

Quantitative photoperiodic control of erect thallus production in *Sargassum muticum*

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Introduction

Most of the photoperiodic responses result in a sharp contrast between development in long and short days, so that qualitative observations are quite sufficient to establish that development is under photoperiodic control, and qualitative information of this type is all that is available for many of the responses (Dring 1984). However, we need to devise some quantitative measurement of the response in order to study the physiological mechanism of photoperiodic control. We report here the quantification of photoperiodic control of erect thalli production of *Sargassum muticum* in different daylength regimes.

Materials & Methods

Mature thalli of *S. muticum* bearing numerous receptacles were collected in Nov. 1998 in Strangford Lough, Northern Ireland. To obtain unialgal cultures, receptacles were cut and rinsed several times in filtered seawater (0.45 μ m pore). Detached young germlings from the receptacles were isolated with pasteur pipettes. The germlings were grown in sterilized petri dishes (5 cm diameter) with 20ml of medium under long-day conditions (LD; 16:8h) with Philips mcFE 40w/33 daylight fluorescent lamps (75 μ mol \cdot m⁻² \cdot s⁻¹ at the surface of the petri dishes) until they became young thalli with four blades. After 60 days culture, young thalli were transferred to short-day (SD; 8:16h) and night break (NB; 8:7.5:1:7.5h) regimes.

The number of plants with erect thalli were counted and expressed as a percentage of the 50 plants in each petri dish. These data were normalized by the arcsine transformation ($X_{\text{norm}} = \sin^{-1} \sqrt{X_{\text{raw}}}$, where X_{raw} = proportion of plants showing response; Parker 1979) before statistical analysis.

Results & Conclusions

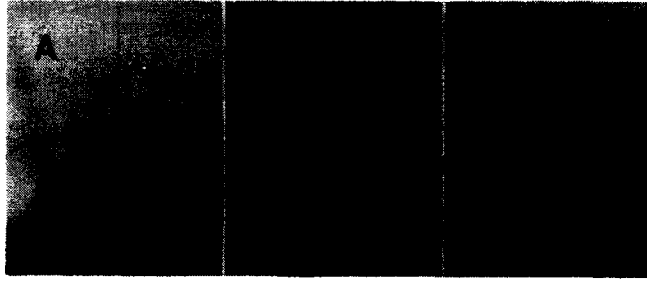


Fig. 1. Daylength effect on the erect thalli production of *S. muticum*: (A) Production of shoot (arrowhead) as erect thalli in the SD regimes after 55 days culture; (B) The erect thalli elongated continuously during 30 days culture after transfer from SD to LD regimes; (C) Young blades without erect thalli formation in NB regimes after 150 days culture.

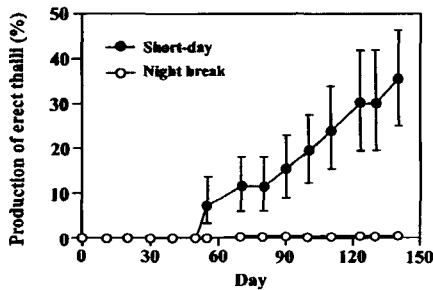


Fig. 2. Daylength effects on the erect thallus production of *S. muticum*.

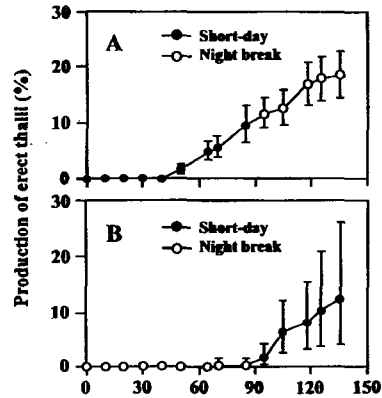


Fig. 3. Effects of changed photoperiods on erect thallus production in *S. muticum*.

A photoperiodic response of erect thallus production has been quantified in *S. muticum*. Up to 35.5% of the plants had produced erect thalli after 140 days culture in the SD regime, but no erect thalli were formed in the NB regime. When plants were transferred from NB to SD regimes, erect thalli were initiated within 10 days, but continued to be produced in plants transferred from SD to NB. Therefore, the development of erect thalli in *S. muticum* is a genuine photoperiodic response, which is inhibited by NB treatments, but continues in a NB regime after sufficient induction in SD.

References

- Dring M.J. 1984. Photoperiodism and phycology. *Progr. Phycol. Res.* 3: 159-192.
 Park C.S., E.K. Hwang, Y.H. Yi and C.H. Sohn. 1995. Effects of daylength on the differentiation and receptacle formation of *Hizikia fusiformis* (Harvey) Okamura. *Korean J. Phycol.* 10: 45-49.