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COMPARATIVE STUDIES ON SOME PRODUCTIVE TRAITS AND RATE OF CALCIUM ABSORPTION OF THREE LOCAL STRAINS OF CHICKEN

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ABSTRACT

A total number of 432pullets (aged 22 weeks) from Gimmizah, Mamourah, and Bandara strains (144 from each strain) were subjected to study. Birds were individually caged (after sexual maturity) to classifying them into three groups according to the time required for egg formation. Pullets of each group (48 pullets) were distributed in 3 breeding pens (each of 16 females and 2 males). The experiment aimed to study the effect of strain and time spent for egg formation on productive performance, thyroid activity and calcium absorption rate of laying hens of different local strains. Results obtained can be summarized as follows.

Bandara pullets had higher average of feed consumption (121.47 gm/hen/day). However, Gimmizah pullets showed higher feed efficiency (0.27 gm egg/gm feed). Pullets needed less than 25 hours for their egg to be formed consumed significantly ($p<0.05$) more feed (119.96 gm/bird/day). Feed efficiency mounted 0.26 gm egg/gm feed in all studied groups of birds of different time needed for egg formation.

Mamourah pullets had higher averages of egg production and egg mass (62.97%/hen /day and 31.11 gm/hen/day, respectively). However, the highest egg weight was found in Gimmizah (49.02 gm). Pullets needed less than 25 hours for their completely formation had higher egg production and egg mass. Significant effect ($p<0.05$) on the rate of egg production only was found due to time of egg formation. Eggs from Gimmizah pullets had significantly the highest mean of shell thickness (0.354 mm) than those of Mamourah (0.344mm) and Bandara (0.339mm).

Eggs laid by Bandara pullets had significantly higher fertility percentage (90.43%). On the other hand, eggs laid by Mamourah pullets had significantly higher hatchability percent (90.68%). Time required for eggs to complete their passage along the oviduct had highly significant effect ($p<0.001$) on hatchability percentage .The total absorption of calcium and absorption per gm dry matter were found to be mostly higher in Gimmizah followed by Bandara then by Mamourah pullets. Pullets needed less than 25 hours to complete its egg formation had significantly higher in total calcium absorption and absorption per gm dry matter. The greatest values of total calcium absorption and absorption per cm length of the small intestinal was attained in ileum followed by jejunum and duodenum, respectively. Highly significant variations ($p<0.001$) in total calcium absorption, absorption per gm dry matter and per cm length were found due to different intestinal regions. Mamourah pullets had significantly ($p<0.001$) the highest level of plasma T3 and T3/T4 ratio. On the other hand, pullets of Gimmizah had the highest level of plasma T4. Pullets needed less than 25 hours for egg formation had higher plasma T3 level and T3/T4 ratio, while pullets needed more than 26 hours for egg formation were high in plasma T4 level.

Keywords: strain, egg formation, egg production, incubation traits, traits of calcium absorption, T3, T4, T3/T4 ratio.

INTRODUCTION

Many investigations pointed out the variation in egg weight due to the birds' breed or strain (Khalifa et al, 1978; Benoff and Renden, 1983; Rasmy, 1984; EL-Gendi, 1985 and Nofal, 1999).

Egg production is a yield of overall performance of a bird concerning many variables such as egg number, rate of lay, sexual maturity age, egg weight, shell thickness and external internal egg characteristics (Verma et al., 1983; Poggenpoel and Duckett, 1988; Nuir, 1990 and Eitan and Soller, 1993).

Pullets strain and age significantly affected the rate of laying, egg weight and egg mass (Khair EL-Din et al., 1976; Choi et al., 1983; EL-Gendi, 1985 and EL-Gendi et al., 1993).

Kirry and Bohren (1975) observed that, hatchability was significantly affected by age of pullets. Fertility and hatchability declined more in eggs of the older birds than that of younger ones (Novo et al., 1988 and Szczerbinska, 1998).

Nofal and Salem (2000) found that, fertility, hatchability, early and late embryonic mortality percentages were affected significantly by birds age.

The absorption of calcium, through chicks and laying hens intestine was found to be regulated in response to their physiological status suggesting an important role of the intestine in the homeostasis of calcium concentration in various body fluids (Hurwitz et al., 1973; Ribovich and Deluca, 1975 and EL-Gendi et al., 1993).

The present work was done to study the effect of strain and time spent for egg formation on productive performance and incubation traits of laying hens of different local strains. In addition the rate of calcium absorption through the various intestinal parts and thyroid activity were also considered.

