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The Regulation of the Life History of *Dumontia contorta* in Comparison to that of Several Other Dumontiaceae (Rhodophyta)*

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Abstract

Effects of daylength and temperature on the formation of erect macrothalli from crustose microthalli of *Dumontia contorta* from Roscoff (49° N.lat.), the Isle of Man (54° N.lat.) and Zeeland (51.5° N.lat.) were investigated. Initiation of macrothalli in all three strains appeared to be a short-day response whose critical daylength, however, differed between the three strains. In the Isle of Man and Roscoff strains the critical daylength was c. 12–13 h, in the Zeeland strain c. 16 h. This latter high value does not seem to have adaptive value to the latitude where this strain occurs. The three strains also differ in the temperature ranges in which macrothalli were formed (Roscoff strain up to 20 °C, Isle of Man strain up to 16 °C, and Zeeland strain up to 24 °C), and these could be related with the highest values of the surface seawater temperature at the three collection sites (Roscoff 16 °C, Isle of Man 14 °C, Zeeland 19 °C). The response to short-day conditions was suppressed by short white light night-break, and a red and blue light night-break are equally effective. Far-red proved to be ineffective. The short-day response of *Dumontia contorta* is compared with that of *Acrosymphyton purpuriferum* and other taxonomically related species.

Introduction

Genera of the Dumontiaceae exhibit heteromorphic or isomorphic life histories. In the genera with heteromorphic life histories large gametophytic macrothalli alternate with small crustose microthalli. In the genera with isomorphic life histories the large gametophytes and sporophytes (macrothalli) arise from small crustose discoid stages (microthalli). Several environmental factors may be involved in the control of these life histories. The influence of environmental factors on developmental processes in the heteromorphic diplohaplontic life history of *Acrosymphyton purpuriferum* (J. Ag.) Sjöst. was investigated extensively by Breeman (1979). Formation of gametangia in this species is mainly influenced by temperature whereas the formation of tetrasporangia is influenced by both temperature, daylength and irradiance. In the isomorphic life history of *Dumontia contorta* (S. G. Gmel.) Rupr., day-

length and temperature control the development of sporophytic and gametophytic macrothalli from crustose discoid microthalli (Rietema and Klein 1981, Rietema 1982). The present paper deals with the influence of these factors on macrothallus development in *Dumontia contorta* from different localities. The short-day responses as observed in *Dumontia contorta* will be compared with that in *Acrosymphyton purpuriferum* and with similar responses in other members of the Dumontiaceae with both isomorphic and with heteromorphic life histories.

Materials and Methods

The present investigations were conducted on *Dumontia* strains from Roscoff, the Isle of Man, and Zeeland (Tab. I). The isolation technique employed was described previously (Rietema and Klein 1981). Briefly it consists of transferring released spores from cultured plants into petridishes whose bottom was covered with glass squares cut from microscope slides. Glass squares with 10–35 microthalli were transferred into deep petridishes and

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