GENETIC ANALYSIS OF PRODUCTIVE PERFORMANCE IN RELATION TO CERTAIN PLASMA CONSTITUENTS IN THREE GENETIC GROUPS OF LOCAL CHICKENS

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ABSTRACT:

Data of productive performance on a total of 663 mature females : 225 Dandarawi, 296 Fayoumi and 142 Golden Montazah were analyzed to investigate the possibility to use some blood plasma biochemical constituents as indicators to egg production-related traits, egg quality, clutch and pause traits in Dandarawi, Fayoumi and Golden Montazah hens.

Values of heritability obtained for Golden Montazah were larger than those of other breeds ranged from 0.19 to 0.81 for egg number, egg weight, egg mass, clutch size, clutch number, pause duration, pause number in the first 90 days of production (CS_{90}, CN_{90}, PD_{90}, PN_{90}), shape index, plasma total cholesterol concentrations at 12 weeks of age and peak of egg production ($PTCC_{12}$ and $PTCC_{Peak}$). However, Dandarawi had higher heritability estimates for yolk index, Haugh unit, shell thickness and plasma glucose concentrations (PGC) at all ages of measurements. Heritability estimates for plasma constituents tended to decrease in magnitude as birds advanced in age which indicating higher variability at earlier ages than that at later ages of determination.

$PTPC_{12}$ in Dandarawi and $PTCC_8$ in Golden Montazah were the most important predictors in attaining AFE. EW_{90} was negatively affected by plasma total protein concentration at 8 weeks ($PTPC_8$, R^2:2.9%) in Fayoumi. No influence was detected for any plasma constituents at any age of measurements studied in Golden Montazah for EW_{90}. The most important predictor in determining CS_{90} was $PTPC_{12}$ in Fayoumi, $PTCC_{12}$ in Dandarawi. The corresponding R^2 were 3.1 and 6.0, respectively. For predicting CN_{90}, $PTCC_{12}$ was the most important significant ($P\leq 0.05$) predictors in determining this trait for Dandarawi. However, all plasma constituents at different ages entered in the model removed for Fayoumi and Golden Montazah. $PTCC_{12}$ was found to be positively influencing the PN_{90} in Dandarawi (R^2 : 6.4% and SEE : 4.21) . PGC_{12} in Golden Montazah was responsible for explaining 25.6% of the variability in its SI. In Fayoumi, whereas, $PTPC_8$ positively affected YI in both Dandarawi and Golden Montazah with R^2 of 8.5 and 15.9 % and SEE of 2.38 and 1.82 . Also, $PTPC_8$ found to be positively affected HU in both Dandarawi (R^2 6.0% and SEE 7.47) and Golden Montazah (R^2 13.4% and SEE 7.82). Therefore, prediction of some productive performance from certain plasma constituents especially at earlier ages could be estimated from the stepwise regression models that determine the most important predictors affecting those traits. Plasma constituents at 8 and 12 weeks in Dandarawi, Fayoumi and Golden Montazah could be used as selection criteria to improve their productive performance.

Key words: Genetic, productive performance, plasma constituents , chickens.

INTRODUCTION

Egg production is the yield of overall performance of a bird depending on many variables such as: age at first egg, egg number, rate of lay, egg weight, shell thickness and other external and internal egg characteristics (**Poggenpoel and Duckett, 1988, Muir, 1990, Brah *et al*., 1992**) which influence egg production system independently and/or associated with each other in positive or negative trends (**Poggenpoel, 1986, Fairfull and Gowe, 1993, El Gendy *et al*., 1997, El Full *et al*., 2000 and El Full 2001**). A knowledge of the interrelationships is highly useful in selecting for characters that are not easily observed or their genotypic values are modified. The breed or strain variation in the associations among these traits to perform egg production system was reported by **Kosba *et al*. (1981), Gowe and Fairfull (1985) and Abdel Latif (2001)**. Several investigators had been estimated correlations between different economic traits in chickens (**Kinney and Shoffner, 1965, Mohapatra and Ahuja, 1971, Prakashbabu, 1978 and Verma *et al*., 1983**). Their results although are mostly consistent in direction, differ widely in the magnitude. Since these estimates of genetic and phenotypic parameters would differ in different populations, it might be desirable to obtain estimates of these parameters for each population.

