

## INFORMATION ON DOCTORAL THESIS

1. Full name: TRAN LAN DAI
2. Sex: Female
3. Date of birth: 16/09/1990
4. Place of birth: Phu Yen
5. Admission decision number: No. 139/QĐ-CNSH date on 11/7/2017 by Director of Institute of Microbiology and Biotechnology
6. Changes in academic process:
  - Changed thesis title, supervisors and extended study period (decision number: No. 320/QĐ-CNSH date on 26/12/2019 by Director of Institute of Microbiology and Biotechnology)
  - Stopped studying (decision number: No. 162/QĐ-CNSH date on 21/06/2022 by Director of Institute of Microbiology and Biotechnology)
  - Changed thesis title (decision number: No. 267/QĐ-CNSH date on 21/11/2022 by Director of Institute of Microbiology and Biotechnology)
7. Official thesis title: Study on improving bacterial leaf blight resistance in the Vietnamese rice cultivar TBR225 mediated CRISPR/Cas9 technology
8. Major: Biotechnology
9. Code: 9420201.01
10. Supervisors: Prof. Dr. Pham Xuan Hoi  
Dr. Nguyen Duy Phuong
11. Summary of the new findings of the thesis
  - Isolated and identified 15 *Xoo* isolates from the northern provinces in Vietnam (VXO) that are highly virulence in rice cultivar TBR225; the initial determination of the molecular pathogenic mechanism of representative VXO isolates. Specifically, VXO\_11 isolate with AvrXa7 TALE induces susceptibility gene *OsSWEET14*; VXO\_80 and VXO\_100 isoalates with two different TALE PthXo2(A) and AvrXa7 induce both susceptibility genes *OsSWEET13* and *OsSWEET14* in rice cultivar TBR225.

- Constructed a transgenic vector, which harbored the expression structure of CRISPR/Cas9 system, is able to simultaneous editing of 4 different positions in the rice genome.

- Obtained 11 TBR225 edited-lines that harbored mutation in *OsSWEET14* gene and T-DNA free; 3 lines in which are completely resistance against VXO\_11 isolate and moderately resistance/susceptibility against VXO\_80 and VXO\_100 isolates.

- Obtained 12 TBR225 edited-lines that harbored mutation in both *OsSWEET13* and *OsSWEET14* genes and T-DNA free; 6 lines in which are broad-spectrum resistance against experimental VXO isolates.

- All of TBR225 edited-lines have the same major agronomic traits as the wild type TBR225 (non-transgenic).

#### 12. Practical applicability, if any:

The broad-spectrum bacterial leaf blight-resistant gene-edited TBR225 rice line created by CRISPR/Cas9 technology, if developed, can contribute to improving not only the yield of the main rice variety in the North of Vietnam in particular but also economy of local people. The success of the thesis also create the prospect of gene editing research to improve yield, tolerance and quality of other plant varieties in Vietnam.

13. Further research directions, if any

- Analysis of genetic stability, evaluation of *OsSWEET13*, *OsSWEET14* gene expression and resistance to bacterial leaf blight of rice lines with simultaneous editing of 2 promoters *SW13-TBR* and *SW14-TBR* in the next generations (T2, T3...)
- Collect and analyze the TALome of the Vietnamese *Xoo* bacterial population to have a suitable strategy for research and breeding of broad-spectrum and sustainable bacterial leaf blight-resistant plants.
- Expanding research on gene editing to improve bacterial leaf blight resistance by CRIPSR/Cas9 system on other major rice varieties.

14. Thesis-related publications:

[1]. Phuong Nguyen Duy<sup>co</sup>, **Dai Tran Lan**<sup>co</sup>, Hang Pham Thu, Huong Phung Thi Thu, Ha Nguyen Thanh, Ngoc Phuong Pham, Huong Bui Thi Thu, Tran Bao Manh, Sebastien Cunac, Hoi Xuan Pham (2021), “Improved bacterial leaf blight disease resistance in the major elite Vietnamese rice cultivar TBR225 via editing of the *OsSWEET14* promoter”, *Plos One* 16(9), pp. e0255470.

[2]. Pham Thu Hang, **Tran Lan Dai**, Nguyen Van Cuu, Pham Thi Van, Do Thi Hanh, Pham Xuan Hoi, Nguyen Duy Phuong (2021), “A protocol for *Agrobacterium*-mediated transformation in TBR225 rice variety”, *Science and Technology Journal of Agriculture and Rural Development* 18, pp. 66-73

[3]. **Tran Lan Dai**, Pham Thu Hang, Pham Thi Van, Cao Le Quyen, Pham Xuan Hoi, Nguyen Duy Phuong (2022), “Genetic identification of target mutations in TBR225 plants transformed *OsSWEET14* promoter-edited TBR225 rice CRISPR/CAS9 construct”, *Vietnam Journal of Agricultural Sciences* 20(5): 576-583

[4]. **Tran Lan Dai**, Phung Thi Thu Huong, Cao Le Quyen, Nguyen Van Cuu, Nguyen Thi Thu Ha, Pham Xuan Hoi, Nguyen Duy Phuong (2022), “Design of TDNA construct for editing *SWEET* genes involved bacterial leaf blight disease in

TBR225 rice variety”, *Science an technology Journal of Agriculture and Rural Development, Science and Technology Journal of Agriculture and Rural Development* 11, pp. 11-18.

[5]. Pham Phuong Ngoc, **Tran Lan Dai**, Do Thi Hanh, Nguyen Quang Huy, Nguyen Duy Phuong (2022), “Functional characterization of the *OsSWEET13* promoter involved in the infection of *Xanthomonas oryzae* pv. *oryzae* (*Xoo*) in rice cultivar TBR225”, *Academia Journal of Biology* 44(3), pp. 57-65.

Date:08/08/2023

**Academic supervisors**

**PhD Student**

**The first supervisor**

**Prof. Dr. PHAM XUAN HOI**

**Tran Lan Dai**

**The first supervisor**

**Dr. NGUYEN DUY PHUONG**