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EFFECT OF VARIOUS FASTING AND FEEDING REGIMES DURING MOULT ON SUBSEQUENT BODY WEIGHT, EGG NUMBER AND SOME SERUM BIOCHEMICAL PARAMETERS OF LAYERS

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Body weight and egg number did not vary significantly in relation to fasting and feeding regimes. Total lipids varied significantly in relation to fasting regimes ($P<0.01$). Total lipid concentration was maximum (1828.2 mg/dl) in birds which had undergone 10 days fasting and minimum in birds that had fasted 15 days (936.3 mg/dl). The cholesterol concentration (82.5 mg/dl) was found to be significantly lower ($P<0.05$) in birds which were fasted for 15 days. Total protein contents were the highest in birds with 10 days fasting and then continuous feeding (6.0 gm/dl). Albumin and globulin concentrations were not significantly different either with the fasting or feeding regime, but globulin content was significantly higher in birds that had had 10 days fasting and continuous feeding (4.0 gm/dl). Glucose concentration was lowest (181.3 mg/dl) in birds having 5 days fasting and continuous feeding. Phosphorus and calcium concentrations were significantly higher (7.4 and 18.5 mg/dl, respectively) in birds subjected to 10 days fasting.

Key words: layers, body weight, egg number, fasting, feeding, serum

INTRODUCTION

The technique of induced moult in commercial layers can be used as a husbandry tool for extending flock performance on an economical basis (Akram, 1998). During moult induction birds lose body weight after withdrawal of feed without (Cleaver et al., 1986; Koelkbeck et al., 1991, 1993) or with water deprivation (Buhr and Cunningham, 1994; Ahmad et al., 1995). Loss in body weight relative to pre-moult depends upon the length of fasting and feed restriction, which have been reported to be significantly positively (Bell, 1991; Bell and Kuney,

1992) or negatively (Buhr and Cunningham, 1994) correlated with the post-moult egg production.

Moulting induced by fasting and restricted feeding has been observed to be associated with changes in blood chemistry, suchas glucose, cholesterol, protein, albumin and globulin concentrations (Cheshmedzhieva and Dimov, 1989; Lien and Siopes, 1993). Feed conversion efficiency and blood constituents such as glucose, cholesterol, and protein have been decreased by severe feed restriction (Arif, 1989). However, less or moderate fasting may be helpful in reducing the overall cost of production without disturbing to much the blood physiology and performance of birds Knowledge of the blood chemistry is potentially useful in the diagnosis and prognosis of bird diseases and nutritional status (Cason and Teeter, 1994). Thus, the present study was aimed at determining the body weight, egg production and at estimating some blood serum variables, namely total lipids, cholesterol, total proteins, albumin, globulin, glucose, phosphorus and calcium in relation to the fasting and feeding regimes in commercial layers after the first induced moult.

MATERIALS AND METHODS

The study involved 180 commercial (Babcock) egg laying hens available at the age of 107 weeks during the post-moult period for 12 weeks at the Poultry Research Station, University of Agriculture, Faisalabad. The birds were kept in cages in 18 experimental units comprising 10 birds each. These units were randomly assigned to six treatment groups having three (fasting regimes) x 2 (feeding regimes) in a factorial arrangement with three replications. The following schedule for fasting and feeding was practised during moult induction according to Abdullah (1996).

Fasting regimes	Feeding regimes
Group A 5 days	AD 45 g ground corn per bird continuously for 10 days AE 45 g ground corn per bird alternately for 10 days
Group B 10 days	BD 45 g ground corn per bird continuously for 10 days BE 45 g ground corn per bird alternately for 10 days
Group C 15 days	CD 45 g ground corn per bird continuousy for 10 days CE 45 g ground corn per bird alternately for 10 days

During the experimental period (post-moult) each bird was given 0.80 kg layer mash weekly. The body weight (kg) of individual birds was recorded on a weekly basis from the start till the end of the experiment and the number of eggs laid during each 24 hours was recorded. At the end of the experiment two birds per replicate were selected at random for blood collection. Five ml blood was drawn from the brachial wein using a needle of 23 gauge. The syringes were placed in a dish at room temperature until the serum became separated. Serum was drawn out and stored in labelled plastic bottles at 4^0C.

The method of Zollner and Kirsch (1962) was followed for the estimation of total lipids, whereas for cholesterol determination Richmond 1973, was con-

sulted. The procedure of Rodkay 1964, was followed for determining total proteins and albumin, while globulin concentration was obtained by subtracting the amount of albumin from that of total serum proteins. Glucose was estimated according to Pileggi and Szustkiewics (1974). Potassium (Oser, 1965) and sodium (Richards, 1981) were determined by flame photometry. For this purpose commercially available kits from "Randox" Laboratories Ltd. (Ardmore, Diamond, Crumlin, Co. Antrim, United Kingdom) were purchased. For statistical procedures, Simpson et al. (1960) were consulted. The level of significance used in all the tests was 95%.

