Webinar of the Polish Phytopathological Society

Plant diseases problems in Italy on ornamental and forest plants in gardens and nurseries on urban trees

Foto: A. Tantardini

Dr. Agr. Andrea Tantardini

andreatantardini@libero.it

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Plant diseases in the North of Italy

Winter hardiness zones in Europe

Winter hardiness zones and their temperature range of middle annual minimum temperature ($t_{\overline{min}}$)

Zone	°F	°C
1	< –50	< –45.5
2	–50 to –40	–45.5 to –40.1
3	–40 to –30	–40.0 to –34.5
4	–30 to –20	–34.4 to –28.9
5	–20 to –10	–28.8 to –23.4
6	–10 to 0	–23.3 to –17.8
7	0 to +10	–17.7 to –12.3
8	+10 to +20	–12.2 to –6.7
9	+20 to +30	–6.6 to –1.2
10	+30 to +40	–1.1 to +4.4
11	> +40	> +4.4

Italy has historical gardens rich in biodiversity due to a particulary milde weather

Foto: A. Tantardini

Many species of ornamentel trees and shrubs grow in parks and garden

The weather and climate is favourable for ornamental plants and there are a lot of nurseries

Foto: A. Tantardini

Globalisation

Old and new pests can damage plants in gardens forests and in agricultural areas

With globalization, the greater the risk of introducing new diseases and pests

Climate change favors the emergence of pathogens of weakness

There is an average increase in temperatures and drought years that weaken certain botanical species and make them susceptible to infections of secondary pathogens
Climate change favors the emergence of pathogens of weakness


Foto: A.Tantardini


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Schizophyllum commune Fr. : Fr. 1815


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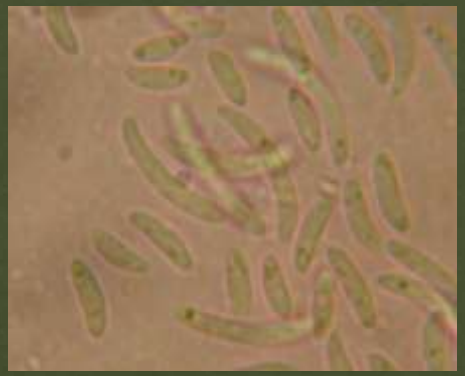
Fomitiporia punctata (P. Karst.) Murrill, 1947
Syn. *Phellinus punctatus*

Species such as beech (*Fagus sylvatica*) , birch (*Betula* spp.), alpine conifers have suffered from hot and dry summers (eg 2003 and 2022 were particularly torrid)

Cytospora decipiens ((DC.) Nitschke, (1867)) e *Endothiella* sp.

Agent of dieback of hornbeam (*Carpinus betulus*)
Fungal disease favored by heat and drought
Present in north of Italy



The dieback of hornbeams

Discovery of infestations of the bark beetle *Scolytus carpini*

Fungal evasions

Flickering holes
bark beetles

Bark beetle larvae

Adult bark beetle

A disease linked to climate change *Hypoxylon mediterraneum on* *Quercus palustris* e *Q. suber*

Hypoxylon mediterraneum (De Not.) Ces. & De Not.(1863).

Synonym of Biscogniauxia mediterranea (De Not.) Kuntze

Boxwood diseases (On *Buxus pumila* and *Buxus sempervirens*)

Importance of boxwood in the gardens

Villa Taverna Torno (CO)

Villa D'Este Tivoli

Villa Medici Giulini Briosco (CO)

Villa Durazzo S. Margherita Ligure.

Cylindrocladium buxicola (Henricot & Culham) *Calonectria pseudonaviculata* (Crous et al.) Lombard et al.

Boxwood blight (also known as box blight or boxwood leaf drop) is a widespread fungal disease affecting boxwoods (box plants).
The disease causes widespread defoliation and eventual death

Reported in Italy since 2009

Other fungal diseases of boxwood

BOXWOOD BLIGHT

Macrophoma candollei (Berk. & Broome) Berl. & Voglino, 1886
Synonym of *Hyponectria buxi* (Alb. & Schwein.) Sacc., 1878

Volutella buxi (DC.) Berk. & Broome (1850)
Pseudonectria buxi

Boxwood root rot

Phytophthora nicotianae (also *P.citricola*) .

Fusarium sp.

Ornamental plants and cultivars alternative to boxwood

Abelia grandiflora prostrata
Azara microphylla
Berberis julianae
Caryopteris x *clandonensis* ‘*Grand Blue*’
Cotoneaster franchetii
Distylium racemosum
Elaeagnus x *ebbingei* ‘Compacta’
Elaeagnus ‘Quicksilver’
Fuchsia magellanica
Ilex crenata fastigiata (erecta)
Ilex crenata ‘Kinme’
Ligustrum ovalifolium ‘Lemon & Lime’
Lonicera nitida
Mahonia aquifolium
Osmanthus armatus
Osmanthus ilicifolius (=Osmanthus heteropyllus)
Phyllirea angustifolia
Pittosporum heterophyllum
Prunus laurocerasus ‘Etna’
Viburnum arboricolum
Viburnum pragense
Viburnum harryanum

