Description of the course contents

The course will cover the fundamentals of epigenetics and its potential role in abiotic and biotic stress adaptation by plants. Mechanisms of and functions of DNA methylation and demethylation, and various histone modifications will be presented. A particular focus will be on RNA-directed DNA methylation and other connections between RNAi and epigenetic regulation. Recent literature on stress-induced changes in DNA methylation and/or histone modifications will be discussed. Plant disease resistance, defense responses and small RNAs contributors to plant innate immunity will be examined.

Suggested readings

Matzke M, Kanno T, Huettel B, Daxinger L, Matzke AJ. Targets of RNA-directed DNA methylation. Curr Opin Plant Biol. 10: 512-519.

Chinnusamy V, Zhu JK. 2009. RNA-directed DNA methylation and demethylation in plants. Sci. China C Life Sci. 52: 331-343.

Chinnusamy V, Zhu JK. 2009. Epigenetic regulation of stress responses in plants. Curr. Opin. Plant Biol. 12: 133-139

Pisa, September 2009

Prof. Luca Sebastiani

The participation to the course is free of charge but registration for students external to Sant'Anna University is compulsory for logistic problems. If the seminars will be overbooked, priority to external participants will be given to registered participants on the base of "first-come-first-served". An upper limit might be placed on the number of allowed participants for a given Institute.

Registration Card (deadline 15 October 2009)
(Only for external participants):

Name: _____

Surname: _____

Affiliation: _____

_____

_____

Telephone: _____

Fax: _____

E-mail: _____

Signature: _____

The personal data supplied by the applicants will be processed by the Scuola Superiore Sant'Anna in accordance with Art. 11 of the Legislative Decree No. 196/2003 ("Code concerning the Protection of Personal Data").

Send by Fax to:

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SCUOLA SUPERIORE SANT'ANNA · PISA ·

Ph.D. Programme in "Agrobiosciences"

Seminars on:

Epigenetic control of plant stress response

26th October 2009

9:30

Aula Magna
Scuola Superiore S.Anna
Piazza Martiri della Liberta, 33
Pisa

Prof. Dr. **Jian-Kang Zhu**

Dr. Zhu is Jane S. Johnson Professor of Plant Biology at the University of California, Riverside. From 2004 to 2006, he served as director of the Institute for Integrative Genome Biology at UC Riverside. He has previously worked at other academic institutions such as the University of Arizona, Auburn University and Rockefeller University.

His research focuses on the molecular mechanisms underlying plant responses to harsh environments such as soil salinity, drought and cold temperatures. In addition, he is interested in the mechanisms of gene silencing and in the role of epigenetic gene regulation in stress adaptation. He uses a combination of genetic, biochemical, genomic and proteomic approaches to analyze various levels of gene regulation (chromatin level/epigenetic, transcriptional, post-transcriptional and protein activities) and to understand stress signaling and stress tolerance. Dr. Zhu's research group identified a number of key genes for plant salt and drought stress tolerance, and discovered a mechanism of active DNA demethylation that is critical for epigenetic gene regulation. He has authored more than 140 journal articles and was recently recognized as the most cited plant scientist in the United States for the period of 1997–2007.

Dr. Zhu holds various professional memberships, and is a fellow of the American Association for the Advancement of Science and a recipient of the Charles Albert Shull Award from the American Society of Plant Biologists for his outstanding contributions to plant biology. He was recognized as the Researcher of the Year in the College of Agriculture and Life Sciences at the University of Arizona in 2002, and received the Distinguished Agricultural Alumni Award from Purdue University in 2005. He also serves on the editorial boards of several international life science journals.

Dr. Zhu earned a bachelor's in Soil Science and Agricultural Chemistry from Beijing Agricultural University in 1987 a master's in Botany from the University of California, Riverside, in 1990, followed by a doctorate in Plant Physiology from Purdue University in 1993.

Prof. Dr. **Hailing Jin**

Dr. Jin is Associate Professor & Associate Molecular Geneticist at the Department of Plant Pathology and Microbiology, University of California, Riverside. She studies the molecular mechanisms of small RNA-mediated gene regulation in plant disease resistance and defense responses. Small RNAs, including microRNAs (miRNAs) and small interfering RNAs (siRNAs), have emerged as important regulators of eukaryotic gene expression by guiding mRNA cleavage, translational inhibition or chromatin modification. siRNA-induced gene silencing is a conserved regulatory process that has evolved as an antiviral defense mechanism in plants and animals. However, it is not known whether host cells also use siRNAs as an antibacterial or antifungal defense mechanism in eukaryotes.

The discovery of a bacteria-induced Arabidopsis siRNA in Dr. Jin's lab provided the first example of the regulatory role of siRNAs in bacterial resistance and plant immunity. Functional analysis of the siRNA target identified a putative negative regulator of the resistance gene RPS2 signaling pathway. This study suggests a broader role forsiRNAs in host-defense mechanisms. The goal of her research is to identify and characterize pathogen-inducible endogenous small RNAs and understand their regulatory mechanisms in gene expression reprogramming during the host defense responses. The aim is to identify novel signaling components within disease resistance network and to elucidate the crosstalk between multiple signal transduction pathways. A combination of functional genomics, molecular genetics and biochemical approaches are applied.

PROGRAM

9:30-10:45

Introduction to epigenetics-DNA methylation and the histone code

Lecturer: Dr. Jian-Kang Zhu

10:45-11:15 Coffee Break

11:15-12:30

Epigenetic regulation and stress adaptation

Lecturer: Dr. Jian-Kang Zhu

12:30-14:00 Lunch Break

14:00-15:15

Plant disease resistance and defense responses

Lecturer: Dr. Hailing Jin

15:15-15:30 Break

15:30-16:45

Host small RNAs are big contributors to plant innate immunity

Lecturer: Dr. Hailing Jin

16:45-17:30
General Discussion