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THE EFFECT OF TAMOXIFEN ON SOME REPRODUCTIVE TRAITS IN TWO LOCAL CHICKEN STRAINS.

2. TAMOXIFEN AND PRODUCTIVE PERFORMANCE OF LAYING HENS.

By

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Abstract: *The present study was conducted to evaluate the responses of Tamoxifen (TAM) administration on sexual maturity, productive and reproductive performance and blood parameters in two local juvenile female strains. Ninety females from each of Gimmizah and Bandarah strains at four weeks of age were divided into three equal groups involving 30 chicks per each and injected intramuscularly with TAM twice a week through all experimental weeks. The first group was injected with 0.2 ml of sunflower oil and ethanol mixture (1:1, v/v) and served as a control, while the second and third groups were injected with 0.2 ml sunflower oil and ethanol mixture which contains 0.5 mg (0.5 TAM) and 1 mg TAM/Kg body weight (1 TAM), respectively. The experiment continued until 28 wks of birds' age. Highest significant (P≤0.05) body weight was recorded for birds group injected with 1 TAM compared with those for 0.5 TAM and control among all experimented ages. Besides, Gimmizah body weight hens were significantly heavier than Bandarah ones at 22 and 28 weeks of age. TAM treatment had no significant effects on feed consumption, mortality rate and egg weight. While, egg number and egg production percentage were significantly (P≤0.05) increased by TAM treatment compared with control group. Moreover, 1 and 0.5 TAM advanced the sexual maturity by 15 and 7 days, respectively as compared to control group. Besides, Bandarah hens were significantly lower and earlier than Gimmizah ones in egg number and age at first egg, respectively. Egg shell percentage and shell thickness were significantly higher in 1 TAM treatment than the other groups at 28 weeks of age. While, there were no significant differences between Gimmizah and Bandarah hens for all egg quality traits. Tamoxifen had no significant effects on egg shape index, Haugh unit, yolk (%), albumen (%), plasma cholesterol, calcium, GOT and GPT. Hematocrit and total lipids concentrations were significantly higher for all tamoxifen treated hens as compared to control, whereas, the significant increase in estradiol was observed in 1 TAM only compared to control. Tamoxifen enhanced relative weight of ovary at 17 and 28 weeks of age, while oviduct relative weight was significantly increased only at 17 weeks of age compared with the control group. Furthermore, Gimmizah hens had significantly (P≤0.05) higher ovary and oviduct percentage weights compared to those for Bandarah hens at 17 weeks of age only. Tamoxifen treatments had no significant influence on fertility and hatchability percentages. Injection of 1 TAM significantly increased hatched chicks weight compared with other groups. In conclusion, using 1 TAM advanced sexual maturity, improved egg number, egg production percentage, increased egg shell thickness, stimulated estrogen secretion and in turn increased ovary and oviduct percentages.*

Key words: ***Tamoxifen, sexual maturity, egg production, egg quality, estrogen, ovary, hatchability.***

INTRODUCTION

Tamoxifen (TAM), a trans isomer of triphenylethylene produces a wide spectrum of activity in different animals (**Patterson, 1981**). It serves as an estrogen agonist and antagonist in the uterus of rats, a sole agonist in the uterus of mice, and as a pure antagonist in the oviduct of hens (**Sutherland, 1981**). It was suggested by **Rozenboim *et al.* (1989)** that TAM has both antioestrogenic and oestrogenic effects on the White leghorn (WL) male, depending on the dose administered and it is not a pure antagonist. Furthermore, in juvenile WL females, low doses of TAM advanced ovarian and oviductal growth, increased plasma oestrogen and androgen, and caused precocious egg laying (**Jaccoby *et al.*, 1992**). Similarly, young Indian native Kadaknath fowl advanced ovarian and oviductal development and enhanced plasma estrogen and progesterone resulting in early egg production (**Biswas *et al.*, 2010**).

The present study evaluated the responses of TAM administration on sexual maturity, productive and reproductive performance and blood parameters in two local juvenile female strains.

MATERIALS AND METHODS

The present study was carried out at El-Sabahia Poultry Research Station (Alexandria), Animal Production Research Institute, Agricultural Research Center, Ministry of Agriculture. Ninety female chicks from each of Gimmizah and Bandarah local strains at four weeks of age were used. The experiment continued until 28 wks of age and the birds were kept in cages during the laying period. Birds were fed a basal diet as shown in Table 1. Experimental diets and water were offered *ad libitum* during the experimental period. The chicks from each strain were divided into three equal groups involving 30 chicks per each and injected intramuscularly with TAM twice a week starting from 4 weeks of age and through all experimental weeks. The treatments as follows: first group was injected with 0.2 ml sunflower oil and ethanol mixture (1:1, v/v) and served as a control, second group was injected with 0.5 mg TAM/Kg BW (0.5 TAM), third group was injected with 1 mg TAM/Kg BW (1 TAM). Tamoxifen was used as tamoxifen citrate (Amriya for Pharmaceutical Industries, Alexandria, Egypt) and dissolved in 0.2 sunflowers oil/ethanol mixture.

