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Transcriptional Profiling of Rice to Nitrogen Deficiency Stress

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Nitrogen (N) is an essential nutrient for rice plant growth and development. However, studies have shown that N deficiency has been one of the factors affecting rice crop productivity worldwide. The present study analysed the differential expression of 12 transcription factors (TFs) related to brown planthopper (BPH) resistance in response to different levels of N stress (1.04 mM NH₄NO₃, 0.64 mM NH₄NO₃ and 0.24 mM NH₄NO₃) in two rice cultivars the TN1 (susceptible to BPH) and IR70 (resistant to BPH). Gene expression profiling revealed that the TF genes were more responsive to N stress in IR70 compared to TN1. All TFs exhibited the highest level of expression under the lowest N level (0.24 mM NH₄NO₃) in both the TN1 and IR70 rice cultivars. Among the TFs investigated, all 12 TFs were up-regulated in IR70 whilst 10 TFs were up-regulated in the TN1 in response to the reduced N levels compared to the optimal N levels (1.44 mM NH₄NO₃). OsNCL1 and OsNCL2 were down-regulated in the TN1 in response to N stress which indicated that both the genes might not be responsive to N stress in this rice cultivar. This study identified 5 TFs which exhibited the highest level of expression in IR70. Our findings highlighted that the TFs which have been linked to resistance to BPH were potentially responsive to N stress in the IR70. The differential expression of these genes in the TN1 and IR70 provided new avenues for further understanding the needs for developing rice cultivars with improved N stress tolerance.

Keywords: rice, nitrogen, transcription factors, up-regulation, down-regulation.

Biography

Dr Uma Priya is currently the Section Head of the Food Microbiology Laboratory with the Department of Chemistry Malaysia, a government agency under the Ministry of Science, Technology and Innovation Malaysia. She has more than 15 years of experience in food and water microbiology testing. She also has experience of running an internationally accredited laboratory with an additional stint of 2 years in the DNA Forensic Laboratory and was responsible for human DNA testing for regulatory matters. Dr Uma holds a PhD in Plant Molecular Biotechnology from Newcastle University, United Kingdom. She obtained her Masters in Environmental Management and Bachelors in Microbiology from the National University of Malaysia (UKM).