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Body Weight and Egg Production Performance of Induced Moulted White Leghorn Layers*

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Abstract: A study was carried out to find out the effect of induced moulting of commercial SCWL laying hens at 60, 65 and 70 weeks of age group. A control group was kept without moulting at their respective ages. The layers were reared in cages for the entire experimental period adopting standard managemental practices. The layers fed commercially available layer diet. After 28 days period of egg production (pre - moult), the layers were subjected to induced moulting by feed and water restriction followed by *ad - libitum* feeding and had free access to wholesome water. Seventeen hours photoperiod was provided daily through out the post - moult laying period. The birds, which were force moulted at the age group of 60, 65 and 70 weeks, had numerically higher egg production after induced moulting, as compared to their respective control groups. The birds in 70 weeks age group had higher livability among the moult induced groups and no change in body weight.

Key words: White leghorn, induced moulting, body weight, egg production

Introduction

Induced moulting is a process by which layer flock was induced to a reproductive pause with the objective of overcoming the problems of unfavourable egg prices, decline in egg production and to reduce the rearing cost of replacement pullets by the adult stock, bring back to egg production at an economic rate. Normally, the layers were maintained up to 72 weeks of age for egg production in commercial operations. As the age increases the number of broken eggs are on the higher side besides decline in egg production. Induced moulting increases the profitability of layer chicken even after 72 weeks of age by prolonging its effective productive life.

Forced moult stimulated egg production rate and diminished its age dependent rate of decline, reduced the proportion of broken and shell less eggs and improved shell quality (Hurwitz *et al*., 1995). With induced moulting, flocks were moulted and returned to lay for additional laying periods, thereby spreading fixed costs over longer time and more units of production (Bell, 2003). Induced moulting was followed during periods of low egg price or periods of high or rising feed cost (McDaniel and Aske, 2000).

Hence, a study was formulated to evaluate the efficiency of spent hens at different age groups after induced moulting on egg performance.

Materials and Methods

One hundred and forty four commercial Single Comb White Leghorn spent hens of 60, 65 and 70 weeks age group were purchased and reared for adaptation up to 61, 66 and 71 weeks of age. Then birds were weighed, leg banded and randomly allotted into six treatment groups with three replicates of eight birds each. Experimental treatments were

T_1 - 60 weeks control group
T_2 - 60 weeks induced moult group
T_3 - 65 weeks control group
T_4 - 65 weeks induced moult group
T_5 - 70 weeks control group
T_6 - 70 weeks induced moult group

Induced moulting programme: In all age groups, the egg production parameters were studied before induced moulting for one 28 days period i.e. 62 - 65, 67 - 70 and 72 - 75 weeks, respectively. All birds were dewormed, two days before induced moulting. Induced moulting was done by withdrawing drinking water for 0 - 3 days, feed for 0 - 10 days and night light for 0 - 14 days. Drinking water was provided from 4^{th} day onwards.

On 10^{th} day evening and 11^{th} day morning, 2 g of jaggery and 0.2 g of electrolyte mixture were given per bird through drinking water, as a starvation breaking liquid diet, to tone up the digestive system.

On 11^{th} day, one hour after giving jaggery - electrolyte water, 40 g of layer mash was given per bird. Sufficient care was taken to ensure uniform feed intake. The feed was increased daily by 10 g / bird / day until full feeding was restored by about 18^{th} day, thereafter *ad - libitum* feeding was followed. During the post - moult laying period, all the hens were fed *ad - libitum*, with a layer mash commercially available.

From 15^{th} day onwards, artificial light was provided during night time for 20 minutes, which was stepped up by 20 minutes per day until five hour night light was

Table 1: Mean body weight (g) (± S.E.) of Single Comb White Leghorn layers at different ages before and after induced moulting

