Lytic bacteriophage lyse bacterial cells quickly after infection and thus have been exploited for bacterial disease control. Known as “phage therapy,” this method was initiated by Félix d’Herelle in 1919 when he successfully treated an outbreak of chicken typhus using phage isolated from chicken feces (2). Phage were first assessed for plant disease control in 1924 when Mallman and Hemstreet (4) applied a filtrate of decomposed cabbage to inhibit in vitro growth of Xanthomonas campestris pv. campestris. Despite initial enthusiasm, many studies demonstrated the impracticality of phage as biological control agents (BCA). For instance, phage-resistant bacteria develop at high phage:bacterium ratios (6). There has been renewed interest in bacteriophage as BCA with increasing reports of antibiotic-resistant bacteria (5). In 2011, Fujiwara et al. (3) treated cells of Ralstonia solanacearum with lytic phage Φ RSL1 and found that infected cells grew slowly and maintained a low density. Φ RSL1 also inhibited bacterial wilt in tomato plants pre-treated with the phage. Other studies have used phage to control fire blight on apple blossoms (7) and reduce gall size in tomato plants infected with Agrobacterium tumefaciens (1). Phage-encoded proteins are also potential BCA. Phage endolysins are extremely effective compounds that kill bacteria in seconds. Wittman et al. (8) demonstrated that extracts of induced endolysin-containing E. coli cells lysed Clavibacter michiganensis. A tomato plant expressing these endolysins may inhibit invasion of C. michiganensis strains, preventing infection. Overall, the continuation of bacteriophage and phage-encoded protein characterization could increase effectiveness of future disease control strategies.
References:


