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## ***DGAT1* Affects Milk Yield in Sudanese Butana × Holstein Crossbred Cattle**

SALMA ELZAKI<sup>1,2</sup>, PAULA KORKUC<sup>2</sup>, DANNY ARENDS<sup>2</sup>, GUDRUN A. BROCKMANN<sup>2</sup>

<sup>1</sup>*University of Khartoum, Dept. of Animal Genetics and Breeding, Sudan*

<sup>2</sup>*Humboldt-Universität zu Berlin, Albrecht Daniel Thaer-Institute for Agricultural and Horticultural Sciences, Germany*

### **Abstract**

In Sudan, the *Bos indicus* zebu cattle Butana is known for its good milk yield and adaptation to extreme environmental conditions. For higher milk yield, Butana cattle have been crossed with Holstein Friesian cattle, resulting in a crossbreed as robust as Butana. The genetic selection for higher milk yield using the well-described K232A polymorphism in *DGAT1* in Sudanese breeds would be helpful to meet the increasing demand for milk and dairy products in Sudan. As previously reported, the protein variant with lysine (K) of the K232A polymorphism was associated with an increase in fat and protein content and a decrease in protein and milk yields. In this study, we investigated the K232A polymorphism of *DGAT1* using the marker rs109234250 (14:611,019 G/A) in 93 purebred Butana and in 203 Butana × Holstein crossbred cattle from Sudan. The allele G corresponds to the protein variant with lysine (K). Allele-specific genotyping was performed using KASP assays. Association analysis with milk production traits and somatic cell score was performed using linear mixed models in R. In purebred Butana cattle, the allele G of the investigated *DGAT1* marker corresponding to the protein variant with K was much higher with a frequency of 0.929. In Butana × Holstein crossbred cattle, allele G had a frequency of 0.394, and significant associations were found with milk yield ( $P=7.6 \times 10^{-20}$ ), fat yield ( $P=2.2 \times 10^{-17}$ ), protein yield ( $P=2.0 \times 10^{-19}$ ), and lactose yield ( $P=4.0 \times 10^{-18}$ ). However, the correlation between these associated traits was high ( $r \geq 0.892$ ). The minor allele G was disadvantageous for the associated traits. No significant associations were found for fat, protein, and lactose content, and somatic cell score. The outcome of this study could explain the higher milk fat content and lower milk yield of Butana cattle, as they had a high frequency for the allele G of the investigated *DGAT1* marker corresponding to these properties. In Butana × Holstein crossbred cattle, we confirmed previously reported effects of this polymorphism on milk and protein yield. Our results could be used for effective selection and thus genetic improvement of milk traits in Butana × Holstein crossbred cattle, which might be helpful in future breeding plans.

**Keywords:** Association analysis, *bos indicus*, *DGAT1* gene, genotyping, milk traits