CURRICULUM VITAE

Dongping Lu, Ph.D.

1. EDUCATION

- Ph.D., Department of Molecular Biosciences & Bioengineering, the University of Hawaii at Manoa, Honolulu, HI. USA. September 2001- December 2007;
- M.S., Institute of Botany, Chinese Academy of Sciences, Beijing. September 1998- July 2001;
- B.S., Department of Biology, Inner Mongolia University, China. September 1994- July 1998

2. PROFESSIONAL EXPERIENCE

- Professor, Research Center for Agricultural Resources, Institute of Genetics and Developmental Biology, Chinese Academy of Sciences, October 2012- present;
- Assistant Research Scientist, Department of Biochemistry and Biophysics, Texas A & M University, February 2011 - September 2012;
- Postdoctoral research associate, Department of Biochemistry and Biophysics, Texas A & M University, February 2009 - February 2011;
- Postdoctoral fellow (Optional Practical Training), Department of Oceanography (Division of Biological Oceanography), University of Hawai`i at Manoa, February 2008 - October 2008

3. HONORS AND ACADEMIC AWARDS

None

4. MAJOR RESEARCH INTERESTS，SELECTED RESEARCH PROJECTS, research background, major research achievements, current research and future directions

1) MAJOR RESEARCH INTERESTS

- The regulatory role of protein ubiquitination in plant innate immunity;
- The crosstalk between the plant innate immunity signaling and other plant signaling pathways;
- The molecular mechanism of interaction between plant and *Magnaporthe oryzae*

2) SELECTED RESEARCH PROJECTS

The project 1: The ubiquitination network in plant innate immunity, awarded by the National Science Foundation to Outstanding Young Scientist;

The project 2: The regulatory role of E3 ubiqitin ligase BAR1 in plant innate immunity, awarded by the National Science Foundation;

The project 3: The identification of molecular module mediating resistance to *Magnaporthe oryzae*, awarded by Chinese Academy of Sciences

3) RESEARCH BACKGROUND

Plants and animals are exposed to an environment full of microorganisms and have to contend with the risk of infection. One evolutionarily ancient immune system, “innate” immunity, is present in both plants and animals. The innate immune system provides the first inducible barrier against pathogens. The immunity signaling is initiated via the perception of pathogen-associated molecular patterns (PAMPs) by pattern recognition receptors (PRRs) localized on the cell surface, or recognition of pathogen effectors by R proteins. And they are termed as (PAMP)-triggered immunity (PTI) and effector-triggered immunity (ETI), respectively. In PTI, the plasma membrane receptor FLAGELLIN SENSING2 (FLS2), the best characterized PRR in plants, confers immunity against bacterial infection through perception of flagellin (flg22). Flagellin

binding triggers the rapid association of the FLS2 with BAK1 (brassinosteroid insensitive1-associated kinase1) and its close homologue BAK1-like1 (BKK1). Then the immune signal is transuded to downstream and launch immunity response. To overcome PTI, successful pathogens exploit effectors, which target immunity components and suppress plant immunity signaling. Recognition of pathogen effectors by plant resistance (R) proteins, either directly or indirectly, always results into defense response of hypersensitive response (HR).

Although the PTI signaling mediated by FLS2 is well studied, how the MAMP signal is transmitted from the BAK1-associated receptor complexes at the plasma membrane to intracellular events is still poorly understand. At the same time, the intensity and duration of immunity signaling must be tightly controlled. Among the ways employed by animal cells to tailor immune response, ubiqitination-mediated protein degradation, especially immune receptors, represents one important pathway to down-regulate immune signaling. However, the role of ubiquitination in the regulation of plant innate immunity remains largely unknown.

