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THE INFLUENCE OF VARIOUS RATIONS DURING THE MOULT ON SUBSEQUENT EGG NUMBER AND EGG QUALITY CHARACTERISTIC IN COMMERCIAL LAYERS

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Two hundred and eighty eight egg laying hens, randomly divided into 18 experimental units having 16 birds each, were used during the present study. Before the start of the moult induction all the birds were given a pre-moult treatment of vaccination and medications for one week to eliminate internal parasites and to protect against various diseases. Forty-eight birds (group A), which served as the control were continued on Ration No.3 (16,5% crude protein (C.P.) + 2850 Kcal/kg metabolizable energy (M.E.). The remaining 240 birds were divided into five groups viz. B, C, D, E, and F, which were fasted for 14 days for the induction of moulting. Only water was given to these birds. After that' different rations were offered with different C.P. and M.E. contents for 14 days. Restricted feed (Ration No. 3) was given to birds of group B on an alternate day basis (after 48 hours). Corn (9% C.P.), Ration No. 1, (20% C.P. + 2800 Kcal/kg M.E.), Ration No. 2 (15% C.P. + 2700 Kcal/kg M.E.) and Ration No. 3 were offered to the hens of groups C, D, E and F, respectively. All the groups were served with the same feed at the termination of the moulting treatment. Post-moult egg number (5,57 ± 0,52) , egg weight (66,78 ± 5,41 g) and shell thickness (0,39 ±0,04 mm) were significantly higher in birds which were subjected to the induced moult. Among the moulted groups the maximum number of eggs (5,80 ± 0,48) was produced by the birds given corn during the moult, whereas the maximum egg weight (68,30 5,58) was noted in birds which were given Ration No. 3. Shell thickness was greatest (0,41 ±0,04 mm) in birds which were treated with the restricted diet during the moult. Post-moult yolk index, Haugh units and meat spot values did not show any significant variations between the groups .

Key words: egg weight, layers, Haugh unit values, post moult egg numbers, shell thickness, yolk index.

INTRODUCTION

It has been postulated that forced moulting rejuvenates the reproductive tract, improves the rate of lay during the post-moult period (Lee, 1982; Metha *et al.* 1986) and consistently leads to a higher percent age of hen-day egg production

that in non-moulted controls (Lee, 1984). Albumen height and shell thickness significantly improved after an induced moult in white leghorn hens (Lee, 1984, 1987) although Rose and Campbell (1986) reported that there were no differences between moulting treatments on post-moult egg weight and strenght. Low salt treatment adversely affected post-moult eggshell thickness which resulted in more broken eggs ($p<0,05$) as compared to the forced moult treatments. Egg weight was also depressed by the low salt treatment (Ross and Herrick, 1981). Berry and Brake (1985) reported that eggshell density improved after moulting and the amount of calbindin in the shell gland and duodenum of birds was significantly higher.

The fasting and feeding regimes applied during the induced moult did not show any significant effect on post-moult egg weight, shell thickness or yolk index. However, the differences in post-moult Haugh unit values in layers induced to moult under various fasting regimes and their interaction with feeding regimes were statistically significant, whereas, feeding regimes alone did not influence the mean Haugh unit values (Mushtaq-ul-Hassan *et al.* 2000). The present paper attempts to determine the influence of various traditional rations during the moult on subsequent egg number and various egg quality characters in commercial layers.

MATERIALS AND METHODS

The study on 288 egg laying hens was conducted at the Poultry Research Center, University of Agriculture, Faisalabad from September 21. 1998 to April 1999.

Pre-moult Treatments: All the birds were randomly divided into 18 experimental units having 16 birds each.These experimental units were allotted to six treatment groups viz. A, B, C, D, E and F with 3 replications of each. Birds were kept in single deck type cages. All the birds were given a pre-moult treatment of vaccination and medication for one week. On day 1 birds were given an antihelmintic course to eliminate internal parasites. On day 2 they received ND vaccine, and on day 4 to 6 a mycosin course was administered to protect them from various diseases.

