プラスチドの形成とその分子生物学

1991 Fiscal Year Final Research Report Summary

Plastid Biogenesis and Its Molecular Biology

Research Project

Project/Area Number

02304005

Research Category

Grant-in-Aid for Co-operative Research (A)

Allocation Type

Single-year Grants

Research Field

植物生理学

Research Institution

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Project Period (FY)

1990 – 1991

Keywords

plastids / plastid interconversion / chloroplasts / amyloplasts / multigene family / adenylate translocator / DNA methylation / ferredoxins

Research Abstract

A little is known about plastids, such as chromoplasts, amyloplasts, etioplasts and proplastids in the different organs or tissues of plant, with the same DNA molecules as in chloroplasts. The cooperative research project "Plastid Biogenesis and Its Molecular Biology" was organized by eleven excellent researchers in order to-investigate the problems as follows : 1) Expression and regulation of plastid genes ; 2) Plastid biogenesis and interconversion ; 3) Formation and function of enzyme systems in plastids ; 4) Interaction between plastid genes and nuclear genes encoding plastidic proteins ; 5) Information exchanges between the investigators.

Several plastid protein genes on neclear genome are present as the multigene family. It was confirmed with both levels of protein and gene that their expressions are controlled differentially during the plastid formations in the different plant organs. The plastid interconversions regulated by light and plant hormones were intensively observed by electron microscopy, using a new model system of the carrot root cullus. A new double silicone oil centrifugation method was developed and used for evidence that an adenylate translocator on the inner membrane of the isolated amyloplasts specifically incorporates ADPG for starch synthesis and that sucrose synthase is the key enzyme for biosynthesis of ADPG. Three genes of plastid enzymes related to the fatty acid biosynthesis were cloned and one of them was introduced into the tobacco plant. The transgenic tobacco plant showed the differences in unsaturated fatty acid content of chloroplast and chilling tolerancy.
Some other interesting results on DNA methylation in the control regions of gene, the identification of unknown ORFs and the presence of enzyme system for nitrogen metabolism in root plastids were obtained.

Research Products (18 results)

All | Other

All | Publications (18 results)

[Publications] S.Morigasaki,et al.: "Purification and Characterization of a Ferredoxin-NADP^+ Oxidoreductase-like Enzyme from Radish Root Tissues." Plant Physiology. 93. 896-901 (1990)

[Publications] M.Frehner et al.: "Enzyme Sets of Glycolysis,Gluconeogenesis.and Oxidative Pentose Phosphate Pathway are not Complete in Nongreen Highly Purified Amyloplasts of Sycamore Cell..." Plant Physiology. 94. 538-544 (1990)

[Publications] Y.Ogura et al;: "Gene Encoding a Putative Zinc Finger Protein in Synechocystis PCC 6803." Agric.Biol.Chem.55. (1991)

[Publications] T.Hase et al.: "Molecular Cloning and Differential Expression of the Maize Ferredoxin Gene Family." Plant Physiology. 96. 77-83 (1991)

[Publications] H.Sakakibara et al.: "Molecular Cloning and Characterization of Complementary DNA Encoding for Ferredoxin-Dependent Glutamate Synthase in Maize Leaf." J.Biol.Chem.266. 2028-2035 (1991)

[Publications] H.Kobayashi: "Differentiation of Amyloplasts and Chromoplasts." In Cell Culture and Somatic Cell Genetics of Plants. Vol.7B. 395-415 (1991)

[Publications] S. Morigasaki, K. Takata, T. Suzuki, K. Wada: "Purification and characterization of a ferredoxin-NADP^+ reductase-like enzyme from radish root tissues" Plant Physiol. 93. 896-901 (1990)

[Publications] S. Morigasaki, K. Takata, Y. Sanada, K. Wada, B. C. Yee S. Shin, B. B. Buchanan: "Novel forms of ferredoxin and ferredoxin-NADP reductase form photosynthetic and non photosynthetic tissues of tomato." Arch. Biochem. Biophys.283. 75-80 (1990)

[Publications] M. Frehner, J. Pozueta-Romera, T. Akazawa: "Enzyme sets of glycolysis, gluconeogenesis, and oxidative pentose phosphate pathway are not complete in nongreen highly purified amyloplasts of sycamore cell suspension cultures." Plant Physiol.94. 538-544 (1990)

[Publications] A. M. Viale, J. Ngernprasirtsiri, T. Akazawa: "Characterization and intraorganellar distribution of protein kinases in amyloplasts isolated from cultured cells of sycamore." Plant Physiol.96. 1142-1149 (1991)

[Publications] T. Hase, Y. Kimata, K. Yonekura, H. Sakakibara: "Molecular cloning and differential expression of the maize ferredoxin gene family." Plant Physiol.96. 77-83 (1991)

[Publications] H. Sakakibara, M. Watanabe, T. Hase, T. Sugiyama: "Molecular cloning and characterization of complementary DNA encoding for ferredoxin-dependent glutamate synthase in maize leaf." Biol. Chem.266. 2028-2035 (1991)

[Publications] J. Obokata, K. Mikami, N. Hayashida, M. Sugiura: "Polymorphism of a photosystem I subunit caused by alloploidy in Nicotiana." Plant Physiol.92. 273-275 (1990)

[Publications] Y. Yamamoto, H. Tsuji, N. Hayashida, K. Inoue, J. Obokata: "Nucleotide sequence of cDNA clones encoding PSI-D2 protein of photosystem I in Nicotiana sylvestris." Plant Mol. Biol.17. 1251-1254 (1991)

[Publications] Y. Sasaki, K. Sekiguchi, Y. Nagano, R. Matsuno: "Detection of small GTP-binding proteins in the outer envelope membrane of pea chloroplasts." FEBS Lett.293. 124-126 (1991)

[Publications] Y. Nagano, R. Matsuno, Y. Sasaki: "An essential gene of Escherichia coli that has sequence similarity of a chloroplast gene of unknown function." Mol. Gen. Genet.228. 62-64 (1991)

[Publications] H. Imai, I. Nishida, N. Murata: "Acyl-(acyl-carrier-protein) hydrolase from squash cotyledons specific to long-chain fatty acids : Purification and characterization." Plant Mol. Biol.(1992)

[Publications] K. Kamide, H. Sakai, S. Morigasaki, Y. Sanada, K. Wada: "Specific distribution of ferredoxin isoproteins in photosynthetic and nonphotosynthetic tissues of tomato." Plant Physiol.(1992)

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