Body weight (kg) was recorded at 10, 16, 22 and 28 weeks of age. Feed consumption (g/bird/day) was measured through the experimental period from 4 to 28 weeks of age. Mortality was recorded daily, and mortality percentage was calculated. At 17 and 28 weeks of age, 5 hens of each group for each strain were slaughtered and blood samples were obtained to determine hematocrit then the samples were centrifuged and plasma stored at -20°C pending determination of total lipids, cholesterol, calcium, GOT and GPT using commercial Kits produced by Sentinel, Italy. Plasma estradiol was determined by using radioimmunoassay kits (Diagnostic Products Corporation, USA). Also, relative weights of liver, abdominal fat, ovary and oviduct were calculated as percentages of body weight. Egg weight was recorded daily (from age of first egg to 28 weeks of age) and egg production percentage was calculated. Ten eggs from each treatment for each strain were taken at 28 weeks of age to study egg shape index, egg shell (percentage and thickness), yolk and albumen percentages as well as Haugh unit. Laying hens for each strain from 26 to 28 wks of age were artificially inseminated twice a week with 0.05 mL undiluted semen from cocks of the same strains within the same age. Hatched eggs which collected daily were incubated three times as replicates in the Egyptian hand incubator through the last three weeks of experiment for detection fertility and hatchability percentages. Hatched chicks

from different treated groups for each strain were detected.

Data were statistically analyzed using two way analysis of variance by using SAS procedures **(SAS, 1996)**. All data percentages were transformed to their arcsine values before analysis and significant differences among means were determined by Duncan multiple range test **(Duncan, 1955)**.

RESULTS AND DISCUSSION

Body Weight, Feed Consumption and Mortality Rate

Highest significant ($P \leq 0.05$) body weight was recorded for birds group injected with 1 TAM compared with those for 0.5 TAM and control among all experimented ages at 10, 16, 22 and 28 wks (Table 2). Besides of that, Gimmizah had a significant heavier body weight than Bandarah hens at 22 and 28 weeks of age. The interaction between TAM and strain is significant, where, the highest body weight was observed at 10 and 16 weeks of age for 1 TAM treatment in Gimmizah and Bandarah hens, respectively. Moreover, Tamoxifen had no significant effects on feed consumption and mortality rate during experimental period (Table 2).This observation is contradicted with the results of **Jaccoby *et al.* (1992) and Biswas *et al.* (2010)** who showed that body weight of laying hens was not affected with any of TAM doses throughout the experiment. The effect of 1 TAM in represented data is similar to the effect of estrogen hormone so the increase in body weight may be due to the changes in carbohydrate metabolism induced by estradiol treatment which is intimately involved in glucose metabolism as reported by **Bell and Freeman (1971)**. No available information was detected in literatures regarding the effect of TAM on feed consumption and mortality rate.

Egg Production and Egg Weight

Tamoxifen had no significant effects on egg weight during experimental period (Table 3). While, egg number and egg production were significantly ($P \leq 0.05$) increased by TAM treatment. Moreover, TAM treatment advanced the onset of egg laying, thus the age at first egg was recorded at 113 days for 1 TAM , while, it was laid at 121 and 128 days for 0.5 TAM and control, respectively. Bandarah hens were significantly lower and earlier than Gimmizah ones in egg number and age at first egg, respectively. The interaction between TAM and strain is significant for age at first egg, where, the lowest age at first egg was observed for Gimmizah hens at 1 TAM treatment (113 days). The increase in egg number and egg production may be due to the estrogenic effect of tamoxifen which in turn activated and enhanced ovulatory process. As well as, **Hamdy *et al.* (2002)** reported that egg number and egg mass were significantly improved when Leghorn pullets and immature quail females were treated with estradiol and they found a significant positive correlation between egg mass and plasma estrogen concentrations. **Khalifa *et al.* (1983)** concluded that the improvement in egg production by estradiol can be explained by the physiological effect of estrogen upon the ovary and oviduct which causing their activation and enhancing ovulatory process. **Biswas *et al.* (2010)** indicated that no differences in egg weight for TAM treated for Kadaknath (Indian native fowl), but low doses of TAM advanced the onset of egg laying, thus the first egg for 0.5 and 1TAM groups was recorded at 145 and 135 days respectively. Also, **Jaccoby *et al.* (1992)** showed that the first egg was laid by a 1 TAM treated hen at 112 and by a 0.1 TAM at 117 day of age, while the first egg in the control group appeared at 126 day of age. **Zatter (1994) and Nawar (1995)** found that age at sexual maturity was negatively correlated with body weight at sexual maturity. This finding support our results as

the heaviest body weight for 1 TAM treatment reached the sexual maturity earlier than those for other groups. Moreover, **Shebl (1991); El-Bodgady *et al.* (1993) and Ghanem (1995)** showed that increasing in egg number and decreasing in egg weight were recorded with early age at sexual maturity birds.

