Proc. 3rd All Africa Conf. Anim. Agric. & 11th Conf. Egyptian Soc. Anim. Prod., Alexandria, Egypt, 6-9 November 2000: 617-621

THE EFFECT OF EXTENDED CYCLE ON THE PERFORMANCE OF LAYERS

A.M.M. Atta[1], Y.A. Abdel-Aziz[2] and N.E. Goher[1]

1- Department of Animal Production, Faculty of Agriculture, Cairo University, Giza , Egypt,
2- Animal Production Research Institute, Ministry of Agricultural, Dokki, Giza, Egypt

SUMMARY

The objective of this study was to compare the production performance of the first and second laying cycles under open and closed side housing systems. The present work was carried out on two commercial poultry farms differed in size and with two different housing systems: Goher Egg Tower (G) where houses were normally ventilated, and the International Co. (I) which had controlled environment housing with negative air pressure ventilation.

The two farms kept commercial layers of Lohman Selected Leghorn in cages and gave the same floor space for each layer. A force-molting regime was used where feed, water, and photoperiod were controlled to induce a second cycle. The treatment and procedure of force - molting were the same on both farms.

Weekly hen day production (HD), mortality rate% (MR) egg weight in grams (EG), body weight in kilograms (BW) during the first and second cycles were recorded. The overall mean of HD increased gradually, and reached the peak at the third month. In all months HD was higher in farm (I) than (G).

The results showed that there were little differences in the overall means of (MR) throughout the months of production. MR of the first farm (G) were higher than the second one .

In the second cycle MR was generally higher than in the first season. The results also indicated that the second season of farm (G) had significantly higher MR than the first season.

The overall mean of EW was 63.27 gm and of BW was 1.55 kg per hen. No significant differences were detected between EW in the three cage levels in the two production cycles. BW followed almost the same trend but all differences among cage levels and production cycles were significant. The highest BW was observed in medium cages.

Keywords: Force molting, egg production, egg weight, body weight and mortality

INTRODUCTION

In an attempt to increase the short-run efficiency of resource utilization in their operations, table egg producers have looked at ways of making more efficient use of laying birds. The increasing cost of flock depreciation has caused producers to question the continued use of traditional annual replacement policies and to consider the feasibility of extending the laying life of their birds beyond the end of the first year (cycle) production.

At the end of a laying cycle, egg production and quality decline significantly, leading some producers to induce molt in the flocks in attempt to improve performance. After the molting period, egg production and quality improve significantly compared to the pre-molt period. Several procedures have been used to initiate molting. These include feed withdrawal up to 10 days (Christams *et al.*, 1985), water withdrawal for 2 days (North and Bell, 1990), photo-periodic reduction (Hembree *et al.*, 1980), feeding low calcium (Breeding *et al.*, 1992) or low sodium diets, and feeding high dietary zinc (Berry and Brake, 1985). Each method can be used alone or in combination with other methods. All molting programs cause body weight loss and cessation of egg production (Shippee *et al.*, 1979).

In general, most researchers report that induced molting improves the postmolt performance of the laying hens compared to the premolt performance. This improvement includes egg size, shell quality, internal egg quality, and the rate of egg production. Egg size is increased significantly after a molt with a higher percentage of large eggs (Zeelen, 1975). Shell weight of eggs of the molted hens are also improved. In addition, there is a marked increase in the interior egg quality, as measured by Haugh units, following molting (Zimmermann *et al.*, 1987). The most important improvement is the increase in the rate of egg production during the postmolting period (Christmas *et al.*, 1985, Wilson *et al.*, 1967).

The objective of this study was to compare the production performance of the first and second laying seasons under open and closed side housing systems.

MATERIALS AND METHODS

The present work was carried out on two commercial poultry farms differed in size and with two different housing systems, Goher Egg Tower Farm (G) using normally ventilated and the International Co (I), which had controlled environment housing with negative air pressure ventilation.The birds used in the two farms were initially commercial layers of Lohman Selected Leghorn (L.S.L).

From one day old to 6 weeks, chicks were fed on commercial starter layer ration (2800-3000 k- cal M.E/kg diet, and 19% crude protein). From 7 to 17 weeks of age the pullets were fed on commercial developer ration (2600-2700 k-cal M.E/kg diet, and 14% crude protein). During the laying period, the hens were fed on commercial layer ration (2800-300 k-cal M.E/kg diet, and 17% crude protein). Feed and water were provided *ad lib.*All hens received 17l:7D as lighting program throughout the production period.

