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EFFECTS OF TEMPERATURE ON PHOTOSYNTHETIC RATES IN DIATOMS ISOLATED FROM THE SOUTHERN OCEAN (ABSTRACT)

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The rates of photosynthesis of Antarctic diatoms were determined as a function of temperature. Clonal cultures of diatoms were isolated from open surface waters (0 m, −0.7~2.2°C) in the Indian sector of the Southern Ocean (59~68°S) during the austral summer. Stock cultures were grown in f/2 medium at 1~4°C under 16:8 hr light:dark cycle at an intensity of 100~200 μEinst m^{-2} s^{-1} for 7~11 months. For photosynthetic rate measurements in the land laboratory, the Antarctic diatoms were incubated in 100 m*l* polycarbonate bottles (three light and two dark) for 4 hr under a saturating intensity of 200 μEinst m^{-2} s^{-1} at different temperatures of −2.5°C, 0°C, 3°C, 5°C, 7°C, 10°C, and 15°C. Photosynthetic rates, based on the stable ^{13}C isotope method, increased by a factor of 2.3~5.9 with temperature from −2.5°C (0.16~0.64 μgC μgChl a^{-1} h^{-1}) to 7°C (0.58~1.89 μgC μgChl a^{-1} h^{-1}). At higher temperatures the photosynthetic rates of *Chaetoceros* sp. and *Nitzschia* sp.1 were decreased rapidly (0.20 and 1.04 μgC μgChl a^{-1} h^{-1}). On the other hand, photosynthetic rates of *Nitzschia* sp.2, *Nitzschia* sp.3, and *Nitzschia* sp.4 were either not decreased or slightly increased up to 15°C (0.76, 1.37, and 2.40 μgC μgChl a^{-1} h^{-1}). The temperatures of maximum photosynthetic rates in these species were clearly higher than those in situ (−0.7~2.2°C) and in stock culture (1~4°C). Nevertheless, these five species all stopped growing at 15°C within 24 hr, and *Nitzschia* sp.1 showed little growth even at 7°C. It thus seems that high photosynthetic rates observed above the natural ambient temperature (−1.8~5°C) may remain for the restricted period that can be endured by the cells.

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