Title : Modeling branching under different light intensity regimes: integrating the role of hormones and sugars.

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Branching is a major agronomic variable that determines yield and quality. Branching is highly sensitive to environmental factors, such as light, and the response is not always intuitive. Predicting this response would be useful to define optimal strategies of light management in controlled conditions. The initiation of a branch is regulated by an intricate network of hormones (auxin, cytokinins, strigolactones, abscissic acid) and nutrients like sugars. Our objective is to build a model of branching response to light intensity, that integrates the roles of these regulators. To do so, we undertook experiments to unravel the relationships between branching and the physiological regulatory network under different light conditions.

First, plants of *Rosa hybrida* were grown under three light regimes: (i) continuous high light intensity, (ii) continuous low light intensity, (iii) temporary light restriction before bud outgrowth. They resulted in three branching phenotypes. In particular, branching was over-stimulated after a temporary light restriction compared to a continuous high light intensity. This pattern was correlated to increased levels of cytokinins and sugars in the stem. Then, we demonstrated that, as cytokinins, an exogenous supply of sugars stimulated branch initiation under continuous high light. This confirms that sugars can stimulate branching under high light intensity, as observed after a temporary restriction. To continue, we investigated why sugars over-accumulated after a temporary light restriction. For that, we quantified the dynamics of sources and sinks for sugars. After a light restriction, the growth of the primary axis, a strong sink for sugars, was reduced compared to continuous high light.

These results indicate a functioning scheme in which, together with cytokinins, sugars are involved in the regulation of branching by light intensity. Next step is to implement this scheme in a computer model and evaluate its ability to simulate the impact of different light regimes on branching.

Key words : branching, light, functional model, hormones