Genomic study and Medical Subject Headings enrichment analysis of early pregnancy rate and antral follicle numbers in Nelore heifers

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Zebu animals (Bos indicus) are known to take longer to reach puberty compared with taurine animals (Bos taurus), limiting the supply of animals for harvest or breeding and impacting profitability. Genomic information can be a helpful tool to better understand complex traits and improve genetic gains. In this study, we performed a genomewide association study (GWAS) to identify genetic variants associated with reproductive traits in Nelore beef cattle. Heifer pregnancy (HP) was recorded for 1,267 genotyped animals distributed in 12 contemporary groups (CG) with an average pregnancy rate of 0.35 (+/- 0.01). Disregarding one of these CG, the number of antral follicles (NF) was also collected for 937 of these animals, with an average of 11.53 (+/- 4.43). The animals were organized in CG: 12 and 11 for HP and NF, respectively. Genes in linkage disequilibrium (LD) with the associated variants can be considered in a functional enrichment analysis to identify biological mechanisms involved in fertility. Medical Subject Headings (MeSH) were detected using the MESHR package, allowing the extraction of broad meanings from the gene lists provided by the GWAS. The estimated heritability for HP was 0.28 +/- 0.07 and for NF was 0.49 +/- 0.09, with the genomic correlation being -0.21 +/- 0.29. The average LD between adjacent markers was 0.23 +/- 0.01, and GWAS identified genomic windows that accounted for > 1% of total genetic variance on chromosomes 5, 14, and 18 for HP and on chromosomes 2, 8, 11, 14, 15, 16, and 22 for NF. The MeSH enrichment analyses revealed significant (P <0.05) terms associated with HP-“Munc18 Proteins,” “Fucose,” and “Hemoglobins”-and with NF-“Cathepsin B,” “Receptors, Neuropeptide,” and “Palmitic Acid.” This is the first study in Nelore cattle introducing the concept of MeSH analysis. The genomic analyses contributed to a better understanding of the genetic control of the reproductive traits HP and NF and provide new selection strategies to improve beef production.

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