The two farms kept layers in cages and gave the same floor space for each layer. Data were collected from each farm weekly for production and mortality information. A force- molting regime was used where feed, water and photoperiod were controlled to induce a second cycle. The treatment and procedure of force- molting were the same on both farms (Table 1).

Data were collected from each farm during the first and second cycles as follow:

Weekly hen housed production per cage, mortality rate, whereas egg weight and body weight were recorded in Farm (G) only.

Table 1. Force-molting regime

Days	Feed	Light-proof house	Photoperiod Open side house
1-5	30 gm cracked+ 5 gm oyster shell + 2.5 gm lime stone	8	Natural day light
6-7	Non (fast)	8	Natural day light
8-12	30 gm cracked+ 5 gm oyster shell	8	Natural day light
13-21	40 gm commercial layer ration	8	Natural day light
22-28	50 gm commercial layer ration	8	Natural day light
29-35	60 gm commercial layer ration	8	Natural day light
36-42	80 gm commercial layer ration	8	Natural day light
43-49	100 gm commercial layer ration	13	14
50	Full feed *(ad. lib.)*		

Statistical analysis

The data were analyzed using the SAS package (1990). General linear model procedure with two way ANOVA model using farm and production cycle or cage level as main effects. Where, appropriate means were separated using Duncan (1955) multiple range test.

RESULTS AND DISCUSSION

1- The effect of farm and production cycle on hen days (HD) per month

Generally the overall mean of HD percentages increased monthly from (29.89%) and reached the peak at the third month (80.58%), after that HD% decreased gradually every month and reached 74.86% by the *6th* month (Tables 2 and 3). It was also apparent that HD% were, in general, higher in farm I than in G, but the differences were not significant through the first six month.

The mean of HD overall farms showed that birds in second cycle produced significantly lower HD at third, fourth and fifth month than that of first cycle (Table 2).

Post-molt production was directly related to pre-molt production (Roland and Brake, 1982). Also, there is an association between the peak of subsequent production and the number of days the birds were out of production. Birds with longer time out of Production showed the highest peak in the post-molt period (Hansen, 1960 and Len *et al* .,1964).

Also Kromin and Gavrish (1974) found that hens molted by fasting feed, depriving water for 4 days and full darkness for 3 days resulted in a 16% higher egg production than the control.

Table 2. Least squares means (x) and standard error (SE) of hen-days per month (HD) in farm (F) and production cycles (P) for the first six months

Month	N	1		2		3		4		5		6	
		X	SE	X	SE	X	SE	X	SE	X	SE	X	SE
Overall mean		29.891	3.14	76.26	2.02	80.58	2.42	79.72	2.25	77.89	2.02	74.86	2.58
F	1	26.24.	4.44	74.08[a]	2.86	78.23[a]	3.43	77.38[a]	3.18	77.28[a]	2.85	73.14[a]	3.65
F	2	33.53[a]	4.44	78.44[a]	2.86	82.93[a]	3.43	82.46[a]	3.18	78.49[a]	2.85	76.57[a]	3.65
P	1	30.50[a]	4.44	79.97[a]	2.86	87.57[a]	3.43	88.32[a]	3.18	84.53[a]	2.85	81.37[a]	3.65
P	2	29.27[a]	4.44	72.55[a]	2.86	73.59[a]	3.43	71.51[b]	3.18	71.24[a]	2.85	68.35[a]	3.65
F X P	11	27.60	6.27	81.26[a]	4.04	81.04[a]	4.85	87.58[a]	4.50	86.67[a]	4.04	80.72[a]	5.16
	12	24.89[a]	6.27	66.90[a]	4.04	69.42[a]	4.85	67.18[a]	4.50	67.90[a]	4.04	65.58[a]	5.16
	21	33.41[a]	6.27	78.69[a]	4.04	88.10[a]	4.85	89.07[a]	4.50	82.39[a]	4.04	82.03[a]	5.16
	22	33.66[a]	6.27	78.19[a]	4.04	77.46[a]	4.85	75.85[a]	4.50	74.59[a]	4.04	71.12[a]	5.16

* Within each classification, means followed by the same letter are not significantly different (P<0.05).

