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POST-MOULT BODY WEIGHT AND PRODUCTION PERFORMANCE OF COMMERCIAL LAYERS INDUCED TO MOULT UNDER VARIOUS NUTRITIONAL REGIMES

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The experiment was carried out on 288 commercial (White Leghorn) egg laying hens available at the age of 71 weeks. Birds were randomly divided into 18 experimental units comprising 16 birds each. These experimental units were randomly allotted to six treatment groups designated as A, B, C, D, E, and F with 3 replications in each. All six groups were given a pre-moult treatment of vaccination and medication prior to subjecting them to the moulting schedule. Group A was maintained as a control. During the post-moult period each bird was offered 110 g/day layer mash. Post-moult hen-day production (%), egg mass and feed efficiency (per kg egg mass basis) varied significantly when compared with non-moulted birds. Less body weight was gained by the birds which were served with restricted feed (1,71 ± 0,11) and corn (1,74 ± 0,15) during the moult. The highest hen day production (%) (82,87 ± 6,89) and greatest feed efficiency (either per dozen eggs; 1,52 ± 0,13 or per kg egg mass; 2,02 ± 0,22) was noted in the birds which were fed on corn during the moult. Maximum egg weight (65,38 ± 6,18) and feed consumption (743,24 ± 30,50) was recorded in the birds which offered ration No. 3 during the moult.

Key words: body weight, egg mass, egg weight, feed consumption, feed efficiency, hen-day production, layers, post moult

INTRODUCTION

Early studies focused on progression of the natural moult and subsequent egg production (Rice *et al.* 1908) and on ways to improve the results after induced moulting (feed restriction - Rice *et al.*, 1908; inorganic sulphur compounds - Hendricks, 1933; amino acid - Taylor and Russell, 1943; light - Riley and Byerly, 1943; diethylstilbestrol - Perek and Sulman, 1945; thiouracil - Glazener and Jull, 1946).

The induced moult is a manage mental technique usually employed on spent layers to enhance profits and to avoid the cost of replacing the pullets annually. The duration of the moult affected the post-moult performance, particularly the egg number (Rose and Campbell, 1986).The shorter the fasting or feed restriction period the shorter the egg laying cycle. Restriction of dietary protein (15 vs. 17 percent) during the moult influenced the post-moult egg weight positively without affecting the percentage of lay (Summers and Leeson, 1977). Groups of birds which were treated for fifteen days by fasting and feeding on alternate days maintained relatively less mean weight (151 kg) leading to significantly higher weekly egg number (4,82), egg mass (290,30 g), hen-day production (68,88 %), and better egg efficiency in terms of feed intake per dozen eggs (1,98) and per kg mass (2,75). However, egg weight showed non-significant differences in relation to either fasting or feeding regimes (Akram *et al.*, 2000). The present study was aimed at determining the post-moult body weight and production performance of commercial layers induced to moult under various nutritional regimes.

MATERIALS AND METHODS

The present study was carried out from September 21 through March 1, 1999 at the Poultry Research Center, University of Agriculture, Faisalabad. The experiment involved 288 commercial (White Leghorn) egg laying hens available at the age of 71 weeks. The birds were kept in single deck type cages. They were randomly divided into 18 experimental units comprising 16 birds each. These experimental units were randomly allotted to six treatment groups designating as A, B, C, D, E and F with 3 replications. All six groups were given a pre-moult treatment of vaccination and medication (Table 1) (Akram *et al.*, 2000) prior to subjecting them to a moulting schedule. Group A was maintained as the control and was not subjected to any moult treatment, while the rest of groups were subjected to an induced moult by the withdrawal of feed for 14 days from September 29 to October 12, 1998. Only water was supplied to the birds under treatment, which were moulted according to the schedule given in Table 2. The composition of the diets offered to the birds during experiment is given in Table 3. The birds in each group were subjected to different treatments during the post fast period of 28 days and thus the moulting period extended over 6 weeks. During the post-moult period each bird on each treatment was offered 110 g/day layer mash on average.

