

EFFECT OF SULPHUR ON SERUM PROTEINS OF FAYOUMI CHICKENS

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ABSTRACT

Fifty Fayoumi birds were kept under standard management conditions for 55 days. These were fed chick starter ration throughout the experiment. At 56 days of age, the birds were divided randomly into five equal groups and supplemented sulphur powder at the rate of 0 (control), 1, 2, 3 and 4 per cent in feed upto 140 days of age.

Serum total proteins were significantly decreased in birds given 2, 3 and 4 per cent sulphur at 84 days post-treatment compared with the control ($P < 0.05$). Serum albumin was significantly lesser in birds supplemented with 3 and 4 per cent sulphur at 84 days post-treatment than the control ($P < 0.05$). Serum globulins were significantly lesser in birds given 2, 3 and 4 per cent sulphur than the control ($P < 0.05$) at 84 days post-treatment. The study indicates that prolonged use of sulphur has adverse effects on serum proteins in the chicken.

INTRODUCTION

Sulphur is one of the most abundant elements in the earth. Nutritional aspects of sulphur are well studied in poultry. It is a part of some amino acids such as cysteine and methionine and two vitamins including thiamine and biotin (Maynard and Loosli, 1969). Information on excess feeding of sulphur in poultry is scarce (Patrick and Schaible, 1980).

In some hilly areas of Pakistan, sulphur is naturally present in water. In Kalar Kahar area, for example, water contains 600 mg sulphur/litre water (Anjum, 1995, personal communication). This water is the only source for poultry. Favourable weather conditions in this area are attracting poultry farming. It is likelihood that poultry in such areas would consume sulphur throughout their life. The effects of excess sulphur feeding on body weight and organs weights (Alam *et al.*, 1998) have already been reported. This paper describes effects of sulphur on serum proteins in the Fayoumi chicken.

MATERIALS AND METHODS

Fifty Fayoumi birds were kept in cages under standard management conditions for 55 days of age. These were offered chick starter ration and water *ad libitum*. The ration contained 18 per cent crude protein and 2750 Kcal metabolisable energy per kg of feed. At 56 days of age, the birds were randomly divided into five groups having 10 birds in each group. Group 1 was fed the chick starter ration without sulphur and served as control. Groups 2 to 5 were supplemented sulphur,

in order, at the rate of 1 per cent, 2 per cent, 3 per cent and 4 per cent in feed upto 140 days of age.

Blood samples were collected without anticoagulant and allowed to clot at room temperature. It was centrifuged at 800 g for 10 minutes and serum was separated. Serum was stored in aliquots at -20°C until analyzed. Serum total proteins, serum albumin and serum globulins were determined following the methods described by Levinson and MacFate (1969). Albumin:Globulins ratio was calculated. The data were subjected to statistical analysis.

RESULTS

Serum total proteins

Serum total proteins are given in Table 1. There was no difference in serum total proteins between control and 1 per cent sulphur-treated birds throughout the study. In birds treated with 2, 3 and 4 per cent sulphur, serum total proteins did not differ from the control birds up to 56 days post-treatment. At 84 days post-treatment, serum total proteins were significantly lesser in birds supplemented with 2, 3 and 4 per cent sulphur than the control birds ($P < 0.05$). There was no sulphur-induced difference in serum total proteins between male and female Fayoumi birds within each group or between treatments.

Serum Albumin

Serum albumin is given in Table 2. The difference in serum albumin content between the control birds and 1 or 2 per cent sulphur-treated birds was nonsignificant

Table 1: Effect of Sulphur on Serum Total Protein concentration (G/dL) of Fayoumi birds.

Days post-treatment	Sulphur concentration feed (%)				
	Control	1	2	3	4
14	2.91±0.14	2.91±0.19	3.16±0.15	3.08±0.18	2.6±0.11
28	3.16±0.15	2.95±0.11	2.96±0.06	3.02±0.12	2.83±0.17
42	3.45±0.12	3.34±0.16	3.20±0.16	3.17±0.15	3.38±0.21
56	3.02±0.11	3.01±0.08	3.17±0.15	2.84±0.15	2.95±0.10
84	3.55±0.12	3.08±0.17	3.05±0.09*	2.98±0.09*	2.77±0.06*

Each figure represents mean (\pm standard error of the mean) of 10 Fayoumi birds. Data subjected to analysis of variance revealed significant differences between treatments.

*P<0.05 compared with the control birds.

