# Fourth epso Conference

# Plants for Life

## Toulon (Côte d'Azur), France

## 22 - 26 June 2008

**Plant Science in Europe - Science Policy**

**Science and Society:**

*The challenges for tomorrow's agriculture*

**Understanding, preserving and using plant diversity**

*Genome structure and evolution;*
*Plant adaptation, domestication and conservation;*
*Climate change and challenges for the next decades*

**Preserving our future by reducing the inputs in agriculture**

*Reducing water input; Reducing fertilizers;*
*Reducing pesticides*

**Improving plant product quantity and quality**

*Developmental biology; Improving yield; Food and feed*

**New products**

*Plant based biofuels: how to improve them?;*
*Biomaterials, biopharmaceuticals and other new products*

**Confirmed Speakers:**

Birgitte K. Ahring, Ian Bancroft, Michael Bevan, Dirk Bosch, Inge Broer, Enrico Coen, Catherine Feuillet, Chris Field, Richard B. Flavell, Andrew D. Friend, Yuri Gleba, Wilhelm Gruissem, Marion Guillou, Timothy Hall, Luis Herrera Estrella, Stephen Hopper, Jonathan Jones, Sophien Kamoun, Jay D. Keasling, Tim Lang, Peter Langridge, Ottoline Leyser, Hélène Lucas, Joachim Messing, Karin Metzlaff, Franco Miglietta, Graham Moore, Javier Paz-Ares, Kaisa Poutanen, Matin Qaim, Rudy Rabbinge, Roberto Ranieri, Søren K. Rasmussen, Babis Savakis, Mark Stitt, Björn Sundberg, Frank Takken, François Tardieu, Wim Van Camp, Nicolaus von Wirén, Lothar Willmitzer, Jian-Kang Zhu

**Coordinators: Karin Metzlaff, EPSO and Hélène Lucas, INRA, France**

**Information and registration at www.epsoweb.org**

# Study of the genetic and physiological control of juvenility in plants

# P 083

**Session: Improving plant product quantity and quality**
**Developmental biology**

**Ioannis G. Matsoukas**
**Andrea Massiah**
**Steven Adams**
**Alison Jackson**
**Veronica Valdes**
**Karl Morris**
**Brian Thomas**

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The juvenile phase (JP) of vegetative growth can be defined as the early period of development during which the plants are incompetent to initiate reproductive development, and they are effectively insensitive to photoperiod. It is during the adult phase of vegetative growth that the shoot apical meristem acquires the competence to respond to floral inducers required for the transition to reproductive phase. The juvenile to adult transition within the vegetative phase is associated with several physiological and biochemical markers whilst very little is known about the molecular mechanisms involved in this process. Significant advances in our understanding of the genetic control of developmental transitions derive from studying the vegetative to reproductive phase change in *Arabidopsis*. During this transition, FLOWERING LOCUS T (FT) protein, an output of the photoperiod pathway, acts at the apex in concert with the *FLOWERING LOCUS D* transcription factor, resulting in floral initiation.

Here we exploit *Antirrhinum* and *Arabidopsis* as model systems to understand the genetic and environmental factors that regulate the floral incompetence during JP. We approached this by hypothesizing that plants are florally incompetent during their JP due to inactivity of the photoperiodic floral induction pathway, FT protein is not translocated to the apex or that the apex is incapable of responding to FT.

A physiological assay has been developed in *Antirrhinum* that allows the length of the JP to be measured. Irradiance has been found as a key modifier of the length of JP; reduced light levels prolonged juvenility. The effect of irradiance on carbohydrate accumulation and its effect on the juvenile to adult transition within the vegetative phase were studied in *Antirrhinum.* HPLC analysis indicates a correlation between limiting photosynthetic assimilates and transition within the vegetative phase. Furthermore, experimental data suggest that a carbohydrate threshold level may be required before plants undergo a transition from a juvenile to an adult phase of plant development. Studying the effect of $CO_2$ on the length of the JP further confirms the linkage of the length of JP and assimilation availability.

Using the physiological assay to determine the length of juvenility in *Arabidop*sis, differences in JP length in Col-0, Ws-4 and Ler have been revealed. Col-0 was found to have the shortest JP length. Moreover, by using this assay with defined mutants, it was possible to identify genes involved in regulation of the vegetative phase transition in *Arabidopsis.*

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