

Re-emergence of a forgotten and damaging strawberry parasite (strawberry crimp nematode, *Aphelenchoides besseyi*), a potential new threat to Florida strawberries

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Summary

During the 2016-17 season, several incidents of strawberries infected with foliar nematodes (*Aphelenchoides* spp.) were reported around Plant City, FL. Infected plants showed leaf crinkling and distortion, dwarfing of the plant, reduction in flowering, and a lack of marketable fruit.

Strawberry plants infected with foliar nematodes were found on 5 farms during the 2016-17 season (out of 15 farms sampled). Two of the farms had a significant number of plants that were infected (up to 10% of the field). Nematode-infected plants were initially all **stunted**, showing curled, **twisted leaves**, especially inside the crown (Fig. 1). Plants remained stunted until the end of the season. However, by late March their appearance drastically changed, and infected plants were larger and greener than non-infected plants (Fig. 2). Nematode-infected plants produced few flowers and small, unmarketable fruit (Fig. 1).

The nematodes were identified as *Aphelenchoides besseyi* (R. Inserra), and they were likely **introduced with transplants**. All infected plants could be traced back to one specific nursery. The PI visited this nursery in September 2017 to collect nematode samples, but the suspected infected site was no longer used and could not be sampled. Three other strawberry transplant fields belonging to the same nursery were sampled, but no foliar nematodes were found in any of these fields.



Fig. 1 Foliar nematode (*Aphelenchoides besseyi*) symptoms on strawberry. Top: twisting, crinkling and curling of strawberry leaves; bottom: abnormally shaped “broccoli” fruit, Plant City, FL, 2016-17 season



Fig. 2 Foliar nematode-infected strawberry plants throughout the 2016-17 season; same row is shown at different times (left: late November, middle: late December, right: late March); note change in size of plants, from small stunted plants early to mid-season to larger and greener plants end of season.

Foliar nematodes have not been studied much in Florida. However, they are not new to the state, and they have been reported from the Plant City area **since the early 1900s** (Brooks, 1929). There have been no new reports since the 1960s.

Most nematodes were found in the inner crown/new leaves. At the farm where the nematodes were first detected, infected plants were sampled throughout the season (Fig. 3). At this farm several chemical and biological treatments were applied in an attempt to manage and control the spread of the nematode (e.g. Luna, Venerate, NemaKill, Dazitol and AgriMek). No clear reductions in infection were observed from any of these treatments. The two farms with most infected plants were managed differently in the off-season. At farm 1, different crop termination treatments were applied (gramoxone, Vapam, and Nimitz), and dead strawberry plants were pulled and left in the row middles during summer. The same beds were re-planted with strawberries in the 2017-18 season; K-pam was applied prior to planting. At farm 2, the beds were removed in spring 2017 and a sun hemp cover crop planted in summer; this field was fumigated with C-35 prior to planting. Very few symptomatic strawberry plants were found during the 2017-18 strawberry season. Although few foliar nematodes were still present at farm 1, no effect of crop termination treatment was noted, and plant

damage and yield loss appeared to be limited. No foliar nematodes could be detected in 2017-18 at farm 2.

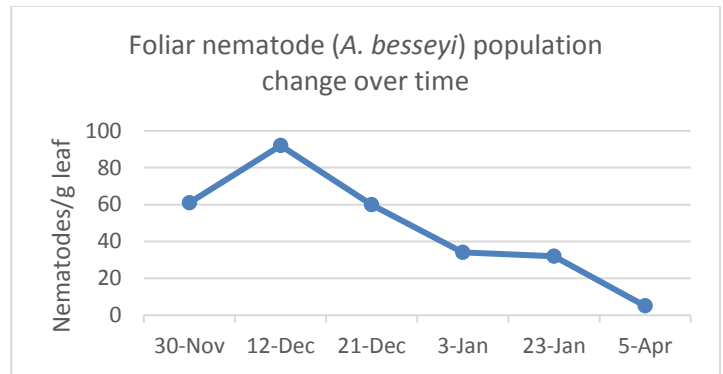


Fig. 3 Foliar nematode population change at CG farm during the strawberry season 2016-17, Plant City, FL.

In addition to the causal agent of strawberry crimp (*Aphelenchoides besseyi*), **three new *Aphelenchoides* species were found** at farm 1— some from fresh leaves, some from dry leaves and some from soil. The correct identification of *Aphelenchoides* is complex, and requires both morphological and molecular techniques. The entire *Aphelenchoides* genus are known to be fungal feeders, and only a few exceptions, such as *A. besseyi*, are known to also feed on plants. It is not yet clear whether or not the other species we found can also feed on plants. We are currently growing all these *Aphelenchoides* species on fungal plates (*Monilinia fructicola*), and are trying to see if they feed and reproduce on strawberry and other plants. We are also evaluating whether or not these nematodes can feed on any of the strawberry fungal pathogens that are present in Florida (e.g. *Colletotrichum*, *Phytophthora*, *Macrophomina*, *Botrytis*). In addition we are also testing different **chemical and biological nematicides** to manage these nematodes, and this coming season we hope to work with Dr. Peres' team to see if heat treatment (plant sauna) can help eliminate these nematodes from transplants. The above research is part of a MSc student's project and we hope to continue this work as part of a PhD project.

More information can be found in a recent EDIS publication that was written on foliar nematodes in Florida strawberries (<http://edis.ifas.ufl.edu/in1184>). Several presentations on this topic were given at extension and scientific meetings in and outside the US (AgriTech, Plant City 2017, Organization of

Nematologists of Tropical America (ONTA), Puerto Rico, 2017, International Strawberry Congress, Antwerp, Belgium, 2017, and Invasive Pathogens Institute, UF, Gainesville, 2018).

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