Biotechnology-2013

OMICS Group Conferences
Accelerating Scientific Discovery

4th World Congress on Biotechnology

September 23-25, 2013 Raleigh-North Carolina, USA

Emerging role of microRNA in drought stress tolerance in the biofuel, bioenergy crop sugarcane

Sangeeta Srivastava

Oklahoma State University, USA

Abstract

Plant growth and development, metabolism and stress responses, as well as a myriad of other functions, depend on the correct regulation of gene expression. This is achieved by multiple mechanisms, with perhaps the most important control being exerted at the level of transcription. However, with the recent discovery of microRNAs (miRNAs) another ubiquitous mode of gene regulation that occurs at the post-transcriptional levels has been identified. miRNAs are 21-nt non-coding RNAs that can silence the target genes by targeting complementary or partially complementary mRNAs for degradation or translational inhibition.

Sugarcane (*Saccharum* spp. hybrid) is one of the leading agricultural crops of the world as a source of sugar and energy, and a large number of other by-products. The production and the productivity of sugarcane are challenged by various biotic and abiotic factors. Among these, drought is the foremost abiotic stress which adversely affects cane productivity by having deleterious effects on plant metabolic processes including stomatal movement, nutrient uptake, production of photosynthetic assimilates, and crop yield. Several microRNAs that mediate post-transcriptional regulation during water stress have been described in other crop species. They function as critical post-transcriptional regulators of drought-responsive genes and control their expression. Recently, an increasing number of drought stress-responsive miRNAs have been described in sugarcane by using high-throughput small RNA deep sequencing. Sugarcane varieties differ in their ability to withstand drought while maintaining sucrose accumulation. miRNAs that are differentially expressed under drought stress have been identified from sugarcane cultivars having differential drought response (tolerant *vs*. sensitive). The target genes predicted for many of these differentially expressed mature miRNAs contain transcription factors, transporters, and proteins, and some of these targets have been validated by RT-qPCR. Essentially, most of these miRNAs target genes encode transcription factors, which place miRNAs at the centre of gene regulatory networks.

This paper dwells upon miRNA-associated complex regulatory networks and their target genes involved in drought stress response in sugarcane, thereby deciphering their role *vis*-à-*vis* potential in paving future efforts to improve drought stress tolerance in sugarcane.

Biography

Sangeeta Srivastava is a DBT-CREST Associate-Visiting scientist working on plant miRNA under the supervision of Dr. R. Sunkar, at the Department of Biochemistry and Molecular Biology, Oklahoma State University, Stillwater, OK, USA. She belongs to the scientific staff of ICAR (Ministry of Agriculture, India) and is presently posted as Principal Scientist in the Division of Crop improvement, Indian Institute of Sugarcane Research, Lucknow, India. She earned her M.Sc. from Lucknow University in 1985 with First position and obtained her Ph.D. degree from CIMAP/Kanpur University in 1989. She went to Germany in 1997 and 2003 on DSE/InWent fellowship. Her scientific contributions are focused on developing molecular diagnostic tools for sugarcane diseases, DNA fingerprinting and molecular diversity studies in sugarcane and sugar beet, and development of sugarcane ESTs. Currently, she is working on functional genomics and transcriptomics of sugarcane with reference to sugar trait and red rot disease. She is also serving as editorial board member of journals *SugarTech*(Springer) and *Journal of Environmental Biology*. She has published more than 80 research papers, 11 book chapters, one e-book, and has several ESTs and rDNA gene sequences in Gen Bank to her credit. Dr.Sangeeta is a recipient of many awards and honours that include Platinum Jubilee Award of ISCA (2013), DBT-CREST Award, Govt. of India (2012), Woman Botanist Gold Medal (2011), YS Murty Gold Medal (2003), ICAR-Young Scientist award (1999), Certificate of Merit (1990), All India Ist rank in ARS (1986), CSIR-NET and UGC-NET (1985)