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Quantitative gene and environment interactions in freshwater Prawns, *macrobrachium rosenbergii* from laboratory to farm management

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In this study, the effect of water temperature and environmental factors on immune gene expression in the freshwater prawn (*Macrobrachium rosenbergii*) were measured by fifteen critical immune genes. The gene was chosen and designed according to our previous study on *M.rosenbergii* transcriptome data and proteome. Laboratory test on the effect of different temperature exposed to the freshwater prawns was applied to the natural environment of the freshwater prawn farm. Two different farms according to the standard and non-standard management and equipment practice were chosen for sampling. Collection of samples were arranged at different time period of the day in different water temperatures from 24°C up to 32°C. The gene-environment interaction of freshwater prawn immune system against thermal shock and management systems was studied by applying differential gene expression profiling (Fluidigm Biomark HD) in three different organs which are serum, hepatopancreas and muscle. The result confirmed that increasing water temperature has a direct effect on freshwater prawn immune responses. In addition, the effect of the different water temperature on gene expression in the serum, hepatopancreas and muscle of freshwater prawn was also investigated by differential gene expression analysis. A comparison of the gene expression data of the three groups showed immune pathways coding genes to be significantly down-regulated and metabolite coding genes significantly up-regulated in comparison to temperature increment. Our study discovered new gene involvement in lectin pathway which is Tachylectin as a new potential candidate gene for the development of environmental stress markers in the freshwater prawn. This study also provided valuable information on the differential expression of giant fresh water prawn immune pathway following environmental stress that will help to improve understanding of gene-environment interactions in this species by using 15 genes that have been designed from transcriptome data obtained in previous study. Furthermore, farm environmental study provided a valuable information on the effect of the soil and water content, prawn feed and farm management strategies on freshwater prawn immune gene improvement and farm yield.

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