EXPERIENCE THE EFFICIENCY OF NEW FORCE MOLTING PROGRAMS IN LAYER HENS USING SOME PRODUCTIVE INDICATORS

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ABSTRACT

This experiment was conducted at Al-Amer Poultry Company (Private Sector) in Babil Governorate for the period 6/14/2020 - 10/14/2020 in order to test new, efficient molting methods that are compatible with animal welfare. Four hundred and eighty Lohman red laying hens, 85 weeks old, were randomly divided into five treatment groups, each treatment 6 replicates.The experimental treatments included: the first treatment (T1), the second treatment (T2), the third treatment (T3), the fourth treatment (T4) and the fifth treatment (T5) which means a control treatment without molting process, the California method, a new method, adding 20 gm/kg feed Nano zinc oxide and 25 gm zinc oxide/kg feed, respectively. The results showed a cessation of egg production and a loss of about 25-26% of the chicken's body weight, as well as a significant decrease in the weights of the liver, pancreas, ovary and oviduct at the end of the molting process in all molting treatments. Egg production increased significantly in the period of egg production post molting (13 weeks) in all molting treatments compared to the control treatment. It is concluded that the new method and the two methods of adding zinc oxide and nano zinc oxide to the feed are effective and merciful as it does not deprive the birds of eating the feed compared to the traditional California method.

Key words:Zin Oxide, nano zinc oxide, force molting, layer chicken, productive performance

تجربة كفاءة طرق نزع ريش جديده في دجاج البيض باستعمال بعض المعايير الانتاجيه

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المستخلص

اجريت هذه التجربة في حقول شركة العامر للدواجن (قطاع خاص) في محافظة بابل للمدة 2020/6/14 – 10/14/ 2020 وذلك لاختبار طرق نزع ريش جديده، كفوءه و تتوافق مع رفاهية الحيوان. استخدمت 480 دجاجة بياضة نوع Lohman أحمر بعمر 85 اسبوع، قسمت بشكل عشوائي الى خمسة معاملات لكل معاملة 6 مكررات. شملت معاملات التجربه: المعاملة الاولى (T1)، المعاملة الثانية (T2)، المعاملة الثالثة (T3)، المعاملة الرابعة (T4) و المعاملة الخامسة (T5) التي تعني معاملة سيطرة دون اجراء عملية نزع ريش، طريقة كالفورنيا، طريقة جديده، اضافة نانو اوكسيد الزنك بمقدار 20 غم/كغم علف و اضافة 25 غم اوكسيد الزنك /كغم علف على التوالي. اظهرت النتائج توقف انتاج البيض وفقدان حوالي 25-26 % من وزن جسم الدجاج وكذلك أنخفاض معنوي في اوزان الكبد ،البنكرياس، المبيض وقناة البيض في نهاية عملية القلش في جميع معاملات القلش. ارتفع انتاج البيض معنويا في فترة انتاج البيض بعد القلش (13 اسبوع) في جميع معاملات القلش مقارنة بمعاملة السيطره. يستنتج ان الطريقه الجديده وطريقتي اظافة اوكسيد الزنك ونانو اوكسيد الزنك الى العلف فعاله ورحيمه حيث لاتحرم الطير من تناول العلف مقارنة بطريقة كاليفورنيا التقليديه.

الكلمات المفتاحية: أوكسيد الزنك، نانو اوكسيد الزنك، نزع الريش الاجباري، دجاج البيض، الاداء الانتاجي

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INTRODUCTION

Many methods have been used to induce force molting in aged laying hen flocks for extending the egg production life of laying hens (2,5,6). Among those methods, feed removal or hen starvation seems to be the most common method (20). During last decade, however, the global concerns for animal rights and welfare have raised concerns over the using feed removal, as a method of force molting for example force molting causes the infection of laying flocks with *Salmonella enteritidis*, which is transmitted to human. in addition to feed withdrawal is inhumane (13,15). As an alternative to fasting, several studies have suggested a non-feed withdrawal method, by manipulation of dietary minerals such as Na, Ca, I and Zn (14, 16) or using hormones. These new methods have been successfully used to induce force molting. Because of its important vital functions inside body organism Zinc have attracted increased attention, This is why many researchers have started using zinc, especially zinc oxide in molting (12). Due to its great importance and high efficiency, nanotechnology has begun to be used on a large scale in many agricultural and industrial applications (18). Despite all this, nanotechnology was not used in the molting process of laying eggs until now. Based on the foregoing, this study was conducted to compare the efficiency of different molting methods.

