Journal of Animal and Veterinary Advances 7 (12): 1613-1617, 2008
ISSN: 1680-5593

The Response of Two Commercial Laying Hen Strains to an Induced Molting Program

[1]Mehmet Yardimci and [2]Ismail Bayram
[1]Department of Animal Husbandry, [2]Department of Animal Nutrition,
Faculty of Veterinary Medicine, Afyon Kocatepe University, 03200 Afyonkarahisar, Turkey

Abstract: There are numerous molting programs used in research and in the commercial layer industry. If the program is conducted properly, the productive life of a laying hen flock can be substantially increased. Many research studies on molting programs have focused on the physical manipulation of the program itself as well as the nutritional recovery of the diet used. Though, there are many methods employed to induce molting of commercial hens, feed removal is used most frequently. Withdrawal of feed for up to 10-14 days is commonly used, resulting in a temporary state of fasting. Logman and Brown Nick strains were used in this study with a production capacity of 78.7 and 68.2% at 72nd week of rearing period. Molting was induced by Feed Withdrawal (FW). Briefly, feed was replaced with mosaic for 10 days, followed by supplementing barley gradually containing 1-1.5% mosaic for the next 10 days. The FW treatment resulted in total cessation of egg production within 14 days for Logman and 28 days for Brown Nick while the birds remained out of production. The rate of egg production was significantly improved by force molting treatments when compared with their 2 weeks period (72-73 week) of the commencement of treatments. Egg production period for Logman hens was shorter than that of Brown Nick which resulted in lower yield in total. Return to pre-molt status was similar in both groups; however menarche time varied between strains. Post-molt menarche and return to pre-molt status had occurred on day 21 for Logman and day 5 for Brown Nick. Post-molt hen-day production peaks were at 86th week for Logman with an 88.8% yield and 83rd week for Brown Nick with 75.0% yield. Brown Nick produced more cracked eggs between 75th and 83rd weeks of the experiment while Logman produced more cracked eggs than that of Brown Nick did during the other periods. Mortality, was evidently high in both groups during the molting period. However, throughout the study, mortality for both molting groups was within the expected range As a result of this study, Brown Nick performed better than Logman in terms of egg production, post molt-menarche time, cracked eggs while Logman was better in terms of post molt hen-day peak and mortality figures.

Key words: Brown nick, egg production, logman, molting, feed withdrawal

INTRODUCTION

Molting is a natural phenomenon in birds during which they replace old plumage with new feathers, reduce feed intake, lose body weight and suspend reproduction. Molting in laying hens can be induced by using photoperiods, feed deprivation or restriction or diets containing minerals or variable amounts of other ingredients. Induced molting can result in higher egg production and improved quality. It reduces mortality, production costs and investments in new farms and hatcheries (Yousaf and Chaudhry, 2008).

Molting (resting) in birds is a physiological phenomenon as in most animals. During the molting 25-30% weight loss is required to attain the maximum egg production post molting (Baker *et al*., 1983; Hussein, 1996). 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 5-9 week in length (Berry, 2003).

In recent years, concern for the well-being of hens during molt has been questioned when feed removal is used. However, practical and economical advantages of non-feed removal methods have not been clearly proved yet. Particularly most of the breeders in the field are still using the FW method for molting. Non-feed withdrawal methods including salt restriction, high dietary zinc and

Corresponding Author: Mehmet Yardimci, Department of Animal Husbandry, Faculty of Veterinary Medicine, Afyon Kocatepe University, 03200 Afyonkarahisar, Turkey

high dietary iodine treatments were compared with feed removal method in a previous study (Albuquerque *et al*., 1999). The results showed that percentage of production was not different among the strains tested.

Apart from the methods, the response of the strain exposed to molting is also important. Considering the egg production differences between the strains during the normal production period, the response to molting is a question of great interest. Moreover, since it has an economical importance for the breeders, studies on response characteristics to molting in different strains attract attention. Therefore, such researches are still carried out to provide adequate information for breeders and researchers.

