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INFLUENCE OF THE MATING SEASON AND PREGNANCY STAGES ON INSULIN AND SOME BLOOD CONSTITUENTS IN BARKI SHEEP.

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ABSTRACT: Thirty Barki ewes were used to study the effect of mating season on insulin hormone, glucose, cholesterol, total protein levels during stages of pregnancy. Animals were divided into two equal groups between two seasons. Mean value of insulin in summer was equal with winter, and gradually increased from early pregnancy till late of pregnancy. Non significant differences were observed in all constituents levels between the two seasons. Glucose level was gradually decreased from early pregnancy till late of pregnancy. Cholesterol was lower at mating, and then increased till 60 days of pregnancy ,and was decreased at 75 days of pregnancy till the end of pregnancy. Highest plasma total protein, albumin and globulin were observed at early pregnancy then declined towards parturition. A/G ratio took the trend of fluctuation in both the two season, was slightly reduced from mating till 15 days of pregnancy. The maintained almost similar levels up to day 75th of pregnancy, then an increase were noticed up to end of pregnancy. From this study it could be concluded that certain blood parameters such as insulin hormone, glucose, cholesterol and total protein can be measured and used as indication of the reproductive status of Barki sheep.

INTRODUCTION

Levels of insulin were lower during the first 64 days of pregnancy than that between 70 and 100 days of pregnancy, then it decreased from 105 to 135 days of pregnancy in sheep (Vernon, et.al. 1981). Fall in the

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number of insulin receptors around parturition is probably due to the fall of insulin in serum (Flint, et.al. 1980). Also the fall in serum insulin during late of pregnancy in sheep was found by Blom, et.al. (1976). Plasma glucose in goats during the 3rd month of gestation was higher during winter as compared to summer months, the trend was reversed during the fourth and fifth months (Shaffer, et.al. 1981, Roussel et.al. 1982 and Hassanin, et.al. 1996). Concentration of glucose was higher at mid than that at early pregnancy and late of pregnancy (Ashour 1998).

In sheep, Okab, et.al. (1993) found that concentration of serum cholesterol was significantly higher in winter than in summer. They add that cholesterol value was high on day 135 of pregnancy and low at parturition. In goats, Ashour (1998) reported that serum cholesterol steadily decreased with advancement of pregnancy. Plasma total proteins play an important role in keeping the volume of the circulating blood within the normal limits through their effect on the osmotic equilibrium between blood and tissue fluids (Khalifa, et.al. 2002). In sheep, Shoukry (1981) observed that plasma total protein exhibted little changes between summer and winter. Mahmoud (1993) found a non-significant decrease in total protein at day 1 after mating and that at the 4th week of gestation. Thereafter, were very limited increased till the 12th week of gestation, while a highly significant reduction was noticed at the last week of gestation. This study aimed to evaluate the effect of mating season on some blood constituents during stage of pregnancy and its relation to reproductive performance.

