Asian Australas. J. Biosci. Biotechnol. 2016, 1 (2), 338-345

Asian-Australasian Journal of Bioscience and Biotechnology
ISSN 2414-1283 (Print) 2414-6293 (Online)
www.ebupress.com/journal/aajbb

Article

Performance of ISA Brown commercial layer after forced molting

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Received: 07 August 2016/Accepted: 21 August 2016/ Published: 31 August 2016

Abstract: A total of 29460 ISA Brown commercial layers were force molted with feed restricted (20g to 70g) forced molting method to assess the effects of molting of ISA Brown commercial layers at Valuka Layer Farm-1, C.P. Bangladesh Co., Ltd. Layers were forced molted between 73 to 76 weeks of age. Forced molting made significant differences on egg production. Egg production (77.11%) and egg weight (66.93g) were increased in post molting period than that in pre molting (67.26%) and molting (22.27%) period. The value of egg weight in pre molting period was 65.51g and molting period was 58.25g. During molting period body weight loss was 193.75g. Whereas, in pre molting and after molting period body weight gain were11.25g and 11.00g respectively. Feed conversion (FC) was significant at 1% level of significance ($P<0.01$). FC was better in post molting period (2.24), moderate in pre molting period (2.67) and worst in molting period (3.33). Mortality was slightly increased in molting period (0.21%) than that of pre molting (0.13%) and post molting (0.13%) period. The result of this experiment may be used to maximize egg production and egg weight in laying hens.

Keywords: forced molting; ISA brown; ad libitum; FCR

1. Introduction

Molting is a major event in the annual life cycle of most avian species, both wild and domestic. In the commercial egg industry, widely different molt techniques are used before the end of the first laying, and enter to a second egg laying cycle (North and Bell, 1999) for extending laying flock performance. Most researchers have reported that forced molting improves the post-molt performance (i.e. egg production, egg quality, and egg weight) of laying hens compared with the pre-molt performance (Christmas *et al*., 1985; Roland and Brake, 1998; Salem *et al*., 2005). Molting is a natural and normal physiological phenomenon where the birds shed their feathers and enter in to a phase of physiological pauses of all birds in an endeavor to renew their feathers prior to migration, shorter days, or cooler weather (Gast and Ricke, 2003). Normally, wild chickens molt once a year, as they produce but a few eggs, the molt is not associated with the laying cycle. However, domestic chickens have been bred for high egg production, and under ordinary circumstances they do not go through a complete molt until the end of a long and intensive laying period (Hussein, 1996). If nothing is done to drop the feathers and grow a new set. It is possible however, to speed up the process through a program of forcing pullets to molt rapidly, growing a new set of feathers, and then stimulating them to begin producing eggs (Mohamed, 1990). Mainly two types of molting method used in chickens (Samad, 2013). One is natural molting and another is forced molting.

The requirements of human to animal protein are increasing day by day. Thus more researches are needed to increase egg production. Forced molting employed commercially to stop egg production in laying and breeding hens to recycle them for another season of egg production (United Egg Producers, 2002). Force molting is

practiced only to give the hen a rest at the end of a long period of egg production (Carter and Ward, 1981). The ability of a hen to produce eggs well after the molt can be attributed only to the rest period the bird receives. Conventional forced molting methods have used fasting of hens for shorter periods or to a targeted body weight with or without water restriction (Rolon *et al*., 1993; Ghatas, 1994; Buhr and Cunningham, 1994). This method efficiently induces a molt because it is management friendly and economically advantageous, and it results in satisfactory post molt performance for the commercial layer industry (Bell, 1996). In this experiment feed restricted (give a limited amount of feed to layers) molting method is used. Forced molting method has many advantages in poultry industry.

2. Materials and Methods

2.1. Statement of the experiment

To find out the production potentiality of ISA Brown commercial layer after feed restricted forced molting. An experiment was conducted with 29460 commercial layers in Valuka Layer Farm-1, C.P. Bangladesh Co., Ltd. Molting was started at 73 weeks of age of layers and continued to 76 weeks of age. Performance data of 7 weeks (2 weeks before molting, 3 weeks during molting and 2 weeks after molting) were recorded in this study. Layers were reared under environmental controlled house. Mash feed was supplied from C.P. Rajshahi Feed Mill and water was supplied *ad libitum* to layers. In this experiment 3 molting status were used: pre molting (PM), molting (M), after molting (AM) period having four replications in each molting status. The layout of experiment and the design are shown in Tables 1 and 2.

