



## Effect of broiler breeder's body weight after induced molting by zinc oxide on egg production, fertility, hatchability and chicks weight

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### Abstract

This study investigates the effect of different body weight of Arbor Acres broiler breeder hens after molting on product performance. 296 hens, the birds were molted by zinc oxide with or without supplementation of vitamin C and the body weight of the birds after molting at 361 days old of age, were randomly divided into eight treatments (T) of body weight: [T1(3.783), T2(3.714), T3( 3.458), T4(3.428), T5(3.380), T6( 3.318), T7(3.276) and T8(3.253) ±50]. Weekly eggs/hen, hen day production and egg mass revealed significant ( $p < 0.05$ ) differences between different body weights of hens. Hens in molting significantly had higher values of these traits compared with non-molting hens. Effect of body weight on Fertility percentage of eggs did not differ while hatchability of fertile eggs and hatchability of total eggs affected by the different treatments with the superiority of molting treatments on non-molting treatments. Results show no significant effect of body weight on egg weight and chick's weight.

### Introduction

“Post molt production” is the second laying cycle that is a direct result of the percent body weight loss during the molt [1]; [2] and [3], which improve productive performance in the poultry [4] and [5]. The reproductive regression by molting procedures affect the rejuvenation the reproductive system, post molt performance [3]. Losing of Body weight by (0.3-0.4 kg) was reported to be necessary for broiler breeders [6] to regression the reproductive system. The low-weight hens laid significantly fewer eggs (survivor-based Egg production) than the medium- and high-weight hens [7].

Sun and Coon (2005) [8] affirm that the body weight of broiler breeder affected egg weight significantly in the pre-peak period, post-peak period, and during the overall 24-65 week period. The similar findings have been reported by [9] and [10] indicating that a positive relationship between body weight and age of the breeder and the egg weight increase. These findings are also in quite conformity with those of [11] and [12].

Moreover, the body weight loss also affects hatchability. [13] found more hatching eggs and chicks from hens losing 0.30% than those which lost 0.20% of their initial body weight. In addition, the fertility and hatchability of the post-peak broiler breeders 60 weeks declined by 11% and 9% respectively in eggs weighing more than 70g [14]. [15] concluded that molting was a procedure to improve hatchability and chick juvenile growth. Molting the breeders, leading to an improvement in hatchability and chick quality in terms of growth performance. Results suggest that the effect of molting on the 1-day old chick could be due to an improvement

of egg quality. The purpose of this study was to study the effect of body weight after molting and the effect of zinc and vit. C supplementation on broiler breeder and reproductive traits.

## Material and Methods

### A. Birds performances study

In the present study, 296 of Arbor Acres strain broiler breeder hens divided into eight treatments (37 hens and five males each) randomly having five replications each, except 2 replications in each treatment 8 hens for each. The birds kept under uniform management conditions throughout the experimental period of 14 weeks post molt period. The birds were molted by zinc oxide with or without supplementation of vitamin C and the body weight of birds after molting at 361 days old of age illustrated in (Table 1).

Table-1: Body weight of hens before and after forced molting by zinc oxide with or without supplementation of vitamin C.

<i>Treatments</i>	<i>Zn levels (ppm)</i>	<i>Vitamin C (g/kg feed)</i>	<i>Body Weight (kg)</i>	
			<i>Before Molting</i>	<i>After Molting</i>
<i>T1 (control)</i>	0	0	3.818	3.783
<i>T2</i>	0	1	3.786	3.714
<i>T3</i>	15000	0	3.802	3.458
<i>T4</i>	15000	1	3.864	3.428
<i>T5</i>	20000	0	3.880	3.380
<i>T6</i>	20000	1	3.874	3.318
<i>T7</i>	25000	0	3.888	3.276
<i>T8</i>	25000	1	3.910	3.253

The hens were fed a layer diet at 155 g/bird/day contained 16% CP and 2858 ME, kcal/kg according to the laying hen diet formulated to meet or exceed recommendations from the Arbor Acres commercial management guide at 361 days old of age, hens exposed to 16 hours of artificial light/day.

Data on production performance (weekly eggs/hen, hen day production and egg mass) were recorded weekly commencing in week 2 of post molting periods, and sent to locally hatchery. At the end of the incubation period, the number of hatching chicks recorded. All un-hatched eggs were broken to ensure a number of fertile eggs to determine the hatchability of fertile eggs and hatchability of total eggs. The numbers of eggs had differences from week to week because of the differences in egg production between weeks.

Table- 2: Composition calculated and analytical content of the diets.