MATERIALS AND METHODS

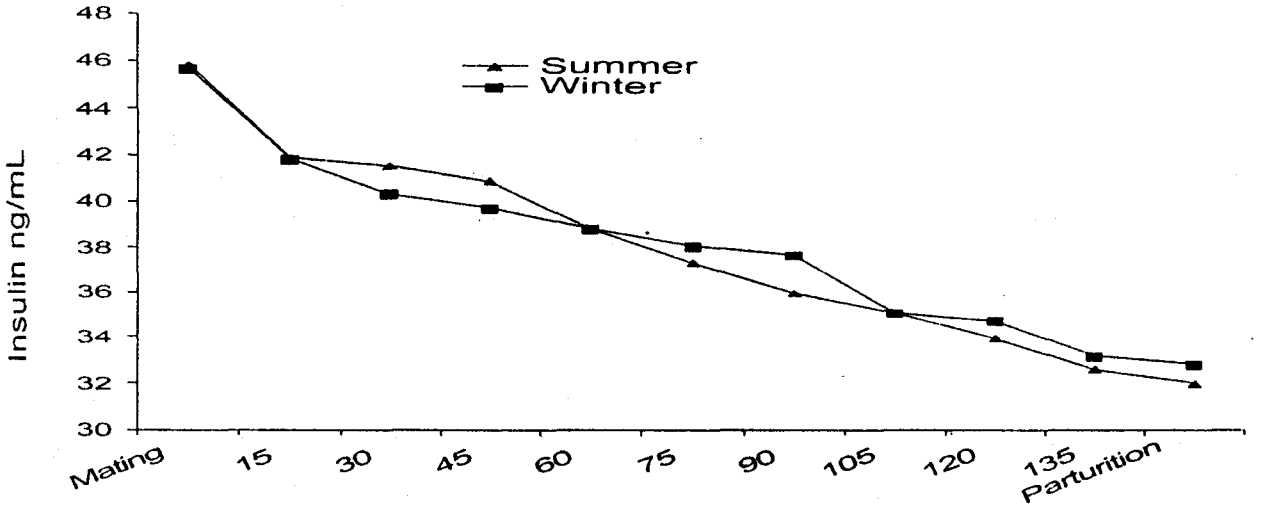
This study was carried out in the sheep research farm of the animal production department, faculty of agriculture, Al-Azhar University. A total number of thirty Barki sheep were used and divided into two equal groups. Group one was mated in summer (June-July), while group two was mated in winter (February). Animals were housed in semi-open pens throughout the experiment which provided reasonable shade and ventilation in summer and protection from rain and wind in winter. During experimental period, under shade the maximum recorded air temperature was 32°C during summer and 18°C during winter. Average monthly relative humidity was 75% during summer and 40% during winter.

Blood samples were taken early in the morning before feeding and watering by jugular vein puncture, on day of mating. Thereafter every 15 days until 135 day of pregnancy and on day of lambing. Blood was centrifuged and plasma was carefully separated and kept frozen at -20°C until analysis. Radioimmunoassay (RIA) was used for determining the level of the insulin. The determination was carried out according to the procedures specified with the kits produced by Diagnostic Products Corporation (DPC, Los Anglos, U.S.A). Blood glucose was estimated according to the method of Bergmeyer (1974). The determination of plasma total cholesterol was carried out as described by Watson (1960). Total protein was determined colorimetrically in plasma according to the method of Weichselbaum (1946). Plasma albumin was estimated colorimetrically as described by Doumas, et.al. (1971). Plasma globulin was calculated by subtraction of albumin from total protein. The A/G ratio was calculated by dividing albumin on globulin values.

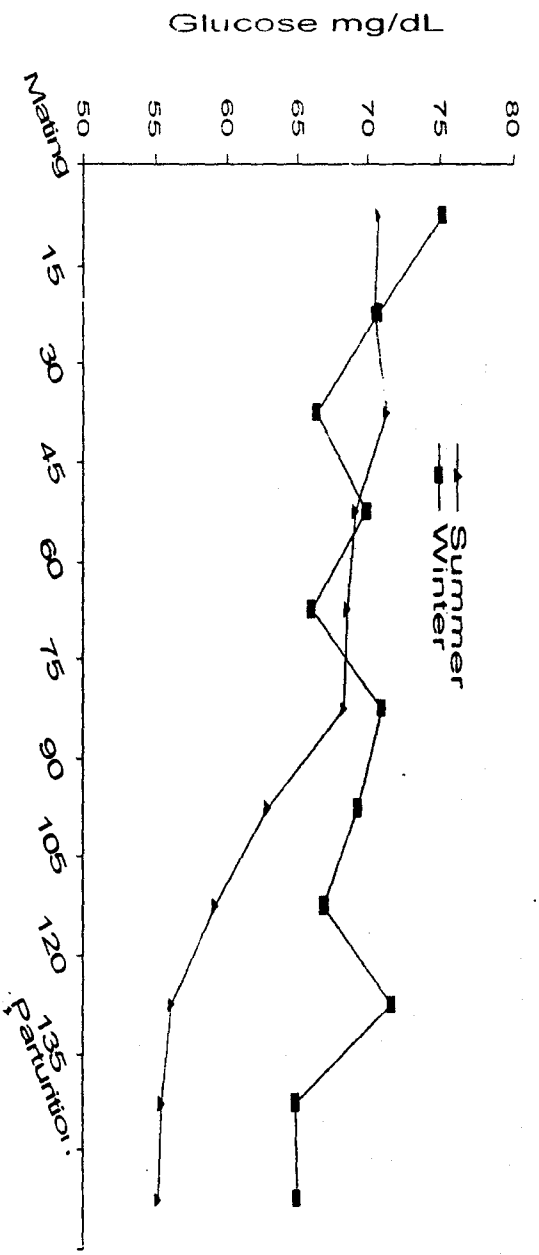
Statistical analysis was followed to detect the source of variation among plasma constituents in different animals during pregnancy using GLM procedure of SAS (1988). Duncan range test was used to compare means (Snedecor and Corchran 1982).

