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PREDICTION OF PRODUCTIVE PERFORMANCE OF LAYING HENS BY MEASUREMENT OF SOME BLOOD CONSTITUENTS

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ABSTRACT: *A total number of 300 females Dokky 4 at 8-wks-old were randomly taken to study the prediction of productive performance by measurements of blood plasma calcium, glucose and alkaline phosphatase activity at 8 weeks of age. Birds were divided into three equal groups according to the level of each blood plasma calcium, glucose and alkaline phosphatase activity. Each group were subdivided into two subgroups according to the level of plasma calcium (10.59 vs 8.78 mg/dl), glucose (170.09 vs 137.16 mg/100 ml) and alkaline phosphatase (201.11 vs 173.23 Iu/L) as high and low groups. Birds of high plasma calcium concentration had significantly higher body weight at 12, 16 and 20 weeks of age, body weight gain during all periods studied, body weight at sexual maturity, egg number production and egg mass than that in birds of low plasma calcium concentration. While, hens with lower plasma calcium concentration matured earlier than higher ones. Birds of high plasma glucose concentration had insignificantly higher body weight at all ages studied, body weight gain during all periods, body weight at sexual maturity and egg weight than the lower ones. While, earlier of the sexual maturity, egg number production and egg mass were shown in hens of low plasma glucose concentration higher than the high ones. Birds with higher plasma alkaline phosphatase activity gave significantly ($P \leq 0.05$) body weight at 12, 16 and 20 weeks of age, body weight gain during periods 8-12 and 12-16 weeks of age, earlier sexual maturity and body weight at sexual maturity greater than that the lower plasma alkaline phosphatase activity. While, egg produced from hens with low plasma alkaline phosphatase activity was better than that produced from the high ones. Plasma calcium seemed to be positively correlated with body weigh at all ages studied, body weight gain during periods 8-12 and 12-16 weeks, body weight at sexual maturity, egg number and egg mass. Body weight at 8 and 12 weeks of age, body weight gain during periods 8-12 and 16-20 weeks and both body weight and age at sexual maturity were positively correlated with*

plasma glucose level. Plasma alkaline phosphatase activity showed positive correlation with body weight at 8 and 12 weeks, age at sexual maturity and egg weight. Positive and significant correlation was found between plasma calcium level with both plasma glucose level and alkaline phosphatase activity and between plasma glucose with plasma alkaline phosphatase activity. It is concluded that laying hens had high plasma calcium or low plasma both glucose and alkaline phosphatase activity at early age (8 weeks) gave egg number and egg mass greater than the other concentrations which curtained from phenotypic correlation between both egg number and egg weight with previous blood plasma constituents.

INTRODUCTION

A significant relationship between alkaline phosphatase activity and productive traits of chickens could be of value to breeders for selection in early life. It could eliminate the need to record these traits later and consequently reduce the intervals between successive generations (Al-Bustany *et al*., 1998). The relationship between plasma alkaline phosphatase activity and the performance traits of chickens has been studied in several laboratories. Singh *et al*. (1983) found that the alkaline phosphatase activities were higher in pullets selected for higher production. However, the data obtained by Gootwine and Brody (1979) failed to show a relationship between alkaline phosphatase activity and production traits. Age and body weight at sexual maturity are important economic traits, which affect on potentiality of egg production. The level of several blood constituents is quite different in female birds when various reproductive states are compared (Bacon *et al*., 1980). The study of such variation in blood constituents in chickens could be associated with growth and egg production. The respective association may explain the physiological basis concerned with performance of both productive and reproductive traits. Numerous investigations were conducted to relate chicken performance with some physical and chemical parameters of blood (Mady, 1990, and El-Bogdady *et al*., 1993). However, the findings of these investigators demonstrated some conflict results in this respect.

Egg production depends on many characters such as age at sexual maturity, egg number, body weight, egg weight, shell thickness, egg specific gravity and others (Muir, 1990 and Brah *et al*., 1992) which influence egg production independently and/or associated with each other. Several investigators have estimated the correlations among the different economic traits in chickens (Prakashbabu, 1978 and Verma *et al*., 1983).

Blood biochemical traits could be important as indicators in breeding for high productivity (Obeidah *et al*., 1978). The value of an indicator trait depends on applied breeding scheme, correlation between a particular indicator trait and the relevant production trait and heritability of the indicator trait and production trait (Lovendahl *et al*., 1989).

