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海洋微藻对游离氨基酸的利用特性研究

Uptake and utilization characteristics of *Prorocentrum donghaiense*, *Phaeocystis globosa*, *Karenia mikimotoi* and *Skeletonema costatum* for dissolved free amino acids

关键词: [海洋微藻](#) [赤潮](#) [溶解游离氨基酸](#) [生长速率](#) F_v/F_m [吸收动力学](#)

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作者 单位

徐宁 暨南大学水生生物研究中心,广州 510632

刘静雅 暨南大学水生生物研究中心,广州 510632

赖海燕 暨南大学水生生物研究中心,广州 510632

胡章喜 暨南大学水生生物研究中心,广州 510632

段舜山 暨南大学水生生物研究中心,广州 510632

摘要: 分别以4种游离氨基酸——丙氨酸、甘氨酸、谷氨酸和天冬氨酸为唯一氮源,采用实验室一次性培养的方法,研究典型赤潮藻——东海原甲藻(*Prorocentrum donghaiense*)、球形棕囊藻(*Phaeocystis globosa*)和米氏凯伦藻(*Karenia mikimotoi*)及常见种类中肋骨条藻(*Skeletonema costatum*)的生长特性、光合特征及对氨基酸的吸收动力学特征,以无机氮源硝氮、氨氮作为对照.研究表明,在无菌条件下,东海原甲藻和球形棕囊藻可以利用多种游离氨基酸快速生长,而米氏凯伦藻和中肋骨条藻在以游离氨基酸为唯一氮源条件下不能维持生长.东海原甲藻和球形棕囊藻在丙氨酸中的生长速率最高,天冬氨酸和谷氨酸次之,甘氨酸最低.氨基酸处理组的 F_v/F_m 值在培养后期降幅小、降速慢,且高于无机氮处理组.东海原甲藻和球形棕囊藻对丙氨酸的最大吸收速率和半饱和常数分别为3.32、0.41 pmol·cell⁻¹·h⁻¹和6.99和20.54 pmol·L⁻¹.因此,海洋微藻对游离氨基酸的吸收利用具有显著的种间差异,东海原甲藻和球形棕囊藻具有更广的氮营养生态位.在近海有机污染不断加剧的背景下,更容易形成优势甚至暴发赤潮.

Abstract: The growth dynamics, photosynthetic characteristics and uptake kinetics of three harmful algae, *Prorocentrum donghaiense*, *Phaeocystis globosa*, *Karenia mikimotoi* and a common phytoplankton species *Skeletonema costatum* were studied in the laboratory. The four algae were isolated or collected from the coastal waters of China, with alanine, glycine, glutamate and aspartate used as its sole nitrogen source, respectively. Dissolved inorganic nitrogen nitrate and ammonium were used as controls. The results showed that *P. donghaiense* and *P. globosa* were able to utilize multiple free amino acids, while *K. mikimotoi* and *S. costatum* could not grow with amino acids as the sole nitrogen sources under axenic conditions. The specific growth rates of *P. donghaiense* and *P. globosa* were the highest when alanine acted as the sole nitrogen source, followed by glutamate, aspartate and glycine. F_v/F_m values of amino acid treatments declined slightly and slowly in the later growth stage, but still higher than inorganic nitrogen treatments. The maximum uptake rates of *P. donghaiense* and *P. globosa* for alanine were 3.32 and 0.41 pmol·cell⁻¹·h⁻¹, respectively, and the half saturation constants were 6.99 and 20.54 pmol·L⁻¹, respectively. Consequently, the capability of uptake and utilization for DFAAs were significantly different among marine microalgae. In the coastal waters with increasing organic pollution, some harmful phytoplankton species equipped with broader nitrogen niche, such as *P. donghaiense* and *P. globosa* may enhance their competition potential, and even form red tides under suitable environmental conditions.

Key words: [microalgae](#) [HABs](#) [dissolved free amino acid \(DFAA\)](#) [growth rate](#) F_v/F_m [uptake kinetics](#)

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