THE GROWTH PHYSIOLOGY OF *PINGUIOCOCCUS PYRENOIDOSUS* WITH AN EMPHASIS ON FATTY ACIDS

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ABSTRACT

The Pinguiophyceae are a new class of photosynthetic stramenopiles consisting of five monotypic genera. These chromophyte microalgae have an unusually high percentage of polyunsaturated fatty acids (PUFAs), especially eicosapentaenoic acid (EPA), though the function of these compounds within the cell is unknown. This high PUFA content and composition make these algae favorable candidates for mariculture and for the nutraceutical industry. Chosen for this study was one member of this class, *Pinguiococcus pyrenoidosus*, which has been observed to possess lipid-like, electron-transparent vacuoles during late stationary phase growth. This study investigated the physiological ecology and fatty acid chemistry of *Pinguioco. pyrenoidosus* grown in batch and continuous culture. The results revealed that *Pinguioco. pyrenoidosus* appears to be an obligate phototroph, uses ammonium as a nitrogen source, and can tolerate a wide range of salinity. This alga contains a high concentration of EPA and other PUFAs including docosapentaenoic acid (DPA), which was previously undetected in this species. PUFA content and composition increase at lower temperatures and in late stationary phase growth. These data suggest that *Pinguioco. pyrenoidosus* utilizes PUFAs as both storage compounds and regulators of membrane fluidity. Maximum PUFA concentration was found in batch culture during late stationary phase growth whereas maximum PUFA production rates were found in continuous culture and reached a plateau at a growth rate of ~50% μ_{max}.