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Growth of Harmful Dinoflagellate Margalefidinium polykrikoides in Different Nutrient Concentrations

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Abstract

Margalefidinium polykrikoides blooms resulted in massive fish mortality in many countries around the world. The prevalence of booms is believed to be associated with the eutrophication of the coastal area. Therefore, this study aims to determine the effects of different nitrogen (N) and phosphorus (P) concentrations on the growth of M. polykrikoides. Experiments were conducted on M. polykrikoides isolated from the affected area by exposing the cell to various N and P ratio: seawater without the addition of N and P (SW), equal N:P ratio (NP), trial ratio of N and P (TR), F/2 medium (+NP), deficient N (−N), and deficient P (−P). The experiments were carried out in triplicates for 20 d in similar environmental conditions with the determination of density, specific growth rate, and cell size during the study period. Furthermore, nutrient concentrations nitrite+nitrate ($NO_2^- + NO_3^-$), phosphate (PO_4^{3-}), and ammonia (NH_4^+) were measured initially in the medium and both nutrients and chlorophyll were determined at the end of the experiment. The results revealed that M. polykrikoides grew in all the experiments, but the growth patterns differed between the treatments. The highest specific growth rate (0.1901 ± 0.017 d^{-1}) with the highest cell density (1709 ± 68.21 cells mL^{-1}) with a long chain of cells was observed in TR during the exponential phase. However, cell size was significantly smaller in SW compared to other nutrient conditions during the exponential phase. This study shows that M. polykrikoides a flexible species in nutrient uptake, thus allowing the species to survive in different nutrient conditions. The understanding of this bloom mechanism is important in monitoring and management of this harmful species, particularly in Sabah coastal waters. © 2022, Department of Science and Technology. All rights reserved.
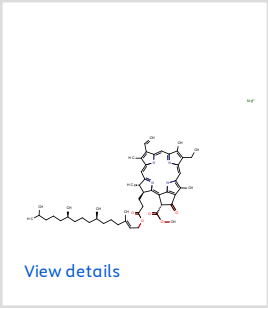
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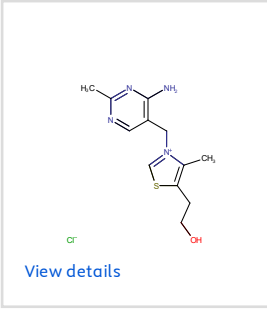harmful algae; Margalefidinium polykrikoides; nitrate; nutrients; phosphate; red tide

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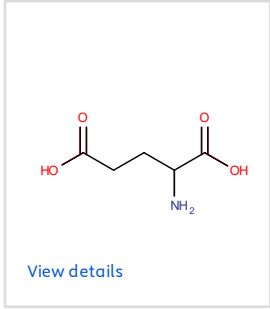
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Details about financial support for research, including funding sources and grant numbers as provided in academic publications.

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