RESULTS AND DISCUSSION

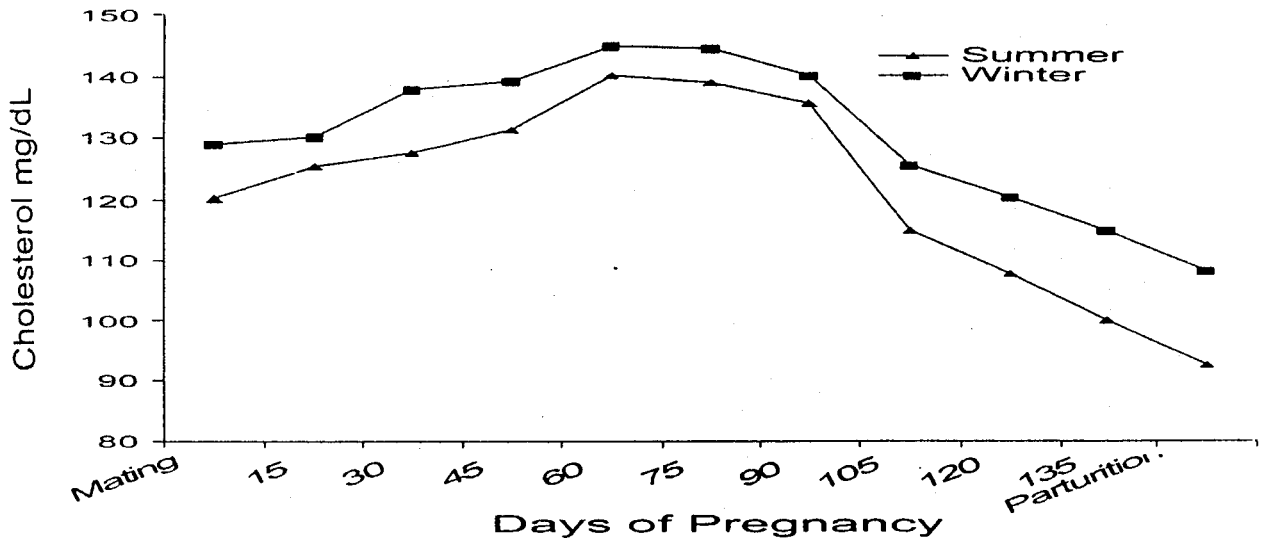
The influence of mating season of insulin is shown in figure (1). It was clear that the overall mean of insulin in summer was equal with that in winter. Plasma insulin was gradually decreased from early pregnancy till late of pregnancy in two seasons. Several factors may be responsible for such as decline. One possible mechanism is an increase in insulin sensitivity (Antunovic, et.al. 2001). Enhanced insulin sensitivity in the last half of the first trimester might be due to a decline in levels of ant-insulin hormone (Antunovic, et.al. 2002). Specifically, a fall in insulin requirements in the first trimester may be mediated through a decline in progesterone, an anti-insulin hormone (Knopp, et.al. 1998). In sheep, Vernon, et.al. (1981) reported that levels of insulin were lower at 1-64 days of pregnancy than at 70-100 days of pregnancy. Also, they mentioned that value of insulin was decreased at 105 and 135 days of pregnancy. Progesterone promotes insulin secretion in the rat (Costrini and Kalkhoff 1971 and Ashby, et.al. 1981) and so it may be at least partly responsible of the higher insulinemia observed during pregnancy (Knopp,



Figure(*1A*): Effect of mating season and pregnancy stages of insulin



Figure(1B):Effect of mating season and pregnancy stages of glucose.