This study was conducted to compare the responses to molt in 2 different laying hen strains.

MATERIALS AND METHODS

Logman (N = 13468) and Brown Nick (N = 15388) laying hens at 72 weeks of age were used for the experiment. The hens were allocated into 2 poultry houses in which same experimental conditions were maintained. Feed and water was provided for ad libitum consumption prior to the start of the experiment. Rooms' temperature kept 17±1°C throughout the experiment. Same molting program was used to compare the effects on post molt production of 2 different strains. Molting was induced at the end of the 72nd week with a production capacity of 78.7 and 68.2%, respectively for Logman and Brown Nick strains. In both groups, %1 of the total hens was weighed in order to determine the expected weight loss (25-30%) during the molting process. Twenty-four h lightening was applied just before the feed removal for 2 days. During the withdrawal period, water was provided for *ad libitum* intake and the photo period was 16 h light day^{-1}. Feed was replaced with mosaic for 10 days based on the reached target weight loss. This stage was followed by feeding the birds with barley gradually (10-100 g hen^{-1}) containing 1-1.5% mosaic for the next 10 days. Afterwards feeding turned to normal procedure as applied in rearing commercial layer hens. Cracked eggs and mortality numbers were recorded daily.

A SPSS-11 Package Program for Windows was used for the statistical analysis. Group comparisons were made by Student t-test. Data on the incidences of mortality in both groups were analyzed using the Chi-Square (χ^2) test.

RESULTS AND DISCUSSION

In the present experiment, briefly we used Feed Withdrawal (FW) method to induce molting as done by many of the breeders. Egg production figures from the molting period to 88th week for Logman and Brown Nick strains are shown in Table 1. During the whole production period, significant differences were observed ($p<0.05$) between the groups except the 72nd, 73rd, 74th, 76th and 81st weeks. At the beginning of the molting period the produced egg numbers were similar. Particularly after the 74th week, a sudden decrease was seen in both groups. This decline continued till 78th week in Logman and 76th week in Brown Nick. Although Brown Nick demonstrated a sudden increase in egg production following the molting period, Logman caught it at 80th week. Thereafter Logman performed better until the 86th week. However a sudden decline was seen in Logman at the 87th week while Brown Nick sustained its performance.

Table 1: Comparison of egg production of logman and brown nick strains

Weeks	Logman egg production x±Sx	Brown nick egg production x±Sx	p-value
72	10597.6±71.5	10513.3±77.2	0.439
73	9931.9±147.4	9687.9±109.0	0.760
74	1332.3±97.4	1353.7±80.1	0.984
75	0.0±0.0	4.0±1.2	0.007
76	0.0±0.0	2.86±1.5	0.084
77	0.7±0.5	760.1±312.5	0.032
78	12.0±5.7	4576.6±38.5	0.000
79	757.3±47.9	6882.1±22.1	0.000
80	5822.0±85.7	8672.0±64.1	0.004
81	9944.0±78.4	9918.9±86.7	0.922
82	10973.4±55.7	10667.4±68.5	0.005
83	11270.4±20.0	10876.7±22.6	0.000
84	11371.3±5.7	10754.3±62.0	0.000
85	11308.4±8.2	10688.0±19.2	0.000
86	11467.6±89.7	10692.4±40.4	0.000
87	3827.7±90.8	10745.9±32.0	0.000
88	-	10468.7±53.4	0.000

