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The relationship between Leptin gene and milk production and its components in Awassi sheep

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Abstract

The study was conducted at the sheep and goat research station, at Al-Shatrah District, Thi-Qar Agriculture Directorate, Thi-Qar Governorate, from 1/11/2021 to 30/6/2022 for one production season. A total of 100 animals were used, consisting of 50 parents and 50 lambs, males and females, the ages of the ewes ranged from 3 to 5 years old. The sheep data used in the experiment were collected from the station records. The genetic part was also completed in the Marshes Research Laboratory at the University of Thi-Qar. The study aimed at the relationship between Leptin gene and milk production and its components.

There were significant differences ($P \leq 0.05$) between the animals of CC, CT and TT genotypes, resulting from mutation at site 119 of the studied segment of the Leptin gene, on total milk production and daily milk production, where animals with TT genotype outperformed animals with CT and CC genotype, there were no significant differences on milk production and daily milk production between CC and CT genotype, also between the CT and TT genotypes. The results of total milk production were as follows: 32.71, 34.29 and 36.51 liters, for daily milk production: 363.47, 381.00 and 405.71 liters, for CC, CT, and TT genotypes, respectively.

Key words: Leptin gen, milk production and its components, Awassi sheep.

Introduction

The production of milk in sheep is one of the important economic characteristics, because of its nutritional importance and its use in various industries, the growth of lambs depends mainly on milk production (Al-Rawi et al., 2002). Estimating the amount of milk produced by ewes, it provides sufficient information to implement optimal management and feeding strategies for ewes and lambs (Abd Allah et al., 2011).

Several studies have been conducted to determine the amount of milk produced for local sheep, the amount of milk produced varies between breeds and between individuals within the same breed and

according to the geographical location, this variation in milk productivity is due to both genetic and non-genetic factors (Cerdotes et al., 2004).

Milk is a very important quantitative trait, because of the commercial interest in milk and its importance to human food, it is also used in many industries, as well as being a food for the growth of newborns in their early stages of life, who depend on milk produced from their mothers (Al-Rawi, 2006).

The quality of milk production is a quantitative trait that is influenced by many factors, including what is hereditary, such as the breed of the animal and the genes it carries, some of them were non-genetic, such as the sex of the newborn, age, production season, health status, production period and other factors in addition to the external environment and its effects (Rashidi et al., 2008; Yavarifard et al., 2015). The biological value of milk components (fat, protein, lactose, vitamins and minerals) and their importance in neonatal nutrition and neonatal weight gain (Afolayan et al., 2009).

Recently, there has been much interest in the hormone and leptin gene as a key to biological control, which were related to important traits in animal husbandry, such as feed intake, meat fat content, and meat quality (Geary et al. 2003). The polymorphism of this gene is evidence of the relative differences between individuals for traits, the markers for this gene have become part of plans for commercial genotyping, to design the so-called Marker Assisted Selection, in many types of agricultural animals (Schenkel, 2005; Nkrumah, 2005).

The Leptin gene was selected in this study, because he explained his participation in the regulation of appetite, metabolism, growth and the characteristics of sacrifices, previous studies have demonstrated its effect on gene expression at the levels of translation or transcription, the sum of this effect is significantly affected by the economic characteristics of the animal (Chilliard, 2005).

The current study aims to show the relationship between the leptin gene on the one hand and milk production and its components on the other hand for Awassi sheep.

Materials and Methods

The study was conducted at the sheep and goat research station, at Al-Shatrah District, Thi-Qar Agriculture Directorate, Thi-Qar Governorate, from 1/11/2021 to 30/6/2022 for one production season. A total of 100 animals were used, consisting of 50 parents and 50 lambs, males and females, the ages of the ewes ranged from 3 to 5 years old. The sheep data used in the experiment were collected from the station records. The genetic part was also

completed in the Marshes Research Laboratory at the University of Thi-Qar. The study aimed at the relationship between Leptin gene and milk production and its components.

The milk production rate was measured based on the daily production rate and throughout the production period, where the total quantity was divided by the number of days, and according to the following equation:

TMY= (T1-T0)M1 +∑(Tr-Tr-1)(Mr+Mr-1)\2

Milk samples were collected during the morning milking, the milk sample was taken after mixing the milk produced from the sheep well, for the sample to be homogeneous with an amount of about 50 ml, transferred directly to the Graduate Studies Laboratory, Agriculture College, Al-Muthanna University. The samples were preserved and not exposed to sunlight or high temperatures, then calculated the components of the milk from fat, protein and lactose every two weeks, from the second week until the end of the production season, using the Dutch-origin EKO Milk Laboratory Milk Analyzer.

The measurement of leptin hormone concentration was based on the method described in the measurement kit manufactured by the Korean Bioassay Company, absorption was measured using Elisa Blood at a wavelength of 450 + 10 nm.