MATERIALS AND METHODS

The present study was carried out at Gimmizah Research Station, Gharbia Governate, Animal Production Research Institute.

A total number of 432 pullets (aged 22 weeks) from Gimmizah, Mamourah and Bandara local strains (144 pullets from each strain) were subjected to study. Birds were individually caged (after sexual maturity) to classifying them into three groups according to the time required for egg formation as pullets needs (<25 hrs, 25-26 hrs and >26 hrs) for formation of the first, second and third groups. Pullets of each groups (48 pullets) were distributed in three breeding pens (replicates) [each of 16 females and 2 males].

Birds were fed ad-libtum on layer ration of nutritive value indicated in table (1). The productive performance parameters estimated were egg production, egg weight and egg mass, feed consumption and efficiency. Shell weight percentage and thickness were considered as parameters detecting the egg shell quality. Data were calculated at 7 intervals of 28 days each.

Fertility was calculated as a percentage of set eggs. Hatchability was calculated as a percentage of fertile eggs and total embryonic mortality was calculated as a percentage of unhatched eggs to fertile ones at 28 th ,40th and 52nd of pullet's age.

Table (1) : The composition and nutritive value of the experimental layerration:

Ingredients	%
Yellow corn	65.40
Soybean meal (44%)	22.00
Wheat bran	3.00
Di- Calcium phosphate	1.39
Lime stone	7.44
Salt	0.30
Vitamins + Minerals (premix)	0.30
DL-Methonine	0.17
Total	100.00
Nutritive value of the ration:	
Crude protein %	16.005
ME (kcal/kg)	2726.76
Ether extract %	2.751
Crude fiber %	3.375
Total calcium %	3.204
Total phosphorus %	0.619
Methionine %	0.449
Lysine %	0.820

Hybrinized blood samples were obtained from wing of pullets selected randomly per each group at the 28 week of age and at the peak of egg production. Plasma samples were prepared and stored at –20°c till the time of chemical analysis.

Plasma T4 was analyzed by double antibody radioammunoassay (RIA) as described by (Grew et al., 1983). While Plasma triiodothyronine (T3) was analyzed by single antibody (RIA) with Gamma Coattm RIA (Clinical Assays Cambridge, MA), the T3/T4 ratio was calculated as indicator of the bioconversion rate T4 to T3.

At the peak of egg production, 4 birds of each experimental group were randomly selected for in-vitro estimation of calcium absorption rate through the various parts of the small intestine. The intestinal sac method was described by Madge (1975) with some modification applied by Radwan et al., (1984) was used.

Data were analyzed using least- square and maximum likelihood program of (SPSS, 1997). A linear model including the effect of strain, time of egg formation, experimental interval and all possible interactions were used for analyzing for such data. Significant tests were varified by Duncan's new multiple range test (1955).

RESULTS AND DISCUSSION

1.Feed consumption and efficiency:

Data presented in (Table, 2) show the average of feed consumption and efficiency for different experimental groups of Gimmizah, Mamourah and Bandara pullets.

Table (2): Least- square means and standard errors for the average of feed consumption gram/bird/day) and feed efficiency (gm egg/ gm feed intake) as affected by studied factors.

Independent	Feed consumption	Feed efficiency
Strain:		
Gimmizah	114.14 c ± 0.89	0.27 a ± 0.01
Mamourah	118.45 b ± 0.89	0.26 a ± 0.01
Bandara	121.47 a ± 0.89	0.25 b ± 0.01
Time of egg formation(hours):		
less than 25	119.96 a ± 0.89	0.26 a ± 0.01
25 – 26	116.92 b ± 0.89	0.26 a ± 0.01
more than 26	117.21 b ± 0.89	0.26 a ± 0.01
Pullets age (weeks):		
28	115.39 a ± 1.35	0.11 c ± 0.01
32	117.42 a ± 1.35	0.30 a ± 0.01
36	118.29 a ± 1.35	0.30 a ± 0.01
40	117.70 a ± 1.35	0.27 b ± 0.01
44	118.86 a ± 1.35	0.29 ab ± 0.01
48	118.64 a ± 1.35	0.27 b ± 0.01
52	119.92 a ± 1.35	0.28 ab ± 0.01

Means having similar letters are not significantly different.