Existence of any significant relationship between biochemical features such as alkaline phosphatase activity, glucose and calcium with performance, may help to identify a selection program which can be used in early life to minimize or obviate later recording of performance traits. This could also result in the shortening of the generation interval and thereby help in increasing the genetic gain per unit of time (Hassan, 1993).

The present study aimed to predict productive performance of Dokky 4 laying hens by the measurement of blood plasma calcium, glucose and alkaline phosphatase activity at 8 weeks of age.

MATERIALS AND METHODS

The present study was carried out at the Poultry Farm of Sakha Animal Research Station, Animal Production Research Institute, Ministry of Agriculture. A total numbers of 300 Dokky 4 females chicks were taken randomly at 8 weeks of age, wing-banded and blood was collected individually from each bird in heparinized tubs in the morning (between 8 and 10 o'clock) before feeding and centrifuged at 3000 rpm for 20 minutes to determine the level of blood plasma calcium, glucose and alkaline phosphatase activity and were divided to six groups (high or low for both calcium, glucose and alkaline phosphatase activity). Plasma calcium (10.59 vs 8.78 mg/dl), glucose (170.09 vs 137.16 mg/100 ml) and alkaline phosphatase (201.11 vs 173.23 Iu/L). The birds were separately kept in floor grower rooms from 8 till 20 weeks of age then transferred to individual egg production cages till the end of the first three months after sexual maturity. The birds were fed a grower diet (15% CP and 2700 Kcal) up to 20 weeks then fed a layer diet (16.5% CP and 2750 Kcal) up to the first 90 days of laying period. Birds were fed *ad libitum* and fresh water was available continuously. Birds were exposed to natural day light till sexual maturity and to 16 hours light/day during egg production period.

The studied traits:-

Individual body weight in grams was recorded at 8, 12, 16 and 20 weeks of age. Body weight gain was calculated using the following equation:

$\Delta W = W1 - W0$

Where: ΔW = Weight gain during a certain period.

W1 = Body weight at the end of a certain period.

W0 = Body weight at the start of a certain period.

Body weight and age at sexual maturity were recorded at the first egg laid for each hen. Egg number, egg weight and egg mass (number of eggs x egg weight per hen) from sexual maturity up to 90 days of egg production were recorded for each hen. The phenotypic correlation was estimated between blood plasma constituents which were measured at 8 weeks of age (calcium, glucose and alkaline phosphatase enzyme) and all productive traits studied. The data were analyzed by the least square means method described by SAS (1996).

The following model was used:-

$Y_{ik} = \mu + B_i + e_{ik}$

Where :

Y_{ik} : observation.

μ : the overall mean.

B_i : Blood plasma level effect.

e_{ik} : random effect.

RESULTS AND DISSCUSSION

The relation between plasma calcium, glucose and alkaline phosphatase concentration at 8 weeks of age and productive performance:

1) Body weight:-

Data tabulated in Table (1) illustrated that body weight at different ages from 8 up to 20 weeks of age in Dokky 4 females related with blood plasma calcium, glucose and alkaline phosphatase levels at 8 weeks of age. It was clear that body weight in birds of high plasma calcium concentration was significantly ($P \leq 0.05$) higher than in birds of low plasma calcium concentration at 12, 16 and 20 weeks of age. Body weight in birds of high plasma glucose concentration was insignificantly greater than low ones at all ages studied.

Birds with higher plasma alkaline phosphatase activity gave significantly ($P \leq 0.05$) body weight at 12, 16 and 20 weeks of age greater than that the lower plasma alkaline phosphatase activity.

2) Body weight gain:-

Data presented in Table (2) show that the average body weight gain in birds with higher plasma calcium concentration was significantly ($P \leq 0.05$) greater than that in birds with lower plasma calcium concentration during all periods studied.

High plasma glucose concentration birds had insignificantly body weight gain during all periods studied higher than low ones.

Body weight gain was significantly ($P \leq 0.05$) greater in birds of high plasma alkaline phosphatase activity than low ones during periods 8-12 and 12-16 weeks of age. An opposite trend was noticed during period 16-20 weeks of age.

These results are in agreement with Smith and Goodman (1970), Banerjee *et al*. (1973) and Hassan (1993) who indicated that higher enzyme alkaline phosphatase activity is associated with better growth rate.