Moult treatments: During the moulting programme group A (comprising 48 birds) served as the control and continued to be fed on Ration No. 3 having 16,5 % crude protein (C.P.) and 2850 (kcal/kg) metabolizable energy (M.E.). The quantity of feed offered was 100 g per bird per day.The other five groups viz. B, C, D, E and F, comprising 240 birds, were fasted for 14 days i.e. from September 29 to October 12. 1998 and only water was given. Restricted feed was then given to birds of group B on an alternate day basis i.e. after 48 hours. Namely, 45g per bird of ration No. 3 was offered to this group every other day. Corn 9 % C.P. was given to birds of group C at 100 g per hen per day.

Ration No. 1 containing 20 % C.P. and 2800 (kcal/kg) M.E. was given to the hens of group D at 100 g per bird per day. Group E was fed on Ration No. 2 having 15 % C.P. and 2700 (kcal/kg) M.E. The quantity of feed offered was 100 g per bird perday. Ration No.3 was given to the birds of group F also at 100 g per bird per day.

Post-moult treatments : At the termination of the moulting treatment i.e. 14 days fasting and 14 days feeding on different rations, all the groups were served

with the same feed i.e. Ration No. 3 up to the end of the experiment. The feed offered at was 110 g per bird per day. On November 21. 1998 the vaccine "Sotase, 100 D", was given for immunization against Newcastle disease and infectious bronchitis. During the experiment the following observations were recorded:

Egg number: The egg number laid during 24 hours was recorded and hence numbers per bird per week were calculated.

Egg quality: Randomly selected 18 eggs (one egg from each replicate) were used fortnightly to determine the egg weight, Haugh unit, yolk index, shell thickness and meat spots for egg quality characteristation according to Mushtaq-ul-Hassan *et al.* (1998), Austic and Nesheim (1990) and Panda (1996).

Statistical analysis: The data thus obtained were subjected to statistical analysis using a Complete Random Design. Significant differences between means were recorded and compared using Duncans Multiple Range test (Steel and Torrie, 1980).

RESULTS AND DISCUSSION

A significant difference in egg number was found between moulted and non-moulted groups. A higher egg number was observed in the moulted group than the control (Table 1). A general increase in productive performance following a moult has been demonstrated by Len *et al.* (1964), Swanson and Bell (1971), Wakeling (1977), Lee (1982) and Mehta *et al.* (1986) and 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, it rejuvenated the layer, which made a significant difference in egg production over the control (Akram, 1998).

Among moulted groups the maximum egg number was recorded in layers moulted by using a diet based on pure corn, whereas the minimum occurred in non-moulted birds (Table 2). 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 group fed on a corn based diet having a low protein content helped in the depletion of adipose tissue and labile protein in the process of gluconeogenesis (Brake and Thaxton, 1979) and rested the reproductive system. This 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.

Egg weight was significantly influenced by the moulting process as well as moulting rations (Tables 1, 2). Moulting through cessation of laying, rests the reproductive system and rejuvenates the layer to produce eggs of comparatively larger size. Among the moulted group a significantly higher egg weight was found in layers fed on ration No. 3 which was a relatively high protein and energy diet. A high protein diet or a diet with a favourable amino acid profile, especially methionine, has been reported to favour reasonable egg size. However, on the other hand, 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).

Table 1. Comparative post-moult egg number and egg quality characteristics (Mean ± SD) of non-moulted and moulted commercial layers.

	Egg number	Egg weight (g)	Shell thickness (mm)	Yolk index	Haugh unit	Meat spots
Non-moulted	4,45 ± 0,40	64,30 ± 4,92	0,35 ± 0,05	0,44 ± 0,26	37,80 ± 2,68	0,33 ± 1,07
Moulted	5,57 ± 0,52	66,78 ± 5,41	0,39 ± 0,04	0,44 ± 0,04	38,26 ± 2,43	0,24 ± 0,65
Prob.	< .50	< .50	< .50	> .50	> .50	> .50

Table 2. Post-moult egg number and egg quality characteristics (Mean ± SD) of commercial layers fed different commercial rations during an induced moult.

