Electric Shock Can Protect Plants Against Viruses

Lai, Shao-Jyun (School: Taipei First Girls High School)
Li, Fu-Ru (School: Taipei First Girls High School)

Plant viruses cause considerable economic losses of crops. However, it is difficult to develop effective crop virucides due to the intracellular infectivity of viruses. Plants usually trigger a salicylic acid (SA)-mediated immune response against biotrophic pathogens such as viruses. SA-mediated responses can also be induced by other stresses such as cold and drought. In this study, we wanted to determine if another manageable stress, i.e., low-voltage electric shock, could induce SA-mediated protection against viruses. We analyzed the effects of electric shock on activation of SA-mediated immune responses in Nicotiana benthamiana, and then used a green fluorescent protein-tagged tobacco mosaic virus (TMV-GFP) to monitor viral infection in the plants. Our results show that applying a 10-V electric shock on the petiole of N. benthamiana for 10 minutes enhanced expression of the SA marker gene PR1, both in treated and systemic leaves. This PR1 stimulating effect lasted for up to 24 hours after the treatment. Intriguingly, numbers of TMV-GFP infection foci were significantly lower in the electric shock-treated group compared to untreated controls. Our findings indicate that electric shock can induce a systemic SA-mediated immune response against virus infection in plants, potentially representing an environmentally sound approach to managing viral diseases.

Awards Won:
Third Award of $1,000