Table 3. Least squares means (x) and standard error (SE) of hen-days per month (HD) in farm (F) (P) for the months 7-13

Month	7		8		9		10		11		12		13	
	X	SE	X	SE	X	SE	X	SE	X	SE	X	SE	X	SE
Overall mean	75.28	4.29	77.01	4.33	70.25	7.76	69.06	4.10	66.68	4.04	66.18	5.25	63.41	0.65
F 1	73.41[a]	6.07	76.32[a]	7.25	65.46[a]	8.25	65.45[a]	7.11	62.94[a]	6.99	64.42[a]	9.11	62.01[a]	9.70
F 2	77.14[a]	6.07	77.70[a]	7.25	75.03[a]	8.25	72.68[a]	7.11	70.43[a]	6.99	67.94[a]	9.11	64.82[a]	9.70

* Within each classification, means followed by the same letter are not significantly different (P<0.05).

2- The effect of farm and production cycle on mortality rate percentage (MR)

Tables 4 and 5 showed that there were little differences in the overall means of mortality percentage throughout the first six months of production and from 7-13 month of the first season.

The results showed that MR of the first farm were higher than those of the second. These differences were significantly higher (P<0.05) in the months 4, 6, 10 and 12. The mortality percentages of the second cycle were generally higher than the first and these differences were significantly higher (P<0.05) in the fourth and fifth month.

The results also indicated that the second cycle of the farm (G) had a significantly higher (P<0.05) MR than the first season. These findings did not exist on the farm (I).

The results partly agreed with Ruiz *et al.* (1978) who used three methods of force molting: 1) fasting for 6 days and depriving water for 2 days, 2) steroid hormones followed by fasting for 3 days , and 3) depriving water for one day. The authors found that mortality during 183 days after molting treatment was negligible, (0.85% and 0.54% for the first and second groups, respectively). Similarly, acceptable low MR was reported by Ross and Herrick (1981). Bally and Horn (1986) found that MR ranged from 2.0% to 6.0% when birds molted by fasting feed for 19 or 20 days and given photo period of 8 hours.

Table 4. Least Squares means (x) and standard error (SE) of mortality% per month in farm (F) and production cycles (P) for the first six months

Month	N	1		2		3		4		5		6	
		X	SE	X	SE	X	SE	X	SE	X	SE	X	SE
Overall mean		1.33	0.32	1.23	0.37	1.42	0.30	1.61	0.16	1.22	0.08	1.14	0.13
F	1	2.16[a]	0.45	1.97[a]	0.53	1.87[a]	0.42	1.82[a]	0.23	1.95[a]	0.11	1.82[a]	3.65
F	2	1.51[a]	0.45	0.48[a]	0.53	0.97[a]	0.42	0.51[b]	0.23	0.48[ab]	0.11	0.47[b]	3.65
P	1	1.06[a]	0.45	1.26[a]	0.53	1.22[a]	0.42	0.97[a]	0.22	0.89[a]	0.11	0.91[a]	3.65
P	2	1.61[a]	0.45	1.19[a]	0.53	1.61[b]	0.42	1.36[b]	0.22	1.54[b]	0.11	1.38[a]	3.65
F X P	11	1.67[a]	0.64	2.06[a]	0.74	1.78[a]	0.60	1.40[ab]	0.32	1.29[a]	0.15	1.38[ab]	5.16
	12	2.65[a]	0.64	1.95[a]	0.74	1.95[a]	0.60	0.24[b]	0.32	2.61[b]	0.15	2.26[a]	5.16
	21	0.45[a]	0.64	0.52[a]	0.74	0.66[a]	0.60	0.54[a]	0.32	0.50c	0.15	0.44[b]	5.16
	22	0.57[a]	0.64	0.44[a]	0.74	1.27[a]	0.60	0.48[a]	0.32	0.47c	0.15	0.49[b]	5.16

* Within each classification, means followed by the same letter are not significantly different (P<0.05).

