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Genomic Mutations and Proton Pumping Efficiency of Bacteriorhodopsin in *Haloarcula sp.* TMR2 isolated from the Indian Hypersaline Environment

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Bacteriorhodopisn(BR), a light- driven proton pump widely distributed among halophilic archaea, has attracted significant interest for its unique photo physical and bioelectronics properties. In this present study, we performed whole genome sequencing of *Haloarcula* sp (TMR2) isolate, followed by mutational analysis of its bacteriorhodopisn (*bop*) gene. This particular strain was isolated from the Tuticorin salt pan, Tamil Nadu, India, and reporting first time from the Indian environment. Comparative mutational analysis of the BOP gene revealed site specific mutation, and further highlighted conserved motifs essential for the protein expression. Photocurrent activity of isolated strain was analyzed and proton pumping response was recorded. These findings not only expand the genomic and evolutionary understanding of BR in extremophiles but also underline its potential as a biosensor for detection of antigen-antibody interactions.

Keywords: Bacteriorhodopisn, *Haloarcula* sp, Mutation, Proton pump, Photo current activity

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