Assessing the impact of environmental factors on plant architecture through an integrative approach

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ASSESSING THE IMPACT OF ENVIRONMENTAL FACTORS ON PLANT ARCHITECTURE THROUGH AN INTEGRATIVE APPROACH

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Plant architecture determines yield, vigour, pathogen resistance of a crop as well as shape and visual quality of plants. Controlling the establishment of plant architecture is therefore a key concern for plant breeders and horticultural growers of field and greenhouse crops. Environmental factors have a strong impact on plant architecture. Better understanding and controlling these factors should allow better mastering cultural practices and increase yield but also reduce the use of chemicals (pesticide and growth retardants). In the case of ornamental crops, this may contribute to better master plant shape and offer the way to create new products. However, the understanding of how the environment modulates plant architecture is still poor and further research is needed. To address this question, ARCH-E (Architecture and Environment) team of the Research Institute on Horticulture and Seeds (IRHS, Angers, France) is developing an integrative research program whereby environmental effects on the establishment of plant architecture are examined from the molecular to the all plant levels. Rosebush is the model plant studied in this program. Architectural analysis is used to describe and objectively discriminate plant shapes (Morel *et al*., 2009, Chéné *et al*; 2012) and the impact of environmental factors, such as quantity and quality of light, nitrogen or water restriction or mechanical stimulation on the architectural components is studied (Thélier *et al*., 2011, Abidi *et al;* 2012, Morel *et al*., 2012). Beside, tools to assess plant shape through sensory analysis are developed and used to train panels of assessors to characterize the rosebush visual quality (Boumaza *et al*; 2010). The more in-depth study of the effect of light on rose architecture is carried on and has revealed that light was essential to bud outgrowth in rose, and that blue or red lights could, each individually, trigger bud burst (Girault *et al*; 2008). Light was shown to be required to stimulate sugar transport (Henry *et al;* 2011), sugar metabolism (Girault *et al*, 2010) and sugar signaling (Rabot *et al*., 2012) as well as the synthesis of the plant hormone gibberellic acid (Choubane *et al* ; submitted). On the basis of these researches, functional and structural modeling is undergone to integrate these results and simulate branching in response to the light environment (Bertheloot *et al*., 2011).

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