RESULTS AND DISCUSSION

In the present study the lowest (1.48 Kg) body weight was found in birds which were subjected to the 15 day fasting regime followed by those on the 10 (1.55 kg) and 5 day (1.57 kg) fasting regimes (Table 1). On the other hand low body weight (1.51 kg) was also found in birds subjected to continuous feeding regimes, while the birds on alternate feeding regimes had a slightly higher (1.55 kg) body weight (Table 1).However, these differences were not statistically significant. As lower body weight of the birds is a prerequisite for better egg production (Rasool, 1997), the birds of lower body weight produced comparatively more eggs as copared to the birds of higher body weights. However, differences in mean egg production due to various treatments were not found to be statistically significant.

Total lipids were significantly ($p<0.05$) lower (936.3 mg/dl) in the birds subjected to 15 days fasting. The birds subjected to continuous feeding regimes had the highest (1825.7 mg/dl) total lipids. However, the difference was not statistically significant ($p>0.05$). This increase in total lipids in the blood was due to the dietary source. Higher dietary lipid contents resulted in higher blood levels (Sturkie, 1986). Thus, the birds which were subjected to a longer (15 days) fasting period had lower lipid concentrations in their subsequent life span. No other published work was readily available for comparison.

The blood cholesterol contents followed a similar pattern as total lipids. As cholesterol level is evidently affected by nutrition (Sturkie, 1986), it is logical that a longer fasting time reduced blood cholesterol concentration which may be due to hyperthyroidism during moulting (Martin, 1976). It may be further added that induced moulting inhibits endogenous cholesterol synthesis (Cheshmedzhieva and Dimov, 1989).

Total protein content was found to be significantly higher (5.2 mg/dl) in the hens subjected to 10 days fasting regimes than in those with the 5 and 15 day fasting regimes. Due to the stress of starvation corticosterone mobilizes both body fat and proteins to maintain physiological homeostasis (Sturkie, 1986; Brains, 1996). When the stress starts it assumes maximum proportions to which, however, the birds become adapted later, known as the adaptive phase (Brains, 1996). In 10 day fasting regimes, the hens may have been adapted to that stress and they maintained physiological levels of serum proteins which decreased drastically on prolonged fasting (15 days).

Table 1. Body weight, egg number and some serum biochemical parameters of layers treated with various (a) fasting (b) feeding regimes and (c) fasting regimes during moult.

Fasting regimes	Body weight (kg)	Egg number	Total lipids (mg/dl)	Cholesterol (mg/dl)	Total protein (gm/dl)	Albumin (gm/dl)	Globulin (gm/dl)	Glucose (mg/dl)	Phosphorus (mg/dl)	Calcium (mg/dl)
a. Fasting regimes										
5 days	1.57 ± 0.11	3.80 ± 0.42	1588.3 ± 240.5 A	118.7 ± 19.8 A	4.4 ± 0.6 B	1.6 ± 0.2	2.8 ± 0.4	193.3 ± 23.4	5.9 ± 0.7 B	9.4 ± 1.9 B
10 days	1.55 ± 0.04	4.18 ± 0.62	1828.2 ± 177.8 A	105.6 ± 5.5 AB	5.2 ± 1.0 A	1.9 ± 0.2	3.3 ± 0.1	220.7 ± 24.8	7.4 ± 1.3 A	18.5 ± 2.4 A
15 days	1.48 ± 0.07	4.57 ± 0.37	936.3 ± 421.6 B	82.5 ± 29.0 B	4.4 ± 0.3 B	1.6 ± 0.3	2.6 ± 0.2	215.3 ± 12.4	5.6 ± 0.7 B	11.9 ± 3.8 B
b. Feeding regimes										
Continuous	1.51 ± 0.07	4.11 ± 0.76	1825.7 ± 485.7	107.0 ± 21.4	5.0 + 0.9 A	1.8 ± 0.3	3.1 ± 0.8	214.6 ± 32.0	6.6 ± 1.2	14.5 ± 4.9
Alternate	1.55 ± 0.09	4.26 ± 0.46	1576.2 ± 464.0	97.7 ± 28.0	4.4 + 0.5 B	1.7 ± 0.2	2.6 ± 0.4	205.0 ± 8.9	6.3 ± 1.2	12.1 ± 4.5
c. Fasting x feeding regimes Continuous										
5 days	1.58 ± 0.06	3.63 ± 0.59	1638.7 ± 270.1	117.3 ± 16.4	4.5 ± 0.4 B	1.7 ± 0.2	2.8 ± 0.2 B	181.3 ± 27.3 B	6.3 ± 0.6	10.5 ± 2.3
10 days	1.51 ± 0.07	4.37 ± 0.94	1956.0 ± 81.9	105.0 ± 5.0	6.0 ± 0.7 A	2.0 ± 0.3	4.0 ± 1.0 A	235.3 ± 28.3 A	7.5 ± 1.9	19.7 ± 0.4
15 days	1.45 ± 0.09	4.33 ± 0.15	1134.0 ± 515.8	98.7 ± 35.6	4.4 ± 0.5 B	1.8 ± 0.4	2.6 ± 0.1 B	227.0 ± 2.6 A	6.2 ± 0.2	13.2 ±4.7
Alternate										
5 days	1.56 ± 0.16	3.97 ± 0.15	1538.0 ± 253.2	120.0 ± 26.5	4.4 ± 0.8 B	1.5 ± 0.2	2.9 ± 0.6 B	205.2 ± 13.8 AB	5.6 ± 0.7	8.3 ± 0.4
10 days	1.59 ± 0.07	4.00 ± 0.10	1700.3 ± 152.5	106.7 ± 7.0	4.4 ± 0.4 B	1.9 ± 0.0	2.5 ± 0.1 B	206.0 ± 9.5 AB	7.3 ± 0.9	17.3 ± 2.5
15 days	1.51 ± 0.02	4.80 ± 0.40	738.7 ± 247.3	66.3 ± 6.5	4.3 ± 0.2 B	1.7 ± 0.3	2.6 ± 0.3 B	203.7 ± 5.5 AB	5.1 ± 0.7	10.5 ± 2.8

