Poster: Systems Biology

Abs # P63007: A systems approach to understanding C4 photosynthetic differentiation in maize

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The maize leaf is an excellent model system to study photosynthetic development as a proximal-distal gradient from base (youngest) to tip (oldest). To exploit this system in understanding C4 photosynthetic differentiation we have conducted a detailed histological, physiological and molecular survey of a maize seedling leaf undergoing the sink-source transition. This survey was used to define four developmental zones of a 9 day old leaf: immature, transition, photosynthetic and mature. Quantitative proteome analysis of the leaf developmental zones, including isolated bundle sheath strands, was performed using large scale spectral counting by high sensitivity tandem mass spectrometry. We have generated over 100 million Illumina reads from cDNA libraries created from RNA isolated from various leaf segments and from laser capture microdissected bundle sheath and mesophyll cells. These data are being integrated with a survey of over 50 primary metabolites and detailed EM sections of the leaf that were taken from the same developmental zones. Collectively, these studies revealed major shifts in primary and secondary metabolism and protein biogenesis associated with leaf development, as well as C4 cell-specific differentiation of photosynthesis and carbon metabolism. The tools that are being developed to interrogate these datasets and the major biological findings will be discussed.

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