

Carbon Allocation Strategies in Algae Exposed to Stressful Conditions

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Algae are able to inhabit the harshest and inhospitable biotopes for other organisms. Algae can be found in places such as arid and hot deserts, hot springs, salt pools and pond, freezing and UV rich biomes of Arctic and Antarctica as well as freezing oceans at temperatures close to -10 °C, where they are still able to thrive and perform photosynthesis. In order to survive, acclimate, and adapt to such hostile environments, cells have to utilize several types of mechanisms to counterbalance the effects of adverse stress on their metabolism. There are at least four major sites of responses to abiotic stresses on the level of photosynthesis, membrane, proteins and carbohydrates. Photosynthesis is known to be heavily influenced by abiotic stresses, particularly by the high light and elevated/lowered temperature. The mechanisms of maintenance of effective function of photosynthesis include adjustment of the antenna size, pigment composition, repair of photoinhibited photosynthetic complexes, and also alterations in the carbon fixation and consecutive carbon metabolism. Second site of response is the acclimation on the level of membrane. Upon stress recognition, the homeostasis is being maintained by the *de-novo* synthesis of fatty acids, fatty acid unsaturation (addition of one or more double bonds to the carbon backbone of fatty acids) and/or elongation (addition of more carbons to the fatty acid chain), and finally utilization of storage lipids. The homeostasis on the protein level includes the degradation of proteins that have been damaged by the effect of stress and synthesis of proteins involved in the protection of the cell. The mechanism for keeping carbohydrate homeostasis under stressful conditions consists of carbohydrate biosynthesis and/or degradation based on the type of stress, and under certain stresses also compatible solutes are being synthesized.

This work aimed for understanding the acclimation and adaptation strategies of algae exposed to various environmental stresses.