Erysiphe pulchra ((Cooke & Peck) U. Braun & S. Takam. 2000)

agent of ornamental cornus powdery mildew disease

Host plants

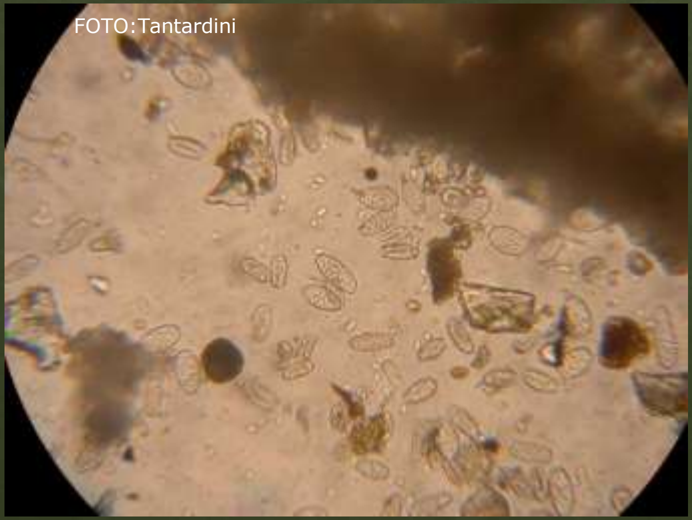
The disease affects many North American species and varieties of ornamental cornus *C.florida* "Rubra", *C.florida* "Cherokee chief", C.florida "Rainbow".
C. florida "Cherokee Brave" and Cherokee Brave

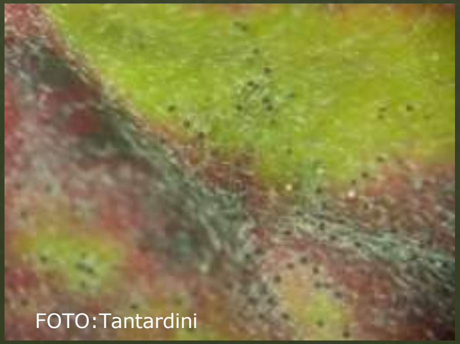
In Italy, *E.pulchra* on ornamental cornus has been present since the summer of 2008 reported in nurseries and gardens in Piedmont (Garibaldi et.al, 2009).

Diffusion

The pathogen is reported in North America (USA, Mass., N. Carolina, Illinois., Wisconsin, Canada), and in Japan.
Some hypotheses support that the powdery mildew caused by *E. pulchra* is of Asian origin.

Symptoms *Erysiphe pulchra* **agent of ornamental cornus powdwey mildew**





Discula destructiva (Redlin 1991) agent of anthracnose of ornamental cornus

Host Plants

Primary hosts: *Cornus florida* (flowering dogwood) and *Cornus nuttallii* (pacific dogwood).

Secondary guests: *Cornus alba*, *C.controversa* (giant dogwood), *C. sericea* (redosier dogwood), *C.stolonifera*, *C. kousa*, *C. alternifolia and C. amomum* are considered relatively resistant

There are no reports of the disease on native European dogwoods (*Cornus mas* and *C. sanguinea*).


FOTO:Tantardini

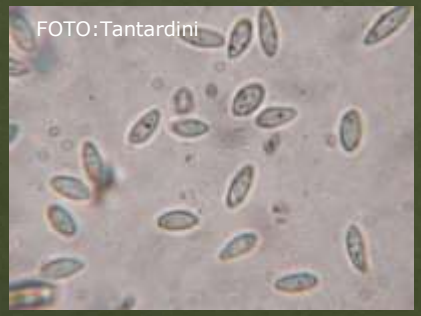
Geographical distribution of the disease

In Europe *D.destructiva* has been present in Germany since 2002, in Italy it was found in 2003 in Lombardy.

In 1995 it was intercepted in the United Kingdom (UK) on *C. florida* imported from the USA. On the North American continent, the disease is present in Canada and the USA.

Symptoms

Discula destructiva agent of anthracnose of ornamental cornus

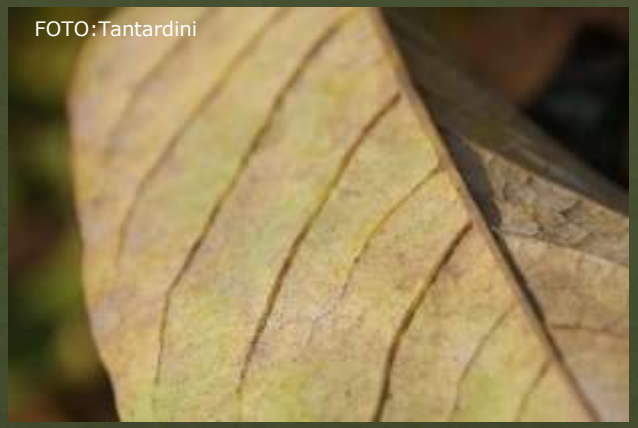


Erysiphe magnifica (U. Braun) U. Braun & S. Takam., (2000)
agent of powdery mildew of deciduous magnolias.

Host plants
The host species of *E. magnifica* causative agent of magnolia powdery mildew are *Magnolia liliiflora*, *M. acuminata*, *M. penicillata*, several varieties of *Magnolia X Soulangeana* and *Magnolia stellata*.

