学位論文内容の要旨

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学 位 論 文 題 目

Studies on the early physiological responses governing heat stress-inducible gene expression in the red alga *Neopyropia yezoensis*

（スサビノリの高温ストレス誘導性遺伝子発現を司る初期生理応答の研究）

Heat stress responses are complex regulatory processes, including sensing, signal transduction, and gene expression. However, the exact mechanisms of these processes in seaweeds are not well known. We explored the relationship between membrane physical states and gene expression in the red alga *Neopyropia yezoensis*. To analyze heat stress-induced gene expression, we identified two homologs of the heat-inducible *high temperature response 2* (*HTR2*) gene in *Neopyropia seriata*, named *NyHTR2* and *NyHTR2L*. We found conservation of *HTR2* homologs only within the order Bangiales; their products contained a novel conserved cysteine repeat we designated the Bangiales cysteine-rich motif. A quantitative mRNA analysis showed that expression of *NyHTR2* and *NyHTR2L* was induced by heat stress. However, the membrane fluidizer benzyl alcohol (BA) did not induce expression of these genes, indicating that the effect of heat was not due to membrane fluidization. In contrast, expression of genes encoding multiprotein-bridging factor 1 (*NyMBF1*) and HSP70s (*NyHSP70-1* and *NyHSP70-2*) was induced by heat stress and by BA, indicating that it involved a membrane

fluidization-dependent pathway. In addition, dark treatment under heat stress promoted expression of *NyHTR2*, *NyHTR2L*, *NyMBF1*, and *NyHSP70-2* but not *NyHSP70-1*; expression of *NyHTR2* and *NyHTR2L* was membrane fluidization independent and that of other genes was membrane fluidization dependent. These findings indicate that the heat stress response in *N. yezoensis* involves membrane fluidization-dependent and -independent pathway.