

## EFFECT OF DIETARY *SACCHAROMYCES CEREVISIAE* ON THE SERUM BIOCHEMISTRY AND CARCASS CHARACTERISTICS IN AFLATOXICOSIS IN BROILERS\*

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The aflatoxins are a group of closely related toxic metabolites produced in feedstuffs by *Aspergillus flavus* (Ciegler and Lillehoj, 1968). Aflatoxicosis represents one of the most serious diseases in broilers. A variety of physical, chemical and biological methods of aflatoxin detoxification have been reported (Goldblatt and Dollear, 1975). But yet, practical, cost-effective and large scale methods for detoxifying aflatoxin in feeds and feedstuffs are currently not available. The present study was aimed to assess the effect of live *Saccharomyces cerevisiae* (SC), a species of yeast in counteracting aflatoxicosis and its consequent effect on selected serum biochemical parameters and carcass characteristics.

### Materials and Methods

Aflatoxin was produced by culturing *Aspergillus parasiticus* 'NRRL 2999' on rice (Shotwell *et al.*, 1966). Estimation of aflatoxin B<sub>1</sub> in mouldy rice was done as described by Romer (1975). After screening the feed ingredients for aflatoxin and ochratoxin, starter as well as finisher basal diets were prepared as per BIS (1992) specifications. Mouldy rice powder containing known quantity of aflatoxin B<sub>1</sub> and a commercial yeast culture containing 5 x 10<sup>9</sup> live cells of SC per gram were incorporated either alone or in combination to prepare the following four treatment diets.

- T<sub>1</sub> - Control diet, without any aflatoxin or SC
- T<sub>2</sub> - Basal diet + aflatoxin (1 ppm)
- T<sub>3</sub> - Basal diet + aflatoxin (1 ppm) + SC (0.1 per cent)
- T<sub>4</sub> - Basal diet + aflatoxin (1 ppm) + SC (0.2 per cent)

Two hundred and forty unsexed one-day old commercial broiler chicks were randomly divided into four treatment groups with two replicates of each thirty chicks. The chicks were fed *ad libitum* with the respective experimental diets till eight weeks of age. All other standard managerial practices were common to all the chicks irrespective of the treatment.

At the end of the experiment serum samples were collected from six birds of each treatment for the estimation of serum total protein, albumin, cholesterol and glucose. Six birds (3 males + 3 females) from each treatment were randomly selected at the end of the experiment to study the eviscerated carcass yield and the weight of the visceral organs like the proventriculus, gizzard, heart, liver and kidney.

All the data obtained in this study were subjected to analysis of variance under Completely Randomised Design (Snedecor and Cochran, 1989).

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## Results and Discussion

The results of serum biochemical parameters are presented in Table 1.

**Table 1** Effect of aflatoxin and combination of aflatoxin and *Saccharomyces cerevisiae* on the serum biochemical values

Treatments	Total proteins** (g/100ml)	Albumin** (g/100ml)	Cholesterol** (mg/100ml)	Glucose** (mg/100ml)
T <sub>1</sub>	4.49 <sup>a</sup>	1.43 <sup>ab</sup>	174.82 <sup>c</sup>	204.26 <sup>ab</sup>
T <sub>2</sub>	2.64 <sup>b</sup>	1.13 <sup>c</sup>	94.81 <sup>c</sup>	128.79 <sup>c</sup>
T <sub>3</sub>	4.04 <sup>a</sup>	1.34 <sup>b</sup>	120.74 <sup>b</sup>	170.02 <sup>b</sup>
T <sub>4</sub>	3.86 <sup>a</sup>	1.33 <sup>b</sup>	125.18 <sup>b</sup>	178.29 <sup>b</sup>

Mean values within each column bearing atleast one common superscript do not differ significantly ( $P < 0.05$ )

\*\* Highly Significant ( $P < 0.01$ )

In agreement with earlier findings of Raina *et al.* (1991) and Kumar (1995), aflatoxin was found to decrease the serum levels of total protein, albumin, cholesterol and glucose in this study. The reduced level of total protein and albumin might be due to the binding of aflatoxin to the DNA and thereby impairing messenger RNA synthesis and selective inhibition of the enzyme activity of RNA polymerase. Damage of the liver, the major cholesterol synthesising organ could be attributed to the lowered serum cholesterol level during aflatoxicosis. The decrease in the blood glucose level could be the sequel of poor feeding status of birds, decreased glycogen reserves in the liver, decreased

absorption of monosaccharides from the intestine and failure of tubular resorption of glucose leading to its excretion in the urine. All the serum biochemical parameters studied were significantly ( $P < 0.05$ ) elevated when SC was included in the aflatoxin contaminated feed supporting earlier observations (Stanley *et al.*, 1993, Devegowda *et al.*, 1994 and Sudarshan *et al.*, 1995). A possible explanation is that SC protected the birds from aflatoxicosis through chelation, by binding the aflatoxin which is then eliminated from the intestinal tract.