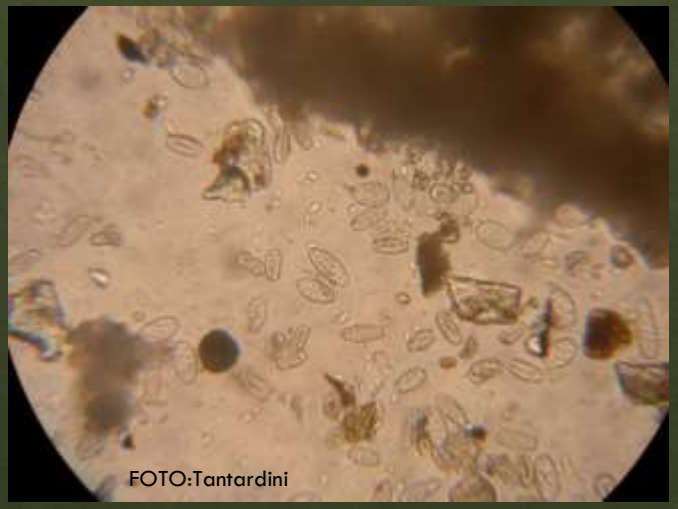
Geographical distribution of the disease
The disease has been reported in Japan and on the Atlantic coast of the United States since 2003 in the Netherlands and Germany; in Italy it made its appearance in 2009.

Erysiphe magnifica agent of powdwry mildew of deciduous magnolias.



Symptoms

Powdery mildew of *Magnolia soulangeana caused by Erysiphe magnifica*



Some possible interventions:
specific fungicides registered for use on ornamentals in nurseries

Erysiphe flexuosa (Peck) U.Braun & S.Takam. (2000).

Erysiphe flexuosa Horse Chestnut powdery mildew


FOTO:Tantardini

Plants

***Erysiphe flexuosa* hosts are *Asculus hippocastanum* A.×*carnea*, *A. glabra*, *A. octandra*, *A. pavia*, *A. parviflora*, *A. neglecta*, *A. sylvatica*, *A. chinensis*, *A. indica*, *A. neglect a*, and *A.*×*plantierensis*.**

The first appearances of the powdery mildew in the various European areas have been ascertained almost exclusively on *A.hippocastanum* and *Aesculus* ×*carnea*, the two species most used in street furniture, in public and private parks and gardens.

Geographical distribution of the disease

Powdery mildew of horse chestnut attacks several species of this essence in North America, in 1987 it appeared in the eastern regions of Russia.

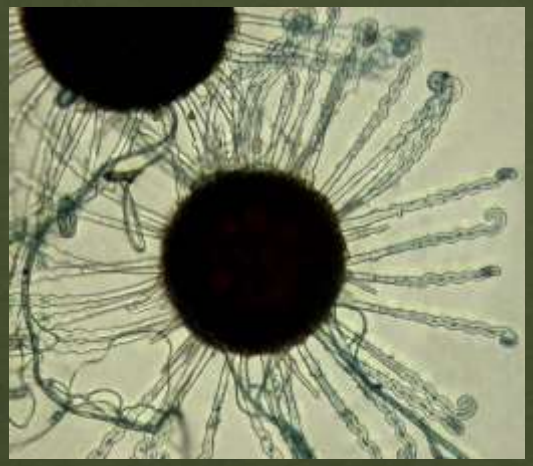
The disease has been reported in Switzerland and Germany since 1999, in 2001 and 2002 in Slovakia, Austria, the Czech Republic, France, Croatia, Poland, and the United Kingdom.

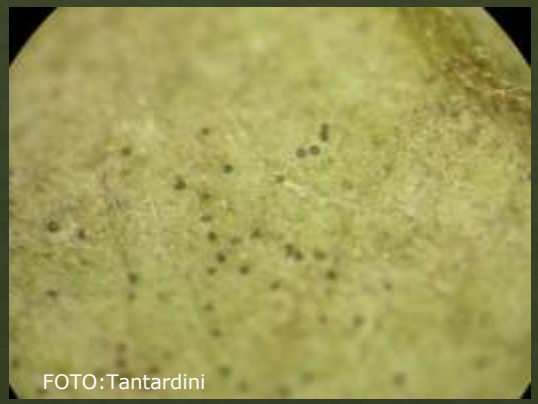
In Italy it appeared in 2003 and is widespread in our country.

Symptoms

Erysiphe flexuosa ((Peck) U. Braun & S. Takam., (2000))

Horse Chestnut powdery mildew





Catalpa bignognoides powdery mildew

- *FOTO:Tantardini*

Erysiphe elevata (Burrill) Braun & Takamatsu, 2000

Erysiphe elevata
on Catalpa bignognoides

A new fungal disease of the walnut tree:

Geosmithia morbida M.Kolařík, Freeland, C.Utley & Tisserat (2010)

Hosts:

- ***Juglans nigra*** (*black walnut*)
- *J. californica* (*Southern California black walnut*)
- *J. hindsii* (*Northern California black walnut*)
- *Juglans* hybrids (e.g. *J. hindsii x J. regia*), occasionally on*J. cinerea* (butternut).
- ***J. regia*** (English walnut) shows symptoms only in rare cases

Eradication activity

First European report of *Pityophthorus juglandis* in 2013 (*Coleoptera: Scolytinae*) and associated pathogen *Geosmithia morbida* (*Ascomycota: Hypocreales*)

Powdery mildew of *Wisteria sinensis*
Oidium pseudoidium

FOTO:Tantardini

Reported in 2007

Powdery mildew on ornamental shrubs

RHODODENDRON and AZALEA

ERICACEAE *Rhododendron sp. e Azalea "Mollis"*
Sphaeroteca pannosa – Erysiphe polygoni –
Microsphaera azaleae

Powdery mildew on ornamental shrubs

On *Euonymus fortunei* and *Syringa vulgaris*

CELASTRACEAE: Euonymus fortunei
Infected by *Oidium evonymi japonici.*

OLEACEAE: Syringa vulgaris infected by *Oidium syringae* e di *Phyllactinia guttata* (*f.c.Ovulariopsis sp.*)

Powdery mildew on ornamental shrubs

On *Lagerstroemia indica*

LYTHRACEAE:Lagerstroemia indica
Infected by *Erysiphe lagerstroemiae*.