p<0.05, P: Student t-test

Although, several methods are being applied to find out the most effective method, FW is still the most commonly used method. Buhr and Cunningham (1994) compared the post molt egg production variables among hens induced into molt by feed removal, by limited daily feeding of a low-density and low-energy molt feed at 22.8 g hen^{-1}, or by limited alternate-day feeding at 45.5 g hen^{-1}, until approximate body weight loss of 15, 20 and 25% was obtained. Hens were housed 2 cage^{-1} (25.4×45.7 cm) in a house of environmental design and photoperiod was reduced to 8 h during the 28 day molt period. They reported that post molt mortality and egg production were not different ($p>0.05$) as a result of molt induction method or percentage body weight loss. At the 4th week post molt, body weights were 50 and 57 g heavier for hens that had lost 15% body weight than those that lost 25 or 20%, respectively and egg production was negatively linearly related to body weight loss. Keshavarz and Quimby (2002) conducted an experiment to evaluate the effect of a number of molting techniques that appeared to be less stressful than the

conventional Feed Withdrawal (FW) method on postmolt performance. The molting techniques involved a continuous FW (T_1, control group), 1 day FW followed by feeding a Grape Pomace (GP) diet containing 10 ppm thyroxine (T_2) ad libitum, feeding a corn diet (T_3) ad libitum, or the corn diet with an initial FW of one day (T_4) or 2 day (T_5), or regimens similar to T_3, T_4 and T_5, respectively, in which the corn diet contained 10 ppm thyroxine (T_6, T_7 and T_8). They started the induction of molting at 66 week of age and lasted until 30% Body Weight Reduction (BWR) or 28 day whichever came first. Postmolt performance information was collected up to 98 week of age. The 30% BWR was obtained after 14 day FW with T_1 and after 16 day FW with T_2. Hens exposed to T_6, T_7 and T_8 had a BWR of 26-29% after 28 day and those exposed to T_3, T_4 and T_5 had a BWR of 16-18% after 28 day from the start of induction of molt. They found that post molt Egg Production (EP) was consistently greater for T_1 and T_2 than the other molting techniques. Therefore, they concluded that the use of a GP diet plus thyroxine could support a similar postmolt performance as the conventional method of continuous FW. However, the physiological response did not indicate that the use of a GP diet plus thyroxine was less stressful than the conventional method of continuous FW. In order to, address animal welfare concerns, efforts have been made by many investigators to reduce or eliminate the FW period of a molting program. McCormick and Cunningham (1987) reported that postmolt EP performance was significantly greater for hens exposed to 10-d FW than for hens fed 20,000 ppm zinc for 4 or 8 day. Koelkebeck *et al.* (1992) reported that a FW of <10 days might yield satisfactory EP and Egg Weight (EW), but shell quality could be enhanced by using FW of 10 days or longer. reported higher EP for hens exposed to 10-14 days FW than those exposed to 4 days FW.

In this study, the rate of egg production was significantly improved by force molting treatments when compared with their 2 weeks period (72-73 week) of the commencement of treatments (Table 1, 2). Force molting displayed different consequences on the post molt performance of laying hens. That is, egg production period for Logman hens was shorter than that of Brown Nick. Incline and declines were sharper in Logman hens. Parallel to the results of egg production, a decrease was seen until 76th week following the molting process in both groups. Brown Nick recovered better than Logman after molting. Beginning from the 81st week Logman performed better until 86th week. However, a sudden decrease was seen in 87th week while Brown Nick sustained its performance. Apart from the comparison of 2 strains, Brown Nick produced eggs until 100th week of age with a gradual decline.

Table 2: Comparison of egg production yields (%) for logman and brown nick strains

Weeks	Logman egg production yield (%) x±Sx	Brown nick egg production yield (%) x±Sx	p-value
72	78.7±0.5	68.2±0.5	0.000
73	73.9±4.1	63.0±3.6	0.069
74	9.9±5.8	8.8±4.7	0.886
75	0.0±0.0	0.03±0.0	0.007
76	0.0±0.0	0.02±0.0	0.084
77	0.0±0.0	5.19±2.1	0.032
78	0.1±0.1	31.3±2.7	0.000
79	5.8±1.9	47.1±1.5	0.000
80	44.9±2.1	59.4±1.4	0.037
81	76.7±1.7	68.1±0.8	0.001
82	84.7±0.4	73.4±0.5	0.000
83	87.1±0.2	75.0±0.2	0.000
84	87.9±0.0	74.3±0.4	0.000
85	87.5±0.1	74.0±0.1	0.000
86	88.8±1.0	74.1±0.3	0.000
87	29.7±0.6	74.5±0.2	0.000
88	-	72.7±0.4	0.000

