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Keynote Forum

(Day 1)

Peter M Gresshoff, Adv Crop Sci Tech 2016, 4:3 (Suppl)
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Peter M Gresshoff

The University of Queensland, Australia

Genomics and genetics to analyze nodulation regulation of legumes

Legume plants, like peas, beans, medics and soybeans, have the ability to interact with prokaryotes like *Bradyrhizobium* and Rhizobium to develop novel root organs called 'nodules'. These house the inducing bacterium to develop a nitrogen-fixing symbiosis that benefits the plant, the bacterial population and resultant agronomy/economy/environment. Genetics and coupled genomic approaches have opened our understanding of the underlying processes related to the nodule ontogeny. Recent advances have clarified further the molecular mechanisms of control of the basic steps of ontogeny. Thus the molecular signals initiating 'Autoregulation of Nodulation (AON)', the critical receptor kinase in the leaf tissue (GmNARK in soybean) and the subsequent signaling cascades of shoot-derived inhibition have been revealed. Plant peptides, LRR receptor kinase, microRNA, cytokinin hormone and transcriptional factors are directly involved. Amazingly the revealed mechanisms appear to be common among all legumes, suggesting possibilities to improve the nitrogen-fixing potential of many crop legumes through lateral transfer of information and technology.

Biography

Peter M Gresshoff is a Professor of Botany at The University of Queensland and Director of the Australian Research Council's (ARC) Centre of Excellence in Integrative Legume Research. He has received his PhD in Genetics from ANU, Canberra in 1974 and DSc in Molecular Genetics in 1988. In his 40 year career in plant science, he has developed deep interests in plant development and its genetic control. He has focused his interests on legume plants and especially the process of root nodulation which is a prerequisite for symbiotic nitrogen fixation. He has published over 300 research papers, edited 10 books and is Co-Inventor listed on 12 patents. He is a fellow of the Indian National Academy of Agricultural Sciences, the Russian Academy of Agricultural Sciences and the American Association for the Advancement of Science (AAAS). He is a Member of numerous international Editorial Boards as well as expert Advisor to the IAEA, the European Union, Qantas and other biotechnology interests. He is a dedicated Teacher and Researcher and feels that the understanding of biological processes is essential for industrial development of an idea.

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Yinghua Huang, Adv Crop Sci Tech 2016, 4:3 (Suppl)
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Yinghua Huang

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Genomics generates new insights into host plant defense and offers novel strategies for crop protection

Plant diseases and insect pests are the important threats to agricultural production and crop losses to diseases and insects can be greater than ~30% of the annual global production. Managing the health of crop plants to assure sustainable agricultural production can be very challenging. However, rapid advances in plant genomics are evolving our ability to analyze plant-pest interactions for a better understanding how host plants defend themselves against those attackers. In recent years, we have been developing and applying these sophisticated genomic tools to examine interactions between crop plants and pests to elucidate the genetic mechanisms of plant resistance and to fill the gap existing between genotype and phenotype of crop plants. Furthermore, the rapid development of high throughput technologies and the availability of immense amount of genomic and genetic data will provide system approaches for understanding and solving the remaining questions on host plant defense against attacking pests. This presentation reports the recent findings in the above mentioned research and demonstrates how genomics approaches can facilitate both the identification and use of resistance genes to diseases and insect pests and the development of novel resistant hybrids and varieties to achieve environmentally friendly crop protection and sustainable crop production.

Biography

Yinghua Huang is a Research Geneticist for US Department of Agriculture and serves as the Lead Scientist for the Plant Genetics Program. He has served as Faculty Member for Oklahoma State University for ten years and remains an Adjunct Professor at the university. He is a Member of Editorial Boards for several scientific journals. He has earned his PhD in Biological Sciences from Michigan Technological University. His scientific background is in plant genetics and molecular biology and he has considerable research experience in plant biotechnology, genomics and crop improvement. The overall goals of his research are to conduct basic studies to enhance our understanding of biological processes in plants, to apply newly developing genomics and biotechnologies to facilitate genetic improvement of crop plants and finally to improve the production system for a better utilization of agricultural and natural resources.

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Meixue Zhou

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Adapt agriculture to changing environment: Introgressing stress tolerance genes to varieties through conventional breeding

Climate is changing so we need to change, so does the plant. Plant breeders have been trying to develop stress tolerant crops using genetic variation in crops at intraspecific, interspecific and intergeneric levels. Two main approaches were employed: Traditional breeding and transgenic approach. Traditional breeding relies largely on the natural intraspecific genetic variations. When introducing a gene from different species, there is not much success due to reproductive barrier and/or the risk of other undesirable traits transferred with the target traits. To avoid this problem, genetic engineering strategy is more preferred, as it only deals with the specific genes transferred. Many abiotic stress tolerance genes have been successfully expressed in intergeneric species. Without any doubt, transgenic technology will continue to aid the search for the cellular mechanisms that underlie tolerance. However, the public acceptance of transgenic plants may face consumer backlash, which limits the use of transgenic approaches in improving abiotic stress tolerance. An effective procedure of introgressing stress tolerance genes to varieties through backcrossing program has been developed. Assisted with molecular markers, this procedure will make it possible to breed varieties or pre-breeding materials with added specific genes within 2-3 years. To achieve this, we need the genes making significant contribution to the traits, molecular markers closely linked to the genes and techniques to speed the process. Detailed requirements and technique will be discussed.

Biography

Meixue Zhou has been involved in plant research for more than 30 years which includes more than 10 years of experience in China. His major research areas include physiological and molecular mechanisms of plant biotic and abiotic stress tolerance. He is serving as a Review Panel Member for ARC of Australia and the Natural Science Foundation of China. He is the Co-Director of Australia China Research Centre of Plant Stress Biology. He has published more than 100 papers in various peer-reviewed journals. He is a Member of Editorial Board of several journals.

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