PREDICTON OF PERFORMANCE BASED ON DIFFERENT ECONOMIC TRAITS IN DANDARAWI AND GOLDEN MONTAZAH PULLETS.

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ABSTRACT:

Different prediction equations were established for egg production (EN_{90}), egg weight (EW_{90}), egg mass (EM_{90}) in the first 90 days of production, sexual maturity, specific gravity (SG), shell thickness (ST) and shape index (SI) of egg based on the coefficient values of selected variables under each. Data from Dandarawi (Dand) and Golden Montazah (GM) were used. The R-square values of each equation were calculated. EN_{90} is a function of either EW_{90} or EM_{90} (Dand). EW_{90} is a function of each of keel length at 8 weeks of age (KL_8,Dand) and KL_{12} in GM. SG is a function of ST for both breeds. More EN_{90} can be predicted through lighter body weight (BW_8) and longer shank length (SL_8) at eight weeks of age, however, heavier BW_8 and shorter SL_8 at eight weeks of age can be used as predictors for higher EM_{90} for Dand pullets. Heavier body weight at sexual maturity (BW_{SM}) and longer KL_{12} resulted in retardation of sexual maturation for Dand. The only significant positive factor resulting in 14.5% of the variability in EW_{90} was BW_{12} for GM. Heavier BW_8 was associated with decreasing EN_{90} in Dand. Each of $EN_{90,}$ EW_{90} and BW_8 were significantly increased EM_{90} for Dand, whereas SL_8 negatively associated with its EM_{90}. For GM, EN_{90} and EW_{90} significantly increased EM_{90}.

In general, equations used for predicting economic traits that had highly significant R-square indicating that variables associated with each Y-trait were actual and prediction for future economic production will be reliable .

Key Words: Economic traits, Body weight, Egg production, Egg quality, Dandarawi, Golden Montazah , chickens.

INTRODUCTION

The economic return of birds depend largely on characters like body weight, age at sexual maturity, egg production, egg weight and other egg quality traits **(Singh and Singh, 1999)**. **Rathore *et al.* (1980)** reported that the phenotypic, genetic and environmental correlations between 12 week body weight and egg production were 0.559, 0.152 and 0.053, respectively. **Abdel Latif (2001)** reported similar findings. According to **Singh and Singh (1999)**, there is a negative correlation between age at sexual maturity and 280day age egg production for White Leghorn. Similarly, genetic correlations are abundant in literature that were calculated between age at sexual maturity and specific gravity of egg, age at sexual maturity and egg mass **(Singh and Singh, 1999)**, egg production and specific gravity **(El Full, 1995)**, egg production and egg weight**,** egg weight and specific gravity **(Abdou *et al*., 1993 and Abdel Latif, 2001)**. However, as shell quality is improved, the breeder must also maintain or improve several other economic traits such as egg production, internal egg quality, fertility, hatchability and viability. Therefore, the choice of shell quality measurement should be based, in part, on correlation with these traits **(Grunder *et al*., 1991)**. Despite of negative correlations between egg number and shell stability, the egg-shell quality could be improved **(Pingel *et al*., 2004)**. But relationships among these traits with egg production, egg weight, specific gravity of egg, shape index and egg mass are very rare and a better understanding of these relationships is necessary for more effective selection to continue the improvement of the laying hen. Thus present study is an attempt to establish equations for prediction of egg production in the first 90 days of production, egg weight, specific gravity, shape index of egg in Dandarawi and Golden Montazah pullets and to find out the most potent variables associating with each of the above economic traits.

MATERIALS AND METHODS

The present study was conducted on the Dandarawi (Dand) and Golden Montazah (GM) pullets maintained at El Azab Poultry Research Center, Animal Production Research Institute, Agricultural Research Center, Ministry of Agriculture, Egypt.

A total of 802 female progenies of G M and 840 female progenies of Dand breeds were produced using 10 sires per each. Six successive pedigreed hatches, seven days apart were taken. All chicks were wing-banded, immunized for Marek's disease immediately after hatching and brooded in floor brooders. The management practices were kept the same as possible throughout the experimental period. Feed and water were offered *ad lib.* Feeds formulated and the mineral and vitamins were adequately supplied to cover the requirements of Egyptian chicken breeds according to the **Ministerial Decree No. 1498 (1996)** .

