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RELATIONSHIP BETWEEN BLOOD PLASMA CONSTITUENTS AND REPRODUCTIVE PERFORMANCE IN INSHAS COCKS AT DIFFERENT AGES

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Abstract: *The present study was carried out at the Poultry Farm of Sakha, Animal Production Research Institute. This experiment aimed to study the effect of different periods of age (30, 36 and 42 weeks) on reproductive performance, some blood plasma constituents and the relationship between some seminal and blood plasma constituents with semen physical characteristics in Inshas cocks.* ***The results revealed that,*** *sperm concentration, sperm motility and percentage of live sperm were significantly ($P \leq 0.05$ or $P \leq 0.01$) higher at 42 wks than those at 36 wks and at 30 wks. The reverse trend was observed for percentage of abnormal sperms, which was decreased significantly ($P \leq 0.05$) with increasing age. There were no significant differences due to age effect on all seminal plasma constituents studied. Blood plasma albumin (A), cholesterol, calcium (Ca), inorganic phosphorus (IP), alkaline phosphatase activity and glutamic oxaloacetic transaminase (GOT) were significantly ($P \leq 0.05$ or $P \leq 0.01$) affected by cocks age. High phenotypic positive and significant correlation was observed between sperm motility with both live sperm and sperm concentration and live sperm with sperm concentration. There was positive significant or insignificant phenotypic correlation between seminal plasma (A) and A/G ratio or Ca, IP and GOT with ejaculate volume, sperm motility and sperm concentration, respectively. Also, there was positive and significant or insignificant phenotypic correlation between seminal plasma cholesterol and alkaline phosphatase or total protein, globulin (G) and Glutamic pyruvic transaminase (GPT) with semen pH and live sperm respectively. Blood plasma total protein, (G), cholesterol, Ca and acid phosphatase were positively correlated with both ejaculate volume and semen pH. Also, blood plasma (A) and (IP) were positively correlated with sperm concentration, sperm motility and live sperm.* ***In conclusion****, this study provide evidence that correlation among some seminal plasma or blood plasma constituents with semen physical characteristics might be useful to predict fertility in cocks.*

INTRODUCTION

The past few years have witnessed an intensive need for artificial insemination of poultry population. This has mandated the study of the physic-biochemical characteristics of semen, which has taken great importance. Evaluation of the poultry semen and seminal plasma has remained a subject of research in many laboratories worldwide. Yet little information is available concerning seminal plasma biochemical characteristics in cocks. Moreover, very few reports are available concerning the relation and correlation between physical characteristics of semen and seminal plasma chemical composition (El-Sahn, 2002). The biochemical composition of fowl seminal plasma has received little attentions. An approach to in vitro preservation of semen may evolve around the hypothesis that fertility may be related to seminal chemistry, or more important, to the chemistry of the female reproductive tract and such information is found for turkeys and chickens, In this concern, little detailed studies about semen traits of local Egyptian chicken strains have been reported (El-Sahn, 2002).

Semen quality was found to have significant correlation with fertility percentage and highly significant correlations were observed between motility and both live sperm percentage (Radwan, 1991), and fertility (Kamar *et al*.,1984). There was a positive phenotypic correlation between motility and live spermatozoa (Gohar *et al*., 1997). The high positive correlation observed between most of semen characteristics, would suggest a positive response to selection not only for traits directly select, but also to other correlated ones (Kamar *et al*.,1984). Therefore, the purpose of the present study was to determine the relationship between some seminal and blood plasma constituents with semen physical characteristics at different periods of age (30, 36 and 42 weeks) in Inshas cocks.

MATERIALS AND METHODS

The present study was carried out at the Poultry Farm of Sakha, Animal Production Research Institute, Ministry of Agriculture. Thirty healthy Inshas cocks were taken randomly and housed in individual cages from 20^{th} to 42^{nd} weeks of age. Cocks were fed *ad libitum* and fresh water was available continuously.