Results obtained showed that Bandara pullets had a higher feed consumption average (121.47 gm/bird/day) when compared to pullets of Mamourah (118.45) and Gimmizah (114.18gm/bird/day). Opposite results were found in feed efficiency. Analysis of variance showed highly significant variation ($p<0.001$) in feed consumption and significant variation ($p<0.05$) in feed efficiency due to pullet's strain. This may be attributed to the differences existing in the rate of metabolism which is stated to be the function of bird's breed and reflected as variation in amount of feed consumed (EL-Gendi et al., 1993). Pullets needed less than 25 hours for their egg to be formed consumed significantly more feed (119.96 gm/bird/day) when compared with those needed more than 26 or between 25 to 26 hours for egg formation (117.21 and 116.92 gm/bird/day, respectively). However, differences between the last two groups were insignificant magnitude. Feed efficiency mounted 0.26 gmegg/gm feed in all studied groups of birds of different time needed for egg formation.

Daily feed consumption per hen slightly increased as bird grew older reaching its maximum value at the end of the experimental period. While, feed efficiency increased consistently with increasing birds' age reaching its maximum value at the 36^{th} week (at the peak of egg production) after which its slightly and insignificant decreased .The increase in feed efficiency as birds grew older may be attributed to the decreased exited in egg production compared with consistently in the amount of feed consumed. Birds'age showed highly significant effect (P<0.001) on feed efficiency only.

2. Egg production, egg weight and egg mass:

Mamourah pullets showed the higher egg production rate (62.97%/hen/day) and egg mass (31.11 gm/hen/day) followed by Bandara (62.51% and 30.60gm) than by those of Gimmizah (61.94%/hen/day and 30.38 gm/hen/day) ones (Table, 3).

Table(3): Least- square means and standard errors for average egg weight (gm) , egg mass (gm/hen/day) and egg production rate (per hen per day %) as affected by studied factors.

Independent Variables	Egg weight	Egg mass	Egg production (%)
Strain:			
Gimmizah	49.02 a ± 0.17	30.38 a ± 0.49	61.94 a ± 0.95
Mamourah	48.97 a ± 0.17	31.11 a ± 0.49	62.97 a ± 0.95
Bandara	48.62 a ± 0.17	30.60 a ± 0.49	62.51 a ± 0.95
Time of egg formation(hours) :			
less than 25	48.67 a ± 0.17	31.61 a ± 0.49	63.82 a ± 0.95
25 – 26	48.93 a ± 0.17	30.90 a ± 0.49	63.05 ab ± 0.95
more than 26	49.01 a ± 0.17	30.02 a ± 0.49	60.54 b ± 0.95
Pullet's age (weeks):			
28	42.49 f ± 0.26	13.08 c ± 0.75	30.86 d ± 1.45
32	45.70 e ± 0.26	34.72 a ± 0.75	75.98 a ± 1.45
36	46.70 d ± 0.26	35.63 a ± 0.75	76.32 a ± 1.45
40	46.44 d ± 0.26	31.87 b ± 0.75	68.62 b ± 1.45
44	50.22 c ± 0.26	33.76 ab ± 0.75	66.53 b ± 1.45
48	54.86 b ± 0.26	32.32 b ± 0.75	58.76 c ± 1.45
52	55.67 a ± 0.26	33.49 ab ± 0.75	60.23 c ± 1.45

Means having similar letters are not significantly different.

The highest average of egg weight was found in Gimmizah (49.02 gm), the lowest one was observed in Bandara (48.62 gm), while egg weight of Mamourah pullets (48.97 gm) was in between the two mentioned strains. Similar results were observed by EL-Gendi (1997). He reported that, the breed variation that may found in egg weight could be negatively correlated with breed different in egg production. He added that, the higher the egg production rate, the lower the averages of egg weight. Results obtained in egg production rate agree with those of EL-Turky (1981) and EL-Dakroury and Mahmoud (1982) who found that, differences between Gimmizah and Bandara strains in the rate of egg production were found to be insignificant magnitude. This may be attributed to the genetic capacity characterized by those strains for egg production.

Eggs of pullets needed more than 26 hours for egg formation were high in egg weight average (49.01 gm) followed by those needed 25 to26 hours (48.93 gm) then by those of less than 25 hours (48.67 gm) needed for complete egg formation. However, differences in egg weight due to time of egg formation were insignificant. Results obtained are logic from scientific side of view .Its well known that egg weight is determined by the genetical abilities owned by laying bird that mainly affect the neurhormonal control for the formation of ovum on the bird's ovary.

Pullets needed less than 25 hours for their eggs for their completely formation had higher egg production rate (63.82%/hen/day) and egg mass (31.61 gm/hen/day) followed by those needed 25 to 26 hours then by those needed more than 26 hours. Significant effect ($P<0.05$) on the rate of egg production only was found due to time of egg formation. This may be attributed to a supporting evidence that the number of eggs laid in a certain period is associated with the rate of egg formation during its passage along oviduct and the time required for maturation of the ovarian follicle.

