VARIATION OF CALPAIN GENOTYPES IN TURKISH GREY STEPPE AND ANATOLIAN BLACK BULLS

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ABSTRACT

Calpain 1 (*CAPN1*) gene is known as the micromolar calcium-activated neutral protease gene and it degrades calcium-dependent cysteine protease, μ-calpain, which reduces myofibrillar proteins in postmortem conditions. This gene has important effects on muscle metabolism and development. The bovine *CAPN1* gene is located at the telomeric end of chromosome 29. This genomic region includes a considerable overlap of QTLs regulating not only beef tenderness but also various growth traits, weaning weight, carcass characteristics, and feed efficiency. Cytosine/guanine (C/G) alteration at the nucleotide position 947 in exon 9 of the *CAPN1* gene is defined as one of the most important genetic markers in the mechanism of postmortem tenderness. Although this gene has been widely studied among various cattle breeds, there is limited information on Turkish native cattle. Therefore, the present study aimed at determining the genetic variability of the *CAPN1* in some Turkish native cattle breeds. In this respect, 99 Turkish Grey Steppe and 41 Anatolian Black bulls were genotyped by the PCR-RFLP. Genomic DNA was extracted by the phenol-chloroform method. PCR-RFLP was performed using appropriate primer sequences, PCR conditions, restriction enzyme, and incubation processes. The digestion products were electrophoresed and visualized by a gel imaging system. The genotypic and allelic frequencies were calculated using standard procedures. The Hardy-Weinberg equilibrium (HWE) was tested by Fisher's exact test. The population genetic parameters including gene heterozygosity (He), the polymorphism information content (PIC), the effective allele numbers (Ne), and the fixation index (FIS) were evaluated based on allelic frequencies. Moreover, the Shannon-Weaver diversity index (H) was calculated. Results revealed that the GG genotype was remarkably predominant in both native breeds. On the other hand, it was observed that the CC genotype was absent resulting in notably low C allele frequency (0.13 and 0.12 in Turkish Grey Steppe and Anatolian Black, respectively). The exact test showed a deviation from HWE for both breed-specific and total cattle population evaluation. Population genetics assessment provides substantial clues about population structure defined by genetic variation in a particular gene or genes. Population parameters indicated low genetic variabilities in the studied breeds. In this context, He, PIC, and Ne were found to be 0.2262, 0.2006, and 1.2923, respectively in Turkish Grey Steppe cattle. Concerning Anatolian Blacks, He, PIC, and Ne values were 0.2112, 1889, and 1.2677. Consistent with these results, FIS and H indexes revealed a low genetic diversity. Taken together, the *CAPN1* marker showed low informativeness in Turkish Grey Steppe and Anatolian Black cattle. The same interpretation applies to the entire cattle population (n= 140). In recent years, although projects and studies on the genetics of native cattle breeds have been carried out in Turkey, these studies have not been sustained consistently. It is important to note that these native animal breeds are one of the basic constituents of biodiversity in Turkey. They are local gene resources that should be protected at the national and international levels. On the other hand, native breeds exhibit high adaptability for surviving under challenging environmental conditions and low-quality feed opportunities. Molecular genetic studies on native breeds should be encouraged to reveal broader perspectives regarding significant biological processes and to achieve a better understanding of complex traits such as growth, muscle development, and feed efficiency.

Keywords: Turkish Grey Steppe cattle, Anatolian Black cattle, CAPN1, single nucleotide polymorphism, population genetics