At 20 weeks of age, the pullets were moved and kept into individual battery cages with standard feeding diets containing 15.5% CP and 2700 Kcal ME/Kg and management practice.

Individual body weights (BW) at 8, 12 weeks of age and at sexual maturity (BW_{SM}), were recorded to the nearest gram and the lengths of shank and keel (SL and KL) were measured to the nearest mm. Age at sexual maturity (SM) calculated in days per each hen. Egg mass (EM_{90}) in grams was obtained by multiplying egg weight (EW_{90}) and egg number (EN_{90}) laid during the first 90 days of production (up to 265 days of age) for each hen per each breed. The specific gravity (SG) of each egg was estimated using floating technique. The length and breadth of eggs were measured at the first 90 days of egg production at maximum length and width by vernier callipers and expressed as percent ratio of width/length (shape index, SI) of the egg. Shell thickness (ST) was measured on the membraneless shells by using Ames gauge to the nearest μ m.

Statistical analysis: Data were corrected for hatch effect before conducting the statistical analyses. The following model was used to calculate the descriptive statistical parameters:

$$Y_{ijk} = \mu + B_i + S(B)_{ij} + e_{ijk}$$

where:

Y_{ijk}: expresses the observation of the ij^{th} hen within breed and sire, **μ**: is the overall mean, B_i: is the effect of i^{th} breed, **S(B)ij**: is the effect of sire within breed and e_{ijk}: is the error term accounted for the k^{th} hen of the j^{th} sire within each i^{th} breed .

The prediction equations based on multiple variables for EN_{90}, EW_{90}, SG of egg, SI and EM_{90} were calculated separately through multiple linear and stepwise regression according to **SPSS (1998)** using the following model:

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

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, **where: a**: represents the Y intercept, b's represents the 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. Correlation coefficients among studied traits and variance components were calculated according to **SAS (2000)**.

RESULTS AND DISCUSSION

Means and their standard errors for BW, SL, KL, egg production related traits and egg quality traits are presented in Table 1. G M pullets had significantly heavier BW and longer shanks at all studied ages and longer keels at eight weeks of age and at sexual maturity. Lower estimates of BW, SL or KL at 8 and 12 weeks of age for the Dand pullets were reported by **Abdel Latif and El Hammady (1992)** and **Abdel Latif (1999)**. However, **Sabri *et al*. (1995)** reported heavier BW_8 and BW_{12} than the present study for Dand chickens. Dand hens were sexually matured at an earlier age than GM hens by 3.84 days. Earlier age at sexual maturity was reported by **Sharaby(1998)** and **Shebl (1998)** for some Egyptian native breeds**.**

Table 1. Means ± SE of Dandarawi and Golden Montazah hens for studied traits.

Trait	Dandarawi	Golden Montazah	Grand mean
BW_8	466.47±5.76[b]	471.46±1.58[a]	468.97±6.02
BW_{12}	722.59±10.85[b]	1039.95±19.95[a]	881.27±11.35
BW_{SM}	1256.21±16.95[b]	1569.73±31.16[a]	1412.97±17.74
SL_8	75.54±0.34[b]	84.94±0.63[a]	80.24±0.36
SL_{12}	89.80±0.51[b]	100.61±0.96[a]	95.21±0.54
SL_{SM}	92.62±0.36[b]	104.78±0.66[a]	98.70±0.38
KL_8	66.08±1.18[b]	78.19±2.02[a]	72.14±1.25
KL_{12}	81.11±3.98[a]	92.31±7.41[a]	86.71±4.21
KL_{SM}	96.44±0.69[b]	107.19±1.28[a]	101.82±0.73
Egg production-related traits			
SM, days	170.94±0.46[b]	174.78±0.84[a]	172.86±0.48
EN_{90}	64.83±0.85[a]	60.03±1.55[b]	62.43±0.88
EW_{90}, g	39.49±0.27[b]	48.17±0.48[a]	43.84±0.27
EM_{90}, g	2559.41±37.02[b]	2888.60±67.51[a]	2724.00±38.49
Egg quality traits			
SG	1.066±0.001[a]	1.062±0.002[a]	1.064±0.001
SI, %	76.67±0.26[a]	75.82±0.49[a]	76.24±0.28
ST, µm	36.99±0.28[a]	37.28±0.53[a]	37.13±0.30

a and b: Means with different superscripts in the same row are significantly different ($P \leq 0.05$).

