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Systems biology approaches for understanding adaptive responses of a tropical fish *Channa striatus* to high temperature stress

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Abiotic stress can lead to changes in development, productivity and severity of stress may even pose a threat towards survivability of the species. Certain abiotic stresses even trigger alterations in genetic sequences leading to genomic plasticity in the species eventually affecting the growth, metabolism and physiology at the cellular level. For any biological sample study, high- throughput "omics" technologies have an added advantage in investigating systematically at DNA-RNA and protein level for such a complex process. Among some of the profound abiotic stresses, atmospheric temperature considered to be one of the major environmental stress encountered by organisms in tropical and sub-tropical regions. *Channa striatus*, being a tropical fish species is also subjected to adaptive responses upon exposure to constant heat stress. In view of this, the present study was carried out to investigate changes in genomic, proteomic and metabolic profiles due to thermal mediated adaptation in lower vertebrates such as *Channa striatus*. The experimental analyses were conducted with the fish species, *Channa striatus* collected from the runoff water of a hot spring located at Atri, Odisha (20o09'N 85o 18'E) as well as long term (30 days) laboratory exposed (36oC) fishes. The amino acid analyses of liver tissues in the *Channa striatus* from hot spring runoff revealed a skewed ratio of essential to non-essential amino acids in contrast to its counterpart collected from ponds as control ones. Hot spring runoff thermo tolerant fish showed significant increase in the level of histidine and glycine and decrease in arginine, cysteine, isoleucine and lysine ($p<0.05$) in comparison to the control ones. Similarly in the transcriptomic study, hsp gene expression analyses of liver tissues suggests an increasing trend in the transcript levels of hsp 70, 78 and 60 for both natural hot spring as well as long term laboratory exposed fishes. Furthermore, upon examination of liver tissue protein profiles by 1-D immunoblot analyses in comparison to the control ones confirmed that Hsp70 and Hsp90 protein bands were increased in both 30 days thermally exposed and hot spring runofffishes. Hsp60 protein expression level found to be high for both 30 days thermally (at 36°C) exposed and hot spring runoff natural fish samples. Efficacy of six selected suitable reference genes such as 18s rRNA, GD3PD, beta actin, ribosomal binding protein L13, tubulin, tata box binding protein were analyzed both for 30 days thermally (at 36°C) exposed and hot spring runoff natural fish samples w.r.tontrol ones and from those tubulin found to be the most suitable reference gene for gene expression analyses. The acquired thermo tolerance mechanisms operating in these lower vertebrates living in such stressful environment might provide the insights to develop mitigation strategies to cope with the climate extremes especially the high-temperature stress and global warming.

Biography

Gopal Krishna Purohit has completed his Msc in Biotechnology from Berhampur University and continuing his PhD degree from KIIT University. He is the Senior Research Fellow of KIIT School of biotechnology.

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