Egg Quality

The results of egg quality traits are presented in Table 4. Irrespective of strain, it could be noticed that egg shape index, Haugh unit, yolk and albumen percentages were not significantly affected by TAM treatments at 28 weeks of age, while, egg shell percentage and shell thickness (mm) were significantly ($P \leq 0.05$) affected and highest records in 1 TAM treatment compared to other groups at the same ages. The increase in egg shell thickness due to 1 TAM treatment could affect and increase egg shell percentage. The interaction between treatment and strain was not significant among all traits. Also, no significant differences between Gimmizah and Bandarah hens were observed for all studied egg quality traits. Results herein are in agreement with the influence of estrogen on egg shell quality. **El-Afifi and Abu Taleb (2002)** mentioned the same conclusion that supplementation with estradiol benzoate on old egg-laying Japanese quail leads to improve eggshell weight and eggshell thickness. This can be attributed to the findings of **Soares (1984)** who suggested that exogenous estradiol can stimulate synthesis of 1,25 dihydroxycholicalciferol which save calcium required for egg shell deposition by increasing calcium absorption. **Grunder *et al.* (1983)** observed a good correlation between eggshell quality and circulating estradiol in laying hens.

Blood Constituents

Hematocrit (%) and total lipids (g/dl) concentrations were significantly higher for all tamoxifen - treated hens as compared to control, whereas, the significant increase in estradiol (ng/ ml) was observed in 1 TAM treatment only compared to control at 17 and 28 wks of age (Table 5). While, there were no significant differences in serum cholesterol, calcium, GOT and GPT among all treatments and strains at the same ages. Moreover, Gimmizah hens were higher than Bandarah in serum total lipids at 17and 28 weeks of age. The interaction between treatment and strain was not significant for all of the blood constituent traits. These results are in accordance with those reported by **Jaccoby *et al.* (1992)** who showed that hematocrit, total lipids and estrogen of the 1 TAM hens were higher than that of the control hens for most of the experimental periods. This effect of 1 TAM is similar to the effect of estrogen hormone as reported by **Pearce and Johnson (1986)** who found that estrogen administration caused a similar rise in blood total lipids in the immature fowl.

Relative Organs Weight

Relative weights of liver and abdominal fat were not significantly affected by any of the TAM treatment either at 17 or 28 wks of age, while, relative weight of ovary was significantly ($P \leq 0.05$) increased by two doses of TAM at both experimented ages. Also, oviduct relative weight was significantly increased only at 17 weeks of age compared with the control (Table 6). Gimmizah hens had significantly ($P \leq 0.05$) higher ovary and oviduct percentage weights compared to those for Bandarah hens at 17 weeks of age only. These results are in a good agreement with those of **Biswas *et al.* (2010)** who found that, administration of TAM might have caused precocious maturation of gonadal pituitary axis in Indian native Kadaknath hen that enhanced the ovarian steroidogenesis, thus increased plasma estrogen and progesterone level in a dose related manner. This elevated concentration of estrogen and progesterone was reflected in the weight of ovary and oviduct. In addition, **Johnson (1986) and Bacon *et al.* (1980)** reported that gonadal hormones regulate the rapid development of the

oviduct which occurs before and during sexual maturation.

Fertility and Hatchability Percentages

There were no significant differences in fertility and hatchability percentages among experimental groups or between chicken strains (Table 7). On the other hand, 1 TAM increased overall mean hatched chick weights compared with those for other groups. Moreover, Gimmizah hatchlings produced from laying hens injected with 1 TAM had the heaviest body weight compared with those of other treatments. Besides, Gimmizah hatched chicks were significantly ($P \leq 0.05$) heavier than Bandarah ones. Data presented in the current study regarding the increase of egg weight as demonstrated in Table 3 and in turn the increase of hatchling weight for 1 TAM in Gimmizah strain compared with those of other treatments added credence to that reported by **Abiola (1999)** who mentioned that there was a close correlation between egg weight and hatchling weight in domestic birds.

It may be concluded that 1 TAM advanced the sexual maturity by 15 as compared to control, improved egg number, egg production percentage, increased egg shell thickness, stimulated estrogen secretion and in turn increased ovary and oviduct percentages.