Dand hens had significantly ($P \leq 0.01$) higher EN_{90} whereas, GM had highly significant ($P \leq 0.01$) heavier EW_{90} or EM_{90} as shown in Table 1. Lower egg number during the first 90 days of production was cited by several authors (**Sharaby, 1998 and Shebl, 1998**). **El Hammady *et al*. (1992)** and **Ragab (1996)** reported heavier egg weight for Dand whereas, lower means of EW was reported by **Abdel Galil (1993)**. Lower egg mass estimates were reported by

Sharaby (1998). Eggs produced by Dand pullets had insignificantly higher SG and SI but lower ST than eggs produced by GM pullets.

Variance components as percentage to total variance are presented in Table 2. It can be seen that sire' variance components for Dand BW's at different ages studied were higher than those for GM. Similar trend was obtained for KL's at 8 and 12weeks of age. Higher Dand' variance components due to sires than GM were found for SM, EW_{90}, SG, and SI. Whereas, GM had higher sire' variance components than Dand for SL_{12}, KL_{SM}, EN_{90}, and ST. Traits showed highly considerable sire components within breed were affected by breed' genetic makeup than SL_8 and SI that affected to a large extent by various environmental factors as shown in Table 2 .

Table 2. Variance components as percent of the total variance for studied traits .

Item	Dandarawi		Golden Montazah	
	Sire	Error	Sire	Error
BW_8	25.15	74.85	22.56	77 .44
BW_{12}	22.28	77.72	21.80	78.20
BW_{SM}	28.38	71.62	12.47	87.53
SL_8	2.31	97.69	16.06	83.94
SL_{12}	7.70	92.30	8.71	91.29
SL_{SM}	14.35	85.65	12.41	87.59
KL_8	21.34	78.66	21.29	78.71
KL_{12}	21.62	78.38	0.23	99.77
KL_{SM}	14.35	85.65	21.45	78.55
Egg production-related traits				
SM	8.04	91.96	3.21	96.79
EN_{90}	3.69	6.31	16.90	83.10
EW_{90}	15.33	84.67	9.04	90.96
EM_{90}	6.91	93.09	5.89	94.11
Egg quality traits				
SG	14.78	85.22	12.31	87.6
SI	4.25	95.75	0.62	99.38
ST	18.62	81.38	21.50	78.50

Phenotypically, SM for Dand positively correlated with BW_{SM} and EW_{90} (0.263, $P<0.01$ and 0.191, $P<0.05$, respectively). EN_{90} for Dand positively correlated with EM_{90} however negatively associated with ST (0.894, $P<0.001$ and -0.191, $P<0.05$, respectively). EW_{90} positively correlated with each of BW_8, BW_{SM},SL_{SM}, KL_8, KL_{SM}, SM, EM_{90} and ST whereas negatively correlated with KL_{12} as shown in Table 3. EM_{90} significantly correlated with either EN_{90} or EW_{90}. SG positively correlated with ST (0.559, $P<0.001$) however ST was negatively correlated with EN_{90} (-0.191,$P<0.05$). This confirm the views of **Singh and Singh (1999)**.

For GM, negative associations were found between SM and either BW_{SM} or SL_{SM} (-0.341 and -0.367, $P<0.05$). EN_{90} was positively correlated with each of EM and SI (0.929, $P<0.001$ and 0.448, $P<0.01$). GM' EW_{90} was positively correlated with BW_{12}, BW_{SM}, SL_8, SL_{SM} and KL_{SM} ranging from 0.388 to 0.735 as shown in Table 3. Significant and positive correlation was found between GM' EM_{90} and either EN_{90} or SI (0.929, $P<0.001$ and 0.371, $P<0.05$). Similar trend of highly significant positive association was found between SG and ST in GM as in Dand as shown in Table 3.

Table 3. Phenotypic correlation among various studied traits.

