Egyptian Poultry Science Journal

http://www.epsaegypt.com

ISSN: 1110-5623 (Print) – 2090-0570 (On line)

EFFECT OF FORCE MOLTING ON PRODUCTIVE PERFORMANCE OF SUDANI DUCKS

A. L. Awad; A. I. A. Ghonim and M. H. A. Fattouh
Anim. Prod. Res. Institute, Agric. Res. Center, Ministry of Agric. Dokki, Giza.

Received: 15/09/2014 Accepted: 13/11/2014

ABSTRACT: The present study aimed to investigate the effect of force molting procedures on the post molt performance and hatchability traits of Sudani ducks. Two hundred and forty Sudani laying ducks aged 65 weeks were randomly taken, weighted and divided into four experimental groups (each of three replicates). Ducks of the first group were fed ad-libitum and considered as control, the second group was force molted by fasting for 14 days, the third and fourth groups were force molted by feeding diets supplemented with Znic (1.0%) as Zinc oxide and Iodide (0.25%) as Potassium Iodide for 14 days, respectively. Photoperiod was natural daylight during force molting period, then increased to 16 h/d after molting. All ducks were fed the layer diet ad-libitum during the post-molting period.

Results indicated that all force molting treatments caused significant ($P \leq 0.01$) decrease in live body weight than the control (non-molted) after molting. Ducks molted by fasting recorded the highest average body weight than the control at the end of experimental period. Viability (%) was not significantly affected due to different force molting treatments during the whole experimental period. Force molting by both fasting and Iodide treatment had significantly ($P \leq 0.01$) higher laying rate and egg number and mass per duck than the control during the overall experimental period. Feed consumption was significantly ($P \leq 0.01$) decreased for duck molted by fasting and Zinc treatment, whereas, ducks molted by Iodide treatment consumed insignificantly lower amount of feed than the control group during the overall experimental period (71-90 wks of age). Feed conversion ratio was significantly ($P \leq 0.01$) improved for all force molting treatments as compared to the control group during the overall experimental period. Egg quality parameters were not affected due to varying force molting treatments than the control. All force molting treatments had significantly ($P \leq 0.01$) higher hatchability percentage of both

Key Words: Sudani ducks, molting methods, laying performance, fertility and hatchability.

Corresponding author: awad1512@yahoo.com

total set and fertile eggs than the control, while, fasting treatment recorded the best values than other force molting treatments. It is concluded that force molting by fasting treatment recorded the best values in productive performance followed by Iodide then Zinc treatment during the post molting period. So, force molting by fasting treatment could be used for Sudani laying ducks to maximize productivity and some hatchability traits during the second laying cycle.

INTRODUCTION

Local Sudani ducks have a dual purpose for meat and egg production, but their production cost was more expensive because of late sexual maturity age and low egg number per season as well as the inconsistent molting nature which appears during the production period (Awad et al., 2013). It is well known that egg production decreases as the age of the laying hen's increases. In order for a laying hen to enter a second or even a third production cycle, it should be exposed to force molting in order to rejuvenate the reproductive tract and allow hens to produce higher quality eggs (Keshavarz and Quimby, 2002).

Molting is a major event in the annual life cycle of most avian species, both wild and domestic. Induced molting is an important tool for the economic management of laying flocks. Forced molting has been widely used in commercial layer management with the aim of extending their productive life, thereby decreasing flock replacement costs (Mazzuco et al., 2011). Induced molt produces discreet changes at the endocrine and cellular levels that improve egg production and eggshell quality such as increasing plasma concentrations of $1,25(OH)_2D_3$ and increasing $1,25(OH)_2D_3$ receptors in egg shell gland as well as cellular proliferation in the shell gland is correlated with increased tissue receptivity to $1,25(OH)_2D_3$ and increases Ca-binding protein content as a result of it increases the level of the hormonal form of vitamin D and tissue sensitivity to the hormone (Berry, 2003).

In duck production, many factors trigger molting properties such as the lack of availability of feed, changes in the composition of the ration for ducks that are caged, displacement of cage, a nuisance animal, and an uncomfortable environment all of which can cause molting (Mumma et al., 2006). The appearance of molting is caused by different stresses and its incidence depends on each individual's resistance to such stress (Webster, 2000 and Duncan, 2001). Conventional induced molting methods have used fasting of ducks (Fattouh, 2001), supplementing dietary minerals such as Zinc (Ahmed et al., 2005; Yousaf and Ahmad, 2006; Koch et al., 2007 and Koelkebeck and Anderson, 2007), iodine, sodium, chloride, Ca, aluminum and copper or the use of anti – ovulatory drugs (Breeding et al., 1992; Keshavarz and Quimby, 2002 and Bell, 2003). Berry (2003) reported that dietary Zn, usually in the form of ZnO, is an effective agent for halting egg production and inducing molting. Zn, when fed at a level of 10,000 to 20,000 ppm/kg diet, which caused a complete cessation of egg production within 5-10 day. Feeding high dietary levels of I as potassium iodide (2,500 to 5,000 mg/kg diet) to hens resulted in complete cessation of egg production within 7 days with or without loss of feather (Berry, 2003). Generally, widely different molt techniques are used before the end of the first laying to force hens for molting and enter to a second egg laying cycle for extending laying flock performance (Salem et al., 2005 and El-Gendi et al., 2009). The present study was conducted to evaluate the capability of a high level of Zinc or Iodide in the diet and fasting, to induce force molting in local Sudani ducks breed and their effects on laying performance and some hatchability traits during post-molting period.