3) Sexual maturity:-

Table (3) shows averages of body weight and age at sexual maturity within different levels of blood plasma calcium, glucose and alkaline phosphatase activity at 8 weeks of age in Dokky 4 laying hens. The results indicated that hens with higher plasma calcium concentration had significantly ($P \leq 0.05$) body weight at sexual maturity greater than lower ones. While, the hens with lower plasma calcium concentration were matured earlier than higher ones. These results are disagreement with reported by El-Bogdady *et al*., (1993) and Kalama *et al*. (2000) who showed that the concentration of calcium was significantly ($P \leq 0.05$) higher in the layers reached sexual maturity in earlier ages.

Body weight at sexual maturity was insignificantly higher in hens of high plasma glucose concentration than low ones. While, earlier sexual maturity was shown in hens of low plasma glucose concentration. The difference in this respect was not significant. These results are in agreement with Kalama *et al*. (2000) who found that the plasma glucose concentration was lower in the layers reached sexual maturity earlier ages. On the other hand, Hassan (1993) indicated that the lower serum glucose birds had later age at sexual maturity than the high ones.

Hens of the higher plasma alkaline phosphatase activity had significantly ($P \leq 0.05$) earlier sexual maturity and body weight at sexual maturity higher than that of the low ones.

These results are in agreement with Singh *et al*. (1983), El-Attar and Bahieldin (1995) and Kalama *et al*. (2000) who indicated that higher enzyme alkaline phosphatase activity is associated with earlier sexual maturity than the low ones.

4) Egg production:-

Data obtained from Table (3) present egg production during first 90 days of production within different levels of blood plasma calcium, glucose and alkaline phosphatase activity at 8 weeks of age in Dokky 4 laying hens. It was found that hens of the higher plasma calcium concentration gave the better egg number and egg mass, and the differences in this respect were significant ($P \leq 0.05$). While, egg weight was nearly similar in both hens of high and low plasma calcium concentration. These results are in agreement with Jain and Rawat (1977) who found that when serum calcium level increased, the egg production was also increased. Moreover, Hassan (1993) indicated that hens higher with plasma calcium concentration had better egg number and egg mass than the lower ones.

Egg number and egg mass were insignificantly higher in hens with low plasma glucose concentration than high ones. An opposite trend was true for egg weight. These results are in agreement with Hassan (1993) and Kalamah, (1995) who showed that the low egg production hens had insignificantly higher plasma glucose as compared to the high ones. These results are disagreement with Abdel Rahman and El-Nadi (1985) who found that the plasma glucose was considerably higher in the active laying hens than that in inactive ones, but the differences were not significant.

Egg produced from hens with low plasma alkaline phosphatase activity was better than that produced from high ones. The difference in this respect, was not significant ($P \leq 0.05$). These results are in agreement with Hassan (1993) who indicated that higher enzyme alkaline phosphatase activity is associated with lower egg weight and egg production**.** On the other hand, Mclung *et al*., (1972) and Gootwine and Brody (1979) failed to reveal any relation between the alkaline phosphatase activity and egg production. The present results failed to confirm the suggestion that alkaline phosphatase activity is related to egg production of the laying hen as reported by Al-Bustany *et al*. (1998).

Phenotypic correlation between plasma calcium, glucose and alkaline phosphatase and productive performance:

Body weight:-

In Table (4) plasma calcium concentration at 8 weeks of age seemed to be significantly and positively correlated with body weigh at all ages studied. This result agrees with Hassan (1993) who showed positive phenotypic correlation between plasma calcium with body weight at 4 and 8 weeks of age.

Body weight at 8 and 12 weeks of age were positively correlated with plasma glucose. On the other hand, body weights at 16 and 20 weeks of age were negatively correlated with plasma glucose. The same result was obtained by Hassan (1993) who showed positive phenotypic correlation between plasma glucose with body weight at 4 and 8 weeks of age. Moreover, Peebles *et al.* (2005) found positive correlations between plasma glucose and body weight at hatch.

Plasma alkaline phosphatase activity showed a positive phenotypic correlation with body weight at 8 and 12 weeks, whereas negative correlation at 16 and 20 weeks of age. These results are in agreement with Hassan (1993) who showed that the phenotypic correlation between alkaline phosphatase activity and body weight was positive at 4 and 8 weeks of age.