Item	SM	EN_{90}	EW_{90}	EM_{90}	SG	SI	ST
Dandarawi:							
BW_8	0.116	-0.132	0.325**	0.044	0.180*	-0.091	0.072
BW_{12}	-0.016	-0.082	-0.011	-0.077	0.031	0.066	0.067
BW_{SM}	0.263**	-0.164	0.430**	0.049	0.064	-0.022	0.110
SL_8	0.121	-0.074	0.079	-0.032	0.127	-0.119	0.047
SL_{12}	0.125	-0.106	-0.172	-0.177	0.025	0.020	0.096
SL_{SM}	0.069	-0.071	0.314***	0.075	0.018	0.027	0.070
KL_8	-0.029	-0.057	0.203*	0.019	0.082	0.102	0.015
KL_{12}	0.096	0.013	-0.196*	-0.092	-0.091	-0.071	-0.003
KL_{SM}	0.108	-0.063	0.232**	0.056	-0.048	0.013	-0.027
SM		-0.069	0.191*	0.023	0.069	0.006	0.101
EN_{90}	-0.069		-0.036	0.894***	-0.096	0.041	-0.191*
EW_{90}	0.191*	0.036		0.405***	0.132	0.004	0.201*
EM_{90}	0.023	0.894***	0.405***		-0.025	0.040	-0.079
SG	0.069	-0.069	0.132	-0.025		0.061	0.559***
SI	0.006	0.041	0.004	0.040	0.061		-0.007
ST	0.101	-0.191*	0.201*	-0.079	0.559***	-0.007	
Golden Montazah:							
	SM	**EN_{90}**	**EW_{90}**	**EM_{90}**	**SG**	**SI**	**ST**
BW_8	-0.026	-0.075	0.309	0.045	0.128	-0.270	0.187
BW_{12}	-0.314	-0.127	0.388*	0.021	0.338*	-0.078	0.166
BW_{SM}	-0.341*	-0.234	0.668***	-0.224	0.292	0.066	0.132
SL_8	-0.225	-0.076	0.350*	0.049	0.09	-0.104	0.187
SL_{12}	-0.159	-0.058	0.296	0.078	0.254	-0.162	0.143
SL_{SM}	-0.367*	0.047	0.735***	0.138	0.095	-0.016	0.103
KL_8	-0.131	-0.314	0.260	-0.209	0.208	-0.065	-0.013
KL_{12}	-0.210	-0.051	0.296	0.077	0.332	-0.167	0.097
KL_{SM}	-0.284	-0.076	0.664***	0.037	0.253	-0.181	0.038
SM		0.030	0.061	0.050	0.063	0.096	-0.176
EN_{90}	0.030		-0.082	0.929***	-0.059	0.448**	0.054
EW_{90}	0.061	-0.082		0.287	0.151	-0.148	0.080
EM_{90}	0.050	0.929***	0.287		0.001	0.371*	0.080
SG	0.063	-0.059	0.151	0.001		0.077	0.467***
SI	0.096	0.448**	-0.148	0.371*	0.077		0.131
ST	-0.176	0.054	0.080	0.080	0.467**	0.131	

*: Significant at $P \leq 0.05$, **: Significant at $P \leq 0.01$, ***: Significant at $P \leq 0.001$.

From Table 4, multiple linear regression analysis clearly showed that BW_8 for Dand had significant ($P \leq 0.05$) negative influence on EN_{90}, perhaps the 8 week age has a significant effect on this economic trait. Whereas, BW_8 significantly($P \leq 0.05$) increased EM_{90} and SG. This confirm the results of **Singh and Singh (1999)** that egg production was a function of body weight in White Leghorn.

Table 4. Multiple linear regression for Dandarawi traits.

