

## Dispersal Modes for Foliar Nematodes<sup>1</sup>

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**INTRODUCTION:** Some species of foliar nematodes in the genus *Aphelenchoides* are known to be parasitic on a wide range of hosts, including cultivated food plants and numerous ornamentals. In Florida, these nematodes have been found to cause necrotic areas on the leaves of around 60 different species of plants. An understanding of all aspects of the biology of foliar nematodes and their hosts, which includes dispersal modes, is essential for developing pest management strategies. This circular summarizes the ways these nematodes are disseminated, including some unique means of foliar nematode dispersal observed in Florida.

**DISSEMINATION BY THE ACTIVE MOVEMENT OF NEMATODES AND SPLASHING:** In nurseries with overhead watering systems foliar nematodes are easily spread in splashed water. Nematodes may be dispersed in the water dripping from plants hung above other nursery stock. Also, foliar nematodes may migrate limited distances by their own active movement in a film of moisture on the surface of plants or other substrates. Wallace (1959) observed that they may move at least six inches up a chrysanthemum stem overnight. By this means, nematodes may move among adjacent plants. Similar dispersal of foliar nematodes may occur outdoors under natural conditions during rainfall or when a film of moisture is created on the plant surface by dew. The author has observed this type of dispersal for *Aphelenchoides fragariae* (Ritzema-Bos) Christie among several ferns hosts which were growing outdoors in crowded conditions and which had numerous foliar lesions (Fig. 1A).

**DISPERSAL IN PLANT TISSUE:** One of the principal means by which nematodes are disseminated over great distances is in seeds, propagative stock and plant debris. *Aphelenchoides besseyi* Christie, the causal agent of the white tip disease of rice, has been distributed throughout the world on seed. Foliar nematodes are readily spread in plants that are propagated vegetatively, e.g., strawberry, azalea, African-violet and begonia. Frequently, the origin of foliar nematodes that cause problems in Florida nurseries can be traced to infected cuttings or liner plants that growers purchased from other nurseries sometimes located in other states or countries. In many cases, when the plants are purchased, symptoms of nematode infection are not apparent but later become evident as the plants develop. Foliar nematodes may also be disseminated with plant debris, due to their remarkable anhydrobiotic ability to survive in dry plant tissue. Goodey (1933) revived *Aphelenchoides ritzemabosi* (Schwartz) Steiner & Buhrer in dried chrysanthemum leaves after three years. The author has observed that *A. fragariae* may survive for almost a year in dried leaves of Philippine-violet, *Barleria cristata* L. Thus, nematodes may disperse from one area to another in plant debris that is carried by man, animals or the wind.

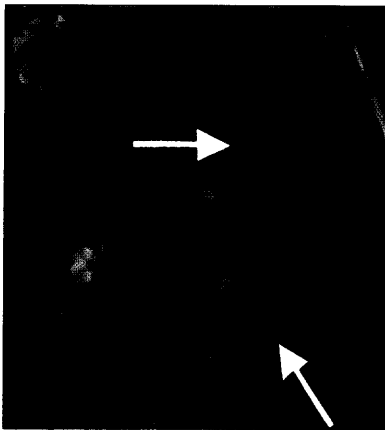


Fig. 1A.



Fig. 1B.



Fig. 1C.

Fig. 1. Modes for foliar nematodes dispersal: A. Dissemination by the active movement of nematodes and splashing on two types of ferns, growing next to each other (left, maidenhair fern; right, Chinese brake fern). Symptoms (arrows) on both ferns are necrotic areas delineated by veins. B. Foliar nematodes were lifted on the seed head of the grass to rubber plant leaves. The first symptoms on rubber plant are chlorotic vein-limited streaks which later became necrotic. C. Mother plant of vegetable fern with fronds about 5 feet in length.