2.2. Layout of the experiment

The layout showing distribution of layers during pre molting (PM), molting (M) and after molting (AM) period.

2.3. Design of experiment

In this experiment feed restricted forced molting method was used. Feed intake, lighting and duration of the method is shown below.

2.4. Diets for the ISA Brown commercial layer

The ingredients and nutrient composition of this ration is given below in Tables 3 and 4.The nutrients requirement of layers was satisfied according to ISA Brown management guide.

2.5. Management

2.5.1. House management

The experiment was conducted in a tunnel ventilated controlled house. Proper management procedures according to ISA Brown manage mental guide and company policy were followed during experimental period.

2.5.2. Housing

The house was equipped Big Dutchman (Germany) company. The house was 90 m long, 15 m wide and 3.9 m high. Layers were reared in pyramid or A type cage.

2.5.3. Distribution of layers in cage

In the house there were 4 columns and every column contains 4 tiers. Each column had 1584 cages that is 196 cages in one tier. So, there were total 6336 cages in a house. Generally, 5 layers were kept in one unit. The area of one cage was 44 cm x 44 cm.

2.5.4. Ventilation system

For maintaining proper ventilation 10 pcs 127 cm exhaust fans, 3 pcs 91.5 cm exhaust fans, air inlets, cooling pads were used. To give the layers optimum condition used all the equipments according to layers' condition by using of viper setting. Negative ventilation method was used by pulling the inside air taking help of exhaust fan.

2.5.5. Feeder and drinker

For feeding the layers automatic feed cart was used. Required amounts of feed pour into hopper and then it was supplied to layers by feed cart. Nipple drinker with appropriate water pressure was used to supply water to each layer.

2.5.6. Management of manure disposal
Layers manure was dropped into floor and every day this manure was cleaned from the house. This manure was collected from front side to back side by the use skover machine.

2.5.7. Vaccination and medication
During molting program no vaccine was used. Multivitamin was used once a week.

2.5.8. Bio-security measures
The experiment was conducted at C.P. layer farm. As a commercial layer farm biosecurity was always maintained in farm to prevent diseases. To maintain strict biosecurity in farm following steps always followed:

- Restrict the entrance of outside personnel.
- If any car (feed car, egg car, medicine car) come to farm, then it should be sprayed with disinfectant (GPC8). After enter into the farm and cars are again sprayed in car spray area for about 5 minutes.
- When farm personnel enter into house area then they must take shower, put farm dress, gumboot, and musk.
- Before enter into shed, all use footbath and hand spray.

2.6. Data collection and record keeping
The following records were kept to conduct the experiment.

2.6.1. Hen day egg production (%)
Egg production performance after molting is the primary objective in this experiment. So, hen day egg production of layers was recorded during molting, pre molting and after molting. The egg production was calculated in hen day egg production (HDEP) by using the following fomula:

$$HDEP = \frac{\text{No. of eggs laid}}{\text{No. of hens housed}} \times 100$$

2.6.2. Egg weight
Everyday about 1% of egg weight were calculated by using measuring scale.

2.6.3. Body weight
The body weights of layers (about 3 %) were taken at the beginning of the experiment. Thereafter, body weights were taken at weekly intervals until the termination of the experiment. The layers were weekly weighed after collection of egg.

2.6.4. Feed intake and FCR
The amount of feed given and feed consumed by the experimental layers are collected and recorded. FCR was also recorded in this experiment by using the following formula:

$$FCR = \frac{\text{Feed intake (g / layer/ day)}}{\text{Egg mass (g / layer / day)}}$$

2.6.5. Mortality
Daily record of mortality was collected for the fulfillment of the objectives of experiment. Every day before collection of eggs checked all the cages and took out the dead layers.

2.7. Statistical analysis
All recorded and calculated variable were of a Completely Randomized Design (CRD). Duncan's Multiple Range Test (DMRT) was used to compare data.

3. Results
The data generated related to effects of feed restricted forced molting on ISA Brown commercial layer performance are presented and discussed in this section.

3.1. Egg Production

Egg production of ISA Brown commercial layers were different (P<0.01) in molting periods (pre molting, molting, after molting) is shown in Table 5.This Table indicated that egg production was much higher (77.11%) after molting period, whereas, in molting period egg production was lower (22.27%) and moderate in pre molting period (67.26%).

