

COMPARING THE ADAPTIVE STRATEGY OF ANTARCTIC ALGAE TO INCREASING TEMPERATURE WITH THAT OF TEMPERATE AND TROPICAL ALGAE

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Increasing global temperature has significant implications on the survival of microalgae which form the basis of all aquatic food webs. Working with the first Malaysian collection of Antarctic microalgae, we investigated the response and adaptation of algae inhabiting different temperature regimes. We compared similar taxa from the Antarctic (*Chlamydomonas* UMACC 229, *Chlorella* UMACC 237 and *Navicula* UMACC 231), Temperate (*Chlamydomonas angustae* UMACC 247, *Chlorella vulgaris* UMACC 248 and *Navicula incerta* UMACC 249) and Tropical (*Chlamydomonas angustae* UMACC 246, *Chlorella vulgaris* UMACC 001 and *Amphiprora* UMACC 239) regions. The Antarctic, Temperate and Tropical strains were grown over specific temperature ranges of 4 to 30°C, 4 to 32°C and 13 to 38°C respectively. All the Antarctic and Temperate strains had optimum temperatures above the ambient. Of the Antarctic strains, *Chlorella* was eurythermal, but *Navicula* was psychrophilic, being very sensitive to temperature increase. If global warming proceeds as predicted, *Chlorella* UMACC 237 will survive but *Navicula* UMACC 231 will disappear. The percentage of PUFA decreased with increasing temperature in *Navicula* UMACC 231. As temperature increases, the growth and nutritional value of this commonly occurring diatom in Antarctica will decrease, with consequences to the food chain. The Temperate and Tropical strains responded as expected. The upper limit for growth of the Tropical algae was much closer to the ambient than the Antarctic algae. The Antarctic and Temperate strains shared a similar strategy based on the composition of fatty-acids in adapting to increasing temperature. Fatty-acid profiles may be used as biomarkers for temperature stress. In the summer of 2005, the Antarctic strains were exposed to field conditions at Casey Station, Antarctica. Their growth response and biochemical composition were compared with results obtained from the laboratory studies. This research on stress adaptation includes investigations on oxidative enzymes and molecular characterisation of stressed algae.