MATERIALS AND METHODS

The present study was conducted at El- Serw Research Station, Water Fowl branch, Rabbit, Turkey and Water Fowl Research Department, Animal Production Research Institute, Agricultural Research Center, Ministry of Agricultural, Egypt.

Bird's management and experimental design:-

A total of 240 Sudani ducks at 65-wks-old, were used, weighted and divided into four experimental groups, each of three replicates (16 ducks and 4 drakes). All birds were reared under similar hygienic and managerial conditions. Ducks of each replicate were housed at 2.3 ducks / m^2. Ducks were molted with the following techniques:-

1- The first group remained without any treatment through the experimental period as a control group.
2- The second group was molted by fasting for 14 days, then fed ad libitum a productive layer diet through the experimental period.
3- The third group was molted by feeding diet supplemented with 1.0 % Zinc as Zinc oxide for 14 days, then fed ad libitum a productive layer diet through the experimental period.
4- The fourth group was molted by feeding diet supplemented with 0.25% Iodide as potassium Iodide for 14 days, then fed ad libitum a productive layer diet through the experimental period

Ducks of all treatments except the fasting group were fed ad libitum during molting period and the photoperiod was natural daylight. Then, all ducks were provided the layer diets ad-libitum and the photoperiod was increased to 16 h/d after molting. The ingredients and chemical composition of the diet are given in Table 1.The experimental period was 26 wk, consisting of a 2-wk pre-experiment period and 4 wk during the molting period, followed by 20 wk of production.

Data collection and estimated parameters:-

1. **Body weight (BW):** All ducks were weighed per replicate at the start of the experiment and after 14 day of treatment, then at the end of the experimental period to determine the weight loss during molting and BW change during the experimental period. Mortality was recorded daily, then viability (%) was calculated.
2. Egg production : Egg number , egg mass and feed consumption were recorded for each replicate then averaged and expressed per duck / 4 wks through the experimental periods : 71-74, 75-78, 79-82, 83-86, 87-90 wks of age and the overall experimental period (71-90 wks of age). Laying rate and feed conversion ratio were calculated through the same periods.
3. Egg quality traits: Twenty eggs per treatment were collected randomly to determine the egg quality characteristics at 80 wks of age.
4. Hatchability traits: Hatching eggs of each treatment group were separately incubated at different ages. The incubated eggs were candled on the tenth day of incubation to determine fertility percentage. Fertility was estimated as number of fertile

eggs/number of eggs set. Hatchability was estimated as percentage of the number of hatched chicks to the number of total set or fertile eggs.

5. Statistical analysis: Data obtained were statistically analyzed using the General linear model of SAS (2004). A one- way model was used,

$Yij = \mu + Ti + eij$ where : Yij = An observation; μ = Overall mean; T = Effect of treatment ; i= (1,2,3 and 4) and eij = Random error. Differences between treatments means were compared using Duncan's multiple range test (Duncan, 1955).

RESULTS AND DISCUSSION

Results in Table 2 revealed significant differences (P≤0.01) among experimental treatments in live body weights (LBW) after molt and at the end of the experimental period, consequently. Changes of LBW were significantly affected due to different molting treatments of Sudani laying ducks. Force molting by both fasting and Zinc treatment resulted in a significant lower LBW after molting comparing to the control, whereas ducks molted by fasting treatment had significantly higher LBW than the control at the end of experimental period. Loss of LBW after molting was 1.54, 16.77, 7.01 and 4.02% for the control, fasting, Zinc and Iodide treatment than the initial BW for the same group. But, LBW was increased by 3.14, 30.72, 14.30 and 11.89% for the previous groups at the end of experimental period as compared with their weights after molting, respectively.

The decline in body weight of molting ducks was probably due to decrease of muscle mass, utilization of adipose tissue, decrease liver weight and/or involution of reproductive organs which accounted approximately 25% of body weight loss (Park et al., 2004). These results are in agreement with those obtained by Fattouh (2001) who reported that the percentages of body weight loss for Muscovy and Domyati ducks after molting by fasting (12 day) and Zinc oxide (20,000 ppm/kg diet) treatments were 15.3, 27.4, 14.6 and 24.0% than the control (non-molting) , respectively. Also, he reported that all force molting groups recovered the body weight loss and exceeded their initial body weights when re-fed after molting. Similar results were found by Ibrahim (1998) who showed that the hens in all force molting treatments resumed their body weight losses at 8 wks post-molting and increased their body weights.

