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ABSTRACT

FACTORS IN THE EPIDEMIOLOGY OF POTATO LEAFROLL IN THE SAN LUIS VALLEY OF COLORADO

Epidemiological studies of potato leafroll (LR) disease in the San Luis Valley (SLV) of Colorado were made during the years 1979-1984. Field inspection data obtained from the Colorado Potato Certification Service and aphid monitoring data from the SLV Integrated Pest Management (IPM) project were collated and analyzed in conjunction with field studies to assess the relative importance of different inoculum sources, the time of LR spread, the importance of various vector species and the impact of the IPM program on LR epidemiology.

Analysis of Colorado Potato Certification Service field inspection data from 1977-1982 revealed the existence of weakly significant correlations between intrafield inoculum and winter test LR incidence, which suggests a relatively minor role played by intrafield inoculum in the spread of LR in seed potato fields.

A total of 1543 samples of 21 weed species commonly found throughout the SLV were tested for the presence of both potato leafroll (PLRV) and beet western yellows (BWYV) viruses. Virus-infected samples were detected in only three instances, suggesting that weeds serving as inoculum sources are of negligible importance compared to inoculum present in non-certified potato fields.

Analysis of IPM aphid trap data from 1974-1979, 1981 in relation to local daily temperature records indicated that a heat unit accumulation (HUA) model was an accurate predictor of green peach aphid (GPA) (Myzus persicae) appearance. HUA was also correlated with LR increase prior to the initiation of the IPM program in the SLV but not after the initiation of the IPM program, which implies that another vector(s) of PLRV and BWYV was involved in the epidemiology of LR in the SLV.

Aphids collected from LR-affected potato plants were tested for virus transmission to Physalis floridana. Three of 117 potato aphids (POA) (Macrosiphum euphorbiae) and 12 of 32 GPA transmitted either PLRV or BWYV, which indicates that both aphids served as vectors.

Aphid trapping sites which consisted of water pan and sticky traps and successive sets of P. floridana bait plants were established and serviced weekly in the SLV during the 1984 growing season. Bait plant infection by either PLRV or BWYV was verified by assay with ELISA. Bait plant infection was correlated with sticky trap aphid counts but not with pan trap counts; no GPA were trapped at any time. LR spread, as determined by bait plant infection, was initially detected at a single site during the week of 17-24 July and was detected at all sites by the last week of bait plant exposure, 14-21 August.

Attempts made to trap viruliferous aphids with a vehicle-mounted scoop net yielded variable results. Scoop-netted aphids were usually damaged or dead; however, one viruliferous POA was detected in 317 transmission tests. No GPA were trapped at any time by this method.

Evidence presented indicates that the principal if not sole source of LR inoculum in the SLV is LR-affected potato plants. Intra-field spread is of relatively minor importance and spread between potato fields occurs during the latter half of the growing season. POA, in addition to GPA, now appears to be a major vector of LR in the SLV and may be solely responsible for interfield LR spread.

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