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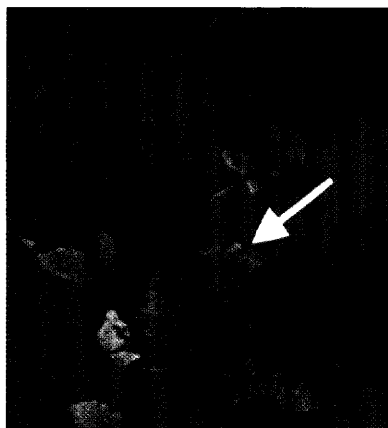


Fig. 1D.



Fig. 1E.

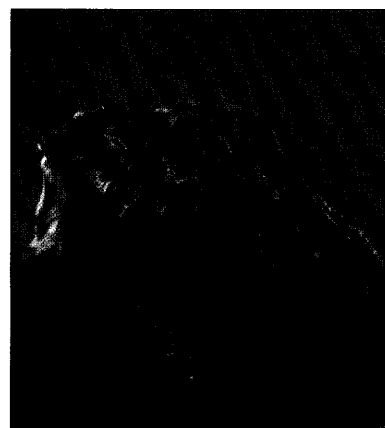


Fig. 1F.

Fig.1. Modes for foliar nematodes dispersal: D. Necrotic areas on daughter vegetable fern fronds (arrow) which developed from infected mother plant fronds. E. Philippine violet plant with seed capsule. F. Open capsule showing the type of Philippine violet pubescent seed on which foliar nematodes are ejected.

**UNIQUE MODES OF DISPERSAL:** An appropriate statement characterizing foliar nematode dispersal might be: 'Find a way.' This is illustrated by three interesting examples that have been observed in Florida.

**1. 'Rising to the occasion.'** An unusual mode of dispersal of *A. besseyi* to the ornamental rubber plant, *Ficus elastica* Roxb. ex Hornem, was observed in a southern Florida nursery (Marlatt 1970). At first scientists could not understand how the nematode gained access to the leaves because the foliage did not touch the soil and experiments showed nematodes did not migrate from the soil via the ficus stems. However, rubber plants were only found to be infected when they were growing adjacent to a smut grass weed, *Sporobolus indicus* (L.) R.Br. (= *S. poiretii*), which was serving as a nematode reservoir host. As the infected smut grass inflorescences matured, nematodes were lifted to where they were able to contact and infect the rubber plant leaves (Fig. 1B).

**2. 'Up and down, here we go again.'** A very unusual mode for nematode dissemination under natural conditions was observed in vegetable fern, *Diplazium esculentum* (Retz.) Sw. This very large fern has fronds that are five to six feet long (Fig. 1C). This plant reproduces vegetatively by producing many small plantlets or bulblets along the rachis of the fronds. When the fronds die and fall to the ground, the daughter plantlets on these fronds may become established as independent plants five to six feet from the mother plants. *Aphelenchoides fragariae* was isolated from necrotic areas on the pinnae of the mother plant and the plantlets (Fig. 1D). Thus, the nematode piggy-backs along, taking advantage of this unusual means of vegetative reproduction. It is disseminated from mother to daughter plant, moving three to six feet with every generation (Lehman 1989).

**3. 'Salute to foliar nematode astronauts.'** Another interesting mode for dissemination was observed on Philippine violet. *Aphelenchoides fragariae* infects the leaves of this plant, flower bracts, seed capsules and the external surfaces of the seeds. The seeds are forcefully ejected three to four feet from the capsules of the mother plant, and thus foliar nematodes are disseminated on the seeds (Fig. 1E; 1F) (Lehman 1989). An equivalent feat for humans, considering the size of foliar nematodes and humans, would be forceful ejection of humans over a distance of two miles.

**CONCLUSION:** Foliar nematodes demonstrate diverse and unique modes for dispersion. The most effective way to manage foliar nematodes is to prevent their dispersal. Consistent use of sanitation practices, such as using nematode-free planting stock, and using plant spacing and watering practices that are less conducive to nematode dispersal by splashing or their active movement in water on the foliage will limit dispersal of foliar nematodes.

#### LITERATURE CITED:

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