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

Ingredients	Starter (0- 8 wks)	Grower (9-12 wks)	Layer (13-28 wks)
Yellow corn	64.00	67.00	64.00
Soybean meal 44%	27.00	15.50	24.78
Wheat bran	4.50	13.70	1.00
Di-calcium phosphate	2.00	1.35	1.61
Limestone	1.85	1.80	7.91
DL-Methionine	0.10	0.10	0.10
Sodium chloride	0.30	0.30	0.30
Vit. & Min. Mixture*	0.25	0.25	0.30
Total	100.00	100.00	100.00
Calculated analysis:			
Metabolizable energy (Kcal/Kg)	2855.00	2783.00	2718.00
Crude protein %	18.15	14.64	16.02
Crude fiber %	3.37	3.64	3.46
Crude fat %	2.92	3.30	2.96
Calcium %	1.19	1.00	3.34
Available phosphorous %	0.52	0.40	0.42
Lysine %	0.91	1.02	0.89
Methionine %	0.36	0.49	0.39
Met+cystine %	0.54	0.76	0.66

*Supplied per kg diet: Vit A, 10000IU; Vit D_3, 2000 IU; Vit E, 10 mg; Vit K_3, 1 mg; Vit B_1, 1 mg; Vit B_2, 5mg; Vit B_6, 1.5 mg; Vit B_{12}, 10 mcg; Niacin, 30 mg; Pantothenic acid, 10 mg; Folic acid, 1 mg; Biotin, 50mcg; Choline, 260 mg; Copper,4 mg; Iron, 30 mg; manganese, 60 mg;Zinc, 50 mg; Iodine, 1.3 mg; Selenium, 0.1mg; Cobalt,0.1mg.

Table (2): Effect of tamoxifen (TAM) on body weight, feed consumption and mortality rate of Gimmizah and Bandarah laying hens at different ages (Means±S.E).

Age (Weeks)	Strain	Control	0.5 TAM	1 TAM	Overall mean
Body weight (kg)					
10	Gimmizah	0.756±0.007^{f}	0.800±0.009^{ef}	0.819±0.009^{d}	0.791±0.005
	Bandarah	0.741±0.007^{f}	0.791±0.006^{e}	0.816±0.008^{d}	0.783±0.005
	Overall mean	0.749±0.005^{c}	0.795±0.006^{b}	0.817±0.007^{a}	
16	Gimmizah	1.271±0.018^{e}	1.253±0.014^{e}	1.281±0.016^{c}	1.269±0.009
	Bandarah	1.191±0.017^{f}	1.250±0.017^{e}	1.353±0.013^{d}	1.264±0.011
	Overall mean	1.231±0.013^{b}	1.252±0.011^{b}	1.317±0.011^{a}	
22	Gimmizah	1.527±0.012	1.553±0.018	1.611±0.010	1.564±0.009^{A}
	Bandarah	1.426±0.017	1.466±0.019	1.545±0.020	1.479±0.012^{B}
	Overall mean	1.476±0.012^{c}	1.510±0.014^{b}	1.578±0.012^{a}	
28	Gimmizah	1.496±0.20	1.540±0.022	1.650±0.026	1.562±0.014^{A}
	Bandarah	1.554±0.023	1.507±0.017	1.516±0.020	1.525±0.012^{B}
	Overall mean	1.525±0.016^{b}	1.523±0.014^{b}	1.583±0.016^{a}	
Feed consumption (g/bird/day)					
10	Gimmizah	49.90±1.11	50.52±1.00	50.31±0.92	50.24±0.86
	Bandarah	50.00±0.95	51.03±0.85	50.70±0.85	50.58±0.65
	Overall mean	49.95±0.86	50.77±0.76	50.51±0.73	
16	Gimmizah	61.70±2.21	62.10±1.87	62.30±2.13	62.03±1.78
	Bandarah	62.00±2.00	62.35±1.65	62.45±2.34	62.27±1.55
	Overall mean	61.85±1.90	62.23±1.00	62.38±1.91	
22	Gimmizah	91.20±3.33	91.37±2.95	91.50±2.48	91.36±2.55
	Bandarah	92.00±3.17	92.10±2.53	92.52±2.57	92.12±2.61
	Overall mean	91.60±3.00	91.74±2.11	91.88±2.10	
28	Gimmizah	110.85±3.77	111.11±3.96	111.21±3.23	111.06±2.96
	Bandarah	111.02±4.10	111.37±4.12	111.57±3.75	111.32±3.27
	Overall mean	110.94±3.51	111.24±3.60	111.39±3.03	
Mortality rate (%)					
4 -28	Gimmizah	6.67±1.00	10.00±2.00	10.00±2.00	8.89±1.00
	Bandarah	10.00±1.50	6.67±1.50	10.00±2.00	8.89±1.00
	Overall mean	8.34±1.00	8.34±1.00	10.00±1.00	

a,b,c = Means having different letters exponents within each row are significantly different at $P \leq 0.05$.
d,e,f = Means within age of hens by tamoxifen injection interaction effect within no common superscript differ significantly ($P \leq 0.05$).
A, B = Means having different letters exponents within each column are significantly different at $P \leq 0.05$.

