

Pawonrat Patipipat 2014: Cloning of *Arsenate reductase* and *Phytochelatinsynthase* genes related to arsenic response in Khoaw Dok Mali 105 rice. Master of Science (Genetics), Major Field: Genetics, Department of Genetics. Thesis Advisor: Associate Professor Pattana Srifah Hunhne, Ph.D. 99 pages.

Accumulation of arsenic (As) in plant at high level can severely inhibit plant growth. Therefore, when plants uptake arsenic substance into root cells, arsenic detoxification mechanism in plant cells is activated by major enzymes such as arsenate reductase (AR) and phytochelatinsynthase (PCS). In this study, two involving detoxification genes were cloned from root of arsenic-treated *Oryza sativa* L. ssp. *indica*, cv. Khao Dawk Mali 105 (Jasmine rice). The results showed that the cloned gene consists of 414 bp encoding a polypeptide with 137 amino acids long. This encoded amino acid sequences contain the consensus motif HisCys(X)<sub>3</sub>Arg that is essential for reductase activity and are similar to the arsenate reductase polypeptide from African rice (*Oryza glaberrima* Steud.). Moreover, the partial *phytochelatinsynthase* gene, containing 1,251 bp, was successfully cloned. The obtained *phytochelatinsynthase* gene encoded for 416 amino acid polypeptides which highly related to phytochelatinsynthase from wheat (*Triticum aestivum* L.). The deduced amino acid sequence contained consensus motif CysCys(X)<sub>3</sub>Cys(X)<sub>2</sub>Cys at C-terminal which serves as a sensor for heavy metal ions and arsenic. The expression levels of *arsenate reductase* and *phytochelatinsynthase* genes in four different rice cultivars, *Oryza sativa* var. *indica* (Khao Dawk Mali 105 and Riceberry) and *O. sativa* var. *glutinosa* (Korkhor 6 and Hang Yi 71) were analyzed by quantitative real-time PCR. Normally, the most expression level of *arsenate reductase* and *phytochelatinsynthase* genes shows in Korkhor 6 and Khao Dawk Mali 105, respectively. However, after exposure to arsenic (50 µM), the expression of *arsenate reductase* was up-regulated to 2.3, 1.02 and 0.3X in roots of Khao Dawk Mali 105, Hang Yi 71 and Riceberry, but did not in Korkhor 6. While the expression of *phytochelatinsynthase* gene was up-regulated to 2.5, 1.4 and 0.4X in roots of Riceberry, Korkhor 6 and Khao Dawk Mali 105 and no gene expression change found in Hang Yi 71.

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Thesis Advisor's signature