Production and partitioning of organic matter during simulated phytoplankton blooms

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ABSTRACT: Few studies have examined the partitioning of organic matter in upwelling systems, despite the fact that these systems play a key role in carbon and nitrogen budgets in the ocean. We examined the production and partitioning of phytoplankton-derived organic matter in deck incubations off Oregon during the upwelling season. During exponential growth of the phytoplankton, ⩾78% of total accumulated organic matter was in particulate (POM) form. This suggests that dissolved organic matter (DOM) is a small fraction of primary production during the exponential growth of coastal phytoplankton blooms. After nitrate depletion, carbon-rich (C :N ⩾ 16) DOM accumulated in incubations dominated by the diatom *Chaetoceros* sp., accounting for 38% (±8.5%) of accumulated total organic carbon (TOC) and 24% (±8%) of accumulated total organic nitrogen (TON). However, in a bloom dominated by the diatom *Leptocylindrus minimus*, a relatively smaller amount of DOM accumulated, accounting for only 15% of accumulated TOC and 7% of accumulated TON. On the basis of measured concentrations of nitrate and accumulated TOC, ~70%-157% more carbon was fixed than would be predicted by Redfield stoichiometry (referred to as "excess carbon fixation"), with 20%-69% of the excess carbon fixation occurring after nitrate depletion. The accumulation of carbon-rich DOM and excess carbon fixation suggests that nitrate assimilation (i.e., new production) might not equate to net production of POM in coastal upwelling systems.

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