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## Horizontal and Vertical Resistances to Bacterial Spot Disease in Pepper is Differentiated by *GFP-Xcv* and Gene Expression Levels of Defense-related Genes

YEAM, In-hwa<sup>1</sup> · HWANG, Ing-yu<sup>3</sup> · KIM, Byung-Dong<sup>1,2\*</sup>

<sup>1</sup>School of Plant Science

<sup>2</sup>Center for Plant Molecular Genetics and Breeding Research

<sup>3</sup>School of Agricultural Biotechnology, College of Agriculture and Life Sciences, Seoul Nat'l Univ., Suwon 441-744, Korea

### Objectives

Bacterial spot of pepper, caused by *Xanthomonas campestris* pv. *vesicatoria* (*Xcv*), often leads to devastating losses. *Xcv* is evolving under selection pressure at the avirulence gene locus to evade host recognition. Breeding based upon single-gene resistance, so-called vertical resistance bears therefore strategic limitation. Horizontal resistance is race-nonspecific and controlled by multiple genes. Since horizontal resistance has no typical phenotypic sign like HR as in vertical resistance, it is very difficult to evaluate the degree of resistance. To help this situation, *Xcv* was tagged by transforming with a reporter gene that encodes the green fluorescent protein (*GFP*).

### Materials and Methods

*Capsicum annuum* 'PBC137' (horizontal resistance), 'PBC458' (susceptible), 'ECW' (susceptible), and 'ECW20R' (vertical resistance) were used for plant materials. Mutant lines of *Xanthomonas campestris* pv. *vesicatoria* expressing strong *GFP* were constructed by conjugation method using mini-Tn5 transposon system. Different responses of these lines upon

infection with *GFP-Xcv* race 3 were observed using Multi-photon Imaging System and portable UV illuminator. Expression levels of several defense-related genes showed differences in these two different (horizontal and vertical) resistance types. Expression levels of several defense-related genes were checked in these two different (horizontal and vertical) resistance types.

### Results and Discussion

1. RFLP and SSR markers development is on going to proceed QTL analysis for Horizontal Resistance of Pepper.
2. *Xcv* expressing GFP was very effectively used in this system. Reliable fluorescence signal within live host cell is detected in susceptible plant inoculated with *GFP-Xcv*. This *GFP*-aided application will provide us better understanding of the Pepper-*Xcv* interactions.
3. Quantitative determination of the fluorescence intensity can be made by this approach using *GFP-Xcv*. This *GFP*-aided approach is expected to provide us convenient tool for studying Horizontal Resistance of Pepper.