Viability percentage (%) of Sudani ducks was not significantly affected by different force molting treatments (Table 2). This result may be due to molting is associated with thymic recrudescence and lymphocytic repopulation that may improve immune function in the hens (Berry, 2003), or may be due to the ducks have the ability to consuming resources made available by catabolism of abdominal and other fat depots and involution the ovary and oviduct which spares other fat and protein reserves during force molting period. This result is in agreement with those obtained by Reddy et al. (2008) who reported that viability rate not significantly affected due to force molting by fasting or Zinc oxide treatment.

Laying performance of Sudani ducks:

Results of Table 3 showed significant differences (P≤0.01) among the experimental groups in egg number (EN) per duck and laying rate % during all periods. Egg number per duck and laying rate were significantly improved by force molting with Zinc treatment during 71-74 and 75-78 wks of age as compared to the control group, whereas, the previous traits were significantly decreased during 83-86 and 87-90 wks of age. Force molting by fasting treatment resulted in a significant higher EN per duck and laying rate during 75-78, 79-82 and 71-90 wks of age as compared to the control, whereas, it was insignificantly higher at 83-86 and 87-90 wks. Laying rate and EN per duck were significantly ($P \leq 0.01$) higher by force molting with Iodide treatment at all the experimental periods except of 71- 74 wks of age as compared to the control group. Significant improvement in EN per duck and laying rate were noticed as a result of force molting by both fasting and Iodide treatments (15.68 and 12.92%) than the control during the overall experimental period (71-90 wks of age), whereas, force molting by Zinc treatment had insignificant higher (5.71 and 5.69 %). The best force molting treatment was fasting followed by Iodide then Zinc for improving EN per duck and laying rate for Sudani ducks as compared to the control (non-molting).

It is well known that egg production decreases as the age of the laying hens increases. In order for a laying hen to enter a second or even a third production cycle, it is exposed to force molting in order to rejuvenate the laying hens reproductive tract and allow hens to produce higher quality eggs (Keshavarz and Quimby, 2002). 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 or another possible reason for improved egg production is the length of egg production cessation period (Hassanabadi and Kermanshahi, 2007). The increase of egg production after force molting mainly due to the rest-period which resulted in recycling and rejuvenating of the molted hens for another season of egg production (El-Gendi et al., 2009). Improvement of egg production after molting by Iodide treatment may be due to thyroid participation in molting, which led to increase in possible interactions of ovarian steroids with thyroid hormones (Berry, 2003), or may be Iodide plays a major role in thyroid activity which affect in the basal metabolic rate. These results are in agreement with those obtained by Fattouh (2001) who found that EN per Muscovy duck was significantly improved by 115.34 and 77.35% for ducks molted by fasting (12 day) and Zinc oxide (20,000 ppm/kg diet) treatment than the control, whereas, it was 104.69 and 94.11 for Domyati ducks during the following weeks up to 18 weeks after molting, respectively. Force molting by fasting treatment had significantly increased egg number and laying rate for Muscovy and Domyati ducks (Fattouh, 2001) and poultry hens (Abd El-Kader, 1997) than other force molting treatments, while, Ibrahim (1998) found that the hens molted by Zinc oxide treatment increased egg production during 0-16 wks after molting than the control. Similarly, El-Gendi et al. (2009) found that non- molted hens had significantly the lowest rates of egg production at all experimental intervals after molting. Hassanabadi and Kermanshahi (2007) and Reddy et al. (2008) reported that fasting force molting method appears to be better egg production than the Zinc oxide (20,000 ppm/kg diet) method in broiler breeder hens. Mazzuco et al. (2011) found a significant improvement ($P \leq 0.01$) of all egg production traits as a result of using different force molting treatments than those non-molted birds.

Significant effects were found on egg weight (EW) and egg mass (EM) per duck due to experimental treatments (Table 4). Force molting by fasting treatment resulted in significantly ($P \leq 0.05$) heavier EW as compared with the control and those molted with Iodide treatment groups at 71-74 wks of age only. Also, EW was significantly improved by force molting with Zinc treatment as compared to those molted by Iodide treatment at 87-90 wks of age. Egg weight was insignificantly heavier by force molting with fasting and Zinc treatments compared to the control during the overall experimental period (71-90 wks of age), whereas, force molting by Iodide treatment resulted in lighter egg weight. These results are in line with Hassanabadi and Kermanshahi (2007) who found that egg weight at the peak of post-molting production was not significantly different between the molted and non-molted birds.

Egg mass (EM) per duck was significantly (P≤0.01) improved by force molting with Iodide treatment during all experimental period except for the first period (71-74 wks of age) as compared to the control, whereas, force molting by fasting treatment had significantly better EM per duck during 75-78 , 79-82 wks of age and the overall experimental period than the control. Force molting by Zinc treatment resulted in lower EM per duck during 79-82, 83-86 and 87-90 wks of age than the control, whereas, it had insignificantly higher EM at the overall experimental period. Force molting by fasting and Iodide treatments resulted in a significant higher EM per duck than the control group during the overall experimental period. These results may be due the different changes at the endocrine and cellular levels that improve egg production and eggshell quality as a result of force molting (Berry, 2003). These results are in agreement with those obtained by Abd El-Kader (1997) who reported that hens molted by fasting treatment had significantly higher egg mass compared to the control and those molted by Zinc oxide treatment. Fattouh (2001) found that egg mass per Muscovy duck was significantly improved by 150.8 and 96.5% than the control group by force molting with fasting (12 day) and Zinc oxide (20,000 ppm/kg diet) treatment during 18 wks after molting, whereas, it was recorded 116.7 and 118.6 % for Domyati duck under the same treatments during 12 wks post-molt.

