

RESEARCH NOTES

Interrelationship of *Aphelenchoides fragariae* and *Xanthomonas begoniae* on Rieger begonia

R. M. RIEDEL and P. O. LARSEN¹

Disease complexes initiated by plant-parasitic nematodes and bacteria on aerial plant parts are relatively uncommon. Interactions involving *Aphelenchoides ritzemabosi* (Schwartz) Steiner & Bührer, *Anguina tritici* (Steinbuch) Chitwood, and *Ditylenchus dipsaci* (Kühn) Filipjev with species of *Corynebacterium* are known (1, 3, 8). *Ditylenchus dipsaci* also is reported to interact with *Erwinia rhapontici* (Millard) Burkholder on aerial portions of rhubarb (6). *Meloidogyne hapla* Chitwood increases the severity of bacterial wilt of alfalfa caused by *Corynebacterium insidiosum* (McCull) Jens (4, 7), and *M. incognita* (Kofoid & White) Chitwood increases wilt symptoms caused by *Pseudomonas solanacearum* Smith in potato and tobacco (2, 5). In these wilt diseases, however, the nematodes and bacteria interact primarily on the roots.

Xanthomonas begoniae (Takimoto) Dowson frequently causes a leaf blight of Rieger begonia (tuberous begonia × *Begonia socotrana* Hook) in Ohio. Observations suggest that this disease occurs more frequently and that symptoms are more severe in greenhouses where *Aphelenchoides fragariae* (Ritzema Bos) Christie, a common pest of begonias, is also prevalent.

This paper reports work to determine whether an interaction exists between *A. fragariae* and *X. begoniae* on Rieger begonia.

Tests were made with Schwabenland Red variety Rieger begonias (Mikkelsens, Inc., Ashtabula, Ohio). Six plants, each bearing four expanded leaves, were used for each of eight treatments. Experiments were repeated at least once.

Plants inoculated with *A. fragariae* received 5000 nematodes/leaf placed directly on each leaf by previously described techniques (9). Leaves of plants inoculated with *X. begoniae* were sprayed to drip-off with 48-h-old shake cultures (10^8 cells/ml) maintained on nutrient

broth (Difco Laboratories, Detroit, Mich.). Treatments were as follows: *X. begoniae* only; *A. fragariae* only; *X. begoniae* and *A. fragariae* inoculated within 1/2 h of each other; *X. begoniae* then *A. fragariae* 2 days later; *X. begoniae* then *A. fragariae* 7 days later; *A. fragariae* then *X. begoniae* 2 days later; *A. fragariae* then *X. begoniae* 7 days later; nutrient broth only. Plants were enclosed in plastic bags for 48 h following each inoculation step. Plants were placed in a shaded greenhouse at 21-24 C during the day and 18 C at night.

Alone, *X. begoniae* in 3-4 wk caused symptoms at the leaf margin consisting of small, water-soaked lesions which later became necrotic (Fig. 1-A). The surrounding



FIG. 1-(A,B). A) Symptoms produced on Rieger begonia (cultivar Schwabenland Red) by *Xanthomonas begoniae* 4 wk after inoculation. B) Symptoms produced by *X. begoniae* and *Aphelenchoides fragariae* 1 wk after simultaneous inoculation with both organisms.

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¹Assistaht Professors, Department of Plant Pathology Ohio Agricultural Research and Development Center, Wooster 44691. Published with approval of the Director, Ohio Agricultural Research and Development Center as Journal Article No. 29-74.

tissues were yellowed. Symptoms developed slowly and centripetally. Three to 4 wk after symptoms first appeared, the entire leaf blade became dry and brown.

Aphelenchoides fragariae alone produced reddening along veins of inoculated leaves within one week and the entire leaf blade became red within 3 wk. Necrosis of leaves was not observed within the test period.

Pathogens inoculated simultaneously produced water-soaked spots over the entire leaf blade within 1 wk (Fig. 1-B.). Leaves died 10-14 days after inoculation. A similar pattern, though with fewer spots, appeared within one week when bacteria were inoculated 2 or 7 days prior to infestation with *A. fragariae*. When bacteria followed nematode infestation by 2 or 7 days, symptoms and their rate of development were similar to those produced by simultaneous inoculation; however, numbers of bacterial spots were fewer.

No symptoms were noted on uninoculated control plants.

Data from these experiments supported observations made in commercial greenhouses that bacterial leaf spot of Rieger begonia is much more severe in the presence of *A. fragariae*. Symptoms appeared more quickly, they were more widespread on the plant, and the onset of necrosis was much more rapid. In terms of practical application, results indicate that control of bacterial spot

on Rieger begonia should be enhanced by control of foliar nematodes when both pathogens are present.

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