Special Research Report #102: Disease Management

Phytophthora nicotianae Crown and Root Rot on Snapdragons

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BACKGROUND

Significant losses in commercial snapdragon fields have occurred as a result of *Phytophthora nicotianae*. Infections of roots and crowns result in wilting, stunting, dieback, and plant death. Research was initiated at two farms growing snapdragons as a cut flower crop. One of the farms had recently planted snapdragon plugs showing *Phytophthora* symptoms in addition to their established beds with *Phytophthora*. At these locations, annual fumigation and applications of Subdue are relied upon to provide disease control. Resistance of *Phytophthora* to Subdue has been documented and is a significant concern to growers managing this disease.

Spore types and significance. *Phytophthora nicotianae* forms two different types of reproductive structures: sporangia, produced by individual isolates, and oospores, produced by pairing of opposite mating types. Sporangia (below) are able

to release swimming spores (zoospores) upon immersion in water and are likely an important part of disease progress from initial points of infection. Oospores (below)

have thick walls and are important for long term survival. Oospores are the product of genetic recombination of two mating types. They are important for generating and maintaining genetic diversity. Outcrossing species, such as *P. nicotianae*, require both A1 and A2 mating types to produce oospores.

MATERIALS & METHODS

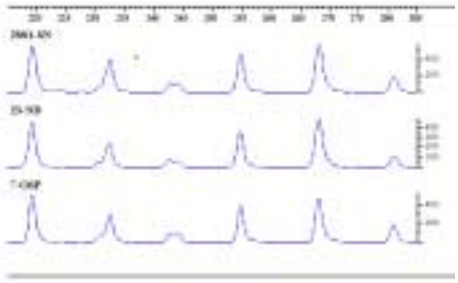
Samples of symptomatic plants were taken on three dates and the location of each sample collected was recorded. One hundred and ninety-five samples of *P. nicotianae* were recovered and the mating type was determined based on crosses with a known mating type. The isolates were screened for sensitivity to Subdue. Twenty-five *Phytophthora* samples representative of the growing areas were further analyzed with genetic fingerprinting in an effort to identify the source of the pathogen.

Phytophthora nicotianae was isolated from seedlings and mature plants. Disease was initially localized to single areas (above), which spread across (below) and within

beds (above). Excess soil moisture plays an important role in infections caused by *Phytophthora* and typically disease is most severe in poorly drained or low areas. Note wilting in previous pictures and brown/black lesions at the soil line with diseased roots (below).

RESULTS

Mating type, sensitivity to Subdue and genetic diversity. One hundred and forty-four of the 195 isolates recovered were screened and identified as the A2 mating type. No A1 mating type isolates were found (both mating types must be present for the oospore to form). The majority of the isolates (135) were highly sensitive to Subdue (<10% growth on amended media compared to control), nine of the isolates recovered had intermediate levels of resistance (between 35% and 44% growth relative to control). Resistance to Subdue has been reported for a wide range of *Phytophthora* spp. on a variety of hosts. Genetic fingerprinting indicated there were no differences between the isolates on either farm, and the *Phytophthora* isolates from the recently planted snapdragon plugs had the same genetic fingerprint as the *Phytophthora* from the established plants on each farm. All snapdragons were received from a single source.



AFLP fingerprint profiles (above) for three *P. nicotianae* isolates from two commercial snapdragon farms (note similarities).

CONCLUSIONS

Very little genetic diversity was detected in the *P. nicotianae* isolates from within or between either farm. This indicates that a single isolate is likely responsible for the multiple occurrences of disease. This clone may have been spread initially on infected plugs. Since only the A2 mating type was found, the production of oospores that are capable of long term survival is unlikely. Thus, fumigation and sanitation will be important tools for eradicating *P. nicotianae* from these farms. The majority of the isolates showed high sensitivity to Subdue, but use of this product on diseased plant material as a "cure" has traditionally resulted in *Phytophthora* populations quickly becoming insensitive. Therefore, Subdue should be used with caution and in rotation with other *Phytophthora*-controlling fungicides.

IMPACT TO INDUSTRY

1. The times most favorable for the application of *Phytophthora* fungicides are:

- When seedlings are in plug trays, just prior to transplanting in the field or into pots.
- Prior to full canopy development to ensure the fungicide reaches the lower plant stem, crown and soil.

2. When scouting, look for:

- Crown and root rot on established plants.
- Wilting or damp-off symptoms on seedlings.
- Brown roots on healthy-appearing snapdragon plugs.

3. Growers can now:

Recognize the importance of starting out with disease-free plug plants.

4. Retailers can now:

Be assured of a consistent, high quality, disease-free snapdragon.

5. Wholesalers can now:

Be assured of a consistent supply of snapdragons.