Semen was collected individually at 3 periods (30, 36 and 42 weeks) of age (twice/ each period) using the massage method. The ejaculate volume was determined to the nearest 0.01 ml. using 1.00 ml. tuberculin

syringe and mass motility was determined according to Nagae *et al.*, (1987). Semen pH was measured by comparative pH paper, percentage of live and abnormal sperms were determined after staining with iosine and nigrosine and sperm concentration was determined by using Thomes – Zeis haemocytometer (Kalamah *et al*., 2000).

Blood (5ml) and pooled semen samples were collected from all cocks at 3 periods (30, 36 and 42 weeks) of age and centrifuged at 35oo rpm for 20 minutes and stored frozen at -20°C until the time of analysis. Blood and seminal plasma total protein, albumin, cholesterol, calcium, inorganic phosphorus, activity of alkaline and acid phophatase, Glutamic Oxaloacetic Transaminase (GOT) and Glutamic Pyruvic Transaminase (GPT), were determined using commercial kits.

The phenotypic correlation was estimated and the data were analyzed by the least square means method described by SAS (1996). Mean values were compared using Dancan's Multiple Range Tests (Dancan, 1955).

The following model was used:-

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

Where :

Y_{ik} : observation.

μ : the overall mean of the concerned that.

A_i : Age effect.

e_{ik} : random effect.

RESULTS AND DISCUSSION:

Physical characteristics of semen:

The mean values of semen physical characteristics as affected by age periods are presented in Table 1. It is clear that the semen ejaculate volume of cocks at 42 wks of age was insignificantly higher than that at 30 and 36 wks of age, which were similar. The same trend was noticed in semen pH, total sperm / ejaculate, total abnormal sperm / ejaculate and total live sperm / ejaculate. The highest values of sperm concentration, sperm motility and percentage of live sperm were obtained significantly ($P \leq 0.05$ or $P \leq 0.01$) at 42 wks followed by 36 wks and the lowest were recorded at 30 wks. The opposite trend was observed for percentage of abnormal sperms, which was significantly decreased ($P \leq 0.05$) with increasing age (Table 1). This result agrees with those of Hanafy (2006), El-Sheikh and Hanafy (2006) and El-Tantawy *et al*., (2007) who found that

semen volume, semen pH, sperm concentration, motility and live sperm of Inshas and Matrouh cocks increased linearly with increasing age, while, abnormal sperm was decreased linearly with increasing age. In contrast, this result disagree with those of Ali *et al*., (2006) and Shahein *et al*., (2007) who found no significant effect was found due to age on semen characteristics such as semen volume, sperm motility, sperm concentration and live sperm.

Seminal plasma constituents:

Concentrations of total protein (TP), albumin (A), globulin (G) and A/G ratio in seminal plasma were not significant among ages (Table 2). However, seminal plasma TP and A produced from cocks at 36 wk were the highest followed by that at 42 wk then at 30 wk. While, seminal plasma G was increased linearly with increasing age. An opposite trend was observed for seminal plasma A/G ratio. These results agree with Thurston *et al*., (1982) who found that seminal plasma protein concentration showed a little variation with advancement of age.

Seminal plasma cholesterol was insignificantly higher at 36 wk than that at 30 and at 42 wk (Table 2). These results agree with Kelso *et al*., 1996, who found significant reduction in concentration of spermatozoa with age progress which associated with large increase in cholesterol ester in seminal plasma. The reverse results were obtained by Ansah and Buckland, 1982, who noticed that cholesterol in seminal plasma or in spermatozoa of broiler males were influenced significantly by age. These effects were perhaps due to both minor environmental variations associated with the percentage of the assays and biological variation in the semen.

Seminal plasma calcium (Ca), inorganic phosphorus (IP) and IP/Ca ratio were increased linearly with increasing age, and the differences in this respect, were not significant (Table 2).