Body weight gain:-

In Table (5) plasma calcium was positively correlated with body weight gain during periods 8-12 and 12-16 weeks, whereas was negative correlation during period 16-20 weeks of age. Positive and low phenotypic correlation of plasma glucose with body weight gain during periods 8-12 and 16-20 weeks, whereas was negative phenotypic correlation between plasma glucose with body weight gain during period 12-16 weeks of age. These results are in agreement with the results of Hassan (1993) who found that there was low positive phenotypic correlation between growth rate during period 4-8 weeks of age with each plasma calcium and glucose. While a negative and low phenotypic correlation was found between plasma alkaline phosphatase activity and body gain during all periods studied.

Sexual maturity:-

A positive correlation was found between plasma calcium and body weight at sexual maturity (Table 6). On the other hand, plasma calcium was negatively correlated with age at sexual maturity. The same trend was

found with Hassan (1993) who found a significant and negative phenotypic correlation of plasma calcium with age at sexual maturity. However, Kalamah (1995) showed that age of sexual maturity had insignificantly and positively correlated with plasma calcium, while plasma calcium did not correlate with body weight at sexual maturity.

Plasma glucose had low positive correlation with both body weight and age at sexual maturity. The phenotypic correlation of plasma glucose with body weight at sexual maturity was positive, while negative phenotypic correlation was obtained with age at sexual maturity (Hassan, 1993).

Low positive correlation of plasma alkaline phosphatase activity was observed with age at sexual maturity, whereas was negatively correlated with body weight at sexual maturity. These results are in agreement with Wilcox *et al*. (1963) who found a significant positive phenotypic correlation between alkaline phosphatase level and age at sexual maturity.

Egg production:

In Table (6) egg number and egg mass in the first 90 days of production were positively correlated with plasma calcium. Whereas, a negative correlation was observed between plasma calcium and egg weight. These results are in agreement with Kamar *et al*. (1985) who found significant and positive phenotypic correlation between plasma calcium concentration and egg production traits. These results are disagreement with Kalamah, (1995) who indicated that there was a significant negative correlation between calcium level and egg number.

Plasma glucose at 8 weeks of age appeared to be negatively correlated with egg number, egg weight and egg mass during the first 90 days of production. These results are in agreement with Narayana *et al*. (1991) and Abdel-Latif (2001) who found that egg number, egg weight and egg mass during the first 90 days of production appeared to be negatively correlated with plasma glucose for Dandarawi hens at 8 weeks of age.

Plasma alkaline phosphatase activity at 8 weeks of age seemed to be positively correlated with egg weight, whereas negatively correlated with both egg number and egg mass in the first 90 days of production. The positive correlation of alkaline phosphatase activity with egg weight indicate that this enzyme is one of the main factors in mobilizing calcium and phosphorus in laying hens (Hassan, 1993). However, some workers found a positive correlation between egg production traits and alkaline phosphatase (Amin *et al*., 1980, Abdel Rahman and El-Nadi, 1985 and Al-

Bustany *et al*., 1998) while reported a negative correlation (Engh and Wilcox, 1971 and Singh *et al*., 1983).

Phenotypic correlation among plasma calcium, glucose and alkaline phosphatase:

The phenotypic correlation among plasma calcium, glucose and alkaline phosphatase activity at 8 weeks of age was shown in Table (7). It was clear that a significant and high positive correlation was found between plasma calcium and both plasma glucose and alkaline phosphatase activity. Similarly, plasma glucose showed significant correlation with plasma alkaline phosphatase activity. These results are in agreement with Jain and Rawat (1977) and Hassan (1993) who showed a significant and positive phenotypic correlations between calcium and both alkaline phosphatase activity and glucose, while between alkaline phosphatase activity and glucose was not significant and this reflects the existence of at least two calcium-regulating mechanisms: one depending on the relationship between calcium and alkaline phosphatase activity, and the other on the relationship between calcium and glucose.

From the present results, it could be concluded that laying hens had high plasma calcium or low plasma both glucose and alkaline phosphatase activity at early age (8 weeks) gave egg number and egg mass greater than the other concentrations which curtained from phenotypic correlation between both egg number and egg weight with previous blood plasma constituents.

It could be also recommended; that previous blood plasma constituents can be done as prediction indicators to increase and improve egg production and can be also used in selection programs to improve egg production traits of chickens at early ages (8 weeks) and this has the advantages of saving time and efforts.

Table 1. Least-square means (LSM ± SE) of body weight at different ages for high and low plasma calcium, glucose and alkaline phosphatase concentration at 8 weeks of age in Dokky 4 chickens.