Powdery mildew of *Prunus laurocerasus*

ROSACEAE
Prunus laurocerasus infected by *Spaerotheca pannosa.*

Other Powdery mildew agents : *Podosphaera oxyacanthae*

Xanthomonas arboricola pv. pruni (Smith) Vauterin et al.

su *Prunus laurocerasus*

Possibility of confusion with symptoms of powdery mildew and corineum

Symptoms of shot-hole

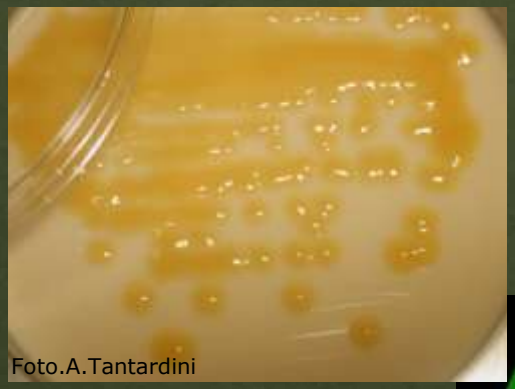
Xanthomonas arboricola pv. *pruni*

On *Prunus laurocerasus*

In Italy present on cultivated stone fruits *Prunus persica, P.domestica, P.salicina* Quarantine pathogen in list A2

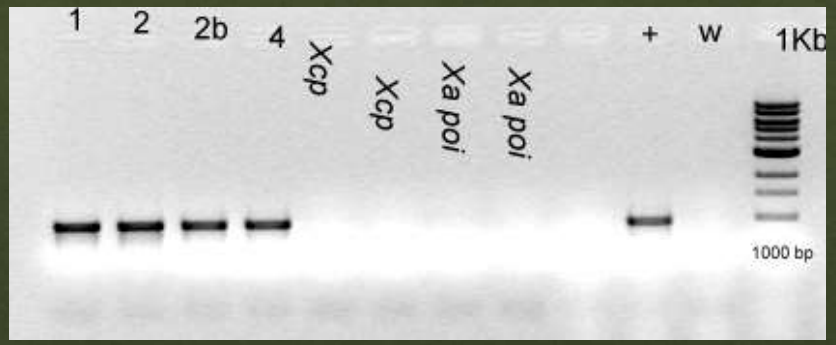
Also indicated as a pathogen for ornamentals: *P.laurocerasus* and *P.davidiana*, first found in Italy.

Classic isolation on YDC



IFA Essay

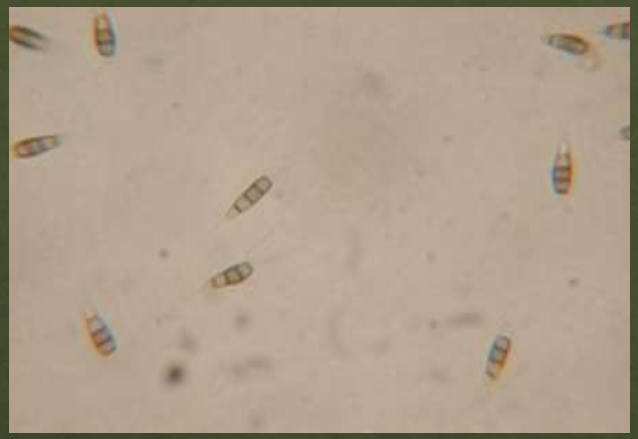
Colony identification with PCR



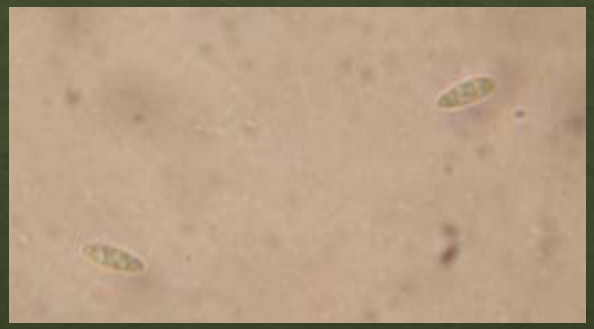
Xcp: *Xanthomonas campestris pelargonii*
Xpoi: *X. axonopodis poinsetticola*
+: *X arboricola pruni* reference strain
1-2-2b-4: colony samples

Elimination of symptomatic plants is recommended. Over-canopy irrigation promotes infection and spread. Cupric products have bacteriostatic action.

