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“Bridging the gap between increasing knowledge and decreasing resources”

## Milk Protein Genetic Variation in Butana Cattle and Characterisation of a New $\alpha$ -Lactalbumin Gene Variant

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### Abstract

Butana, a dairy cattle breed of Sudan, has been gradually declining in numbers over the last years due to the breed substitution, and indiscriminate crossbreeding. Breeding and conservation strategies for this breed should be based on a combination of genetic and phenotypic characteristics. Therefore, milk protein genetic variants are of interest for breeding in terms of milk yield and composition. The present study aimed at assessing allelic variations of milk protein genes that are characteristic for Butana cattle.

Five Butana cattle were sequenced for all exons and flanking intronic sequences of the bovine milk protein genes CSN1S1, CSN2, CSN1S2, CSN3, LALBA and LGB. The obtained sequences were compared with the *Bos taurus* reference sequence for cattle at Ensembl (*Bos taurus*:UMD3.1.69). 50 unrelated individuals were genotyped to determine allele frequency of identified non-synonymous SNPs.

We identified 98 SNPs in Butana cattle compared to the reference sequence at Ensembl: nine non-synonymous, seven synonymous, four 5' UTR, 14 3' UTR and 64 intronic SNPs. Fifty-eight SNPs were novel. Among them a non-synonymous SNP (BTA5:31348386G<sub>A</sub>) was identified in exon 2 of *LALBA* causing the amino acid substitution Ile60Val in the protein. According to the alphabetical order of already described variants, the corresponding protein variant was named *LALBA\*E*. The most frequent allele encoded the *LALBA\*B* protein variant (0.46). For the other genes, the most frequent variants encoded the proteins *LGB\*A* (0.88), *CSN3\*B* (0.74), *CSN1S1\*C* (0.66) and *CSN1S2\*A* (0.61). The Sudanese Butana cattle are highly polymorphic in the milk protein genes. High genetic variability for milk proteins provides a resource for breeding, utilisation and conservation of the local breeds.

**Keywords:** *Bos indicus*, Butana cattle, genetic variants, milk protein genes