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Genome-wide transcriptional analysis of two wild soybean genotypes in response to pi supply

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Phosphate (Pi) deficiency has a serious impact on plant growth and development, and eventually reduce productivity of crops. Wild soybean (*Glycine soja*) is considered to be more stress-tolerant than cultivated soybean (*Glycine max*), and has considerable genetic variation for increasing low-phosphorus (P) tolerance of soybean. However, the whole-genome molecular mechanisms contributing to wild soybean acclimation to Pi deficiency remain largely unknown. In this research, we investigated the transcriptome profiles in the roots, stems and leaves of a P-tolerant wild soybean variety N06 and a P-sensitive wild soybean variety N22 under Pi-sufficient and Pi-deficient conditions for 15 days. Then we compared the differentially expressed genes (DEGs) between treatments and genotypes to identify low-P responsive genes. In the P-tolerant genotype N06, 1145, 1420 and 1547 genes were differentially expressed ($|\log_2 FC| \geq 2$) under Pi-limited conditions in roots, leaves and stems, respectively, with 103 overlapped DEGs. Go terms mainly enriched in these DEGs were “response to stimulus” in roots, “metabolic process” in stems, and “oxidation reduction”, “metabolic process” and “carbohydrate metabolic process” in leaves. The associated genes primarily encoded transporters, protein kinases, transcription factors, inorganic pyrophosphatase, acid phosphatase, photosynthesis and carbohydrate mobilization related proteins. The eight most significantly expressed ($|\log_2 FC| \geq 7$) genes—GLYMA04G19450, GLYMA08G06090, GLYMA08G20820, GLYMA10G07180, GLYMA13G21070, GLYMA17G36130, GLYMA19G27060, GLYMA19G37201 — are candidates for improving soybean low-P tolerance. Interestingly, we also found 31 overlapped DEGs which were expressed in leaves, stems and roots of N06 and N22, including the eight most significantly expressed DEGs. These findings will be helpful for analysis and elucidation the molecular mechanisms of low-P tolerance in wild soybean; they also provide a basis for cultivating new soybean varieties of high phosphorus efficiency in future breeding programs.