

Nanoformulations for xylem pathogens: *Xylella fastidiosa*

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The xylem-limited pathogen *Xylella fastidiosa* causes severe economic losses worldwide, and no effective antimicrobial disease management options are available. The only chemical control used in the field target insect vectors. There are no antibacterial compounds effective in planta against this pathogen because of the difficulty of reaching the vascular system. We have first tested a novel nano-size formulation (Zinkicide®, ZnK) against a different vascular (phloem) bacterial pathogen in citrus. That formulation showed effective reduction of Huanglongbing (HLB) symptoms in citrus in Florida in a field trial ongoing for five years. We are currently testing different versions of the ZnK formulation against *X. fastidiosa* in the greenhouse with promising results. Phytotoxicity assessments in the greenhouse demonstrated that ZnK can be applied as soil drench to tobacco and blueberry at a rate of 500 ppm/plant/week in a total of 4 doses with one week-gap interval without causing visible damage. ZnK was evaluated for disease control in the greenhouse using tobacco infected with *X. fastidiosa* subsp. *fastidiosa* strain TemeculaL. Three ZnK soil drench applications with one-week gap intervals at 500/500/1000 ppm, reduced *X. fastidiosa* populations by $>3 \log_{10}$ units and disease severity by $\approx 77\%$ compared to the control. Similarly, when blueberry plants infected with *X. fastidiosa* subsp. *multiplex* strain AlmaEm3 were treated with ZnK applied twice at concentrations of 1000 ppm each over a one-week gap interval, bacterial population was reduced by $\approx 1-2 \log_{10}$ units, and disease severity decreased by $\approx 38\%$ when compared to the control. Overall, our studies show ZnK can effectively reduce disease symptoms and populations of *X. fastidiosa* under controlled conditions. The availability of an antibacterial chemical treatment easily applied in the field by soil drench or foliar spray will be a useful tool to be adopted by growers to manage *X. fastidiosa* diseases.