

Effects of Crude Oil on Growth Rate and Variable Fluorescence of *Synechococcus* sp. Marine Cyanobacteria

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In past research on the impacts of crude oil on phytoplankton, marine cyanobacteria have been relatively under-studied. The effects of crude oil on three strains of the marine cyanobacteria *Synechococcus* sp. were studied in dose-response experiments measuring growth and photosynthetic physiology. An estuarine (PC-Rich), coastal (PE-Rich) and open-ocean (WH8102) strain were used. Five oil concentrations were tested (1, 10, 50, 100, and 250 ppm oil by weight added as a freshly-made water-oil emulsion). Physiological reaction time to oil addition was quantified using variable chlorophyll fluorescence (F_v , F_v/F_m) following addition of oil. Decrease in physiological state (measured by F_v) occurred almost immediately following addition of oil, and F_v/F_m was significantly decreased at high concentrations after 2-4 hours, indicating direct effects of oil on photosystem II. Growth rates were measured over several days of oil exposure. No significant negative impact on growth rate was observed for oil concentrations below 50 ppm. All strains exhibited significantly decreased growth rates at 100 ppm and 250 ppm. The open-ocean and estuarine strain exhibited significant decreases in growth rate at 50 ppm while the coastal strain only showed a significant decrease in growth rate at 100 ppm and above, suggesting some strain-specific differences in oil tolerance. However, a single dose response curve adequately fit all three species, demonstrating a fairly consistent overall negative relationship between oil concentration and *Synechococcus* growth across strains isolated from different habitats.