

## Section 2

### **Executive summary of the project**

Dehydration of crop plants due to several environmental conditions such as drought and high salinity is one of the most crucial factors that may impair plant growth and development and thereby resulting in poor crop productivity. In recent years, the physiological and molecular basis for plant responses to dehydration tolerance has been a subject of intense research. However, the plant tolerance mechanisms are poorly understood. Thus, the identification of novel genes, determination of their differential expressions, and understanding of their functions are important in improving plants' levels of tolerance against such stress.

Dehydration stress is becoming a serious problem in rice cultivation in Sri Lanka due to low quality water supply, high input agriculture and climatic changes. Recently, a breeding program for the development of drought resistant rice has been launched with exotic parents because of lack of knowledge on genetic potential of dehydration stress tolerance of Sri Lankan rice germplasm. Therefore, the present study is proposed with the main objective of identifying genes and proteins responsible for dehydration tolerance in selected rice varieties using both genomics and proteomic approaches with gene regulation and 2-Dimensional gel electrophoresis.

A series of laboratory and plant house experiments were conducted to achieve the above objective over a period of two years under 5 identified specific objectives (page 8). At the end of the project period, all the objectives except 4<sup>th</sup> specific objective (given in section 3), were completed fully and valuable research findings were produced as follows.

- Morphological screening at germination level revealed that varieties such as *Goda heenati*, Bg 360, Bg 357, Bg 304 and Bg 450 were performed well as similar to salinity check *Pokkali*. *Pokkali* showed higher tolerance even tested highest level of chemical induced drought. Furthermore, 100 mM NaCl concentration and 10% PEG were identified as the two screening levels for both drought and salinity stress at germination stage of Sri Lankan rice through the experiment.
- Biochemical analysis was performed for *Goda heenati* and *Pokkali* by analyzing chlorophyll content, total proteome and relative water content against drought stress. Based on findings *Goda heenati* showed a resistance against drought stress.

- Protein extraction was done from two weeks old both drought affected and well watered rice seedlings of rice variety; *Goda heenati* by saline phosphate buffer and extracted proteins were separated by 2DE gel electrophoresis. About 50 reproducible proteins spots were recorded on 12% acrylamide gels and they were spread over a pH range of 5-8 with molecular weights (15-75 kDa). Among them, three proteins were identified as up or down regulated during drought stress and those detected proteins were similar to the proteins which identified by previous studies.
- Genomic assay was completed through PCR and sequencing of targeted transcription factors was done. Sequencing results of PCR products were analyzed using molecular tools and detected variations of presence of *cis*-elements in targeted transcription factors of all tested varieties. Also we identified a specific deletion/ insertion in *Goda heenati* and *Pokkali* within an analyzed promoter region of ABRE gene.

Based on the findings in the present study, *Goda heenati* could be identified as a dehydration stress tolerating rice and further studies could be conducted to confirm its stress tolerance.