Table (3): Effect of tamoxifen (TAM) on egg production traits and age at first egg of Gimmizah and Bandarah laying hens (Means ± SE).

Traits	Strain	Control	0.5 TAM	1 TAM	Overall mean
Egg weight (g)	Gimmizah	47.53±0.38	48.12±0.64	48.95±0.42	48.20±0.29
	Bandarah	48.77±0.48	47.61±0.49	47.97±0.45	48.12±0.28
	Overall mean	48.15±0.35	47.86±0.40	48.46±0.33	
Egg number (hen/month)	Gimmizah	17.82±0.50	18.67±0.72	19.01±0.61	18.50 ± 0.37^{A}
	Bandarah	17.12±0.56	18.20±0.62	18.27±0.58	17.86 ± 0.35^{B}
	Overall mean	17.47 ± 0.40^{b}	18.43 ± 0.48^{a}	18.83 ± 0.45^{a}	
Egg production (%)	Gimmizah	59.04±1.70	62.00±2.40	63.47±2.03	61.50±1.26
	Bandarah	57.07±1.89	60.67±2.01	60.89±1.92	59.54±1.17
	Overall mean	58.06 ± 1.32^{b}	61.34 ± 1.60^{a}	62.18 ± 1.51^{a}	
Age at first egg (days)	Gimmizah	128 ± 1.10^{d}	129 ± 1.38^{d}	113 ± 0.60^{e}	123 ± 1.00^{A}
	Bandarah	127 ± 1.28^{d}	116 ± 0.58^{e}	114 ± 0.63^{e}	119 ± 1.10^{B}
	Overall mean	128 ± 1.05^{a}	121 ± 0.90^{b}	113 ± 0.43^{c}	

a,b,c = Means having different letters exponents within each row are significantly different at $P \leq 0.05$.
d,e = Means within age of hens by tamoxifen injection interaction effect within no common superscript differ significantly ($P \leq 0.05$).
A, B = Means having different letters exponents within each column are significantly different at $P \leq 0.05$.

Table (4): Effect of tamoxifen (TAM) on some egg quality characteristics of Gimmizah and Bandarah laying hens at 28 weeks of age (Means ± SE).

Traits	Strain	Control	0.5 TAM	1 TAM	Overall mean
Egg shape index	Gimmizah	75.00±0.19	74.70±0.45	74.52±0.37	74.74±0.20
	Bandarah	73.80±0.35	73.54±0.30	73.58±0.38	73.64±0.19
	Overall mean	74.40±0.27	74.12±0.32	74.05±0.29	
Haugh unit	Gimmizah	80..28±0.63	79.70±0.42	79.64±0.58	79.87±0. 30
	Bandarah	80.30±0.41	78.96±0.38	79.14±0.47	79.47±0.27
	Overall mean	80.29±0.35	79.33±0.30	79.39±0.36	
Egg yolk (%)	Gimmizah	31.18±0.22	31.13±0.41	30.70±0.36	31.00±0.36
	Bandarah	31.22±0.24	31.26±0.37	31.02±0.35	31.17±0.39
	Overall mean	31.20±0.15	31.21±0.26	30.86±0.22	
Egg albumen (%)	Gimmizah	56.98±0.28	56.56±0.59	56.12±00.19	56.22±047
	Bandarah	57.06±0.38	56.88±0.56	55.98±0.35	56.64±0.55
	Overall mean	57.02±0.24	56.72±0.39	56.05±0.19	
Egg shell (%)	Gimmizah	11.84±0.13	12.30±0.19	13.18±0.10	12.44±0.17
	Bandarah	11.72±0.43	11.86±0.37	13.00±0.31	12.19±0.27
	Overall mean	11.78 ± 0.23^{b}	12.08 ± 0.21^{b}	13.09 ± 0.16^{a}	
Shell thickness (mm)	Gimmizah	0.338±0.004	0.340±0.004	0.356±0.005	0.345±0.003
	Bandarah	0.339±0.004	0.344±0.005	0.350±0.004	0.344±0.003
	Overall mean	0.338 ± 0.002^{b}	0.342 ± 0.003^{b}	0.353 ± 0.003^{a}	

a,b = Means having different letters exponents within each row are significantly different at $P \leq 0.05$.

