

The Adriatic seaweed *Fucus virsoides* (Don.) J. Ag. is able to penetrate into low-salinity areas and is rather tolerant to environmental stresses. It was cultivated in diluted seawater as well as in two different types of natural mineral waters in order to find out whether this eulittoral furoid is able to survive in media other than seawater.

Salinity influence on the chemical composition and physiological properties of furoids was reported (MUNDA and KREMER 1977) and the Adriatic *Fucus virsoides* was studied separately regarding its autecology and responses to different ecological stresses, such as dilution, excess of nutrients and heavy metals (KREMER and MUNDA 1982). In this preliminary contribution the influence of two different natural mineral waters on the survival and growth of *Fucus virsoides* is dealt with. One of the waters used in the present experiments originates from a typical acrothermal spring (Dobrna - spring temperature 35.6°C), which contains 74 mg.l⁻¹ of Ca, 21 mg.l⁻¹ of Mg, 1 mg.l⁻¹ of Cl, 318 mg.l⁻¹ of HCO₃ and traces of V, Li, Fe, Al, Cu, Zn. The other mineral water (Radenska spring) is rich in free CO₂ as well as in Ca (219 mg.l⁻¹), Mg (96 mg.l⁻¹), Na (480 mg.l⁻¹), with 47 mg.l⁻¹ of Cl, 89 mg.l⁻¹ of SO₄ and 2370 mg.l⁻¹ of HCO₃.

Methods

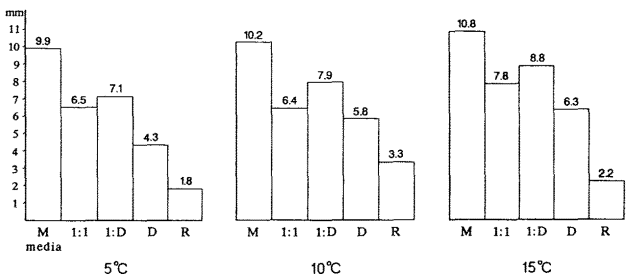
Adults plants of *Fucus virsoides* were collected at Piran in the Gulf of Trieste during different seasons. Ten subsequent series of experiments were run with winter, spring, late spring, summer and autumn material of this species. Small individuals from the same population or pieces of bigger plants (3 - 5 cm long) were kept in stagnant media in 500 ml glass dishes at 5°C, 10°C, 15°C, and in some series also at 20°C. The following media were used: filtered seawater - salinity 37.87‰ (M) diluted seawater - salinity 17,61‰ with a - freshwater (1 : 1), b - with water from the Dobrna spring (1 : D), water from the Dobrna (D) and the Radenska (R) springs. Media were changed every third day. The length increase (in mm) of the experimental plants was measured after two, four, eight and twelve weeks incubation. At the end of the experiments the protein content was determined by micro Kjeldahl procedure.

Results

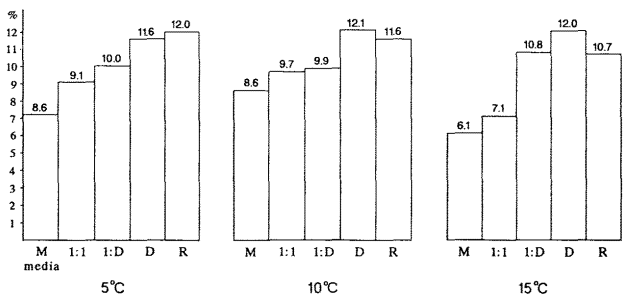
Results of all the experimental series indicated that *Fucus virsoides* is able to survive and even grow slightly in media other than seawater viz. natural mineral waters. Values (elongation in mm and protein content) for one of the series run with spring material are presented in the figure. The overall trend of media-dependent growth performance showed the usual dilution (induced, decrease in the 1 : 1 medium whereas dilution of seawater with the Dobrna spring water (1 : D) enhanced growth. In some of the series it even surpassed that of the control plants. In the two mineral waters growth was decreased to about one half in the Dobrna water and even more in the Radenska water, as related to the controls. Growth maxima were indicated at 15°C for plants kept in the diluted media and the Dobrna water, whereas in the Radenska water growth was decreased at the higher temperatures. In the latter necrosis was noticed after four weeks and in some cases even earlier, while the Dobrna water allowed survival and growth even after a twelve weeks incubation. Plants collected during different seasons did not deviate from this trend, thought some variations regarding the growth expressions and temperature optima were notable (10°C for the winter and the early spring material and 15°C or 20°C for the rest). The relation between growth performances in the two extreme stress media varied with the seasons in which the plants were collected. Growth was lowest in the summer material where necrosis occurred soon in the two stress media. The protein content, measured at the end of the experiments exhibited the usual trend of dilution induced increase. In all the experimental series it was highest in plants kept in the two mineral waters, reaching up to 16% of dry weight in the summer material.

Media-induced growth strategies varied, however, with the time when the plants were collected. Growth was highest in the material collected in late spring. In this case growth of plants kept in the 1 : D medium surpassed that of the controls, while pure Dobrna water induced a relatively high growth performance.

Average length increase in mm



Protein content (% of dry weight)



REFERENCES

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 MUNDA I.M. and KREMER B.P., 1977.- Chemical Composition and Physiological Properties of Furoids under Conditions of Reduced Salinity. *Marine Biology*, 42, 9-15 (1977).