Blood biochemical constituents could be used as indicator traits in a breeding program for high productivity (**Obeidah *et al*., 1978**). Metabolic differences among animals with potential or ongoing production may be useful predictors of genetic merit for economic production traits (**Peterson *et al*., 1982**). Concerning the native fowls: Dandarawi which is well known and widely distributed in Upper Egypt, its characteristics of egg production and egg quality traits are still lower than that well known for the standard breeds as reported by **Sharara (1974), Abdel Latif (1977)** and **Abdel Latif and El Hammady (1992)**, Golden Montazah, that developed from a cross between the Rohde Island Red and Dokki-4 (**Mahmoud *et al*., 1974 and El Hossori *et al*., 1992**) and Fayoumi which is well known and widely distributed in Egypt, but its characteristics of egg production and egg quality are still lower than the standard breeds after termination of short-term selection for egg number in the first 90 days of production (**El Full *et al*., 2000**). Therefore, this study aimed to assess properties and structure of egg production and investigate the possibility to use some blood plasma biochemical constituents as indicators to egg production, clutch, pause and egg quality traits in Dandarawi, Fayoumi and Golden Montazah hens.

MATERIALS AND METHODS

This work was carried out at El Azab Poultry Research Center, Animal Production Research Institute, Agricultural Research Center, Ministry of Agriculture, Egypt. Data on a total of 663 mature females : 225 Dandarawi, 296 Fayoumi and 142 Golden Montazah were used in this study. Pedigreed eggs were collected daily and stored in a standard condition. Eggs were incubated in an electric forced draft Master incubators. All chicks were wing-banded, vaccinated for Marek's disease immediately after hatching and brooded in floor brooders. Feeding and management practices were kept uniform as possible throughout the experimental period. At 8 weeks of age, the two sexes were separated and females reared to the age 20 weeks, thereafter pullets were moved to individual battery cages and maintained up to 60 weeks of age. Blood samples were collected at 8, 12 weeks of age and at the peak of egg production. About 3 cm^3 of blood from each female were taken from the wing vein in the morning (between 8 and 10 o'clock) before feeding. Blood samples were immediately centrifuged at 3000 rpm for 15 minutes to separate plasma. The prepared plasma samples were stored at –20°C till the time of chemical analyses. Plasma samples were analyzed at the laboratories of Poultry Production Department, Faculty of Agriculture, Fayoum University.

The studied traits were:

1. **Egg production-related traits:** Age at first egg (AFE) individually recorded in days for each hen, egg number, egg weight and egg mass in the first 90 days of egg production (EN_{90} in eggs, EW_{90} and EM_{90} in grams) .
2. **Clutch and Pause traits:** Two measurements for either clutch or pause traits were considered during the first 90 day of production**:** the number of eggs per clutch of each hen (CS_{90}), the number of clutches (CN_{90}), the average length of pause duration (PD_{90}, days) and the occurrence number of pauses (PN_{90}).
3. **Egg quality traits:** Shape index (SI, %), yolk index (YI, %) , albumen height was measured according to the method described by **Amer (1972)**. Egg weight and albumen height were used to estimate Haugh unit for each individual egg according to **Haugh (1937)**. Shell thickness (ST) was estimated on the membraneless shells by using Ames shell thickness Gauge to the nearest µm.
4. **Plasma constituents (mg/100ml):** Using STANBIO Laboratory INC., Texas, USA, on Spekol Spectrophotometer, plasma glucose, total protein and total cholesterol concentrations (PGC, PTPC, PTCC mg/100ml) were quantitatively determined based on an enzymatic-colormetric technique described by **Trinder (1959, 1969).** Total protein in plasma was colormetrically determined according to the methods described by **Weichselbaum (1946).**

Statistical analysis:

Data were corrected for hatch effect before estimating genetic parameters and hierarchical analyses of variance and covariance were done to compute the heritabilities (h^2), genetic (rg) and phenotypic correlations between the studied characters according to **Kempthorne (1957**).

The following model was fitted, by strain, for each trait to calculate the genetic parameters using **SAS (2000)**:

$$Y_{ijk} = \mu + S_i + D_{ij} + e_{ijk}$$

where:

Y_{ijk} : expresses the observation of the ijk^{th} hen, μ : is the overall mean
S_i : is the effect of i^{th} sire, D_{ij} : is the effect of the j^{th} dam mated to i^{th} sire
e_{ijk} : is the error term accounted for the k^{th} hen of the j^{th} dam and i^{th} sire.