3.2. Egg weight

Table 5 indicates that egg weight supported higher (66.93g) in after molting period. While pre molting period egg weight (65.51g) was less than after molting period. On the other hand during molting period had the lowest egg weight (58.25g). The Table also showed that there was difference (P<0.01) in egg weight among the layers exposed to different molting periods.

3.3. Body weight change

Body weight was lower during molting period (Table 5). During molting period, body weight was changed negatively, means body weight was decreasing continuously (193.75g) in molting period. Pre molting and after molting period had positive change in body weight. Molting period had significant difference (P<0.01) in body weight compare with two other periods (pre molting and after molting). There was no significant difference in body weight change between pre molting and post molting.

3.4. Feed Conversion (FC)

There was difference (P<0.01) in FC among 3 different molting status (Table 5).This table also indicated that molting period had the lower FC value (3.33) among three molting status. FC was higher in post molting period (2.24) whereas, pre molting period had moderate FC value (2.67).

3.5. Mortality

Table 5 showed that layers in molting period had the highest mortality (0.21%). Mortality was different (P<0.01) among the molting periods. Mortality was 0.13% in both pre molting and post molting period.

4. Discussion

4.1. Egg production

A gradual increase in egg production (Table 5) at post molting period is supported by El-Gendi *et al*. (2009), Park *et al.* (2004) and Salem *et al*. (2005). They reported that, egg production of force molted layers were higher when layers were given of some feed restriction than that of different level of feed restriction. Hassanabadi and Kermanshahi (2007) reported that the rate of egg production was improved by feed restricted force molting treatments when compared with their 2 weeks prior period (79-81wk) of the layers. The improvement in egg production post forced molting period may be probably arisen for involution of reproductive tract, proportionate to the loss of body weight and that the rebuilding of the reproductive tract would lead to the removal of fat accumulation and therefore increased tissue efficiency.

4.2. Egg weight

Heavier eggs obtained in layers in post molting period (Table 5). In such scenario was agreed with Rolon *et al.* (1993), Ahmad *et al.* (1995), Akram (1998), North and Bell (1999). They reported that egg weight increased (P<0.05) in post molt production period. Egg weight during post molt period was high may for efficient utilization of feed by layers. Another possible reason may be egg weight is largely affected by the environment and feed restriction along with evidence of genetic involvement including breed effect.

4.3. Body weight change

Several researchers (Herremans, 1988; Gonzalez, 1988; Brake, 1993) reported that decreased body weight during molting period might have a relation with restricted feeding. Ruszler (1998) showed that for successful molting the body weight loss should be between 15-40% during molting period. According to Petek *et al.* (2008), Aygun and Olgun (2010) and Aygun (2013) found that body weight loss may be (19.70%) and (19.77%) during molting period. In this experiment body weight was also decreased in molting period about 10-12%. This reduction in BW may be for feed restriction, stress, decreased muscle mass, utilization of adipose tissue, decreased liver weight and involution of the reproductive organs.

Table 1. Layout of the experiment.

Replication	Molting status (period)			Total
	PM	M	AM	
1	2455	2455	2455	7365
2	2455	2455	2455	7365
3	2455	2455	2455	7365
4	2455	2455	2455	7365
Total	9820	9820	9820	29460

Table 2. Design of the experiment.

Day	Feed (g/layer)	Water	Photoperiods (hrs)	Photo intensity (lux)
1	20	*ad libitum*	8	3
2	20	*ad libitum*	8	3
3	20	*ad libitum*	8	3
4	20	*ad libitum*	8	3
5	20	*ad libitum*	8	3
6	35	*ad libitum*	8	3
7	35	*ad libitum*	8	3
8	35	*ad libitum*	8	3
9	35	*ad libitum*	8	3
10	35	*ad libitum*	8	3
11	45	*ad libitum*	8	3
12	45	*ad libitum*	8	3
13	45	*ad libitum*	8	3
14	45	*ad libitum*	8	3
15	50	*ad libitum*	10	3
16	50	*ad libitum*	10	3
17	50	*ad libitum*	10	3
18	50	*ad libitum*	10	3
19	70	*ad libitum*	10	5
20	70	*ad libitum*	10	5
21	Full feed(115)	*ad libitum*	12	5

(Source: C.P. Bangladesh Co., Ltd.)

