Distribution and seasonal variation of concentrations of particulate carbohydrates and uronic acids in the northern Indian Ocean

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Abstract

Suspended particulate matter (SPM) samples were collected from the surface seawaters at 31 stations, and from various depths (2 to 1000 m) at 9 locations in the northern Indian Ocean during various seasons. SPM samples were analyzed for total particulate carbohydrate (TPCHO), total particulate uronic acid (TPURA) and total particulate neutral carbohydrate (TPNCHO) concentrations and composition. Strong spatial, temporal and depth related variations were evident in the distribution of these compounds. In surface waters, concentrations of TPCHO, TPNCHO, and TPURA varied from 0.57 to 3.58 $\mu$M C, 0.11 to 2.34 $\mu$M C, and from 0.01 to 0.31 $\mu$M C, respectively, and accounted for 2.6 to 34.6%, 2 to 24.5%, and 0.2 to 6.3% of POC, respectively, whereas the TPURA accounted for 4.7 to 22.7% of TPCHO. Concentrations and yields of both TPNCHO and TPURA decreased rapidly in the upper 100 m of the water column suggesting their utilization by heterotrophic organisms. Glucose was the most abundant constituent of the TPNCHO. Glucose mole fraction decreased while that of other monosaccharides, especially galactose, arabinose, mannose, rhamnose and fucose increased in the upper 100 m water. Below this depth, mole fraction of glucose increased while that of other sugars decreased with the increasing water depth. Generally, high C:N ratios were associated with low yields of carbohydrates and uronic acids. Inverse correlation between the mole fractions of arabinose plus xylose and rhamnose plus fucose indicates the importance of biogenic and terrestrial organic matter input to the Bay of Bengal. TPURA are surface-active in nature and thus may play an important role in coagulation of particles and macromolecules. The observed spatial and seasonal variations of these compounds may be due to differences in phytoplankton biomass, nutrient status, and the influence of terrestrial material. © 2006 Elsevier B.V. All rights reserved.

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1. Introduction

In oceanic environments, particulate organic matter (POM) is mostly derived from phytoplankton (Deuser et al., 1981). Conversely, POM in the coastal and shelf waters is influenced by the inputs of terrestrial organic matter discharged by rivers and re-suspension of bottom sediments (Degens and Ittekkot, 1985). In aquatic environments, POM serve as an important source of food for the aquatic organisms. Moreover, POM is of considerable biogeochemical and oceanographic importance because it serves as a vehicle for the transport of