MARINE ACIDIFICATION EFFECTS ON REPRODUCTION AND GROWTH RATES OF CORALLINACEAE SPORES (RHODOPHYTA).

Francesco Cumani [1]*, Fulvia Bradassi [1], Annarita Di Pascoli [1] and Guido Bressan [1]
[1] University of Trieste, Dept Life of Sciences - francescocumani@libero.it

Abstract
A study on the effect of marine acidification on the production and surface increase of Corallinales spores was realized in an artificial controlled culture. The increase of CO_2 concentration in the artificial culture inhibited Corallinaceae spore production and growth, and caused an increase in the mortality of germination disks.
Keywords: Global Change, Algae, Adriatic Sea

During the last few years the effect of the increase of carbon dioxide has been studied on mature calcareous red algae [1], [2], [3]. But little is known on the effect of marine acidification on the reproduction rates and surface increase of the Corallinaceae. For this reason a study on the production and growth of Corallinales spores was realized in an artificial controlled culture (microcosm). The values of pH, salinity, temperature and Total Alkalinity of the seawater were recorded several time every day at random intervals.
The calcareous red algae were submitted to different concentrations of carbon dioxide in three different bathtubs (15 l each). We carried out three "monophase cultures" (May and October 2008, May 2009) during which the values of pCO_2 and of pH (first "control" bathtub pCO_2 = 370 ppm and pH = 8,2; second "intermediate" bathtub pCO_2 = 550 ppm and pH = 8,0; third "acid" bathtub pCO_2 = 760 ppm and pH = 7,8) [4], were maintained constant in each bathtub during the entire period of insemination; we made a "triphase culture" (July 2008) during which the pCO_2 was progressively fitted step by step in three phases from 370 to 760 ppm in third bathtub and fitted step by step in two phases from 370 to 550 ppm in second bathtub. The calcareous encrusting red alga *Lithophyllum incrustans* Philippi (Corallinaceae) was sampled in the gulf of Trieste (north Adriatic, Mediterranean Sea) to a depth of 3-4 m. The samples were subjected to thermic shock (temperature of about 24°C), to induce better sporulation (production and morphogenetic development of the spores). The spores were grown on specific supports slides for evaluation under the microscopy. A census of the growth disks was carried out within the first week from the beginning of the insemination, under the optic microscope. Subsequently some selected thalli were marked randomly and photographed weekly to study the surface growth rates (Image Pro Plus 6.0) [5].

In "monophase culture", even if developed in different seasons, a decrease in the presence of the thalli was observed as the CO_2 concentration increased. In the July culture ("triphase culture" – progressive acidification), October 2008 and May 2009 ("monophase culture" – pCO_2 and pH constant) after one month from the beginning of the culture a new census of the thalli was carried out. In all three cases an increase in the mortality of thalli was recorded with pCO_2 increase (Fig. 1).

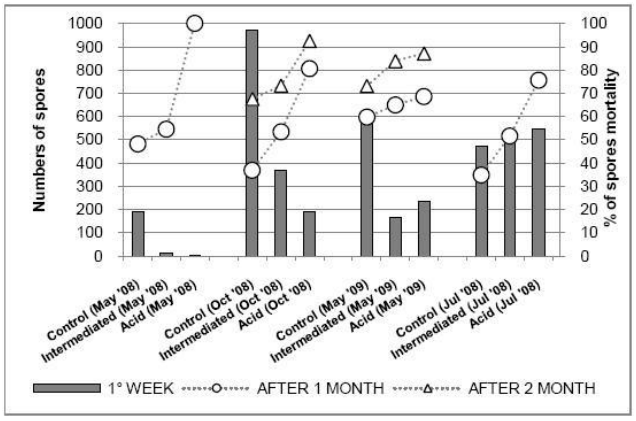

Fig. 1. Number (bars) and % mortality of coralline algae spores (circles and triangles) in "monophase" (May and Oct '08, May '09) and "triphase" (Jul '08) cultures

The rate of growth of the germinated disks was expressed as the difference between the surface of the thalli on their last day of culture and their measured surface after a week from the beginning of the insemination (ΔS). In "monophase culture" the thalli show a smaller growth with an increase of seawater acidity (Fig. 2).

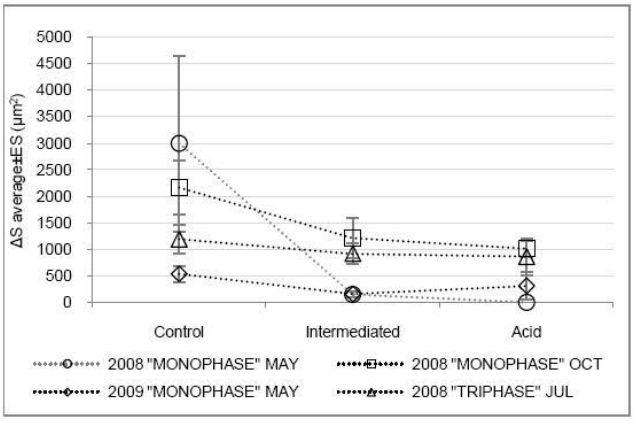

Fig. 2. Average spores growth (ΔS average) after 1 month in "monophase" and "triphase" culture

The results indicate that the increase of CO_2 concentration in the artificial culture inhibits the Corallinaceae spore production and growth, and an increase of the mortality of germination disks. This could have a negative influence on the colonization of calcareous algae not only at the species level, but at an ecosystem level since other authors have reported similar results [1], [2].

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