



Assessment of relative phosphorus limitation of *Trichodesmium* spp. in the North Pacific, North Atlantic, and the north coast of Australia

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Limnol. Oceanogr., 53(6), 2008, 2495-2502 | DOI: 10.4319/lo.2008.53.6.2495

ABSTRACT: *Trichodesmium* spp. is a colonial diazotrophic cyanobacterium that occurs in the oligotrophic tropics and subtropics. Because of its ability to fix atmospheric N_2 , it is likely to be growth limited by P or Fe, and it has been hypothesized that limitation differs among different ocean basins. Two assays used as indices of P limitation or stress in *Trichodesmium* spp. are uptake of $^{33}PO_4^{3-}$ to determine maximal P uptake (V_{max}) and hydrolysis of P from methylumbelliferone phosphate to estimate alkaline phosphatase activity (APA). The kinetics of PO_4^{3-} uptake were determined for *Trichodesmium* spp. colonies in the North Pacific, North Atlantic, and in waters north of Australia, whereas APA was determined in the North Pacific and North Atlantic. *Trichodesmium* spp. V_{max} was significantly greater (~fourfold or more) in the North Atlantic compared with the North Pacific and waters north of Australia when normalized to both chlorophyll a content and number of trichomes per colony. APA in the North Atlantic was also greater than in the North Pacific. The half-saturation constant for PO_4^{3-} uptake (K_p) was not significantly different among the three locations. These data indicate that *Trichodesmium* spp. is more strongly P limited in the North Atlantic compared with the North Pacific or waters along the north coast of Australia. We suggest that the *Trichodesmium* spp. communities in the North Pacific and waters north of Australia are primarily Fe rather than P stressed and that these differences reflect differing relative inputs and availability of two major controlling variables for diazotrophy, P and Fe, in these geographically divergent areas.

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