Egg weight was significantly increased in approximately all experimental groups of birds with advancing age. It reached its maximum value at the end of the experimental period. However, egg production rate and egg mass increased significantly by advancing age reaching their maximum value at the 36^{th} week of age (peak of egg production) then slightly decreased towards the end of the experimental period for egg production, while for egg mass it decreased then remained approximately constant up the end of the experimental period. Highly significant variation (P0.001) in average egg weight, mass and egg production rate were found due to pullet's age. The interaction between strain and time of egg formation only had highly significant effect ($P<0.001$) on the average of egg mass and egg production rate.

3. Proportional egg shell weight and shell thickness:

The lowest proportional shell weight was found in eggs laid by Mamourah pullets (11.78%) whereas the highest one (12.58%) was found in Gimmizah' s eggs. However, eggs from Gimmizah pullets had significantly the highest mean of shell thickness (0.354mm) than those of Mamourah (0.344mm) and Bandara (0.339mm) ones (Table, 4). These results agreed with those of Hassan et al., (2000) who reported that, Gimmizah hens had the highest significant ($P<0.01$) means of shell thickness when compared with Alexandria, Fayomi, Fayomi cross, Golden and Silver Montazah strains. Variation in egg shell thickness due to the pullets strain may be attributed to the variation exited between their eggs weight and rate of egg production.

Table(4): Least- square means and standard errors for proportional egg shell weight (%) and shell thickness (mm) as affected by studied factors.

Independent Variables	Shell weight percentage	Shell thickness (mm)
Strain:		
Gimmizah	12.58 a ± 0.20	0.354 a ± 0.002
Mamourah	11.78 b ± 0.20	0.344 b ± 0.002
Bandara	12.24 ab ± 0.20	0.339 b ± 0.002
Time of egg formation(hours) :		
less than 25	12.02 a ± 0.20	0.342 a ± 0.002
25 – 26	12.12 a ± 0.20	0.343 b ± 0.002
more than 26	12.45 a ± 0.20	0.352 a ± 0.002
Pullet's age (weeks):		
28	12.72 a ± 0.30	0.336 a ± 0.003
32	11.47 b ± 0.30	0.342 d ± 0.003
36	11.79 bc ± 0.30	0.356 c ± 0.003
40	12.38 ac ± 0.30	0.347 cd ± 0.003
44	11.74 bc ± 0.30	0.347 cd ± 0.003
48	12.56 ac ± 0.30	0.362 b ± 0.003
52	12.63 ac ± 0.30	0.337 b ± 0.003

- **Means having similar letters are not significantly different.**

Pullet's eggs that lasted less than 25 hours for their formation had the lowest average of shell percent (12.02%) and shell thickness (0.342mm). While, egg laid by pullets needed more than 26 hours for egg formation had the highest proportional shell weight (12.45%) and shell thickness (0.352mm). The effect of time of egg formation on shell thickness was found to be of highly significant value (P<0.01).

Shell thickness was higher in egg laid by pullets aged 28 week (0.366mm) .It gradually declined up to the 48th week of pullets age (0.362mm) then decreased to reach (0.337mm) at the end of the experimental period. Highly significant variation in shell proportional weight and shell thickness were found in response to pullets age.

4. Fertility, hatchability and embryonic mortality:

Eggs laid by Bandara pullets had significantly higher fertility percentage (90.43%) when compared by those of Gimmizah (88.80%) or Mamourah ones (88.39%). Pullets' strain had highly significant effect (P<0.001) on fertility percentage. On the other hand, eggs laid by Mamourahpullets showed significantly higher hatchability percent (90.68%) than did those laid by either Bandara (88.12%) or Gimmizah ones (86.16%) as shown in table (5). Analysis of variance revealed that pullet's strain had highly significant effect (P<0.001) on the percentages of hatchability. These findings agreed with those of EL- Hossari et al., (1992) and Abd EL-Galil (1993) who indicated that, hatched eggs of different strains differed in there fertility and hatchability values.

Concerning embryonic mortality percentage it was observed its highest value was attained in the eggs of Gimmizah strain (13.84%) followed by those of Bandara (11.88%) and Mamourah (9.32%) ones (Table, 5). Variations in embryonic mortality due to bird's strain were found to be of highly significant value (P<0.001).