Fungal diseases on cupressacee



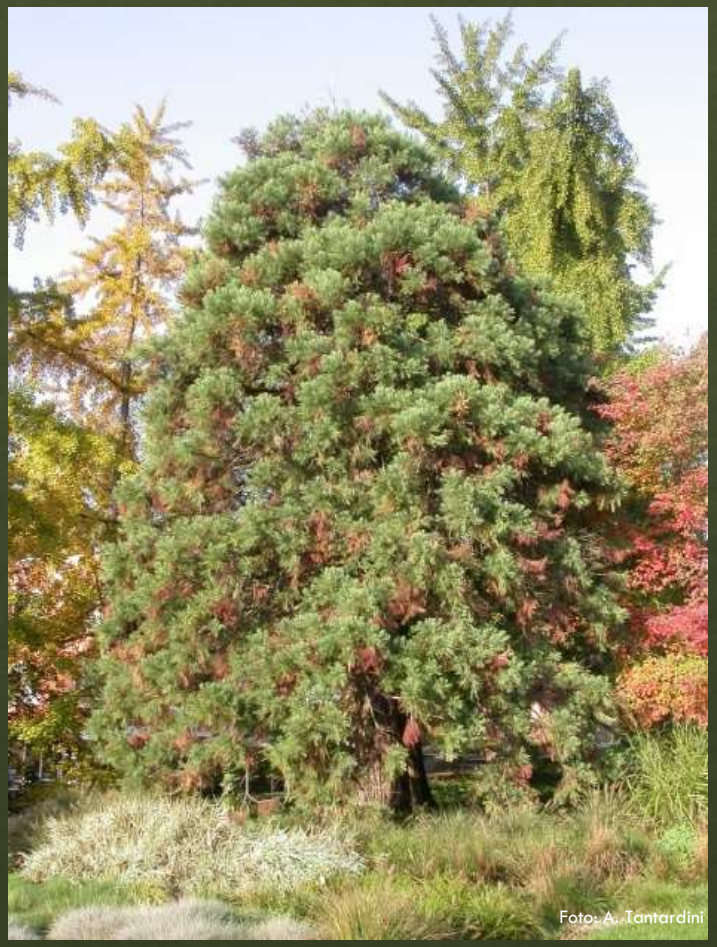
Pestalotiopsis funerea



Botryosphaeria dothidea (Moug.: Fr.) Ces. & De Not su *Sequoiadendron giganteum* (Lindl.) Buchh.

Some possible interventions:
removal of dead branches,
Copper treatments in nurseries

CASES IN 2023-2024

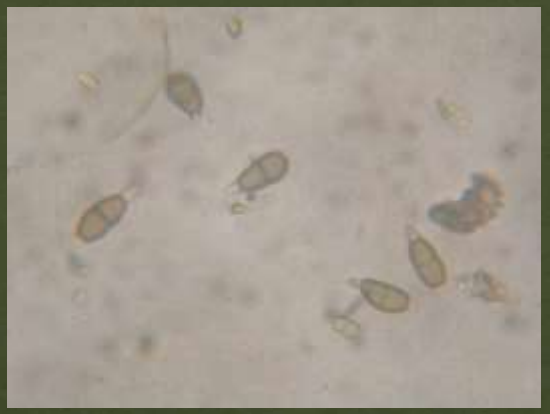


Lophodermium cedrinum Maire, 1917

Some possible interventions: collection as far as possible of infected needles that have fallen to the ground;

Biostimulation at the root level of plants.

Cedar twig dieback on *Cedrus deodara* caused by *Truncatella hartigii (Tubeuf) Stey. Liés*



Truncatella hartigii (Tubeuf) Stey. Liés

Sphaeropsis sapinea

Some possible interventions: elimination of dead branches, treatments with coppers in nurseries

Sirococcus tsugae a new disease spreading on cedars

Fo

Coniophora arida (Fr.) P. Karst., 1868

•***Coniophora arida***
su Cedrus sp.

•Brown wood caries agent

•THE IMPORTANCE OF

•RECOGNITION

•MORPHOLOGICAL

•MICROSCOPIC

•AND/OR MOLECULAR

A widespread and polyphagous phytopathogenic fungus in gardens

Armillaria mellea

Cedrus deodara attached from Armillaria sp.

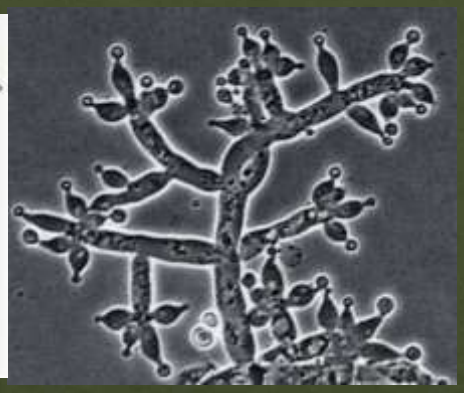
Root rot

The management of trees infected with Armillaria

Evaluation of stability and an attempt to remediate a cedar infected with Armillaria with dendrosurgical practice

Biological defence options against telluric pathogens

Antagonist fungi: *Trichoderma harzianum* and *T.asperellum*



Antibiosis and mycoparasitism of Trichoderma vs. Armillaria spp.

