

Regulation of of auxin transporters and auxin responses in Arabidopsis root developments by hormones and nutrients

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Abstract

Lateral root (LR) formation in higher plants displays considerable plasticity in response to many different (external and internal) regulatory signals. One such example is the influence of nitrate nutrition on LR development. In *Arabidopsis*, nitrate has two opposing effects on LRs: a localised stimulation on LR elongation and a systemic inhibition by high nitrate. Our current efforts focus on dissecting the underlying mechanism for the latter effect (the high nitrate-induced LR Inhibition) and have led to a conclusion that ABA plays an important part in mediating the high nitrate signal and in LR regulation. Supporting evidence for the above conclusion includes: 1) Regulation of auxin transporters and auxin responses in Arabidopsis roots by hormones and nutrients. 2) ABA's inhibition on lateral root development.

Detailed morphological analysis reveals that the ABA-induced LR inhibition is reversible and occurs immediately after the emergence at the LR primordium from the parent root. Comparison between LRs developed on the ABA+ medium and those on the ABA- medium suggests that there is a novel ABA-sensitive developmental checkpoint at the activation step of the LR meristem. This novel checkpoint is auxin-independent, as the inhibition can not be rescued by either an exogenous auxin application or enhanced auxin synthesis. The ABA induced lateral root inhibition occurs at a specific developmental point, i.e. the activation of the lateral root meristem. Interestingly, our analysis of LR regulation by nitrate and ABA has also uncovered novel cross-talks between nitrate, ABA and auxin in Arabidopsis roots.