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**Abiotic stress induced over  
expression of transcription factor  
OsDREB2A in transgenic local rice  
variety Bg94-1: its role in  
improving abiotic stress tolerance  
in rice**

A thesis submitted to the Faculty of Science,  
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## Abstract

Drought and salt are the two primary abiotic stresses that have a severe negative impact on rice productivity in Sri Lanka as well as around the world. Rice plants survive the stress by responding at the molecular, cellular, and organismal levels. Transcription factors play a critical role in inducing expression of abiotic stress responsive genes, which leads towards development of higher tolerance to drought, high salinity stress in plants.

In this study, the *OsDREB2A* gene which is a rice homolog of *DREB2A* was isolated from indica rice variety pokkali and HVA1 like promoter was isolated from INGER 46.

By following a transgenic approach, transcription factor *OsDREB2A* under the regulation of abiotic stress inducible HVA1 like promoter was introduced to local rice variety Bg94-1. The highly efficient method reported in this study for *Agrobacterium*-mediated transformation and development of transgenic rice for Bg94-1 was achieved by optimizing embryogenic calli induction, *Agrobacterium*-mediated transformation of callus cells and ensuing selection and regeneration of intact individual rice plants containing HVA1-GUS-nos, CaMV35S-GUS-nos, HVA1-*OsDREB2A*-nos and CaMV35S-*OsDREB2A*-nos transgene constructs.

The GUS histochemical analysis and real time Qt-PCR analysis in HVA1-GUS-nos & CaMV35S-GUS-nos transgenic rice plants subjected to drought and salinity stress demonstrated the sensitivity of the HVA1 like promoter towards abiotic stresses and established its role in regulation of gene expression in rice under drought and salinity stresses. The *OsDREB2A* transcript levels analyzed by real time Qt-PCR in HVA1-*OsDREB2A*-nos rice plants showed an increase in transcript levels as early as 30mins after rice plants were subjected to drought and salinity stress. However the gradual increase of the *OsDREB2A* transcript levels observed in these plants up to 2 hours of stress demonstrated a decrease after 4 hours. *OsDREB2A* expression was found to be markedly induced by drought and salinity treatment.

Induced over-expression of *OsDREB2A* driven by the HVA1 like promoter in transgenic rice plants under the drought and salinity stresses was observed showing significant phenotypic effects such as enhanced root growth, increased dry mass and root mass which may bring about abiotic stress tolerance in rice.