In seedlings of Pinus radiata, jasmonic acid and auxin are differentially distributed on opposite sides of tilted stems affecting lignin monomer biosynthesis and composition

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Plants respond to the loss of vertical growth re-orientating their affected organs. In trees, this phenomenon has received the scientific attention due to its importance for the forestry industry. Nowadays it is accepted that auxin distribution is involved in the modulation of the tilting response, but how this distribution is controlled is not fully clear. Auxin transporters that determine the spatio-temporal auxin distribution in radiate pine seedlings exposed to 45° of tilting were identified. Additionally, based on indications for an intimate plant hormone crosstalk in this process, IAA and JA contents were evaluated. The experiments revealed that expression of the auxin transporters was down-regulated in the upper half of the tilted stem, while being induced in the lower half. Moreover, transporter-coding genes were first induced at the apical zone of the stem. IAA was consistently redistributed toward the lower half, which is in accordance with the expression profile of the auxin transporters. In contrast, JA was mainly accumulated in the upper half of tilted stems. Finally, lignin content and monomeric composition were analyzed in both sides of stem and along the time course of tilting. As expected, lignin accumulation was higher at the lower half of stem at longer times of tilting. However, the most marked difference was the accumulation of the H-lignin monomer in the lower half, while the G-lignin unit was more dominant in the upper half. Here, we provide detailed insight in the distribution of IAA and JA, affecting the lignin composition during the tilting response in Pinus radiata seedlings.

Auxin transporters

Indole-3-acetic acid

Jasmonic acid

Lignin composition

Pinus radiata

Tilting stress

cyclopentane derivative

indoleacetic acid derivative

jasmonic acid

lignin

oxylipin

phytohormone

plant protein

biosynthesis

DNA sequence

gene expression regulation

genetics

growth, development and aging

metabolism

phylogeny

pine

plant stem

real time polymerase chain reaction

seedling

Cyclopentanes

Gene Expression Regulation, Plant

Indoleacetic Acids

Lignin

Oxylipins

Phylogeny

Pinus

Plant Growth Regulators

Plant Proteins

Plant Stems

Real-Time Polymerase Chain Reaction

Seedlings

Sequence Analysis, DNA