Alkaline phosphatase activity of seminal plasma was insignificantly higher at 36 wk than that at 30 and at 42 wk (Table 2). Seminal plasma acid phosphatase activity and GPT were nearly similar in all ages. While, seminal plasma GOT was insignificantly decreased linearly with increasing age. On the other hand**,** Glogowski *et al*., (1994) found that acid phosphatase in the seminal plasma was decreased with increasing age.

Blood plasma constituents:

Table (3) shows that cocks at 36 wk of age had insignificantly higher plasma total protein and A/G ratio, and significantly ($P \leq 0.05$) higher

plasma albumin (A) than that in cocks at 30 and 42 wk of age. Plasma globulin (G) was insignificantly increased linearly with increasing age. These results agree with the results of Kalamah *et al*., (2003), Soliman (2003) and El-Sheikh and Hanafy (2006).

Plasma cholesterol was significantly ($P \leq 0.05$) higher in cocks at 36 wk then 42 and 30 wks of age. These results agree with the results of Kalamah *et al*., (2003), Hassan *et al*., (2003) and Kosba *et al*., (2004). The reverse results were found by Siam *et al*., (2004) who observed that cholesterol level did not significantly change from 34 to 43 wks of age.

Both plasma calcium (Ca) and inorganic phosphorus (IP) were significantly ($P \leq 0.05$ or $P \leq 0.01$) increased linearly with increasing age. The reverse trend was found for plasma IP / Ca ratio, it was insignificantly decreased gradually with increasing age. In this respect, Kalamah *et al*., (2003), Soliman (2003) and El. Mostafa, *et al*., (2006) found that plasma calcium and inorganic phosphorus increased linearly with increasing age.

Cocks at 36 wk of age had significantly ($P \leq 0.05$) higher plasma alkaline phosphatase activity and insignificantly higher plasma acid phosphatase activity than cocks at 30 and 42 wk of age. Plasma GOT was significantly ($P \leq 0.01$) higher in cocks at 30 wk and 42 wk than that at 36 wk of age, while, plasma GPT was insignificantly increased with increasing age (Table 3). These results agree with the results of Hanafy (2006) and El-Sheikh and Hanafy (2006).

Phenotypic correlation between semen physical characteristics:

The phenotypic correlation among the semen characteristics are presented in Table 4. In general, the high phenotypic positive and significant correlation was observed among sperm motility with both live sperm and sperm concentration and between live sperm with sperm concentration. While, the low phenotypic positive and insignificant correlation was observed between ejaculate volume with sperm motility, abnormal sperm and live sperm. On the other hand, the phenotypic negative and significant correlation was observed between sperm motility with abnormal sperm and abnormal sperm with both live sperm and sperm concentration. These results agree with the results of Machal *et al*.(1996), Gohar *et al*. (1997), Saeid (1998) and Kamar *et al*. (1984) who reported tha0…..t phenotypic correlation between all semen quantitative traits were positive and significant and the high positive correlation observed between most of semen characteristics would suggest a positive response to selection not only for traits directly selected but also to other correlated ones.

Phenotypic correlation between seminal plasma constituents and semen physical characteristics:

Seminal plasma total protein and globulin (G) were highly positively correlated with semen pH and live sperm, and negatively correlated with ejaculate volume, sperm motility and sperm concentration. Plasma albumin (A) and A/G ratio were highly positively and significantly correlated with ejaculate volume, sperm motility and sperm concentration, and negatively and significant correlated with semen pH and live sperm (Table 5). These obtained results agree with Thurston *et al*., (1975), Hess *et al*., (1982), Thurston *et al*., (1982) and Blesbois and Caffin (1992) who detected that seminal plasma albumin increased the motility of spermatozoa and may be one of the motility stimulating factors in seminal plasma. Moreover, Thurston *et al*., (1992) reported that the seminal plasma protein measurement was shown to be useful to predict the reproductive potential of males.