Figure(1C): Effect of mating season and pregnancy stages of cholesterol concentrations.

et.al. 1973 and Flint, et.al. 1979). Changes in insulin responsiveness at mid pregnancy, end pregnancy and lactation may be adaptation that allows gilts to be acclimating to increasing demand of glucose by the growing conceptus and even greater demands of lactation (Pere and Etienne 2007).

Effect of mating season and stages of pregnancy on the plasma glucose level are shown in figure (1). It is clear that the overall mean of glucose after summer mating was slightly lower than winter mating, however this difference was non-significant. Glucose level was gradually decreased from early pregnancy till late of pregnancy in two mating season. Similar findings were reported in cows by Rowlands, et.al. (1980), Rajora and Rachauri (1994) and Fahmy, et.al. (2004) in buffaloes by Abdul-Quayam, et.al. (1990) and in goats by Hassanin, et.al. (1996) and Ashour (1998). High utilization of energy near parturition for the impending parturition and diversion of energy for lactation purpose were the possible reasons to decrease plasma level of glucose behind the decline in blood glucose level at parturition (Haresing and Cloe 1981). Also, Rao, et.al. (1981) and Singh, et.al. (1999) found that blood glucose level showed decreasing trend towards advanced pregnancy, which could be due to energy demands of growing fetus. Glucose level in the present study (especially in summer) was decreased from mating towards parturition, which may be referred to increase of fetus size which caused increased respiration in the dam. Badr, et.al. (2002) showed that decrease in the glucose concentration may be due to the increased respiratory rates which lead to rapid utilization of blood glucose by respiratory muscles.

The plasma cholesterol level was lower at mating in the two seasons, and then increased till 90 days of pregnancy. Cholesterol level was decreased thereafter till the end of pregnancy figure (1). The trend of changes in cholesterol concentration in the present study is in accordance whith those reported for goats (Ashour 1998) sheep (Okab, et.al. 1993) cattle (Sakukar, et.al. 1985) and buffaloes (Badr, et.al. 2002). The fall in cholesterol level at parturition may be due to a mainly hormonal influences. Okab, et al (1993) showed that lower values of cholesterol at parturition could be attributed to the increased concentration in level of thyroid hormones. The high cholesterol value during mid pregnancy was probably due to the high level gonadal steroids which have a relation with cholesterol metabolism (Sahukar, et.al. 1985). Decrease in cholesterol level near parturition, observed in the present study was probably due to

the increasing stress of parturition (Singh, et.al. 1999). Parmer and Mehta (1991) found that cholesterol value was lower in winter than in summer seasons in Surti buffaloes. In accordance result the present study th plasma cholesterol was higher during winter than that in summer during pregnancy, in sheep (Okab, et.al. 1993).

The overall mean of plasma total protein, albumin and globulin concentrations in winter and summer among weeks of pregnancy are illustrated in figure (2). Plasma total protein, albumin and globulin concentration exhibited similar pattern of changes during pregnancy in both winter and summer. Levels of total protein, albumin and globulin were highest at early pregnancy then they declined towards lambing. Plasma total proteins found in this study are close to those reported by Badr, et.al. (2002) and Fahmy, et.al. (2004). El-Naggar and Abdel-Raouf (1971) reported that reduction in serum protein in late gestation is coincide with the rapid increase in the uterine weight, the fetal fluids and the fetal membrane. Mahmoud (1993) and Rajora and Pachauri (1994) mentioned that the reduction in serum protein in late pregnancy was attributed to the decrease in both serum albumin and globulin. Rowlands, et.al. (1975) observed that the decline in serum total protein concentration during late pregnancy was mainly due to the 15% decrease in the globulin concentration and the increased protein breakdown required for glyconeogenesis. In the present work mating season had no significant effect on plasma protein levels. However, Ghsal, et.al. (1973) reported that total protein was significantly higher in summer than in winter. In contrast, Okab, et.al. (1993) mentioned that total protein was higher in winter than in summer in pregnant sheep. While in goats, Ashour (1998) found no significant difference in total proteins between summer and winter.

