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Mutations in cytochrome B gene effects female reproduction of Ghungroo pig

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Abstract:

Cytochrome B is an important polypeptide of the mitochondria helpful in energy metabolism through oxidative phosphorylation. Cytochrome B plays an immense role in the reproduction of animals and due to its mutation prone nature, it can affect the basic physiology of animals. Cytochrome B affects reproductive system in males and equally plays an important role in transferring and providing energy in the development of the embryo, zygote, and oocytes precisely in females. The present study was conducted on Ghungroo pig to study their molecular and reproductive traits and the effect of the cytochrome B gene in the female reproduction of the Ghungroo pig. Although studies are available for cytochrome B gene analysis for evolutionary studies through phylogenetic analysis. This is the first report for the study of Cytochrome B gene on reproduction in pigs. Cytochrome B gene was sequenced and seven SNPs were observed out of which three were non-synonymous. INDEL mutation was detected in Variant B which had lead to Frame Shift mutation resulting in a stop codon AGA. The effect in the reproductive traits of the sow was studied due to the occurrence of nucleotide substitution. Bioinformatics analysis (I-mutant, PROVEAN, and SIFT) had revealed that the mutations were deleterious for the mutant type. Mutation leading to alterations in post-translational modification sites as phosphorylation site, leucine-rich nuclear export signal, occurrence of transmembrane helices, arginine and lysine peptide cleavage site for the mutant variant had resulted in a reduced physiological response. 3 D protein structure, (predicted through bioinformatics analysis) for cytochrome B has revealed distinct structural differences in mutated form with truncated protein by RMSD analysis through TM-Align software. Associated studies of genotype variants with reproductive traits have revealed the significant effect of variants of cytochrome B gene on reproductive traits namely litter size at first, second and third furrowing, piglet mortality, age at first furrowing and furrowing interval. Mitochondrial gene as Cytochrome B variants might be used as a marker for studying female reproduction of Ghungroo sow in future.

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