<i>Ingredient</i>	<i>%</i>
<i>Yalow Corn</i>	54.8
<i>Wheat</i>	14.2
<i>Soybean meal</i>	21.5
<i>Breedmix-2.5 W</i>	2.5
<i>Dicalcium Phosphate</i>	0.3
<i>Limestone</i>	6.5
<i>Salt</i>	0.2
<i>Total</i>	100
<b><i>Calculated</i></b>	
<i>ME, kcal/kg</i>	2858

<i>CP (%)</i>	<i>16</i>
<i>Calcium (%)</i>	<i>3.2</i>
<i>Methionine + cyst. (%)</i>	<i>0.69</i>
<i>Lysine (%)</i>	<i>0.85</i>
<i>Fiber (%)</i>	<i>3.1</i>
<b><i>Analytical</i></b>	
<i>Moisture (%)</i>	<i>9.3</i>
<i>CP (%)</i>	<i>17.5</i>
<i>Calcium (%)</i>	<i>3.5</i>
<i>Phosphors (%)</i>	<i>1.87</i>
<i>Methionine (%)</i>	<i>0.3</i>
<i>Lysine (%)</i>	<i>0.7</i>
<i>Ash (%)</i>	<i>12.1</i>
<i>Zn</i>	<i>80ppm</i>

### ***B. Statistical Analysis***

The data thus collected were subjected to Analysis of Variance (ANOVA) in CRD-Factorial Design using XLstat program. Comparison among treatment means made through Duncan’s Multiple Range (DMR) test [16].

### **Results and Discussion**

Table (2) shows that effect of body weight of hens after molting on egg/bird/week, hen house egg production %, and egg mass was significant ( $P < 0.05$ ). Maximum egg/bird/week, hen house egg production %, and egg mass was obtained by hens in molting treatments compared with non-molting treatments. This result attributed to molting processing which improving the egg production by rejuvenating the reproductive organs [5], as well as, to the reduction of body weight. The similar findings which reported by [17] who observed higher egg production and egg mass in molted hens than those of non-molted. This is could be attributed to a loss in body fat deposits in the ovary [18].

While between molting treatments the hens in higher body weight T4 and T3 followed by T5 have significantly higher egg/bird/week and hen house egg production% compared with other molting treatments (low weight). These results supported by [19] who reported that body weight significantly affected post molt egg production and egg weight. [20] reported that breeder hens with a body weight of 2.8 kg or less produced eggs at a significantly higher level than breeder hens with a body weight of 2.9 kg or greater. [6] reported that broiler breeder hens having a body weight of 3.2 kg or less exhibited significantly higher egg production than breeder hens with a body weight of 3.3 kg or greater. The small weight of birds provide maximum egg production percent, egg number, and egg mass g/bird compared with medium size [20]. Additionally, it was reported that hens molted by lower levels of ZnO exposed to less stressful conditions and reduce less weight therefore, resulting in a satisfactory level of egg production [21] and [22], as well as return to egg production earlier than hens exposed to molting by higher levels of ZnO [22]. Such results may be attributed to chickens exposed to molting in high body weight “lower body weight loss” initiated to produce eggs earlier than hens in low body weight “higher body weight loss” [22].

The non-significant results of egg mass between molting treatments except T7 could be attributed to higher egg production. Moreover, improvement in egg size after molting with a higher percentage of large size eggs

have been reported in earlier studies [25]; [26] and [27]. While found that egg mass was affected by both age and body weight.

Table- 2: Effect of body weight after molting on egg production performance.

<i>Treatments</i>	<i>Body Weight after Molting</i>	<i>Egg/bird/week</i>	<i>Hen House Egg production %</i>	<i>Egg Mass (g)</i>
<i>T1</i>	3.783	3.059 <i>f</i>	38.240 <i>f</i>	22.191 <i>d</i>
<i>T2</i>	3.714	3.351 <i>e</i>	41.888 <i>e</i>	24.602 <i>c</i>
<i>T3</i>	3.458	4.837 <i>a</i>	60.459 <i>a</i>	40.629 <i>a</i>
<i>T4</i>	3.428	4.941 <i>a</i>	61.760 <i>a</i>	41.075 <i>a</i>
<i>T5</i>	3.380	4.714 <i>b</i>	58.929 <i>abc</i>	38.956 <i>a</i>
<i>T6</i>	3.318	4.578 <i>c</i>	57.219 <i>bcd</i>	39.501 <i>a</i>
<i>T7</i>	3.276	4.331 <i>d</i>	54.133 <i>d</i>	36.444 <i>b</i>
<i>T8</i>	3.253	4.520 <i>c</i>	56.505 <i>cd</i>	38.889 <i>a</i>
<i>Mean ± Standard-error</i>		4.291 ± 0.060	53.642 ± 0.744	37.200 ± 0.532

Different alphabets on means in a column show significant differences at  $p < 0.05$ .