The standard errors of heritabilities were obtained according to **Swiger *et al.* (1964)**. Separate models for predicting egg performance traits through plasma constituents at 8, 12 weeks of age and at peak of egg production were fitted. The following linear regression model (**Steel and Torrie, 1980)** was:

$$\hat{Y} = a + b_1X_1 + b_2X_2 + b_3X_3 + \ldots + b_kX_k + \varepsilon_i.$$

where
$\hat{Y}$: is the expected value or mean of the population of Y's for a specified set of values of the **X's**, **a**: represents the **Y** intercept, **b's** represents slopes of **Y on X** that measures the increase or decrease in **Y** per unit of **X** and **ε_i:** is a deviation of the observation from the regression line, or a residual. In order to compare the relative efficiency of various models and to select the most suitable model, the coefficient of determination (**R^2**) and the standard error of the estimate (**SEE**) were estimated. A larger value of R^2 and smaller value on SEE indicate best fit of the model.

RESULTS AND DISCUSSION

As shown in Table 1, Dandarawi hens were sexually matured at earlier age than Golden Montazah and Fayoumi ($P \leq 0.01$) by 5.18 and 24.35 days, respectively. Earlier AFE was reported by several authors for native or foreign breeds ranged from 129 to 170 days (**Sandoval and Gernat, 1996, Sharaby, 1998, Shebl, 1998 and El Full *et al.* (2005a).** Also, Dandarawi produced the highest EN_{90} whereas Fayoumi had the lowest estimate ($P \leq$ 0.01,64.16 vs 23.51 eggs). Golden Montazah hens laid significantly heavier EW_{90} and EM_{90}, however, Fayoumi had the lowest EW_{90} and EM_{90} (48.22 and 2963g vs 37.6 and 902g) as shown in Table 1. The cited estimates of EN_{90} ranged from 23.1 to 57.04 eggs for most native or White Leghorn hens (**Sherif, 1991, El Hossari *et al.*, 1995, Sharaby, 1998 and Sharma *et al.*, 1999).** However, higher estimates of EN_{90} were reported by **Leeson *et al*. (1997)** and **El Full *et al.* (2005a).** Heavier EW_{90} for Dandarawi was reported by **El Hammady *et al.* (1992)** and **Ragab (1996)** whereas **Abdel Galil (1993)** cited lower EW of 36.2 for the same breed. Similar trend for EM was reported by **Kader and El Sayed (1986), Abdel Latif (2001)** and **El Full *et al.* (2005a).** However, lower estimates were cited for EM by **Attia and Hakim (1972)** and **Sharaby (1998)** for Baladi hens. Golden Montazah had significantly ($P \leq 0.01$) longer CS_{90} whereas Fayoumi had shorter CS_{90} than others (3.69 vs 1.51 eggs). Higher CN_{90} was shown for Dandarawi whereas Fayoumi had the lowest CN_{90} ($P \leq 0.01$, 19.22 and 15.4). The longest PD_{90} was 6.77 days for Fayoumi, however, Dandarawi had shorter PD_{90} than other breeds. PN_{90} had same trend as CN_{90} as shown in Table 1. Similar trend for clutch and pause traits was reported by **El Full *et al.* (2005b)**. Concerning egg quality traits, Fayoumi had significantly higher SI, YI, HU and thicker shells than other breeds ($P \leq 0.01$, 79.6, 50.48, 89.92% and 39.88µm, respectively). Fayoumi had significantly higher PGC but lower PTPC and PTCC than other breeds ($P \leq 0.01$, 165.49, 6.69 and 91.23 mg/100ml, regardless of age of measurements). Whereas Dandarawi had the highest PTPC and Golden Montazah had the highest PTCC (7.20 and 105.71mg/100ml) as shown in Table 1. Similar results for Golden Montazah and Dandarawi plasma constituents concentrations were reported by **Abdel Latif (2001)** and **Moawad (2002).**

Table 1. Means ± SE of the studied productive traits in the different genetic groups.

