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# Distribution of Some Genetic Loci During the Early Stage of Pregnancyin Some Egyptian Sheep Breeds

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**Abstract:** The main objective of this study was to investigate the most predominant genetic alleles of pre-albumin, albumin and transferrin loci during early pregnancy in some breeds of Egyptian sheep. Seventeen Barkiand fifteen Rahmany ewes were used. Ewes were clinically and ultrasonography examined. Blood samples were collected from ewes during the first month of gestation. Serum was biochemicallyanalyzed for blood protein polymorphism using poly-acrylamide gel electrophoresis and for progesterone level using ELIZAtechnique. The results revealed that the mostpredominate loci during pregnancy are: $Alb^{S}$(0.727) and $Tf^{A}$ (0.772) for Barkiewe and the $Alb^{S}$ (0.687), $Tf^{B}$ (0.772) for Rahmany ewes. On the other hand, $Pr^{D}$ allele showed a questionable result as it gave a dominance state in pregnant Barki ewes (0.636) and in non-pregnant Rahmany ewes (0.642). Progesterone levelwas significantly high in both breeds as compared with the non pregnant ewes and averaged 3.88±0.23l and 2.59± 0.93ng/ml, inpregnant Rahmany and Barki ewes, respectively. It was concluded that, there are a closely correlation between certain genetic alleles of some blood protein loci and pregnancy in Egyptian ewes.

**Key words:** Genetic Loci · Early Pregnancy · Egyptian Ewes · Barki · Rahmany

## INTRODUCTION

Reproduction in sheep had received much attention in Egypt owing to their high value as source of meat and wool. Increasing of reproductive efficiency of native breeds of sheep such as Barki and Rahmany needs some identifications of the characteristic changes of the reproductive cycle [1].

In sheep breeding, ewe productivity is the most important trait affecting profitability and genetic progress in this complex trait can lead to more efficient lamb production [2]. There are many established factors that may affect the reproductive performance of ewes in the term of breed, age, season, health condition, nutrition and genetic constitution.Moreover, it is important to study genes associated with fertility so that breeding can include genotypic information from animals. This will increase the genetic improvements in reproduction traits since it will be easier to collect data and information of the animal's traits. Focusing of development of fertility traits will have a long-term effect on profitability in the sheep production [3].

Using the immunogenetic methods specially blood protein polymorphism to evaluate and improve the reproductive efficiency in sheep were previously [4-9] studied.

The study of genes associated with fertility is important and has many applications both in the animal and human health sector, thus sheep can provide a genetic model for the study of fecundity genes and ovulation rate [10].

Although the reproduction of native breed of sheep is very reliable for meat and wool production, there is no enough attention for these breeds from genetic point of view. There for the objective of this current investigation was to determine of gene frequencies of 3 blood proteins: pre-albumin (Pr), albumin (Alb) and transferrin (Tf ) and study the possibility or correlation of these genetic alleles with progesterone level during the early stage of pregnancy in some local Egyptian sheep breeds.

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## MATERIALS AND METHODS

**Experimental Animals:** Seventeen Barki and fifteen Rahmany ewes raised in a private farm, located in Sharkia governorate, Egyptwere used in this study. The animals were apparently healthy, managed under routine condition and examined for detection of early pregnancy using Ultrasonography (Pia Medical Falcse` Saote, Netherlands).

**Blood Samples:** Blood samples were collected via vein puncture. Plasma was separatedand kept at -20°C until analyzed for plasma protein and progesterone level.

Analysis of blood protein was carried out using polyacrylamide gel electrophoresis [11].

Plasma progesterone levels were assayed using ELIZA micro wells technique, kits from Novotec, Germany and ELIZA reader (AnthosZenyth 200rt) [12]. The kit had a sensitivity of 0.002 ng/ml with the inter and intra- run precision coefficient of variation of 2.9 and 4.85, respectively.

**Gene Frequenciesand Equilibrium:**

- Gene frequencies was determined according to method of Hardi-Vainberg law [13].
- Genetic equilibrium $x^2$ was determined by the law: $x^2 = \Sigma (f-F)^2 / F$ where f = number of observed genotypes and F = number of expected genotypes.

**Statistical Analysis:** Data were analyzed statistically using analysis of variance ANOOVA according to Ropert and James [14].

## RESULTS

**Genotyping and Gene Frequencies of Studied Genetic Loci:** The distribution of serum protein genotypes and its gene frequencies is showed in Table 1. The results revealed that all studied loci were polymorphic and each of them is controlled bytwo autosomalalleles, $Alb^S$ and $Alb^F$ for albumin, $Pr^D$ and $Pr^F$ for pre-albumin and $Tf^A$ and $Tf^B$ for transferrin. The pregnant Barkiewes were distinguished by high frequency of $Alb^S$(0.727) and $Tf^A$ (0.772) while, the pregnant Rahmany ewes showed high frequency of $Alb^S$(0.687) and $Tf^B$(0. 772). Another interested result was revealed by $Pr^D$ which gave predominance state for pregnant Barki (0.636) as well as for non-pregnant Rahmany (0.642) ewes.

**Progesterone Level of Some Egyptian Ewes in Relation to Early Pregnancy:** As comparing with the non pregnant ewes, progesterone level (ng/ml) was significantly high and averaged 2.59±0.93 ($P < 0.05$) and 3.88±0.23 ($P < 0.01$) in pregnant Bark and Rahmany ewes, respectively.

## DISCUSSION

To increase economic returns from sheep, genetic improvement of ewe productivity traits is required; therefore, the selection objective should emphasize on these traits [15]. Furthermore, to design the effective selection programs for improving the efficiency of ewe production, the knowledge of genetic parameters for ewe traits and the genetic relationships among the traits are of significant importance. Therefore, estimates for genetic parameters, selection criterion, response to selection and construction of selection indexes are needed [16]. Previous studies have shown that reproductive traits are not only influenced by the genes of the individual and the environment in which it is raised, but also by the service sire and the maternal environment [10].

