

## *Spongospora subterranea* detected in commercial peat-based potting mix in the United States

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### Background

- Spongospora subterranea* (Ss) is a soil-borne, obligate parasite in the Plasmodiophora family.
- Ss is found in 18 states in the U.S.
- Ss is the vector of *Potato mop-top virus*, an important tuber necrotic virus.



Figure 1. Signs and symptoms of Ss: resting spore or "sporisorus" (left); powdery scab symptoms on potato (middle); root galls on potato roots (right).

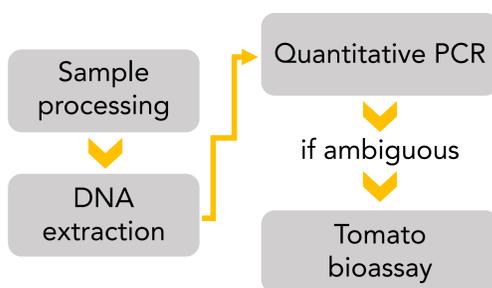
- Powdery scab symptoms were reported in seed potato minitubers grown in peat-based potting mix in 2017 and 2018.

### Methods

#### Tomato bioassay

- Two potting mixes obtained from different seed potato growers.
- qPCR on unused potting mixes.
- Positive control = inoculated potting mix with 9 sporosori per gram of potting mix (sp/g).
- Negative control = autoclaved potting mix.
- Bioassay with tomato plants as bait (six plants/potting mix, 4 reps).
- Tomato roots washed, stained, viewed under microscope.
- qPCR to confirm Ss in tomato roots.

#### Diagnostic sample testing



### Conclusions

- Ss is present in commercial peat-based potting mix.
- Using peat-based potting mix is a risk for greenhouse seed potato, ornamental, and nursery crop production and research.
- qPCR alone is not effective for Ss detection in peat-based potting mix.
- A tomato bioassay, followed by qPCR of tomato roots can be used to determine Ss presence in commercial potting mixes.

# *Spongospora subterranea* is present in commercial peat-based potting mix used in greenhouse production of multiple crops

## Baiting assay findings

### Potting mix source

### Ss-infected plants/total



Plasmidium in tomato roots

A  
B  
C  
D  
E  
F  
G

0/24  
16/24  
0/6  
0/6  
0/8  
2/2  
5/8



Zoosporangium in tomato roots



Scan here for a link to Ana Cristina's webpage

#### References:

- Falloon, R. E. et al. 2003. Susceptibility of potato (*Solanum tuberosum*) cultivars to powdery scab caused by *Spongospora subterranea* f. sp. *subterranea*, and relationships between tuber and root infection. *Australasian Plant Pathology*, 32(3), 377–385
- van de Graaf, P. et al. 2003. Detection and quantification of *Spongospora subterranea* in soil, water and plant tissue samples using real-time PCR. *European Journal of Plant Pathology* 109:589-9
- Mallik, I. et al. 2019. Detection and Quantification of *Spongospora subterranea* sporosori in soil by quantitative real-time PCR. *Plant Disease*, published online: <https://doi.org/10.1094/PDIS-05-19-1092-RE>



Ana Cristina Fulladolsa is a Research Scientist and Diagnostician in the CSU Plant Diagnostic Clinic. She is interested in advancing detection and management methods for plant viral diseases. She is also interested in the application of science to solve agricultural problems and is committed to science communication and education.

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### Pathogen Information

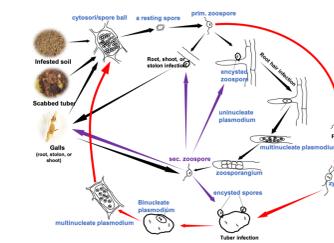


Figure 2. *S. subterranea* life cycle (Courtesy of Yuan Zeng)

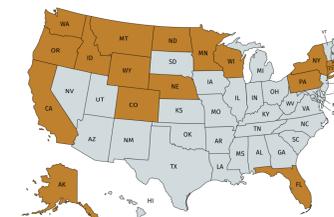


Figure 3. Ss distribution across the U.S.

### Tomato bioassay results

Table 1. Ss sporosori/g, based on qPCR, for potting mix samples before plating tomato bait plants

Potting mix ID	No. of reps <sup>a</sup>	Mean sp/g <sup>b</sup>	SD <sup>c</sup> sp/g
Source A	6	31	57
Source B	6	36	34
Positive control	10	12	8
Negative control	2	0	0

<sup>a</sup> No. of replicate DNA extractions performed on each sample.  
<sup>b</sup> sp/g: Ss sporosori per gram of potting mix.  
<sup>c</sup> SD: standard deviation.

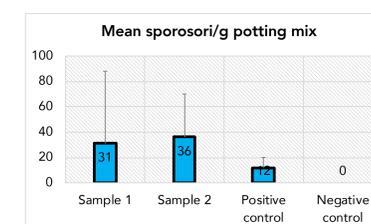


Figure 4. Ss qPCR results for potting mix subsamples were highly variable

Table 2. Tomato bioassay results.

Potting mix ID	Tomato variety	Ss-infected plants	qPCR result <sup>a</sup>
Source A	Alaskan Fancy	2/3	+
	Anna Russian	1/3	-
Source B	Alaskan Fancy	3/3	+
	Anna Russian	2/3	+
Positive control	Alaskan Fancy	1/3	+
	Anna Russian	2/3	+
Negative control	Alaskan Fancy	0/3	-
	Anna Russian	0/3	-

<sup>a</sup> A threshold level of 35 sp/g was used to determine if Ss was present (+) or absent (-) in the sample.



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This material is based upon work that is partially supported by the NIFA and APHIS, U.S. Department of Agriculture, under award numbers 2014-51181-22373 and 2015-37620-25766.