p<0.05, P: Student t-test

Table 3: Time of post molt-menarche and return to pre-molt status

Strain	Pre-molt egg yield (%)	Menarche time (day)	Return to pre-molt status
Logman	78.7	21	9 Week
Brown Nick	68.2	5	9 Week

Table 4: Comparison of post molt hen-day production peaks

Strain	Hen-day peak (%)	Time (week)
Logman	88.8	86
Brown nick	75.0	83

Return to pre-molt status was similar in both groups; however menarche time varied between strains (Table 3). This difference was the first typical indicator for response to molting between two strains. Brown Nick obviously performed better compared to Logman. During the study, egg production ceased at the end of 74th week. Post-molt menarche and return to pre-molt status had occurred on day 21 for Logman and day 5 for Brown Nick.

Post-molt hen-day production peaks were at 86th week for Logman with an 88.8% yield and 83rd week for Brown Nick with 75.0% yield (Table 4). Brown Nick displayed a linear incline and decline yield figure whereas peak was observed in the middle of this period. However, Logman displayed a long term incline following a sudden decline in which peak was seen at the end.

Regarding the cracked eggs, variable results were seen between the groups. Brown Nick produced more cracked eggs between 75th and 83rd weeks of the experiment (Table 5). This could be related to the non-production period followed by the beginning of post molt period for Logman. Therefore, it could be

Table 5: Comparison of cracked eggs for logman and brown nick strains

Weeks	Logman cracked eggs x±Sx	Brown nick cracked eggs x±Sx	p-value
72	203.4±11.6	142.7±3.3	0.000
73	324.9±39.2	209.7±26.9	0.000
74	385.1±46.1	102.7±34.2	0.001
75	0.0±0.0	0.2±0.3	0.337
76	0.0±0.0	0.1±0.1	0.337
77	0.0±0.0	16.0±8.3	0.080
78	0.0±0.0	136.1±9.8	0.000
79	5.9±3.2	211.7±12.5	0.000
80	55.7±6.7	206.8±12.1	0.000
81	131.3±9.6	179.0±10.1	0.016
82	164.1±5.6	213.7±16.2	0.004
83	187.7±10.0	199.8±13.7	0.488
84	187.1±11.3	183.1±8.1	0.778
85	235.9±6.4	143.1±10.3	0.000
86	204.4±22.3	175.9±12.7	0.048
87	1542.2±74.9	196.1±17.0	0.000

p<0.05, P: Student t-test

Table 6: Comparison of mortalities between logman and brown nick strains

Weeks	Logman mortality number (n = 13468)	Brown nick mortality number (n = 15412)	χ^2	p-value
72	20	24	0.024	0.876
73	12	37	9.663	0.002
74	57	193	57.522	0.000
75	116	393	119.445	0.000
76	52	82	3.915	0.048
77	107	39	39.499	0.000
78	92	15	64.748	0.000
79	23	26	0.000	0.985
80	17	22	0.190	0.663
81	14	28	3.189	0.074
82	10	34	10.506	0.001
83	12	29	5.256	0.022
84	12	31	6.412	0.011
85	6	17	4.112	0.043
86	20	17	1.711	0.191
87	8	20	3.903	0.048

p<0.05, P: Chi-square (χ^2) test

accepted normal. Considering the other periods, it was clear that Logman produced more cracked eggs than that of Brown Nick did.