Significant differences (P≤0.01) were observed among the experimental groups in feed consumption (FC) and feed conversion ratio (FCR) during all experimental periods (Table 5). Feed consumption per duck (kg / duck / 28 days) was significantly (P≤0.01) decreased by force molting with Zinc treatment than the control during all studied periods, whereas, force molting by fasting treatment resulted in a significant decrease in FC per duck than the control during all experimental period except 75-78 and 87-90 wks of age. On the other hand, force molting by Iodide treatment resulted in insignificant effects in FC than the control during all experimental periods except the first period (71-74 wks of age). However, FC per duck was significantly (P≤0.01) decreased by about 12.25 and 6.20 %, respectively for groups molted by Zinc and fasting treatments as compared to the control during the overall experimental period (71-90 wks of age), while force molting by Iodide treatment was insignificantly decreased by about 3.31 %. Similar results were found by Fattouh (2001) who reported that molted Muscovy and Domyati ducks by fasting and Zinc oxide treatments consumed less daily feed than the control during post molting period (18 wks), whereas, Ibrahim (1998) found that daily feed intake per hen throughout the experimental period post molting (24 wks) did not significantly affected among force molting treatments than the control.

Feed conversion ratio (g. feed / g. egg mass) was significantly (P≤0.01) improved due to force molting by fasting and Iodide treatments during all interval periods except of the first period (71-74 wks of age) as compared to the control group, whereas, force molting by Zinc treatment had significantly improved during 71-74 , 75-78 and 71-90 wks of age only (Table 5). The improvement of FCR was 19.15, 17.84 and 13.91 %, respectively for the groups molted by fasting, Zinc and Iodide treatments as compared to the control during the overall experimental period (71-90 wks of age). Improvement of feed conversion ratio may be due to that all force molting groups were consumed less amount of feed and produced more egg mass than the control during all experimental intervals and the whole experimental period. Also, this may be due to the additive minerals such as Zinc has a protective role on pancreatic tissue against oxidative damage, it may help the pancreas to function properly including secretions of digestive enzymes, thus improving digestibility of nutrients (Mazzuco et al., 2011).These results are in line with those obtained by Fattouh (2001) who reported that feed conversion ratio for egg production was significantly better for Domyati ducks which molted by fasting and Zinc oxide treatments (3.38 and 3.57) than the control (7.59) during 12 wks after molting, whereas, it was recorded 4.68 , 5.51 and 10.88 for molted Muscovy ducks by fasting and Zinc oxide treatment than the control (un-molted), respectively during 18 wks after molting.

Fertility and hatchability traits:

Fertility and hatchability percentages as well as ducklings weights at hatch for molted Sudani ducks are presented in Table 6. The statistical analysis of data showed no significant differences among treatments in egg fertility and chick weights, while hatchability percentage of total set and fertile eggs was significantly differed ($P \leq 0.01$) compared to the control group. The hatchability percentage was significantly improved by 14.89, 8.94 and 9.20 % of total set eggs and 21.98, 17.91 and 13.21 % of fertile eggs, respectively for the groups molted by fasting, Zinc and Iodide treatments as compared to the control. Duckling weights at hatch were insignificantly heavier by 1.90 to 2.14% for different force molting groups than the control, whereas, fertility percentage of eggs was insignificantly decreased by 3.29 to 7.79%. Similar results were found by Abd El-Kader (1997) who reported that the different treatments of force molting resulted in insignificant lower values of fertility percentages and had significantly the best values of hatchability percentages of fertile eggs compared to the control, whereas, the fasting treatment had the best fertility and hatchability values than high Zinc. Reddy et al. (2008) found that no significant difference in fertility due to different force molting methods in broiler breeder hens. Also, Ibrahim (1998) found that all force molting treatments had significantly improved hatchability percentages, but fasting treatment recorded the best hatchability value. Fattouh (2001) found that hatchability of Muscovy duck eggs was improved by 3.2 and 5.1% by force molting either fasting (12 day) or Zinc (20,000 ppm/ kg diet) treatments than the control, whereas, it was significantly improved by 10.84 and 10.03% of Domyati duck eggs, respectively. In contrary, he found that all force molting treatments resulted in a significant improvement in fertility percentage for Muscovy and Domyati duck eggs than the control.

Egg quality characteristics:

Data on egg quality measurements which produced by molted Sudani ducks are presented in Table 7. No significant differences were observed among the experimental groups in egg quality parameters at 16 wks-post molting (80 wks of age). These results may be due to that egg is produced during a very short period of time, and therefore depends on the availability of nutrients at the time it is formed, independently of the molting period. These results are consistent with those observed by Molino et al. (2009) and Hassanien (2011) who did not find any effects of treatments to induce molting on post-molting egg quality.

