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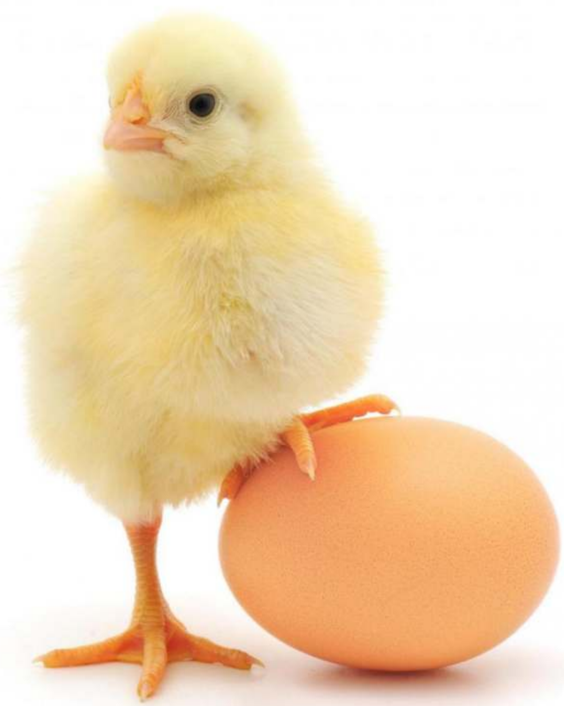

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Effect of Force Molting on Postmolt Performance of Laying Hens

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Abstract: An experiment was conducted using 6168 Hyline White hens (79 wk of age) randomly assigned to two dietary treatments. The treatments included high dietary zinc (Zn) and Feed Withdrawal (FW) methods. In the Zn method, hens were fed a layer ration containing 20,000 ppm of zinc as zinc oxide for 10 d and the light was reduced to 12 h/d. At day 11, hens were returned to the control layer ration and received 16 h of light/d. In FW method, feed deprivation was continued for 5 d, water was provided for ad libitum intake and the photo period was reduced to 12 h/d. On day 6, were returned to the control layer ration and received 16 h of light/d. Data were analyzed using student's T-test procedure of SAS. The hens subjected to Zn and FW methods lost 5 and 20% of their initial body weight by 11 and 6 days of the experiment, respectively. The FW treatment resulted in total cessation of egg production within 7 d and the birds remained out of production until 16 d of the experiment. Hens subjected to Zn treatment ceased egg production by 8 day of the experiment and remained out of production until day 29. The mortality percentage throughout the entire experiment for Zn and FW were 0.057 and 0.032%, respectively which was significantly different. No differences were observed between feed removal treatment and nonfeed removal treatment for postmoult hen day production, egg weight, feed intake, feed efficiency and internal Zn of the eggs laid after Zn treatment. Our results indicated that nonfeed removal method is as effective as feed removal method on postmolt performance, although it caused significantly more mortality.

Key words: Egg production, induced molting, laying hen, nonfeed removal

Introduction

Egg production, decrease as the age of hen increases. Several institutions have published the specific details and guidelines of molting programs (Swanson and Bell, 1974; Brake and Carey, 1983; Harms, 1983; Koelkebeck *et al*., 1992). Feed withdrawal is the primary procedure to induce molt and stimulate multiple egg-laying cycles in hens (Brake, 1993; Holt, 1995). The complete removal of feed for 10 to 14 d combined with a reduction in photoperiod from 16 to 8 h remains the method of choice (Brake, 1993; Bell, 2003) because the birds are out of production for a relatively short time (Brake, 1993). Shorter periods of feed removal (4 to 5 d) are also used. These shorter removal periods have been shown to yield egg production that is comparable to the more traditional 10-d method (Christmas *et al*., 1985; Koelkebeck *et al*., 1992). A number of studies have been conducted in an attempt to develop effective methods to molt hens without the use of feed removal. Low-sodium diets (Whitehead and Shannon, 1974; Scheideler *et al*., 2002) and high-Zn diets (Berry and Brake, 1987; McCormick and Cunningham, 1987), some of the pharmaceuticals like enheptin, nicarbazin, methallibure and tamoxifen (Ruszler, 1998) and injection of gonadotropin-releasing hormone agonist (Attia *et al*., 1994) are the methods that have been researched extensively. However, neither of these alternative methods is widely practiced in the industry due to cost and inconsistent results.

Brake and Carey (1983) recommend molting a flock by feed removal until they have reached a target body weight loss. Their method requires a period of feed removal for at least 10 d and often longer. In recent years, concern for the well-being of hens during molt has been questioned when feed removal is used (Bar *et al*., 2003; Gast and Ricke, 2003; Webster, 2003; Park *et al*., 2004). The objective of the current experiment was to determine non feed withdrawal method could be used to induce a molt with similar efficacy as that of commonly used feed withdrawal programs.