Eggs of pullets lasted more than 26 hours for complete formation had significantly higher fertility percentage (90.49%) when compared with eggs that needed between 25 to 26 hours (89.35%),and those lasted less than 25 hours(87.78%) in various portions of oviduct (Table, 5). Highly significant effect (P<0.001) was found in fertility percent due to time needed for complete egg formation. On the other hand, eggs lasted less than 25 hours for egg formation showed the best hatchability (89.40%) followed by those of pullets lasted between 25 to26 hours (89.13%) then by those lasted more than 26 hours (86.47%), Table (5). Time required for eggs to complete their passage along the oviduct had highly significant effect (P<0.001) on hatchability percentage.

Table(5):Least- square means and standard errors for fertility, embryonic mortality . and hatchability (%) as affected by studied factors.

Independent Variables	Fertility (%)	Embryonic mortality (%)	Hatchability (%)
Strain:			
Gimmizah	88.80 b ± 0.20	13.84 a ± 0.21	86.16 c ± 0.20
Mamourah	88.39 b ± 0.20	9.31 c ± 0.21	90.68 a ± 0.20
Bandara	90.43 a ± 0.20	11.88 b ± 0.21	88.09 b ± 0.20
Time of egg formation(hours) :			
less than 25	87.78 c ± 0.20	10.62 b ± 0.21	89.40 a ± 0.20
25 – 26	89.35 b ± 0.20	10.87 b ± 0.21	89.11 a ± 0.20
more than 26	90.49 a ± 0.20	13.53 a ± 0.21	86.42 b ± 0.20
Pullet's age (weeks):			
28	86.94 c ± 0.20	16.64 a ± 0.21	83.32 c ± 0.20
40	92.52 a ± 0.20	8.50 c ± 0.21	91.50 a ± 0.20
52	88.15 b ± 0.20	9.87 b ± 0.21	90.12 b ± 0.20

- Means having similar letters are not significantly different.

The lowest embryonic mortality percentage was recorded in eggs that lasted less than 25 hours in the pullets' oviduct to complete their egg formation (10.60%). While, the highest value of embryonic mortality was found in eggs that need more than 26 hours for egg formation (13.53%). Eggs lasted between 25to26 hours had embryonic mortality value lied in-between (10.87%) the previously mentioned values. Differences in embryonic mortality due to time of egg formation were found to be of highly significant value (P<0.001).

Fertility percentage significantly decreased at 28th week of pullets' age (86.94%), thereafter, it significantly increased reached its maximum value at the 40th week (92.52%) then significantly decreased at the 52nd week of pullet's age (88.15%). Hatchability percentage showed the same trend, it mounted (83.36%) at the 28th weeks, (91.50%) at 40th and (90.13%) at the 52nd week of pullet's age. Pullets' age had highly significant effect (P<0.001) on percentages of both fertility and hatchability.

These results agreed with those of Nofal and Salem (2000) who indicated that, fertility and hatchability percentages were significantly (P<0.01) affected by birds'age. Fertility and hatchability expressed as percentages for total and fertile eggs were decreased in eggs laid by older ages. This may be attributed to the high water vapor loss per cm² of surface area during 0-18 days of incubation and low specific gravity, which resulted in the high early embryonic mortality and subsequently low hatchability.

Embryonic mortality had the highest value at the 28th week of pullets' age (16.64%) then significantly decreased at the 40th week (8.50%) and significantly increased, thereafter to reach (9.87%) at 52nd week of pullet's age.

Pullets' age had highly significant effect (P<0.001) on embryonic mortality percentage.

All interactions between studied factors had highly significant effect (P<0.001) on fertility, hatchability and embryonic mortality percentages.

5. Rate of calcium absorption in-vitro throughout the various regions of the small intestine:

Data lasted in table (6) showed that, the higher value of total calcium absorption (60.00 mg/hr) and absorption per gm dry matter (6.75mg /hr) were recorded in Gimmizah pullets followed by Bandara (57.89 and 4.93 mg /hr) then by Mamourah (50.56 and 4.70mg/hr, respectively). However, amount of calcium absorption per cm length of different small intestinal regions per hour was higher in Bandara pullets (0.443 mg/hr) than Gimmizah (0.393) and Mamourah (0.332 mg/hr).

Analysis of variance showed highly significant effect (P<0.001) due to pullets' strain on total calcium absorption, absorption per gm dry matter and absorption per cm length per hour. These results are inagreement with the finding of Radwan et al., 1984; EL-Gendi et al., 1993 and EL-Sayed 1995.

