ISSN 1682-8356
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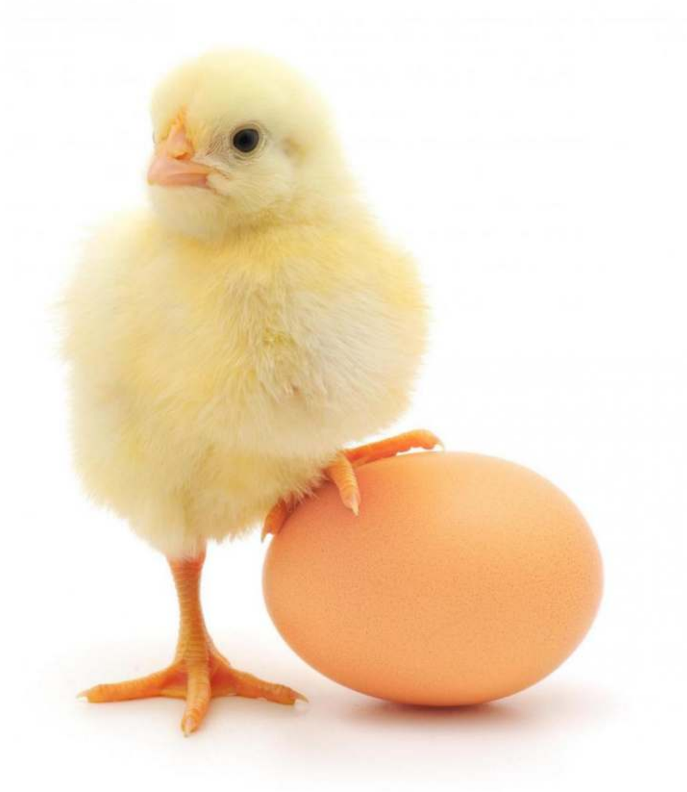

INTERNATIONAL JOURNAL OF POULTRY SCIENCE

ANSInet
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan
Mob: +92 300 3008585, Fax: +92 41 8815544
E-mail: editorijps@gmail.com

International Journal of Poultry Science 5 (1): 47-50, 2006
ISSN 1682-8356

Alternative Induced-Molting Methods for Continuous Feed Withdrawal and Their Influence on Postmolt Performance of Laying Hens

E. Asadi Khoshoei and F. Khajali
Department of Animal Science, Faculty of Agriculture, Shahrekord University, Shahrekord, Iran

Abstract: One experiment was conducted to evaluate a number of molting techniques that were less stressful than conventional feed withdrawal. A total of 360 80-wk-old Hyline W36 hens were used. Experimental treatments were as follow: Treatment 1 (T1) used a conventional feed withdrawal (FW) period until about 30% body weight loss had occurred and considered as the control. Hens on T2 received a layer diet containing 35% delinted ground cotton seed. Hens on T3 fed a 92% corn middlings diet continuously for 28d. Hens on T4 were subjected to 3d feed withdrawal followed by T3. Hens on T5 fed a 92% wheat middlings diet continuously for 28d. Hens on T6 were subjected to 3-d feed withdrawal followed by T5. Hens on T7 fed a 50:50 mixture of corn and wheat middlings (92%) continuously for 28d. Hens on T8 were subjected to a 10-d feed withdrawal and then fed a low-protein diet (12% CP). Birds subjected to continuous feed withdrawal (T1) and ground cotton seed (T2) had body weight loss of 32.5 and 25% after 14d, respectively. Hens on other molting regimes did not have weight loss more than 10%. There was no significant difference in terms of postmolt performance between the birds fed the molt diets and those subjected to feed withdrawal. Shell thickness was comparable between the birds on T1 and other treatments at all post molt stages.

Key words: Molting, layer, performance, egg quality

Introduction

Conventional induced molting strategies have used fasting of hens for a particular length of time, or to a targeted body weight. The length of molting, defined as the time from initiation of fasting until 50% egg production, varies with the particular molting technique and conditions. Induced molts generally range from 5 to 9 wk in length (Berry, 2003). There are essentially three fasting programs being used by commercial egg producers today. They are short fasting for 4 to 6d, medium fasting for 10d, and long fasting from 12 and up to 16d (Ruszler, 1998).