Table (5): Effect of tamoxifen (TAM) on blood concentrations of hematocrit, total lipids, cholesterol, calcium, GOT, GPT and estradiol of Gimmizah and Bandarah laying hens at 17 and 28 weeks of age (Means ± SE).

Ages (weeks)	Strain	Control	0.5 TAM	1 TAM	Overall mean
Hematocrit (%)					
17	Gimmizah	34.92±0.56	40.41±0.50	40.90±0.60	38.74±0.48
	Bandarah	35.80±0.71	41.01±0.63	41.30±0.58	39.37±0.60
	Overall mean	35.36±0.50^{b}	40.71±0.55^{a}	41.10±0.53^{a}	
28	Gimmizah	36.33±1.52	40.67±0.65	41.50±0.71	39.44±1.00
	Bandarah	39.00±0.58	40.33±0.76	40.67±0.70	40.00±0.49
	Overall mean	37.67±0.46^{b}	40.42±0.53^{a}	41.08±0.66^{a}	
Total lipids (g/dl)					
17	Gimmizah	3.57±0.35	5.27±1.00	4.83±0.64	4.56±0.37^{A}
	Bandarah	3.33±0.45	3.60±0.12	4.30±0.51	3.74±0.23^{B}
	Overall mean	3.45±0.26^{b}	4.43±0.59^{a}	4.57±0.38^{a}	
28	Gimmizah	3.73±0.50	4.87±0.19	5.30±0.65	4.63±0.34^{A}
	Bandarah	3.00±0.31	3.30±0.23	3.93±0.30	3.41±0.20^{B}
	Overall mean	3.37±0.31^{b}	4.08±0.37^{a}	4.62±0.44^{a}	
Cholesterol (mg/dl					
17	Gimmizah	116.73±17.16	117.60±12.95	144.93±21.57	126.42±11.25
	Bandarah	141.63±16.27	148.67±20.69	118.47±18.83	136.26±14.34
	Overall mean	129.18±18.86	133.13±11.64	131.70±14.84	
28	Gimmizah	98.70±8.05	112.17±5.38	109.30±17.13	106.72±6.78
	Bandarah	106.58±8.67	111.80±11.84	141.67±16.08	120.01±9.13
	Overall mean	102.64±5.58	111.98±5.82	125.48±12.76	
Calcium (mg/dl)					
17	Gimmizah	15.77±1.24	17.90±2.23	17.80±2.28	17.16±1.44
	Bandarah	15.73±1.46	17.27±1.32	17.60±2.68	16.87±1.20
	Overall mean	15..75±1.23	17.58±1.05	17.70±2.26	
28	Gimmizah	15.97±1.65	17.47±0.54	18.00±1.88	17.48±1.38
	Bandarah	15.87±2.31	17.00±2.75	17.73±1.40	16.53±1.31
	Overall mean	15.92±1.43	17.24±1.91	17.87±1.06	
GOT (u/ml)					
17	Gimmizah	30.63±0.98	30.43±0.28	30.93±0.41	30.67±0.33
	Bandarah	29.1±0.56	32.00±0.56	31.57±0.82	30.89±0.56
	Overall mean	29.87±0.61	31.22±0.45	31.25±0.43	
28	Gimmizah	32.23±1.17	30.97±0.58	30.67±0.95	31.29±0.52
	Bandarah	29.30±1.19	31.80±1.46	30.50±1.31	30.53±0.75
	Overall mean	30.77±0.99	31.38±0.73	30.58±0.73	
GPT (u/ml)					
17	Gimmizah	11.40±0.47	12.57±0.23	11.80±0.21	11.92±0.24
	Bandarah	11.67±0.43	12.07±0.18	12.37±0.95	12.03±0.32
	Overall mean	11.53±0.29	12.32±0.17	12.08±0.45	
28	Gimmizah	11.77±0.70	12.03±0.28	11.83±0.27	11.88±0.23
	Bandarah	10.77±0.84	11.63±0.18	12.07±0.57	11.49±0.35
	Overall mean	11.27±0.54	11.83±0.17	11.95±0.29	
Estradiol (ng/ml)					
17	Gimmizah	129.73±13.43	142.75±29.54	191.65±29.00	154.71±15.18
	Bandarah	127.73±12.53	161.80±22.28	195.18±40.46	161.57±14.67
	Overall mean	128.73±11.89^{b}	152.28±17.50^{ab}	193.41±23.05^{a}	
28	Gimmizah	156.78±13.42	171.20±6.12	192.85±13.62	173.61±7.52
	Bandarah	142.50±11.11	168.08±13.04	277.15±42.17	179.24±17.40
	Overall mean	149.64±8.50^{b}	169.64±6.69^{ab}	210.00±21.51^{a}	

a,b = Means having different letters exponents within each row are significantly different at $P \leq 0.05$.