Trait	Dandarawi	Golden Montazah	Fayoumi
Egg production-related traits in the first 90 days of production			
Age at first egg (day)	170.17±1.22[d]	175.35±1.53[c]	194.52±0.68[b]
Egg number (egg)	64.16±0.62[a]	61.46±0.78[b]	23.51±0.35[c]
Egg weight (g)	39.89±0.23[b]	48.22±0.28[a]	37.96±0.13[c]
Egg mass (g)	2553 ±25.82[b]	2963±32.5[a]	902±14.54[c]
Clutch and Pause traits in the first 90 days of production			
Clutch size (egg)	3.32±0.04[b]	3.69±0.05[a]	1.51±0.02[c]
Clutch number	19.22±0.36[a]	18.09±0.45[b]	15.40±0.20[c]
Pause duration (day)	1.59±0.66[c]	1.70±0.83[b]	6.77±0.37[a]
Pause number	18.78±0.35[a]	17.54±0.44[b]	15.23±0.20[c]
Egg quality traits			
Shape index (%)	76.57±0.51[b]	75.92±0.74[b]	79.60±0.34[a]
Yolk index (%)	41.99±0.34[b]	42.14±0.56[b]	50.48±0.23[a]
Haugh unit (%)	70.69±0.79[b]	72.43±1.30[b]	89.92±0.53[a]
Shell thickness, µm	37.40±0.20[b]	36.45±0.33[c]	39.88±0.13[a]
Plasma constituents traits			
PGC (mg/100ml)	98.75±3.06[b]	103.13±4.51[b]	165.49±2.36[a]
PTPC (mg/100ml)	7.20±0.08[a]	7.04±0.10[a]	6.69±0.16[b]
PTCC (mg/100ml)	103.72±1.69[a]	105.71±2.19[a]	91.23±3.51[b]

PGC: Plasma glucose concentration, PTPC: Plasma total protein concentration, PTCC: Plasma total cholesterol concentration. Means having different superscripts within each raw are significantly different at P≤0.01.

Results in Table 2, age of measurements was significantly affected (P≤ 0.01) plasma constituents concentrations. The highest PGC and PTCC were measured at eight weeks of age (163.71 and 109.79mg/100ml), whereas the highest PTPC was shown at peak of egg production (8.25mg/100ml, Table 2). This result was in full agreement with those reported by **Abdel Latif (2001)**, **El Full (2001)** and **Moawad (2002)** which indicated that these constituents were significantly affected by age of measurements. Higher estimates for these constituents at 8 and 12 weeks of age of measurements were reported by **Abdel Latif (2001)** and **Moawad (2002)** for Dandarawi and Golden Montazah**.** Higher PGC at the peak of egg production were reported by **Obeidah *et al.* (1978), Rai *et al.* (1987)** and **Bakir *et al.* (1988).** Higher PTCC $_{Peak}$ was reported by **Naryana *et al.*(1991)** , however lower PTPC and PTCC were reported by **Bakir *et al.*(1988).** Whereas, **Obeidah *et al.* (1978)** and **Scott and Jensen (1993)** reported higher estimates for PTPC**.** Significant breed by age of measurement interaction (P≤ 0.01) effects on PGC, PTPC and PTCC as shown in Table 2. The highest PGC was 210.22 mg/100ml for Fayoumi at eight weeks whereas the lowest PGC was shown by each of Golden Montazah and Fayoumi at peak of egg production and Dandarawi at eight weeks and peak of egg production. Significantly higher estimates of $PTPC_{Peak}$ were shown by Dandarawi, Fayoumi and Golden Montazah (8.28, 8.25 and 8.18mg/100ml, respectively) than at other ages of measurements, whereas Fayoumi at eight weeks had the lowest PTPC of

5.59mg/100ml. Golden Montazah showed significantly higher PTCC $_{Peak}$, however the lowest PTCC of 56.17mg/100ml was shown for Fayoumi at peak of egg production.

Table 2. Effects of age of measurements and breed x age interaction on plasma constituents traits in the different genetic groups.

