OVERWINTERING AND MONITORING OF POTATO LEAFROLL VIRUS IN SOME WILD CRUCIFERS

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Abstract

A potato leafroll virus (PLRV) isolate has been successfully transmitted to and recovered from two wild crucifers, *Sisymbrium altissimum* L. (Jim Hill or tumble mustard) and *Capsella bursa-pastoris* (L.) Medic. (shepherd's purse) by the green peach aphid (GPA), *Myzus persicae* (Sulzer). Virus antigen in both plant species was found to be higher in root tissue than in foliar tissue, based on enzyme-linked immunosorbent assay (ELISA) determinations. *C. bursa-pastoris* was apparently a relatively poorer source of inoculum for the GPA than *S. altissimum*. Using two geographically-separated biotypes of *C. bursa-pastoris*, a Washington biotype was found to contain higher antigen titer in both leaf and root tissue than a California biotype, as determined by ELISA. Field studies demonstrated that both weed species can serve as overwintering sources of PLRV.

Compendio

Un aislamiento del virus del enrollamiento de la hoja de la papa (PLRV) ha sido exitosamente transmitido y recobrado de dos crucíferas silvestres, *Sisymbrium altissimum* L. (Jim Hill o mostaza postrada) y *Capsella bursa-pastoris* (L.) Medic. (bolsa de pastor) por el áfido verde del melocotonero (GPA), *Myzus persicae* (Sulzer). Basándose en determinaciones efectuadas con la prueba inmunológica ELISA se encontró que el antígeno del virus en ambas especies vegetales era más alto en los tejidos de las raíces que en los de las hojas. *C. bursa-pastoris* fue aparentemente una fuente más o menos pobre de inóculo para el GPA, en comparación con *S. altissimum*. Utilizando dos biotipos geográficamente separados de *C. bursa-pastoris*, se encontró que...
Introduction

Literature on potato leafroll virus (PLRV) is extensive but lacks experimental data to characterize the seasonal epidemiology of this pathogen. PLRV has been considered the causative agent of one of the oldest known virus diseases of plants, and its association with phloem necrosis in potato tubers is established (12). Non-solanaceous hosts of PLRV include members of Amaranthaceae, Cruciferae, Nolanae and Protulacaceae, and only shepherd's purse, *Capsella bursa-pastoris* (L.) Medic., in the Cruciferae (7).

Thomas (15) reported that in central Washington State, volunteer potato plants from outside the commercial potato fields are the chief source of both leafroll primary inoculum and the aphid vector and that annual weeds are probably not a major source of primary inoculum. In Maine, weeds were reported to be an important source of aphids entering commercial potato fields, but they were not believed to host PLRV (13).

The objective of the field phase of this study was to determine if two cruciferous weed species that are common and prolific in the potato growing areas of the Pacific Northwest could harbor PLRV through the winter and serve as an inoculum source for green peach aphid (GPA), *Myzus persicae* (Sulzer), the following spring. In the laboratory phase, particular emphasis was placed on differentiating between results obtained from enzyme-linked immunosorbent assay (ELISA) determinations of host plants and aphid transmission bioassays from host plants to indicator plants as they relate to specific host plant species. Also, tests were initiated to determine if *C. bursa-pastoris* selections from different geographical origins express similar reactions to PLRV infection and what effect this has on ELISA detection results and aphid vectoring capability.

Materials and Methods

Characterization of PLRV Isolate 2243

The potato leafroll virus isolate (PLRV-2243) used in this study was taken from *Solanum tuberosum* L. cv. Russet Burbank; it causes primary foliar leafroll symptoms and also net necrosis in some progeny tubers of this cultivar. Negative ELISA reactions result when infected plant tissue samples are tested against beet western yellows virus (BWYV) antiserum.

PLRV-2243 was propagated in *Datura tatula* L. grown in greenhouse soil beds. Plants were inoculated as seedlings using GPA. When infected