The percentage of Albumin content in blood ranged between 3.5-0.5 g/dl. The low molecular weight of albumin (66241M.W.) gives ability to pass faster than high molecular weight contents of serum proteins during electrophoresis. The polymorphism of serum albumin gives about 20 genotypes of albumin which controlled by 6 autosomal codominant alleles (D, F, S, T, V and W) [6, 9, 17-19].

In the present investigation the electrophoretic pattern of albumin locus gave two alleles $Alb^S$ and $Alb^F$ with superior dominant of allele SS, especially in case of pregnancy and the result agree with the finding of Hrinca [6], Henks *et al*. [20], Shahrbak *et al*. [21] and Zahrane *et al*. [22].

Transferrin is considered as fraction of β1-globulin and its level in plasma ranged between 200-300 Mg% or 10% of serum protein of sheep. The essential role of transferrin is the binding and carrying of $Fe^{+++}$ in the body also it plays a significant role as antibacterial effect, whereas, the molecular weight of transferrin in sheep averaged 77, 000 KD [23]. Electrophoresis of transferrin either with starch gel or polyacrylamide gel gives about 10-13 genotypes formed from different combinations of A, B, C, D, M and Ealleles [9: 24-26]. One of the most important characteristics of transferrin is the large variety of its genotypic constitution as well as, its multiple vital functions which made it one of the most important genetic markers for productive and reproductive traits [25].

Table 1: Some Genetic Markers during the Early Stage of Pregnancyin Ewe of some EgyptianBreeds of Sheep

| | | Albumin | | | | | Pre- Albumin | | | | | Transferrin | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Breed | Condition | SS | SF | FF | Frequency | $X^2$ | DD | DF | FF | Frequency | $X^2$ | AA | AB | BB | Frequency | $X^2$ |
| Barki | Non pregnant | 1*(1.04) | 3(2.9) | 2(2.04) | $Alb^S$ 0.416 $Alb^F$ 0.583 | VL | 2(2.04) | 3(2.9) | 1(1.04) | $Pr^D$ 0.583 $Pr^F$ 0.416 | VL | 2(2.6) | 4(2.6) | 00(0.7) | $Tf^A$0.666 $Tf^B$ 0.333 | VL |
| | Pregnant | 7 (5.8) | 2(4.3) | 2(0.8) | $Alb^S$0.727 $Alb^F$0.272 | 4.2 | 5(4.4) | 4(5.07) | 2(1.4) | $Pr^D$ 0.636 $Pr^F$ 0.363 | 0.056 | 7(6.5) | 3(3.85) | 1(0.56) | $Tf^A$ 0.772 $Tf^B$ 0.227 | 0.67 |
| Rahmany | Non pregnant | 1 (1.3) | 4(3.4) | 2(2.3) | $Alb^S$ 0.428 $Alb^F$ 0.571 | VL | 3(2.9) | 3(3.2) | 1(0.9) | $Pr^D$0.642$Pr^F$ 0.357 | 0.13 | 2(1.3) | 2(3.4) | 3(2.3) | $Tf^A$ 0.428$Tf^B$ 0.571 | 0.44 |
| | Pregnant | 5(3.7) | 1(3.4) | 2(0.7.8) | $Alb^S$ 0.687$Alb^F$ 0.312 | VL | 3(2.5) | 3(3.9) | 2(1.5) | $Pr^D$0.562$Pr^F$ 0.437 | 0.33 | 2( 0.44) | 1(2.8) | 5(4.7) | $Tf^A$ 0.227$Tf^B$ 0.772 | 2.7 |

* inbrackets theexpected theoretical No. of genotypesBarki n=17 ; Rahmany n= 15) VL very low

Table 2: Plasma Progesterone Levels during the Early Stage of Pregnancy in ewes of some EgyptianBreeds of Sheep

| | Progesterone (ng/ml) | |
|---|---|---|
| Breed | Non pregnant | Pregnant |
| Barki | 0.44±0.03 | 2.59±0.93* |
| Rahmany | 0.104±0.02 | 3.88±0.23 ** |

* P< 0.05 **P< 0.01

In the present study the transferrin locus gave three genotypes AA, AB and BB with predominance of $Tf^A$ (0.772) and $Tf^B$ (0.772) in pregnant Barki and Rahmany ewes, respectively and the condition is agreed with the results of Kemiec [27] for Polish species, Akinyeni and Salako [26] for Nigerian species and Yadav *etal.* [28] for Indian species.

The correlation between $Tf^A$ and $Tf^B$ and fertility in sheep was in line with those results obtained by Hrinca *et al*. [6] who suggested that the Karakul species with Tf AC and BC genotypes characterized by high fertility rats in case of heterozygote genotypes due to the presence of allele A and B, but not to homozygotic genotypes (CC) because this genotype characterized by superior dominance in fertility of Karakul sheep.

The relationship between blood and steroid hormones based on the fact that biological activity of the steroid hormones is greatly affected by plasma concentration of binding protein receptors. Ovarian steroid hormone stimulates RNA and protein synthesis lead to concept that these hormones acting at the gene level through a receptor-mediate mechanism [29]. In the present study it was observed that the $Tf^{BB}$ was associated with decrease in the progesterone level (0.08±0.04ng/ml). Concerning progesterone concentration during pregnancy in Rahmanysheep, our results were similar with the finding of Omar and Salama [30].

It was concluded that, there are a closely correlation between certain genetic alleles of some blood protein loci and pregnancy in Egyptian ewes. This result can be used as a tool for monitoring reproductive efficiency of sheep.

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