The present study revealed that the eviscerated carcass yield (Table 2) of broilers

**Table 2** Effect of aflatoxin and combination of aflatoxin and *Saccharomyces cerevisiae* on the relative organ weights and carcass yield

Treatments	Relative organ weight					Carcass yield*
	Proventriculus*	Gizzard <sup>NS</sup>	Heart <sup>NS</sup>	Liver**	Kidney**	
T <sub>1</sub>	0.37 <sup>b</sup>	1.92	0.43	2.13 <sup>c</sup>	0.70 <sup>b</sup>	61.74 <sup>a</sup>
T <sub>2</sub>	0.46 <sup>a</sup>	2.21	0.41	3.04 <sup>a</sup>	1.13 <sup>a</sup>	59.40 <sup>b</sup>
T <sub>3</sub>	0.41 <sup>a</sup>	2.05	0.46	2.65 <sup>ab</sup>	0.87 <sup>b</sup>	0.82 <sup>ab</sup>
T <sub>4</sub>	0.44 <sup>a</sup>	1.99	0.47	2.51 <sup>b</sup>	0.87 <sup>b</sup>	60.90 <sup>ab</sup>

Mean values within each column bearing atleast one common superscript do not differ significantly ( $P < 0.05$ )

\*\* Highly Significant ( $P < 0.01$ ) \* Significant ( $P < 0.05$ )

<sup>NS</sup> Not Significant

fed aflatoxin ( $T_2$ ) was significantly lower than the control ( $T_1$ ). The above finding is in agreement with the results of Reddy *et al.* (1982) and Doerr *et al.* (1983). The reduced carcass yield might be a sequel of general reduction in the growth rate due to wasting of musculature. The results of this study showed that the addition of SC did not have any significant ( $P < 0.05$ ) effect in counteracting the adverse effects of aflatoxin on eviscerated carcass yield.

The organ weights presented in Table 2 are expressed as relative organ weights (Grams organ per 100 g body weight). The relative weights of the gizzard and heart did not differ significantly ( $P < 0.05$ ) among the experimental groups. However, Chen *et al.* (1985) observed increased relative weight of the heart during aflatoxicosis. The chicks fed aflatoxin contaminated feed ( $T_2$ ) had significantly ( $P < 0.05$ ) higher relative weights of the kidney, liver and proventriculus. The findings of this study are in agreement with those of Huff *et al.* (1992). Enlargement of the liver and kidney, the major organs involved in the excretion of xenobiotics indicates the edema and degenerative changes caused to them by aflotoxin. Enlargement of the liver might also be due to the deposition of lipids in hepatocytes. The increased relative weight of the kidney during aflatoxicosis was restored to normal with

the supplementation of SC at 0.1 and 0.2 per cent levels ( $T_3$  and  $T_4$ ), while that of the liver was restored only by 0.2 per cent SC ( $T_4$ ). However, the inclusion of SC had no significant ( $P < 0.05$ ) effect in resorting the relative weight of the proventriculus. The findings of this study agree with those of Devegowda *et al.* (1994) who also observed protective effect of SC on the liver against aflatoxin but differed with the beneficial effect of SC on the proventriculus reported by Stanley *et al.* (1993).

### Summary

The effect of *Saccharomyces cerevisiae* (SC) in counteracting the toxicity of aflatoxin in broilers was studied. Aflatoxin (1 ppm) caused significant ( $P < 0.05$ ) reduction in the serum concentration of total protein, albumin, cholesterol and glucose and in eviscerated carcass yield. Relative weights of the gizzard and heart did not differ significantly ( $P < 0.05$ ) among different treatments. Relative weights of the liver, kidney and proventriculus increased significantly ( $P < 0.05$ ) during aflatoxicosis. SC counteracted the toxic effects of aflatoxin on the serum biochemistry and relative weights of the liver and kidney. However, eviscerated carcass yield and relative weight of the proventriculus remained unchanged with the addition of SC.

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