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THE BACTERIAL WILT OF POTATO CAUSED BY *Pseudomonas solanacearum*: A NEW DISEASE OF IMPORTANCE IN THE DOMINICAN REPUBLIC

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ABSTRACT. The bacterial wilt of potato was first noticed as a new potential threat of economic importance in the highland valley of Tireo in 1993. The disease has been disseminated, apparently by infected tuber-seed and plowing implements, and it is currently reported as an important problem in all lowland and highland potato production areas of the Dominican Republic. Chemical control attempts have been unsuccessful. The best results have obtained with an integrated approach of cultural practices, emphasizing the use of certified *Pseudomonas*-free tuber-seeds, crop rotation without susceptible plant species and avoiding excessive irrigation.

INTRODUCTION

Potato (*Solanum tuberosum*) is an important root-vegetable crop in the Dominican Republic. Potato production in the Dominican Republic is concentrated in the highlands (800 to 1200 meters above sea level) of Ocoa, Constanza and neighboring areas. Secondary production sites are found in the lowland valleys of San Juan de la Maguana, La Altagracia and La Romana provinces. White potatoes are preferred, and tuber "seeds" are both imported and locally produced. Potato diseases commonly found in the Dominican Republic include late blight (*Phytophthora infestans*), black stem rot (*Erwinia carotovora*), stem-root diseases caused by *Rhizoctonia solani* and *Sclerotinia sclerotiorum* and a number of viral diseases.

In 1993, an epidemic of a new disease, which growers named "el muerto" ("the dead"), developed in fields of "Atlantic" potato in Tireo, Constanza. Affected plants first presented wilted and yellowing foliage, followed by complete plant death. The pathogenic agent was identified as *Pseudomonas solanacearum*, one of the most important pathogens of potato worldwide. It has been speculated that the disease was accidentally introduced in the Dominican Republic in imported seed tubers of "Atlantic" potato. Although this disease was initially localized to the Tireo and Constanza surroundings and to the highly susceptible "Atlantic" cultivar, it has been rapidly spread to other areas by seed tubers and plowing implements. In early 1997 *Pseudomonas solanacearum* was either confirmed or apparently present in all the major and secondary potato production regions and attacking all the potato cultivars utilized in the Dominican Republic. In extreme cases, potato fields can be completely lost due to *Pseudomonas* wilt, but usually yield losses amount to nearly 50%.

PAST, PRESENT AND FUTURE MANAGEMENT

Shortly after the first outbreaks of *Pseudomonas* potato wilt, a number of strategies for its control were devised and tested in the affected areas. Attempts to control the development of this disease with cupric treatments to the foliage, plant base and/or seed tuber did not succeed. Using *Pseudomonas solanacearum*-free and whole seed tubers in a crop rotation program that excluded susceptible plant species (especially legumes, musaceae and

solanaceae) for at least one year reduced the negative impact of the disease when potato was planted again in previously infected soils. Important crops known to be immune or more tolerant to *Pseudomonas solanacearum* are maize, sorghum, rice, pastures, garlic, sweet potato, carrot, red beet, brassicas, and lettuce. Avoiding excessive irrigation has also proven to be an effective means to decrease the dissemination of inoculum in potato fields.

Although good results have been obtained using fumigants for the control of *Pseudomonas solanacearum* in Florida (Weingartner and Shumaker 1990), the successful and sustainable management of this disease appears to be based on the implementation of cultural practices that impair the pathogen's ability to infect and/or rapidly develop in the host. The use of disease-free seed tuber and early planting and harvesting dates have resulted in better potato yields in *Pseudomonas solanacearum* infected regions under different climatic regimes in India (Shekhawat et al. 1990). Because the survival of *Pseudomonas solanacearum* in the soil is a function of the presence of potato debris and of soil temperature and water holding capacity (Shekhawat and Perombelom 1991), reduction of initial inoculum can be achieved by crop residue removal, solarization to increase soil temperature above 35C prior to planting, fertilization, and controlled irrigation.

Weed control could also play an important role in a potato wilt management system, as this pathogen has also been shown to survive in a number of weed species (Sunaina et al. 1989). Mixed cropping of potato with maize (*Zea mays* L.) has successfully reduced the incidence and development of epidemics of bacterial wilt caused by *Pseudomonas solanacearum* in potato, apparently due to the increased distances between potato plants, which decreased the opportunity of root contact and inoculum transmission between host plants (Autrique and Potts 1987). Biological control of the disease using avirulent races of the bacterium has been tried in Florida with promising results (Ciampi-Panno et al. 1989; McLaughlin et al. 1990; McLaughlin and Sequeira 1988).

Future management of *Pseudomonas solanacearum* potato wilt in the Dominican Republic should be based on integrated systems. The basic components of the management systems include the use of disease-free, whole seed tubers, the introduction of more tolerant cultivars, controlled irrigation, restricted use of plowing implements from affected areas, rotation excluding susceptible crop species for at least one year, but preferably longer than two years, mixed cropping with non host species, and the control of stem-root insects and weeds. Novel approaches such as solarization and biological control should be taken into consideration in those systems.

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