The effect of treatments on fertility, hatchability of total eggs and hatchability of fertile eggs percentage was significant ( $P < 0.05$ ) (Table 3). The lowest values were observed in body weight of hens in T1 and T2 (non-molting) compared with molting treatments. Molting broiler breeders could improve fertility percentage and earlier researchers reported higher hatchability percentage. [15] concluded that molting was a procedure to improve hatchability percentage. [29] reported that fertility and hatchability percentage would be better if a molting program is used. [30] found significant ( $P < 0.01$ ) differences between all treatments (molting and non-molting) of total hatchability and fertility percentage, furthermore, he found no significant ( $P > 0.01$ ) differences between all treatments in hatchability of fertile eggs percentage. [2], [31] and [32] found that forced molting had no significant effect on fertility percentage and hatchability of total eggs percentage. [33] observed no improvement in fertility percentage and over control birds when broiler males and female parents which forced molting.

Results revealed that the fertility did not affect by body weight of molting treatments, while hatchability of total egg and hatchability of fertile eggs percentage were significant (Table 3), these results may attributed to that eggs were considered throughout the postmolt periods. [34] found significant differences between pre and post molting period in hatchability of fertile eggs. [5] also found that molting treatments with different supplements significantly affect on fertility. [35] found that induced molting had no a significant effect on (hatchability of fertile eggs) traits. Induced molting by adding ZnO had no significant effect on fertility and hatchability of total egg percentage traits [31]; [32] and [2]. The loss in body weight is an important factor contributing to the success of forced molting because of its effect on reproductive [36] and [37]. The practice of induced molting beneficially affects productive lives of birds, which would otherwise be culled as soon as they begin to produce lower eggs yield [38] and [39].

Table- 3: Effect of body weight after molting on egg production performance.

<b>Treatments</b>	<b>Body Weight after Molting</b>	<b>Fertility (%)</b>	<b>Hatchability of Total Eggs (%)</b>	<b>Hatchability of Fertile Eggs (%)</b>
<b>T1</b>	3.783	71.222 <i>b</i>	58.667 <i>d</i>	81.551 <i>c</i>
<b>T2</b>	3.714	71.019 <i>b</i>	65.972 <i>c</i>	81.541 <i>c</i>
<b>T3</b>	3.458	85.444 <i>a</i>	78.519 <i>ab</i>	91.641 <i>a</i>
<b>T4</b>	3.428	86.398 <i>a</i>	78.787 <i>ab</i>	91.291 <i>ab</i>
<b>T5</b>	3.380	87.796 <i>a</i>	81.472 <i>a</i>	92.435 <i>a</i>
<b>T6</b>	3.318	80.407 <i>a</i>	74.241 <i>b</i>	86.964 <i>b</i>
<b>T7</b>	3.276	80.398 <i>a</i>	72.657 <i>b</i>	89.887 <i>ab</i>
<b>T8</b>	3.253	80.491 <i>a</i>	73.148 <i>b</i>	91.141 <i>ab</i>
<b>Mean ± Standard-error</b>		80.397±1.088	89.876±0.653	88.306±0.660

Different alphabets on means in a column show significant differences at p<0.05.

There were no significant differences in egg weight between all treatments (Table 4). Several researchers have stated that force molting had little or no influence on egg weight [40] and [41]. [42] found no differences observed for egg weight, for the different levels of vitamin C in the molting diet. Such results in contrariwise with [36] who found no differences were observed for egg weight, for the different levels of vitamin C in the molting diet.

The heavy weight category birds had maximum egg weight followed by that of medium and small size groups [20]. [43] stated that the selection of quails for live body weight influenced egg weight due to increase in size of ova produced in the ovaries of females. These findings are also in quite conformity with those of [11] and [12] who observed that heavy eggs were obtained from the heavy birds and the small size birds produced the light eggs. It has further been indicated that a positive correlation exists between body weight and egg weight [44] and [45].

Chicks weight post-hatching was differed numerically, due to numerical differences in egg weight (Table 4). Due to the positive relationship between egg weight and chick weight. Such results can firm what was found earlier. [15] have shown that egg weight is a main factor affecting chick weight at hatch. Also, [46] reported that the difference in chick weight at hatching is due to egg size. [14] reported that there was a relationship between breeder age, egg size, and chick size. Egg size increases with breeder age, and that chick size is directly related to egg size [47].

Table- 4: Effect of body weight after molting on egg production performance.

<b>Treatments</b>	<b>Body Weight after Molting</b>	<b>Egg Weight (g)</b>	<b>Chick Weight (g)</b>
<b>T1</b>	3.783	69.523	41.605
<b>T2</b>	3.714	69.428	41.663
<b>T3</b>	3.458	69.317	41.698
<b>T4</b>	3.428	69.323	41.576
<b>T5</b>	3.380	69.491	41.594
<b>T6</b>	3.318	69.467	41.860
<b>T7</b>	3.276	68.969	41.323
<b>T8</b>	3.253	68.370	41.741
<b>Mean ± Standard-error</b>		69.211±0.202	41.632±0.130

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