CONCLUSION

Generally, the force molting by fasting treatment recorded the best values in productive performance followed by Iodide then Zinc treatments during the post molting laying period. So, force molting by fasting treatment could be used for Sudani laying ducks to maximize productivity and some hatchability traits during the second laying cycle.

Table (1): Composition and calculated analysis of the experimental diet.

Ingredients	%
Yellow corn	67.10
Soya bean meal (44%)	17.75
Gluten meal (60%)	05.35
Di-calcium phosphate	01.70
Limestone	07.30
Vit. & Min. premix *	00.30
Salt (NaCl)	00.30
DL. Methionine (97%)	00.20
Total	100.00
Calculated analysis **	
Crude protein %	17.01
ME (Kcal / kg)	2851
Calcium (%)	03.21
Av. phosphorus (%)	00.43

*Each 3 kg of the Vit. and Min. premix containing: Vit. A 10 MIU, Vit. D 2 MIU, Vit E 10 g, Vit. K 2 g, Thiamin 1 g, Riboflavin 5 g, Pyridoxine 1.5 g, Niacin 30 g, Vit. B_{12} 10 mg, Pantothenic acid 10 g, Folic acid 1.5 g, Biotin 50 mg, Choline chloride 250 g, Manganese 60 g, Zinc 50 g, Iron 30 g, Copper 10 g, Iodine 1g, Selenium 0. 10 g, Cobalt 0.10 g. and carrier $CaCO_3$ to 3000 g.

** According to NRC (1994)

Table (2): Effect of different force molting treatments on body weight and weight change for Sudani ducks.

Parameters	Control	Force molting treatments			Sig.
		Fasting	Zinc	Iodide	
Body weight, g					
Before molt (B)	1618.3±47.6	1610.0±10.0	1561.7±15.6	1576.7±14.5	NS
After molt (A)	1593.3±43.9 [a]	1340.0±15.0 [c]	1452.3±17.0 [b]	1513.3±15.3 [b]	0.01
End experiment (E)	1643.3±37.5 [b]	1751.7±20.1 [a]	1660.0±25.0 [b]	1693.3±18.0 [ab]	0.05
Change of body weight , g					
A - B	- 25.0±9.0 [d]	- 270.0±10.0 [a]	- 109.4±8.0 [b]	- 63.4±5.8 [c]	0.01
E - A	+ 50.0±11.5 [c]	+ 411.7±12.1 [a]	+ 207.7±9.0 [b]	+ 180.0±10.0 [b]	0.01
E - B	+ 25.0±10.4 [c]	+ 141.7±11.0 [a]	+ 98.3±10.4 [b]	+ 116.7±7.0 [b]	0.01
Viability %					
65- 90 wks of age	98.33±1.67	96.67±1.67	98.33±1.67	100.0±0.0	NS

a,b,c :means in the same row within each item with different superscripts are significantly different (P≤ 0.05).
NS = not significant

Table (3): Effect of different force molting treatments on egg number per duck and laying rate of Sudani ducks.

Age (wks)	Control	Force molting treatments			Sig.
		Fasting	Zinc	Iodide	
Egg number per duck					
71 - 74	9.00 ±0.92 [b]	7.98 ±0.50 [b]	13.25±0.66 [a]	7.86 ±1.17 [b]	0.01
75 - 78	10.60±0.58 [c]	14.52±0.36 [a]	12.50±0.48 [b]	12.68±0.29 [b]	0.01
79 - 82	10.85±0.18 [c]	13.76±0.15 [a]	10.68±0.49 [c]	11.90±0.24 [b]	0.01
83 - 86	10.72±0.16 [b]	11.93±0.40 [b]	8.89 ±0.39 [c]	13.32±0.48 [a]	0.01
87 - 90	6.60 ±0.13 [b]	7.08 ±0.19 [b]	5.18 ±0.21 [c]	8.18 ±0.27 [a]	0.01
71 - 90	47.77±1.07 [c]	55.26±0.59 [a]	50.50±0.28 [bc]	53.94±0.02 [ab]	0.01
Laying rate, %					
71 - 74	32.14±3.30 [b]	28.49±1.78 [b]	47.34±2.35 [a]	28.07±4.19 [b]	0.01
75 - 78	37.86±2.07 [c]	51.84±1.29 [a]	44.62±1.70 [b]	45.29±1.04 [b]	0.01
79 - 82	38.75±0.63 [c]	49.14±0.55 [a]	38.14±1.74 [c]	42.52±0.86 [b]	0.01
83 - 86	38.27±0.57 [b]	42.59±1.43 [b]	31.74±1.40 [c]	47.56±1.73 [a]	0.01
87 - 90	23.57±0.45 [b]	25.29±0.70 [b]	18.51±0.75 [c]	29.21±0.97 [a]	0.01
71 - 90	34.12±0.76 [c]	39.47±0.42 [a]	36.07±0.20 [bc]	38.53±1.26 [ab]	0.01

a,b,c :means in the same row within each item with different superscripts are significantly different (P≤ 0.05).

