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Advances in Proteomics and Bioinformatics in Agriculture Research and Crop Improvement

Keyura Katam1#*, Khoranhlai Anjuli Jones1# and Katsumi Sakata2 *

1 Department of Biological Sciences, Florida A&M University, Tallahassee FL 32307 USA 2 Maebashi Institute of Technology, Maebashi, Japan # Equal Contribution

ABSTRACT

Proteomics is the study of proteins on a genome-wide scale. Within the wide field of functional OMICS, proteomics has become a useful tool. The completion of genome sequencing projects and the improvement of methods for protein characterization surges this action forward. Presently, the usage of proteomics is being extended to analyze the different features of proteins including the activities structures, and protein-protein interactions. Proteomics research is quite advanced in animals, yeast and bacteria, but it is still in the beginning stages of plant research due to its highly complex and dynamic status. In view of the advances in crop biotechnology, it is critical to understand the role of proteins during plant development and response to biotic and abiotic stimuli. In this review, we present several plant proteomic studies to illustrate the applications in crop productivity. The advances in proteomics in recent years include protein isolation methods, mass spectrometry, protein-protein interactions and post translational modifications. We further discuss the strengths and weaknesses of proteomic technologies and the limitations of current techniques in the perspective of plant biology. We conclude that advances in protein interactions and bioinformatics will have an increasing impact on better understanding the various functional aspects in plants, such as PTM, subcellular localization, and protein interactions. Proteomics involves the study of the protein complement of the genome [1]. Plant proteomic projects include structural proteomics of the whole organism, organs, tissues, cells, and sub cellular compartments, as well as comparative proteomics on various processes. Yields of crops are reduced by numerous abiotic and biotic factors, such as flooding, drought, salinity, acidity, and nutrient limitation. Plant interactions with other organisms trigger biotic stresses and defenses. Research has greatly increased in the past decade not only by observing the existence of each process, but their interactions as well. Recent studies have found that responses to abiotic and biotic stresses influence each other both positively and negativelyWith recent advances in the technology, currently, more genomic resources are available to improve breeding strategies and enhance crop productivity. Furthermore, advances in proteomics and bioinformatics tools have increased our understanding of the function and metabolic pathways of the molecules. In the past few years, there has been significant progress in plant proteomics studies due to the advances in protein isolation, separation methods and high-resolution using software tools and bioinformatics. The creation of modern systems biology comes from the need to gather information from genome-scale studies and being able to present them in biological interpretations. Systems biology is continuous, Among various crops, soybean, rice, maize and tomato are considered too highly sensitive to flooding stress. Various studies on hypoxia or waterlogging stress have been carried out using cytosolic and membrane proteins from roots and have shown regulation of cytosolic ascorbate peroxidase-2 under flooding stress in soybean

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