MATERIALS AND METHODS

The study was conducted at the Al-Amir Poultry farm Company (private sector) located in Babil province for the period between June 14, 2020 and 14 October 2020. In this experiment, 480 lohman red layer chickens were used at the age of 85 weeks, randomly divided into five treatments, for each treatment 6 replicates by 16 chickens per replicate. The chickens were reared in a closed house with 120 cages, 40x42 x 35 cm in dimensions. Four chickens were reared in each cage. The birds were raised under the same administrative and health conditions.The experiment included the following treatments: first treatment (T1), control treatment without the process of molting, second treatment (T2), use of california method (Table-1), third treatment (T3), use of a new method (Table-2), fourth treatment (T4), addition of 20g nano zinc oxide / kg feed and fifth treatment (T5), addition 25g zinc oxide/ kg feed. Seven days before the start of the molting process, feed and water were freely offerd for all chicken treatments and open the lighting 24 hours a day with 4 watt/ m2 light intensity. Laying ration was used (table 3). The program included adding nano zinc oxide to the laying chicken diet and lighting period (8) hours/day until there was a decrease in body weight between 20-25% and egg production stops, followed by giving full production diet and 16 hours/day light. Molting program used by adding 25 g zinc oxide/ 1kg diet was the same as nano zinc oxide program. The nano zinc oxide (U.S. Research nanomaterials, Inc. USA) and zin oxide (Thomas Baker company, India) were purchased from the local market.

Statistical analysis for the traits studied was carried out using the SAS Ready Statistical Programme (17). To test the significance of the differences between the means the Duncan multiple range test was used (8) .

RESULTS AND DISCUSSION

Egg production decreased significantly ($P<0.01$) in all experimental treatments compared to the control treatment in the first week of starting the molting process, and egg production stopped completely in the third week of molting. The mean of egg production for the three weeks of the molting process in all experimental treatments was significantly ($P<0.01$) lower than the control treatment (Table 4). Egg production began to rise significantly in all molting treatments compared to the control treatment from 3rd week after molting and continued until the end of the experiment (week 13). The mean of weekly egg production for a period post molting was significantly higher in all experimental treatments (T2, T3, T4 and T5)) compared to the control treatment (T1), while no significant differences were recorded among the experimental treatments (Table 5) (Figure 1). Treatment T3 showed a greater decrease in body weight after molting than the rest of the treatments and it was significant ($P<0.01$) compared to treatments T2 and T5, while there were no significant differences between treatments in the percentage of body weight loss (Table 6). The absolute and the relative weights of liver, pancreas, ovary and oviduct were significantly decreased in treatments T2, T3, T4, and T5 compared to treatment T1, while there were no significant differences between the treatments in the absolute and relative weight of the heart (Table 7). The process of weight loss during molting and then returning it is called regeneration or rejuvenation (7). The cessation of egg production at the end of the molt refers to the cessation of ovarian activity, which is due to its atrophy, and then the cessation of the secretion of the female sex hormones estrogen and progesterone. The atrophy of the ovary and oviduct occurs as a result of the apoptosis (10). The effect of zinc oxide and nano-zinc oxide and the new method was stronger than the traditional method (California) in reducing body weight at the end of the molting process. This may be due to the significant decrease in the weights of the liver, pancreas, ovary and oviduct, which may be these organs are potential targets for the action of the zinc element (2,9). Nano zinc oxide also reduces yolk lipids by decreasing its biosynthesis and increasing its degradation (1,19,21). It is concluded that the new method and the two methods of adding zinc oxide and nano-zinc oxide to the feed are effective and merciful, as they do not deprive the birds from eating the feed compared to the traditional California method.

Table 1. California force molting program

Day	Feed	water	Light
1-14	- non	-available	- 8 h.
15- 35	-Full feed of cracked corn or low protein and calcium diet	- available	- 8 h.
36-68	- laying ration	-available	-14-16 h.

(11)

Table 2.A new annovative force moulting program

Day	Feed	Water	Light
1-14	- 5 g crushed corn/ layer	-available - 1 kg sugar/100 L water	- 8 h. - 1 watt/m2
15- 28	-50 % of productive ration	- available - 1 kg sugar/100 L water	- 8 h. - 1 watt/m^2
28- up	Full laying ration (120 g/day)	-available	-16 h. 4 watt/m^2

Table 3. Feed Ingredients and chemical composition of laying ration used in the experiment * (feedstuffs Reference Issue and data 2018-2019).

