INSECT TRANSMISSION OF *ERWINIA CAROTOVORA* VAR. *CAROTOVORA* AND *ERWINIA CAROTOVORA* VAR. *ATROSEPTICA* TO POTATO PLANTS IN THE FIELD

J.W. Kloepper¹, J.W. Brewer², and M.D. Harrison

Abstract

Adult fruit flies (*Drosophila melanogaster* Meig.) artificially contaminated with *Erwinia carotovora* var. *carotovora* (Jones) Dye (*Ecc*) and/or *E. carotovora* var. *atroseptica* (van Hall) Dye (*Eca*) readily transmitted the bacteria to plants in the field that had been injured by crushing the stem. Injured, inoculated plants developed disease symptoms when maintained at high relative humidities. *Erwinia* was transmitted to ten-hour-old injuries and they became infected as frequently as freshly made wounds. Insect transmission of *Eca, Ecc*, and mixtures was greatest during the afternoon, which was the warmest part of the day. *Ecc* was transmitted significantly less frequently during the cold morning than during afternoon or evening hours. A potato cull pile placed in a commercial potato field attracted a natural insect population which increased during the season. Both *Ecc* and *Eca* were isolated from uninoculated rotting tubers in the cull pile and from insects associated with the pile from May through September. These naturally infested insects transmitted *Ecc* and/or *Eca* from the cull pile to artificially injured field plants during July and August at distances as great as 183 m from the cull pile. No *Erwinia* was isolated from injured plants in a neighboring control field, which lacked a cull pile, further than 6 m upwind from the cull pile. We suggest that insects are important agents in the epidemiology of potato blackleg and soft rot even in areas with low relative humidities.

Resumen

Moscas adultas de la fruta (*Drosophila melanogaster* Meig) contaminadas artificialmente con *Erwinia carotovora* var. *carotovora* (Jones) Dye (*Ecc*) y/o *E. carotovora* var. *atroseptica* (van Hall) Dye (*Eca*) transmitieron fácilmente la bacteria a plantas en el campo que habían sido dañadas por rompimiento del tallo. Las plantas dañadas e inoculadas desarrollaron síntomas de la enfermedad cuando estuvieron mantenidas

¹Formerly Research Assistant Colorado State University; currently Assistant Professor University of California, Berkeley; ²Professor of Entomology and Professor of Plant Pathology, respectively, Colorado State University, Fort Collins, CO 80523. Published with approval of the Colorado State University Experiment Station as Scientific Series Paper No. 2536. Received for publication June 20, 1980.

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a alta humedad relativa. *Erwinia* fue transmitida a heridas efectuadas diez horas antes y ellas se infectaron tan frecuentemente como heridas efectuadas en el momento. La transmisión por insectos de *ECA*, *ECC* y mezclas fue mayor durante la tarde, la parte más calurosa del día. *ECC* fue transmitida significativamente menos durante las mañanas frías que durante las tardes en horas del atardecer. Una pila de papa de descarte colocada en un campo de papa comercial atrajo una población natural de insectos, la cual aumentó durante la estación. Ambas *Erwinia* fueron aisladas de tubérculos podridos desde la pila de descarte, y de insectos asociados con la pila un desde Mayo hasta Setiembre. Estos insectos naturalmente infectados transmitieron *ECC* y/o *ECA* desde la pila de desearte a plantas dañadas artificialmente en el campo durante Julio y Agosto a distancias tan grandes en un campo vecino que carecía de pila de descarte (control) más allá de 6 m desde la pila, en dirección contraria al viento.

Sugerimos que los insectos son agentes importantes en la epidemiología de la pierna negra y la pudrición blanda en áreas con baja humedad relativa.

**Introduction**

The use of stem cut stock as an approach to the control of potato blackleg caused by *Erwinia carotovora* var. *atroseptica* (van Hall) Dye (*Eca*) and *Erwinia carotovora* var. *carotovora* (Jones) Dye (*Ecc*) is gaining acceptance due to the superior performance of such seed. However, low levels of *Erwinia* are re-introduced quite rapidly into fields planted with stem cutting stocks (2, 9, Harrison unpublished data). *Erwinia*-contaminated insects and bacterial aerosols are suggested as possible sources of these bacteria. Graham *et al.* (4) isolated identical serotypes of *Ecc* from infected potato plants in the field and from insects collected from nearby vegetable cull piles and suggested that the insects were responsible for the transmission of *Erwinia* from the cull piles to the potato plants.

Molina *et al.* (8) caged *Drosophila melanogaster* Meig, which had acquired *Eca* from laboratory cultures, on healthy, injured plants in the greenhouse and found that they readily transmitted the bacterium. Harrison *et al.* (5) showed that insects from potato cull piles in Scotland transmitted *Erwinia* to injured plants in the greenhouse. The relevance of such insect transmission to *Erwinia*-free potato fields is unknown, especially in arid environments of the western U.S.

The purpose of this study was to determine the importance of insect transmission of *Ecc* and/or *Eca* under field conditions in the semi-arid climate of Colorado. The work was conducted during 1976 in the San Luis Valley in southern Colorado. Studies were designed to determine if artificially contaminated insects can transmit *Ecc* or *Eca* to wounded plants under field conditions and if transmission in the field results in infection. The