Item	SM	EN_{90}	EW_{90}	EM_{90}	SG	SI	ST
a	115.32	54.34	35.61	-2077.50	0.95	55.85	-107.60
BW_8	-1.53E-02	-6.51E-03*	-2.91E-03	0.25*	8.42E-05*	-5.71E-03	-1.58E-02
BW_{12}	8.19E-04	-6.82E-04	-4.01E-04	2.27E-02	4.73E-07	1.99E-03	1.05E-03
BW_{SM}	1.43E-02**	-8.80E-04	-1.37E-04	2.86E-02	-1.09E-05	2.88E-05	2.36E-03
SL_8	0.19	6.29E-02	2.16E-02	-2.37	8.38E-06	-0.19	3.51E-02
SL_{12}	8.77E-02	-8.63E-03	-8.54E-03	0.27	-1.56E-05	4.76E-02	4.00E-02
SL_{SM}	-0.25	4.46E-02	-2.36E-02	-1.63	-1.23E-04	7.35E-02	4.83E-02
KL_8	-0.13	2.54E-02	2.51E-02	-1.03	3.28E-04	8.87E-02	-6.56E-02
KL_{12}	0.11	1.61E-02	9.59E-03	-0.64	-1.09E-04	-6.75E-02	2.58E-02
KL_{SM}	5.72E-02	-2.86E-02	-2.36E-02	1.12	-4.09E-04	3.81E-03	-1.19E-02
SM	---	-1.05E-03	4.26E-03	3.25E-02	1.28E-04	2.51E-02	-1.05E-02
EN_{90}	-2.93E-02	---	-0.62***	38.32***	2.39E-04	-6.34E-02	-0.32
EW_{90}	0.29	- 1.49***	---	58.02***	2.02E-04	-0.167	-0.19
EM_{90}	6.10E-04	2.58E-02***	1.62E-02	---	-5.44E-06	2.12E-03	6.90E-03
SG	23.11	1.54	0.54	-52.21	---	25.91	146.72***
SI	5.15E-02	-4.66E-03	-5.09E-03	0.23	2.94E-04	---	-4.29E-02
ST	-2.74E-02	-2.99E-02	-7.16E-03	0.96	2.12E-03***	-5.46E-02	---
R^2	0.172	0.991	0.960	0.992	0.375	0.071	0.388

*: Significant at P≤0.05, **: Significant at P≤0.01, ***: Significant at P≤0.001.

A significant effect of BW_{SM} (P≤0.01) on SM was found. A significant (P≤0.001) mutually negative effect persists between EN_{90} and EW_{90}. However, EM_{90} significantly (P≤0.001) increased by EN_{90} and EW_{90}. **Singh and Singh (1999)** illustrated that the effect of egg weight on egg production is negative indicating that more egg production resulted in loss of weight of egg. ST increased significantly (P≤0.001) with SG.

As shown in Table 5, multiple linear regression analysis indicated that SL_{12} for GM pullets negatively (P≤0.01) affected either EN_{90} or EW_{90} however, significantly (P≤0.01) increased EM_{90}. It is clear that EN_{90} significantly decreased EW_{90} whereas EW_{90} significantly (P≤0.01) decreased EN_{90} but increased (P≤0.001) EM_{90}. Consequently, significant (P≤0.001) positive effects were shown for EM_{90} on EN_{90} and EW_{90}. ST of GM' egg increased significantly (P≤0.01) with SG. Similar trends were reported by **Petec *et al.* (2000)** for a commercial layer flock and **Amardeep *et al.* (2001)** in two White Leghorn strains that shank length significantly affected layer performance and would be a very useful method for estimating pullet quality.

From stepwise regression results presented in Table 6 after excluding insignificant factors, it is clear that EN_{90} for Dand significantly affected by EM_{90},EW_{90},BW_8, SL_8 with R^2 of 0.990. It can be concluded that more EN_{90} can be predicted through lighter BW_8 (P≤0.001) and longer SL_8(P≤0.01). However, higher EM_{90} can be expected through higher EN_{90}, heavier EW_{90} and BW_8 associated with shorter SL_8 (R^2 =0.991). Heavier BW_8 (P≤0.001) and shorter SL_8 (P≤0.01) can be used as predictors for higher EM_{90} for Dand. Similar finding was reported by **Petec *et al.* (2000)** that as SL increased EN and EM increased. Using EM_{90}, EN_{90} and KL_8 as predictors resulted in 0.956 of variations in EW_{90} for Dand. Longer KL_8 can be used as a predictor to heavier

EW_{90}. ST resulted in 31.1% of variability in SG, however either EN or SG resulted in 33.5% of the variability in ST of Dand' eggs. It is clear that heavier BW_{SM} and longer KL_{12} resulted in retardation of sexual maturation for Dand.

Results of stepwise regression for GM showed that EM_{90} and EW_{90} as predictors significantly ($P \leq 0.001$) affected EN_{90} with R^2 of 0.996 as shown in Table 7. EN_{90} and EW_{90} significantly ($P \leq 0.001$) increased EM_{90} with R^2 of 0.996. The only significant positive factor resulting in 14.5% of the variability in EW_{90} was BW_{12} for GM. Both ST and KL_{12} significantly ($P \leq 0.05$) explained 28.3% of the variation in SG for GM. The only significant positive factor resulting in 17.9 % of the variability in ST was SG for GM. EN_{90} significantly increased SI ($P \leq 0.01$, R^2 of 0.208). SL_{SM} negatively affected SM for GM ($P \leq 0.05$,R^2 =0.137).