Group	Age	PGC,mg/100ml	PTPC, mg/100ml	PTCC, mg/100ml
Age of measurement effect:				
	8	163.71±3.05[A]	5.69±0.08[C]	109.79±2.21[A]
	12	162.71±2.31[A]	6.46±0.08[B]	96.94±2.20[B]
	Peak	91.22±2.76[B]	8.25±0.07[A]	86.93±2.00[C]
Breed x Age of measurement interaction effect:				
Fayoumi	8	210.22±2.81[a]	5.59±0.10[d]	118.59±2.62[ab]
	12	191.09±3.02[b]	6.26±0.10[c]	97.87±2.61[d]
	Peak	93.91±2.84[e]	8.25±0.10[a]	56.17±2.66[f]
Dandarawi	8	92.12±3.97[e]	5.78±0.14[cd]	98.06±3.69[d]
	12	122.59±3.97[c]	6.98±0.14[b]	100.06±3.69[cd]
	Peak	84.70±3.22[e]	8.28±0.14[a]	109.86±3.71[bc]
Golden Montazah	8	106.89±6.54[d]	6.00±0.23[cd]	94.40±6.08[d]
	12	118.37±7.02[cd]	6.13±0.23[c]	83.41±6.08[e]
	Peak	92.07±4.99[e]	8.18±0.23[a]	125.27±6.08[a]

PGC : Plasma glucose concentration, PTPC: Plasma total protein concentration, PTCC: Plasma total cholesterol concentration. Means having different superscripts per each effect within each column are significantly different at P≤0.01.

Heritability estimates of the different studied traits based on sire+dam components of variance are presented in Table 3. Heritability estimates for AFE of Fayoumi tended to be higher than those of Dandarawi and Golden Montazah (0.27 vs 0.24 and 0.12, respectively). Lower estimateof heritability of 0.07 was reported by **Acharya *et al.* (1969)**, however higher estimates were reported by **Brah *et al.* (1991)** and **Bais *et al.* (1997).** Values of heritability obtained for Golden Montazah were larger than those of other breeds ranged from 0.19 to 0.81 for EN_{90}, EW_{90}, EM_{90}, CS_{90}, CN_{90}, PD_{90}, PN_{90}, SI, $PTCC_{12}$ and $PTCC_{Peak}$ (Table 3). However, Dandarawi had higher heritability estimates for YI, HU, ST, PGC at all ages of measurements, PTPC at 8 and 12 weeks and $PTCC_8$, respectively ranging from 0.14 to 0.99 than others. Higher estimate for $PTPC_{Peak}$ of 0.76 was shown for Fayoumi than other breeds. Similar trend of heritability to this of the present study was reported by **Abdel Latif (2001)** and **El Full (2001).** However, lower range between 0.26 and .32 was cited for egg production-related traits by **Goher *et al.* (1978a, b), Hanafi and El Labban (1984), Sharma *et al.* (1984)** and **Singh *et al.* (1986).** As shown in Table 3, heritability estimates ranged from 0.01 to 0.73, 0.03 to 0.76 and 0.01 to 0.52 for PGC, PTPC and PTCC, respectively. Cited ranges in the literature for these constituents were 0.13 to 0.37, 0.12 to 0.43 and 0.24 to 0.45, respectively (**Abdel Latif, 2001**, **El Full, 2001** and **Moawad ,2002)**. Similar trends for PTCC and PTPC were reported by **Obeidah *et al.* (1978), Rai *et al.* (1987)** and **Naryana *et al.* (1991)**. Accordingly, it could be concluded that heritability estimates tended to decrease in magnitude as hens progressed in age, associated with higher variability in blood constituents determined at earlier ages than at later ages of determination. Therefore, plasma constituents at 8 and 12 weeks in Dandarawi and Golden Montazah can be used as selection criteria to improve their egg performance.

Table 3. Heritability estimates ± SE of the studied productive traits in the different genetic groups based on full-sib correlations.

