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Molecular Mechanism of Plant Development

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Keywords	Epegenetics, Programmed Cell Death, Metacaspase
Technical Support Skills	・ Biochemical analysis(enzyme、protein purification) ・ Molecular biology(gene cloning) ・ Plant tissue and cell culture

Research Contents — Plant Programmed Cell Death and Epigenetics in Reation to Adaptation.

Plants are constantly exposed to abiotic stress such as high or low temperature and drought, or biotic stress such as infection of microorganisms. I am interested in how plant which is sessile organism, cope with environmental changes by means of molecular changes. We study the programmed cell death and the epigenetics in plants as short-time cellular and long-time population response to environmental changes and stresses.

I Plant Programmed Cell Death

Programmed cell death (PCD) is the essential process for development, growth, morphogenesis, immune and homeostasis of plants. To clarify the molecular mechanism of plant PCD will contribute to establishment of technology for improving immunity and productivity of plants,

We have focused the role of metacaspase in plant PCD. Metacaspases is cysteine protease which is distributed in the plant, fungi and protozoan kingdom. It has been expected that plant metacaspase is the counterpart to caspase which controls animal PCD, apoptosis. However, in vivo function of plant metacaspase is poorly understood.

We are studying the function of metacaspase gene in plant PCD by using metacaspase gene-deficient mutants of Arabidopsis. and also the biochemical property of metacaspases by using gene recombination into E. coli.

II Plant Programmed Cell Death

Epigenetics refer to (the studies on) stable heritable changes in phenotypes that are not associated with changes in DNA sequence. Genomic DNA methylation, one of the molecular mechanisms of epigenetics, is thought to change the phenotype by bringing about a change in gene expression. It has been reported that changes in DNA methylation occur in plants and animals that have undergone various environmental stresses. Therefore, mechanisms have been proposed in which changes in the environment lead to changes in DNA methylation, which lead to changes in gene expression and exhibit environmentally adapted phenotypes. However, there are few reports that demonstrate such a mechanism working in natural plant populations.

Plants in which a true individual is consisting of plural functional individuals (ramet) linked by rhizomes and stolons, are called clonal plants. The ramets of the clonal plant is suitable for epigenetics studies because their DNA sequence is identical as in the case of human monozygotic twins. Moreover, epigenetics is supposed to plays an important role in environmental adaptation of clonal plants. The goal of this research is to clarify the change and inheritance of DNA methylation in the natural population of clonal plants and their relationship with the environmental variation and gene expression.

Available Facilities and Equipment

Thermal cycler x2(Takara, Applied Biosystem)	
Flow cytometer(facs, BD)	
Chemiluminescence photography apparatus(Biorad)	