Item	(%)
Ingredients	
Yellow corn	42
Wheat	21
Premix for layer	2.5
Soybean meal (46% C.P)	25
Sunflower oil	1.8
Limstone	7.5
Salt (NaCl)	0.2
Cemical composition	(%)
Crude protein	18.3
Metabolizable energy	2857 Kcal/ kg diet
Methionin	0.45
Lysine	0.92
Methionin+ cystein	0.86
Arginin	0.94
Thrionin	0.69
Valien	0.81
Tryptophan	0.21
Isoluecin	0.72
Calcuim	0.29

*** (feedstuffs Reference Issue and data 2018-2019).**

Table 4. Effect of different methods on cease egg production during force molting period (mean ± S.E)

Treatment	Weeks			Mean of egg	Total egg
	1	2	3	production	produced
T1	56.17± 5.33 a	49.71 ± 4.44 a	44.29± 0.055 a	50.01 ± 4.48a	1055
T2	20.43 ± 2.67 b	00±0.00 c	00±0.00 b	6.81 ± 0.08b	143
T3	19.42 ± 2.07 b	00±0.00 c	00±0.00 b	6.47 ± 0.04b	136
T4	21.71 ± 3.39 b	0.5710±0.000 b	00±0.00b	7.42 ± 0.07b	156
T5	21.71± 3.03 b	0.571±0.000 b	00±0.00b	7.42 ± 0.07b	169
P value	**	**	**	**	

In this Table and the following, T1,T2,T3, T4 and T5 mean control treatment without force molting, California method, new method, addition of 20g nano zinc oxide / kg feed and addition 25g zinc oxide/ kg feed respectively

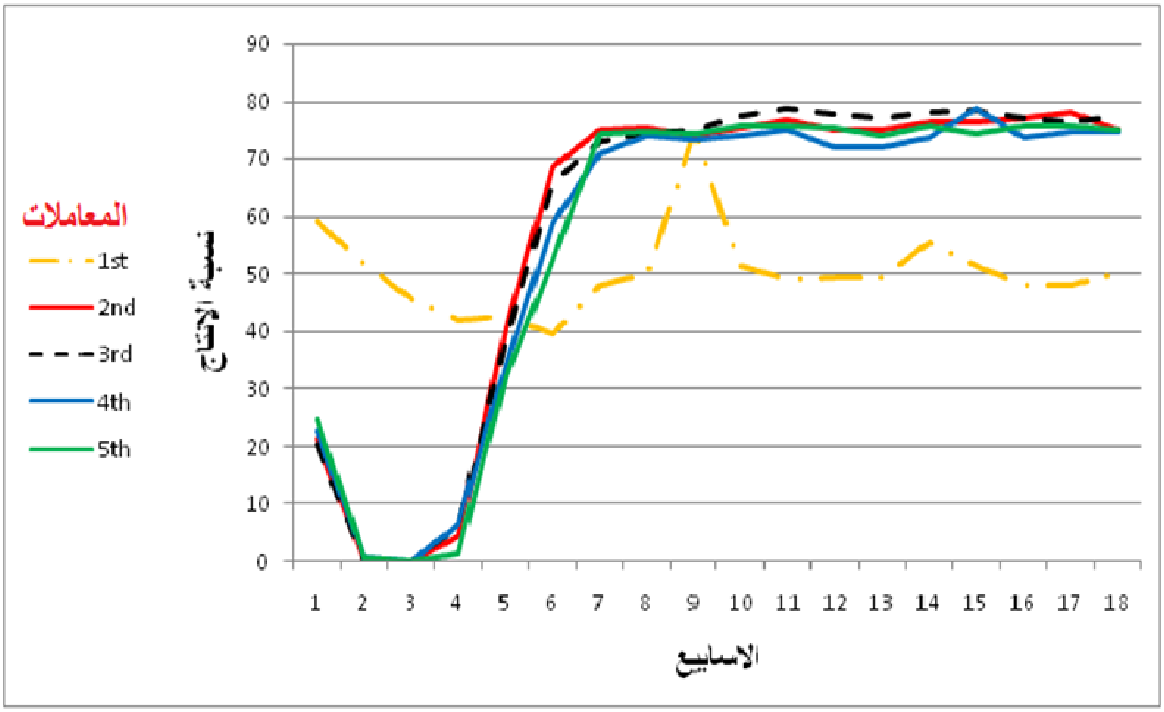

Figure 1. Effect of diferent force molting methods on egg production in aged laying hens

Table 5. Effect of different methods of force molting on weekly & mean egg production during post-molting laying period (mean ± S.E)