Pullets needed less than 25 hours for complete egg formation were significantly higher in total calcium absorption (57.78 mg/hr) and absorption per gm dry matter (5.90 mg/hr). However, pullets needed more than 26 hours had significantly the lowest value of total calcium absorption (53.22 mg/hr) and absorption per gm dry matter (5.12 mg/hr). Pullets needed 25 to26 hours for egg formation had the lowest value of calcium absorption per cm length of the small intestine (0.385 mg/hr) compared with those needed less than 25 or more 26 hours as time of egg formation (0.391 and 0.392 mg/hr, respectively). However, variations in this trait due to hens' strain were insignificant.

Table(6): Least- square means and standard errors for total calcium absorption (mg/hr), calcium absorption (mg/gm dry matter)and Calcium absorption (mg/cm) as affected by studied factors.

Independent Variables	Total calcium absorption (mg/hr)	Calcium absorption (mg/gm dry matter)	Calcium absorption (mg/cm)
Strain:			
Gimmizah	60.00 a ± 0.34	6.75 a ± 0.12	0.393 b ± 0.013
Mamourah	50.56 b ± 0.34	4.70 b ± 0.12	0.332 c ± 0.013
Bandara	57.89 a ± 0.34	4.93 b ± 0.12	0.443 a ± 0.013
Time of egg formation(hours) :			
less than 25	57.78 a ± 0.34	5.90 a ±0.12	0.391 a ± 0.013
25 – 26	57.45 a ± 0.34	5.36 b ± 0.12	0.385 a ± 0.013
more than 26	53.22 b ± 0.34	5.12 b ± 0.12	0.392 a ± 0.013
Intestinal parts:			
Duodenum	9.19 c ± 0.34	4.69 b ± 0.12	0.339 b± 0.013
Jejunum	20.70 b ± 0.34	4.19 b ± 0.12	0.341 b ± 0.013
Ileum	26.26 a ± 0.34	6.78 a ± 0.12	0.489 a ± 0.013

- **Means having similar letters are not significantly different.**

The greatest value of total calcium absorption (26.26 mg/hr) and absorption per cm (0.489 mg/hr) was attained in ileum followed by jejunum (20.70 and 0.341 mg/hr) and duodenum (9.19 and 0.339mg/hr) for total calcium absorption and absorption per cm of the small intestinal length, respectively. Calcium absorption per gm dry matter per hr averaged 4.69,4.19 and 6.78 mg /gm/hr for duodenum, jejunum and ileum, respectively. Results obtained agreed with those of (EL-Gendi et al., 1993 and EL-Sayed, 1995).

Analysis of variance showed highly significant variation ($P<0.001$) in total calcium absorption, absorption per gm dray matter and per cm length due to different intestinal regions.

From the previously mentioned results it could be concluded that, ileum may be the main site of calcium absorption since the amount of total calcium absorption and the rate of total calcium absorption per cm length and per gm dry matter were found to be higher than through the other two intestinal regions (duodenum and jejunum). This may be attributed to the relative higher number of villi found in ileum than in either duodenum or jejunum (Radwan, 1980;EL-Gendi, 1985 and Nofal, 1999).

6.Plasma T3,T4 and T3/T4 ratio:

Pullets of Mamourah strain had significantly the highest value of plasma T3(2.66 n mol/l) followed by those of Gimmizah (2.57 n mol /l) then by Bandara(2.54 n mol/l) strains.Analysis of variance revealed highly significant effect on plasma T3 due to pullets'strain (Table,7).These results agreed with those of Rai et al.,(1980) who found that ,theT3 I^{-}125 uptake in laying White Leghorn was higher compared with White Cornish .They attributed this difference to the higher laying performance of White Leghorn.

On the other hand, pullets of Mamourah strain had the lowest average of plasma T4 (8.32n mol/l) which was insignificantly lower than Bandara ones (8.41 n mol/l). Pullets of Gimmizah strain had significantly the highest average of plasma T4 (8.70 n mol/l) when compared with those of the other tow strains. Pullet's strain showed highly significant effect ($P<0.001$) on plasma T4 (Table, 7). The present findings are in agreement with those of May and Marks (1983) who reported that, the T4 concentration of Dwarf birds was significantly higher than those of Normal birds.

It could be noted that, pullets of Gimmizah strain had significantly the lowest T3/T4 ratio (0.298 n mol/l) when compared with those of Bandara (0.316 n mol/l) and Mamourah (0.323 n mol/l) strains. Differences found in T3/T4 ratio between pullets of Bandara and Mamourah strains were of insignificant value. The T3/T4 ratio was significantly ($P<0.001$) affected by bird's strain (Table, 7). Results obtained agree with those of Khalifa and Shoukry,(1991) who found that,birds of Lohman Selected Leghorn (high egg producer) had the highest T3/T4 ratio than those of Fayomi (low egg producer) .