Fasting results in weight loss which is necessary for rest and rejuvenation of reproductive organs. The reduction in body weight due to fasting is the result of ovarian and oviduct regression, depletion of fat and labile protein reserves, the loss of gastrointestinal canal contents, and initial water intake reduction. Improved post molt performance is associated with the amount of regression and subsequent redevelopment of body organs and tissues (Ruszler, 1998).

Concerns about the effects of fasting on the welfare of hens and reports that suggest that molting hens may be more susceptible to *Salmonella enteritidis* have led to calls for the abolition of induced molting (Ricke, 2003; Holt, 2003). Because of the economic significant of induction of molt to the poultry industry, alternative molting techniques warrant further investigation.

Due to the ever-increasing public concern about animal welfare, the present experiment was conducted to evaluate a number of molting techniques that, although their application could be practical and have the potential of a satisfactory postmolt performance, would be less stressful than conventional feed withdrawal of 10 to 14d fast. The molting techniques in this experiment either did not involve a fasting period, or the period of fasting were reduced to 3d. In addition, the molt diets were supplemented with adequate levels of Ca, P, Na, trace minerals similar to levels that are normally used in commercial layer diets. Photoperiod and water limitations were not considered as a part of the molting techniques used in the current experiment.

Materials and Methods

A total of 360 80-wk-old Hyline W36 hens were housed in a cage layer house of commercial design with water and feed provided at will. Prior to start the experiment, all hens were weighted and allocated to each replicate according to equal body weights. Replicates consisted of 15 birds located in three adjacent cages with 5 birds per cage (30×45 cm). Three such replicates were randomly assigned to each treatment. Experimental treatments were as follow: Treatment 1 (T1) used a conventional feed withdrawal (FW) period until about 30% body weight loss had occurred and considered as the control. Hens on T2 received a layer diet containing 35% delinted ground cotton seed. Hens on T3 fed a 92% corn middlings diet continuously for 28d. Hens on T4 were subjected to 3d feed withdrawal followed by T3. Hens on T5 fed a 92% wheat middlings diet

Table 1: The effect of different molting techniques on body weight during molt period (81 to 85wk)

Molt regimes	Initial BW at 81wk(gr)	BW after 14d (gr)	BW loss (gr)
T1 Continuous FW	1456.5	983.5[c]	32.5[a]
T2 Cottonseed included	1455.1	1091.6[b]	25[b]
T3 Continuous corn diet	1442.7	1363.0[a]	5.5[c]
T4 3d FW + corn diet	1438.0	1366.0[a]	5.1[c]
T5 Continuous wheat diet	1450.7	1385.7[a]	4.6[c]
T6 3d FW + wheat diet	1436.0	1305.3[a]	9.1[c]
T7 50:50 corn : wheat diet	1444.0	1320.0[a]	8.6[c]
T8 10d FW + low protein diet	1475.0	1317.0[a]	10.7[c]

