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**Quality *Phytophthora* species isolated from woody ornamental hosts in Galician nurseries***Especies de Phytophthora de calidad aisladas de especies leñosas ornamentales en viveros de Galicia*

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FREE PAPER – ARTÍCULO GRATUITO

**Abstract**

In the present paper the author describes the quality –not quarantine– *Phytophthora* species isolated from woody ornamental hosts in Galician nurseries, as part of his work as an independent phytopathological consultant. He isolated a total number of 6 species as pathogens to plants with different symptoms: *Phytophthora cinnamomi*, *P. cactorum*, *P. palmivora*, *P. nicotianae*, *P. cryptogea* and *P. citrophthora*. The author compares the different hosts included in his results with the hosts described by the specialized literature.

**Key words:** *Phytophthora cinnamomi*, *P. cactorum*, *P. palmivora*, *P. nicotianae*, *P. cryptogea* and *P. citrophthora*.

**Resumen**

En el presente trabajo el autor describe las especies de *Phytophthora* aisladas de especies leñosas ornamentales en los viveros de Galicia, en su labor como consultor fitopatológico independiente. Aísla un total de 6 especies patógenas de plantas con síntomas diversos: *Phytophthora cinnamomi*, *P. cactorum*, *P. palmivora*, *P. nicotianae*, *P. cryptogea* and *P. citrophthora*. El autor relaciona las diferentes especies hospedadoras sobre las que se aíslan discutiendo y comparándolas con los hospedadores que describe la bibliografía especializada.

**Palabras clave:** *Phytophthora cinnamomi*, *P. cactorum*, *P. palmivora*, *P. nicotianae*, *P. cryptogea* y *P. citrophthora*.

**1. Introduction**

During the last 15 years the author has intensified the phytopathological inspections due to the detection of *Phytophthora ramorum* (Werres *et al.*, 2001) in Galicia (Pintos *et al.*, 2004), causal agent of the sudden oak death. As a result of these inspections the author also detected other species of *Phytophthora* different to *P. ramorum* but without less economical importance for woody

ornamental nurseries in Galicia –NW Spain–. In this paper the author carries out a revision of his own phytopathological data from 1999 to 2019 describing the different *Phytophthora* species isolated by him, from woody ornamental hosts, in his own laboratory, as part of his work as an independent phytopathological consultant. Except for the valuable work carried out by the research

group leaded by Pérez-Sierra in Valencia, there is a great lack of information about *Phytophthora* species pathogenic to woody ornamental hosts collected in Spanish nurseries. This research group carried out several surveys on woody ornamental nurseries of Eastern Spain that pointed out the existence of thirteen different *Phytophthora* species causing disease in the 70% of the nurseries studied. These were the following: *P. cactorum*, *P. cinnamomi*, *P. citrophthora*, *P. cryptogea*, *P. drechsleri*, *P. hibernalis*, *P. multivora*, *P. nicotianae*, *P. palmivora*, *P. niederhauserii*, *P. plurivora*, *P. syringae* and *P. tentaculata* (Pérez-Sierra *et al.*, 2012).

In Galicia Mansilla-Vázquez pointed out the presence of *Phytophthora cinnamomi* infecting *Camellia japonica* (Mansilla-Vázquez *et al.*, 2005) and, more recently, Andrés references the presence of *Phytophthora nicotianae* infecting several woody ornamental hosts –*Ceanothus repens*, *Dracaena marginata*, *Aucuba japonica*, *Araucaria araucana*, *Boronia gunni*, *Hydrangea macrophylla*, *Leptospermum scoparium*, *Cotoneaster lacteus*, *Miscanthus sinensis*, *Polygala myrtifolia*, *Correa reflexa*, *Phormium tenax* and *Rhododendron*–, of *Phytophthora cinnamomi* infecting *Camellia japonica*, azaleas, *Buxus sempervirens*, *Arbutus unedo* and *rhododendron*, of *Phytophthora cryptogea* infecting *Lavandula angustifolia*, and of *Phytophthora cactorum* infecting *Arbutus unedo*, localizing all of these diseases in Galician nurseries (Andrés, 2016 a, 2016 b, 2017 a, 2017 b, 2017 c, 2018, 2019).

## 2. Material & Method

### 2.1. Plant production centres included in the study and sampling method

The study has been carried out in thirteen woody ornamental production centres of Galicia –nine located in the province of Pontevedra, three in A Coruña and the other one in Lugo–. The samples taken in this study in field conditions were plant material with symptoms of the disease. Each sample contained six plants. The samplings were carried out on each centre, every two or four weeks, intermittently, from 1999 to 2019.

### 2.2. Identification of potential telluric pathogens

#### 2.2.1. Isolation method

The isolation of the pathogen was carried out in the phytopathological laboratory of the firm Consultorías Noroeste S.C. Fragments of the stem and

root bases of diseased plants were prepared for fungi isolation. The surface of these fragments were disinfected with 10% sodium hypochlorite solution for 4 minutes and plated on PDA (potato dextrose agar) (Rapilly, 1968). The fungi were grown under laboratory conditions and microscope observations were carried out every 24 hours during one week.

