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BIOGEOGRAPHY OF THE PLANT PATHOGEN *PSEUDOMONAS SYRINGAE* IN ALPINE HEADWATERS OF RIVERS IN THE USA, FRANCE AND NEW ZEALAND

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Non host, environmental reservoirs of pathogens play key roles in their evolutionary ecology and in particular in the evolution of pathogenicity. In light of recent reports of the plant pathogen *Pseudomonas syringae* in pristine waters outside of agricultural regions and its dissemination *via* the water cycle, we have examined the genetic and phenotypic diversity, population structure and biogeography of *P. syringae* from headwaters of rivers on three continents and their phylogenetic relationship to strains from crops. A collection of 236 strains from 11 sites in the USA, in France and in New Zealand was characterized for genetic diversity based on housekeeping gene sequences and for phenotypic diversity based on measures of pathogenicity and ice nucleation activity. Phylogenetic analyses revealed several new genetic clades from water. The genetic structure of *P. syringae* populations was not influenced by geographic location or water chemistry, whereas the phenotypic structure was affected by these parameters. Comparison with strains from crops revealed that the metapopulation of *P. syringae* is structured into three genetic ecotypes: a crop-specific type, a water-specific type, and an abundant ecotype found in both habitats. The abundance and diversity in water relative to crops suggest that adaptation to the freshwater habitat has played a non negligible role in the evolutionary history of *P. syringae*. In particular, it seems that adaptation to dissemination via the water cycle is linked to the epidemiological success of this plant pathogen. Our data suggest that strains that are the most active ice nuclei – and could therefore enhance their ability to re-deposit to the ground after being transported with aerosols up to clouds – are the most aggressive strains with the broadest host range and are also found among the widest diversity of non agricultural substrates associated with the water cycle.