OFFICIAL ABSTRACT and CERTIFICATION

Regulation of a Temperature-Induced Lipocalin (TIL) by Cold Stress and Epibrassinolide in the Gametophytes

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Global warming has been linked to many of the emerging weather patterns i.e. hotter heat waves, drier droughts, greater snowfall, etc. Numerous studies have shown that sudden extreme cold stress can significantly decrease crop productions. To develop crops that are capable of adapting to sudden temperature change, it is important to identify genes and signaling pathway specifically affected. This study identifies and characterizes the regulation of a Temperature Induced Lipocalin (TIL) gene in the semi-aquatic subtropical fern Ceratopteris richardii.

When gametophytes of Ceratopteris are treated with cold stress (4-10 °C), there was a significant reduction in the prothalli area and cell count, but an increase in cell elongation. This increase in cell elongation may be responsible for inflation or ballooning of the cells of the prothalli not observed at room temperature. When gametophytes, however, are pretreated with epibrassinolide (EBL), their inflations are dramatically reduced during cold stress, suggesting that the brassinosteroid signaling pathway may be involved in mediating cold stress response.

Using various bioinformatics programs, an orthologue of a Temperature Induced Lipocalin (CrTIL) gene was identified and characterized from an EST cDNA library in Ceratopteris. RT-PCR revealed that cold stress as well as the brassinosteroid signaling pathway increase the expression of the CrTIL gene.

Further characterization of CrTIL gene and the brassinosteroid signaling pathway in gametophytes can help develop strategies to allow plant to cope with sudden cold stress.

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