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Exposure amongst Veterinarians, Para-Veterinarians and Animal

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Description

Goats are considered as one of the most efficient ruminant species that adapt to both tropical and desert environments (Metawi 2011; Kaliber et al., 2016). In addition, they are less expensive and easier to keep than other livestock in developing countries, where space and capital are limited (Khalil et al., 2013). Moreover, they present a significant economic interest in many countries (Selvaggi et al., 2014; Chen et al., 2019), where its milk is desirable for many people around the world due to its richness in various nutrients, as well as, it is relatively often used as an alternative to cow milk because of its ease in digestibility and low allergenicity (Clark and Mora Garcia, 2017). Milk production traits have fundamental importance in livestock production and the related economy (Erhardtet al., 2010 and An et al., 2012).

Milk and Blood Samples

Milk fatty acids play an essential role in cheese making and its quality, it has been found that milk fat includes about 98% triglycerides (TGs) (Mansson, 2008). The final and the only committed step in the biosynthesis of Triglycerides (TGs) are catalyzed by Diacylglycerol acyltransferase (DGAT) enzymes (DGAT1 and DGAT2) as reported byCases et al. (2001). Acyl CoA: diacylglycerol acyltransferase (DGAT1) gene was reported as a production-associated gene in several animals including buffalo, sheep and goat (Mansson, 2008). DGAT1 gene is expressed in nearly all tissues, including the mammary glands (Khan et al., 2021) and acts as a catalyst to triacylglycerol synthesis, which has an essential role in milk fat metabolism (Mohamed, 2016). Increasing productive performance through genetic selection is a common goal for many animal breeding programs worldwide (Meredith et al., 2012, Narayana et al., 2017 and Heimes et al., 2019). In order to improve productivity, animals with better quality traits such as milk production, growth, meat, and carcass quality have been selected and used in the breeding program in the animal industry. Selection aimed to increasing the frequency of alleles with a positive effect on a given trait initiated by geneticists (Dekkers, 2004). In goats, the DGAT1 gene (Gene ID: 100861225) is located on chromosome 14 with 18 exons (Khan et al., 2021). Several studies reported single nucleotide polymorphisms (SNPs) in the goat DGAT1 gene; An et al. (2012) detected different points of mutation were (ins. C) at 407-408 in intron 14, C6852T and C6798T at exon 7, where those SNPs showed a significant effect on fat percentage and milk yield. Consistently, Martin et al. (2017) observed two SNPs R251L and R396W in DGAT1 in Saanen and Alpine goat. They reported that the two types of mutation lead to substitution in the protein sequence and were associated with a decrease in milk fat but this association was not strongly significant.

Sequence Analysis and SNP Detection

Sequence analysis showed three SNPs in the studied samples. The first one from cytosine (C) to thymine (T) at position 12 which give only one genotype C1T1, the second from C to T at position 84 which give C2T2 genotype only and the last mutation was from guanine (G) to adenine (A) at 219 gives one AG genotype. According to those SNPs, animals were divided into three groups. Moreover, Yang et al. (2011) recorded three genotypes TT, CC, and CT in four Chinese sheep breeds and a SNP (C→ T) in exon 17 of the DGAT1 gene, which is synonymous mutation as it didn't cause any substitution in amino acids. Similarly, Tabaran et al. (2014) observed three genotypes CC, TT, and CT in Turcana goat breed. Meanwhile, different polymorphisms were reported by Evrigh et al. (2018) at exon 17 were T110G, C111G, A129C, and A151T in Iranian Khalkhali goat. On the other hand, Eidet al. (2020) observed two mutations (T703C and T713C) at the same region of DGAT1 in Zaraibi goats.

Moreover, four polymorphisms (T21153G, C21154G, A21172C, and A21194T) were identified in the Iranian Khalkhali goat. The variants T21153G and C21154G caused the transformation of serine to glycine amino acids, while A21172C was associated with the change in aspartic acid to alanine amino acid (Evrigh et al., 2018). Oppositely, Ozmen and Kul (2014) detected T to C mutation in intron 16 of goat DGAT1 locus with no significant effect for TT and TC genotypes on milk yield, fat and lactose. In addition, Tabaran et al. (2014) reported no significant differences in milk fat percent among three genotypes CC, TT, and CT genotypes which were observed in the exon 17 of DGAT1 genes of the Turcana goat breed. In Egypt, Zaraibi goats are considered the most famous native breed due to their productive and reproductive capabilities. It produces milk fat content ranged 2.6- 3.9% during 210 days lactation periods (Teleb et al., 2016). Identifying and validating genetic markers for milk production traits in Zaraibi goats are the initial and crucial steps to establish a marker assisted selection system (MAS). Eidet al. (2020) detected two important mutations (T703C and T713C) at DGAT1 in Zaraibi goats. They found that polymorphism T713C at the coding region was associated with the substitution of amino acid isoleucine to threonine, which significantly regulated the milk total solid and milk yield. This work is a complementary to previous study on DGAT1 gene polymorphism in Zaraibi goats (Eid et al., 2020). Using different samples, this study aims to investigate new SNPs in DGAT1 gene and their association with milk quality.