Pullets needed less than 25 hours for egg formation had significantly the highest value of plasma T3 (2.73 n mol/l) compared with those needed 25to26 hours (2.51 n mol/l) or more than 26 hours (2.52 n mol/l). However, differences in this trait between the last two groups were insignificant (Table,7).

Time of egg formation had highly significant ($P<0.001$) effect on plasma T3 levels (Table, 7).

Table (7): Least- square means and standard errors for plasma T_3 , T_4 (n ol/l) and T_3 / T_4 ratio as affected by studied factors.

Independent Variables	T_3	T_4	T_3 / T_4
Strain:			
Gimmizah	2.57 a ± 0.014	8.70 a ± 0.038	0.298 a ± 0.003
Mamourah	2.66 b ± 0.014	8.32 b ± 0.038	0.323 b ± 0.003
Bandara	2.54 a ± 0.014	8.41 b ± 0.038	0.316 b ± 0.003
Time of egg formation(hours) :			
less than 25	2.73 a ± 0.014	7.81 a ± 0.038	0.359 a ± 0.003
25 – 26	2.51 b ± 0.014	8.38 b ± 0.038	0.304 b ± 0.003
more than 26	2.52 b ± 0.014	9.24 c ± 0.038	0.274 c ± 0.003
Pullet's age (weeks):			
At 28th wk of age	2.41 a ± 0.014	9.04 a ± 0.031	0.27 a ± 0.003
At the peak of production	2.76 b ± 0.014	7.91 b ± 0.031	0.36 b ± 0.003

Means having similar letters are not significantly different.

The levels of plasma T4 increased with the increasing of time needed for egg formation (Table, 7). Pullets needed less than 25 hours egg formation had significantly the lowest value of plasma T4 (7.81 n mol/l). On the other hand, pullets needed more than 26 hours had significantly the highest value (9.24 n mol/l) of plasma T4, while those needed 25 to26 hours egg formation had plasma T4 value lies between (8.38 n mol/l) the two previously groups Table (7).

Time of egg formation had highly significant effect (P<0.001) on plasma T4 level (Table, 7). This may be attributed to the increase in bioconversion of T4 toT3.

Pullets needed less than 25 hours for complete egg formation had significantly the highest T3/T4 ratio (0.359 n mol/l) followed with pullets needed 25 to 26 hours (0.304 n mol/l) and more than 26 hours (0.274 n mol/l) for complete egg formation, table (7). This may be attributed to that thyroidal hormones have the greatest role in determining the optimum metabolic activity essential for functional efficiency of the ovary and oviduct during the time of egg formation.

It is apparent that plasma T3 level and T3/T4 ratio attained their minimum values at the 28^{th} week of pullets age (2.41 and 0.270 n mol/l, respectively), while reached their maximum values at the peak of egg production (2.76 and 0.360 n mol/l, respectively). On the other hand, T4 had its maximum value at the 28^{th} week of pullets' age (9.04 n mol/l). It decreased to reach its minimum value at the peak of egg production (7.91 n mol/l).

Highly significant effect (P<0.001) due to bird's age was found on plasma T3, T4 and T3/T4 ratio (Table, 7). Results obtained agreed with those of Bakir et al., (1988) who reported significant (P<0.01) variation in plasma T4 levels due to bird's age. The highest concentration of plasma T4 was recorded at sexual maturity. On the other hand, plasma T3 levels changed with birds ages (Elizabith et al., 1999).

Interactions between studied factors showed highly significant effect (P<0.001) on plasma T3, T4 and T3/T4 ratio except the interaction between bird's strain and time of egg formation and bird's age (S xTxP) which showed insignificant value on T3/T4 ratio only.

7.Partial regression coefficient values of T3 and T4 on egg production:

The constant estimates of linear regression coefficient of egg production on plasma T3 was positive while, The constant estimate of linear coefficient on plasma T4 was negative. However, the two coefficients were statistically non-significant (Table, 8).