Mortality, was evidently high in both groups during the molting period (Table 6). The mortalities just after the molting period at 75th, 76th and 77th weeks were dramatic in both groups. The figures in other weeks varied. Contrary to egg production figures, mortality was generally higher in Brown Nick layers than that of Logman. Considering the molting process as a stressful event, mortalities could be accepted normal since the numbers were reasonable compared to standard commercial layer hen production.

As a result of this study significant difference was occurred between two strains as response to molting process. Brown Nick performed better than Logman in terms of egg production, post molt-menarche time, cracked eggs while Logman was better in terms of post molt hen-day peak and mortality figures. The reasons for this difference are not clear, but it is very well known that the efficiency of a molting program depends on several factors, such as strain of bird, body weight characteristics and environmental conditions. Differences in response to forced molt are known to occur even between lines of the same strain. Thus, in practice, molting procedure must be adapted to the strain of the hens, the environment and their conditions at the end of the first laying cycle.

CONCLUSION

In conclusion, feed removal method found to be an effective molting method on post-molt performance, although it caused short-term mortalities. Egg production as well as profitability of egg production improved significantly while no significant change occurred in terms of cracked egg numbers in Logman and Brown Nick strains compared to the pre-molt period. In general, Brown Nick responded molting better than Logman considering the performance, length and amount of the total egg production.

ACKNOWLEDGMENT

We thank to Mr. Munir Bilgili for his support in providing us the research materials and allowing us to use his poultry houses.

REFERENCES

Albuquerque, R. de, C.X. de Mendonca, E. Ghion and C.G. Lima, 1999. Effect of different methods of forced molt on performance of laying hens. Braz. J. Vet. Res. Anim. Sci., 36: 3. DOI: 10.1590. http://www.scielo.br/scielo.php?script=sci_arttext&pid=S1413-95961999000300010&tlng=en&lng=en&nrm=iso.

Baker, M., J.T. Brake and G.R. McDeniel, 1983. The relationship between body weight loss during a forced molt and post molt reproductive performance of caged layers. Poult. Sci., 62: 409-413. PMID: 6844205.

Berry, W.D., 2003. The physiology of induced molting. Poult. Sci., 82: 971-980. PMID: 12817453. http://www.poultryscience.org/ps/paperpdfs/03/p0360971.pdf.

Buhr, R.J. and D.L. Cunningham, 1994. Evaluation of molt induction to body weight loss of fifteen, 20 or 25% by feed removal, daily limited, or alternate-day feeding of a molt feed. Poult. Sci., 3 (10): 1499-510. PMID: 7816724.

Hussein, A.S., 1996. Induced moulting procedures in laying fowl. Worlds Poult. Sci. J., 52: 175-187. DOI: 10.1079.

Keshavarz, K. and F.W. Quimby, 2002. An Investigation of Different Molting Techniques with an Emphasis on Animal Welfare. J. Applied Poult. Res., 11: 54-67. http://japr.fass.org/cgi/reprint/11/1/54.pdf.

Koelkebeck, K.W., C.M. Parsons, R.W. Leeper and J. Mostaghian, 1992. Effect of duration of fasting on postmolt laying hen performance. Poult. Sci., 72: 2229-2235. PMID: 1561209. http://japr.fass.org/cgi/content/abstract/15/3/483?ijkey=e9376b076bfae10d1a46cb095b7b2ef42274a294&keytype2=tf_ipsecsha.

McCormick, C.C. and D.L. Cuningham, 1987. Performance and physiological profiles of high dietary zinc and fasting as methods of inducing a forced rest: A direct comparison. Poult. Sci., 66: 1007-1013. PMID: 3658876. http://grande.nal.usda.gov/ibids/index.php?mode2=detail&origin=ibids_references&therow=263595.

Yousaf, M. and A.S. Chaudhry, 2008. History, changing scenarios and future strategies to induce moulting in laying hens. Worlds Poult. Sci. J., 64: 65-75. DOI: 10.1017.