

EFFECT OF BLOOD GROUPS ON SOME PHYSIOLOGICAL PARAMETERS OF CHICKENS

By

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Abstract: *Two breeds of chickens, White Leghorn and Fayoumi, segregating for six different B-blood group genotypes (Four B haplotypes B^1 , B^2 , B^{13} and B^{19} were identified in White Leghorn breed, while only two B haplotypes B^9 and B^7 were identified in Fayoumi breed) were used to study the effect of B-blood group genotypes on some physiological traits in chickens.*

The results revealed that the ejaculate volume, sperm motility and live sperm percentage were insignificantly higher in Fayoumi than White Leghorn cocks. However, the sperm concentration was significantly higher ($P \leq 0.05$) in Fayoumi than in White Leghorn cocks. The differences among B-blood group genotypes of White Leghorn breed were highly significant ($P \leq 0.05$) for ejaculate volume and semen pH and not significant for sperms motility, abnormality %, live sperms % and concentration of sperms. There were significant differences ($P \leq 0.01$) due to B-blood group genotypes effect on only ejaculate volume in Fayoumi breed. Seminal plasma total protein, globulin (G) and calcium (Ca) were significantly higher ($P \leq 0.01$) in White Leghorn than Fayoumi cocks. An opposite trend was true for seminal plasma albumin (A), A/G ratio, inorganic phosphorus (IP), IP/Ca ratio and alkaline phosphatase activity. $B^1 B^1$ genotype was higher in seminal plasma total protein, globulin, calcium and alkaline phosphatase than other genotypes of White Leghorn, the differences in this respect, were highly significant ($P \leq 0.01$). Meanwhile, $B^9 B^9$ genotype was higher than $B^7 B^7$ genotype of Fayoumi breed for seminal plasma total protein, globulin and alkaline phosphatase activity. An opposite trend was observed for seminal plasma calcium, inorganic phosphorus and Ca/IP ratio. Seminal plasma acid phosphatase in both breeds and B-blood group genotypes was quite similar. Body, skin and feather temperature in White Leghorn was higher than in Fayoumi breed. The differences, in this respect, were highly significant ($P \leq 0.01$) for skin temperature and not significant for body and feather temperature. The differences among B-blood group genotypes for body, skin and feather temperature were not significant in either White

Leghorn or Fayoumi breeds. The respiration rate in Fayoumi was significantly higher ($P \leq 0.01$) than in White Leghorn breed. $B^{19}B^{19}$ genotype of White Leghorn was significantly ($P \leq 0.05$) higher for respiration rate than other genotypes.

INTRODUCTION

Several studies had been carried out on semen characteristics of chicken males (Sturkie, 1986, Omeje and Marrire, 1990 and Darwish *et al.*, 1993). Semen volume ranged from 0.11 to 1ml and the concentration of spermatozoa ranged from 3.0 to 3.5×10^9 /ml. The same authors found breed differences in semen characteristics and fertilizing ability. Moreover, Sarkar *et al.*, (1996) showed that the hybrid broiler had the best semen quality, followed by the Deshi cross and hybrid layers.

Genetic differences between Fayoumi and White Leghorn breeds are widely varied under different environmental factors. The performances of these chickens depend mainly on the management system. Their true genetic potential can be expressed only under improved conditions. It is well known that there are correlations between certain alleles of the B- blood group system and a number of some economic traits in chicken. These traits are livability and egg production (Nordskog *et al.*, 1973 and Gebriel *et al.*, 1984a) and body weight (Birkmeyer *et al.*, 1982 and Gebriel *et al.*, 1984b). Abaza *et al.*, (1991) stated that the blood group genotypes had no effect on body weight (Alexandria strain) at 4 and 8 weeks of age, as well as egg weight. They added that, B2 and A2 alleles had superior effect on egg production within the first 90 days of laying, while the B1, A3 and D4 alleles caused a significant reduction in this trait. The homozygote B2 B2 and A2 A2 had favorable effects on age at sexual maturity, whereas the alleles B^4 , B^{13} , A^3 and D^4 had unfavorable effect on this age. The literature on the relationship between B-blood group genotypes and physiological parameters is relatively few. The present work aimed to study the effect of B- blood group genotypes on some physiological parameters such as semen production, blood plasma constituents and body reactions in White Leghorn and Fayoumi and breed.

MATERIALS AND METHODS

The present experiment was carried out at the Farm of Poultry Production, Faculty of Agriculture, Minufiya University, Shebin El - Kom.