- **Elimination of predisposing causes:**
- **Stagnations**
- **Irrigation systems**
- **Water jets on logs**

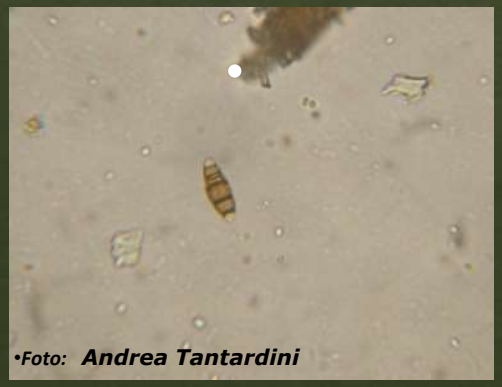
Dieback of araucaria branches caused by *Fusicoccum araucariae*

Stromi and fructifications of F. araucariae

Some possible interventions: removal of dead branches, Copper treatments in nurseries

Cypress bark cancer

•Foto: **Andrea Tantardini**



•Foto: **Andrea Tantardini**

Multiseptate conidium of C.cardinale

Seiridium cardinale *(Wag.) Sutton & Gibson*

Prevention through the use of resistant clones
(e.g. "Bolgheri, Agrimed)
In the gardens, treatments with copper products

Cryptocline taxicola (Allesch.) Petrak (Coelomycetes) (Syn. *Gloeosporium taxicola*)

Decay agent of *Taxus baccata*

Some possible interventions:
removal of dead branches,
Copper treatments in nurseries
avoid wetting of the leaves by irrigation systems if present

Diseases and pests of acidophilic plants

Phythopthora spp. agent of rhododendron root rot

Phythopthora spp.

Armillaria mellea on Rhododendron sp., chlorosis, physiological problems

Soil management and irrigation

•Incorrect irrigation causes
•asphyxiation fungal diseases or ferric chlorosis

•*Armillaria mellea Whitish mycelium under bark*

•*Drainage, coring, analysis, pH correction*

Root rot and desiccation

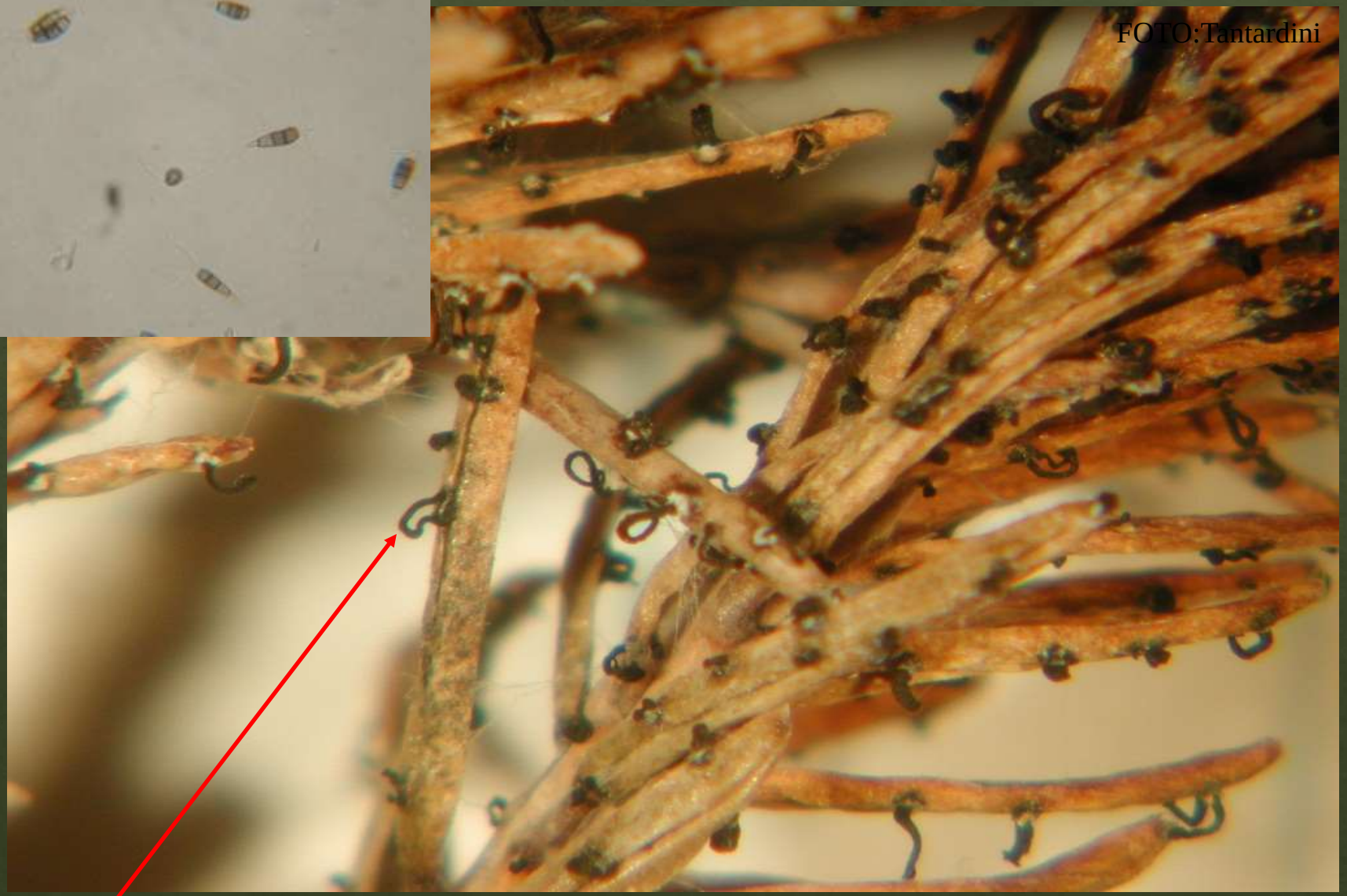
Phytophthora citricola
P.cinnammomi

Twig dieback on *Erica* sp. caused by *P. citricola*

Asymmetrical semipapillate sporangium of P. *citricola*.