In ewes, Batavani, et.al. (2006) found that the mean concentration of total protein was fluctuated insignificantly throughout gestation until the 125^{th} day of pregnancy. They also showed a significant decrease in protein level occurred at 145 days of pregnancy. They concluded that protein level declined sharply during late gestation where the nutrient demands of the fetus were maximal.

Abd El-Khalek (1997) and Ashour (1998) found that blood albumin decreased with advanced pregnancy. The decrease in albumin with the advancement of gestation may be due to the acceleration in protein synthesis by the fetus (Jainudeen and Hafez 1980) which causes a

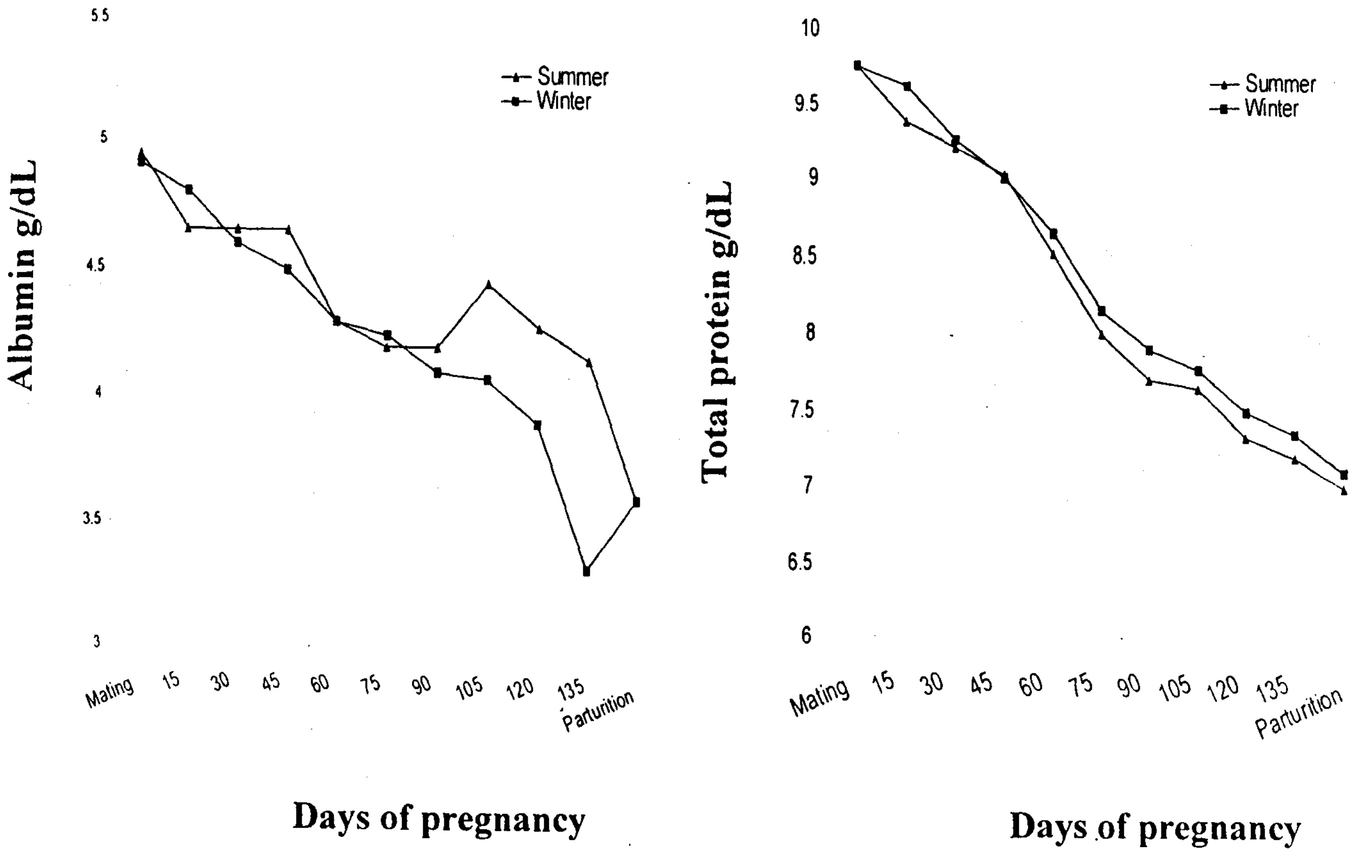
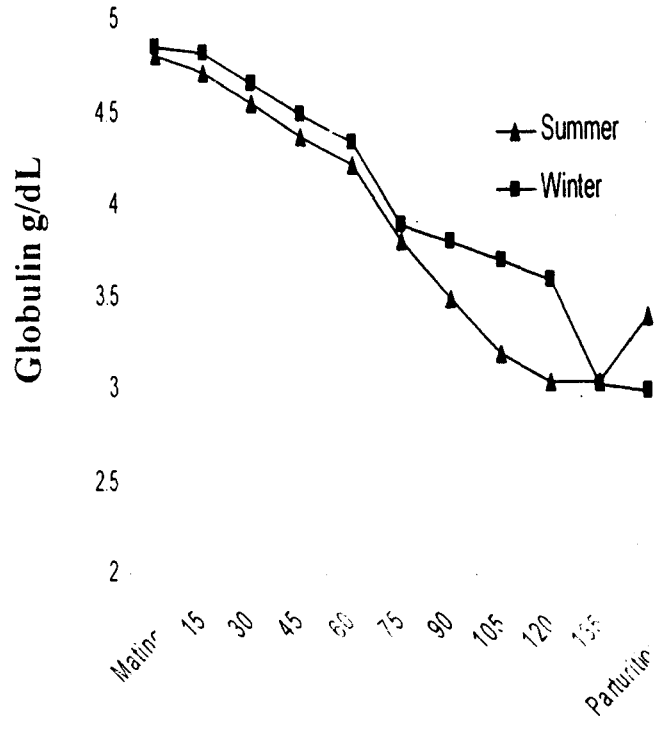