A, B = Means having different letters exponents within each column are significantly different at $P \leq 0.05$.

Table (6): Effect of tamoxifen (TAM) on relative weights of liver, abdominal fat, ovary and oviduct weight of Gimmizah and Bandarah laying hens at 17 and 28 weeks of age (Means ± SE).

Ages (weeks)	Strain	Control	0.5 TAM	1 TAM	Overall mean
Liver weight (%)					
17	Gimmizah	1.78±0.04	1.82±0.10	1.86±0.08	1.82±0.06
	Bandarah	1.73±0.09	1.80±0.09	1.80±0.07	1.77±0.05
	Overall mean	1.76±0.04	1.81±0.07	1.83±0.05	
28	Gimmizah	1.97±0.07	2.03±0.09	2.20±0.15	2.07±0.06
	Bandarah	1.87±0.07	1.97±0.07	2.03±0.08	1.96±0.04
	Overall mean	1.92±0.04	2.00±0.05	2.12±0.08	
Abdominal fat (%)					
17	Gimmizah	2.00±0.15	2.02±0.13	2.08±0.06	2.03±0.10
	Bandarah	1.95±0.13	1.98±0.12	2.00±0.06	1.97±0.09
	Overall mean	1.97±0.11	2.00±0.09	2.04±0.05	
28	Gimmizah	2.20±0.15	2.16±0.13	2.23±0.10	2.19±0.08
	Bandarah	2.13±0.26	2.22±0.12	2.25±0.09	2.20±0.13
	Overall mean	2.17±0.13	2.19±0.09	2.24±0.06	
Ovary weight (%)					
17	Gimmizah	1.01±0.07	1.16±0.8	1.33±0.10	1.17 ± 0.06^{A}
	Bandarah	0.90±0.04	0.98±0.07	1.08±0.03	0.99 ± 0.04^{B}
	Overall mean	0.95 ± 0.04^{c}	1.07 ± 0.05^{b}	1.20 ± 0.06^{a}	
28	Gimmizah	1.06±0.09	1.30±0.06	1.40±0.10	1.25±0.07
	Bandarah	1.08±0.07	1.33±0.07	1.33±0.03	1.25±0.05
	Overall mean	1.07 ± 0.05^{b}	1.32 ± 0.04^{a}	1.37 ± 0.06^{a}	
Oviduct weight (%)					
17	Gimmizah	1.77±0.10	1.96±0.11	2.22±0.08	1.98 ± 0.10^{A}
	Bandarah	1.33±0.03	1.47±0.03	1.63±0.06	1.48 ± 0.05^{B}
	Overall mean	1.55 ± 0.06^{c}	1.71 ± 0.09^{b}	1.93 ± 0.05^{a}	
28	Gimmizah	2.03±0.12	2.07±0.09	2.17±0.09	2.09±0.04
	Bandarah	1.87±0.12	2.03±0.13	2.07±0.10	1.99±0.07
	Overall mean	1.95±0.08	2.05±0.07	2.12±0.05	

a,b,c = Means having different letters exponents within each row are significantly different at $P \leq 0.05$.
A, B = Means having different letters exponents within each column are significantly different at $P \leq 0.05$.

Table (7): Effect of tamoxifen (TAM) on fertility, hatchability and hatched chick weight of Gimmizah and Bandarah laying hens (Means ± SE).

Traits	Strain	Control	0.5 TAM	1 TAM	Overall mean
Fertility (%)	Gimmizah	94.00±0.58	95.33±0.47	95.00±0.58	94.78±0.32
	Bandarah	95.30±0.33	95.67±0.36	95.00±0.63	95.33±0.24
	Overall mean	94.67±0.42	95.50±0.22	95.00±0.37	
Hatchability (%)	Gimmizah	91.83±0.33	92.89±0.72	93.00±0.93	92.57±0.48
	Bandarah	91.97±0.58	92.85±0.61	92.90±0.38	92.57±0.63
	Overall mean	91.90±0.30	92.87±0.93	92.95±0.5	
Hatched chick weight (g)	Gimmizah	$31.38±0.65^{f}$	$33.23±0.33^{ef}$	$35.15±0.36^{d}$	$33.26±0.22^{A}$
	Bandarah	$33.50±0.38^{e}$	$31.92±0.62^{f}$	$32.28±0.58^{ef}$	$32.56±0.35^{B}$
	Overall mean	$32.44±0.36^{b}$	$32.58±0.33^{b}$	$33.72±0.44^{a}$	

a,b = Means having different letters exponents within each row are significantly different at $P \leq 0.05$.
d,e,f = Means within age of hens by tamoxifen injection interaction effect within no common superscript differ significantly ($P \leq 0.05$).
A, B = Means having different letters exponents within each column are significantly different at $P \leq 0.05$.

