STABILITY OF DISEASE EXPRESSION IN THE POTATO LATE BLIGHT PATHOSYSTEM: A PRELIMINARY FIELD STUDY

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Abstract

The interactions of four potato cultivars, with three isolates of Phytophthora infestans were assessed in different environments and in different years. Preliminary tests with these cultivars and isolates were conducted in Toluca, Mexico, and Freeville, New York, U.S.A. in 1986 and 1987. Although data were available from only one year for cultivar Alpha, this cultivar had a dramatically different resistance ranking in Toluca, than that in Freeville—a result consistent with previous observations. The difference in resistance between two other cultivars also changed with site, but less dramatically and did not cause a change in resistance ranking. The resistance of the fourth cultivar appeared to be relatively unaffected by change in site. In both sites, all isolates ranked all cultivars in the same order. Although aggressiveness was slightly different in different locations and on different cultivars, variations were small and there were no consistent trends (consistent over all trials) concerning isolate aggressiveness. Thus, changes in location appeared to have different effects on the different cultivars but little or no effect on the isolates used.

Compendio

Las interacciones de cuatro cultivares de papa, con tres aislamientos de Phytophthora infestans, fueron determinadas en diferentes ambientes y años. Pruebas preliminares con estos cultivares y aislamientos se condujeron en Toluca, México y en Freeville, New York, EE.UU., en 1986 y 1987. No obstante que para el cultivar Alpha se contó sólo con información de un año, este cultivar tuvo una resistencia dramáticamente diferente en Toluca, en comparación con la observada en Freeville, un resultado que fue consistente con observaciones anteriores. La diferencia en resistencia entre los otros dos cultivares varió también con el lugar, pero fue menos dramática y no causó cambios en el orden de resistencia por ellos alcanzado. La resistencia del cuarto cultivar aparentemente no varió con el cambio de

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lugar. En ambos lugares, todos los aislamientos clasificaron a todos los cultivos en el mismo orden. Aunque la agresividad fue ligeramente diferente en los diferentes lugares y cultivares. Las variaciones fueron pequeñas y no existieron tendencias consistentes (consistentes en todos los ensayos) respecto a la agresividad de los aislamientos. Por lo tanto, el cambio de lugar parece tener efectos diferentes sobre los diferentes cultivares, pero poco o ningún efecto sobre los aislamientos utilizados.

Introduction

The development and use of disease resistant cultivars is often the best solution to the problems caused by plant diseases in agricultural systems; however, the stability of that resistance (consistent relative expression, not consistent level of disease) is of tantamount importance. Instability could be caused by changes in the pathogen population in different sites or at different times, and by differences in the physical environment in different sites or at different times. Several studies of the Solanum tuberosum: Phytophthora infestans pathosystem have been conducted (2, 7, 10, 14) and two main themes emerge from these and other studies: 1) despite a usually stable cultivar resistance ranking, cultivar x isolate interactions do occur, i.e. sometimes, cultivars behave differently depending on the isolates used, and sometimes isolates behave differently depending on the cultivars used; and 2) different environments, or trials exert a greater effect on the cultivars and isolates than do the cultivars and isolates on each other (7, 9, 10). In order to identify the effect of environment, it is important that the same cultivars and pathogen isolates be used in the different field locations so that the environment is the only major uncontrolled variable. To our knowledge, no studies have evaluated cultivar resistances in very different locations (environments) with the same pathogen isolates in both locations.

We were interested in the reactions of potato cultivars and P. infestans isolates in Freeville, New York (42 N, 320 m above sea level) compared to those in Toluca, Mexico (19 N in a highland valley in central Mexico at 2680 m above sea level). Toluca is in a region conducive to the development of late blight epidemics (5, 11). A presumed reason for high disease levels recorded in Toluca, investigated in this study, is a conducive climatic environment for the development of the disease (5). We wanted at least a preliminary assessment of the relative expression of general resistance of potato genotypes inoculated with the same pathogen isolates in both locations.

The central questions we asked were: 1) do the cultivars exhibit stable resistance (estimated by their relative resistance ranking and possible interactions with other factors) both across isolates and environments; and 2) do the isolates exhibit stable aggressiveness (measured by their relative aggressiveness ranking and the possible presence of interactions) across cul-