Table 2: Effect of Sulphur on Serum Albumin (G/dL) in Fayoumi birds.

Days post-treatment	Sulphur concentration in feed (%)				
	Control	1	2	3	4
14	1.60±0.08	1.60±0.9	1.72±0.08	1.69±0.09	1.44±0.06
28	1.69±0.07	1.61±0.06	1.64±0.03	1.63±0.05	1.53±0.09
42	1.85±0.05	1.77±0.08	1.74±0.07	1.76±0.06	1.81±0.09
56	1.62±0.5	1.62±0.05	1.69±0.08	1.52±0.08	1.57±0.07
84	1.88±0.04	1.68±0.07	1.66±0.04	1.64±0.05*	1.53±0.03*

Each figure represents mean (\pm standard error of the mean) of 10 Fayoumi birds. Data subjected to analysis of variance revealed significant differences between treatments.

*P<0.05 compared with the control birds.

Table 3: Effect of Sulphur on Serum Globulins (G/dL) in Fayoumi birds.

Days post-treatment	Sulphur concentration in feed (%)				
	Control	1	2	3	4
14	1.31±0.06	1.31±0.09	1.44±0.08	1.39±0.08	1.20±0.06
28	1.46±0.08	1.34±0.06	1.32±0.03	1.37±0.07	1.29±0.08
42	1.60±0.07	1.57±0.07	1.45±0.91	1.51±0.09	1.53±0.13
56	1.40±0.07	1.40±0.05	1.48±0.07	1.31±0.08	1.37±0.05
84	1.67±0.08	1.41±0.09	1.38±0.05*	1.34±0.05*	1.24±0.04*

Each figure represents mean (\pm standard error of the mean) of 10 Fayoumi birds. Data subjected to analysis of variance revealed significant differences between treatments.

*P<0.05 compared with the control birds.

throughout the study. In birds given 3 and 4 per cent sulphur, serum albumin did not differ from the control birds up to 56 days of age. At 84 days post-treatment, serum albumin was significantly lesser in birds given 3

and 4 per cent sulphur than the control (P<0.05). When analyzed on sex bases, the serum albumin content in male or female in response to sulphur treatment was similar to the above mentioned.

Table 4: Effect of Sulphur on Albumin/Globulin (A/G) ratio in Fayoumi birds.

Days post-treatment	Sulphur concentration in feed (%)				
	Control	1	2	3	4
14	1.23±0.01	1.24±0.02	1.20±0.02	1.22±0.01	1.21±0.01
28	1.18±0.02	1.21±0.01	1.25±0.03	1.20±0.01	1.19±0.03
42	1.16±0.02	1.14±0.03	1.21±0.03	1.19±0.03	1.17±0.03
56	1.18±0.04	1.17±0.04	1.15±0.02	1.17±0.03	1.15±0.05
84	1.14±0.03	1.24±0.02	1.20±0.03	1.23±0.01	1.23±0.03

Each figure represents mean (\pm standard error of the mean) of 10 Fayoumi birds. Data subjected to analysis of variance revealed non-significant differences between treatments.

Serum globulins

Serum globulins concentration is shown in Table 3. Serum globulins did not differ between the control birds and 1 per cent sulphur-treated birds throughout the study. Serum globulins also did not differ between the control and 2, 3 or 4 per cent sulphur-treated birds up to 56 days post-treatment. However, serum globulins concentration was significantly lesser in 2, 3 and 4 per cent sulphur-treated birds than the control birds at 84 days post-treatment ($P < 0.05$). Effect of sulphur on serum globulin content in male or female birds was similar to the general trend.

Albumin/globulin (A/G) ratio

A/G ratio is given in Table 4. A/G ratio did not differ significantly between sulphur-treated and the control birds throughout the study period. Effect of sulphur, when analyzed on sex basis, showed no difference between male or female birds.

DISCUSSION

Sulphur is part of some amino acids such as cystine and methionine and two vitamins including thiamine and biotin (Maynard and Loosli, 1969). Excess feeding of sulphur in poultry can be detrimental. It causes destruction of vitamin D, increased production of faeces, loss of membrane permeability and fluid collection around the breast (Patrick and Schaible, 1980). Due to favourable weather conditions, poultry farming is increasing in certain hilly areas of Pakistan. In some of these areas sulphur is naturally present in water in high quantities. For example, in Kalar Kahar, water contains as high as 600 mg sulphur/litre. The same water is to be offered to poultry.