Treatment	Pre - moult period	Post - moult periods	
		I - Period	II - Period
T_1. 60 weeks Control	1518.17^{A}±26.73 (24)	1487.48^{A}±36.36 (24)	1476.33^{A}±50.09 (24)
T_2. 60 weeks Induced moult	1528.83^{A}±22.19 (24)	1455.63^{AB}±27.47 (24)	1442.13^{AB}±25.73 (24)
T_3. 65 weeks Control	1449.21^{AB}±27.98 (24)	1384.67^{BC}±25.85 (24)	1355.67^{BC}±16.29 (24)
T_4. 65 weeks Induced moult	1407.96^{B}±23.38 (24)	1303.36^{C}±23.32 (22)	1301.94^{C}±1.26 (22)
T_5. 70 weeks Control	1490.08^{AB}±28.72 (24)	1442.17^{AB}±22.84 (24)	1442.58^{AB}±28.07 (24)
T_6. 70 weeks Induced moult	1518.75^{A}±18.06 (24)	1448.21^{AB}±20.40 (24)	1437.17^{AB}±26.03 (24)

Treatment	Post - moult periods		
	III - Period	IV - Period	Overall mean
T_1. 60 weeks Control	1459.54^{A}±57.84 (24)	1482.68^{A}±52.47 (23)	1476.51^{A} ±6.10 (4)
T_2. 60 weeks Induced moult	1442.17^{AB}±24.80 (24)	1456.60^{A}±38.37 (23)	1449.13^{AB}±4.04 (4)
T_3. 65 weeks Control	1348.17^{BC}±19.92 (24)	1391.13^{AB}±14.90 (24)	1369.91^{C}±10.58 (4)
T_4. 65 weeks Induced moult	1287.18^{C}±7.26 (21)	1337.33^{B}±11.79 (20)	1307.46^{D}±10.61 (4)
T_5. 70 weeks Control	1427.56^{AB}±41.23 (24)	1451.15^{A}±25.31 (23)	1440.87^{B}±4.89 (4)
T_6. 70 weeks Induced moult	1447.00^{AB}±35.15 (24)	1480.83^{A}±35.67 (24)	1453.30^{AB}±9.50 (4)

$^{A - D}$ Means within a column with no common superscript differ significantly (P<0.01). Value given in parenthesis in each cell indicates the number of observations

reached, making a total of 17 hour photoperiod per day. Between 18th and 20th day, vaccination against Ranikhet disease using Komarav strain (RDVK) was carried out. Multivitamins were administered in the morning at the recommended dose in drinking water for about a week, after RDVK vaccination.

Body weight: Initial individual body weight of the spent hens in all treatment groups were recorded at pre - moult period and subsequently once in every 28 days up to four periods of post - moult study. During moulting body weight of spent hens were recorded immediately after end of 10th day feed withdrawal.

Egg production: During the experimental period, the egg production was recorded daily. Based on the data, egg production was calculated in terms of hen day (per cent) and hen housed (number) egg production.

Results

Body weight: The effect of induced moulting at different ages on mean body weight of Single Comb White Leghorn (SCWL) layers before and after moulting are presented in Table 1.

Differences in mean body weight of SCWL layers before and after induced moulting were significant (P<0.01) among treatment groups.

Highly significant (P<0.01) difference in body weight of birds of 65 weeks age group was observed in overall mean values for the post - moult periods and for other age groups, the differences were not significant.

Body weight loss: The per cent body weight loss (Table 2) in 60, 65 and 70 weeks age group birds were 28.91, 31.08 and 29.19 per cent, respectively after induced moulting. On observation the mean body weight at first egg after moult was lower in all the moulted groups compared to their respective control.

Egg production

Hen housed egg production: Hen housed egg production (Table 3) was numerically better in all the post - moulted groups of birds compared with their respective controls. The cumulative hen housed egg production had also revealed a similar trend with T_2 and T_6 group recorded the highest egg production of 89.13 eggs while T_1 with the lowest (84.83 eggs). The statistical analysis revealed significant difference (P<0.05) on hen housed egg production at first period of post - moult due to resumption of laying.

Hen day egg production: The overall post - moult results of the study showed that birds in group T_4 (81.26 per cent) recorded the highest hen day egg production followed by birds in group T_2 (80.53 per cent), T_6 (79.75 per cent), T_3 (79.06 per cent). However, the birds in group T_1 (76.34 per cent) and T_5 (76.04 per cent) had lower hen day egg production than other treatment groups (Table 4).