4) MAJOR RESEARCH ACHIEVEMENTS

(1) Direct ubiquitination of FLS2 attenuates plant innate immunity

As in animal, the plant immune receptor FLS2 signaling is attenuated by the similar mechanism of receptor ubiquitination and subsequent degradation. Flagellin induces recruitment of two U-box E3 ubiquitin ligases, PUB12 and PUB13, to FLS2 by BAK1. BAK1 phosphorylates PUB12 and PUB13. The association between FLS2 and PUB12/13 requires BAK1. PUB12 and PUB13 directly ubiquitinate FLS2 and promote flagellin-induced FLS2 degradation. The *pub12* and *pub13* mutants exhibited elevated immune responses. Thus, It is worthy to note that FLS2-PUB12/13 represents a unique regulatory circuit, and the direct ubiquitination and turnover of FLS2 is mediated by a third protein, BAK1, which also participates other immune receptors mediated signaling as well.

Lu D, Lin W, Gao X, Wu S, Cheng C, Avila J, Heese A, Devarenne TP, He P, Shan L. (2011) Direct ubiquitination of pattern recognition receptor FLS2 attenuates plant innate immunity. **Science**. 332(6036):1439-1442.

(2) BIK1 associates with FLS2 receptor complex to initiate innate immunity

The discovery of BIK1 was originated from the observation that BIK1 transcripts were induced by flagellin. Furthermore, BIK1 is rapidly phosphorylated upon flg22 perception. The phosphorylation of BIK1 could be easily detected by western blot as a mobility shift. BIK1 is localized on plasma membrane and associates with membrane-localized FLS2 and BAK1. And the association is reduced after flagellin perception. Thus BIK1 might be released from receptor complex to propagate MAMP signaling from plasma membrane.

Lu D, Wu S, Gao X, Zhang Y, Shan L, He P. (2010) A receptor-like cytoplasmic kinase, BIK1, associates with a flagellin receptor complex to initiate plant innate immunity. **PNAS**. 107(1):496-501.

5) CURRENT RESEARCH

(1) The ubiquitination network in plant innate immunity

In animal, ubiquitination have been proved to play very significant roles in regulating immunity. In order to understand the fine-tuning mechanism of plant PTI signaling, we are trying to explore and construct the ubiquitination network during PTI signaling from two opposite directions: both from E3s to substrates and from substrate to E3s. Moreover we are going to elucidate the roles of the ubiquitination network on regulation of plant innate immunity.

(2) The crosstalk between the innate immunity signaling and the other plant signaling pathways

We have found that there are a couple of key nodes in plant innate immunity signaling, which are involved in other plant signaling as well. We are trying to elucidate the mechanism of the crosstalk between immunity signaling and any other related signaling.

(3) The identification of molecular module mediating plants resistance to *Magnaporthe oryzae*

We are trying to identify the molecular modules that could be the genetic material underlying the plant resistance to *Magnaporthe oryzae*.

6) FUTURE DIRECTIONS

(1) Continue to study the ubiquitinition and deubiquitination in plant innate immunity signaling;

(2) Continue to study the crosstalk among plant innate imunity signaling and any other related plant signaling;

(3) Further study the Mechanism of Interaction between Plant and *Magnaporthe oryzae*, identify potential effectors from the fungi

5. FUNDING AND LABORATORY PERSONNEL

1) FUNDING

- 1000 talents for young scientists, 2013.01-2016.12，￥3,000,000
- The identification of molecular module mediating plants resistance to *Magnaporthe oryzae*, Chinese Academy of Sciences, 2013-2014.12, ￥1,000,000

2) LABORATORY PERSONNEL

Assistant Professor:

Dr. Yanmin Zou, Dr. Yanjie Luo, Dr. Dedong Yin

Ph.D. Student：

Fenggui Fan, Shuangfeng Wang, Guozhong Huang

Master Student:

Jianhang sun, Tianhua Liu, Jiaojiao Bai, Jun Liu

Project Research Assistant：

Yufang Hna, Yinyin Zhang, Wan Zhang

6. SELECTED PUBLICATIONS, PATENTS GRANTED，VARIETIES OBTAINED, major invited international conference talks

None

7. EDIRORIAL DUTIES

Reviewer for Journal of Experimental Botany, Plant Cell Report, and Science China

8. CONFERENCE ORGANIZATION

None