Seminal plasma cholesterol was significant and correlated positively with semen pH and live sperm. In this respect, Ansah and Buckland (1982) reported that membrane integrity, which is known to be improved by higher seminal plasma cholesterol level which plays a role in fowl spermatozoa function. Also, Parks and Lynch (1993) concluded that cholesterol was the major sterol in sperm membrane lipids of rooster.

There was highly phenotypic correlation between seminal plasma minerals with semen physical characteristics, it was ranged (from -0.60 to 0.69) with seminal plasma calcium (Ca), (from -0.82 to 0.86) with seminal plasma inorganic phosphorus (IP) and (from -0.99 to 0.99) with IP/Ca ratio. However, seminal plasma IP/Ca ratio was significantly correlated either positively with ejaculate volume, sperm motility and sperm concentration, or negatively with semen pH and live sperm (Table 5). In this respect, Ashizawa *et al*., (1992) demonstrated that motility and respiration of fowl spermatozoa are strongly influenced by their intracellular calcium concentration. These agree with our results which showed a high positive correlation between seminal plasma Ca with sperm motility. So, calcium is the major stimulatory factor in seminal plasma and it is possible that calcium is a key regulator of sperm motility in the fowl as well as in other species.

There was a significant positive phenotypic correlation between activity of alkaline phosphatase in the seminal plasma with semen pH and live sperm. While, a significant negative phenotypic correlation was found with ejaculate volume and sperm concentration. Seminal plasma acid

phosphatase activity was correlated either positively with semen pH, abnormal and live sperm or negatively with ejaculate volume, sperm motility and sperm concentration. These results agree with the results of Singer *et al*., (1980), El-Shafei (1983) and Belgili *et al*., (1985). Moreover, Glogowski *et al*., (1994) found that acid phosphatase in semen and seminal plasma of turkeys is very important in the biochemical processes leading to ovum fertilization. This disagree with Szekely *et al*., (1979).

Enzyme of GPT in the seminal plasma had a positive phenotypic correlation with semen pH, abnormal and live sperm (from 0.63 to 0.84) and had a negative phenotypic correlation with ejaculate volume, sperm motility and concentration (from -0.69 to -0.82). The reverse trend was observed with enzyme of GOT in the seminal plasma (Table 5). These results agree with the results of Hammond *et al*., (1965) who found no significant negative correlation between the concentration of alkaline phosphatase and sperm motility.

Phenotypic correlation between blood plasma constituents and semen physical characteristics:

In table (6) blood plasma total protein and globulin (G) are phenotypic positive correlation with ejaculate volume and semen pH and phenotypic negative correlation with sperm motility, sperm concentration, abnormal and live sperm. Plasma albumin (A) is positively correlated with semen pH, sperm motility, live sperm and sperm concentration, and negatively correlated with ejaculate volume and abnormal sperm. These results agree with the results of Soliman (1996) who showed that all blood plasma constituents studied were insignificant negatively correlated with ejaculate volume of Norfa cocks.

Also, there were phenotypic positive correlation between plasma A/G ratio with sperm motility, live sperm and sperm concentration, and phenotypic negative correlation were found with other semen physical characteristics studied (Table 6).

Blood plasma cholesterol was positively correlated with ejaculate volume, semen pH and live sperm while, there was negative correlation with sperm motility, abnormal sperm and sperm concentration. These results disagree with the result of Soliman (1996).

There was a positive phenotypic relationship of plasma calcium (Ca) with ejaculate volume, semen pH and live sperm, inorganic phosphorus (IP) with semen pH, sperm motility, live sperm and sperm concentration and IP/Ca ratio with sperm motility, sperm concentration,

abnormal and live sperm. But there was negative phenotypic relationship of Ca, IP and IP/Ca ratio with other semen physical characteristics studied (Table 6). These results agree with Soliman (1996), Ashizawa *et al*., (1995) and Mann and Mann, (1984) who found that calcium ions can depress motility and metabolism of spermatozoa. In this respect, Tash and Means, (1983) observed that external calcium appears to have different effects rather than internal calcium on sperm function, depending on the species.