Materials and Methods

A total of 6168 commercial strain (Hyline) Single Comb White Leghorn hens, 79 wk of age were used in the present study. The hens were randomly divided into two rooms, housed 4 birds in each cage (40×40×40 cm) and received 15 h of light and 9 h of darkness/d. Feed and water were provided for ad libitum consumption prior to the start of the treatments. The experiment was conducted during the winter months. Rooms' temperature was maintained 16±2°C throughout the experiment. The two molting programs used to compare their effects on postmolt production. The treatments included high dietary zinc (Zn) and Feed Withdrawal (FW) methods. In the Zn method described previously by North and Bell (1990), hens were fed a layer ration (Table 1) containing 20,000 ppm of zinc as zinc oxide for 10 d and the light was reduced to 12 h/d. At day 11, hens

Table 1: Composition and nutrient content of the experimental diet

Ingredients	%
Corn	27.17
Wheat	39.00
Wheat bran	2.50
Soybean meal 44%	13.59
Fish meal	2.50
Dicalcium phosphate	0.65
Limestone	11.63
Oyster shell	1.00
Common salt	0.03
Sunflower oil	1.00
Vitamin premix[1]	0.25
Mineral premix[2]	0.25
DL-Methionine	0.11
L-Lysine HCl	0.05
Calculated Analysis (as-is-basis)	
CP	15.70
ME (Kcal/Kg)	2537
Ca	5.10
Available P	0.29
Methionine	0.37
Lysine	0.75
Linoleic acid	1.50

[1]Mineral mix supplied the following per kg of diet: Cu, 20 mg; Fe, 100 mg; Mn, 100 mg; Se, 0.4; Zn, 169.4 mg, [2]Vitamin mix supplied the following per kg of diet: vitamin A, 18000 IU; vitamin D3, 4000 IU; vitamin E, 36mg; vitamin K3,4 mg; vitamin B12,0.03 mg; thiamine, 1.8 mg; riboflavin, 13.2 mg; pyridoxine, 6 mg; niacin, 60 mg; calcium pantothenate, 20 mg; folic acid, 2 mg; biotin, 0.2; choline chloride, 500 mg

were returned to the control layer ration (Table 1) and received 16 h of light/d. In FW method, feed deprivation was continued for 5 d. During the withdrawal period, water was provided for ad libitum intake and the photo period was reduced to 12 h/d. On day 6, birds were returned to the control layer ration (Table 1) and received 16 h light/d. In order to determine the approximate body weights, forty birds from each group were weighed at the beginning of the experiment and end of the treatment period (Zn) or at the end of the withdrawal period. Two weeks before and 13 weeks after treatments egg production and mortality were recorded daily and feed intake, feed efficiency were recorded weekly starting at 2 wk prior to treatments and continued until 13 wk following the postmolt production for each treatment, including the period in which the birds were out of production. At the end of the week of postmolt production of each treatment, 6 eggs from each treatment were collected, weighed and the internal Zn content of the eggs was measured as described by AOAC (1984) using atomic absorption spectrophotometry. Data were analyzed using student's T-test procedure of SAS (SAS Institute, 1985).

Results

The effect of Zn and FW treatments on production parameters in different postmoult periods are shown in Table 2. The hens subjected to Zn and FW methods lost 5 and 20% of their initial body weight by day 11 and 6 of the experiment, which Zn body weight loss was significantly lower than the loss in hens in the FW group. Hens subjected to Zn treatment ceased egg production by day 8 of the experiment and remained out of production until day 29; day 29 was the first day of egg production. On the other hand, FW hens ceased egg production on day 7 and remained out of production until day 16 of the experiment. Hens reached to 5% hen-day postmolt egg production by days 37 and 27, in Zn and FW group, respectively, which was 27 to 22 days following the return to full-feed layer ration and 16 h of light/d. Furthermore, hens in Zn treatment group reached peak production by 10 and in FW group by 9 wk following the return to full feed layer ration and 16 h of light/d. Hen-day egg productions during the peak week were approximately 82% for both Zn and FW groups. The rate of egg production during the peak weeks of postmolt production for both groups was not significantly different. The mortality percentage throughout the entire experiment for Zn and FW were 0.057 and 0.032%, respectively (Table 2) which was significantly different ($p<0.035$). The mortality for FW group was equally distributed throughout the experiment; and mortality for Zn group occurred following Zn rich diet consumption. The effect of Zn and FW treatments on egg weight at different periods of postmolt production is shown in Table 2. No significant differences were found in egg weight between the treatments. Feed intake and efficiency also were not significantly different between two treatments at different periods of postmolt production (Table 2). Internal Zn content of the eggs was not significantly different between two treatments. However, it was in Zn treatment numerically more than FW treatment (0.08 mg/gr Dm vs 0.07 mg/gr Dm).