Fourty White Leghorn and twenty Fayoumi cocks aged 32 weeks were used. White Leghorn cocks were divided into four lines according to the B-blood group genotypes (B^1B^1 , B^2B^2 , $B^{13}B^{13}$ and $B^{19}B^{19}$) while

Fayoumi cocks were divided into two lines (B^yB^y and B^zB^z), as given in Table (1).

Table (1): The lines and number of cocks according to B-blood group genotypes of each breed used during the experimental period

Breed	Line	Blood group Genotypes	No.
White Leghorn	L1	B^1B^1	10
	L2	B^2B^2	10
	L3	$B^{13}B^{13}$	10
	L4	$B^{19}B^{19}$	10
Fayoumi	L5	B^yB^y	10
	L6	B^zB^z	10

Cocks were fed *ad libitum* and fresh water was available continuously. The study was run in three trials:

Trial (1): To study the effect of breed and B-blood group genotypes on semen physical characteristics. Semen was collected individually over three months twice a week in 6 equal groups. Semen was collected using the massage method and the ejaculate volume was determined to the nearest 0.01 ml. using 1.00 ml. tuberculin syringe. Mass motility was determined according to Nagae *et al.*, (1987), initial semen pH by comparative pH paper, percentage of live and abnormal sperms were measured after staining with iosine and nigrosine ,and sperm concentration using Thomes – Zeis haemocytometer.

Trial (2): To study the effect of breed and B-blood group genotypes on some seminal plasma constituents. Pooled semen samples were collected from each line. Seminal plasma protein, albumin, calcium, inorganic phosphorus and activity of alkaline and acid phosphatase were determined in each line using kits.

Trial (3): To study the effect of breed and B-blood group genotypes on some body reactions; body, skin, feather temperatures and respiration rate were determined twice a week up to 2 months after sexual maturity. Body temperature was measured using a thermocouple thermometer inserted approximately 2 cm into cloaca. Respiration rate was measured by counting the chest movements for one minute using a stopwatch.

Serological technique: The serological technique for identifying the B-blood groups system was determined according to Briles *et al.*,(1982).

Statistical analysis: Data obtained were statistically analyzed according to Snedecor and Cochran (1973) and Gill (1978) .Duncan`s multiple range test was used for the multiple comparisons of means (Duncan, 1955).

The following models were used:-

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

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

Where :

Y_{ik} : observation.

μ : the overall mean of the concerned that.

BG_i : B-blood group genotypes effect.

BR_i : breed effect.

e_{ik} : random effect.

RESULTS AND DISCUSSION:

Semen physical characteristics

1- Effect of breed

The ejaculate volume in Fayoumi cocks was significantly higher than that in White Leghorn cocks, it was 0.16 and 0.14 ml., respectively (Table 2). This result agrees with El- Hammady *et al.* (1995), Soliman (1996) and Kalamah *et al.* (2000).

The motility of sperms in Fayoumi cocks was higher than White Leghorn cocks (Table 2), but the differences were not significant. These results agree with Khalifa *et al.* (1983), Soliman (1996) and Kalamah *et a.* (2000).

Semen pH of Fayoumi and White Leghorn cocks were nearly similar (7.86 and 7.84, respectively). The differences of semen pH according to breed effect were not significant. Similarly, Soliman (1996) and Kalamah *et al.* (2000) found that the value of semen pH of heavy cocks was the same value of light cocks, but reverse results were reported by El - Hammady *et al.* (1995).

The abnormal sperms percentage (Table 2) was nearly similar in both of Fayoumi (23.50 %) and White Leghorn cocks (23.68 %). Kamar *et al.* (1979) reported that the total abnormalities of sperms in Fayoumi were higher than that of Rhode Island Red. Also, Khalifa *et al.* (1983) found that the White Plymouth breed had the lower values of all different types of sperm abnormalities when compared with Fayoumi breed.

Data observed in Table (2) showed that the overall average of live sperm percentage was 81.53 and 81.80 % in White Leghorn and Fayoumi cocks, respectively. The differences, in this respect, were not significant.

Similar findings were found by El – Hammady *et al.* (1995) and Laila *et al.* (1997). The sperm concentration in semen of Fayoumi cocks was significantly ($P \leq 0.05$) greater than that of White Leghorn cocks, it was 3.14×10^9 and 2.92×10^9 , respectively. Similar findings were reported by Khalifa *et al.* (1983), Sarhan (1983) and Sarkar *et al.* (1996).