Blood plasma enzymes were poorly correlated with semen physical characteristics (Table 6). Activity of both plasma alkaline and acid phosphatase were positively correlated with ejaculate volume and live sperm. While, both plasma GPT and GOT were negatively correlated with most semen physical characteristics studied.

In conclusion, the present results provide evidence that correlation among some seminal plasma or blood plasma constituents with semen physical characteristics might be useful to predict fertility in cocks.

Table1. Least square means (LSM ± S.E) of semen physical characteristics of Inshas cocks as affected by age.

Semen traits	Age (wks)			Significance
	30	36	42	
Ejaculate volume (ml)	0.27 ± 0.013	0.27 ± 0.013	0.29 ± 0.013	N . S
Sperm concentration x 109 /ml.	3.58 ± 0.167b	3.64 ± 0.167b	4.27 ± 0.167a	**
Total sperm / ejaculate x 10^9	0.97	0.98	1.24	
Sperm motility	2.97 ± 0.143b	3.03 ± 0.143b	3.47 ± 0.143a	*
Semen Ph	7.60 ± 0.064	7.68 ± 0.064	7.70 ± 0.064	N .S
Abnormal sperm (%)	19.23 ± 1.094a	16.60 ±1.094ab	15.87± 1.094b	*
Total abnormal sperm / ejaculate x 10^9	0.69	0.60	0.68	
Live sperm (%)	79.70±1.523b	85.97±1.523a	87.13±1.523a	**
Total live sperm / ejaculate x 10^9	2.85	3.13	3.72	

Means followed by different letters are significantly different as shown by Duncan's test.

N.S: Not significant, * Significant at P≤ 0.05, **Significant at P≤ 0.01

Table 2. Least square means (LSM ± S.E) of seminal plasma constituents of Inshas cocks as affected by age.

Seminal plasma	Age (wks)			Significance
	30	36	42	
Total protein (mg%)	37.48±3.447	43.10±3.447	42.63±3.980	N.S
Albumin (A) (mg%)	14.75±0.752	15.45±0.752	15.13±0.869	N.S
Globulin (G) (mg%)	22.75±3.418	27.65±3.418	27.83±3.946	N.S
A/G ratio	0.69±0.088	0.58±0.088	0.58±0.101	N.S
Cholesterol (mg%)	98.83±3.976	100.98±3.976	97.57±4.591	N.S
Calcium (Ca) (mg%)	80.85±4.394	76.70±4.394	82.30±5.074	N.S
Inorganic phosphorus (IP) (mg%)	53.38±2.041	53.38±2.041	57.23±2.357	N.S
IP/Ca ratio	0.66±0.037	0.70±0.037	0.71±0.043	N.S
Alkaline phosphatase (U/100 ml)	3.91±0.132	4.02±0.132	3.74±0.152	N.S
Acid phosphatase (U/100 ml)	10.36±0.478	10.54±0.478	10.48±0.552	N.S
GPT (U/l)	14.75±0.848	14.75±0.848	14.97±0.979	N.S
GOT (U/l)	19.73±0.942	18.70±0.942	17.23±1.088	N.S

N.S : Not significant

Table 3. Least square means (LSM ± S.E) of blood plasma constituents of Inshas cocks as affected by age.

