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EFFECT OF FORCE MOLTING ON EGG FERTILITY, HATCHABILITY PERCENTAGE AND CONCENTRATION OF ZN IN THE EGG COMPONENTS TRAITS OF BROILER BREEDER

*** Hemin Nuradden Mohammed[1] and ** Khasraw Abdulla Ali**
* Department of Animal production/Faculty of Agricultural Sciences/Sulaimani University
** Head of Halabja University

Key words: Molting, broiler breeder, zinc oxide, vitamin AD3E, Ross-308

Correspondence: H.N. Mohammed
Email: hemn33@yahoo.com

K.A. Ali
Email: Kasraw_abdulla@yahoo.com

ABSTRACT

This study was conducted (153 hens and 24 roosters) of broiler breeder (Ross-308) at age 60 weeks. The study was carried out to investigate the effect of utilization of different levels of ZnO and addition of vitamin AD_3E on concentration of Zn in the eggs components and egg fertility and hatchability percentage traits of Ross-308 broiler breeder hens at the 60 weeks of age. The experimental treatments were (T1: Control diet [without adding (ZnO) and vit. (AD_3E)], T2: T1 + 2 g/kg of vit. (AD_3E), T3: T1 + 25000 ppm of (ZnO), T4: T1 + 25000 ppm (ZnO) + 2 g/kg vit. (AD_3E), T5: T1 + 30000 ppm (ZnO), T6: T1 + 30000 ppm (ZnO) + 2 g/kg vit. (AD_3E), T7: T1 + 35000 ppm of (ZnO) and T8: T1 + 35000 ppm (ZnO) + 2 g/kg vit. (AD_3E). The results obtained from this study were summarized as: The effects of interactions between treatments and age periods significantly ($P<0.01$) affected zinc concentration in the yolk and albumin of eggs and fertility (F) and total egg hatchability (TEH) percentage traits, but there are no significant effect on fertile egg hatchability (FEH) trait. The data were analyzed statistically by using tow-way of ANOVA with (SPSS-17 Package Program for Windows). Least Significant Difference tests (L.S.D) were used to determine the significance of difference among treatments means. Level of significance used in all results was ($P<0.01$) and all percentage data were converted Arcsines prior to analysis.

تأثير القلش الاجباري على تركيز الخارصين في الصفار والبياض البيض، نسبة الخصوبة والتفقيس للبيض الامهات فروج اللحم

***هيمن نورالدين محمد و ** خسرو عبدالله علي**
* قسم النتاج الحيواني/ فاكلتي للعلوم الزراعية/جامعة السليمانية
** رئيس جامعة حلبجة

الخلاصــة

اجريت هذه الدراسة على (153 دجاج الامهات و 24 ديكة) لسلالة Ross-308. تم اجراء التجربة بعاملة الطيور في الحقل وذلك لمعرفة تاثير المعاملات المختلفة على الصفات نسبة الخصوبة والتفقيس للبيض، وكذلك تقدير تركيز الخارصين في الصفار والبياض البيض في المختبر. تم تقسيم فترة التجربة الى خمس فترات المتساوية، ثلاث اسابيع لكل فترة. اما المعاملات المستخدمة في هذه التجربة فكانت استخدام مستويات مختلفة من مسحوق اوكسيد الخارصين (ZnO) باضافة الفيتامين (AD_3E) كاضافات العلفية. الهدف من هذه الدراسة هي معرفة تاثير ومقارنة المعاملات باستخدام تراكيز مختلفة من (ZnO) باضافة الفيتامين (AD_3E) على الصفات نسبة الخصوبة والتفقيس للبيض، وكذلك تقدير تركيز الخارصين في الصفار والبياض البيض لدجاج الامهات من نوع Ross-308 عند عمر (60) الاسبوع. استخدم ثمانية معاملات في هذه الدراسة كما موضح ادناه:

معاملة الاولى : عليقة السيطرة (بدون اضافة ZnO و فيتامين AD_3E).
معاملة الثانية : معاملة الاولى + 2 غم / كغم من فيتامين(AD_3E) .
معاملة الثالثة : معاملة الاولى + 25000 ppm (ZnO).
معاملة الرابعة : معاملة الاولى + 25000ppm (ZnO) + 2 غم / كغم من فيتامين(AD_3E) .
معاملة الخامسة: معاملة الاولى + 25000ppm (ZnO).
معاملة السادسة: معاملة الاولى + 30000 ppm (ZnO) + 2 غم / كغم من فيتامين(AD_3E).

كلمات مفتاحية : القلش الاجباري ، الخارصين ، صفار وبياض البيض ، نسبة الخصوبة ، التفقيس .