II Effect of B- blood group genotypes

Table (2) indicated that semen physical characteristics were affected by B-blood group genotypes. In this respect, $B^{19}B^{19}$ genotype of White Leghorn produced the larger semen volume than other genotypes, and the differences in this respect, were significant ($P \leq 0.05$). Similarly, in Fayoumi cocks, the volume of semen production of B^2B^2 was significantly ($P \leq 0.01$) greater than that of B^yB^y . Also, pH of semen was highest in B^2B^2 and it was lowest in B^1B^1 genotypes of White Leghorn. The statistical differences were significant ($P \leq 0.05$). In B^2B^2 genotype pH of semen was insignificantly higher than in B^yB^y of Fayoumi cocks.

Semen characteristics concerning the motility, abnormality, live sperms and concentration were almost similar in all B- blood group genotypes. The statistical differences were not significant. In this respect, El – Hammady *et al.* (1995) found that the differences between genotypes in semen characteristics were highly significant ($P \leq 0.01$). On the other hand, Kamar *et al.* (1984) and Omeje and Marire (1990) found insignificant differences between genotypes in their semen pH. Moreover, In Norfa cocks, Kalamah *et al.*, (2003) and Soliman (2003) found that the B^2B^2 genotype had significantly ($P \leq 0.01$) higher sperms motility, sperms concentration and percentage of live sperms, followed with $B^{15}B^{15}$. An opposite trend was true for B^1B^1 in percentage of abnormal sperms. They added that, the differences among B – blood group genotypes on ejaculate volume and semen pH were not significant, while they were significant ($P \leq 0.05$) for abnormal sperms percentage and highly significant ($P \leq 0.01$) for sperm motility, live sperms percentage and sperms concentration.

Semen chemical characteristics:-

a- Seminal plasma proteins:-

Seminal plasma total protein and globulin were significantly higher ($P \leq 0.01$) in White Leghorn than Fayoumi cocks (Table 3). The opposite trend was true for seminal plasma albumin and A/G ratio. The B^1B^1 genotype gave seminal plasma total protein and globulin significantly higher ($P \leq 0.01$) than other B – blood group genotypes in White Leghorn cocks. Also in Fayoumi cocks the B^yB^y genotype had seminal plasma total protein and

globulin significantly ($P \leq 0.01$) higher than B^2B^2 genotype. However, there were insignificantly differences due to B – blood group genotypes on seminal plasma albumin and A/G ratio in both breeds.

Bentley *et al.* (1984) found that the overall average of total seminal plasma protein of the selected and control lines were 0.874 and 0.752 g / 100ml., respectively, in broiler breeder. Soliman (1996) and Kalamah *et al.* (2000) found that the total protein in seminal plasma of heavy Norfa cocks was higher than that of light cocks , the seminal plasma albumin in heavy and light cocks were 1.49 and 1.40 g / 100ml ., respectively . The lowest value of seminal plasma globulin was in heavy cocks, and it was 2.79 g/ 100 ml., while the value of seminal plasma globulin in light cocks was 2.80 g/100 ml., the seminal plasma A/G ratio in heavy cocks was greater than light cocks .

b- Seminal plasma minerals:

Seminal plasma calcium (Ca) was significantly higher ($P \leq 0.01$) in White Leghorn than that of Fayoumi cocks (Table 3). An opposite trend was true for either seminal plasma inorganic phosphorus (IP) or IP/Ca ratio. The B^1B^1 genotype of White Leghorn was significantly higher ($P \leq 0.01$) than other genotypes in seminal plasma calcium. B^2B^2 and $B^{19}B^{19}$ of White Leghorn were similar, in this concept. While, the B^2B^2 genotype had seminal plasma inorganic phosphorus significantly higher ($P \leq 0.01$) than other genotypes. There were highly significant differences ($P \leq 0.01$) due to B – blood group genotypes in White Leghorn on seminal plasma IP/Ca ratio (Table3). In Fayoumi cocks, the B^2B^2 genotype had seminal plasma calcium and inorganic phosphorus significantly higher ($P \leq 0.01$) than the B^yB^y genotype, and significant differences ($P \leq 0.05$) for seminal plasma IP/Ca ratio (Table3).