Blood plasma	Age (wks)			Significance
	30	36	42	
Total protein (mg%)	45.40 ± 1.077	47.69 ± 0.244	47.44 ± 1.077	N S
Albumin (A) (mg%)	13.67 ± 0.244c	15.45±0.752a	14.64 ± 0.244b	**
Globulin (G) (mg%)	31.53 ± 1.087	31.91 ± 1.087	33.10 ± 1.087	N S
A/G ratio	0.46 ± 0.020	0.51 ± 0.020	0.45 ± 0.020	N.S
Cholesterol (mg%)	131.54 ± 2.13b	138.60 ± 2.13a	134.90 ± 2.13ab	*
Calcium (Ca) (mg%)	167.35±7.71b	172.27 ± 7.71b	197.82 ± 7.71a	*
Inorganic phosphorus (IP) (mg%)	89.36 ± 2.87b	85.96±2.87b	100.11 ± 2.87a	**
IP/Ca ratio	0.56 ± 0.241	0.53 ± 0.237	0.52 ± 0.237	N S
Alkaline phosphatase (U/100 ml)	14.24 ± 0.241b	15.33 ± 0.241a	14.17 ± 0.241b	*
Acid phosphatase (U/100 ml)	3.63 ± 0.170	3.88 ± 0.170	3.44 ± 0.170	N.S
GPT (U/l)	37.60 ± 0.579	38.47 ± 0.579	38.57 ± 0.579	N.S
GOT (U/l)	54.67 ± 0.631a	52.13 ± 0.631b	54.83 ± 0.631a	**

Means followed by different letters are significantly different as shown by Duncan's test.

N.S: Not significant, * Significant at $P \leq 0.05$, **Significant at $P \leq 0.01$

Table.4. Phenotypic correlation between semen physical characteristics.

Semen	Ejaculate volume	Semen pH	Sperm motility	Abnormal sperm	Live sperm	Sperm concentration
Ejaculate volume	--------	--------	--------	--------	--------	--------
Semen pH	-0.134	--------	--------	--------	--------	--------
Sperm motility	0.004	-0.189	--------	--------	--------	--------
Abnormal sperm	0.065	-0.101	-0.509*	--------	--------	--------
Live sperm	0.130	-0.084	0.709*	-0.666*	--------	--------
Sperm concentration	-0.038	-0.178	0.804*	-0.496*	0.618*	--------

* Significant at $P \leq 0.05$

Table.5. Phenotypic correlation between seminal plasma constituents and semen physical characteristics.

Seminal plasma	Semen physical characteristics					
	Ejaculate volume	Semen pH	Sperm motility	Abnormal sperm	Live sperm	Sperm concentration
Total protein	-0.79	0.86	-0.73	0.26	0.87	-0.86
Albumin (A)	0.96*	-0.98*	0.87*	-0.67	-0.89*	0.99*
Globulin (G)	-0.46	0.50	-0.32	-0.15	0.59	-0.47
A/G ratio	0.94*	-0.99*	0.90*	-0.63	-0.91*	0.99*
Cholesterol	-0.87	0.96*	-0.87	0.60	0.91*	-0.97*
Calcium (Ca)	0.51	-0.60	0.69	-0.42	-0.60	0.63
Inorganic phosphorus (IP)	0.79	-0.82	0.83	-0.59	-0.76	0.86
IP/Ca ratio	0.94*	-0.99*	0.91*	-0.63	-0.91*	0.99*
Alkaline phosphatase	-0.89*	0.97*	-0.88	0.51	0.89*	-0.97*
Acid phosphatase	-0.84	0.93*	-0.86	0.45	0.81	-0.90*
GPT	-0.82	0.84	-0.69	0.63	0.66	-0.80
GOT	0.79	-0.68	0.66	-0.46	-0.64	0.74

* Significant at $P \leq 0.05$

Table 6. Phenotypic correlation between blood plasma constituents and semen physical characteristics.

