{bc}± 0.72	86.72^{c}± 1.02
19-22	91.82^{a}± 0.51	85.97^{b}± 0.73	80.22^{c}± 0.76	78.72^{c}± 2.81	80.84^{c}± 1.15
23-26	89.58^{a}± 1.39	82.03^{b}± 1.91	78.36^{bc}±3.36	78.96^{bc}± 1.30	75.49^{c}± 1.19
Overall mean (7-26)	84.79^{a}± 0.55	81.28^{b}± 1.12	79.09^{bc}±1.41	78.02^{c}± 0.89	77.00^{c}± 0.85

REFERENCE

Garlich, J.D., Tung, H.T. and Hamilton, P.B. 1973. The effects of short term feeding ofaflatoxin on egg production and some plasma constituents of the laying hen. *Poult. Sci*. **52**: 2206-2211.

Hamilton, P.B. and Garlich, J.D. 1971. Aflatoxin as a possible cause of fatty liver syndrome in laying hens. *Poult. Sci.* **50**: 800-804.

Howarth, B. and Wyatt, R.D. 1976. Effect of dietary aflatoxin on fertility, hatchability, and progeny performance of broiler breeder hens. *Appl. Environ. Microbiol.* **31**: 680-684.

Huff, W.E., Wyatt, R.D. and Hamilton P.B. 1975. Effects of dietary aflatoxin on certain egg yolk parameters. *Poult. Sci.* **54**: 2014-2018.

Oliveira, C.A.F., Rosmaninho, J.F., Butkeraitis, P., Correa, B., Reis, T.A., Guerra, J.L., Albuquerque, R. and Moro, M.E.G. 2002. Effect of low levels of dietary aflatoxin B1 on laying Japanese quail. *Poult. Sci.* **81**: 976-980.

Pandey, I. and Chauhan, S.S. 2007. Studies on production performance and toxin residues in tissues and eggs of layer chickens fed on diets with various concentrations of aflatoxin AFB1. *Br. Poult. Sci*, **48**: 713-723.

Shotwell, O.L., Hesseltine, C.W., Stubblefield, R.D. and Sorenson, W.G. 1966. Production of aflatoxin on rice. *Appl. Microbiol.* **145**: 425-428.

Siloto, E.V., Sartori, D.R.S., Oliveira, E.F.A., Sartori, J.R., Fascina, V.B. and Berto, D.A. 2011. Performance and egg quality of laying hens fed diets containing aflatoxin, fumonisin and adsorbent. Braz. *J. Poult. Sci.* **13**:21-28.

Sudhakar, B.V. 1990. Effect of aflatoxins on egg production and its quality. *Poult. Adv.* **23**: 43-46.

Wolzak, A., Pearson, A.M., Coleman, T.H., Pestka, J.J. and Gray, J.I. 1985. Aflatoxin deposition and clearance in the eggs of laying hens. *Food Chem. Toxicol.* **23**:1057-1061.

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