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Plants for Life

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Plant Science in Europe and Beyond - Science Policy

Science and Society:

Food security and safety – challenges ahead

Achieving sustainability

Crop genomes for sustainable agriculture

Breeding tools and strategies

Achieving quality:

From plant architecture to traits

From photosynthesis to solar fuels

Tree biology for multiple uses

From metabolites and recombinant proteins to plant-made-pharmaceuticals

Plants with improved nutritional quality and value

Strengthen ecosystems functioning

Plant health

Climate change and plant production

Climate, ecosystems and genomics

Biodiversity

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Information and registration at www.epsoweb.org

Physiological and Genetic Control of the Juvenile Phase in Plants

P 104

Session: Achieving sustainability II: Breeding tools and strategies

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One of the distinguishable plant developmental events is the transition from the vegetative to reproductive phase of development. This stage is preceded by the juvenile to adult transition within the vegetative phase. During the juvenile phase plants are incompetent to initiate reproductive development and are effectively insensitive to photoperiod. With the change to the adult phase, plants attain competence to respond to floral inducers, which is required for the transition to reproductive phase.

This study exploits *Antirrhinum* and *Arabidopsis* as model systems to understand the genetic and environmental factors that regulate floral incompetence during the juvenile phase. A physiological assay has been developed that allows the length of the juvenile phase to be measured and has provided a platform for several different approaches. Determinants such as irradiance and [CO_2] have been found to be key modifiers of the juvenile phase in *Antirrhinum*. A relationship between photosynthetic assimilate levels and vegetative phase transition has been revealed by analysis of carbohydrates in plants at defined developmental stages. Experimental data suggest that carbohydrate levels may be required to reach a specific threshold before plants undergo the transition from a juvenile to an adult phase of vegetative growth. This may be necessary in order to sustain a steady supply of sugars for sufficient bulk flow from the leaves to the shoot apical meristem, via the phloem, to enable delivery of florigen, which thus renders the shoot apical meristem competent to flower.

Determination of the juvenile phase in *Arabidopsis* mutants impaired in different genetic pathways has shown that multiple inputs influence the timing of the vegetative phase transition. Carbohydrates have been demonstrated to be involved possibly through their function as nutrients or signals or by their interaction with hormones. Physiological analysis of flowering time mutants has shown that a variety of signals act to promote and enable the juvenile to adult phase transition that involves both floral activators and repressors.

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