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SOME BLOOD COMPONENT AND MILK YIELD RELATIONSHIP WITH HIGH AND LOW LITTER SIZE IN CROSSBRED GOATS IN EGYPT

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ABSTRACT: A total of forty crossbred female goats (Zaraibi x Baladi) were used to study the relationship between intial litter size and some blood component and milk yield . Females goats were classified according to their intial litter size into three groups (low, medium and high litter size). Oestradiol-17β at oestrus, total proteins and albumin during pegnancy and milk yield were highly significant (P<0.01) increased with high litter size, while , fat % was highly significant (P<0.01) with low litter size in crossbred female goats. progesterone hormone , total proteins and albumin levels were highly significant (P<0.01) increased due to pregnancy period. Milk yield and fat % were significantly differences (P<0.01) due to lactation period. It could be concluded there is significant relationship between litter size and some blood components such, estradiol-17β, (at estras), total protein albumin during pregnancy months and between milk yield and milk fat percent during months of lactation.

INTRODUCTION

Meat is the most important product from goats in Egypt. Goats' meat is widely consumed and are popular Gallad *et al.*, (1988). During normal pregnancy in several animal species, various hormones and proteins appear or increased in the maternal circulation, many of these proteins are of feto - placental origin and have been detected in several ruminants Ruder *et al.* , (1988) . Several protein like substances have identified in maternal blood

during pregnancy, some of these substances are products originating in the concepts, whereas other may be secreted at higher levels during gestation, thus , they can be used as indicator of pregnancy Hafez , (2000) . The progesterone hormone directly related to pregnancy , is known for its role in the maintenance of pregnancy through its effects on uterine stromal cell differentiation Bell, (1984). The progesterone hormone in goats during pregnancy have been studied , however, their relation with litter size and foetal sex is not well established Jain *et al.*, (1980). Some studies suggest that there is positive relationship between litter size and milk production in sheep and goats Montaldo *et al.*,(1995) . The present study reveals some relationship between blood components and litter size during gestation period on reproductive performance of goats.

MATERIALS AND METHODS

The study was carried out in goats Farm, Experimental Farms Project, Nucler Research Center , Atomic energy Authority, at Inshas, Sharkia Province. On 40 crossbred female goats of (Zaraibi x Baladi) aged from 2-3 years with average body weight 25 kg during autumn until summer . Animals were fed ration consisted of pelleted concentrates and rice straw according to the body weight and physiological status as recommended by NRC (1985).

The does were access to water daily free . All animals were bred using fertile bucks aged 3 years . After parturition the does were classified according to litter size into three groups . The first group low litter size (had single, group 1) included 10 does, the second group medium litter size (had twins, group 2) included 20 does and the third group high litter size (had triple or more, group 3) included 10 does.

Blood samples from the jugular vien were collected exactly at oestrus and every two weeks throughout the whole period of pregnancy. The serum was separated by centrifugation for 15 minutes at 3000 rpm and the serum was stored frozen (-20°C) until analyzed. Both progesterone and oestradiol -17β concentrations in serum were determined used radioimonunoassay (RIA) technique by the human diagnostic kit I^{125} coated tubes as described by Kupasik, (1984) and Dobson & Dean,

(1974) with some modification to over-come the broblem of using. The concentrations of total protein, and albumin in serum were measured colorimetrically as described by Armstrong and Carr, (1964) for total proteins Doumas *et al.*, (1971) for albumin. Serum globulins were determined by substracting serum albumin concentration from serum total protein concentration. Milk yield was determined after parturition and continual at all of lactation period, daily milk yield was hand - milked once at day and weighed.

Milk fat percent was determined by using the standard Gerber method according the British Standard Institute B. S. I.. (1955) . Milk total solids percent was estimated by drying a small sample at hot oven as described by British Standard Irstitue B. S. I., (1955). The data were statistically analyzed using General Liner Model of the computer program SPSS, (1997). Comparison between means were performed by using Duncan multiple range test Duncan, (1955).