Trait	Dandarawi	Golden Montazah	Fayoumi
Egg production-related traits			
AFE (day)	0.24±0.10	0.12±0.08	0.27±0.13
EN_{90} (egg)	0.11±0.15	0.50±0.21	0.45±0.25
EW_{90} (g)	0.66±0.19	0.77±0.29	0.61±0.23
EM_{90} (g)	0.14±0.16	0.54±0.21	0.43±0.40
Clutch and Pause traits			
CS_{90} (egg)	0.26±0.20	0.57±0.26	0.31±0.25
CN_{90}	0.24±0.22	0.47±0.24	0.37±0.28
PD_{90} (day)	0.62±0.25	0.81±0.21	0.45±0.30
PN_{90}	0.19±0.21	0.50±0.25	0.24±0.40
Egg quality traits			
SI (%)	0.37±0.12	0.67±0.19	0.41±0.18
YI (%)	0.82±0.16	0.29±0.13	0.25±0.14
HU (%)	0.99±0.17	0.46±0.16	0.18±0.11
ST, µm	0.59±0.16	0.20±0.11	0.36±0.19
Plasma constituents traits			
PGC_8 (mg/100ml)	0.73±0.21	0.13±0.19	0.03±0.09
PGC_{12} (mg/100ml)	0.42±0.19	0.20±0.18	0.17±0.10
PGC_{Peak} (mg/100ml)	0.14±0.20	0.10±0.19	0.01±0.05
$PTPC_8$ (mg/100ml)	0.29±0.23	0.20±0.19	0.07±0.08
$PTPC_{12}$ (mg/100ml)	0.57±0.21	0.11±0.19	0.03±0.08
$PTPC_{Peak}$ (mg/100ml	0.35±0.18	0.54±0.14	0.76±0.38
$PTCC_8$ (mg/100ml)	0.52±0.22	0.23±0.39	0.01±0.09
$PTCC_{12}$ (mg/100ml)	0.10±0.25	0.43±0.17	0.01±0.07
$PTCC_{Peak}$(mg/100ml)	0.07±0.20	0.19±0.17	0.01±0.20

AFE: Age at first egg, EN: Egg number, EW: Egg weight, EM: Egg mass , PGC : Plasma glucose concentration, PTPC: Plasma total protein concentration, PTCC: Plasma total cholesterol concentration, CS: Clutch size, CN: Clutch number, PD: Pause duration, PN: Pause number, SI: Shape index, YI: Yolk index , HU: Haugh unit, ST: Shell thickness.

The fitted equations of stepwise regression to predict egg production-related traits from plasma constituents at 8, 12 and peak of egg production which are presented in Table 4, indicated that the PGC_{Peak} was the most important factor in determining AFE in Fayoumi ($P\leq 0.05$) whereas $PTPC_{12}$ in Dandarawi ($P\leq 0.01$) and $PTCC_8$ in Golden Montazah ($P\leq 0.05$) were the most important predictors in attaining AFE. The later breed had higher R^2 than those of Dandarawi and Fayoumi (17.9 vs 10.9 and 2.3%, respectively). All variables entered in the stepwise model in either Fayoumi or Dandarawi were removed when predicting EN_{90}. However, $PTCC_{Peak}$ found to be the most important plasma constituents affecting EN_{90} in Golden Montazah

Table 4

($P\leq 0.05$) indicating that this trait was negatively influenced by $PTCC_{Peak}$ and 17.4% of its variability was explained by $PTCC_{Peak}$. EW_{90} was negatively affected by $PTPC_8$ ($P\leq 0.05$, R^2:2.9%) in Fayoumi, however in the Dandarawi, $PTPC_{Peak}$ explained 8.0% of the variation in its EW_{90} with lower SEE than Fayoumi (2.58 vs 3.9, Table 4). No influence was detected for any plasma constituents at any age of measurements studied in Golden Montazah for EW_{90}. EM_{90} was positively affected ($P\leq 0.05$, R^2:5.9%) by $PTPC_{Peak}$ in Dandarawi, however all other constituents at all ages entered into stepwise regression model were removed in both Fayoumi and Golden Montazah (Table 4).

As shown in Table 5, results of stepwise regression for predicting clutch and pause traits of different breeds from certain plasma constituents at studied ages indicated that the most important predictor in determining CS_{90} was $PTPC_{12}$ ($P\leq 0.05$) in Fayoumi, $PTCC_{12}$ in Dandarawi ($P\leq 0.05$) and $PTPC_{Peak}$ in Golden Montazah. The corresponding R^2 were 3.1, 6.0 and 12.6%, respectively. For predicting CN_{90}, $PTCC_{12}$ was the most important significant ($P\leq 0.05$) predictors in determining this trait for Dandarawi. However, all constituents at different ages entered in the model wer removed for Fayoumi and Golden Montazah. Also, all variables entered the regression model were removed when predicting PD_{90} in all breeds studied and same trend was observed in both Fayoumi and Golden Montazah for predicting PN_{90}. However, $PTCC_{12}$ found to be positively influenced PN_{90} in Dandarawi ($P\leq 0.05$, R^2 : 6.4% and SEE : 4.21) as shown in Table 5.