Plasma \ Body weight		8 wk	12 wk	16 wk	20 wk
Calcium	High	463.96±10.437	1046.98±15.984	1322.08±17.864	1460.57±17.405
	Low	457.00±10.246	897.64±15.691	1114.55±17.536	1304.55±17.085
	Significance	N.S	*	*	*
Glucose	High	471.08±11.070	983.14±19.475	1213.33±23.576	1407.06±20.844
	Low	454.46±10.564	954.29±18.585	1195.89±22.499	1367.68±19.892
	Significance	N.S	N.S	N.S	N.S
Alk. Pho.	High	450.35±11.858	1071.40±17.134	1349.77±18.788	1482.56±17.578
	Low	471.18±10.888	901.37±15.732	1115.10±17.251	1308.24±16.141
	Significance	N.S	*	*	*

NS = not significant, * significant at P< 0.05

Table 2. Least-square means (LSM ± SE) of body weight gain during different periods for high and low plasma calcium, glucose and alkaline phosphatase concentration at 8 weeks of age in Dokky 4 chickens.

Plasma \ Body gain		8-12 wks	12-16 wks	16-20 wks
Calcium	High	583.02±18.626	275.09±10.058	191.82±14.812
	Low	440.64±18.284	216.92±9.873	138.49±15.089
	Significance	*	*	*
Glucose	High	512.06±23.307	241.61±10.290	193.73±14.472
	Low	499.82±22.242	230.20±10.783	171.79±13.811
	Significance	N.S	N.S	N.S
Alk. Pho.	High	621.05±20.671	278.37±11.077	132.79±15.406
	Low	430.20±18.981	213.73±10.171	193.14±14.146
	Significance	*	*	*

NS = not significant, * significant at P< 0.05

Table 3. Least-square means (LSM ± SE) of body weight and age at sexual maturity, egg number, egg weight and egg Mass during the first 90 days of egg production for high and low plasma calcium, glucose and alkaline phosphatase concentration at 8 weeks of age in Dokky 4.

Plasma \ Egg production		Body weight (g)	Age (day)	Egg number	Egg weight	Egg mass
Calcium	High	1560.38±17.918	155.02±1.790	41.69±1.812	40.29±0.320	1679.69±72.574
	Low	1428.91±17.589	149.28±1.823	34.69±1.778	40.09±0.326	1390.72±71.04
	Significance	*	*	*	N.S	*
Glucose	High	1523.73±19.081	153.61±1.902	36.02±1.890	40.29±0.332	1451.25±78.06
	Low	1482.88±18.210	150.96±1.815	40.03±1.820	40.01±0.317	1601.60±74.11
	Significance	N.S	N.S	N.S	N.S	N.S
Alk. Pho.	High	1570.70±17.478	148.56±1.960	37.11±2.030	40.07±0.360	1487.0±83.02
	Low	1433.53±16.048	155.22±1.779	39.82±1.893	40.21±0.330	1601.16±76.04
	Significance	*	*	N.S	N.S	N.S

NS = not significant, * significant at $P < 0.05$

Table 4. Phenotypic correlation between plasma calcium, glucose and alkaline phosphatase Concentration at 8 weeks of age and body weight at 8, 12, 16 and 20 weeks of age of female Dokky 4 chickens.

Body weight / Plasma	8 wk	12 wk	16 wk	20 wk
Calcium	0.511*	0.430*	0.489*	0.446*
Glucose	0.034	0.015	-0.080	-0.005
Alk. Pho	0.037	0.059	-0.032	-0.089

* significant at P< 0.05

Table 5. Phenotypic correlation between plasma calcium, glucose and alkaline phosphatase Concentration at 8 weeks of age and body weight gain during periods 8-12, 12-16 and 16-20 weeks of age of female Dokky 4chickens.

Body gain / Plasma	8-12 wks	12-16 wks	16-20 wks
Calcium	0.388*	0.270	-0.145
Glucose	0.001	-0.201	0.122
Alk. Pho.	-0.005	-0.046	-0.128

* significant at P< 0.05

Table 6. Phenotypic correlation between plasma calcium, glucose and alkaline phosphatase concentration at 8 weeks of age and sexual maturity (body weight and age), egg number, egg weight and egg mass during the first 90 days of egg production of female Dokky 4 chickens.

