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Comprehensive proteomic approach for understanding xylem vessel cell differentiation

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Xylem vessel is a type of water-conducting tissues found in vascular plants and composed of the cells that are characterized with thick secondary cell wall and programmed cell death. We have been studying on the regulatory molecular system of xylem vessel cell differentiation and successfully showed that the Vascular-Related NAC-Domain (VND) proteins, plant-specific NAC domain transcription factors act as key regulators of xylem vessel cell differentiation. Transcriptomic and molecular genetics analysis revealed the evolutionarily-conserved VND-based transcriptional regulatory network for the water-conducting cell differentiation in land plants; however, our knowledge about dynamics of biosynthesis, degradation, transport and secretion of proteins during water-conducting cell differentiation is still limited. In this study, we performed 2-dimensional electrophoresis-based proteomic analysis on xylem vessel cell differentiation using the transgenic tobacco BY-2 culture cells carrying the VND7 inducible system in which the trans-differentiation into xylem vessel cell can be induced synchronously and effectively. The result showed that at least 23 proteins such as cell death-related proteins (cysteine protease and metalloproteinase) and cell wall-related proteins (pectate lyase-like proteins) were increased after 24 hour-induction of trans-differentiation. Interestingly, only 8 of them had been showed to be up-regulated during xylem vessel cell differentiation by previous transcriptomic analysis. These findings suggest that the post-translational regulation greatly contribute to the proteome during xylem vessel cell differentiation.

Biography

Masahiro Noguchi is pursuing Doctor's program since 2014 in Nara Institute of Science and Technology.

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