Table (4): Effect of different force molting treatments on egg weight and egg mass per duck of Sudani ducks.

Age (wks)	Control	Force molting treatments			Sig.
		Fasting	Zinc	Iodide	
Egg weight, g					
71 - 74	67.0±0.1[b]	70.9±0.3 [a]	69.8±0.4[ab]	68.3±0.9 [b]	0.05
75 - 78	72.5±1.1	73.1±1.2	72.8±0.5	73.1±0.3	NS
79 - 82	71.7±0.1	71.1±0.7	72.2±0.3	71.7±0.6	NS
83 - 86	71.2±1.3	70.1±0.2	72.7±1.4	70.1±0.8	NS
87 - 90	72.6±1.5 [ab]	72.0±0.6 [ab]	74.6±0.6 [a]	70.4±1.4 [b]	0.05
71 - 90	71.4±0.7	71.5±0.3	72.0±0.1	70.9±0.2	NS
Egg mass (g) per duck					
71 - 74	620.3±62.4 [b]	565.2±33.6 [b]	924.6±49.9 [a]	536.5±80.8[b]	0.01
75 - 78	767.4±38.4 [c]	1063.1±9.9 [a]	909.2±29.2[b]	926.6±25.2[b]	0.01
79 - 82	777.6±13.4[c]	979.2±19.2[a]	770.3±32.3[c]	853.3±9.8[b]	0.01
83 - 86	763.9±25.4[b]	837.0±29.1[ab]	645.2±16.0[c]	934.3±43.3[a]	0.01
87 - 90	479.8±18.4[b]	509.5±10.0[b]	386.5±13.5[c]	575.4±8.2[a]	0.01
71 - 90	3408.9±44.7[c]	3950.0±25.1[a]	3635.8±21.5[bc]	3826.3±35.6[ab]	0.01

a,b,c :means in the same row within each item with different superscripts are significantly different (P≤ 0.05).
NS = not significant

Table (5): Effect of different force molting treatments on feed consumption and feed conversion ratio for Sudani ducks.

Age (wks)	Control	Force molting treatments			Sig.
		Fasting	Zinc	Iodide	
Feed consumption (kg/duck)					
71 - 74	3.74±0.04[a]	3.43 ±0.02[b]	3.13 ±0.01[c]	3.49 ±0.04[b]	0.01
75 - 78	4.36 ±0.02[ab]	4.30 ±0.01[bc]	4.19 ±0.01[c]	4.43 ±0.06[a]	0.01
79 - 82	4.34 ±0.02[a]	4.09 ±0.02[c]	4.19 ±0.02[bc]	4.24 ±0.06[ab]	0.01
83 - 86	4.27 ±0.02[a]	3.74 ±0.01[b]	3.59 ±0.21[b]	3.96 ±0.09[ab]	0.05
87 - 90	4.11 ±0.04[a]	3.97 ±0.05[a]	3.17 ±0.11[b]	4.01 ±0.08[a]	0.01
71 - 90	20.82±0.11[a]	19.53±0.05[b]	18.27±0.28[c]	20.13±0.33[ab]	0.01
Feed conversion ratio (g. feed: g. egg mass)					
71 - 74	6.06±0.69 [a]	6.09±0.39[a]	3.39±0.17[b]	6.52±1.04 [a]	0.05
75 - 78	5.69±0.30 [a]	4.05±0.05[c]	4.60±0.14[bc]	4.78±0.20 [b]	0.01
79 - 82	5.59±0.08 [a]	4.18±0.10[c]	5.45±0.26[ab]	4.97±0.13[b]	0.01
83 - 86	5.60±0.16 [a]	4.48±0.15 [b]	5.57±0.21 [a]	4.25±0.30 [b]	0.01
87 - 90	8.58±0.32 [a]	7.79±0.07 [b]	8.20±0.12 [ab]	6.96±0.05 [c]	0.01
71 - 90	6.11±0.11 [a]	4.94±0.04 [b]	5.02±0.07 [b]	5.26±0.27 [b]	0.01

a,b,c :means in the same row within each item with different superscripts are significantly different (P≤ 0.05).

Table (6): Effect of different force molting treatments on fertility and hatchability traits for Sudani duck eggs.

Traits	Control	Force molting treatments			Sig.
		Fasting	Zinc	Iodide	
Fertility (%)	83.33±3.05	78.19±1.83	76.84±3.08	80.14±2.53	NS
Hatchability of set eggs (%)	47.74±1.32 [b]	54.85±2.94 [a]	52.01±1.54 [a]	52.13±0.62 [a]	0.01
Hatchability of fertile eggs (%)	57.55±3.24 [b]	70.20±2.54 [a]	67.86±2.24 [a]	65.15±1.45 [a]	0.01
Duckling Wt. (g)	44.82±0.55	45.78±0.053	45.67±0.50	45.71±0.68	NS

a,b :means in the same row within each item with different superscripts are significantly different (P≤ 0.05).
NS = not significant

Table (7): Effect of different force molting treatments on egg quality traits for Sudani ducks at 80 wks of age.