Effective active ingredients on Phythoptora: Fosetyl aluminium Phosphites, Phenylamides.

Twig dieback caused by Pestalotiopsis sp.



Cirri of Pestalotiopsis sp. Infected vegetation on *Erica* spp.

Camellia japonica flower rot caused by *Ciborinia camelliae* Kohn

It is a fungal disease native to Japan, present in Canada and North America.
Reported in Italy in the spring of 2000.

Acidophilic plant foliar diseases

Cercospora rhododendri
on *Rhododendron* sp.

Colletotrichum
acutatum
on azalea

Acidophilic plant foliar diseases

Exobasidium Japonicum su azalea

Exobasidium cameliae

Fungal diseases of cover plants

Hedera helix* root rot caused by *Phytopthora palmivora

Patologia

Francesca Gaffuri*, Stefano Sacchi*, Andrea Tantardini*

Rinvenimento di *Phytophthtora palmivora* associata a marciume radicale e del colletto su edera

Sporangi di P.palmivora (Foto A.Tantardini)

L'edera (*Hedera elix*) è una pianta appartenente alla famiglia delle *Araliaceae*, essa è diffusa in natura in ambienti umidi ed ombrosi, nelle sue diverse varietà è utilizzata come pianta ornamentale da esterno dove grazie alle sue capacità tappezzanti e rampicanti è spesso utilizzata per coprire massicciate per formare pergolati per ricoprire pareti e muri. Per i suoi utilizzi ornamentali sono state selezionate numerose varietà che si diversificano per: il loro tipo di sviluppo per la forma e la colorazione fogliare che può essere variegata, screziata, con margine bianco o giallo.

L'edera è una pianta rustica tuttavia alcune varietà soffrono i ritorni di freddo o le gelate anticipate. In condizioni particolari possono verificarsi attacchi parassitari di insetti fitomizi, in particolare, afidi (*Aphis hederae*), cocciniglie (*Coccus spp., Icerya purchasi, Planococcus spp., Aspidiotus spp., Ceroplastes spp., Astrolecanium spp.*) e cicaline (*Metcalfa pruinosa*); oltre ai danni diretti dai suddetti parassiti, legati alla sottrazione di linfa elaborata si può assistere a generale deperimento della vegetazione, oltre all' ingiuria legata all'imbrattamento della chioma di melata e successivi incrostamenti da fumaggini.

Tra le avversità, invece, è utile sottolineare come l'edera possa essere colpita, in annate particolarmente piovose e umide, da antracnosi fogliari ad eziologia fungina, con partico-

*Laboratorio Fitopatologico SFR Regione Lombardia c/o Fondazione Minoprio - viale Raimondi 54, Vertemate con Minoprio, 22070 Como - fitolab.agricoltura.lombardia.it

Fusarium solani on ivy (*Edera helix*)

Fusaria on *Hebe* sp.

F.oxysporum mycelium developed on Hebe After incubation I n humid room.

Macroconidia of Fusarium oxysporum found on Hebe sp.

Fusarium Control and Prevention
use of antagonistic fungi (e.g. Trichoderma)

Desiccation on *Pachysandra terminalis* caused by *Volutella pachysandricola*

Decay of violets
presence of *Phytophthora*

Decay of «Sunpatiens»

Sclerotium rolfsii

Plasmopara obducens (J. Schröt.) J. Schröt., (1886)
Impatiens downy mildew

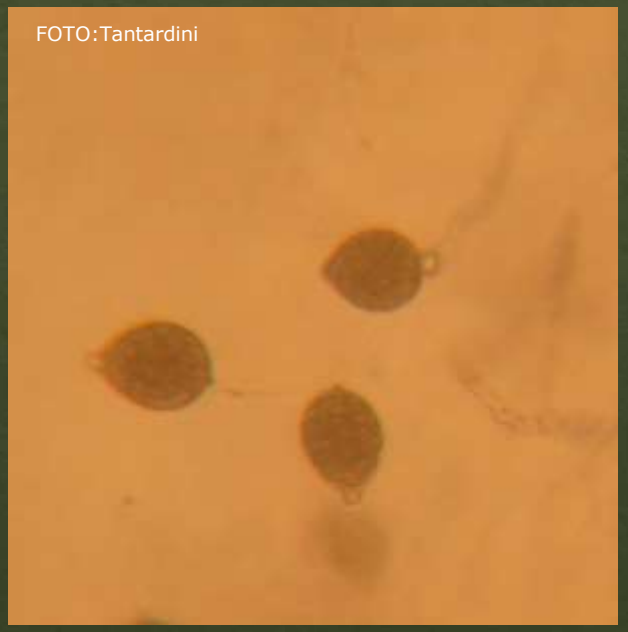
EPPO Region: Germany, Italy (found in Lombardy in 2008), Slovenia (found in 2 greenhouses in 2008), United Kingdom