In this respect, Soliman (1996) and Kalamah *et al.* (2000) showed that seminal plasma calcium of heavy and light Norfa cocks were 7.95 and 8.72 mg /100 ml., respectively. The seminal plasma inorganic phosphorus was nearly the same in heavy and light cocks. The seminal plasma IP/Ca ratio was greater in light cocks than heavy cocks.

c- Seminal plasma phosphatases:-

Alkaline phosphatase activity of seminal plasma was significantly higher ($P \leq 0.01$) in Fayoumi than in White Leghorn breed (Table 3). Seminal plasma acid phosphatase activity in both breeds was quite similar. The B^1B^1 genotype of White Leghorn was significantly ($P \leq 0.01$) higher than other B-blood group genotype. The B^yB^y genotype of Fayoumi was

significantly higher ($P \leq 0.01$) than B^2B^2 . However, seminal plasma acid phosphatase activity in all B – blood group genotypes was quite similar (Table 3). However, Soliman (1996) and Kalamah *et al.* (2000) reported that the seminal plasma alkaline phosphatase activities in heavy and light Norfa cocks were nearly similar. They added that seminal plasma acid phosphatase activities in heavy and light Norfa cocks were 10.51 and 10.10 unit / 100ml. respectively.

Body reactions:-

a- Body, skin and feather temperature:-

The body temperature in White Leghorn was higher than in Fayoumi breed. The differences in this respect, were highly significant ($P \leq 0.01$) for skin temperature, and not significant for either body or feather temperature (Table 4). There were insignificant differences due to B – blood group genotypes effects on body, skin and Feather temperature of both White Leghorn and Fayoumi cocks (Table 4).

Fathi *et al.* (1998) showed that Na na genotype had the lowest body temperature (40.99°C) followed by frizzled one (41.24°C). The reduction in body temperature associated with Na gene was about 0.45°C , whereas it was 0.19°C for frizzled genotype as a deviation from normally feathered genotype. Moreover, Galal *et al.* (2000) found that rectal temperature measured at sexual maturity for both heterozygous naked neck and frizzle genotypes was slightly higher than that of both normal feathered (na na and ff) ones. Abdou *et al.* (1999) showed that body temperature of pullets exposed to acute heat stress increased by 0.48, 0.66, 0.71, 0.94 and 1.26°C for Sinai, Fayoumi, Norfa, Mamourah and White Leghorn, respectively. On the other hand, Sabria and Younis (1999) showed that rectal temperature was significantly affected by genotypes. Also, Kalamah *et al.*, (2003) and Soliman (2003) reported that the body temperature was nearly similar in B^1B^1 , B^2B^2 and $B^{15}B^{15}$ genotypes in Norfa chickens, the differences in this respect were not significant.

b- Respiration rate:-

The respiration rate in Fayoumi was significantly ($P \leq 0.01$) higher than in White Leghorn breed. The $B^{19}B^{19}$ genotype had respiration rate significantly higher ($P \leq 0.05$) than other B – blood group genotypes in White Leghorn breed. But, in Fayoumi breed, there were insignificant differences due to B – blood group genotypes effects on respiration rate (Table 4). Kalamah *et al.*, (2003) and Soliman (2003) found that the B^1B^1 genotype had respiration rate higher than both B^2B^2 and $B^{15}B^{15}$ genotypes.

The differences between B – blood group genotype and respiration rate were not significant .

From these results it could be concluded that, the B- blood group genotypes can be used in selection programs to improve some physiological traits such as semen production, body reactions and respiration rate in chickens at early ages.

Table (2): Effect of blood group genotypes on semen characteristics in White Lghorn and Fayoumi cocks. ($X \pm S.E$)

Breed	Semen B.G	Volume (mL)	Motility	pH	Abnormality %	Live sperms %	Concentration $\times 10^9$
W Leghorn	B1B1	0.13 ^a ±0.005	3.10±0.137	7.80 ^a ±0.033	24.4±0.78	80.8±1.3	2.66±0.13
	B2B2	0.13 ^a ±0.005	3.41±0.134	7.96 ^a ±0.030	23.3±0.57	82.5±1.2	3.04±0.12
	B13B13	0.14 ^a ±0.005	3.47±0.135	7.88 ^a ±0.03	22.9±0.51	82.0±1.1	2.99±0.11
	B19B19	0.16 ^a ±0.006	3.47±0.135	7.80 ^a ±0.030	24.1±0.61	80.8±1.2	2.98±0.12
	Total mean	0.14±0.005	3.36±0.133	7.86±0.030	23.68±0.63	81.53±1.6	2.92±0.14
	Significant	*	N.S.	*	N.S.	N.S.	N.S.
Fayoumi	ByBy	0.14±0.005	3.72±0.139	7.82±0.031	23.6±0.63	82.3±1.1	3.19±0.12
	BzBz	0.17±0.007	3.57±0.137	7.86±0.033	23.4±0.75	81.13±1.2	3.09±0.14
	Total mean	0.155±0.007	3.65±0.140	7.84±0.034	23.5±0.81	81.80±1.3	3.14±0.15
	Significant	**	N.S.	N.S.	N.S.	N.S.	N.S.