Measurement method

1. Prepare samples at room temperature before adding reagents.
2. Add 50 µl of the standard solution to the 2 mL tube.
3. Then add 25 microliters of the sample with the standard solutions of the test kit to the tube.
4. Add 50 µl of streptavidin HRP
5. Then cover the samples at a temperature of 37 for 60 minutes
6. Then add 50 µl of substrate A .
7. After that the samples are washed 5 times with Wash Bufffer Concentrate and after the washing process the samples are incubated for 1 hour at a temperature of 37
8. The device is set to a wavelength of 450 and the samples or optical density (OD values) were read for each sample.

The data were statistically analyzed using the SAS program (2012), significant differences between means were compared using the Duncan (1955) multiple range test, by applying the Least square means method.

Results and discussion

The study showed in Table (1) that there were significant differences ($P \leq 0.05$) on the percentage of milk fat among the genotypes, resulting from mutation at site 119 of the studied segment of the leptin gene. The TT genotype outperformed both

CC and CT, as the percentage of fat was 4.12, 3.65, and 3.64, respectively. There were no significant differences between animals carrying the genotypes, resulting from the aforementioned mutation with milk sugar. The results confirmed that there were significant differences (P≤0.05) in the protein content, the TT genotype was superior to the CC genotype, also, there were no significant differences between the TT and CT genotypes and the CT and CC genotypes, the results were 6.45, 6.64 and 6.73. The results also showed significant differences (P≤0.05) in the non-fatty solids, the TT genotype was superior to the CC genotype, also, there were no significant differences between the TT and CT genotypes and the CT and CC genotypes, the results were 11.96, 12.27 and 12.37 for CC, CT and TT genotypes, respectively. In a study on three types of goats (Sokoto Red, Sahel Goat and West African Dwarf), found differences in milk components according to the season, where the proportions in fat were 4.49 and 5.04% and protein 3.52 and 3.53%, as for lactose, it was 4.25 and 4.85%, as well as the non-fat solids, they were 11.58 and 11.68%, respectively (Addass et al., 2013).

Table (1) The relationship between the genotypes of the studied segment of the leptin gene on the components of milk.

Genotypes	**Animal number**	**Fat (%)**	**Lactose (%)**	**Protein (%)**	**non-fat solids (%)**
CC	**23**	3.64±0.14 B	4.64±0.01	6.45±0.05 B	11.96±0.10 B
CT	**19**	3.65±0.08 B	4.64±0.01	6.64±0.08 AB	12.27±0.10 AB
TT	**8**	4.12±0.10 A	4.65±0.01	6.73±0.03 A	12.37±0.06 A
Sig.		**0.05**	**N.S**	**0.05**	**0.05**

The results of Table (2) showed that there were significant differences (P≤0.05) between animals carrying CC, CT and TT genotypes, resulted from mutation at site 119 of the studied segment of the leptin gene in the rate of total milk production

and daily milk production, where animals with TT genotype outperformed animals with CT and CC genotypes, there were no significant differences in the rate of milk production and daily milk production between CC and CT genotypes, also, there were no significant differences between CT and TT genotypes.

The results for the total milk production rate were as follows: 32.71, 34.29 and 36.51, for daily milk production: 363.47, 381.00 and 405.71 for CC, CT and TT genotypes, respectively. The study also showed that there was no significant effect of the heat tolerance coefficient on the CC, CT and TT genotypes, the results were 88.73, 124.43 and 89.71, respectively. Several previous studies confirmed the existence of variation in milk production, Abd-Allah et al. (2011) found highly significant differences at the level (P≤0.01) on the amount of milk produced between Chios and Rahmani sheep, where the average daily production was 561.6 and 868.8 g, respectively, challenged our study (Al-Nouri *et al*., 2014), the effect of the gender of the newborn was observed in a study on Turkish Awassi sheep. The milk production was found to be 0.657 and 0.588 kg/day for ewes with male and female births, respectively. The percentage of protein was 5.10 and 5.16%, and the percentage of fat was 5.33 and 5.24%. The percentage of lactose was 5.67 and 5.58% for males and females, respectively.

Table (2) A relationship between Polymorphism of the studied segment of the leptin gene in the rate of milk production, the age of the mother and the heat tolerance coefficient.

Polymorphism	**Animal number**	**Mother age**	**Newborn gender**	**Total milk production**	**Daily milk production**	**Heat tolerance**
CC	**23**	4.26± 0.16 A	1.65±0.10	32.71±0.16 B	363.47±5.72 B	88.73±1.28
CT	**19**	4.05±0.15 A	1.40±0.11	34.29±0.68 AB	381.00±7.58 AB	124.43±39.70
TT	**8**	3.42±0.20 B	1.42±0.20	36.51±1.32 A	405.71±14.77 A	89.71±2.31
Sig.	**50**	0.05	0.05	0.05	0.05	N.S

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