RESULTS AND DISCUSSION

Means (± S.E.) of oestradiol-17β at oestrus, progesterone, total proteins, albumin and globulins concentrations with different litter size during pregnancy in crossbred female goats are showed in Table 1. Oestradiol -17β level at oestrus was highly significant (P<0.01) increased with high litter size. The highest values were in high litter size (triple or more) followed by medium litter (twing) and the lowest values were in litter size single. The differences between litter size groups of estradiol-17β levels were significant (P<0.01). These results were in a great accordance with there obtained by Salah (1994) who found that the oestogen concentration was the highest with high litter size . These results may be due to that the additional follicales could be expected increase production of estradiol-17β Daniel *et al.*, (1988)and El-Darawany (1994). There was significantly (P< 0.01) positive correlated (0.978) between estradiol-17β and litter size. Progesterone hormone levels were not affected with litter size. This result were in similar with obtained by Sousa *et al.* (1999). This may be due to the number of corpora lutea or fetuses did not influence the progesterone concentration after day 30 of pregnancy Jarrell and

Dziuk ,(1991). While, there was found significant (P<0.01) positive correlation between litter size and progesterone hormone in 2^{nd} fortnight of 1^{st} month of pregnancy was showed in Table 3. This may be due to the highest number of corpora lutea as source of progesterone during the emberyonic phase of pregnancy and probably throughout the pregnancy period Bradford *et al.*, (1986). Total protein and albumin concentrations during pregnancy were highly significant (P<0.01) increased with litter size . The highest values recorded in 2^{nd} group and lowest in 1^{st} group, while the differences between 2^{nd} group and 3^{rd} group were not significant and were significant with 1^{st} group. This may be due to the embryonic unit produces a protein Joe and John , (1997). Also, there was found significant (P< 0.05) correlation between total proteins with the litter size in 1^{st} fortnight of the first month of pregnancy and it has been found non-significant correlation between albumin and litter size (Table 3). The globulins concentration was not significant affected by litter size (Table 3).

Mean values (± S.E) of progesterone hormone, total proteins, albumin and globulins concentrations as affected by pregnancy period of female goats were showed in Table 2.

Progesterone concentration was highly significant (P<0.01) affected with pregnancy period. The highest value was in 5^{th} month and the lowest value was in the first month. The differences between 2^{nd}, 3^{rd}, 4^{th} and 5^{th} months were not significant. These results were in a great accordance with these obtained by Sousa *et al.*, (1999) . Sheldrick *et al.*, (1981) who illustrate that the dramatic increase in maternal serum progesterone concentration during the fetal phase (week 8 to 20) of pregnancy is due to the role of the placenta as a source of progesterone. Total proteins concentrations were significantly differed (P<0.01) due to pregnancy period. The highest value was recorded in 2^{nd} month and lowest value was in 5^{th} month. There were not significant differences between the first four months of pregnancy, while, there was significant differences (P< 0.05) between 4^{th} and 5^{th} months of pregnancy.

Table 1. Mean values (± S. E.) of some blood components with different litter size in female goats during oestrus and pregnancy months .

Traits	Litter size			Overall mean
	1	2	≥ 3	
Estradiol-17β (Pg/ml)at oestrus	32.40±1.78^{C}	52.60±1.7^{B}	86.83±1.62^{A}	57.28±1.00
Progesterone (ng/ml)	8.40±0.54	5.52±0.43	8.91±0.55	8.94±0.58
Totoal protein (g/dl)	6.77±0.77^{B}	7.42±0.13^{A}	7.19±0.10^{A}	7.12±0.10
Albumin (g/dl)	4.18±0.07^{B}	4.76±0.11^{A}	4.84±0.09^{A}	4.61±0.52
Globulin (g/dl)	2.44±0.18	2.57±0.18	2.81±0.18	2.53±0.18

Means values with different large supercripts within the same row differ significnatly (P<0.01) .