Discussion

In the present experiment, the rate of egg production was significantly improved by force molting treatments when compared with their 2 weeks prior period (79-81 wk) of the treatments (Table 2). This result could be due to body weight loss as reported by Brake and Thaxton (1979) and Brake (1992), who indicated that the higher body weight loss, the higher postmolt production. However at the present study we did not observe differences between two treatment posmolt productions with different boy weight loss. Body weight loss of Zn group was only 5% and body weight loss of FW group was 20%. Those authors also reported that induced molting leads to the involution of reproductive tract, which is proportional 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. Another possible reason for improved egg production is the length of egg production cessation

Table 2: Effect of nonfeed (Zn) and Feed Withdrawal (FW) molting methods on postmolt performance

Variables	Feed intake			Feed efficiency			Hen day production%			Egg weight (gr)		
Age (wk)	Zn	FW	P>F'	Zn	FW	P>F'	Zn	FW	P>F'	Zn	FW	P>F'
79-81	109.0	110.0	0.44	2.66	2.70	0.65	64.8	65.1	0.97	62.3	62.3	0.06
SE	1.28	1.16		0.14	0.11		0.60	0.39		0.11	0.15	
85-88	-	-		-		-	11.2	12.0	0.007	64.1	64.1	0.42
SE							0.91	0.67		0.19	0.17	
88-91	108.5	119.3	0.53	3.56	3.55	0.77	64.1	64.2	0.96	64.1	64.2	0.96
SE	1.43	1.41		0.22	0.24		1.73	1.82		0.15	0.15	
91-94	127.0	121.4	0.74	2.61	2.43	0.2	77.4	78.6	0.41	63.7	63.8	0.93
SE	1.63	1.82		0.06	0.02		0.29	0.26		0.19	0.18	
81-94	97.1	95.0	0.34	3.71	3.72	0.75	34.7	38.7	0.78	63.6	63.7	0.10
SE	1.5	1.6		0.15	0.16		1.72	1.74		0.12	0.11	

Table 3: Effect of nonfeed (Zn) and feed withdrawal (FW) molting methods on mortality and body weight

Variables	Mortality (%)			Variables	Body weight		
Age (wk)	Zn	FW	P>F'	Age (wk)	Zn	FW	P>F'
79-81	0.04	0.03	0.28	79	1.58	1.57	0.7
SE	0.01	0.01		SE	0.018	0.024	
81-84	0.15	0.08	0.0001	82	1.26	1.49	0.04
SE	0.02	0.1		SE	0.02	0.01	
81-94	0.057	0.032	0.0	84	1.62	1.47	0.03
SE	0.006	0.004		SE	0.03	0.01	
84-87	0.04	0.02	0.0	92	1.74	1.85	0.75
SE	0.009	0.005		SE	0.08	0.1	
87-90	0.029	0.018	0.39				
SE	.006	0.005					
90-94	0.021	0.015	0.035				
SE	0.005	0.004					