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

* Significant at ≤ 0.05 ** highly significant at ≤ 0.01 N.S. Not significant

Table (3) Effect of blood group genotypes on seminal plasma proteins, minerals and phosphatases in White Lghorn and Fayoumi cocks. ($X \pm S.E$).

Breed	Semen B.G	Total protein g/L	Albumin (A) g/L	Globulin (G) g/L	A/G ratio
W.Leghorn	B ¹ B ¹	48.7 ^a ±0.894	13.2±1.140	35.5 ^a ±0.0316	0.37±0.037
	B ² B ²	44.5 ^b ±0.707	14.6±1.414	29.9 ^b ±0.707	0.49±0.071
	B ¹³ B ¹³	43.1 ^b ±1.061	15.1±1.414	28.0 ^b ±0.354	0.54±0.050
	B ¹⁹ B ¹⁹	44.5 ^b ±0.894	15.3±0.707	29.2 ^b ±0.447	0.52±0.032
	Total mean	45.2±0.634	14.6±0.584	30.7±0.697	0.48±0.027
	Significant	**	N.S.	**	N.S.
Fayoumi	B ² B ²	43.1±0.707	18.8±0.707	24.3±0.316	0.77±0.031
	B ² B ²	40.3±0.316	18.1±0.707	22.2±0.447	0.82±0.089
	Total mean	41.7±0.593	18.5±0.486	23.3±0.413	0.80±0.045
	Significant	**	N.S.	**	N.S.

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

* significant at ≤ 0.05 ** highly significant at ≤ 0.01 N.S. Not significant

Table (3) : Cont .

Breed	Semen B.G	Calcium(Ca)	Phosphorus	IP/Ca	Alkalin	Acid
		mg /L	(I P) mg /L	Ratio	Phosphatas u /L	Phosphatase u /L
White Leghorn	B ¹ B ¹	150.0 ^a ±3.54	27.0 ^a ±0.707	0.18 ^a ±0.004	32.7 ^a ±1.414	85.7±2.236
	B ² B ²	133.4 ^b ±2.12	40.0 ^a ±1.414	0.30 ^a ±0.221	13.9 ^a ±0.949	85.7±3.162
	B ¹³ B ¹³	116.7 ^c ±3.16	26.0 ^b ±1.414	0.22 ^a ±0.009	28.5 ^b ±1.140	85.7±1.414
	B ¹⁹ B ¹⁹	133.3 ^b ±2.83	15.0 ^c ±0.0447	0.11 ^a ±0.009	13.9 ^a ±0.707	85.7±3.536
	Total mean	133.4±3.02	27.0±2.093	0.20±0.017	22.3±2.008	85.7±1.246
	significant	**	**	**	**	N.S
Fayoumi	B ¹ B ¹	83.4±3.54	28.0±0.633	0.34±0.014	54.5±2.828	85.7±2.828
	B ² B ²	116.7±4.47	50.5±2.236	0.43±0.014	15.7±1.414	85.7±4.243
	Total mean	100.1±6.17	39.3 ±3.827	0.39±0.539	35.1±6.636	85.7±2.404
	Significant	**	**	*	**	N.S

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

* significant at ≤0.05 ** highly significant at ≤0.01 N.S. Not significant

Table (4): Effect of blood group genotypes on body reactions in White Leghorn and Fayoumi cocks. (X± S. E)

Breed	Traits B.G	Body	Skin	Feather	Respiration
		temperature	temperature	temperature	rate
	B ¹ B ¹	106.30±0.1516	100.14±0.4254	96.10±0.3993	39.00 ^a ±1.3390
	B ² B ²	106.00±0.4011	100.18±0.4182	96.90±0.5260	40.66 ^{ab} ±1.4323
	B ¹³ B ¹³	105.74±0.3657	100.53±0.3381	97.00±0.5382	39.60 ^{ab} ±1.5665
	B ¹⁹ B ¹⁹	106.21±0.4687	100.30±0.3305	97.00±0.7176	41.37 ^a ±1.6186
	Total mean	106.06±0.1820	100.29±0.1884	96.75±0.2771	40.16±0.2614
	Significant	N.S	N.S	N.S	*
W.Leghor	B ¹ B ¹	105.75±0.5262	99.03±0.4220	96.11±0.6580	44.21±1.4022
	B ² B ²	105.93±0.6555	99.10±0.4298	95.71±0.5993	44.89±1.3567
	Total mean	105.84±0.4169	99.07±0.2891	95.91±0.4420	44.55±0.2701
Fayoumi	Significant	N.S	N.S	N.S	N.S

