Significance of plant biotechnology to overcome the crisis of biosphere in the coming 21st century

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The most serious problem, which we, human beings, shall face in the 21st century, is how we can overcome the crisis in the biosphere that will occur on this planet.

There are two reasons why we should anticipate a crisis in the biosphere. One is that we shall be unable to achieve a sufficient level of agricultural production to support an explosively increasing population, which will result in human starvation.

The other is that all the life on this small planet will be jeopardized by destruction of environments, caused by pollution, global warming and desertificaion of lands which are due to increases in industrial production for raising the standard of living and excess usage of fertilizers, herbicides and pesticides for promotion of crop production.

Plant science should play a leading role in the rescue of human beings from the crisis in the biosphere ; plant biotechnology can improve functions of crops to promote food production rapidly and efficiently.

Plant biotechnology also can produce plants resistant to environmental stresses such as drought, salinity and coldness and thus would expand land available for cultivation. It is also possible to produce crops resistant to diseases and insects using plant biotechnology to suppress the excess usage of agricultural chemicals such as herbicides and insecticides.

Woody plants also play important roles in the suppression of the increase in CO_2 in the atmosphere, and to produce plant biomass. Plant biotechnology can improve the functions of woody plants and provide seedlings in a large scale to replace the destroyed tropical forests to preserve environments.

Agriculture in the 21st century should be the sustainable agriculture. Crops can be improved by cellular breeding as well as traditional breeding which will be still very important in the next century. We can minimize usage of herbicides and pesticides by production of disease and insect resistant crops. Minimum using of fertilizers can be achieved by production of crops which can utilize efficiently nutrients. Production of crops resistant to low temperature, drought and salinity will result in expansion of land for cultivation. We can improve crops to give rise to high yield.

Thus, "the low input and high output agriculture", the sustainable agriculture, will be possible to establish by plant biotechnology, and the preservation of environments and sufficient production of crops to support the increased population will be achieved by plant biotechnology, which should result in rescue of human beings from the crisis.

Finally, I would like to mention that complete understanding of plant functions is the prerequisite for the applications of plant functions to biotechnology. In this context, I emphasize the importance of basic researches of plant sciences. Without advances in basic researches, applications of plant functions to biotechnology could not be achieved. Excellent results presented in this Symposium will surely contribute to the rescue of human beings from the crisis in the biosphere in the coming century.