In either Fayoumi or Golden Montazah PGC was negatively influenced SI at peak of production for the former breed with $R^2$3.3% and SEE 4.25 ($P\leq 0.05$) and higher $R^2$and lower SEE for the later breed ($P\leq 0.01$, 25.6% and 2.41) indicating that PGC_{12} in Golden Montazah was responsible for explaining 25.6% of the variability in its SI. In Fayoumi, $PTCC_{Peak}$ found to be the most important predictor negatively influenced YI ($P\leq 0.001$, R^2: 19.1% and SEE 2.89) as shown in Table 6. Whereas, $PTPC_8$ positively affected YI in both Dandarawi ($P\leq 0.01$) and Golden Montazah ($P\leq 0.05$) with R^2 of 8.5 and 15.9 % and SEE of 2.38 and 1.82. Model 2 that using $PTCC_{Peak}$ and $PTPC_8$ as predictors for predicting HU was better than model 1 for Fayoumi hens with higher R^2 and lower SEE (5.8% and 3.73, $P\leq 0.001$) as shown in Table 6. Also, $PTPC_8$ found to be positively affected HU in both Dandarawi (R^2: 6.0% and SEE: 7.47, $P\leq 0.05$) and Golden Montazah (R^2: 13.4% and SEE: 7.82, $P\leq 0.05$). For predicting ST, model 2 that using $PTCC_{Peak}$ and PGC_{Peak} as predictors in Fayoumi was better than model 1 with R^2 34.9% and SEE 0.89 at $P\leq 0.001$, as shown in Table 6. However all variables entered the model of prediction of ST from plasma constituents at different ages of measurements in both Dandarawi and Golden Montazah were removed. Therefore, prediction of some productive performance from certain plasma constituents especially at earlier ages can be estimated from the stepwise regression models to determine the most important predictors affecting them.

Table 5. Stepwise regression for predicting clutch and pause traits in the different genetic groups from certain plasma constituents at different ages of measurements.

Y	Breed	Predictors	Fitted equation	r	R^2 (%)	SEE	Sig.
CS_{90}	Fayoumi	$PTPC_{12}$	$\hat{Y}=1.28 + 3.72E^{-02}\ PTPC_{12}$	0.18	3.1	0.37	*
	Dandarawi	$PTCC_{12}$	$\hat{Y}= 5.04 – 1.58E^{-02}\ PTCC_{12}$	-0.24	6.0	1.07	*
	Golden Montazah	$PTCC_{90}$	$\hat{Y}= 5.44 – 7.74E^{-02}\ PTCC_{90}$	-0.35	12.6	1.38	*
CN_{90}	Fayoumi		Variables entered/removed				
	Dandarawi	$PTCC_{12}$	$\hat{Y}=11.82 + 6.57E^{-02}\ PTCC_{12}$	0.27	7.1	4.06	*
	Golden Montazah		Variables entered/removed				
PD_{90}	Fayoumi		Variables entered/removed				
	Dandarawi		Variables entered/removed				
	Golden Montazah		Variables entered/removed				
PN_{90}	Fayoumi		Variables entered/removed				
	Dandarawi	$PTCC_{12}$	$\hat{Y}= 11.52 + 6.41\ E^{-02}\ PTCC_{12}$	0.25	6.4	4.21	*
	GOLDEN MONTAZAH		Variables entered/removed				

Y: Dependent variable, Ŷ: Predicted variables, CS: Clutch size, CN: Clutch number, PD: Pause duration, PN: Pause number,
PGC : Plasma glucose concentration, PTPC: Plasma total protein concentration, PTCC: Plasma total cholesterol concentration,
r: correlation coefficient, R^2: Coefficient of determination, SEE: Standard error of an estimate and Sig.: Significance, *: $P \leq 0.05$.

Table 6

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التحليل الوراثى للأداء الإنتاجى لثلاثة مجموعات وراثية من الدجاج المحلى
وعلاقتها ببعض مكونات البلازما

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تم تحليل الأداء الإنتاجى لعدد ٦٦٣ دجاجة بالغة: ٢٢٥ دندراوى و ٢٩٦ فيومى و١٤٢ منتزه ذهبى لبحث إمكانية استخدام بعض مكونات بلازما الدم البيوكيماوية كدلائل على كل من الصفات المتعلقة بانتاج البيض والجودة النوعية للبيض وصفات السلسلة وفترات التوقف فى دجاج الدندراوى و الفيومى والمنتزه الذهبى.