	Sexual Maturity				
Traits / Plasma	Body weight (g)	Age (day)	Egg number	Egg weight	Egg mass
Calcium	0.350	-0.264	0.305	-0.081	0.276
Glucose	0.022	0.071	-0.247	-0.053	-0.246
Alk. Pho.	-0.101	0.313	-0.222	0.209	-0.127

* significant at P< 0.05

Table 7. Phenotypic correlation among plasma calcium, glucose and alkaline phosphatase activity at 8 weeks of age of female Dokky 4 chickens

Plasma	Calcium	Glucose	Alk. Pho
Calcium	----------	0.858*	0.511*
Glucose	----------	----------	0.399*
Alk. Pho.	----------	----------	----------

* significant at P< 0.05

REFERENCES

Abdel Latif, H.A.2001. *Inheritance of certain plasma constituents and their association with some economic traits in Dandarawi and Golden Montazah hens. M.Sc., Thesis, Fac. of Agric., Cairo Univ., Egypt.*

Abdel Rahman, H. and M.M. El-Nadi. 1985. *Relation between some blood constituents and activity of reproductive organs of Norfa and Fayoumi hens. Proceeding of the first scientific somposium. Evaluation of economic studies on local strains of Poultry. Alexandria, 23-24 March, 1: 213-214.*

Al-Bustany, Z., A.K. Al-Athari and I.A. Abdul-Hassan. 1998. *Plasma alkaline phosphatase and production traits in laying hens as influenced by dietary protein, strain and age. Br. Poult. Sci., 39:568-571.*

Ali, M.F. and F.M. Attia. 1980. *Serum alkaline phosphatase in Fayoumi and White Leghorn hens as related to egg production and dietary protein. Egypt. J. Anim. Prod. 20: 189-194.*

Amin, S.W., B.S.Misra and B.P. Singh. 1980. *Association of alkaline phosphatase level with egg production in strain of White Leghorn. Indian Vet. J., 57:403-406.*

BaCon, W.L., K.I. Brown and M.A. Musser. 1980. *Changes in plasma calcium, phosphorus, lipids and estrogens in turkey hens with reproductive state. Poult. Sci., 59:444-452.*

Banerjee, A.K., R.N. Desai and R.P. Chanhary. 1973. *Plasma alkaline phosphatase and its association with economic traits in White Leghorn. Indian J. Poult. Sci., 8:94-102.*

Brah, G.S., M.L. Chaudhary and J.S. Sandhu. 1992. *Heritabilities and correlations for egg shell crack frequency, body checking, egg number and egg weight in laying hens. Br. Poult. Sci., 33:947-951.*

El-Attar, A.H. and A.M. Bahieldin. 1995. *Genetic variability of serum acid phosphatase, alkaline phosphatase and esterase isozymes with relation to the performance of two laying strains. Egypt. Poult. Sci., 15:299-326.*

El-Bogdady, A.H., M.A.M. Kicha and E.B. Soliman. 1993. *The effect of breed and age at sexual maturity on performance of laying hen. 11-Physical, chemical properties of blood and physiological responses. Egypt. Poult. Sci., 13:271-300.*

Engh, H.A. and F.H. Wilcox. 1971. *Chicken serum alkaline phosphatase isozymes egg production. Poult. Sci., 50:346-349.*

Garcia, F.X. 1980. *Selection of crossbred Leghorn hens. A.B.A., 48:4255.*

Goher, N.E., W.H. Mcgibbon, J.J. Rutledge and A.B. Chapman. 1978. *Evaluation of methods in a poultry breeding program. 2-correlated responses. Egypt. J. Genet. Cytol. 7:91-107.*

Gootwine, E. and T. Brody. 1979. *The relation between plasma alkaline phosphatase activity and reproductive traits in poultry. Poult. Sci., 58:1640-1643.*

Hassan, K.M. 1993. *Inheritance of some constituents of blood serum and their relationship with production traits in Alexandria and Norfa chickens. M.Sc. Thisis, Fac. of Agric., Alexandria Univ., Egypt.*

Jain, A.K. and J.S. Rawat. 1977. *Serum alkaline phosphatase enzymes in relation to serum-calcium and blood sugar level in laying birds. Indian Vet. J., 54(7):533-535.*

Kalamah, M.A. 1995. *Changes in blood profile of Norfa and Fayoumi chickens associated with sexual maturity and egg production. First Egypt. Hungarian Poult. Conference, 17-19 September, Part 11:339-357.*

Kalamah, M.A., M.M. El-Nadi, F.H. Abdou and Nadia A. Hassan. 2000. *Performance and some blood constituents of quail chicks hatched from eggs exposed to different light colours during incubation. Egypt. Poult. Sci., 20:583-601.*