4.4. Feed Conversion (FC)

Haq *et al.* (1997) found that FC values of layers during the first production cycle were better than in the second production cycle. Lee (1982) reported that feed efficiency had been improved in the forced molted layers as compared to premolt and during molting period with lowest hen day production and poorest feed efficiency. In this study feed conversion ratio (FC) was higher in post molting period than that of pre molting and molting period. This may be for better utilization of feed, higher egg production in post molting period than that of their unmolted counterparts.

Table 3. Ingredients used to formulate diets.

Ingredients	(%)
Maize	40.50
Rice	20.00
Rice polish	7.50
Soybean meal	6.70
Cotton seed meal	1.50
Corn gluten 60%	6.10
Fish meal	5.30
DCP	2.70
Limestone	7.00
Molasses	2.20
Vitamin/mineral premix	0.50
Total	**100.00**

Table 4. Nutrient composition of the ration.

Nutrient profile	Amount
ME (Kcal/kg)	2800.00
CP (%)	17.70
Lysine (%)	0.82
Methionine (%)	0.41
Cystine + Methionine (%)	0.71
Ca(%)	3.60
Available P(%)	0.40
Tryptophan (%)	0.18

Table 5. Effect of forced molting on ISA Brown commercial layer upon hen day egg production (%), egg weight (g), body weight change (g), FC and mortality(%).

Parameter	Molting status (period)			Level of
	Pre molting	Molting	After molting	significance
Egg production(%)	67.26^{b}	22.27^{c}	77.11^{a}	**
Egg weight (g)	65.51^{b}	58.25^{c}	66.93^{a}	**
Body wt change (g)	11.25^{b} (+)	193.75^{a} (-)	11.00^{b} (+)	**
Feed conversion	2.67^{b}	3.33^{a}	2.24^{c}	**
Mortality (%)	0.13^{b}	0.21^{a}	0.13^{b}	**

$^{a, b, c}$, mean values with dissimilar superscripts are significantly different, ** ,p<0.01;+, body weight increase; - , body weight decrease.

4.5. Mortality (%)

Mortality appeared to remain similar in the pre molting and post molting period but slightly higher in molting period (Table 5). Biggs and Douglas (2003), Petek *et al.* (2008), Aygun and Yetisir (2009), reported that the mortality was ranging from 1.20 to 8.3% in molting period. Yousaf and Ahmad (2006) showed that mortality rate in second production cycle following forced molting was low against first production cycle. Change in house environment, stress for restricted feeding may be possible reasons for more mortality during molting period.

5. Conclusions

Forced molting method had significance (P<0.01) on egg production. Both egg production and egg weight were higher after molting period. During molting period body weight was reduced to 10-12%. Whereas, there was no significant change in body weight during pre molting and after molting period. Mortality percentage was slightly higher in molting period. The results suggest that feed restricted forced molting can be considered as a potential method to increase the productivity of commercial layers at later part of their laying cycle. Necessary

precaution should be taken to conduct experiment with low amount of feed supply for forced molting to the laying hens.

References

Ahmed N, Zia-ur-Rehman, M AkramShah, TH. and M Yousaf,1995. Effect of new moulting programme on productive performance of spent layers under indigenous conditions. Pakistan Veterinary Journal, 15: 46-48.

Akram M, 1998. Effect of induced moult on the subsequent second production cycle performance of commercial layers reared under various lighting and feeding regimes. PhD Thesis, Dept. Poultry Husbandry, University of Agriculture, Faisalabad, Pakistan.

Aygun A, 2013. Effects of Force Molting on Eggshell Colour, Egg Production and Quality Traits in Laying Hen. Revue de Medecine Veterinaire, 164 : 46-51.

Aygun A and O Olgun, 2010. The Effect of Nonfeed and Feed Withdrawal Molting Methods on Molt and Postmolt Performance in Laying Hens. Trends in Animal Veterinary Sciences, 1: 1-4.

Aygun A and R Yetisir, 2009. Researches on the Responses of Different Hybrid Layers with Respect to Egg Production Performances to Forced Molting Programs with and without Feed Withdrawal. Journal of Animal Veterinary Advances, 8: 2680-2686.

Brake J, 1993. Recent advances in induced molting. Journal of Poultry Science, 72: 929-931.

