562(S529)

STUDY OF PHOTOSYNTHETIC METABOLISM AND ACTIVITY OF ENZYME IN SINGLE ROOTED LEAVES OF SWEET POTATO PLACED UNDER SOURCE-LIMITED CONDITION

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The single rooted leaves of sweet potato were introduced to the source-limited condition by active growth of their tubers. 1) These model plants allocated assimilates mainly to their growing tubers but not other organs (leaves, stems, shoots). 2) The source activity in the plants increased with the increase in sink activity in growing tubers. 3) The increase in the source activity was caused to increases in leaf area and photosynthetic activity. 4) The increase in the photosynthetic activity was dependent on increases in activation rate and amount of RuBPcase.

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ULTRASTRUCTURAL LOCALIZATION OF PHOTOSYNTHTIC AND PHOTORESPIRATORY ENZYMES IN EPIDERMAL, MESOPHYLL, BUNDLE SHEATH, AND VASCULAR BUNDLE CELLS OF A C_4 DICOT

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In the leaves of the NAD-ME-type C_4 dicot *Amaranthus viridis* L., there are chloroplasts in the vascular parenchyma cells (VPC), companion cells (CC), ordinary epidermal cells (EC), and guard cells (GC), as well as in the mesophyll cells (MC) and the bundle sheath cells (BSC). However, the chloroplasts of the VPC, CC, EC, and GC are smaller than those of the MC and BSC. In this study, the accumulation of photosynthetic and photorespiratory enzymes in these leaf cell types was investigated by immunogold electron microscopy. Strong labeling for PEPC was found in the MC cytosol, with weak labeling in the CC and GC cytosol. Labeling for PPDK occurred to varying degrees in the chloroplasts of all cell types except CC. Labeling for Rubisco was detected in the chloroplasts of all cell types except MC. For both NAD-ME and glycine decarboxylase (P-protein) intense labeling was found in the BSC mitochondria; weaker labeling was recognized in the VPC mitochondria. These data indicate that when not only the MC and BSC but also the other leaf cell types are included, the cell-specific expression of the enzymes in C_4 leaves becomes more complex than that known previously. These findings are also discussed in relation to the metabolic function.

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ISOLATION AND CHARACTERIZATION OF A PEPC KINASE cDNA CLONE FROM A C4 PLANT, *Flaveria trinervia*

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PEPC activity in C4 plants is regulated by reversible phosphorylation in response to light. The cDNA for specific protein kinase (PEPC-PK) has not been cloned, though some cDNAs for PEPC-PKs from C3 and CAM plants have been isolated recently.

Flaveria is suitable for the research of C4 photosynthesis in two respects, (1) *Flaveria* has both C4- and C3-type species in its genus, (2) *Flaveria* can be relatively easily transformed. In this study, we tried to isolate and characterize PEPC-PK cDNA from *Flaveria*. A complete cDNA clone encoding PEPC-PK was isolated from C4-type *Flaveria* (*F. trinervia*) by screening cDNA library with PCR product prepared by degenerate primers. Sequence analysis revealed that the cloned cDNA contained an ORF for a protein of 281 amino acid residues, and it was composed of the kinase domain only. The mRNAs of PEPC-PK accumulated abundantly in the C4-type *Flaveria*, while they were not detected in the C3-type *Flaveria*. This suggested that this PEPC-PK is mainly involved in the C4 photosynthesis.

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The Expression of C4 Photosynthesis Enzymes and Other Chloroplast Proteins in Maize Seedlings Photobleached by Norflurazon (NF)

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Plant seedlings treated by NF, a carotenoid biosynthesis inhibitor, receive extreme photooxidative damage under high intensity light. Consequently, chloroplasts lose their internal structure and plants are photobleached. These photobleached plants are often used for analysis of crosstalk between nucleus and chloroplasts. It is known that expression of *Cab* and *RbcS* are supressed in photobleached seedlings. Here we investigated the expression levels of nuclear-coded C4 photosynthetic enzymes and other chloroplast destined proteins in photobleached maize seedlings. Cytosol destined PEPC was not affected both at mRNA and protein levels, as previously described. PEPC phosphorylation was also detected. Chloroplast destined PPDK and NADP-ME were not critically reduced in mRNA accumulation, but only PPDK were markedly reduced at protein level. These data suggest a certain crosstalk at or post-transcriptional level. Other chloroplast destined proteins involved in chloroplast biogenesis were also investigated by using antibodies. The expression levels of Tic110 and Toc34 were critically supressed by NF treatment, but those of SecA, chHSC70, GroEL and Cpn20 were not reduced. These data indicated that C4 photosynthesis enzymes and other chloroplast destined proteins are not tightly controled by the presence of photosynthetically active chloroplast.