Treatment	Weeks 1	2	3	4	5	6	7	8	9	10	11	12	13	Mean of egg production	Total egg produced
T1	43.0 ± 2.9 a	49.43± 4.18 a	42.71 ± 3.2 c	44.57± 2.9 b	50.43 ± 2.6 b	47.71± 2.15 b	45.43 ± 1.66 b	45.86 ± 3.31 b	51.43 ± 3.5 b	47.29 ± 3.20 b	44.17 ± 3.29 b	44.49 ± 3.6 b	46.43± 7.7 b	52.93 ± 3.7 b	4100
T2	4.14 ± 0.09 b	38.15 ± 4.2 ab	64.0 ± 3.4 a	70.29 ± 3.3 a	64.57± 2.7 a	70.86± 4.9 a	72.15 ± 3.8 a	70.43 ± 4.9 a	71.57 ± 3.6 a	71.71 ± 5.9 a	72.28 ± 4.99 a	73.28 ± 4.7 a	70.71 ± 9.1 a	62.62 ± 5.2 a	5740
T3	5.86± 1.0 b	31.86± 3.01 b	61.14± 3.1 b	68.43± 3.4 a	70.86 ± 3.4 a	72.0 ± 3.8 a	73.14 ± 4.4 a	72.26 ± 2.2 a	73.29 ± 4.4 a	74.14 ± 4.6 a	73.14± 6.55 a	73.57 ± 4.9 a	71.85± 6.99 a	63.1 ± 3.1 a	5778
T4	4.14 ± 0.06 c	30.57 ± 2.8 b	63.0 ± 2.8 a	68.0 ± 2.1 a	70.86 ± 2.18 a	70.0 ± 3.2 a	72.57 ± 2.7 a	70.86 ± 2.9 a	74.0 ± 2.08 a	73.0 ± 4.8 a	72.42 ± 3.2 a	73.0 ± 4.8 a	70.57 ± 6.5 a	62.50 ± 3.2 a	5687
T5	4.14 ± 0.03 c	39.71 ± 2.8 b	58.71 ± 2.8 b	70.0 ± 2.6 a	69.14± 5.4 a	70.26 ± 4.3 a	70.29 ± 3.0 a	68.57 ± 2.8 a	73.28 ± 3.18 a	69.14± 4.5 a	73.28 ± 4.3 a	72.14 ± 3.78 a	70.28± 5.5 a	62.20 ± 3.2 a	5640
P value	*	*	*	**	*	*	*	**	**	**	**	**	**	**	

Table 6. Effect of different force molting methods on absolute & percentage of body weight loss at the end of molting period (mean ± S.E)

Treatment	Body weight pre – molting	Body weight post – molting	Weight loss	Weight loss percent (%)
T1	1930.47 ± 20.8 b	-------	-----	-----
T2	2006.75 ± 14.9 a	1475.6 ± 7.8	532.03 ± 4.01 a	26.7 ± 1.3
T3	1991.58 ± 15.6 a	1479.25 ± 8.16	512.33 ± 4.14 b	25.6 ± 1.2
T4	2000.67± 16.14 a	1472.6 ± 8.7	528.68 ± 3.99 ab	26.4 ± 1.4
T5	1986.5 ± 16.14ab	1477.8 ± 8.4	508.71 ± 3.19 c	25.6 ± 1.7
P Value	*	N.S	**	N.S

Table 7. Effect of different force molting methods on liver, pancreas, heart, ovary and oviduct weights (g) at the end of force molting period(mean ± S.E)

Treatment	Liver		Pancreas		Heart		Ovary		Oviduct	
	absolute	Relative	absolute	Relative	absolute	Relative	absolute	Relative	absolute	Relative
T1	43.17 ± 3.89 a	0.022 ± 0.002	7.50 ± 0.8 a	0.004 ± 0.0002	12.83± 2.08	0.007 ± 0.001	35.66 ± 3.4 a	0.0185± 0.003 a	65.83 ± 5.8 a	0.034± 0.001 a
T2	29.83 ± 1.27 b	0.015± 0.004	5.17 ± 0.5 b	0.0026 ± 0.0002	11.84± 1.55	0.006 ± 0.001	12.00 ± 1.5 b	0.006± 0.0004 b	30.00 ± 4.6 b	0.015± 0.0001 b
T3	29.33 ± 1.44 b	0.015 ± 0.003	5.00 ± 0.4 b	0.0025± 0.0001	12.67 ± 2.02	0.006± 0.001	12.33 ± 0.99 b	0.0062± 0.001 b	29.17 ± 3.87 b	0.014± 0.001 b
T4	29.33 ± 0.99 b	0.014 ± 0.003	4.67 ± 0.6 b	0.002 ± 0.0006	10.68 ± 1.77.	0.005± 0.0009	13.00 ± 0.95 b	0.0065± 0.0003 b	32.7 ± 4.15 b	0.016 ± 0.002 b
T5	30.13 ± 1.74 b	0.015 ± 0.002	4.83 ± 0.7 b	0.0024 ± 0.0004	12.00 ± 1.34	0.006 ± 0.003	13.00 ± 0.86 b	0.007 ±0.00001 b	33.00 ± 5.53 b	0.017 ± 0.001 b
P value	**	N.S	**	N.S	N.S	N.S	**	*	**	*

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