All of the *Phytophthora* and formerly *Pythium* (*Phytophythium*, *Pythium* and *Globisporangium*) isolates were passed to V8 medium, grown for one week and then passed to sterile petri dishes with sterile water, where they were grown under fluorescent light in order to produce sporangia.

#### 2.2.2. Taxonomical criteria for the determination of *Phytophthora* species

*Phytophthora* species were identified following taxonomical criteria described by Stamps *et al.* (Stamps *et al.*, 1990).

## 3. Results

The different *Phytophthora* species identified from woody ornamental hosts in Galician nurseries were the following:

### 1. *Phytophthora cinnamomi* Rands

Isolated hosts: *Pittosporum tobira*, *Araucaria araucana*, *Laurus nobilis*, *Camellia japonica*, *Rhododendron*, *Chamaecyparis lawsoniana*, *Ilexaquifolium*, *Euonymus japonica*.

Type of crop: soil and container.

Province: A Coruña, Pontevedra, Lugo.

### 2. *Phytophthora cactorum* (Lebert & Cohn) J. Schrot (1886)

Isolated hosts: *Ceanothus repens*.

Type of crop: soil and container.

Province: A Coruña.

### 3. *Phytophthora palmivora* Butler

Isolated hosts: *Chamaerops excelsa*.

Type of crop: soil and container.

Province: Pontevedra.

#### 4. *Phytophthora nicotianae* Breda de Haan (1896)

Isolated hosts: *Ceanothus repens*, *Dracaena marginata*, *Aucuba japonica*, *Araucaria araucana*, *Boronia gunni*, *Hydrangea macrophylla*, *Leptospermum scoparium*, *Cotoneaster lacteus*, *Myscanthus sinensis*, *Polygala myrtifolia*, *Correa reflexa*, *Phormium tenax*, *Rhododendron*, *Thuja plicata*, *Eriostemon myoporoides*, *Lophomyrthus ralphii*, *Hydrangea macrophylla*, *Phormium tenax*, *Acacia dealbata*, *Azalea*, *Grevillea juniperina*, *Picea abies*, *Taxus baccata*, *Eleagnus × ebbingei*, *Euonymus japonicus*, *Abelia grandiflora*, *Diosma ericoides* and *Nandina domestica*.

Type of crop: container.

Province: A Coruña, Pontevedra, Lugo.

#### 5. *Phytophthora cryptogea* Pethybr & Laff (1919)

Isolated hosts: *Lavandula angustifolia*.

Type of crop: container.

Province: Pontevedra.

#### 6. *Phytophthora citrophthora* (R.E. Sm & E.H. Sm.) Leonian (1906)

Isolated hosts: *Citrus sinensis*.

Type of crop: container.

Province: Pontevedra.

#### 4. Discussion

The species determination, among the *Phytophthora* genus, has a double transcendence: quarantine and fungicide resistance. The existence of certain *Phytophthora* species considered quarantine pathogens for certain countries including Spain, makes the genus determination completely useless for nursery plant producers as well as for plant inspectors. These need quick and sure analysis, that may determine up to species status, in order to avoid introductions and spread of this quarantine pathogens.

On the other hand there are references of certain isolates resistant to certain fungicides belonging to the phenylamides –moA code A1 and Frac group 4–. These are the following: *Phytophthora cactorum* in strawberry and American ginseng (Bal *et al.*, 1987; Hill & Hausbeck, 2008), *Phytophthora cinnamomi* in avocado (Darras & Becker, 1984); *Phytophthora nicotianae* in ornamentals (Hu *et al.*, 2011), periwinkle (Ferrin

& Kabashima, 1991) and tobacco (Shew, 1985), *Phytophthora palmivora* in laboratory conditions (Lucas *et al.*, 1990) and *Phytophthora citrophthora* in laboratory conditions (Serrhini *et al.*, 1985). This fact also points out the necessity of species determination in order to design sustainable plant protection programs.

The data shown in this paper demonstrate the existence of new pathogen-host interaction for Spain. These are the following: *Pittosporum tobira*, *Araucaria araucana* and *Euonymus japonica* infected by *Phytophthora cinnamomi*; *Phytophthora cactorum* pathogenic to *Ceanothus repens* and *Thuja plicata*, *Eriostemon myoporoides*, *Lophomyrthus × ralphii*, *Hydrangea macrophylla*, *Acacia dealbata*, *Grevillea juniperina*, *Picea abies*, *Eleagnus × ebbingei*, *Abelia grandiflora*, *Diosma ericoides* and *Nandina domestica* infected by *Phytophthora nicotianae* (Pérez-Sierra *et al.*, 2012; Andrés, 2015 a, 2015 b, 2017 a, 2017 b, 2017 c, 2018, 2019; Melgarejo *et al.*, 2010; Farr & Rossman, 2019; Farr & Rossman, 2019 b; Farr & Rossman, 2019 c).

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