Table 2. Means values (± S. E.) of some blood components as affected by monthes of pregnancy in female goats .

Traits	Months of pregnancy					Overall mean
	1st	2nd	3rd	4th	5th	
Progesterone (ng/ml)	6.32± 0.67^{B}	9.07± 0.67^{A}	9.03± 0.67^{A}	9.86± 0.67^{A}	10.44± 0.61^{A}	8.94± 0.63
Totoal protein (g/dl)	7.12± 0.14^{A}	7.31± 0.14^{A}	7.20± 0.14^{A}	7.28± 0.14^{Aa}	6.72± 0.14^{Bb}	7.13± 0.14
Albumin (g/dl)	4.65± 0.12^{a}	4.83± 0.12^{a}	4.62± 0.12^{a}	4.48± 0.12^{ab}	4.36± 0.12^{b}	4.57± 0.12
Globulin (g/dl)	2.44± 0.18	2.58± 0.18	2.47± 0.18	2.82± 0.18	2.36± 0.18	2.53± 0.18

Means values with different large supercripts within the same row differ significnatly (P<0.01) and mean values with different small superscripts within the same row differe significantly (P<0.05) .

Table 3. Correlation coefficient between litter size and some blood components during pregnancy period in female goats .

Traits	Months of pregnancy									
	1st		2nd		3rd		4th		5th	
	1st fort-night	2nd fort-night	1st fort-night	2nd fort-night	1st fort-night	2nd fort-night	1st fort-night	2nd fort-night	1st fort-night	2nd fort-night
Progesterone	-0.267	0.555**	0.330	0.184	0.268	0.161	0.286	0.396	0.384	-0.179
Total protein	0.382*	-0.179	0.049	0.227	0.242	0.025	-0.268	-0.125	-0.125	-0.124
Albumin	0.148	-0.002	0.303	0.261	0.315	0259	0.112	-0.017	0.046	-0.005
Globulin	0.291	-0.133	0.020	0.028	-0.052	-0.109	-0.165	-0.136	0.127	-0.110

** P<0.01
*P<0.05

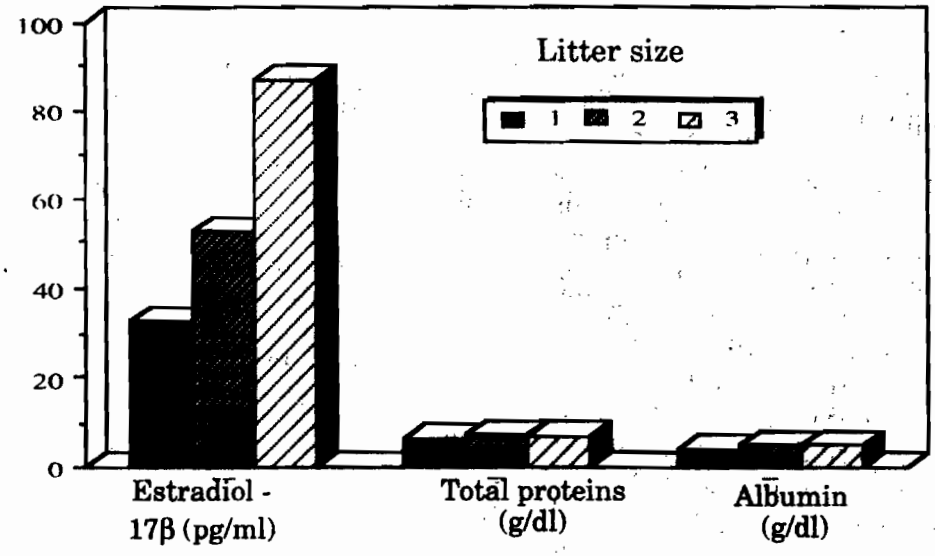

Figure 1. Relationships between litter size and some blood components during oestrus and pregnancy months in female goats.

