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Technical Note:

Easy and Rapid Induction of Vascular Cells by VISUAL

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The vascular system is composed of xylem and phloem tissues intervened by cambial cells, which undergo cell division to supply vascular cells. Since vasculature is located deep inside the plant body, it is quite difficult to monitor the differentiation process. To overcome such difficulty, several xylogenic cultures have long been used for analyzing xylem development. However, no efficient system for phloem differentiation has been developed, which prevents the easy and rapid investigation of phloem development. Recently, we established a new tissue culture system for vascular cell differentiation named VISUAL (Kondo *et al.* 2014, 2015, 2016). Here we examined phloem differentiation after VISUAL induction with the use of the phloem-specific marker SEOR1pro: SEOR1-YFP (Froelich *et al.* 2011).

Xylem (magenta) and phloem (green) differentiation appeared ectopically in cotyledons, indicating that VISUAL can generate a large number of phloem cells as well as xylem cells within only four days. Indeed, we revealed a co-expression network for early and late stages of phloem differentiation with the VISUAL system

(Kondo *et al.* 2016). Therefore, VISUAL is a powerful tool for analyzing phloem development and will be useful for understanding the multipotency of cambial cells.

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