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الملخص العربي

تأثير التاموكسيفين على بعض الصفات التناسلية في سلالتين من الدجاج المحلى

٢- التاموكسيفين والأداء الانتاجى فى الدجاجات البياضة

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أجريت هذه الدراسة لتقيم استجابة الحقن بالتاموكسيفين على النضج الجنسى و الأداء الانتاجى و التناسلى و مقاييس الدم لكتاكيت اناث سلالتين محليتين. حيث تم تقسيم ٩٠ كتكوت انثى من كل من سلالة الجميزة والبندرة عند عمر ٤ أسابيع إلى ٣ مجاميع متساوية تحتوى على ٣٠ كتكوت فى كل مجموعة و تم حقنهم فى العضل مرتين أسبوعيا ابتدءا من عمر ٤ أسابيع وخلال اسابيع التجربة. المجموعة الأولى المقارنة (الكنترول) تم حقنها بـ ٠.٢ مللي من مخلوط زيت عباد الشمس وإيثانول (بنسبة حجمية ١:١) بينما المجموعة الثانية والثالثة تم حقنهم بـ ٠.٢ مللي من مخلوط زيت عباد الشمس وإيثانول والذى يحتوى على ٠.٥ ملجم (٠.٥ TAM) و ١ ملجم لكل كجم من وزن الجسم (١ TAM) على التوالى. وأستمرت التجربة حتى عمر ٢٨ أسبوع وقد تم تربية الطيور فى أقفاص اثناء فترة انتاج البيض. كان أعلى وزن الجسم تم تسجيله للطيور المحقونة ١ TAM مقارنة بـ ٠.٥TAM و الكنترول بين جميع الاعمار التجريبية. الى جانب ذلك وزن الجسم لدجاجات الجميزة كان أثقل معنويا من البندرة عند عمر ٢٢ و ٢٨ أسبوع. التاموكسيفين ليس له تأثير معنوى على الغذاء المستهلك و معدل النفوق و وزن البيضة أثناء الفترة التجريبية. بينما عدد البيض و النسبة المئوية لانتاج البيض زاد معنويا بالمعاملة بالتاموكسيفين مقارنة بمجموعة الكنترول. علاوة على ذلك ١ و ٠.٥ TAM بكرا فى عمر النضج الجنسى بمقدار ١٥ و ٧ أيام على التوالى مقارنة بمجموعة الكنترول. بينما دجاجات البندرة كانت معنويا أقل و أكثر تبكيرا من دجاجات الجميزة فى عدد البيض و العمر عند أول بيضة على التوالى. النسبة المئوية للقشرة و سمك القشرة كانت أعلى معنويا للمعاملة ١ TAM مقارنة بباقى المجاميع عند عمر ٢٨ أسبوع. لم يلاحظ أى أختلافات معنوية بين دجاج الجميزة و البندرة لجميع صفات جودة البيضة المدروسة. كما وجد أن التاموكسيفين لم يؤثر معنويا على معامل شكل البيضة ووحدة هيو و النسبة المئوية للصفار و البياض و تركيز البلازما من الكولستيرول و الكالسيوم و GOT و GPT. كما وجد أن مستويات الهيماتوكريت و الدهون الكلية كانوا أعلى معنوياً فى المجموعتين المعاملة بالتاموكسيفين مقارنة بالكنترول، بينما كان هناك زيادة فى تركيز الأستراديول فى البلازما عند الجرعة ١ TAM فقط مقارنة بالكنترول. أدى التاموكسيفين إلى زيادة معنوية للوزن النسبى للمبيض عند عمر ١٧ و ٢٨ أسبوع. بينما الوزن النسبى لقناة البيض ازداد معنوياً عند عمر ١٧ أسبوع فقط مقارنة بمجموعة الكنترول.علاوة على ذلك دجاجات الجميزة كانت أعلى معنويا من البندرة فى الوزن النسبى للمبيض و قناة البيض عند عمر١٧ أسبوع فقط. المعاملة بالتاموكسيفين لم تؤثر معنوياً على النسبة المئوية للخصوبة و الفقس. بينما الحقن بـ ١ TAM زاد معنوياً من وزن الكتكوت الفاقس مقارنة بالمجاميع الأخرى. من هنا يمكن التوصية بان ١ TAM يبكر من عمر النضج الجنسى كما يحسن عدد والنسبة المئوية لانتاج البيض و يزيد من جودة قشرة البيضة و ينبه أفراز الأستروجين و الذى بدوره يزيد من الوزن النسبى للمبيض وقناة البيض.