The present study has revealed that 1 per cent sulphur in feed did not influence serum total proteins

(Table 1) up to 84 days post-treatment. However, higher sulphur levels i.e., 2, 3, and 4 per cent significantly decreased serum total proteins after 56 days post-treatment (Table 1, $P < 0.05$). The decrease was due both to albumin (Table 2) and globulins (Table 3). There was no change in A/G ratio (Table 4). The significant decrease in serum total proteins could have serious bearing on health of the chicken. In a previous study, it has been reported that birds supplemented with higher contents of sulphur had lesser body weight than the control birds (Alam *et al.*, 1998). In addition, liver weight and histological structure were altered in sulphur-treated birds (Alam, 1995). Since liver is responsible for protein synthesis (Benjamin, 1978), the liver damage induced by sulphur might have resulted in low synthesis of serum proteins in this study.

Further to effects on body weight (Alam *et al.*, 1998), a decrease in serum albumin due to sulphur (Table 2) might predispose birds to ascites (Benjamin, 1978). The consequences of decrease in serum globulins can also be grave. Globulins are generally antibodies. A decrease in globulin content (Table 3) might influence humoral defence of birds. However, immunosuppressive effects of sulphur, if any, need further investigation.

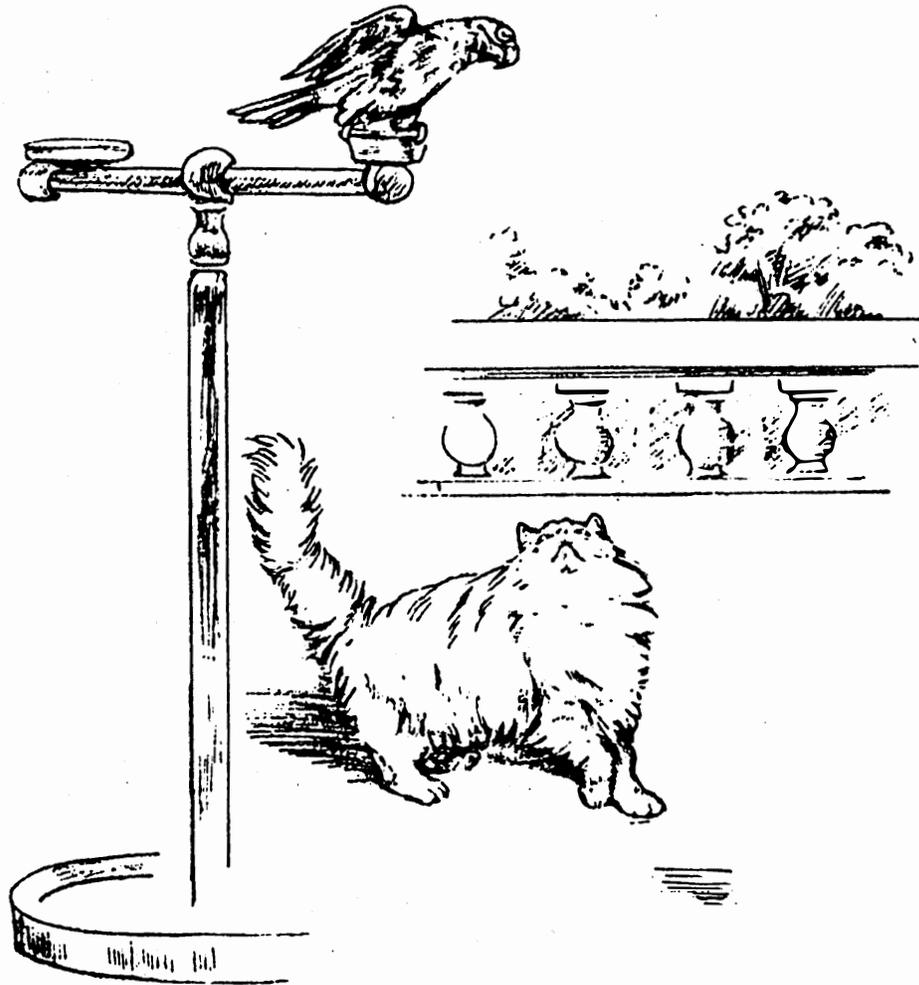
In conclusion, prolonged sulphur treatment decreased serum total proteins, serum albumin and serum globulins which may impair health of the chicken.

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'Farewell ! thou art too dear for my possessing.

Sonnet.

A page from the book "SHAKESPEARE WITH THE PETS"

By

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