Table 1. Pre-moult schedule for commercial layers

Days	Vaccination and Medication	Feed	Light
1	Deworming (Farbenda)	Ad libitum	24 hours
2	ND vaccine	‡	‡
3	–	‡	‡
4	Mycosine	‡	‡
5	Mycosine	‡	‡
6	Mycosine	‡	‡
7	–	‡	‡

Table 2. Moulting

Group	Fasting-days	Type of feed offered after fast	Quantity g/bird/day
A- control	No fasting	Layer feed- continued as such	100
B-restricted	14 days	Layer feed- feed restricted/ duration 28 days	45 on alternate day
C- fullfeed	14 days	Corn/28 days	100
D- fullfeed	14 days	Starter feed/ 28 days	100
E- fullfeed	14 days	Growth feed/28 days	100
F- fullfeed	14 days	Layer feed/28 days	100

Table 3. Composition of the diet offered to the experimental birds

	Crude protein- CP %	Metabolizable energy- ME (kcal/kg)
Ration No 1 Chick starter feed	19- 20	2800
Ration No 2. Growth feed	15	2700
Ration No 3. Layer feed	16	2850

The body weight of the experimental birds and the production performance parameters viz., hen-day production (%), egg weight (g), egg mass (g), feed consumption (g) and feed efficiency (per dozen egg basis per kg egg mass basis) were calculated according to Akram *et al.* (2000) and Mushtaq-ul-Hassan *et al.*(2000).

For statistical procedures Simpson *et al.* (1960) were consulted. The level of significance used in all the tests was 95%.

RESULTS AND DISCUSSION

A non-significant difference in body weight was observed between the moulted hens and the non-moulted controls (Table 4). The difference in body weight of layers moulted using various poultry rations was found to be statistically significant (Table 5). More body weight was gained by the layers moulted using ration No. 2 having low protein and energy levels. Less body weight was gained in the restricted fed birds (Table 5). A higher live body weight was recorded with high protein (18%) high energy (2900 kcal/kg) rations during the post-moult stage reflecting that feeding high protein, high energy diets leads to more weight gain, making the bird less productive in the post-moult production cycle. The post-fast body weight gain during 2 to 3 weeks following the fast was greater for hens fed on a 9% than a 16% CP moult diet (Andrews *et al.* 1987; Koelkebeck, 1991).

Table 4. Post- moult performance- (mean ± SD) of White Leghorn hens in comparison with non-moulted hens

	Body Weight (kg)	Hen day production (%)	Egg weight (%)	Egg mass (%)	Feed consumption (g)	Feed efficiency per dozen eggs	Feed efficiency per kg egg mass
Non-moulted	1.7±0.16	63.4±.7	63.21±.29	282.28±3.30	738.92±2.77	2.01±.29	2.67±.42
Moulted	1.77±.16	79.69±.52	63.76±.41	354.57±8.57	732.06±7.07	1.60±.94	2.09 ±0.25
Probability	> 0.05	< 0.05	> 0.05	< 0.05	> 0.05	> 0.05	< 0.05

Table 5. Post - moult production performance (mean ± SD) of White Leghorn layers fed on different commercial rations during an induced moult

	Body weight (kg)	Hens day production (%)	Eggs weight (%)	Egg mass (%)	Feed consumption (g)	Feed efficiency per dozen eggs	Feed eficiency per kg egg mass
Control	1.77±0.16 AB	63.84±5.91 D	64.27±9.66 A	282.29±43.30 B	738.92±72.79 A	2.01±0.29 A	2.67±0.41 A
Restricted	1.71±0.11 B	78.14±8.83 BC	64.26±4.73 A	350.42±44.47 A	726.98±22.26 B	1.62±0.24 B	2.11±0.33 B
Corn	1.74±0.15 B	82.87±6.89 A	63.89±6.08 AB	365.94±41.93 A	728.82±20.06 B	1.52±0.13 C	2.02±0.22 C
Ration 1	1.76±0.12 AB	77.40±6.69 C	64.94±4.13 A	349.27±35.11 A	730.07±30.00 B	1.63±0.14 B	2.12±0.21 C
Ration 2	1.83±0.15 A	80.89±8.06 AB	62.01±3.86 B	349.13±33.93 A	732.28±29.34 AB	1.58±0.17 BC	2.12±0.21 C
Ration 3	1.78±0.23 AB	79.26±5.64 C	65.38±6.18 A	358±35.27 A	743.24±30.50 A	1.63±0.13 B	2.09±0.21 C

ABC - Mean values in the same column not sharing letter are significantly different ($p < 0.05$)

The lower body weight of the birds maintained on the restricted allowance of feed during moulting subsequently fixed their metabolism at a lower feed intake to maintain their lower body weight. The effect of feed and nutrient restriction was found to be significant during the post-moult period (Akram, 1998). Haq (1995) reported a similar response to feeding treatments during rearing as well as the first production cycle. Kashiwagi *et al.* (1981) also found that the body weights of hens, reared on restricted feed were lower than those reared on full feed, throughout the laying period.