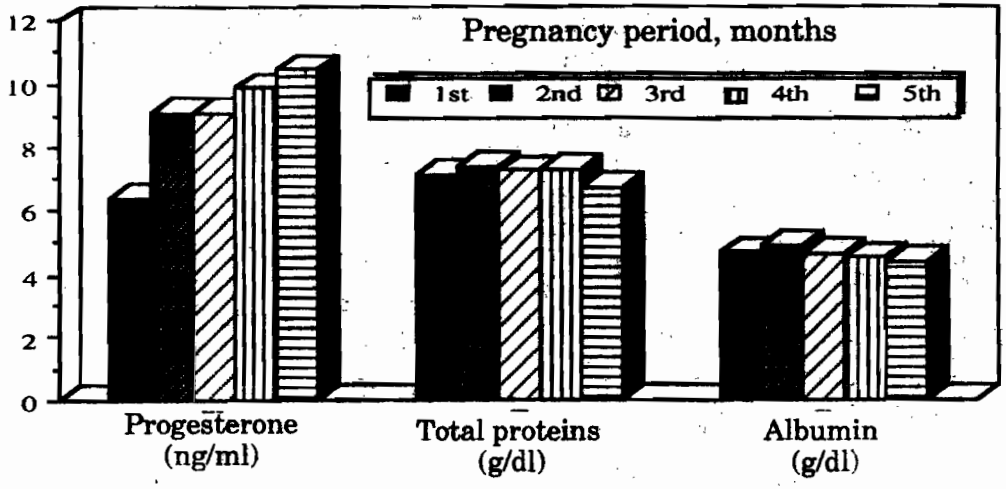

Figure 2. Effect of pregnancy preriod on some blood components in female goats.

These results were in similar with those obtained by Al-Saied *et al.*, (1999) . This may be due to the demand of the fetus to some amount of amino acids that taken from maternal circulation , especially in the second half of the gestation period Hassan *et al.* , (1982). Albumin concentrations were significantly (P<0.05) affected by pregnancy period. The highest values were recorded in the first three months of gestation followed by 4^{th} month, and the lowest value was in 5^{th} month (Table 2). The differences between albumin concentration at first three months of pregnancy were not significant, while the differences between 5^{th} month and first three months of pregnancy were significant (Table 2). These results were in a great accordance with those obtained by Darwish, (1993) who found that the plasma albumin decline especially at mid pregnancy. This result suggested that the rate of albumin mobilization greater during the end of pregnancy period Kaneko, (1980). There were significant differences between globulins concentrations during the months of pregnancy period.

Mean values (± S.E.) of milk yield, milk fat and milk toal solids with litter size during lactation period of female goats were showed in Table 4. Milk yield during lactation period were highly significant (P<0.01) affected by litter size . The highest values were in high litter size (3^{rd} group) followed by medium litter size (2^{nd} group) and lowest values were in low litter size (1^{st} group).The milk yield were significantly (P<0.01) differed between litter size groups. These results were similar with those obtained by Sangre and Panday (2000), they have been found that the milk yield was significantly influenced by number of kids born , and the does which give birth to multiple kids produced sigificantly (P <0.01) more milk over the lactation compared to does that produced single. This may suggested physiological mechanisms during pregnancy that prepare the udder to produce more milk when a does carrying multiple fetuses Hatfield *et al.*, (1995). It has been found significant (P<0.01 and P< 0.05) positive correlation between litter size and milk yield (Table 5). The milk fat was significantly (P<0.01) differences with litter size, however, the highest val-

ues were in low litter size (group 1) followed by medium litter size (group 2) and lowest values were in high litter size (group 3) . The difference between group 2 and group 3 was not significant. These results were similar with obtained by El-Feel (1998). Those is proposed that litter size effect on milk fat yield were due to modified endocrine in prepartum does (Browning *et al.*,1995). The total solids percent were not affected by number of kids born. The effect of lactation period on milk yield, milk fat percent and milk total solids percent showed in Table 4. Milk yield during lactation period were significantly (P<0.01) differed with lactation period. The highest value was in first month followed by second and third month, and lowest values were in fourth and fifth months of lcatation. The differences between fourth and fifth months of lactation were significant (P < 0.01), while the difference between first month and second month was not significnat , also the diffeence between second and third months of lactation was not significant.

