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Abstract

The primary inflorescence architecture and the dynamic of the floral stem development have been studied in 4 ecotypes of Arabidopsis. Clear differences have been found between ecotypes. Lansberg erecta (Ler) ecotype has a short inflorescence and a progressive decreasing in the internode length train. The three other ecotypes showed an organization with successive alternation of long and short internodes. At the level of the internode, floral stem growth dynamic showed only a well synchronization with light and dark alternation with Ler ecotype. Moreover, circadian oscillations in growth rate were observable with Ler and Columbia (Col) ecotypes but not with C24 or Wassilewskija (Ws).

Reference


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FLORAL STEM GROWTH OF ARABIDOPSIS ECOTYPES.
I. DIFFERENCES DURING SYNCHRONIZED LIGHT REGIME AND CONTINUOUS LIGHT FREE RUN

BY

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ABSTRACT

Floral stem growth of Arabidopsis ecotypes. I. Differences during synchronized light regime and continuous light free run - The primary inflorescence architecture and the dynamic of the floral stem development has been studied in 4 ecotypes of Arabidopsis. Clear differences have been found between ecotypes. Lansberg erecta (Ler) ecotype has a short inflorescence and a progressive decreasing in the internode length train. The three other ecotypes showed an organization with successive alternation of long and short internodes. At the level of the internode, floral stem growth dynamic showed only a well synchronization with light and dark alternation with Ler ecotype. Moreover, circadian oscillations in growth rate were observable with Ler and Columbia (Col) ecotypes but not with C24 or Wassilewskija (Ws).

Key-words: Floral stem, architecture, elongation, synchronization, circadian rhythm, ecotypes, Arabidopsis thaliana.

Abbreviations: Ler = Landsberg erecta; Col = Columbia. Ws = Wassilewskija. LVDT = linear voltage differential transformer.

INTRODUCTION

Plant growth is slow, and sensitive methods are required to resolve the short-term dynamics of growth. When analyzed on a slow time scale, plant growth appears as a linear phenomenon but increasing the sampling frequency and the accuracy of the measuring apparatus reveals changes in the elongation rate. Linear voltage differential transformers (LVDTs) are among the most appropriate devices to obtain high-resolution measurements of stem segment (PRAT AND PARÉSY, 1995) and intact plant elongation (PENNY et al., 1974; KERCKHOFFS et al., 1997). Plant growth exhibits many rhythms and pseudo-rhythms with very different periods, such as the annual and circadian rhythms (RUIZ-FERNANDES & WAGNER, 1994).

Arabidopsis thaliana (L.) Heynh. is a small annual weed that belongs to the Brassicaceae family one of the most extensively used in research. Although of no inherent economic value, Arabidopsis offers many advantages for rapid genetic and molecular analysis including its small size, rapid life cycle, small simple genome, prolific seed production and the availability of numerous mutations. Most of the commonly used laboratory strains have a single seed as the original source and have been inbred for many generations. They are thus homozygous at most loci. Some common laboratory strains,
Arabidopsis thaliana first inflorescence internode extension rate of four ecotypes in L:D (12:12) as a function of time. A: Ler = Landsberg erecta. B: Col = Columbia. C: C24. D: Ws = Wassilewskija. Time 0 was considered as the beginning of the photoperiod of the first measurement day. Results are the data displayed by a representative measured plant, extension rate is expressed in mm·h⁻¹.

Arabidopsis thaliana first inflorescence internode extension rate of four ecotypes in continuous light as a function of time. A: Ler = Landsberg erecta. B: Col = Columbia. C: C24. D: Ws = Wassilewskija. Time 0 was considered as the beginning of the photoperiod of the first measurement day. Results are the data displayed by a representative measured plant, extension rate is expressed in mm·h⁻¹.
three other ecotypes showed fluctuations in length with alternation of small and longer internodes.

*Arabidopsis* first inflorescence node growth was measured during light/dark or continuous light. Under a L:D (12:12) cycle the Ler floral stem extension rate was modulated by the successive light-on and light-off. This entrainment property was usually observed as indicated by BUNNING (1973) for biological rhythms. Nevertheless, this ability to synchronize the growth rate rhythm to the L:D (12:12) photoperiod seem no to be the case for all the ecotype studied. It has been shown in a previous paper (JOUVE et al., 1998a) that Ler ecotype was really well synchronized under L:D (12:12) photoperiod but less or almost not under L:D (16:8) regime. This could be in relation with the ecological environment origin of the ecotype inducing a greater affinity with the photoperiod for expressing the rhythm and the synchronization property. Furthermore than synchronization, it could be seen in each ecotype a certain modulation of the growth rate linked to the light to dark or reciprocally transitions. This point will be developed in a following article of this issue (JOUVE et al., 2000).

In continuous light exposure, periods of low and high extension rate were persisting and showed a circadian rhythmicity with Ler and Col ecotypes. This response has been already observed in *A. thaliana* for several parameters (JOHNSON et al., 1995; MILLAR et al., 1995a, 1995b; HICKS et al., 1996, SWARUP et al., 1999). Results observed with C24 and Ws did not display growth rate oscillation, and particularly circadian one.

Taken together, these results showed that in a same species gender, depending on the ecotype, the morphological and dynamical behavior is different. Moreover, results clearly displayed an expressed circadian rhythm in Ler and Col ecotypes but not in C24 and Ws. In view of the large interest of this species, and the possible genetical control of the circadian growth rhythm, it would be interesting to check more extensively the differences between *A. thaliana* ecotypes as SWARUP et al. (1999) did.

**RÉSUMÉ**

**CROISSANCE DE LA HAMPE FLORALE DE PLUSIEURS ÉCOTYPES D'ARABIDOPSIS.**

I. DIFFÉRENCES OBSERVÉES EN LUMIÈRE ALTERNÉE ET EN LUMIÈRE CONTINUE

L'architecture primaire de l'inflorescence et la dynamique du développement de la hampe florale de 4 écotypes d'*Arabidopsis* ont été étudiées. Des différences claires ont été montrées entre les écotypes. L'écotype de Ler a une inflorescence courte et une distribution décroissante de la longueur des entre-nœuds. Les trois autres écotypes ont montré une organisation avec des alternances d'entre-nœuds longs et courts. Au niveau de l'entre-nœud, la dynamique de croissance de la tige florale a montré une bonne synchronisation avec l'alternance lumière et obscurité uniquement avec l'écotype Ler. De plus, des oscillations circadiennes dans la vitesse de croissance ont été observées avec les écotypes de Ler et Col mais pas avec C24 ou Ws.

**Mots-clés:** Hampe florale, architecture, élongation, synchronisation, rythme circadien, *Arabidopsis thaliana.*
REFERENCES


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