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Utilization of Two Microalgae Species, *Synechococcus* sp. and *Chaetoceros* sp., for Aquatic Toxicity Assessments in the Qatari Marine Environment

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Microalgal bioassays are currently used worldwide to help assess the impacts of contaminants on aquatic ecosystems. Algae are particularly important to such assessments because they represent the basic trophic level of the aquatic food web and contribute to ecosystem biodiversity. Toxicological impacts to these species may have follow-on effects (e.g., depletion of food source) on higher trophic levels and subsequent biodiversity consequences. ExxonMobil Research Qatar in collaboration with Qatar University Environmental Sciences Center and the Ministry of Environment are currently conducting research to understand the impact of several water borne contaminant species of microalgae found in the Qatari marine environment.

The two algal species used in this study included *Synechococcus* sp. which is a unicellular cyanobacterium that is very widespread in the marine environment and are preferentially found in the upper well-lit surface waters. The other species, *Chaetoceros* sp. is a centric diatom and is abundantly found in Qatari seawaters. *Chaetoceros* is a highly diverse diatom genus and has been described as the most dominant phytoplankton group in the ocean, in general. They play an important role in various marine ecosystem as a preferred food source for zooplankton and invertebrate larvae.

Two microalgal species were isolated from the Qatari coastal waters and cultured in the laboratory. The cultures were maintained at $22 \pm 1.0^\circ\text{C}$, under a 14 h:10 h/light:dark cycle provided by cool white fluorescence light ($7000 \pm 10\%$ lux), in nutrient-enriched synthetic seawater (F/2 medium) at pH 8.0 ± 0.5 and salinity 40 g/L. The effect of abiotic factors such as salinity and temperature on the growth of both species was also investigated during culture development.

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Salinity effects were studied in the range of 25 to 45‰. The results show that both species are euryhaline - that is, able to grow at all tested salinities - with best growth achieved at 30 and 40‰. Both species were subsequently tested for tolerance to temperature ranging between 16 to 38°C, at both 30 and 40‰ salinities. These temperature experiments show that the highest growth rate was observed in cultures at 30°C and salinity 30‰. Similar results were obtained at 30°C and salinity 40‰. The lowest growth rates were observed at the lowest temperatures, while a decreased rate was also observed at the highest temperature.

Acute (24 hr) and chronic (72 hr) toxicity tests were carried out on both microalgae species, with copper chloride which is widely used as a reference toxicant. Tests were performed using copper chloride at concentrations ranging between 0.05 and 0.75 mg/l. The test endpoints included: cell division rate inhibition, light-scattering properties of algal species, chlorophyll a fluorescence and esterase activity. Results for *Synechococcus* sp. and *Ceratoceros* sp. show a dose-dependent response to contaminant exposure. Consequently, it is apparent that both species may be considered as model test species for use in toxicity assessment and serve as a key component in a battery of toxicity tests with other native Qatari marine organisms. In particular, the tolerance of these microalgae species to fluctuations in salinity and temperature make them an ideal species to further explore the impact of potential effects of toxicants in Qatari waters.