These results were in a great accordance with those obtained by Peris *et al.* (1997). These differences were prbably related to differences in both the genotype and mutational environment Gall, (1981). Milk fat percent was significantly (P<0.01). differed indifferent months of lactation. The highest value was in 5^{th} months followed by 2^{nd} month and the lowest value was in 1^{st} month of lactation. The difference between the first and second months was significant (P<0.01), while the difference between 4^{th} and 5^{th} months was not significant, also the difference between second and third months of lactation was not significant. This may be due to the decreased milk yield in the second month of lactation so the milk fat increased (Peris *et al.*,1997). The milk total solids percent was not affected by lactation period , while it has been found significant (P<0.01 and P<0.05) positive correlations between milk yield in 4th and 5th months of lactation were showed in Table 5. The percent of total solids increased with the milk yield decreased during the second lactation period (Peris *et al.*,, 1997). It could be concluded there is significant relationship between litter size and some blood components such,

Table 4. The effect of litter size and lactation period on milk yield , milk fat and milk total solids in female goats.

Items	Traits		
	Milk yield (kg/day)	Milk fat (%)	Milk total solids (%)
Litter size			
1	0.52 ± 0.04^{C}	$3.96 + 0.28^{A}$	13.48 ± 0.48
2	0.64 ± 0.03^{B}	$3.21 + 0.14^{B}$	12.73 ± 0.24
≥ 3	0.80 ± 0.04^{A}	$2.87 + 0.25^{B}$	12.24 ± 0.42
Months of lactation			
1^{st}	0.88 ± 0.09^{A}	$2.38 + 0.44^{C}$	11.90 ± 0.76
2^{nd}	0.82 ± 0.03^{AB}	$3.04 + 0.23^{B}$	12.98 ± 0.40
3^{rd}	0.76 ± 0.03^{B}	$2.68 + 0.25^{BC}$	12.31 ± 0.43
4^{th}	0.49 ± 0.03^{C}	$4.11 + 0.25^{A}$	13.32 ± 0.43
5^{th}	0.32 ± 0.03^{D}	$4.50 + 0.25^{A}$	13.57 ± 0.43
Overall mean	0.66 ± 0.04	$3.36 + 0.25$	12.61 ± 0.42

Mean values with different large supercripts within the same item differ significantly ($P<0.01$) .

Table 5. Correlation coefficient between litter size and each of milk yield, milk fat and milk total solids during lactation period in female goats.

Traits	Litter size during lactation period																		
	1st				2nd				3rd				4th				5th		
	Time, weeks				Time, weeks				Time, weeks				Time, weeks				Time, weeks		
	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd
Milk yield	0.386	0.375	0.549**	.369	0.352	0.477*	0.472*	0.268	0.527**	0.318	0.351	0.656**	0.356	0.618**	0.694**	0.184	0.404	0.631**	0.234
Milk fat	-0.102				-0.103				-0.198				-0.139				-0.143		
Milk total solids	-0.087				-0.188				-0.306				-0.495**				0.439*		