Traits	Control	Force molting treatments			Sig.
		Fasting	Zinc	Iodide	
Egg Wt. , g	71.72±1.58	72.51±2.03	71.80±1.13	73.02±1.39	NS
Egg shell Wt., %	13.17±0.20	13.72±1.02	13.38±0.24	13.33±0.62	NS
Yolk Wt., %	36.31±1.47	35.83±1.43	36.38±0.50	35.69±1.55	NS
Albumen Wt., %	50.52±1.52	50.45±0.73	50.24±0.61	50.90±1.80	NS
Shape index, %	74.94±2.90	75.55±1.57	74.61±0.70	72.08±1.85	NS
Yolk index, %	41.56±2.91	42.44±2.40	41.78±0.92	43.90±1.94	NS
Shell thickness, mm	00.40±0.02	00.39±0.01	00.40±.01	00.39±0.01	NS

NS = not significant

REFERENCES

Abd El-Kader, A.H. (1997). Effect of force molting on laying performance, egg quality and hatching results of some local strain. Ph. D. Thesis, Agric. Fac., Zagazig Univ., Egypt.

Ahmed, A.M.H. ; A.B. Rodriguenz-Navarro; M.L. Vidal; J. Goutron; J.M. Garcia-Ruiz and Y. Nys (2005). Changes in the eggshell properties, crystallographic texture and in matrix proteins induced by molt in hens. Br. Poult. Sci., 46: 268- 279.

Awad, A. L.; Kout Elkloub, M. El. Moustafa; A.I.A. Ghonim and Nehad, A. Ramadan (2013). Comparative study for different levels of energy and protein in local duck breeds rations during laying period. Egypt. Poult. Sci., 33: 825-847.

Bell, D. D. (2003). Historical and current molting practices in the US table egg industry. Poult. Sci., 82:965–970.

Berry, W. D. (2003). The physiology of induced molting. Poult. Sci., 82:971–980.

Breeding, S. W.; J. Brake; G. D. Garlich and A. L. Johnson (1992). Molt induced by dietary Zinc in a low-calcium diet. Poult. Sci., 71:168–180.

Duncan, I.J.H. (2001). Animal welfare issues in the poultry industry: Is there a lesson to be learned. J. Appl. Anim. Welf. Sci., 4:207- 221.

Duncan, D.B. (1955). Multiple range and multiple F tests. Biometrics, 11:1-42.

El-Gendi, G. M.; H. R. Samak and A. A. Mohamed (2009). Effect of induced molting on some productive and physiological traits in HY-Line hens. Egypt. Poult. Sci. ,29: 385-405.

Fattouh, M.H. (2001). Improvement of productive performance of ducks. Ph. D. Thesis, Agric. Fac., Mansura Univ., Egypt.

Hassanien, H.H.M. (2011). Effect of force molting programs on egg production and quality of laying hens. Asian J. Poult. Sci., 5 : 13-20.

Hassanabadi, A. and H. Kermanshahi (2007). Effect of Force Molting on Postmolt Performance of Laying Hens. Inte. J. Poult. Sci.,6 : 630-633.

Ibrahim, M.A.B. (1998). Studies on some economical traits in chickens. Ph. D. Thesis, Agric. Fac., Mansura Univ., Egypt.

Keshavarz, K. and F. W. Quimby (2002). An investigation of different molting techniques with an emphasis on animal welfare. J. App. Poult. Res., 11:54–67.

Koch, J.M.; D.C. Lay; K.A. Macmunn; J.S. Moritz and M.E. Wilson (2007). Motivation of hens to obtain feed during a molt induced by feed withdrawal, wheat middlings or melengesterol acetate. Poult. Sci., 86 : 614-620.

Koelkebeck, K.W. and K.E. Anderson (2007). Molting layers alternative methods and their effectiveness. Poult. Sci., 86: 1260-1264.

Mazzuco, H.; V. S. Avila ; A. Coldebella ; R. Mores ; F. R. F. Jaenisch and L. S. Lopes (2011). Comparison of the effect of different methods of molt: Production and welfare evaluation. Poult. Sci., 90 :2913–2920.

Molino, A.B.; E.A. Garcia; D.A. Berto; K. Pelícia; A.P. K, Silva and F. Vercese (2009). The effects of alternative forced-molting methods on the performance and egg quality of commercial layers. Brazilian J. Poult. Sci., 11: 109-113.

Mumma, J. O.; J. P. Thaxton; Y. Vizzier-Thaxton, and W. L. Dodson (2006). Physiological stress in laying hens. Poult. Sci. 85:761–769.

NRC (1994). Nutrient Requirements of Poultry. 9th rev. ed. National Academy Press, Washington, DC.

Park, S. Y. ; S.G. Birkhold ; L.F. Kubina ; D.J. Nisbet and S.C. Ricke (2004). Effects of high Zinc diets using Zinc propionate on molt induction, organs and postmolt egg production and quality in laying hens. Poult. Sci., 83:24-33.

