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Genomic Loci Affecting Somatic Cell Score in a Butana × Holstein Crossbreed Population in Sudan

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Abstract

Butana is an indigenous *Bos indicus* dairy cattle breed in Sudan, which is well adapted to extreme environmental conditions such as low feed intake, low water requirements, high temperature, and tropical diseases and parasites. Most dairy breeding programs aim at the improvement of milk production by selection, which consequently led to decreased udder health and increased genetic susceptibility to mastitis, a frequent and costly udder disease. Thus, genetic selection for mastitis resistance should be considered to maintain healthy and productive cows. As the somatic cell count in milk is increased when cows have mastitis, the somatic cell score (SCS) is frequently used as an indicator trait for mastitis.

Previously, 10 SNPs have been identified to be associated with SCS in German Holstein. In this study, we tested those SNPs in 109 purebred Butana and in 203 Butana × Holstein crossbreed cattle in Sudan. Allele-specific genotyping was performed using KASP assays. Association analysis was performed using linear mixed model implemented in R programming language.

We found that 1 out of the 10 previously reported SNPs was significantly associated with SCS in the Butana × Holstein crossbreed population ($p = 0.0054$). This SNP is located on chromosome X (at position 30341984 bp). Two additional SNPs located on chromosomes 6 and 19 show almost suggestive association with SCS in the same population ($p = 0.1557$ and 0.1423). No association was found between the 10 SNPs and SCS in purebred Butana cattle.

The marker associated with SCS on the X chromosome can be used for genetic improvement of mastitis resistance in Butana × Holstein crossbreed cattle, which are increasingly used in Sudan. The markers on chromosomes 6 and 19 have to be followed up in a bigger population. The genetic improvement of mastitis resistance and selection for lower SCS is consistent with the goal of maximising genetic improvement for total economic merit and should be included in breeding programs.

Keywords: Association analysis, *Bos indicus*, genotyping, mastitis, SNPs