CULTIVATION OF NANNOCHLOROPSIS OCEANICA F&M-M24 AND TETRASELMIS SUECICA F&M-M33 IN A COMBINED GREEN WALL PANEL®-RACEWAY POND PILOT PLANT

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The work presented here was carried out in the frame of the EU FP7 BIOFAT project that aims to demonstrate at pilot and then demo scale the feasibility of biofuel production from microalgal biomass. Two marine strains, the lipid producer *Nannochloropsis oceanica* F&M-M24 and the carbohydrate producer *Tetraselmis suecica* F&M-M33 were cultivated in two 250-m2 modules of GWP®-II photobioreactors (Patents WO 2004/074423 to UNIFI, WO 2011/013104 to F&M) for inoculum production and in two 530-m2 raceway ponds for growth and starvation trials, at the BIOFAT Pilot Plant in Camporosso (Imperia, Italy). The pre-inoculum phase was performed at the nearby facility of Archimede Ricerche S.r.l. in GWP®-I photobioreactors. The experiments were performed from July to September with *N. oceanica* F&M-M24 and in March, August and September with T. *suecica* F&M-M33. For *N. oceanica* F&M-M24, growth in the GWP® led to a panel productivity of about 15 g m-2 d-1 corresponding to an overall areal productivity (OAP) of about 8 g m-2 d-1, while in the raceway ponds productivities of 9.5 g m-2 d-1 were achieved. The starvation phase was performed in seawater without nutrient addition and led to a productivity of about 10 g m-2 d-1 during the first four days. Total lipids reached 45% (of dry weight) after 5 days. The cultures suffered from some problems of contamination by amoebas and diatoms, but proved to be resistant to temperatures as high as 33 °C and to high irradiances. *T. suecica* F&M-M33 was cultivated under nitrogen starvation in one of the GWP®-II modules in the early spring and performed well reaching a panel productivity of 15 g m-2 d-1 corresponding to an OAP of 12 g m-2 d-1. Carbohydrates reached 52% of the dry biomass after 5 days of culture. Carbohydrate synthesis was higher during the morning hours, leading to a higher content in the noon and afternoon samples. The culture was thus harvested in the afternoon. During the summer this strain was cultivated in a GWP®-II module to produce inoculum for the raceway pond. The panel productivity reached was 22 g m-2 d-1, corresponding to an OAP of 13 g m-2 d-1. The starvation was performed in the raceway pond, but, although the productivity was quite good (10 g m-2 d-1), carbohydrate accumulation barely surpassed 35%, confirming results previously obtained by our group in small scale ponds. T. suecica suffered neither from grazers nor from competing microalgae. It is worth noting that there was not cross-contamination when the two microalgae were cultivated at the same time in adjacent raceways. The two strains prove to be promising for biofuels production, although to reach profitable productivities further optimization is needed.

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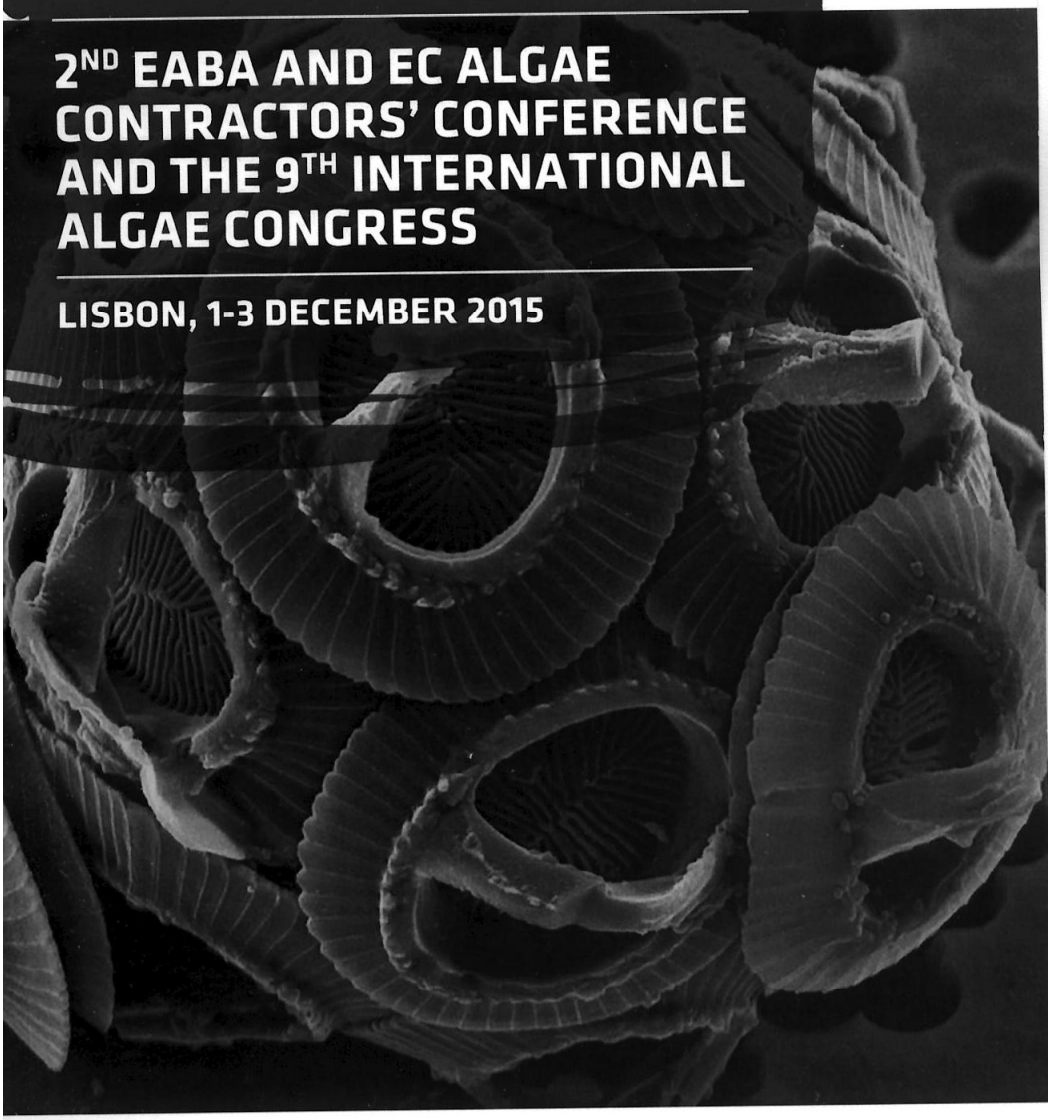

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