Buhr RJ and DL Cunningham, 1994. Evaluation of molt induction to body weight loss of fifteen, twenty, or twenty-five percent by feed removal, daily limited, or alternate-day feeding of a molt feed. Journal of Poultry Science, 73: 1499-1510.

Carter TA and and JB Ward, 1981. Limited and full feeding of layer during the non-laying period of a molting cycle. Journal of Poultry Science, 60:1635.

DD Bell,1996.Molting technologies—welfare issues. 10th Australian Poultry and Feed Convention, Melbourne, 112–118.

El-Gendi GM, HR Samak and AA Mohamed, 2009. Effect of induced molting on some productive and physiological traits in HY-LINE hens.

FR Mohamed,1990. Studies on molting and its relationship with egg Production in the fowl. Ph.D. Thesis, Faculty of Agriculture, Cairo University, Egypt.

Gast RK and SC Ricke, 2003. Symposium: Current and future prospects for induced molting in laying hens. Journal of Poultry Science, 82: 964.

Ghatas MS, 1994. Studies on second year performance of force molted hens in some local chicken breeds. M. Sc. Thesis, Faculty of Agricultural Minia University, Egypt. Page: 31-32.

Gonzalez R, 1988. Effect of weight loss of light and semi-heavy hens during forced moulting in the second production cycle. Vetrenaria-Mexico, 19: 63.

Gordon R, MM Bryant and DA Roland, 2009. Performance and profitability of second-cycle laying hens as influenced by body weight and body weight reduction during molt. Journal of Applied Poultry Research, 18: 223–231.

Haq A, N Ahmad, S Rasool and TH Shah, 1997. Effect of light and feed restriction during rearing on production performance of egg strain layers. Asian-Australian Journal of Animal Science, 10: 657-664.

Hassanabadi A and H Kermanshahi, 2007. Effect of force molting on postmolt performance of laying hens. International Journal of Poultry Science, 6: 630-633.

Herremans M,1988. Age and strain differences in plumage renewal during natural and induced molting in hybrid hens. British Poultry Science, 29: 825-835.

Hussein AS, 1996. Induced molting procedures in laying fowl. World's Poultry Science Journal, 52: 175-187.

Lee K,1982. Effect of forced molt period on postmolt performance of Leghorn hens. Journal of Poultry Science, 61: 1594-1598.

North MO and DD Bell,1999. Commercial Chicken Production Manual, 4: 433-452

Park SY, SG Birkhold, LF Kubina DJ Nisbet and SC Ricke,2004. Effects of high zinc diets using zinc propionate on molt induction, organs and postmolt egg production and quality in laying hens. Journal of Poultry Science, 83:24-33.

PE Biggs and MW Douglas, 2003. Evaluation of Nonfeed Removal Methods for Molting Programs. Journal of Poultry Science, 82: 749–753.

Petek M, SS Gezen, F Alpay and R Cibik, 2008. Effects of non feed removal molting methods on egg quality traits in commercial brown layer hens in Turkey. Tropical Animal Production, 40: 413- 417.

PL Ruszler,1998. Health and husbandry considerations of induced molting. Journal of Poultry Science, 77: 1789-1793.

RB Christmas, RH Harms and OM. Junquera,1985. Performance of Single Comb White Leghorn subjected to 4 or 10 day feed withdrawal force rest procedures. Journal of Poultry Science, 64: 2321-2324.

Roland DA and JH Brake, 1998. Influence of pre molt production on post Molt. Performance with explanation for improvement in egg production due to force molting. Journal of Poultry Science, 61: 2473 - 2481.

Rolon A, RJ Buhr and DL Cunningham,1993. Twenty-four-hour feed withdrawal and limited feeding as alternative methods for induction of molt in laying hens. Journal of Poultry Science, 72: 776- 785.

Salem S, U Puthpongsiriporn and M Beck, 2005.Comparison of traditional fasting molt versus nonfeed restriction low sodium molt diets and pre-molt photoperiod effects on molt and second cycle production parameters. Journal of Poultry Science, 81: 22-23.

Samad MA, 2013. Poultry layer farming and egg production. Avian Medicine, 2:453-457.

United Egg Producers, 2002. Molting, Animal Husbandry Guidelines. Alpharetta, 8–9.

Yousaf M and N Ahmad, 2006. Effects of housing systems on productive performance of commercial layers followed forced molting by aluminum oxide supplementation. Pakistan Veterinary Journal, 26: 101-104.