Organizer's Overview

Plant Biotechnology required on the earth of the 21st century

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Molecular breeding is one of the most useful methods for producing plants with superior quality. Genetically modified organism (GMO) technology has been very successful in improving crop quality. GM crops were first put on the market in the early 1990s, and many varieties of GM crops derived from soybean, corn, canola and cotton have been commercialized. Controversies surrounding GM crops commonly focus on human health and environmental safety, but many studies have proven their safety and utility. The total surface area of land cultivated with GM crops increased to 1,140,000 km^2 in 2007, of which 70 percent were in the United States.

In addition to the benefits to agricultural production, plant biotechnology could contribute to solving the environment and energy problems, which endangers the future of earth in the 21st century. Bio-refinery systems, including bio-fuel production, have become an especially important research topic in the field of plant science. Starchy and cellulosic materials of plant origin are the most abundant utilizable and renewable biomass resources. Fuel ethanol has already been produced from sugar cane and starch-rich grains in Brazil and the United States, and the level of alcohol production is increasing rapidly (see opinion by Shinmyo). However, alcohol production from starchy and cellulosic materials remains unfeasible economically, and the development of a more effective and high-yield ethanol production system is required in order for biomass to be used as a universal substitute for petroleum. Molecular breeding to increase plant biomass production, as well as improve qualitative and quantitative properties of cellulosic compounds in the plant cell wall, should be prioritized, both regarding the consolidated bio-refinery system and the optimization of the fermentation process. In order to achieve our targets, we must accumulate and combine a great many results derived from basic research in the plant sciences. This research should include investigations of the molecular mechanisms of environmental stress responses, photosynthesis, and the development of the plant body plan.

The JSPS colloquium "Frontiers in Plant Biotechnology" was held in collaboration between Stockholm University and Nara Institute of Science and Technology (NAIST) in Stockholm on 4 October 2007. Since Sweden is a pioneer in bio-fuel and environmental biotechnology, and Japan is very active in research of the plant molecular biology, that the conference represented a valuable opportunity for scientists involved in plant biotechnology in both countries to meet each other and intensively discuss research topics of mutual interest. Papers presented in the colloquium are presented in this special issue of *Plant Biotechnology*, in the hope that these proceedings will help to stimulate collaboration toward shared goals by researchers in both countries.

The colloquium was initially planned by Professor Hiroshi Sano at the Stockholm Office of the Japanese Society for the Promotion of Science (JSPS). He contacted Professors Birgitta Bergman (Stockholm University) and Atsuhiko Shinmyo (NAIST), who gladly agreed to serve as the organizers of the meeting. Consequently, the colloquium was organized and managed by the JSPS Stockholm Office staff, and the proceedings of the meeting are published as a special issue of this journal, using budget provided by JSPS. Participation and presentation by graduate students from NAIST was supported by the Global COE Program at NAIST, "FrontierBiosciences: Strategies for survival and adaptation in a changing global environment", the Ministry of Education, Culture, Sports, Science and Technology (MEXT), Japan. We would like to thank Professor Birgitta Bergman and Professor Sophia Ekengren (Department of Botany, Stockholm University) for their work in arranging the colloquium and reviewing manuscripts by Swedish participants. We would also like to thank the staff of the Stockholm office of JSPS for their devoted support in preparing and managing the colloquium. We wish to express our sincere gratitude to Professor Masaaki Umeda in NAIST, the editor-in-chief of *Plant Biotechnology*, Ms. Kuniko Yasumi, the manuscript manager and all the editors and reviewers concerned in this process, for their helpful advice and support.

It is with great sadness that we report the untimely death of Dr. Kazuya Yoshida on May 30, 2008. He will be remembered warmly by all who participated in last year's JSPS colloquium, as well as for his contributions as an associate editor of *Plant Biotechnology*.
Masaaki Umeda, Editor-in-Chief of *Plant Biotechnology*