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The first finding of pythium root rot and leaf blight of elephant foot yam (*Amorphophallus paeonifolius*) in India

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Elephant foot yam *Amorphophallus paeonifolius*, formerly known as *A. campanulatus*, produces an edible corm and is widely cultivated from West Bengal to Tamil Nadu, India. It is an example of a crop species that is indigenous to this region and has been included in the National Germplasm Evaluation Programme for tuber crop improvement. This important crop has recently suffered from a root rot and leaf blight disease.

Symptoms of affected plants ranged from chlorosis, stunting to a complete blight as the disease progressed. Necrotic root symptoms began at the tip, but progressed quickly eventually killing the whole root. The cortex of severely affected roots could be easily sloughed off, leaving only parts of the vascular system intact. Samples of affected plants from production fields and an experimental farm (All India Coordinated Research Project on Tuber Crops in Nadia district, West Bengal) were collected. The pathogen was isolated by plating affected tissues on amended V8 agar (Guha Roy *et al*., 2006). Resultant isolates were identified using morphological characters, DNA fingerprinting and sequencing.

Sporangia were ovoid to globose, papillate, caducous and non-proliferating (41·46 μm ± 2·9 × 37·64 μm ± 2·0). Isolates were homothallic. Oogonia were spherical, smooth walled with elongate diclinous antheridia and aplerotic oospores (39·16 μm ± 2·26 diameter). Hyphal swellings were absent. Based on the above morphological features and ITS sequencing (GenBank Acc. No. EF455802), the organism was identified as *Pythium helicoides*. Its SSCP (single stranded conformational polymorphism) pattern was also typical of *P. helicoides* (Kong *et al*., 2004). Pathogenicity was confirmed by wound-inoculating stem bases of 3-month old healthy plants of *A. paeonifolius* with a 9-mm cork borer and placing 7-mm mycelial discs of 5-day old *P. helicoids*-test cultures in the holes. Plants were maintained at approximately 30 ± 1°C and assessed 15 days post inoculation. *Pythium helicoides* was successfully re-isolated, thus completing Koch's postulates. Control plants inoculated with agar alone remained symptomless.

This is the first report of *P. helicoides* affecting *A. paeonifolius* in India and worldwide. One isolate was deposited in the World *Phytophthora* Collection and Virginia Polytechnic Institute and State University, USA, under accession numbers P10973 and 33B2, respectively.

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Pathogenicity of *Pythium spiculum* and *P. sterilum* on feeder roots of *Quercus rotundifolia*

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A severe decline affecting *Quercus suber* and *Q. rotundifolia* has been reported since the early 1990s in southern Spain and Portugal. Root rot caused by *Phytophthora cinnamomi* has been the main factor involved in the decline (Brasier 1996). Since 2003, *Pythium spiculum* (Paul *et al*., 2006) and *P. sterilum* (Belbahri *et al*., 2006) were isolated from feeder roots of declining oaks and from soil samples but there is no information about their pathogenicity on oak.

Pathogenicity tests were conducted on 4-year-old *Q. rotundifolia* plants inoculated with nine isolates of *P. spiculum*, one isolate of *P. sterilum* and one isolate of *Phytophthora cinnamomi*. Inocula were prepared by shaking and mixing the mycelium produced in carrot broth in three Petri dishes with 100 mL sterile water, before adding to each root ball to be inoculated. There were ten inoculated and ten non-inoculated control plants each per isolate. All the plants were waterlogged to favour root infection and maintained in a growth chamber (17–25°C and 12 h light per day). One month later, the inoculated plants showed symptoms of root necrosis, that resulted in foliar wilting followed occasionally by defoliation. Control plants did not develop foliar symptoms and showed a very low level of root necrosis, averaging 0·6 on a 0–4 scale (0 = healthy root, 4 = dead root) used to assess root symptoms (Sánchez *et al*., 2005). Analysis of variance and comparison of means by the Fisher's LSD test was performed for root necrosis values. Root damage severity exhibited significant differences in relation to the control plants for all the isolates tested, with *P. cinnamomi* the most pathogenic isolate (average root necrosis, 2·8). Isolates PE154, PA053, PA054, PA055, PE137, PE138, PE144 of *P. spiculum* produced values of root necrosis (2·2 in average) similar to isolate PE101 of *P. sterilum* (averaging 2·1), but significantly higher than isolates PE155 and PE156 of *P. spiculum*, averaging 1·6. The inoculated oomycete was always reisolated from necrotic roots and never from the roots of control plants.

This is the first report of *P. spiculum* causing root rot on *Quercus* in Spain and Portugal. The root disease is similar in symptomatology to that caused by *Phytophthora cinnamomi*, with lower disease severities depending on the isolate. *Pythium sterilum* appears to be a weaker pathogen in comparison with *Phytophthora cinnamomi*, but nonetheless has the potential to cause root disease on *Quercus* spp.

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