PHAGE BIOCONTROL

A viral alternative to antibiotics

Nat. Biotech. http://doi.org/dg8j (2019).

Credit: Catherine Falls Commercial / Moment / Getty

Plant pathogenic bacteria are responsible for severe losses of agriculture worldwide. An effective approach is to use chemical bactericides, including antibiotics, to control the spread of bacterial plant diseases, which have been applied to several fruits and other crop species. However, people are worried that the non-specificity of antibiotics might cause environmental crisis, and pathogenic bacteria could gain resistance to antibiotics easily. Alternatively, there are biocontrol approaches proposed using bacteriophages — the viruses that infect and colonize bacteria — to combat the diseases. Recently, Xiaofang Wang and Zhong Wei et al. in Nanjing Agricultural University, China, reported an application of phage biocontrol on tomato that significantly decreased the incidence of bacterial wilt disease caused by *Ralstonia solanacearum*, and further explained the underlying mechanisms.

Wang and Wei et al. used different phage combinations, ranging from one to four phage types, to treat the tomato cultivars (*Solanum lycopersicum* cv. 'Hezuo 903') in both greenhouse and field conditions. Single-type treatment as well as the combinations caused reduction of pathogen density and, more importantly, disease severity. In the field experiment, four-type phage combination treatment achieved an average 80% reduction in disease index that measures the severity of wilting symptoms. Phage treatment promoted the growth of resistant bacteria. In this case, the authors found that this resistant group is slow growing and less virulent. A hypothesis that phage resistance is costly due to the impaired phage receptors, which are potentially involved in nutrient uptake and bacteria fitness, might explain the observations. In support, Wang and Wei et al. showed a negative correlation between bacteria phage resistance and the pathogen carrying capacity, and even a steeper slope when resistance is developed for multiple phage types. Moreover, they surveyed the effects of the phage treatment on the rhizosphere microbial communities and reasoned the changes of microbiome composition from indirect feedbacks of the treatment.

One thing to note is that the experiments were all conducted in a single growth season. So, it is yet to be testified whether the strategy is effective for long-term crop disease control, and it will be interesting to follow their updates in the future.

Lei Lei

Published online: 16 January 2020
https://doi.org/10.1038/s41477-019-0584-8