Table 5. Least squares means (x) and standard errors (SE) of mortality% per month in farm (F) (P) for the months 7-13

Month	N	7		8		9		10		11		12		13	
		X	SE	X	SE	X	SE	X	SE	X	SE	X	SE	X	SE
Overall mean		1.17	0.35	0.82	0.14	1.03	0.24	1.49	0.09	1.77	0.34	1.57	0.13	1.42	0.19
F	1	1.24[a]	0.25	1.24[a]	0.25	1.73	0.41	2.65[a]	0.16	3.20[a]	0.60	2.74[a]	0.23	2.39[a]	0.34
F	2	0.41[a]	0.25	0.41[a]	0.25	0.33[a]	0.41	0.33[b]	0.16	0.35[a]	0.60	0.40[b]	0.23	0.46[a]	0.34

* Within each classification, means followed by the same letter are not significantly different (P<0.05).

3. Effect of production cycle and cage location on egg weight and body weight

Data were collected monthly over the two production cycles on farm (G) only. Hens were kept in three cage levels, high, middle and low.

Although the EW was negatively related with the cage level, which were 64.4, 63.9 and 60.8 gms in cage level 1,2 and 3, respectively, but differences were not significant (Table 6). Also, the results showed that EW were heaver (65.5 gms) in the second season than in the first (61.0 gms) but the difference was not significant.

Len *et al.* (1964) used the followed conventional force molting regime: fasting feed and water depriving for 3-5 days and decreasing the day length to less than 12 hours. The authors found that the average EW for force- molted hens (65.5 gm) was significantly heavier than those of both the non-molted hens (64.9 gm) and the first year layers (58.5 gm).

Ruiz *et al.* (1978) compared EW of force-molted hens using a conventional method (6 days fasting feed, 2 days water withdrawal followed by feed restriction for 6 days) and that of hens molted by steroid hormone. Conventionally force- molted hens produced heavier eggs (64.9 gm) than eggs of hens molted by steroid hormone (64.5 mg).

McDanial (1985) found that the force molting method of fasting feed for 12 days, water withdrawal for 2 days and light restriction, resulted in significantly heavier post-molt egg weights (64.2 gm) as compared to pre-molt ones (62.0 gm).

On the other hand, both production cycle and cage location significantly influenced body weight. The significantly highest BW was found in middle cages (1.6 Kg) whereas lowest was that of the first level. BW of second season was significantly higher than that of first season (Table 6).

Table 6. Least squares means (X) and standard error (SE) of egg weight (EW) and body weight (BW) and body weight (BW) as affected by production cycle and cage location

		N	EW	SE	N	BW	SE
Overall mean		4399	63.27	2.1	696	1.55	0.1
Production	1	2256	61.07a	2.9	346	1.42a	0.2
	2	2143	65.59a	3.0	350	1.68b	0.2
Cage level	1	1786	64.47a	3.2	232	1.48a	0.2
	2	1328	63.99a	3.8	234	1.61b	0.2
	3	1285	60.86a	3.8	230	1.55c	0.2

* Within each classification, means followed by the same letter are not significantly different from each other.

According to Brake and Carter (1978) specific body weight must be achieved during fasting period to attain optimal post-molt performance. Severin (1983) noted that Plymouth hens, which was fasted for ten days lost 29% of there weight at 28 days post treatments. Baker *et al.* (1983) concluded that a body weight loss of approximately 27 to 31% produced the optimum post molt performance. While Brake and Carey (1983) showed that 35% loss of body weight during molting is better to production performance of second season. Hembree *et al.* (1980) conducted two treatments: 1- removing feed for ten days and then fed ground corn *ad. lib.* and 2) removing feed for ten days and then fed ground corn *ad. lib.* supplemented with amino acids (cysteine, glycine, serine and threonine). Body weight losses during the 28 days force molting period were 16.8% and 10.6% for the first and second groups, respectively.

Carter and Ward (1981) reported that feed withdrawl for five days in Agust caused losses 15% of the layers from their body weight, while in December 21% body weight losses occured.

Brake and Thaxton (1979a and b) found that body weight loss during fasting would be directly with the time during which birds were fasted.

REFERENCES

Baker, M.T., J. Brake and G.R. McDaniel, 1983. The relationship betwenn body weight loss during a forced molt and postmolt reproductive performance of caged layers. Poultry Sci., 62:409-413.

Ballay, M. and Horn, 1986. Performance of meat-type parent stocks in first and second laying period following force molt. Proceeding of *7th* European Poultry Conference, Paris. Vol. I:805-808.

Berry, W.D., and J.T. Brake, 1985. Comparison of parameters associated with molt indced by fasting, zinc, and low dietary sodium in caged layers. poultry Sci. 64: 2027-2036.