** P< 0.01
* P< 0.05

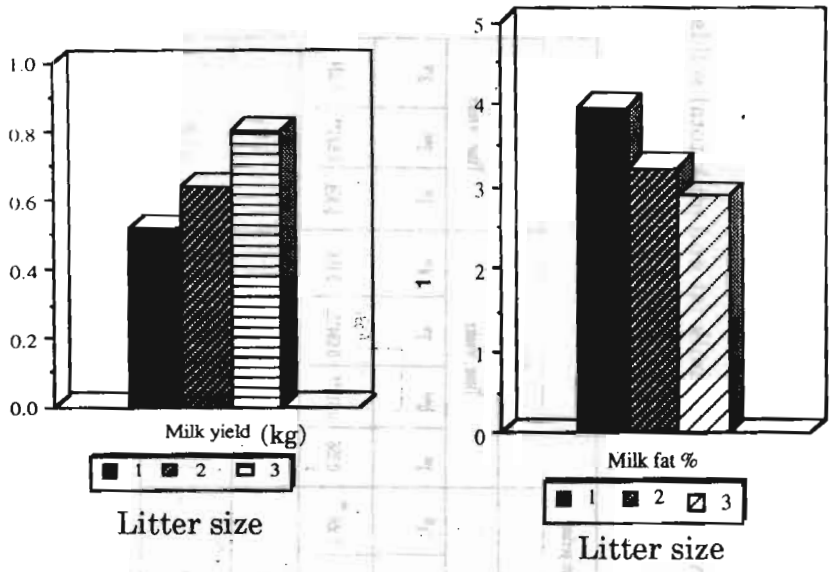

Figure 3. Effect of litter size on mik yield and milk fat .

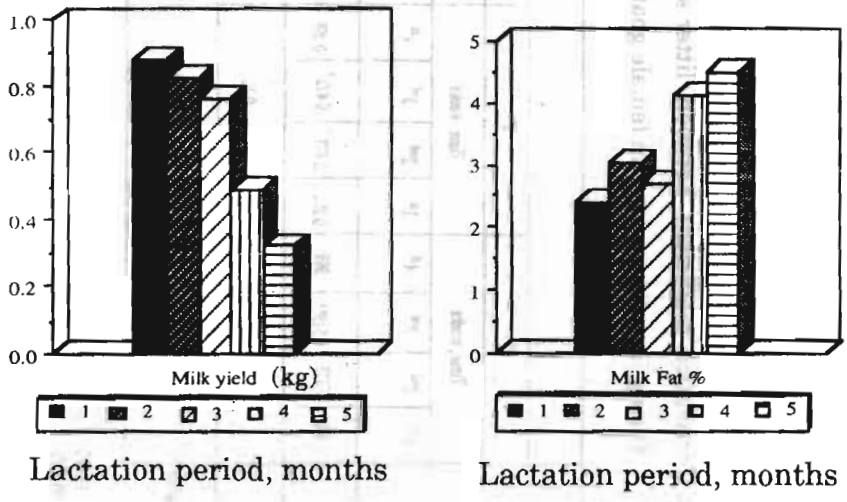

Figure 4. Effect of lactation period on milk yield and milk fat .

estradiol-17β, (at estras), total protein albumin during pregnancy months and between milk yield and milk fat percent during months of lactation.

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العلاقة بين الحجم البطن العالى والمنخفض وبين بعض مكونات الدم وانتاج اللبن فى إناث الماعز الخليطة فى مصر

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**قسم التطبيقات البيولوجية مركز البحوث النووية هيئة الطاقة الذرية - مصر

لدراسة هذه العلاقة استخدمت أربعون أنثى ماعز خليط (٥٠٪ زرايبى × ٥٠ بلدى) لدراسة العلاقة بين حجم البطن وبعض مكونات الدم وانتاج اللبن . وقد تم تقسيم الحيونات طبقاً لحجم البطن إلى ثلاث مجموعات هى :

١- المجموعة الأولى : أمهات ذات ولادات فردية وتشمل ١٠ أمهات.

٢- المجموعة الثانية : أمهات ذات ولادات توامية وتشمل ٢٠ أم .

٣- المجموعة الثالثة : أمهات ذات ولادات ثلاثية أو رباعية وتشمل ١٠ أمهات .