Table 2: The effect of molting techniques on layer performance

	Treatments								
	T1	T2	T3	T4	T5	T6	T7	T8	LSD
Peak									
HDEP	78.1[a]	76.2[a]	74.1[ab]	77.8[a]	71.6[ab]	72.1[ab]	64.1[b]	76.1[a]	9.42
HDFI	94.4[ab]	89[b]	94.4[ab]	95.5[a]	92.8[ab]	90.8[ab]	90.6[ab]	92.8[ab]	6.18
EW(g)	65.5[ab]	65.3[ab]	65.7[ab]	65.7[ab]	65.4[ab]	64.3[b]	64.7[ab]	66.2[a]	1.81
FCR	1.8[b]	1.8[b]	1.9[b]	1.8[b]	1.9[ab]	1.9[b]	2.2[a]	1.8[b]	0.02
1mppk*									
HDEP	77.6[a]	73.2[ab]	76.5[ab]	76.1[ab]	73.24[ab]	72.5[ab]	65.0[b]	74.9[ab]	10.1
HDFI	103.2[ab]	95[b]	103.7[ab]	102.6[ab]	101.2[ab]	99.0[ab]	99.4[ab]	106.4[a]	9.0
EW(g)	64.76	65.2	65.01	66.09	65.7	64.3	65.0	65.3	1.8
FCR	2.05	2.0	2.1	2.0	2.1	2.1	2.3	2.1	0.3
2mppk									
HDEP	67.6	68.5	66	70.6	68.9	65.3	60.4	70.4	11
HDFI	102	96.4	105.2	104.4	100.6	100.9	98.5	101.5	9.4
EW(g)	62.8	63.4	64.1	63.7	64.1	63.5	63.7	63.7	1.6
FCR	2.4	2.2	2.6	2.3	2.2	2.4	2.5	2.2	0.4
3mppk									
HDEP	66.7[ab]	69.5[ab]	68.8[ab]	67.5[ab]	66.3[ab]	61.8[ab]	60.1[b]	71.1[a]	10.0
HDFI	102.1	100.9	107.8	109.8	112.5	102.7	102.7	105.2	12.1
EW(g)	62.8	62.6	63.1	64.4	63.7	64.6	64.6	63.6	2.7
FCR	2.4	2.3	2.5	2.5	2.6	2.5	2.6	2.3	0.3
4mppk									
HDEP	66.1	69.2	65.6	63.6	65.4	62.8	60.5	70.5	10.5
HDFI	105.3[ab]	104.6[b]	109.3[ab]	114.6[ab]	115.3[a]	107.1[ab]	108.8[ab]	108.5[ab]	10.2
EW(g)	65.6	65.6	65.6	67.4	65.9	65.9	66.6	65.6	1.8
FCR	2.4	2.4	2.5	2.6	2.7	2.5	2.5	2.3	0.3

a-bMeans within rows with no common subscript differ significantly($P<0.05$).

*HDEP: hen day egg production; HDFI: hen day feed intake. EW: egg weight; FCR: feed conversion ratio; MPPK: months post peak.

continuously for 28d. Hens on T6 were subjected to 3-d feed withdrawal followed by T5. Hens on T7 fed a 50:50 mixture of corn and wheat middlings (92%) continuously for 28d. Hens on T8 were subjected to a 10-d feed withdrawal and then fed a low-protein diet (12% CP).

On day 1 (the initiation of feed withdrawal or feeding molt diets), the daily photoperiod was reduced to 10h. On day 24 and 31, the daily photoperiod was increased to 12 and 13h, respectively, then increased 15 min per week until 17h per day was achieved.

The experiment ran from 81 to 105 wk of age. The first 4wk (81 to 85wk of age) were used for induction of molt by using various techniques, and the subsequent 5 periods of 4 wk (85 to 105 wk) were allocated to collection of production data for comparing the effect of various molting techniques. Egg production was recorded daily. Egg weight was measured on all eggs produced on 2 consecutive days each week. Shell thickness, shell resistance against breaking, albumen height and specific gravity were determined on the same eggs for the measurement of egg weight. Specific gravity was made by using salt solutions varying in specific gravity from 1.050 to 1.115 in increments of 0.050. Body weights of sample birds from each treatment were determined several times during induced molt to