In general, equations used for predicting economic traits that had highly significant R-square indicating that variables caused variation under each Y-trait was actual and prediction for future economic production will be reliable.

Table 5. Multiple linear regression for Golden Montazah traits.

Item	SM	EN_{90}	EW_{90}	EM_{90}	SG	SI	ST
a	-78.220	14.138	12.416	-699.530	0.929	55.180	-176.113
BW_8	-2.19E-02	-2.19E-03	-1.62E-03	9.71E-02	1.97E-05	-2.49E-03	-5.70E-03
BW_{12}	1.69E-03	2.76E-04	6.04E-04	-2.12E-02	1.32E-05	6.61E-03	-1.32E-03
BW_{SM}	-2.08E-02	2.35E-04	1.31E-04	-1.79E-02	1.66E-06	6.54E-03	5.83E-03
SL_8	-2.57E-02	4.40E-02	3.57E-02	-1.94	-3.72E-04	1.13E-02	0.14
SL_{12}	4.24E-02	3.75E-02	3.23E-02	-1.73	-7.48E-05	2.44E-02	4.57E-02
SL_{SM}	-0.46	8.21E-02	6.88E-02	-3.78	-6.07E-04*	0.16	0.25*
KL_8	6.79E-02	1.63E-02	1.99E-02	-0.87	9.77E-05	5.85E-02	-8.81E-02
KL_{12}	0.29	-0.12**	-0.10**	5.73**	3.25E-04	-0.18	-0.17
KL_{SM}	0.21	-1.49E-02	-1.67E-02	0.82	2.97E-04	-0.19	-0.14
SM	---	1.04E-02	1.19E-02	-0.52	8.83E-05	6.24E-02	-1.16E-02
EN_{90}	0.65	---	-0.81***	45.29	1.09E-03	-0.22	-0.45
EW_{90}	1.11	-1.21***	---	54.83***	1.09E-03	-0.43	-0.52
EM_{90}	-1.59E-02	2.19E-02***	1.78E-02***	---	-2.39E-05	6.99E-03	1.03E-02
SG	196.77	38.94	31.47	-1751.99	---	24.86	225.14**
SI	0.64	-3.51E-02	-4.47E-02	2.30	1.13E-04	---	-0.13
ST	-0.16	-0.10	-7.73E-02	4.69	1.40E-03**	-0.18	---
R^2	0.341	0.997	0.983	0.998	0.557	0.438	0.534

*: Significante at $P \leq 0.05$, **: Significante at $P \leq 0.01$, ***: Significante at $P \leq 0.001$.

Table 6. Stepwise regression parameters, coefficient of determination (R^2), standard error of the estimate (SEE) for predicting different economic traits ($\hat{Y}$) of Dandarawi pullets.

Model	Fitted equation $\hat{Y} = a + b_1X_1 + b_2X_2 + b_3X_3 + .. + b_kX_k + \varepsilon_i$.	R^2	SEE	Sig.
Dependent variable:EN_{90}				
Predictors: $EM_{90}, EW_{90}, BW_8, SL_8$	$\hat{Y}$ = 56.46+2.59EM_{90} –1.50 EW_{90} –9.12E-03BW_8 +7.54E-02 SL_8	0.990	0.89	*** *** **
Dependent variable:EM_{90}				
Predictors: $EN_{90}, EW_{90}, BW_8, SL_8$	$\hat{Y}$ =-2151.48+38.23 EN_{90}+57.97EW_{90} +0.34 BW_8-2.89SL_8	0.991	34.38	*** *** **
Dependent variable:EW_{90}				
Predictors: EM_{90}, EN_{90}, KL_8	$\hat{Y}$ =36.37+1.59E-02EM_{90}–0.61EN_{90} +2.68E-02KL_8	0.956	0.58	*** ***
Dependent variable: SG				
Predictors : ST	$\hat{Y}$ = 0.99+2.09E-03 ST	0.311	1.11E-02	***
Dependent variable: SI	Variables Entered/Removed			
Dependent variable: ST				
Predictors : SG, EN_{90}	$\hat{Y}$ =-112.58+144.03SG–6.19E-02EN_{90}	0.335	2.92	*** *
Dependent variable: SM				
Predictors: BW_{SM} , KL_{12}	$\hat{Y}$ =148.05+1.21E-02 BW_{SM}+0.13KL_{12}	0.115	4.68	*** **

Sig.: significance, **: significantly different at P≤ 0.01 ,***: significantly different at P≤0.001 .