	Egg number	Egg weight	Shell thickness	Yolk index	Haugh unit	Meat spots
Control	4,44 ± 0,40 C	63,93 ± 4,44 C	0,35 ± 0,05 C	0,44 ± 0,03	37,80 ± 2,68	0,33 ± 1,07
Restricted	5,46 ± 0,61 B	66,44 ± 4,92 BC	0,41 ± 0,04 A	0,43 ± 0,03	37,96 ± 1,98	0,37 ± 0,88
Corn	5,80 ± 0,48 A	65,15 ± 4,81 BC	0,38 ± 0,04 B	0,44 ± 0,05	37,98 ± 2,04	0,07 ±0,27
Ration 1	5,41 ± 0,45 B	67,05 ± 6,00 AB	0,38 ± 0,05 B	0,44 ± 0,03	38,20 ± 2,41	0,22 ± 0,58
Ration 2	5,61 ± 0,54 AB	66,89 ± 5,61 AB	0,38 ± 0,05B	0,44 ± 0,03	38,96 ± 2,92	0,26 ± 0,71
Ration 3	5,54 ± 0,40 B	68,30 ± 5,58 A	0,39 ± 0,04 AB	0,44 ± 0,03	38,57 ± 3,20	0,19 ± 0,56

ABC - Mean values in the same column not sharing letters are significantly different ($p < 0,05$).

The difference in shell thickness between moulted and non-moulted layers was found to be statistically significant (Table 1). Moulted layers improved their shell thickness as a result of the moulting process which has been reported to restore shell formation potential after rejuvenation (Mehta *et al.*, 1986) over aged non-moulted layers. Aging in hens is accompanied by a gradual decline in egg production due to increased soft-shell eggs (Ottinger, 1991).

Among the moulted groups (Table 2) maximum shell thickness was noticed in the restricted feed group. As the restricted group was maintained on a limited amount of feed on a skip-a-day basis for another 14 days following complete feed withdrawal for 14 days, the shell gland had an opportunity to rest for another 14 days which facilitated it to override other moulted birds in improving shell thickness. Shell thickness was reported to be affected more than other parameters by the length of the rest period (Ingram and Mather, 1988).

Neither moulting per se nor the moulting diets made any difference in albumen height and yolk index of layers (Tables 1 and 2). As the moulting process has been reported to improve shell thickness and to reduce the number of shell-less or soft shelled eggs there is an improvement in the number of eggs (Akram, 1998) but internal egg quality characteristics i.e.. Haugh unit and Yolk index were not affected. Most of the improvement in production after moulting was not caused by an increase in ovulation rate but it was by a decrease in shell-less egg production (Roland and Bushong, 1978, Roland and Brake, 1982).

Neither moulting nor moulting diets affected meat spot values in the layers (Tables 1 and 2). As meat spots are the remnants of injuries taking place in the uterus, which is usually accidental, meat spots are not dependent on moulting or moulting diets.

The result of the present study cleary indicate that moulting is preferable to replacement of the whole flock of hens, because it increases egg number, shell thickness and egg weight of commercial layers.

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UTICAJ RAZLIČITIH OBROKA ZA VREME MITARENJA NA BROJ I KVALITET JAJA KOD KOMERCIJALNIH NOSILJA

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SADRŽAJ

U ovom ogledu ispitivan je uticaj različitih vrsta obroka na karakteristike i broj jaja posle indukovanog mitarenja kod komercijalnih Leghorn nosilja. Broj jaja, njihova težina kao i debljina ljuske su bili značajno veći kod nosilja sa veštački indukovanim mitarenjem. Najveći broj jaja je registrovan u grupama nosilja koje su za vreme mitarenja bile hranjene kukuruzom a debljina ljuske kod kokošaka koje su bile podvrgnute delimičnoj restrikciji hrane. Žumanjčani indeks i broj Hugovih jedinica nisu se značajno razlikovali kod ispitivanih nosilja.