Table 3: The effect of molting techniques on egg quality parameters

	Treatments								
	T1	T2	T3	T4	T5	T6	T7	T8	LSD
Peak									
SR	3.93	3.56	3.8	4.07	3.74	4.13	3.4	4.1	0.66
ST	0.39^{a}	0.35^{b}	0.41^{a}	0.40^{a}	0.38^{ab}	0.39^{ab}	0.39^{ab}	0.40^{a}	0.03
AH	4.39	4.74	4.04	4.44	4.48	4.02	4.11	4.96	0.91
SG	1.10	1.09	1.10	1.09	1.09	1.09	1.10	1.09	0.006
1mppk*SR	3.63	3.29	3.49	3.67	3.31	3.29	3.4	3.76	0.524
ST	0.41^{ab}	0.403^{b}	0.419^{ab}	0.419^{ab}	0.421^{ab}	0.40^{b}	0.40^{b}	0.43^{a}	0.022
AH	5.21	4.79	4.13	4.52	4.84	4.67	5.2	4.82	1.10
SG	1.109	1.106	1.108	1.108	1.107	1.107	1.109	1.108	0.004
2mppkSR	3.93	3.67	3.81	3.84	4.01	4.06	3.75	3.68	0.606
ST	0.426^{ab}	0.406^{b}	0.415^{b}	0.410^{b}	0.434^{ab}	0.408^{b}	0.445^{a}	0.414^{a}	0.025
AH	6.24	5.48	6.10	6.46	6.30	6.25	6.42	5.99	0.987
SG	1.1	1.1	1.1	1.05	1.10	1.1	1.1	1.10	0.056
3mppkSR	3.83	3.91	3.73	4.21	3.61	3.43	3.76	3.88	0.716
ST	0.409	0.400	0.382	0.398	0.382	0.396	0.389	0.407	0.258
AH	5.32^{a}	4.64^{ab}	4.09^{b}	4.81^{ab}	4.94^{ab}	4.13^{b}	4.27^{ab}	5.07^{a}	0.93
SG	1.1^{a}	1.09^{ab}	1.09^{ab}	1.09^{b}	1.09^{ab}	1.09^{ab}	1.09^{ab}	1.09^{ab}	0.002
4mppkSR	3.26	3.78	3.72	3.83	3.67	3.53	3.58	3.59	0.807
ST	0.396	0.408	0.399	0.396	0.400	0.397	0.414	0.405	0.032
AH	4.09	3.74	3.7	4.02	4.04	4.56	4.18	4.04	0.873
SG	1.10	1.10	1.10	1.1	1.1	1.1	1.1	1.1	0.005

a-b Means within rows with no common superscript differ significantly(P<0.05).
*SR: shell resistance against breaking; ST: shell thickness; AH: albumen height; SG: specific gravity.

determine the approximate age at which 30%bodyweight loss occurred. Data were analyzed by ANOVA using SAS (1997) software and multiple range Duncan's test was used for mean comparisons.

Results and Discussion

Birds subjected to continuous feed withdrawal (T1) and ground cotton seed (T2) lost 32.5 and 25% of their body weight after 14d, respectively (Table 1). This difference was significant (P<0.05). The difference between these two treatments with all other treatments in terms of body weight loss was significant (P<0.05). Keshavarz and Quimby (2002) reported 30.8% weight loss following continuous feed removal for 14d which is close 40 the results reported herein.

Post molt performance of the birds is shown in Table 2. Birds on T2 had the lowest feed intake compared to other groups and this difference was significant (P<0.05) during peak and postmolt Nevertheless, egg production of the birds on T2 was still quit high. So T2 had better feed conversion ratio. Davis *et al.* (2002) demonstrated that birds molted by inclusion of 40% cottonseed in their diets had post molt egg production similar to the birds subjected to continuous feed removal. There was no significant difference between the birds fed the corn molt diet and those fed the wheat molt diet (T3 vs T4). Application of 3d fasting did not have a significant impact on post molt performance criteria (T3 vs T4 and T5 vs T6). Egg production of short fasted birds (3d fast) was comparable to those on continuous feed removal. This is in agreement to Koelkebeck *et al.* (1992). There were no significant trends for average egg weights.

Table 3 depicts the results for postmolt egg quality indices. There were no significant effects of molt regimes on shell resistance and specific gravity towards the end of the post molt period. Similar results were obtained by Keshavarz and Quimby (2002). Albumen height of eggs from birds on continuous feed removal, for the most part, was not significantly higher than birds on other molting regimes. The only exception was at 3 month post peak so that birds in T1 had significantly (P<0.05) higher albumen height compared to T3. The difference between T1 and other treatments was not significant in terms of shell thickness at all post molt stages. These findings disagree with other studies reported that shell quality enhanced by using feed removal for 10 d or longer.

In general, the results of this experiment indicated that non-feed removal methods resulted in a comparable postmolt performance to the conventional feed removal technique.

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