Except first moult period, the analysis of variance of data revealed no significant difference among treatment groups. Comparison of means indicated that the birds in post - moulted groups had higher hen day production compared to their respective controls.

Discussion

Body weight: The mean body weight of SCWL layers at different ages before and after induced moulting showed a significant difference (P<0.01) among the treatment groups.

The body weight was lowest (1287.18 g) at post - moult third period of 65 weeks induced moult group and

Table 2: Mean body weight changes (g) (± S.E.) of Single Comb White Leghorn layers at different ages before and after induced moulting

Treatment	Pre - moult	Immediately after 10th day feed withdrawal	Percentage of body weight loss	Weight at first egg
T1 - 60 weeks Control	1518.17A±42.09 (24)	1523.85A±41.83 (24)	0.35±0.17 (24)	1471.71A±39.99 (24)
T2 - 60 weeks Induced moult	1528.83A±44.67 (24)	1017.75C±96.11 (24)	-28.91±0.99 (24)	1420.25A±31.21(24)
T3 - 65 weeks Control	1449.21AB±19.27 (24)	1463.33A±17.07 (24)	1.03±0.16 (24)	1387.96A±12.70 (24)
T4 - 65 weeks Induced moult	1407.96B±36.35 (24)	970.10C±27.74 (24)	-31.08±0.14 (24)	1260.85B±8.90 (22)
T5 - 70 weeks Control	1490.08AB±34.48 (24)	1485.27A±33.09 (24)	-0.41±0.12 (24)	1463.08A±41.65 (24)
T6 - 70 weeks Induced moult	1518.75A±9.15 (24)	1076.58BC±11.94 (24)	-29.19±0.67 (24)	1397.13A±5.06 (24)

A - CMeans within a column with no common superscript differ significantly (P<0.01). Value given in parenthesis in each cell indicates the number of observations

Table 3: Mean hen housed egg production (eggs/hen) (± S.E.) of Single Comb White Leghorn layers at different ages before and after induced moulting

Treatment	Pre-moult period	Post - moult periods				Cumulative egg production
		I - Period	II - Period	III - Period	IV - Period	
T1 - 60 weeks Control	23.83±1.09	23.17a±1.38	22.63±1.78	20.75±1.65	18.29±1.69	84.83±6.12
T2 - 60 weeks Induced moult	24.04±1.09	19.58ab±1.83	24.50±0.99	23.71±1.41	21.33±1.34	89.13±5.52
T3 - 65 weeks Control	23.71±1.08	23.21a±0.71	24.92±0.41	22.54±0.37	17.88±0.51	88.54±1.13
T4 - 65 weeks Induced moult	22.29±0.65	18.10b±0.30	25.29±0.91	24.21±1.16	21.39±1.72	88.99±3.42
T5 - 70 weeks Control	22.96±1.43	21.29ab±1.05	23.50±1.95	20.29±1.03	20.08±0.67	85.17±4.47
T6 - 70 weeks Induced moult	21.33±2.46	17.79b±1.15	24.50±1.94	23.96±1.55	22.88±1.88	89.13±6.38

a, bMeans within a column with no common superscript differ significantly (P<0.05). Value given in each cell of pre - moult and post - moult periods is the mean of three observations. Column wise mean is the mean of six observations. Cumulative egg production row wise is the sum of four observations

highest body weight (1528.83 g) at pre - moult in 60 weeks group. The lowest body weight at third period (65 weeks age) might be due to high body weight loss during moult (31.08 per cent) and delay in physiological recovery and vice - versa in other age groups. Induced moulting in SCWL layers at different ages (60 and 65 weeks) reduced the weight of layers when compared to unmoulted groups wherein 70 weeks age moult induced birds gained weight in overall mean body weight.

The mean body weight of SCWL layers at pre - moult period did not exhibit any significant difference at their respective ages viz. 60, 65 and 70 weeks. The mean body weight during the post - moult period for all age groups and overall mean for 60 weeks age moult induced birds were comparable. The 65 weeks moult induced group had significantly (P<0.01) lesser overall mean body weight. In 70 weeks age group, the overall mean the body weight of moult induced group had higher body weight than their corresponding control.