للمراسلة : هيمن نورالدين محمد
بريد الكتروني : hemn33@yahoo.com
خسرو عبدالله علي
بريد الكتروني : Kasraw_abdulla@yahoo.com

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معاملة السابعة : معاملة الاولى + 35000 ppm (ZnO) .

معاملة الثامنة : معاملة الاولى + 35000 ppm (ZnO) + 2 غم / كغم من فيتامين(AD_3E).

تتلخص النتائج هذه الدراسة بمايلي:تاثيرالتداخل بين المعاملات والفترات العمرية كان معنوياعاليا ($P<0.01$) في تركيزالخارصين في الصفار والبياض البيض.كما كان تداخل بين المعاملات والفترات العمرية تاثيرات عالية معنوية ($P<0.01$) في الصفات نسبة الخصوية ونسبة البيض المفقس من البيض الكلى المعد للتفقيس ولكن ليس هناك تاثير على صفة ونسبة البيض المفقس من البيض المخصب.

INTRODUCTION

The avian egg is a complex system whose primary purpose is reproduction. However, understanding the properties of the egg enable it to be used as a versatile and functional food source (Kevin and Wilson, 2000). Chicken egg is an excellent source of enriched food for developing embryo in it and for human, also as complete food source, hence it is easily digestible; potential source of food for children, working men and pregnant women, sick and old people or rather for all categories of human (Jadhave and Siddiqui, 2007).

In nature, birds replace some of their feathers in the course of a year to maintain good plumage at all times. A natural molt often happens before the next winter season, and needs long time especially in the chickens (layer and breeder, In such cases we can depend on artificial methods (process) called (force molting) (Naji et al., 2007).

Force molting is an economic practice of laying hens to extend their productive life (Ahmad and Roland, 2003). Induced molting not only improved performance and eggshell quality, but also increased profits by optimizing the use of replacement flocks (Bell, 2003). Feeding molted hens is a challenge to sustain their optimum production performance and retain essential body nutrients at the same time (El-Deek and Al-Harthi, 2004) Objectives of forced molting in chickens (hen layers and breeders) are it's used to extend their productive lives by benefited of second production year and third production year (Ahmad and Roland, 2003), to improve the productive performance and egg quality traits like (egg weight, egg shell, hatchability and egg component traits) (Thirunavukkarasu et al., 2006), decreases the costs to replacement flocks (Bell, 2003), to give rest duration to the chicken to rejuvenate the reproductive system when decreases efficiency flocks from egg production (Donalson et al., 2005) and minimize the effect of chicken age on egg production and egg quality (Bar et al., 2001, 2003).

The main objectives of the present study were:

1- Determine the best concentration of zinc oxide (ZnO) to force molting method.

2- Study the effect of ZnO molting method for maximize profits in (**Ross-308**) broiler breeder hens.

3- Study the role of vitamin AD_3E mixture with ZnO on molted hens during post-molt periods.

Materials and methods

- **Study design.**

A total of (153 hens and 24 roosters) of broiler breeder (Ross-308) were used in this experiment, at age 60 weeks. Birds were randomly allotted in to 8 different treatments, each treatment had 3 replicates and constitute from 3 male and 18 or 21 females .The experimental treatments were as the following: **(T1):** Control diet [without adding (ZnO) and vit. (AD_3E)], **(T2):** T1 + 2 g/kg of vit. (AD_3E), **(T3):** T1 + 25000 ppm of (ZnO), **(T4):** T1 + 25000 ppm (ZnO) + 2 g/kg vit. (AD_3E), **(T5):** T1 + 30000 ppm (ZnO), **(T6):** T1 + 30000 ppm (ZnO) + 2 g/kg vit. (AD_3E), **(T7):** T1 + 35000 ppm of (ZnO), **(T8):** T1 + 35000 ppm (ZnO) + 2 g/kg vit. (AD_3E).

- **Housing environment.**

Before treating the birds, photoperiod was 16 hours/day and during treatment period for (9 days) photoperiod was reduced to 8 hours/day; at day 10 hens fed on control diet and received 16 hours of light /day. Temperatures were recorded three times a day at (8:00 am, 1:00pm and 6:00

pm). Their average values are shown in table (1) and the ventilation was controlled by fans type (Damandeh) to good air ventilation.

Table (1) Temperature during the study.

Bird age (week)	Average of temperature (°C)
61-63	17
64-66	19
67-69	20
70-72	20
73-75	19

- **Feeding.**

During the experiment period, birds were fed on the following ration; its chemical calculated component is shown in table (2).

Table (2): Ingredient composition and calculated analysis of the basal diet provided to the broiler breeder.