تم تقدير تركيز هرمونى الاستراديول ١٧ بيتا ، البروجستيرون ، مستوى البروتين الكلى والالبيومين ، الجلوبيولين ، كمية اللبن اليومى ونسبتى الدهن والجوامد الصلبة الكلية خلال فترة الحليب .

وقد أظهرت الدراسة النتائج الاتية :

١- تركيز هرمون الاستراديول ١٧ بيتا أعلى معنوياً (١٪) فى المجموعة الثالثة عن المجموعة الأولى والثانية ، أيضاً كان تركيزة في المجموعة الثانية أعلى عن الأولى . كما وجد إرتباط معنوى (١٪) بين حجم البطن وهرمون الاستراديول ١٧ بيتا .

٢- تركيز هرمون البروجستيرون لم يتأثر مع حجم البطن ولكن وجد إرتباط معنوى (١٪) بين حجم البطن وهرمون البروجستيرون فى النصف الثانى من الشهر الأول من الحمل. مستوى هرمون البروجستيرون أعلى معنوياً (١٪) فى كل من الشهر الثانى والثالث ،والرابع والخامس عن الشهر الأول من الحمل .

٣- البروتين الكلى كما تركيزة أعلى معنوياً (١٪) في المجموعتين الثانية والثالثة عن الأولى . تركيز البروتين الكلى أعلى معنوياً (١٪) فى الشهور (الأول ، الثانى ، الثالث ، الرابع) من الحمل عن الشهر الخامس . أيضاً وجد ارتباط معنوى (١٪) بين تركيز البروتين الكلى مع حجم البطن فى النصف الأول من الشهر الأول من الحمل

٤- تركيز الألبيومين أعلى معنوياً (١٪) فى المجموعتين الثانية والثالثة عن الأولى كذلك هناك اختلافات معنوية (٥٪) فى تركيز الألبيومين فى شهور الحمل المختلفة حيث كان أعلى فى الشهور (الأول ، الثانى ، الثالث ، الرابع) عن الشهر الخامس من الحمل .

٥- تركيز الجلوبيولين لم يتأثر مع حجم البطن أو شهور الحمل ولايوجد أى ارتباط معنوى بين تركيز الجلوبيولين وخجم البطن أثناء شهور الحمل.

٦- أنتاج اللبن اليومى كان أعلى معنوياً (١٪) فى المجموعة الثالثة عن المجموعتين الأولى والثانية بينما كان انتاج اللبن أعلى معنوياً (١٪) فى الثلاث شهور الأولى من الحليب عن الشهرين الرابع والخامس كذلك وجد ارتباط معنوى (١٪ ، ٥٪) بين انتاج اللبن وعدد الخلفة الناتجة .

٧- نسبة الدهن كانت أعلى معنوياً (١٪) فى المجموعة الأولى عن المجموعتين الثانية والثالثة . نسبة الدهن أعلى معنوياً (١٪) فى الشهرين الرابع والخامس مقارنية بالشهور الثلاثة الأولى من الحليب .

٨- نسبة الجوامد الصلبة الكلية لم تتأثر بحجم البطن أو بشهور الحليب . ولكن وجد ارتباط معنوى (١٪ ، ٥٪) فى نسبة الجوامد الصلبة الكلية مع عدد الخلفة الناتجة فى الشهرين الرابع والخامس .

وعلى ذلك يمكن استنتاج أنه يوجد ارتباط معنوى بين عدد من الصفات فى الدم مع حجم البطن وتشمل هرمون الاستراديول ١٧ بيتا والبروتين الكلى والالبيومين كذلك انتاج اللبن اليومى ونسبة الدهن من خلال فترة الحليب وبناء عليه نستطيع التوقع بحجم البطن العالى والمنخفض من خلال بعض الصفات فى الدم لكى نعطى أهمية خاصة للحيونات العالية فى حجم البطن من الناحية الرعائية والادارية.