Kamar, G.A.R., M.A.M. Kicka, A.A. El-Far and M.M. El-Nadi. 1985. *Interrelationship between some biochemical constituents of blood serum and economic egg characters in turkeys. Egypt. J. Anim., 25(1):31-46.*

Lovendahl, P., K. Searsen and B.B. Anderson. 1989. *Release of growth hormone as juvenile predictors of diary merit. Now selection themes in cattle: nucleus programs. E.A.A.P. Publication, No.44.*

Mady, M.E.I. 1990. *Variability of serum thyroxin and cholesterol in serum and yolk with reproductive state. Egypt. J. Anim. Prod., 27:99-106.*

McClung, M.R., H.M. Hyre and W.G. Martin. 1972. *Two-way selection for serum alkaline phosphatase in laying hens. Poult. Sci., 51:1428-1437.*

Miller, E.R., H.R. Wilson and R.H. Harms. 1978. *The relationship of production status to serum calcium and phosphorus in hens. Poult. Sci., 57:242-245.*

Mohapatra, S.C. and S.D. Ahuja. 1971. *Selection for egg production in a flock of White Leghorn. 2. Response in the secondary traits and their heritabilities. Indian J. of Poult. Sci., 6:17.*

Muir, W.M. 1990. *Association between persistency of lay and partial record egg production in White Leghorn hens and implications to selection programs for annual egg production. Poult. Sci., 69:1447-1454.*

Narayana, R., S.K. Verma and U. Gupta. 1991. *Inheritance of plasma protein, cholesterol and glucose, and their association with egg quality traits in inbred lines of White Leghorn. Indian J. of Anim. Sci., 61(4):445-448.*

Obeidah, A., H.M. Morad, A.A. Sami and A.Mostageer. 1978. *Genetic and phenotypic parameter of egg production and some constituents of blood serum in Fayoumi layers. Ann. Genet. Sel. Anim. 10(1):47-60.*

Peebles,E.D., R.W. Keirs, L.W. Bennett, T.S. Cummings, S.K. Whitmarsh, and P.D. Gerard. 2005. *Relationships among prehatch and posthatch physiological parameters in early nutrient restricted broilers hatched from eggs laid by young breeder hens. Poult. Sci., 84(3): 454-461.*

Poggenpool, D.G. and J.S. Duckitt. 1989. *Genetic basis of the increase in egg weight with pullet age in a White Leghorn flock. Poult. Sci., 67:863-867.*

Prakashbabu, M. 1978. *Genetic and phenotypic relationships among body size, body condition and egg production in chickens. Ph.D. Dissertation submitted to Punjab Agric. Univ., Ludhiana.*

Proudman, J.A., W.J. Mellen and H.O. Hultin. 1975. *Activity of certain liver enzymes in fast and slow-growing lines of chickens. Poult. Sci., 54:1585-1597.*

Rai, D., Nerma, S.K., Prasad and R.B. Kumar. 1987. *A genetics association of plasma protein, cholesterol and glucose with egg quality characters in inbred lines of White Leghorn. Indian J. of Anim. Sci., 57(8):896-898.*

Roland, D.A., Sr.D.R. Sloan and R.H. Harms. 1975. *The ability of hens to maintain calcium deposition in the egg shell and egg yolk as the hen ages. Poult. Sci., 54:1720-1723.*

SAS' Procedure Guide. "Version 6.12 Ed." SAS Institute Inc., Cary, NC, USA.

Shivaprasad, H.L. and R.G. Jaap. 1977. *Egg and yolk production as influenced by liver weight, liver lipid and plasma lipid in three strains of small bodied chickens. Poult. Sci., 56:1384-1390.*

Singh, R.P., J. Kumar, P.K. Dwarkanath and D.S. Balaine. 1983. *Association of plasma 5-nucleotidase and alkaline phosphatase with production traits in chickens: Genetic and phenotypic variability. Br. Poult. Sci., 24:483-488.*

Smith, T.L. and B.L. Goodman. 1970. *Heritability and correlation estimates for serum alkaline phosphatase and growth in the chick. Poult. Sci., 49:1728-1729.*

Snapir, W. and W. Perek. 1970. *Comparative studies of blood and uterus calcium levels, alkaline phosphatase and carbonic anhydrase activities in White Lghorn and White Plymoth Rock hens, in relation to shell quality and production rate.*

