

## **Development and application of CRISPR/Cas systems for fundamental research and crop improvement at the Vietnam Academy of Science and Technology**

***Phat Tien Do, Nhung Hong Nguyen, Trang Hoang Thi Huyen***

*Institute of Biology, Vietnam Academy of Science and Technology*

Genome editing using CRISPR/Cas systems has driven major advances in both basic research and applied plant science. CRISPR/Cas systems are widely regarded as one of the most powerful and efficient tools for modern plant breeding. At the Vietnam Academy of Science and Technology (VAST), researchers have successfully optimized and applied multiple CRISPR/Cas systems for both functional genomic and crop improvement studies. To accelerate genome editing, we have developed effective hairy root transformation protocols for various plant species. In functional genomics, we have employed CRISPR/Cas9 to investigate the functions of candidate genes involved in root development, stress, hormones, and nutrient responses in rice, as well as candidate genes controlling root hair formation in cucumber. For crop disease resistance, we have used the CRISPR/Cas9 system to enhance PVY resistance in tobacco and powdery mildew tolerance in the local soybean varieties. To improve crop nutrition quality, we have targeted genes related to various metabolic pathways in tomato and soybean to enhance fruit quality and seed traits. Most recently, we optimized the prime editing system and successfully applied it to precisely regulating gene functions in rice. Several of these gene-edited lines show strong potential for cultivation, breeding, and commercial production. Therefore, in this talk, we will also discuss the perspectives and considerations from scientists, policymakers, and stakeholders regarding gene-edited crop production and regulation in Vietnam.

**Keywords:** CRISPR/Cas, crop improvement, plant breeding, prime editing, VAST