The Potato Corky Ringspot Pathogen, *Tobacco rattle virus*, Occurs in Native Habitats in Minnesota

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In 2008, corky ringspot of potato caused by *Tobacco rattle virus* (TRV) (Fig. 1) was reported for the first time in Minnesota and Wisconsin (1). A study was subsequently initiated to identify possible sources of TRV causing infection in potato in Minnesota. Potato tubers showing typical corky ringspot symptoms were collected in two locations in Stearns and Sherburne counties, and a number of plant species showing foliar virus-like disease symptoms were collected in wooded areas with no recorded history of potato or other cultivation in four locations (Anoka, Isanti, Scott, and Stearns counties) in the potato growing area of central Minnesota. All samples were tested for presence of TRV by transmission electron microscopy (TEM) and immunosorbent electron microscopy (ISEM) (2) using partially-purified preparations, and by reverse transcription PCR (RT-PCR) using total RNA extracted with a Qiagen RNasey Kit (Venlo, Netherlands) and oligonucleotide primers that generated a 462 bp product from TRV RNA 1 (4). Amplicons were sequenced directly. Tobravirus-like virus particles were observed readily by TEM in partially-purified tuber or leaf tissue extracts of symptomatic potatoes from the two sites sampled, from *Hepatica acutiloba* (hepatica) collected in Stearns and Scott counties, from adventitious seedling *Hosta* spp. collected in Anoka and Isanti counties, and from *Mitella diphylla* (bishop’s cap) collected in Stearns and Anoka counties. Virus particles present in the potato, *Hepatica*, *Mitella*, and *Hosta* samples were identified as those of TRV by ISEM (trapping and decoration). Amplicons of the expected size (462 bp) were obtained from potato, *Hepatica* and *Hosta* samples but not from either of the two *Mitella* samples. Plants of *Sanguinaria canadensis* (bloodroot), *Trillium* sp. (trillium), *Geranium* sp. (cranesbill), *Thalictrum dioicum* (meadowrue), *Polygonatum biflorum* (Solomons-seal), and *Vitis riparia* (frost grape) showing virus-like symptoms and collected in the above sites all tested negative for TRV by the three assay methods used. Based on nucleotide sequence comparisons of the PCR products obtained, the Stearns county potato TRV isolate (JF935235) had 89% identity to the Sherburne county potato isolate (JF935234), 90% identity to the Anoka county hosta isolate (JF325233), and 99 to 100% identity to the Isanti hosta isolate (JF325237) and the *Hepatica* isolates from Stearns and Scott counties (JF935236 and JF935239, respectively). The Sherburne county potato TRV isolate had 94% identity to the Anoka county hosta isolate and 89 to 90% identity to the Isanti county hosta isolate and the *Hepatica* isolates from Stearns and Scott counties. From the data presented above, it was concluded that TRV occurs in Minnesota in habitats with no known history of cultivation to

![Fig. 1. Potato tuber showing typical symptoms of corky ringspot caused by *Tobacco rattle virus*.](image)
potatoes or other crops, that TRV isolates occurring in potatoes and in natural habitats are diverse, and that virus isolates occurring in potato are similar to some of those occurring in undisturbed natural habitats. These findings challenge the current notion that in Minnesota, TRV is an exotic pathogen entering primarily in perennial ornamentals imported from Europe (3). If validated by additional research they would suggest that the incidence and epidemiology of corky ringspot of potato in this region may result from interactions between environmental conditions and crop management practices and an endemic pathogen-nematode vector population rather than from the use of imported TRV-infected seed potatoes. Further studies, for example using bait plants such as tobacco and cucumber, would be useful in determining whether native populations of nematode vectors (Trichodorus and Paratrichodorus spp.) are active in TRV transmission and hence maintenance in undisturbed woodland habitats in Minnesota.

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Literature Cited