

Biology

Why Do Plants Produce Medicinal Substances? Clarification of Genomic Basis for Plants' Chemical Diversity

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Background of Research

Plants are thought to produce metabolites which number from 200,000 to 1,000,000 in variety, which far exceeds the total number of metabolomes (sum of metabolites found in a cell) produced by mammals including human. Consequently, by solving the problems related to the principle and significance of such chemical diversity, we can not only get close to the foundation of life strategy of plants but also freely produce useful plant compounds (medical products, food, bio energy materials, and more) by applying the found principle and implementing a rational strategy.

Functional genomics that has begun with the recently promoted genome sequencing is the key to approaching the foundation of this research field. The genome research can dramatically clarify the principle of the biosynthesis and control system of plant components at a genomic level, the biological significance in a particular plant kind, and the trace as well as process of evolution, and thus propose a rational path to biotechnology that is based on Genomics.

Achievements of Research

In promoting the functional genomics research of plants, in addition to the exhaustive study of genetic expression (transcriptomics), we have been undertaking metabolomics research, a comprehensive study on metabolites, ahead of the rest of the world.

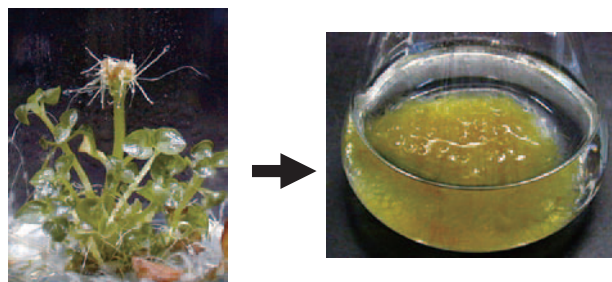
Arabidopsis thaliana is a small plant of brassica family, and it is useful for research due to its preset genomic size and short period of generations. For this reason, we took up this plant and vigorously conducted research for integrated analysis of metabolomics and transcriptomics. As a result, we have been able to identify a number of novel genes related to production of useful plant components (health function components including sulfur, anthocyanin having an antioxidative effect, etc). Another remarkable achievement of our study is that the papers we published discussing these research results were

ranked at the top for citation in the field of plant biotechnology.

In addition, we applied this method to the medicinal plants for making anti-cancer compounds in medicinal plants used as natural or Chinese herbal medicine, and as a result identified the genetic elements that produce medicinal properties including anti-cancer compounds. We also clarified the reason why such medicinal plants have resistance against the toxic components they themselves produce (since medicinal substances are toxic at the same time).

Prospect of Research

Our research is expected to be of help for solving the current problems regarding health, food and environment that mankind is facing, by rationally utilizing the potential capabilities of plants for producing medicinal substances.



Induction of Highly Productive Organism from Medicinal Plant Producing Anti-Cancer Properties