Reddy, V.; V.K. Malathi and B.S. Venkatarami (2008). Effect of induced molting in male and female line broiler breeder hens by Zinc oxide and feed withdrawal methods on post molt performance parameters. Inter. J. Poult. Sci., 7: 586-593.

Salem, A.A.; Eman M. Abo-Etta and M.E. Nofal (2005). Productive and physiological performance of local laying hens as affected by force molting methods. Egypt. J. Appl. Sci., 20:12-31.

SAS (2004). SAS / DSTAT User s Guide. SAS Institute Inc., Cary,Nc.

Webster, A.B. (2000). Behaviour of White Leghorn hens after withdrawal of feed. Poult. Sci., 79:192- 200.

Yousaf, M. and N. Ahmad (2006). Effects of housing systems on productive performance of commercial layers following induced molting by aluminium oxide supplementation. Pak. Vet. J., 26: 101-104.

الملخـــص العربـــي

تأثير القلش الإجبارى على الأداء الإنتاجى للبط السودانى

عوض لطفى عوض ، أيمن ابراهيم عبده غنيم ، محمد حسن عبدالعزيز فتوح
معهد بحوث الإنتاج الحيواني – مركز البحوث الزراعية- وزارة الزراعة – دقي – جيزة

أستخدم في هذه الدراسة عدد ٢٤٠ طائر بط من سلالة السوداني عمر ٦٥ أسبوع (١٩٢ أنثى +٤٨ ذكر) تم وزن و تقسيم الطيور عشوائيا إلى أربع مجاميع تجريبية بكل مجموعة ثلاث مكررات متساوية وذلك لدراسة تأثير إستخدام المعاملات المختلفة للقلش الإجبارى (كنترول ، التصويم ، إضافة الزنك بمعدل ٠,١% ، إضافة اليود بمعدل ٠,٢٥ % للعليقة) لمدة ١٤ يوم على أداء إنتاج البيض ومقاييس جودة البيض وصفات التفريخ. تم تسجيل وزن الجسم في بداية المعاملات وبعد انتهائها وفى نهاية التجربة ، تم تسجيل عدد البيض ووزنه لكل مكررة وتم تسجيل العليقة المستهلكة وعدد النافق خلال فترة التجربة، وتم إجراء تجربة تفريخ للبيض الناتج لتقدير نسبتي الخصوبة والفقس، كما تم إجراء إختبار الجودة للبيض الناتج. وتم حساب كفاءة التحويل الغذائي لإنتاج البيض خلال فترة التجربة وكذلك الحيوية.

وبتحليل النتائج اتضح الآتي :

لوحظ إنخفاض معنوي في وزن الجسم لكل معاملات القلش الإجبارى بعد انتهاء فترة القلش مقارنة بالكنترول بينما إرتفع وزن الجسم معنويا لمعاملة التصويم مقارنة بالكنترول عند نهاية التجربة. كما لم تتأثر حيوية الطيور معنويا بمعاملات القلش الإجبارى المختلفة خلال الفترة الكلية للتجربة مقارنة بالكنترول. كما وجد تحسن معنوي لكل من عدد وكتلة البيض لكل بطة ومعدل وضع البيض نتيجة للقلش بالتصويم مقارنة بالكنترول خلال الفترة الكلية للتجربة (٧١-٩٠ أسبوع من العمر) بينما كان هذا التحسن غير معنوي فى معاملات الزنك واليود .

لوحظ إنخفاض كمية العليقة المستهلكة معنويا للبط نتيجة القلش بالتصويم والزنك مقارنة بالكنترول بينما كان الإنخفاض غير معنوي بالقلش باليود خلال الفترة الكلية للتجربة (٧١-٩٠ أسبوع من العمر) . كما تحسنت الكفاءة الغذائية لإنتاج البيض معنويا لجميع معاملات القلش الإجبارى مقارنة بالكنترول خلال الفترة الكلية للتجربة بينما سجلت المعاملة بالتصويم أفضل القيم مقارنة بالمعاملات الأخرى.

لوحظ عدم تأثر صفات جودة البيض المدروسة بالمعاملات المختلفة للقلش الإجبارى مقارنة بالكنترول. تحسنت نسبة الفقس عند تقديرها على أساس عدد البيض الكلى الموضوع أوالمخصب لكل معاملات القلش الإجبارى مقارنة بالكنترول وكانت المعاملة بالتصويم أفضل تلك المعاملات .

من النتائج السابقة سجلت طريقة القلش بالتصويم أفضل القيم فى الأداء الإنتاجي خلال الفترة بعد القلش تلتها المعاملة بإضافة اليود (٠,٢٥%) ثم إضافة الزنك (٠,١%) للعليقة لمدة ١٤ يوم. لذلك يمكن التوصية بإستخدام طريقة القلش بالتصويم (١٤ يوم) لتحسين الأداء الإنتاجي وصفات التفريخ للبط السوداني لموسم ثاني لإنتاج البيض.