Verma, S.K., P.K. Pani and S.C. Mohapatra. 1983. *Genetic, phenotypic and environmental correlations among some of the economic traits in White Leghorn. Indian J. of Anim. Sci., 53(10):1113-1117.*

Varley, H., A.H. Gowenlock and M. Bell. 1980. *Practical clinical biochemistry. Wiliam Heinemann Medical Books Ltd.*

Wilcox, F.H., L.D. Vanvleck and W.R. Harvey. 1963. *Estimates of correlations between serum alkaline phosphatase level and productive traits. Poult. Sci., 42:1427-1458.*

الملخص العربي

التنبؤ بالأداء الانتاجى للدجاج البياض بتقدير بعض مكونات الدم

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تم اجراء هذا البحث على عدد 300 انثى من سلالة دقى 4 عند عمر 8 أسابيع حيث تم اخذهم عشوائيا لدراسة امكانية التنبؤ بالأداء الانتاجى عن طريق قياس تركيزات الكالسيوم (المجموعة الأولى)، الجلوكوز (المجموعة الثانية) وأنزيم الفوسفاتيز القاعدى (المجموعة الثالثة) فى بلازما الدم فى الأعمار المبكرة (8 أسابيع) وقد تم تقسيم كل مجموعة من المجاميع الثلاثة السابقة الى مجموعتين تبعا لتركيزات البلازما السابقة الى (عالى - منخفض) وأوضحت النتائج مايلى:

- وجد أن الطيور ذا ت التركيز العالى من الكالسيوم أعطت وزن جسم عالى معنويا عند 12، 16 و 20 أسبوع من العمر، ووزن جسم مكتسب خلال جميع فترات العمر المدروسة، ووزن جسم عند النضج الجنسى، وعدد وكتلة البيض خلال 90 يوم الاولى من الانتاج أعلى عن تلك المحتوية على تركيز منخفض من الكالسيوم والتى بدورها تميزت بالتبكير فى النضج الجنسى.

- وجد أن وزن الجسم وكذلك الوزن المكتسب خلال جميع الفترات المدروسة، والوزن عند النضج الجنسى، ووزن البيض كان أعلى فى الطيور ذات التركيز العالى من الجلوكوز عن تلك المنخفضة والتى تميزت بالتبكير فى النضج الجنسى وأعطت عدد وكتلة بيض أعلى.

- الطيور المحتوية على تركيز عالى من انزيم الفوسفاتيز القاعدى أعطت زيادة معنوية فى كل من أوزان الجسم عند 12، 16 و 20أسبوع ، ووزن جسم مكتسب خلال الفترات 8-12 و 12-16 أسبوع ، والوزن عند النضج الجنسى وكانت مبكرة جنسيا أيضا عن تلك المحتوية على تركيز منخفض من تلك الأنزيم والتى كانت مميزة فى انتاج البيض.

- وجد أن هناك ارتباط مظهرى موجب بين الكالسيوم و جميع أوزان الجسم، الوزن المكتسب خلال الفترتين من 8-12و 12-16 أسبوع، والوزن عند النضج الجنسى وعدد وكتلة البيض.

- وجد أن أوزان الجسم عند 8 و12 أسبوع، ووزن الجسم المكتسب خلال الفترتين من 8-12 و 16-20 أسبوع ، وكل من وزن وعمر النضج الجنسى كانوا مرتبطين ارتباطا مظهريا موجبا مع الجلوكوز.

- وجد ان انزيم الفوسفاتيز القاعدى كان مرتبطا ارتباطا مظهريا موجبا مع كل من أوزان الجسم عند 8 و 12 أسبوع، وعمر النضج الجنسى ووزن البيض.

- وجد أن هناك ارتباط مظهرى موجب ومعنوى بين مكونات بلازما الدم السابقة مع بعضهم البعض.

- نستنتج من هذه الدراسه ان السلاله المحليه دقى 4 عند عمر 8 أسابيع ذو مستوى بلازما الدم العالى فى الكالسيوم و المنخفض فى كل من الجلوكوز و انزيم الفسفاتيز القاعدى اعطى عدد بيض وكتلة بيض اعلى من التركيزات الاخرى و هذا ما اكده الارتباط المظهرى بين الصفات و مكونات الدم سابقة الذكر و بالتالى يمكن التنبؤ بانتاج البيض عند عمر 8 أسابيع بتقدير مكونات يلازما الدم سابقة الذكر وادخال ذلك فى برامج الانتخاب.