Glucose is the key component of the physiological pool of the body. It is absolutely necessary that it must be kept within physiological homeostatic limits for the survival of the animal, so even short starvation causes immediate mobilization of hepatic carbohydrate reserves to liberate free glucose to maintain normal blood glucose level (Sturkie, 1986). Thus, even though the bird loses body weight due to depletion of fats and body proteins mediated by glucagon (Sturkie, 1986), the formation of glucose is maintained in a remarkable stable state (Hazelwood and Lorenz, 1959; Body et al., 1978). In the present studies the blood glucose remained normal under the different treatments, which may substantiate the above mentioned discussion.

Calcium and phosphorus are the main constituents of the skeleton and of egg shells in hens. Most of the calcium in the blood of hens is in the form of protein-calcium complexes under the influence of estrogen and increases in during egg production. This increases calcium binding protein (Bacon et al., 1980). It was found that total proteins were highest in the birds subjected to the 10 day fasting regime. The blood calcium was also high in the same treatment group. Moreover, the difference in protein was concentration not significant in the continuous and alternate feeding regimes. Along with calcium, phosphorus followed the same trend, so that neither difference was significant due to these treatments.

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UTJECAJ RAZLIČITIH REŽIMA ISHRANE I GLADOVANJA NA TEKESNU MASU, NOSIVOST I NEKE BIOHEMIJSKE PARAMETER NOSILJA TOKOM MITARENJA

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SADRŽAJ

Režim ishrane i gladovanja nije značajno uticao na telesnu masu i nosivost nosilja. Koncentracija ukupnih lipida u krvnom serumu je statistički značajno varirala ($p < 0.01$) u zavisnosti od režima gladovanja: najveća je utvrđena nakon desetodnevnog (1928.2 mg/dl), a najmanja nakon petnaestodnevnog gladovanja (936.3 mg/dl). Interesantno je da nakon 15 dana gladovanja nije utvrđen značajan ($p<0.05$) pad koncentracija holesterola (82.5 mg/dl). Najviša koncentracija ukupnih proteina (6.0 g/dl) je ustanovljena u krvnom serumu ptica kojesu nakon perioda gladovanja (10 dana) kontinuirano hranjene 6 dana. Pri različitim režimima ishrane nisu ustanovljene značajne varijacije koncentracije albumina i globulina u krvnom serumu, osim statistički značajnog rasta globuilinemije (4.0 gm/dl) koji je ustanovljen kod ptica koje su normalno hranjene nakon 10 dana izgladnjivanja. Najveća glikemija (181.3 mg/dl) je utvrđena u grupi nosilja nakon pet dana izgladnjivanja i ishrane, a najveća kalcijemija i fosfatemija (7.4 i 18.5 mg/dl, po redosledu) je ustanovljena kod ptica nakon desetodnevnog izgladnjivanja.