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RESEARCH ARTICLE

EFFECT OF AFLATOXIN AND TOXIN BINDERS ON THE GAMA GLUTAMYL TRANSFERASE OF BREEDING JAPANESE QUAILS, *COTURNIX COTURNIX JAPONICA*

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ABSTRACT

There are varieties of agents that can impair the normal resistance mechanism of birds. The presence of such agents in modern poultry operation is of great importance as they can directly affect performance of birds and incidence of diseases. One of the most common immunosuppressive agents in poultry is mycotoxin produced by fungi. Various species of poultry differ in susceptibility to acute and sub-acute aflatoxicosis. This work was carried out to study the role of locally available herbal plant extracts such as *Azadirachta indica, Cynodon dactylon* and *Curcuma longa* in counteracting the effects of experimental aflatoxicosis in laying Japanese quail by feeding them with diets containing aflatoxin at 1.5 and 3 ppm levels for a period of six weeks.

INTRODUCTION

Aflatoxin "a silent killer" is one of the most common toxins that threaten the human life. Turkey `X' disease was reported to be dietary in origin. (Allcroft and Carnaghan, 1963) due to incorporation of Brazilian Peanut meal (Blount, 1961) which was one of the common ingredients of the feed stock for the turkeys and a chloroform extract of the meal yielded toxic components which were responsible for the occurrence of the disease in ducklings (Allcroft *et al.,* 1961). Aflatoxins were cited as the cause of the Turkey X disease which resulted in high mortalities in southern England in 1960 (Asplin and Carnaghan, 1961) and it might also be a cause of poultry haemorrhagic syndrome (Forgacs, 1962) and fatty liver syndrome (Hamilton and Garlich, 1971). Aflatoxins that accumulate in milk or other tissues from food producing animals may impose serious threat to young animals or infants consuming such products.

MATERIALS AND METHODS

Laying Japanese quail, *Coturnix coturnix japonica* was selected for the present investigation. The birds, about 13 weeks of age were obtained from Poultry Research station, Nandanam, Chennai.

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Aspergillus parasiticus strain NRRL 2999 was used to produce aflatoxin. Inoculum was prepared by inoculating the tubes of potato-dextrose agar slant with spores of *Aspergillus parasiticus* NRRL 2999. *Aspergillus parasiticus* were scraped with a sterilized inoculating wire and the spores were spread on the slant of the agar medium. The inoculated test tubes were placed undisturbed for about 7-11 days. On the 11th day, a velvety growth of green spores of *Aspergillus parasiticus* was seen. Aflatoxin was produced by inoculating the cultured *Aspergillus parasiticus* spores on rice culture (Shotwell *et al*., 1966). The aflatoxin was extracted and estimated Pons *et al.* (1966). Leaves of *Azadirachta indica* and *Cynodon dactylon* and rhizome of *Curcuma longa* were collected from locally available plants. They were sun dried and ground into a fine powder. Aminovit was obtained from Intervet India Pvt. Ltd, Pune. The present study dealt with the effect of dietary aflatoxin (1.5 and 3 ppm) on laying Japanese quails and the role of herbal extracts such a *Azadirachta indica, Cynodon dactylon* and *Curcuma longa* in counteracting the negative effects of dietary aflatoxin. The experimental groups of birds were divided into 12 groups. Animals within each treatment groups were treated daily with dietary aflatoxin for a period of six weeks. The different dietary treatments were as follows:

Group 1: Control- without any dietary aflatoxin feed.

Group 2: Fed with estimated amount of aflatoxin containing diet (1.5 ppm).
Group 3: Fed with estimated amount of aflatoxin (1.5 ppm) containing diet along with powdered extract of *Azadirachta indica.*
Group 4: Fed with estimated amount of aflatoxin (1.5 ppm) containing diet along with powdered extract of *Cynodon dactylon.*
Group 5: Fed with 1.5ppm aflatoxin containing diet along with powdered extract of *Curcuma longa.*
Group 6: Fed with 1.5ppm aflatoxin containing diet with powdered extract mixture of all the above three mentioned herbals.
Group 7: Fed with estimated amount of aflatoxin (3 ppm).
Group 8: Fed with estimated amount of aflatoxin (3 ppm) containing diet along with aminoacid supplementation.
Group 9: Fed with estimated amount of aflatoxin (3 ppm) containing diet along with powdered extract of *Azadirachta indica.*
Group 10: Fed with 3ppm aflatoxin containing diet along with powdered extract of *Cynodon dactylon*.
Group 11: Fed with 3ppm aflatoxin containing diet along with powdered extract of *Curcuma longa.*
Group 12: Fed with 3ppm aflatoxin containing diet along with powdered extract mixture of all the above three mentioned herbals.

At the end of the sixth week, birds were sacrificed, blood was collected and the samples of blood collected in test tubes were allowed to clot and centrifuged at 1500 rpm for 20 min to separate the sera. Serum samples were analyzed individually for total protein, albumin, globulin, , cholesterol, serum glutamate oxaloacetate transaminase (SGOT), serum glutamate- pyruvate transaminase (SGPT), gamma- glutamyl transferase (GGT) and lactate dehydrogenase (LDH) using colorimeter or BTS 320 Semi-auto analyzer.

RESULTS AND DISCUSSION

The mean (± S.E) of the gamma glutamyl transferase (GGT) (IU/l) in the laying Japanese quail fed with different types of aflatoxin diets is shown in Table 1.

Table 1. Effect of aflatoxin and toxin binders on (mean ± S.E) serum gamma glutamyl transferase (IU/l) in Breeding Japanese quail

Treatments	SGGT (Mean ± S.E.)*
T1	$6.75^{e} \pm 0.21$
T2	$12.70^{b} \pm 0.38$
T3	$9.28^{d} \pm 0.29$
T4	$10.05^{d} \pm 0.23$
T5	$10.00^{cd} \pm 0.53$
T6	$8.50^{d} \pm 0.59$
T7	$14.40^{a} \pm 0.49$
T8	$15.37^{a} \pm 0.49$
T9	$9.97^{cd} \pm 0.39$
T10	$9.25^{d} \pm 0.62$
T11	$11.33^{bc} \pm 0.52$
T12	$6.25^{e} \pm 0.46$

*Means carrying atleast one common superscripts do not differ significantly (P≥0.01).

ANOVA FOR GGT

Source	DF	SS	MS	F
Treatments	11	1008.27	91.6606	36.47**
Error	132	331.79	2.5135	
Total	143	1340.05		

** Highly Significant (P≤0.01)

A highly significant ($P \leq 0.01$) variation was observed between the control and experimental groups. The increasing concentration of aflatoxin in the diet showed an increase in GGT levels. The toxin binder fed groups however showed lower levels of GGT as compared to the groups fed with aflatoxin without any binder. Breeding Japanese quail fed with 1 and 3 ppm dietary aflatoxin resulted in a highly significant increase in the GGT levels by 88.14% and 113.33% respectively as compared to the control. Raju and Devegowda (2000) also observed a similar increase in GGT levels in quail fed with aflatoxin and when coupled with toxin binders showed a reduction in the GGT levels. Thus, there was a significant improvement in the performance of Japanese quails fed with toxin binders. GGT is an enzyme that takes part in the bile duct proliferation in poultry (Brugere *et al.,* 1987). The increased levels of this enzyme in the serum are due to the hyperactivity of the liver caused due to the liver injury resulting from aflatoxicosis. The raised levels of this enzyme speak of the various hepato-pathological changes.

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