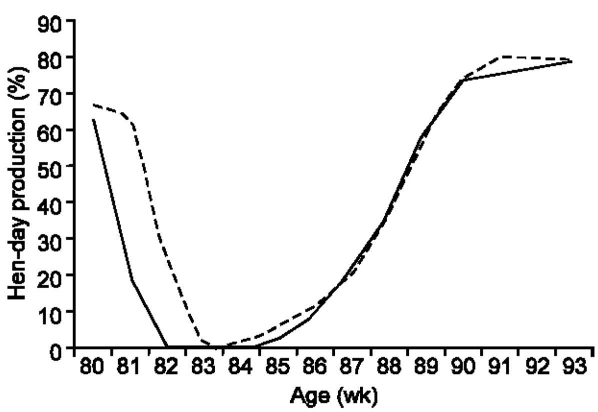

Fig. 1: Hen-day production curve of Zn (---) and Fw (-) treatments

period. In the present study, although hens in FW method lost more body weight than hens of the Zn group, both groups laid eggs at the almost same rate during the peak of postmolt production. This result could be due to the fact that hens in Zn group stayed out of production for a longer period of time (21 d) than hens in FW group (9 d). Furthermore, hens in the FW group lost body weight significantly more than the Zn group. This result could be because the Zn hens stayed out of production (35 d) longer than hens in the Zn group (24 d) and that resulted in same egg production, as previously reported by Buhr and Cunningham (1994) and Noles (1966). Those authors suggested that the longer the cessation period, the better the postmolt production. Within the two molting procedures, our results, in general, indicate that molting hens by Zn or FW methods allows a return to production at a same rate (Fig. 1). Postmolt internal Zn concentration of eggs in Zn treatment was determined to ensure that it is not toxic for human consumption. We observed Zn of the eggs was not significantly different between two treatments. However, it was in Zn treatment numerically more than FW treatment (0.08 mg/gr Dm vs 0.07 mg/gr Dm). In the resent study, egg weight at the peak of postmolting production was not significantly different between the molted hens. This finding is in agreement with those of Christmas *et al.* (1985), Said *et al.* (1984) and Wilson *et al.* (1967), who found that different induced molting programs did not significantly affect egg weight when compared to the nonmolted birds. The mortality percentage throughout the entire experiment for Zn and FW were 0.057 and 0.032%, respectively which was significantly higher for Zn group Than FW (Table 3). The mortality for FW group was equally distributed throughout the experiment; but it occurred in Zn group mostly following Zn rich diet consumption. Apparently high mortality in Zn group was due to toxic effect of Zn on laying hens. This result is in contrast with findings of Abu-Serewa and Karunajeewa (1985). They fed a laying diet containing zinc (23.7 g/kg) and found that there was not significant difference between Zn and control group.

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References

Abu-Serewa, S. and H. Karunajeewa, 1985. A comparison of methods for rehabilitating aging hens. Australian J. Experimental Agri., 25: 320-325.

AOAC, 1984. Official Methods of Analysis. 14th Ed. Association of Official Analytical Chemists. The William Byrd Press, Inc., Richmond, Virginia, USA.

Attia, Y.A., W.H. Burke and K.A. Yamani, 1994. Response of broiler breeder hens to forced molting by hormonal and dietary manipulation. Poult. Sci., 73: 245-258.

Bar, A., V. Razaphkovsky, D. Shinder and E. Vax, 2003. Alternative procedures for molt induction: Practical aspects. Poult. Sci., 82: 543-550.

Bell, D., 2003. Historical and current molting practices in the U. S. Table egg industry. Poult. Sci., 82: 965-970.

Berry, W.D. and J. Brake, 1987. Postmolt performance of laying hens molted by high dietary zinc, low dietary sodium and fasting: Egg production and eggshell quality. Poult. Sci., 66: 218-226.

Brake, J., 1993. Recent advances in induced molting. Poult. Sci., 72: 929-931.

Brake, J.T., 1992. Mechanisms of and metabolic requirements for complete and rapid reproductive rejuvenation during an induced molt-a brief review. Ornis Scand., 23: 335-339.

Brake, J.T. and J.B. Carey, 1983. Induced molting of commercial layers. North Carolina Agricultural Extension Service Poultry Science and Technical Guide No. 10. North Carolina State University, Raleigh, NC.

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

Buhr, R.J. and D.L. 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. Poult. Sci., 73: 1499-1510.

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

Gast, R.K. and S.C. Ricke, 2003. Symposium: Current and future prospects for induced molting in laying hens. Poult. Sci., 82: 964.

Harms, R.H., 1983. Influence of protein level in the resting diet upon performance of force rested hens. Poult. Sci., 62: 273-276.

Holt, P.S., 1995. Horizontal transmission of Salmonella enteritidis in molted and unmolted laying chickens. Avian Dis., 39: 239-249.

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.

McCormick, C.C. and D.L. Cunningham, 1987. Performance and physiological profiles of high dietary zinc and fasting as methods of inducing forced rest: A direct comparison. Poult. Sci., 66: 1007-1013.

Noles, R.K., 1966. Subsequent production and egg quality of force molted hens. Poult. 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.

Park, S.Y., W.K. Kim, S.G. Birkhold, L.F. Kubena, D.J. Nisbet and S.C. Ricke, 2004. Induced molting issues and alternative dietary strategies for the egg industry in the United States. World's Poult. Sci. J., 60: 196-209.

Ruszler, P.L., 1998. Health and husbandry considerations of induced molting. Poult. Sci., 77: 1789-1793.

Said, N.W., T.W. Sullivan, H.R. Bird and M.L. Sunde, 1984. A comparison of two force molting methods on performance of two commercial strains of laying hens. Poult. Sci., 63: 2399-2403.

SAS Institute, 1985. SAS User's Guide. Statistics. SAS Institute Inc., Cary, NC.

Scheideler, S., U. Puthpongsiriporn and M. Beck, 2002. Comparison of traditional fasting molt versus non-feed restriction low sodium molt diets and pre-molt photoperiod effects on molt and second cycle production parameters. Poult. Sci., 81 (Suppl. 1): 22-23 (Abstr.).

Swanson, M.H. and D.D. Bell, 1974. Force molting of chickens. II. Methods. University of California Leaflet 2650, University of California, Davis, CA.

Webster, A.B., 2003. Physiology and behavior of the hen during induced molt. Poult. Sci., 82: 992-1002.

Whitehead, C.C. and D.W.F. Shannon, 1974. The control of egg production using a low-sodium diet. Br. Poult. Sci., 15: 429-434.

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