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

* significant at ≤0.05 ** highly significant at ≤0.01 N.S. Not significant

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الملخص العربى

تأثير مجاميع الدم على بعض الصفات الفسيولوجية فى الدجاج

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تم إجراء هذا البحث لدراسة تأثير التركيب الوراثية لمجموعة الدم B على بعض الصفات الفسيولوجية فى نوعين من الدجاج وهما اللجهورن الابيض والفيومى. وقد تم تقسيمهم الى 6 مجاميع ممتاثله، النوع الاول الى 4 مجاميع (B^1 , B^2 , B^{13} and B^{19})، بينما النوع الثانى تم تقسيمه الى مجموعتين (B^y and B^z) والنتائج المتحصل عليها يمكن تلخيصها فى التالى :-

1- وجد أن ديوك الفيومى أعطت زيادة غير معنوية فى حجم القذفة للسائل المنوى وحركة ونسبة الحيوانات المنوية الحية عن ديوك اللجهورن الابيض، بينما كان تركيز الحيوانات المنوية عالى معنويا (باحتمال 0.05).

2- وجد ان الاختلافات بين مجاميع الدم B فى ديوك اللجهورن الابيض كانت معنوية (باحتمال 0.05) بالنسبة لحجم القذفة وتركيز أيون الهيدروجين، بينما كانت غير معنوية للحركة والنسبة المنوية لكل من الحيوانات المنوية الحية والشاذة وكذلك تركيز الحيوانات المنوية.

3- أوضحت النتائج وجود أختلافات عالية المعنوية (باحتمال 0.01) راجعة للاختلافات بين مجاميع الدم B على حجم القذفة فقط فى ديوك الفيومى.

4- وجد أن تركيز البروتين الكلى، الجلوبيولين والكالسيوم فى السائل المنوى كان عالى معنويا (باحتمال 0.01) فى ديوك اللجهورن الابيض عن الفيومى، وعلى العكس من ذلك كان

الالبومين، نسبة الالبومين الى الجلوبيولين، الفوسفور الغير عضوى، نسبة الفوسفور الى الكالسيوم ونشاط أنزيم الفوسفاتيز القاعدى.

٥-أوضحت النتائج أن مجموعة الدم B^1B^1 كانت عالية معنويا عن التراكيب الوراثية لمجموعة الدم B الأخرى وذلك بالنسبة لتركيز البروتين الكلى، الجلوبيولين و الكالسيوم ونشاط أنزيم الفوسفاتيز القاعدى فى ديوك اللجهورن الابيض ، بينما فى ديوك الفيومى وجد أن مجموعة الدم B^2B^2 كانت اعلى من مجموعة الدم B^2B^2 فى تركيز البروتين الكلى والجلوبيولين ونشاط أنزيم الفوسفاتيز القاعدى، وعلى العكس من ذلك كان الكالسيوم، الفوسفور الغير عضوى ونسبة الفوسفور الى الكالسيوم

٦- أوضحت النتائج أن درجات حرارة الجسم والجلد والريش كانت أعلى فى اللجهورن الابيض عن الفيومى، وكانت الاختلافات فى ذلك عالية المعنوية (باحتمال 0.01) بالنسبة لدرجة حرارة الجلد، بينما كانت غير معنوية لدرجة حرارة كل من الجلد والريش.

٧- وجد أن الاختلافات بين مجاميع الدم B على درجات حرارة الجسم والجلد والريش كانت غير معنوية سواء فى اللجهورن الابيض أو الفيومى.

٨- وجد أن معدل التنفس فى ديوك الفيومى كان عالى معنويا (باحتمال 0.01) عن ديوك اللجهورن الابيض، كما أن مجموعة الدم $B^{19}B^{19}$ كانت عالية معنويا (باحتمال 0.05) عن التراكيب الوراثية لمجموعة الدم B الأخرى فى معدل التنفس.