A significant difference in hen-day production was found between moulted and non-moulted groups (Table 4). Higher hen-day egg production was observed in the moulted group than in controls. A general increase in productive performance following moulting was demonstrated by Len *et al.* (1964), Swanson and Bell (1971), Wakeling (1977), Lee (1982) and Mehta *et al.* (1986) and has been referred to as rejuvenation. The ability of a flock to produce eggs at a high rate during the second production cycle can be attributed to this rest period (North and Bell, 1990). As moulting gave proper rest to the ovary through cessation of laying mobilizing extra fat, reducing body weight by 25% and replacing old feathers, layers were rejuvenated which made a significant difference in egg production compared with the control.

Among the moulted groups, the greatest hen day egg production was recorded in layers which were moulted by using a diet based on pure corn, whereas the least occurred in those offered ration No. 1 having a high protein content. Swanson and Bell (1974) demonstrated good post-moult performance for hens fed a low protein cracked corn diet, and recommended the feeding of low nutrient, unbalanced rations during this period. Maximum egg production in the corn based diet group helped to deplete adipose tissue and labile protein under the process of glukoneogenesis (Brake and Thaxton, 1979) and rested the reproductive system which might have facilitated the layers to enhance production. A low protein corn moult diet containing 8 - 9% CP (Swanson and Bell, 1974) gave good post-moult performance in hens fed a low protein cracked corn diet.

A non-significant difference was observed in egg weight between moulted and non-moulted layers (Table 4). However, among the moulted groups significantly less egg weight was found in layers that were offered ration No. 3 having a medium protein and energy content (Table 4). Restriction of dietary protein (15 vs. 17 percent) during the moult influenced the post-moult egg weight positively without affecting the percentage of lay (Summers and Leeson, 1977). Birds receiving a 15% and 17% protein diet had higher egg weight (Bhattia and Sharma, 1989). A high protein diet or a diet with a suitable amino acid profile, especially concerning methionine, has been reported to support reasonable egg size (Zia-ul-Hassan, 1998).

A significantly higher egg mass was produced by the moulted hens than by the non-moulted control (Table 4). However, among the moulted groups no-significant difference was observed in egg mass in relation to moulting diet (Table 5). The moulted group which was subjected to fasting for 14 days to give the ovaries a complete rest and then maintained on restricted feeding for 14 days on a skip-a-day basis laid eggs at a much higher rate giving rise to larger egg mass than the non-moulted control, because the layers were able to rejuvenate their productive potential (Akram, 1998).

A non-significant difference was observed in feed consumption between the moulted and non-moulted layers (Table 4). Among the moulted groups minimum feed was consumed by the layers that were maintained on restricted feeding than on full fed after fasting for 14 days (Table 5). Minimum feed consumption in restricted fed birds may have helped to fix their maintenance metabolism at the restricted level and the rest of the feed could then be utilized in producing eggs (Akram, 1998).

Significantly better feed efficiency per dozen eggs and per kg egg mass was noticed in the moulted layers than in the non-moulted control (Table 4). Less feed consumption was reported per egg in the moulted than in the control unit (Mehta *et al.*, 1986). As more eggs were produced by the moulted hens consuming the same amount of feed, greater conversion of feed into eggs was recorded in the moulted layers.

Among the moulted groups the most favorable feed efficiency was recorded in hens that were maintained on the corn based moult diet (Table 5). Corn helped the birds to deplete their extra visceral or adipose tissue through gluconeogenesis (Brake and Thaxston, 1979) and to decrease and then to maintain their lower body weight. Utilization of less feed to maintain body weight allows more feed to be utilized to produce a greater number of larger eggs (Akram, 1998).

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TELESNA MASA KOMERCIJALNIH NOSILJA I NJIHOVE PROIZVODNE KARAKTERISTIKE NAKON INDUKOVANOG MITARENJA PRI RAZLIČITIM REŽIMIMA ISHRANE

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SADRŽAJ

U ovom radu su izneti rezultati uticaja različitih režima ishrane komercijalnih Leghorn nosilja za vreme perioda mitarenja na telesnu masu nosilja i njihove proizvodne karakteristike. Nosilje koje su bile podvrgnute restrikciji hrane ili su bile hranjene samo kukuruzom imale su manju telesnu masu po isteku perioda mitarenja. Međutim, nosilje hranjene samo kukuruzom imale su po isteku mitarenja najbolje iskorišćavanje hrane i najveću nosivost. Najveća masa jaja i najveći utrošak hrane su registrovani kod kokica hranjenih koncentrtatom koji je sadržavao 16.5% sirovih proteina i 2850 Kcal/kg.