Table (8): Partial regression coefficient of T_3 and T_4 on egg production

T_3		T_4	
Linear	**Quadratic**	**linear**	**Quadratic**
2.03 ± 1.61	- 8.57 ± 3.99	-2.36 ± 0.72	-3.98 ± 3.12

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دراسة مقارنة علي بعض الصفات الإنتاجية ومعدل امتصاص الكالسيوم لثلاث سلالات محلية من الدجاج

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استخدم في هذه الدراسة ٤٣٢ دجاجة في عمر ٢٢ أسبوع من سلالات الجميزة والمعمورة والبندرة (١٤٤ دجاجة لكل سلالة) . وضعت في أقفاص فردية (بعد النضج الجنسي) حيث قسمت بعد ذلك إلى ثلاث مجموعات (٤٨ طائر/ مجموعة) وزعت تبعاً للزمن اللازم لتكوين البيضة بالتساوي في ثلاث بيوت كل منها يحتوي علي ١٦ دجاجة و ٢ ديك . استهدف هذا البحث دراسة تأثير السلالة والزمن اللازم لتكوين البيضة علي الأداء الإنتاجي ونشاط الغدة الدرقية ومعدل امتصاص الكالسيوم في دجاجات السلالات المحلية المختلفة.

أظهرت دجاجات البندرة أعلي معدل لاستهلاك الغذاء (١٢١,٤٧ جرام / طائر / يوم). بينما تفوقت دجاجات الجميزة في كفاءة التحويل الغذائي (٠,٢٧ جرام بيض / جرام غذاء). كانت دجاجات المجموعة التي تستغرق أقل من ٢٥ ساعة زمناً لتكوين البيضة هي الأعلى معنوياً في معدل استهلاك الغذاء (١١٩,٩٦ جرام / طائر / يوم). كانت كفاءة التحويل الغذائي في كل مجاميع الطيور وعلي اختلاف فترات تكوين البيضة متساوية (٠,٢٦ جرام بيض/ جرام غذاء).

تفوقت دجاجات المعمورة في معدل إنتاج البيض وكتلة البيضة (٦٢,٩٧ % / دجاجة/يوم ، ٣١,١١ جرام /دجاجة/يوم علي الترتيب) بينما كانت الجميزة هي الأعلى في متوسط وزن البيضة (٤٩,٠٢ جرام). أظهرت المجموعة الأولي (أقل من ٢٥ ساعة زمناً لتكوين البيضة) تفوقاً في معدل إنتاج البيض وكتلة البيضة ، كان للزمن اللازم لتكوين البيضة تأثيراً معنوياً (عند مستوي ٠,٠٥) علي معدل إنتاج البيض فقط. تفوق بيض دجاجات الجميزة معنوياً في سمك القشرة (٠,٣٥٤ ملم) مقارنة بالمعمورة (٠,٣٤٤ ملم) والبندرة (٠,٣٣٩ ملم).

أظهر بيض دجاجات بيض البندرة تفوقاً معنوياً في نسبة الإخصاب (٩٠,٤٣ %) بينما تفوق بيض دجاجات المعمورة معنوياً في نسبة الفقس (٩٠,٦٨ %). كان للزمن اللازم لتكوين البيضة تأثيراً عالي المعنوية (عند مستوي ٠,٠١) علي نسبة الفقس.

أظهرت دجاجات سلالة الجميزة أعلي قيمة لكمية الكالسيوم الكلية الممتصة والممتص من الكالسيوم لكل جرام مادة جافة يليها دجاجات البندرة ثم دجاجات المعمورة. كانت دجاجات المجموعة الأولي (أقل من ٢٥ ساعة زمناً لتكوين البيضة) الأعلى معنوياً في كمية الكالسيوم الكلية الممتصة والممتص لكل جرام مادة جافة. كانت أعلي قيمة لكمية الكالسيوم الكلية الممتصة والممتص لكل ١ سم من طول الأمعاء الدقيقة في المعي الصائم يليه اللفائفي ثم الأثني عشر علي الترتيب. كما أظهرت الأجزاء المختلفة للأمعاء اختلافات عالية المعنوية (عند مستوي ٠,٠٠١) في كمية الكالسيوم الممتصة الكلية والممتص لكل جرام مادة جافة ولكل ١ سم طول من الأمعاء.تفوقت دجاجات المعمورة معنوياً في مستوي البلازما من هرمون الثيرونين ثلاثي اليود وكذا النسبة بينه وبين هرمون الثيروكسين. بينما أظهرت دجاجات الجميزة أعلي مستوي لهرمون الثيروكسين في البلازما. كانت دجاجات المجموعة الأولي (اقل من ٢٥ ساعة زمناً لتكوين البيضة) هي الأعلى في محتوي بلازما الدم من هرمون الثيرونين ثلاثي اليود وكذا النسبة بينه وبين هرمون الثيروكسين بينما أظهرت المجموعة الثالثة (أكثر من ٢٦ ساعة زمناً لتكوين البيضة) أعلي مستوي لهرمون الثيروكسين في الدم.