Figure (2A)Effect of mating season and pregnancy stages of total protein, albumin,



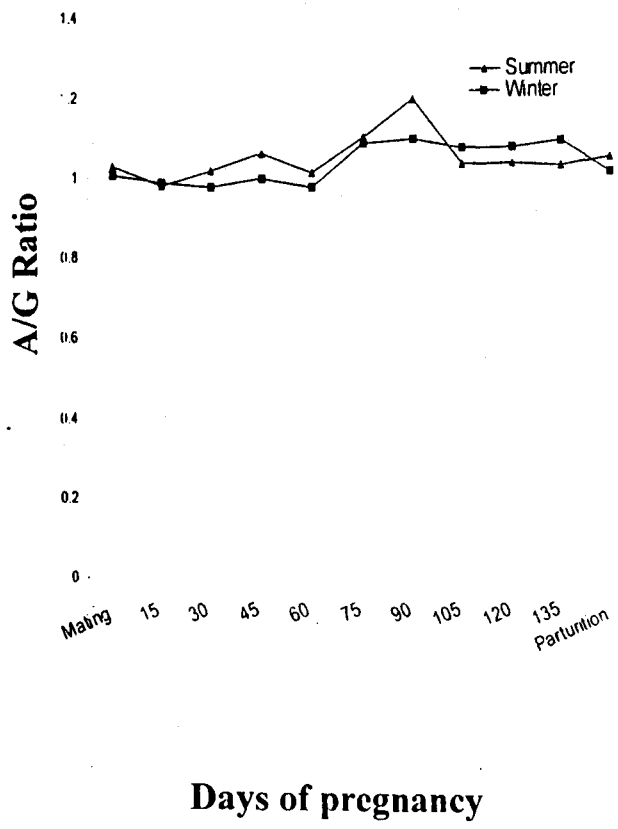


Figure (2B)Effect of mating season and pregnancy stages of globulin concentrations and A/G ratio.