Table 7. Stepwise regression parameters, coefficient of determination (R^2), standard error of the estimate (SEE) for predicting different economic traits ($\hat{Y}$) of Golden Montazah pullets.

Model	Fitted equation $\hat{Y} = a + b_1X_1 + b_2X_2 + b_3X_3 + .. + b_kX_k + \varepsilon_i$.	R^2	SEE	Sig.
Dependent variable:EN_{90}				
Predictors: EM_{90}, EW_{90}	$\hat{Y}$ = 56.46+2.59EM_{90} –1.50 EW_{90}	0.996	0.74	*** ***
Dependent variable:EM_{90}				
Predictors: EN_{90}, EW_{90}	$\hat{Y}$ =-2453.76+45.59 EN_{90}+54.09EW_{90}	0.996	33.85	*** ***
Dependent variable:EW_{90}				
Predictors: BW_{12}	$\hat{Y}$ =35.83+1.19E-02BW_{12}	0.145	3.38	*
Dependent variable: SG				
Predictors : ST, KL_{12}	$\hat{Y}$ = 1.01+9.76E-04ST+2.51E-04KL_{12}	0.283	3.97E-03	* *
Dependent variable: ST				
Predictors : SG	$\hat{Y}$ =-138.43+165.42SG	0.179	1.64	*
Dependent variable: SI				
Predictor: EN_{90}	$\hat{Y}$ =71.23+7.67E-02EN_{90}	0.208	1.71	**
Dependent variable: SM				
Predictor:	$\hat{Y}$ =219.98–0.43SL_{SM}	0.137	5.25	*

Sig.: significance, *: Significant at P≤0.05, **: Significant at P≤0.01, ***: Significant at P≤0.001.

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التنبؤ بالأداء الإنتاجى للصفات الاقتصادية المختلفة فى دجاج الدندراوي والمنتزه الذهبي

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تم حساب معادلات التنبؤ المختلفة لإنتاج البيض $\mathbf{EN_{90}}$ ووزن البيض وكتلة البيض المنتجة فى التسعين يوم الأولى من الإنتاج، عمر النضج الجنسى، الكثافة النوعية وسمك القشرة ودليل الشكل للبيضة بناءاً على قيم معاملات المتغيرات المختارة مع كل منها. تم حساب قيم معاملات التقدير.

كان $\mathbf{EN_{90}}$دالة لكل من$\mathbf{EW_{90}}$ و $\mathbf{EM_{90}}$ للدندراوى. كان $\mathbf{EW_{90}}$ دالة لطول القص عند عمر ٨أسابيع للدندراوى و١٢ أسبوع لنوع المنتزه الذهبى. كان الوزن النوعى **(SG)** دالة لسمك القشرة **(ST)** لكلا النوعين. يمكن التنبؤ بزيادة $\mathbf{EN_{90}}$ من خلال وزن الجسم الأخف (BW_8) وطول الساق الأطول **(SL_8)** عند عمر ٨ أسابيع بينما وزن الجسم الأثقل وطول الساق الأقصر عند عمر ٨ أسابيع يمكن استخدامه للحصول على $\mathbf{EM_{90}}$ أعلى لدجاج الدندراوى. ويرتبط كل من وزن الجسم الأثقل عند النضج الجنسى وطول القص الأطول مع تأخر عمر النضج الجنسى للدندراوى. وكان وزن الجسم عند عمر ١٢ أسبوع هو العامل الوحيد المعنوى المسبب لـ ١٤.٥% من الاختلافات فى $\mathbf{EW_{90}}$.
وبصفة عامة، فإن معادلات التنبؤ بالصفات الاقتصادية التى تستخدم هى التى يكون لها معامل تقدير عالى ومعنوى ويبين ذلك أن المتغيرات التى تسبب تبايناً مع كل صفة تابعة حقيقية ويكون التنبؤ بإنتاج الصفات الاقتصادية فى المستقبل معولا عليه.