

CPI大部分缺失影响莱茵衣藻光能转换特性的研究

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用紫外光处理野生型莱茵衣藻 (*Chlamydomonas reinhardtii*) CC-125得到突变体CC-1047。电泳检测证明:突变型衣藻CC-1047缺失了绝大部分色素蛋白复合体I (CPI)。进而详细地研究了CPI的部分缺失对突变型衣藻的光物理和光化学反应的影响。野生型衣藻的低温荧光峰有两个, 分别在691 nm和717 nm左右;突变型CC-1047的低温荧光峰只有一个, 在709nm左右, 且荧光强度增加了3~4倍。709nm的峰被认为是光系统I捕光天线色素所发出的。在突变体中出现的这个峰, 说明天线色素吸收的光能未能传递到光系统I的反应中心, 再进行电荷分离;而是以荧光的形式释放出来, 即从天线色素到反应中心的光能传递不能正常进行。CC-1047的叶绿素荧光动力学也发生了改变, 野生型和突变型的荧光在开启作用光后都很快上升, 但随后野生型的逐渐下降, 而突变型CC-1047的则基本上不下降; 与野生型相比, 突变型衣藻CC-1047的光系统I反应中心色素P700的氧化还原活性降低80%以上, 表明突变型衣藻细胞内与PSI相关的电子传递已不能正常运转。

LIGHT CONVERSION CHARACTERISTICS OF *Chlamydomonas reinhardtii* MUTANT DEFICIENT IN CPI

Mutant *Chlamydomonas reinhardtii* CC-1047 was obtained by UV irradiation. LDS-PAGE showed that most of chlorophyll-protein complex I of photosystem I (PSI) missed in the CC-1047 mutant. The effect of the CPI-deficiency on the photophysical and photochemical characterization of the mutant alga was further studied. At low temperature (77K), there is a high peak (around 709nm) of fluorescence in mutant *C. reinhardtii* that is different from the two-peaks-feature (691nm and 717nm) of wild type. Previous work showed that the 709nm emission is thought to arise from some PSI antennae and is quenched in the wild type by the presence of PSI traps located in CPI. The appearance of the fluorescence peak at 709nm reflects that the light energy absorbed by light harvesting chlorophyll could not be transferred to PSI reaction center to cause charge separation and so the energy was released as fluorescence. On the other hand, from observing the kinetics of fluorescence emission, it showed that after the actinic light was turned on, the fluorescence intensity of both types increased quickly, but then it decreased slowly only in wild-type while in mutant type it almost maintained a higher level. These results indicate that the operation of the electron transport related with PSI was abnormal in mutant *C. reinhardtii*. Compared with wild type, the oxidation-reduction activity of P700 in mutant *C. reinhardtii* was decreased to 20% of that of wild type. These results reflect the light conversion mechanism of related with PSI in the *C. reinhardtii*.

关键词

CPI; 突变体 (Mutant); 光能转换 (Light conversion); 荧光 (Fluorescence)