Brake, J.T. and J.B. Carey, 1983. Induced molting of comercial layers. Poultry Sci., Technology Guide No. 10 N.C. Agric. Ext. Serv., Raleigh, NC.

Brake, J. and P. Thaxton, 1979a. Physiological changes in caged layers during a forced molt. 1- Body temperature and selected blood parameters. Poultry Sci., 58:699-706.

Brake, J. and P. Thaxton, 1979b. Physiological changes in caged layers during a forced molt. 2- Gross changes in organs. Poultry Sci., 58:707-716.

Brake, J. and T.A. Carter, 1978. Force molting of caged layers. Poultry Sci., and Technology Guide No. 10 Ext. Poultry Sci., North Carolina State Univ., Raleigh, N.C. (Cited in Brake and McDaniel, 1981a).

Breeding, S.W., J.T. Brake J.D. Garlich and A.L. Jhnson, 1992. Molt induced by dietary zinc in a low culcium diet. Poultry Sci., 71:168-180.

Carter, T.A. and J.B. Ward, 1981. Limeted and full feeding of layers during the non-laying period of a molting cycle. Poultry Sci., 60:1635-1636.

Christmas,R.B., R. H. Harms, and O. M. JUnGueire, 1985. Performances of single comd White Leghorn hens subjected to 4-or 10-day feed withdrawal force rest orocedures. Poultry Sci. 64:2321 - 2324.

Duncan, D.B., 1955. Multiple range and multiple F test. Biometrics, 11:7-42.

Hansen, R.S., 1960. The effect of methods of forced molting on reproductive performance of chickens. poultry Sci., 39:1257. (Abstract).

Hembree, D.J. A. W. Adams, and J.V. Craig, 1980.Effects of force molting by conventional and experimental light restriction methods on performance and agonistic behavior of hens. Poultry Sci. 59:215-223.

Kromin,. V. and A. Gavrish, 1974. Extension of the productive life of hens by forced molting. Ptitsevodstvo No. 8:14-17. (A.B.A. 43:152).

Len, R.E., H. Abplanalp and F.A. Johnson, 1964. Second year production of force molted hens in the Califorina Random sample test. Poultry Sci., 43: 638- 646.

McDanial, G.R., 1985. Factors affecting broiler breeder performance. 6. The Relationship of permolt performance to postmolt performance. Poultry Sci., 64: 2267-2272.

Noles, R.K.,1966. Subsequent production and egg quality of forced molted hens. Poultry Sci.,45:50-57.

North, M. o. and D.D. Bell, 1990. pages 433-452 in: Commercial Chicken Production Manual. *4th* ed. Chapman and Hall, New York, NY.

Roland, D.A. Sr. and J.Brake, 1982. Influence of premolt production on postmolt performance with explanation for improvement in egg production due to force molting. Poultry Sci., 61: 2473- 2481.

Ross, E. and R.B. Herrick, 1981. Forced rest induced by molt or low salt diet and subsequent hen performance. Poultry Sci., 60:63-76.

Ruiz, V.J.G., G.I.J. Gomez and C.E. Castro, 1978. Induction of forced moulting by means of steroid hormones. Medellin, 31 (1) : 85-92. (A.B.A., 48:297).

SAS, 1990. SAS / Stat User's guide. Rel 6.03. Editor. SAS Institute, Inc. Cary, North Carolina,USA.

Severin, V., 1983. Dynamics of egg production, body weight and viability of Plymouth Rock XNH layers subjected to a programme of forced moulting. Medicina Veterinara, 26:73-73. (A.B.A. 53:986).

Shippee, R.L., P.E. Stake, U. Koehn, J.L. Lambert, and R.W. Simmons,III, 1979. High dietary zinc or magnesium as forced-resting agents for laying hens. poultry Sci. 58: 949-954.

Wilson, H.R.,J. L. Fry, R.H. Harms, and, L.R. Arrington, 1967. Performance of hens molted by various methods. Poultry Sci. 46: 1406-1412.

Zeelen, H.H.M., Jr., 1975. Technical and economic resulys from force molting of laying hens. World's Poult. Sci. J.31: 57-67.

Zimmermann, N. G., D.K. Andrews, Andrews, and j.McGinnis, 1987. Comparisons of several induced molting methods on subsequent performance of Single Comb White Leghorn hens. Poultry Sci. 66: 408-417.