Blood plasma	Semen physical characteristics					
	Ejaculate volume	Semen pH	Sperm motility	Abnormal sperm	Live sperm	Sperm concentration
Total protein	0.121	0.131	-0.116	-0.070	-0.082	-0.158
Albumin (A)	-0.135	0.029	0.111	-0.137	0.176	0.063
Globulin (G)	0.164	0.078	-0.111	-0.048	-0.114	-0.140
A/G ratio	-0.186	-0.062	0.137	-0.007	0.167	0.131
Cholesterol	0.087	0.156	-0.035	-0.059	0.021	-0.070
Calcium (Ca)	0.035	0.236	-0.041	-0.165	0.038	-0.021
Inorganic phosphorus (IP)	-0.106	0.042	0.083	-0.226	0.201	0.060
IP/Ca ratio	-0.104	-0.187	0.093	0.033	0.086	0.047
Alkaline phosphatase	0.008	-0.041	-0.029	-0.010	0.046	-0.158
Acid phosphatase	0.049	0.046	-0.204	-0.051	0.080	-0.192
GPT	-0.011	0.007	-0.105	0.049	-0.041	-0.038
GOT	-0.081	0.151	-0.044	-0.084	-0.012	0.069

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الملخص العربى

العلاقة بين مكونات بلازما الدم والأداء التناسلى فى ديوك انشاص فى فترات مختلفة من العمر

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أجريت هذه الدراسة بمحطة بحوث الانتاج الحيوانى بسخا-معهد بحوث الانتاج الحيوانى- مركز البحوث الزراعية. وكان الهدف من البحث هو دراسة تأثير فترات مختلفة من العمر (30، 36 ، 42 أسبوع) على الأداء التناسلى وبعض مكونات الدم وكذلك العلاقة بين مكونات كل من بلازما السائل المنوى وبلازما الدم مع صفات السائل المنوى الطبيعية فى ديوك أنشاص.

والنتائج المتحصل عليها يمكن تلخيصها فى التالى:-

1- وجد أن تركيز وحركة الحيوانات المنوية والنسبة المئوية للحيوانات المنوية الحية كانت أعلى معنويا عند عمر 42 أسبوع عن الأعمار الأخرى ، وعلى العكس من ذلك كانت النسبة المئوية للحيوانات المنوية الشاذة.

2-أوضحت النتائج عدم وجود أختلافات معنوية لتأثير العمر على مكونات بلازما السائل المنوى.

3- وجد أن تركيز الألبيومين، الكولستيرول، الكالسيوم، الفوسفورالغير عضوى وأنزيمى الفوسفاتيز القاعدى و GOT فى بلازما الدم تأثر معنويا (باحتمال 0.01 or 0.05) باختلاف العمر.

4-أوضحت النتائج وجود ارتباط مظهرى موجب ومعنوى بين حركة الحيوانات المنوية مع كل من النسبة المئوية للحيوانات المنوية الحية وتركيز الحيوانات المنوية، وبين النسبة المئوية للحيوانات المنوية الحية وتركيز الحيوانات المنوية.

5-هناك ارتباط موجب معنوى أو غير معنوى بين تركيز الألبيومين و النسبه بين الألبيومين و الجلوبيولين أو الكالسيوم، الفوسفور الغير عضوى و GOT فى بلازما السائل المنوى مع حجم القذفة، حركة وتركيز الحيوانات المنوية على التوالى وكذالك بين تركيز الكولسترول و أنزيم الفوسفاتيز القاعدى أو البروتينات الكلية، الجلوبيولين و GPT فى بلازما السائل المنوى مع pH السائل المنوى و النسبة المئوية للحيوانات المنوية الحية على التوالى.

6- يوجد ارتباط موجب بين تركيز البروتينات الكلية، الجلوبيولين، الكولستيرول، الكالسيوم و انزيم الفوسفاتيز الحامضى فى بلازما الدم مع كل من حجم القذفة و pH السائل المنوى. ايضا هناك ارتباط موجب بين الألبيومين و الفوسفور الغير عضوى فى بلازما الدم مع تركيز وحركة الحيوانات المنوية و النسبة المئوية للحيوانات المنوية الحية .

نستنتج من هذه الدراسه أن العلاقه بين بعض مكونات بلازما الدم أو بلازما السائل المنوى مع الصفات الطبيعيه للسائل المنوى تكون مفيده فى التنبؤ بخصوبة الديوك.