The non significant difference observed in 60 weeks moult induced group with the control group observed in this experiment is in agreement with the earlier observations of Koelkebeck *et al.* (1993), Buhr and Cunningham (1994). They observed that moulted hens returned to egg production sooner and regain body weight faster when fed diet containing 16 per cent crude protein.

Higher body weight in the overall period at 70 weeks of age moulted birds over their corresponding control group is in agreement with results observed by Hurwitz *et al.* (1995) and Hurwitz *et al.* (1998). They indicated that the moult induced bird's body weight reached the values higher than those of unmoulted controls. The lower overall body weight in the 65 weeks moult induced group compared to their unmoulted control might possibly be due to the numerically lower body weight in that group of birds during the pre - moult period.

The reduction in body weight of moulted hens at 65 weeks age group might possibly be due to feed and water restriction during moulting programme and relative decrease in weight of internal organ (Brake and Thaxton, 1979).

Body weight loss: The highest percentage of body weight loss (31.08 per cent) occurred in 65 weeks, followed by 70 weeks (29.19 per cent) and in 60 weeks (28.91 per cent) induced moult groups.

According to Brake (1994), the body weight loss of SCWL layers ranged from 27 - 32 per cent and produced best post - moult performance which was in agreement with the results of this study. Similar findings were also observed in layers by Brake (1993); Hussein (1996); Shalini and Singh (2003) and Ocak *et al.* (2004).

There was no significant change in post - moult cumulative hen housed and per cent hen day production in all treatment groups regardless of percentage of body weight loss during moult period. Sixty five weeks age moult induced birds regained body weight much slower compared to other treatment groups because of high body weight loss (31.08 per cent) during moult period.

Egg production: The analysis of data on effect of induced moulting did not show any significant effect on hen housed egg production and hen day egg production

Table 4: Mean per cent hen day egg production (± S.E.) of Single Comb White Leghorn layers at different ages before and after induced moulting

Treatment	Pre-moult period	Post - moult periods				Overall mean
		I - Period	II - Period	III - Period	IV - Period	
T1 - 60 weeks Control	85.11±3.88	82.75a±4.92	80.82±6.35	74.11±5.91	67.69±3.88	76.34±3.42
T2 - 60 weeks Induced moult	85.86±3.88	69.93bc±6.55	87.50±3.54	84.68±5.04	80.02±8.21	80.53±3.85
T3 - 65 weeks Control	84.68±3.86	82.89ab±2.54	89.00±1.47	80.50±1.32	63.84±1.80	79.06±5.38
T4 - 65 weeks Induced moult	79.61±2.32	64.64c±1.09	90.32±3.26	86.96±3.99	83.12±2.74	81.26±5.74
T5 - 70 weeks Control	82.00±5.12	76.04abc±3.76	83.93±6.98	72.46±3.67	71.71±2.39	76.04±2.79
T6 - 70 weeks Induced moult	76.18±8.77	63.54c±4.09	87.50±6.93	85.57±5.53	82.40±7.31	79.75±5.50

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among different treatment groups except at the first period of post - moult which might be due to resumption of egg laying.

The highest overall mean egg production was noticed in 65 weeks induced moult group and the difference was not significant as observed by koelkebeck *et al.* (1992). One of the major reasons for increased post - moult egg production was decreased post - moult production of shell less eggs (Roland and Brake, 1982) and enhancement of ovarian functions due to oviductal tissue rejuvenation might also had resulted in the improvement of egg production (Ocak *et al.*, 2004).

The hens laying at highest rate during pre - moult showed not much improvement (T_1, T_2, T_3 and T_5) whereas those laying at the lowest rate showed the greater improvement (T_4, T_6), which was similar to the findings of Roland and Brake (1982).

The peak egg production was observed during second post - moult period which coincides with the findings of Berry and Brake (1987) and Charles and Cunningham (1987).

Koelkebeck (1991); Koelkebeck *et al.* (1991); Koelkebeck *et al.* (1992) and Alodan and Mushaly (1999) observed that the fasting period of 10 days and post - moult diet with 16 per cent crude protein produced better performance in SCWL layers. Similar results were also observed in this study with 17 per cent crude protein.

From the above findings, it could be suggested that the low rate of egg production might be improved by induced moulting.

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