PHAEODACTYLUM METABOLISM CONVERGES TO PHOSPHOENOLPYRUVATE FORMATION DURING GROWTH UNDER DIFFERENT LIGHT CONDITIONS

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Gigatons of CO2 are yearly converted into organic compounds by photosynthetic organisms and diatoms are among the most important contributors in this process. Both the capacity of carbon fixation and the fate of fixed carbon are strongly impacted by the environmental factors. Because light can constitute a stressful factor when present in inadequate amount, various mechanisms have been developed by diatoms to adapt very efficiently to changing irradiance. The molecular mechanisms on which light acclimation in diatoms relies remain largely unknown. To obtain further information on these mechanisms, the impacts of different growth photon flux densities (30 (LL), 300 (ML), 1000 (HL) µmol m-2 s-1) were studied at the physiological, biochemical and molecular levels in the model diatom Phaeodactylum tricornutum. The integrated results indicate that the impact of ML and HL on diatom cells were similar but quite different from LL. In addition of light and growth phase could affect pigments concentration and primary metabolites. The trend of gene expression coding enzymes in central carbon metabolism pathways differed under LL, but the orientation of the metabolisms was toward either phosphoenolpyruvate (PEP) or pyruvate formation under all three light intensities. LL provided a condition for cells to accumulate chrysolaminarin and lipids, while ML mostly stimulated lipid synthesis. A significant increase in the amount of proteins was observed under HL. We concluded that PEP and pyruvate are key intermediates in diatom to synthesis valuable compounds such as lipids, proteins, aromatic amino acids and polyphenolics.