Feed stuff	%
Wheat	45
Barley	10
Yellow corn	16
Soybean meal (44%)	12
Meat and bone meal	5
Corn oil	2
Limestone	7.6
Di-calcium phosphate	1.4
Salt (Nacl)	0.2
Methionine	0.1
Lysine	0.2
Choline	0.2
Mixture of vitamins & minerals	0.3
Calculated chemical component	
Crude protein %	15.5
Metabolized energy kcal/kg	2750
Calcium %	3.6
Available phosphorus%	0.7

The nutritional requirement determined according to (NRC1994)

RESULTS AND DISCUSSION

Effect of force molting using ZnO and addition vitamin AD_3E on:

-Concentration of Zn in the eggs components.

The effects of interactions between treatments and age periods significantly (P<0.01) affected Zn concentration in the yolk and albumin of the eggs (table 3). The highest value of yolk zinc concentration was resulted at P1/ T7 (29.70) followed by T8 (27.86), T5 (23.43), T6 (22.13), T3 (17.81), T4 (17.09) and the lowest value was resulted in non-treated hens in T2 (10.51) and T1 (10.86). The concentration was returned to the normal level in the T3, T5, T6, T7 and T8 after 5 weeks but in the T4 after 4weeks of starting to egg production. The highest value of albumin zinc concentration was resulted at P1/ T8 (11.66) followed by T7 (11.55), T6 (8.39), T5 (7.80), T3 (7.74), T4 (7.32) and the lowest value was resulted in non-treated hens in T1 (3.30) and T2 (3.27). The concentration was returned to the normal level in the (T8, T6, T3), (T5, T7), (T4) after 4, 5 and 3 weeks respectively.

Table (3): Effect of interactions between treatments and age periods on yolk zinc and albumin zinc concentration traits (Mean±SEM).

Treatments	Yolk zinc concentration (ppm)					
	Periods					
	1	2	3	4	5	6
1	10.86 ±0.12	10.44±0.32	10.43±0.06	10.88±0.59	10.37±0.34	10.50±0.07
2	10.51±0.15	10.35±0.08	10.57±0.33	10.55±0.19	10.66±0.02	10.43±0.07
3	17.81±0.17	13.69±0.26	13.34±0.14	12.71±0.28	11.15±0.17	10.42±0.30
4	17.09±0.10	14.36±0.35	14.00±0.27	13.70±0.20	10.47±0.26	10.12±0.01
5	23.43±0.03	15.36±0.01	14.54±0.19	12.55±0.19	11.27±0.16	10.47±0.10
6	22.13±0.66	14.92±0.57	15.30±0.32	13.20±0.28	11.12±0.43	10.33±0.07
7	29.70±0.04	18.00±0.74	16.77±0.34	15.47±0.17	12.25±0.07	10.83±0.07
8	27.86±0.31	17.28±0.16	16.25±0.21	14.19±0.07	12.50±0.40	10.65±0.31
LSD (P<0.01)	0.98					
Albumin zinc concentration (ppm)						
	1	2	3	4	5	6
1	3.30±0.17	3.35±0.08	3.57±0.07	3.82±0.08	3.78±0.13	3.54±0.44
2	3.27±0.16	3.40±0.29	3.23±0.09	3.24±0.12	3.62±0.17	3.56±0.01
3	7.74±0.05	5.28±0.18	5.30±0.17	4.46±0.14	3.50±0.24	3.45±0.02
4	7.32±0.32	5.74±0.38	4.94±0.18	3.85±0.07	3.55±0.42	3.59±0.12
5	7.80±0.66	6.09±0.11	5.30±0.13	4.43±0.20	4.26±0.11	3.80±0.15
6	8.39±0.25	5.79±0.10	4.42±0.23	4.23±0.10	3.58±0.17	3.67±0.09
7	11.55±0.19	8.59±0.33	6.62±0.06	5.74±0.04	4.55±0.23	3.76±0.21
8	11.66±0.08	7.74±0.37	6.41±0.26	4.37±0.41	3.88±0.10	3.42±0.28
LSD (P<0.01)	0.84					

P1= Day 3 of molting
P2= First week after relaying
P3 = Second week after relaying
P4 = Third week after relaying
P5 = Fourth week after relaying
P6 = Fifth week after relaying

The increasing level of zinc concentration in the yolk and albumin of the eggs during P1 in all treated hens may be due to feeding the birds of the diet supplemented with zinc oxide and increase absorption of this element and transport through circulating system to the body organs especially liver and reproductive organs, thereafter accumulate in the yolk and albumin of the eggs.