reduction in the amino acids available for liver to synthesize albumin (El-Sharabassy 1990). Rowlands, et.al. (1980) and Fahmy, et.al. (2004) reported that in cows, fatty acids and bilirubin were the major factors in producing albuminaemia at calving. The decrease in blood globulin concentration during late of pregnancy has been attributed to transfer of immuno-globulin to colostrums (Williams and Millar 1979, Rowlands, et.al. 1980 and Gadhave, et.al. 2000).

Data obtained showed that A/G ratio took the same trend of fluctuation in both winter and summer mating groups (Figure 2). Albumin/globulin ratio was unchanged from mating till 60 days of pregnancy. Thereafter, an increase was noticed up to end of pregnancy. This result agrees with that found by Rajora and Pachauri (1994), Gadhave, et.al. (2000) and Badr, et.al. (2002) who showed that A/G ratio increased during late of pregnancy. While, disagree with that reported by El-Sayed (1986), Abd El-Bary (1990) and Ashour (1998). The decrease in A/G ratio during early pregnancy than in other stages was attributed to the higher globulin during this period (Abd El-bary 1990).

From this study it could be concluded that certain blood parameters such as insulin, glucose, cholesterol, total protein, albumin, globulin and A/G ratio can be measured and used as indication of the reproductive status of Barki sheep.

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الملخص العربى

تأثير موسم التلقيح ومراحل الحمل على هرمون الأنسولين وبعض مكونات الدم في النعاج البرقي .

عبدالله محمد عاشور و حسين محمد بدر وصلاح الدين إسماعيل محمد علي

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أجريت هذه الدراسة بمزرعة قسم الإنتاج الحيواني كلية الزراعة جامعة الأزهر بمدينة نصر ، استخدمت في هذه الدراسة ثلاثون نعجة برقي لدراسة تأثير موسم التلقيح ومدة الحمل على مستويات هرمون الانسولين والجلوكوز والكوليسترول والبروتين الكلي.

المتوسط الكلي لمستوى هرمون الأنسولين كان متساوي بين موسمي الصيف والشتاء ، لوحظ زيادة تدريجية في مستوى الأنسولين من بداية الحمل وباتجاه نهاية الحمل في كلا الموسمين . لم يلاحظ اختلافات معنوية في مستوى الجلوكوز بين موسمي الصيف والشتاء ، مستوى الجلوكوز كان ينقص تدريجياً من بداية الحمل وباتجاه نهاية الحمل في كلا الموسمين ، مستوى الكوليسترول كان منخفض على بداية الحمل في كلا الموسمين ثم بدأ في الزياة حتى اليوم الستون من الحمل، ثم بدأ في الانخفاض من اليوم الخامس والسبعون من الحمل وحتى نهاية الحمل في كلا الموسمين . مستوى البروتين الكلي والالبيومين والجلوبيولين كان متقارب في موسمي الصيف والشتاء لوحظ أن التركيز كان عالي على بداية الحمل ثم بدأ التركيز يقل باتجاه الولادة . نسبة الالبيومين إلى الجلوبيولين كانت منخفضة من يوم التلقيح وحتى اليوم الخامس عشر من الحمل ثم تستمر على ذلك حتى اليوم الخامس والسبعون من الحمل ثم تبدأ هذه النسبة في الزيادة باتجاه الولادة في كلا الموسمين. نستنتج من هذه الدراسة أن تقدير المكونات السابقة في الدم يمكن استخدامها في معرفة الحالة التناسلية في الأغنام البرقي.