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硝酸盐对湖泊沉积物磷释放的影响

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Phosphorus (P) release from sediment is a key process affecting the effectiveness of eutrophication mitigation.

We hypothesized that high nitrate (NO₃⁻) input may have dual effect on sediment P release: reduce the

sediment P release by improving the oxidation of sediment or promote P release by stimulating the growth of

phytoplankton and increase the decomposition rates and oxygen consumption at the sediment water interface.

To test the effect of different NO₃⁻ concentrations, we conducted a three-month experiment in 15 cement tanks

(1 m³), with five targeted concentrations of NO₃⁻: control, 2 mg L⁻¹, 5 mg L⁻¹, 10 mg L⁻¹, and 15 mg L⁻¹. The

results showed that: i) when NO₃⁻ was maintained at high levels: NO₃⁻≥5-7 mg L⁻¹ (range of median values),

there was no effect of NO₃⁻ on net P release from the sediment, likely because the positive effects of NO₃⁻

(increasing oxidation) was counteracted by a promotion of phytoplankton growth. ii) after NO₃⁻ addition was

terminated NO₃⁻ dropped sharply to a low level (NO₃⁻≤0.4 mg L⁻¹), followed by a minor P release in the low N

treatments but a significant P release in the high N treatments, which likely reflect that the inhibition effect of

NO₃⁻ on P release decreased, while the promotion effects at high NO₃⁻ concentrations continued. The results thus supported our hypotheses of a dual effect on sediment P release and suggest dose-dependent effect of NO₃⁻ loading on stimulating P release from the sediment, being clear at high NO₃⁻ exceeding 5-7 mg L⁻¹.

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