The decrease zinc concentration levels in the other periods refer to feeding the birds of the control diet (without adding ZnO) and decrease zinc concentration in the blood and body organs. Prasad and Oberleas, (1976) reported that excretion zinc elements from the body through urine and excreta, therefore zinc element not remain in the body tissue for the long time. These results were in agreement with the suggestions of (Maulood, 1996; Kaya *et al.*, 2001; Ahmed, 2008 and Yousaf *et al.*, 2009) whom found that induced molting by adding ZnO had a significant effect on the concentration of zinc element in the yolk and albumin of egg. While the results were in contrast with finding of (Hassanabadi and Kermanshahi, 2007) who found that internal Zn of the eggs laid after Zn treatment had no a significant different between Zn treated and FW methods.

-Effect of force molting using ZnO and addition vitamin AD_3E on egg fertility and hatchability percentage.

The effects of interactions between treatments and age periods significantly ($P<0.01$) affected fertility (F) and total egg hatchability (TEH) percentage (table 4). Its observed in this study that the percentage of the (F), (TEH) and fertile egg hatchability (FEH) traits were lower in the P1 for all treated hens and increase these traits in P2 and P3 that was may be attributed to the toxic effect of high level zinc concentration on the embryo during early embryonic growth periods (at the incubation periods). On the other hand, those traits in the treated eggs were higher than non-treated eggs. This may be due to improve egg shell thickness in the treated eggs. The effects of interactions between treatments and age periods had no a significantly effect on (FEH) traits. The result was in agreement with the suggestions of (Alsobayel and Alkhateeb, 1992) whom found that induced molting by adding ZnO had no a significant effect on (FEH) traits. While these results were in contrast with finding of (Kaya *et al.*, 2001; Durmuş *et al.*, 2004 and Reddy *et al.*, 2008) whom found that induced molting by adding ZnO had no significant effect on (F) and (TEH) percentage traits.

Table (4): Effect of interactions between treatments and age periods on fertility, total egg hatchability and fertile egg hatchability percentage traits (Mean±SEM) .

Interactions		Traits		
Age period	**Treatments**	**Fertility (%)**	**Total egg Hatchability (%)**	**Fertile egg hatchability (%)**
1	**T1**	91.67 ± 8.33	75.00 ± 14.43	80.56 ± 10.02
	T2	100.0 ± 3.79	76.67 ± 14.53	76.67 ± 14.53
	T3	75.56 ± 4.44	55.56 ± 8.01	75.00 ± 14.43
	T4	60.00 ± 10.00	45.00 ± 10.41	75.00 ± 14.43
	T5	68.89 ± 5.88	51.11 ± 8.89	75.00 ± 14.43
	T6	72.22 ± 14.70	44.44 ± 5.56	66.67 ± 16.67
	T7	36.67 ± 8.82	30.00 ± 10.00	83.33 ± 16.67
	T8	83.33 ± 16.67	66.67 ± 16.67	83.33 ± 16.67
2	**T1**	42.22 ± 8.89	35.56 ± 2.22	88.89 ± 11.11
	T2	75.56 ± 12.37	68.89 ± 17.36	88.89 ± 11.11
	T3	83.33 ± 8.33	75.00 ± 6.23	91.67 ± 8.33
	T4	91.67 ± 8.33	85.00 ± 7.64	93.33 ± 6.67
	T5	95.24 ± 4.76	95.24 ± 4.76	100.0 ± 3.32
	T6	72.22 ± 2.78	72.22 ± 2.78	100.0 ± 6.3
	T7	80.56 ± 10.02	73.89 ± 3.89	93.33 ± 6.67
	T8	100.0 ± 6.71	75.00 ± 14.43	75.00 ± 14.43
3	**T1**	62.22 ± 11.76	48.89 ± 14.57	75.00 ± 14.43
	T2	75.00 ± 4.27	50.00 ± 14.43	66.67 ± 19.25
	T3	100.0 ± 2.36	88.89 ± 11.11	88.89 ± 11.11
	T4	73.33 ± 6.67	60.00 ± 7.11	83.33 ± 8.33
	T5	86.67 ± 6.67	73.33 ± 6.67	85.00 ± 7.64
	T6	77.78 ± 11.11	77.78 ± 11.11	100.0 ± 10.25
	T7	86.67 ± 13.33	73.33 ± 6.67	86.67 ± 6.67
	T8	80.56 ± 10.02	72.22 ± 14.70	88.89 ± 11.11
LSD (P<0.01)		**33.44**	**39.38**	**ns**

ns = not significant.
F: Fertility
THE: Total egg Hatchability
FEH: Fertile egg hatchability

P1 = first week after relying (bird age 66 week)
P2 = forth week after relying (bird age 70 week)
P3 = seventh week after relying (bird age 73 week)

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