كانت قيم العمق الوراثى للمنتزه الذهبى أعلى عن باقى الأنواع و تتراوح بين ٠.١٩ الى ٠.٨١ لصفات عدد البيض، وزن البيضة، كتلة البيض، طول السلسلة ، عدد السلاسل ، طول فترة التوقف، عدد فترات التوقف، تركيز كوليسترول البلازما عند عمر ١٢أسبوع و عند قمة انتاج البيض. كان العمق الوراثى فى دجاج الدندراوى لصفات دليل الصفار، وحدات هاو ، سمك القشرة و تركيز جلوكوز البلازما عند كل الأعمار المدروسة أعلى من باقى المجموعات المدروسة. وقد كانت قيم العمق الوراثى لمكونات بلازما الدم تميل للتناقص بتقدم عمر القياس، مبينة أن أعمار القياس المبكرة تظهر تبايناً أعلى عنه عند أعمار القياس المتأخرة.

كان تركيز البروتين الكلى عند عمر ١٢أسبوع فى الفيومى و الكوليستيرول الكلى عند ١٢أسبوع فى الدندراوى و تركيز الكوليسترول الكلى عند عمر ٨أسابيع فى المنتزه الذهبى هو الأكثر أهمية فى التنبؤ بالعمر عند أول بيضة و كانت معاملات لتقدير المصاحبة ٣.١ ، ٦.٠، ١٧.٩% على التوالى. يتأثر وزن البيضة تأثرا سالباً بتركيز البروتين الكلى عند ٨أسابيع (معامل التقدير: ٢.٩%) فى الفيومى. لم يظهر أى تأثير لأى من مكونات البلازما عند أى من الأعمار المدروسة على وزن البيضة فى المنتزه الذهبى. كان العامل الأهم فى التأثير على طول السلسلة هو تركيز البروتين الكلى عند ١٢أسبوع فى دجاج الدندراوى. وكانت معاملات لتقدير المصاحبة ٣.١ ، ٦.٠ % على التوالى كان تركيز كوليسترول البلازما الكلى عند ١٢أسبوع هو الأهم معنوياً. للتنبؤ بعدد سلاسل البيض فى الدندراوى. بينما لم تؤثر أى من مكونات البلازما على الصفة فى كل من الفيومى والمنتزه الذهبى. وجد أن تأثير تركيز الكوليسترول الكلى عند ١٢أسبوع موجباً على صفة عدد فترات التوقف فى الدندراوى (معامل التقدير:٦.٤% والخطأ المعياري للقياس٤.٢١). وكان تركيز الجلوكوز فى البلازما عند عمر ١٢أسبوع هو المسئول عن ٢٥.٦% من الاختلافات فى دليل الشكل لها. وفى الفيومى يؤثر تركيز البروتين الكلى عند عمر ٨أسابيع تأثيراً موجباً على دليل الصفار فى كل من الدندراوى والمنتزه الذهبى بمعامل تقدير ٨.٥، ١٥.٩% وخطأ معياري للقياس ٢.٣٨ و ١.٨٢. أيضاً وجد لتركيز البروتين الكلى عند ٨ أسابيع تأثيرا موجباً على وحدات هاو فى كل من الدندراوى (معامل التقدير:٦% والخطأ المعيارى ٧.٤٧، $P \leq 0.05$) و المنتزه الذهبى (معامل التقدير: ١٣.٤% والخطأ المعيارى ٧.٨٢، $P \leq 0.05$). لذلك فإن هناك إمكانية للتنبؤ ببعض الصفات الانتاجية خاصة عند الأعمار المبكرة بواسطة بعض مكونات البلازما باستخدام تحليل الانحدار التدريجى لتحديد المكونات الأهم تأثيراً. وعلى ذلك فإن مكونات البلازما عند ٨ و ١٢ أسبوع فى كل من الدندراوى، الفيومى والمنتزه يمكن استخدامها كمقاييس انتخابية لتحسين أدائها الإنتاجى.