Foto: Andrea Tantardini


Foto: Andrea Tantardini

Some possible interventions: avoid stagnation, humidity or excessive irrigation

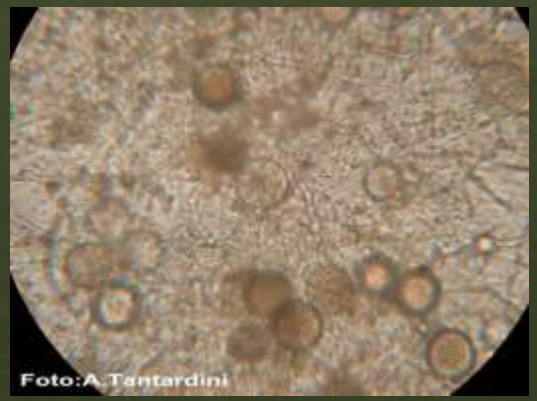
EMERGING PHYTOPATHOLOGICAL PROBLEMS ON HORNAMETAL AND FOREST PLANTS



Phytophthora acerina su Acer pseudoplatanus

Fungal diseases on urban trees

Phytophthora cactorum on Fagus sylvatica



Phytophthora cinnamomi on *Quercus ilex*

Root rot caused by *Fusarium solani* on Juglans regia

Some possible interventions: avoid stagnation or excessive irrigation, treatments with Trichoderma-based products

Belisario A., Maccaroni M., Coramusi A., Valier A., 2004. Cases of common walnut wasting associated with collar and stem cancer: a syndrome related to Fusarium solani. Phytopathological Informant, 11: 38-42.

Fusarium solani
On poplar plantation

Phomopsis tirrenica on polpar

Fusarium sp. Dieback agent of Magnolia grandiflora

Some possible interventions:
avoid stagnation or excessive irrigation,
treatments with Trichoderma-based products

f.con. Sphaeropsis malorum Berk
(f.asc.Botryosphaeria obtusa (Schw.))

Twig dieback on Prunus laurocerаus


Foto: **Andrea Tantardini**


Foto: **Andrea Tantardini**


Foto: **Andrea Tantardini**

Prevention:

- Avoid large pruning cuts

- Eliminate affected plants and branches

- Disinfect the woody parts as much as possible with copper solutions after pruning

- Lawn sprinklers should not wet hedges

Thedgonia ligustrina

Cercosporiosis of the privet

•*Foto: A.Tantardini*

Anthracnose of the hackberry (*Celtis australis*)

Sirosporium celtidis

Taphrina coerulescens
Fungal disease: red oak blister
(Quercus rubra)

A historical case of introduction of a fungal disease

After World War II the colored canker of the plane tree (*Ceratocystis platani*) struck and destroyed the majestic Vialone Carlo III

Casse di legno militari americane infette

ISTITUTO DI PATOLOGIA VEGETALE, UNIVERSITA', NAPOLI, PORTICI

LA MORIA DEL PLATANO IN CAMPANIA (1)

M. CRISTINZIO, F. MARZIANO e R. VERNEAU

In una recente nota intitolata « I nostri platani sono in pericolo! » (Panconesi, 1972) è stata segnalata una moria del Platano in Lucchesia, causata da *Ceratocystis fimbriata* (Ell. et Halst.) Davidson forma *platani* Walter. Purtroppo non si tratta solo di un pericolo ma di una triste realtà già verificatasi da almeno 27-28 anni in Campania, anche se solo nel 1960 il parassita fu isolato da piante colpite.

Infatti la *Ceratocystis* causò una tale moria delle piante di platano costituenti l'alberatura monumentale del Vialone Carlo III conducente alla celebre Reggia Vanvitelliana di Caserta, da costringere, nel tempo, all'abbattimento di ben 900 piante sul solo Vialone, ossia della totalità di esse.

La dolorosa decisione — che tante critiche ha sollevato — fu presa a suo tempo, cioè nel 1964, da una Commissione composta da botanici, fitopatologi, funzionari della Soprintendenza ai Monumenti, del Corpo forestale e dell'ANAS. E' da notare che si trattava di piante bicentenarie, alte oltre i 45 metri, che per il loro stato minacciavano di crollare sul Vialone che è parte della ss 87 Sannitica, conducente da Napoli a Caserta (Tav. I, I).

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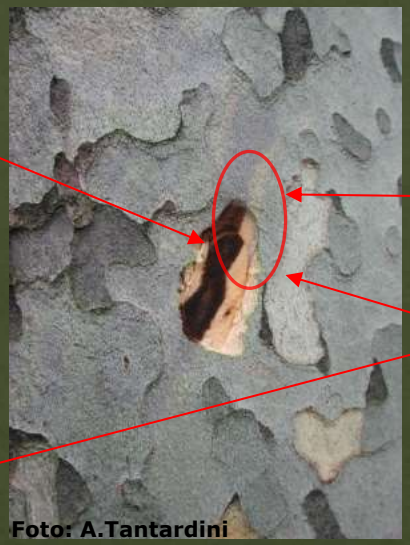
(1) Pervenuto in redazione il 23 maggio 1973.

Absence of healing callus



Symptoms of *Ceratocystis platani* and sample collection

Under the bark and wood dowels

Picking up 4-5 dowels

- Point of passage between healthy and sick

Wooden dowels and
3-4 cm bark

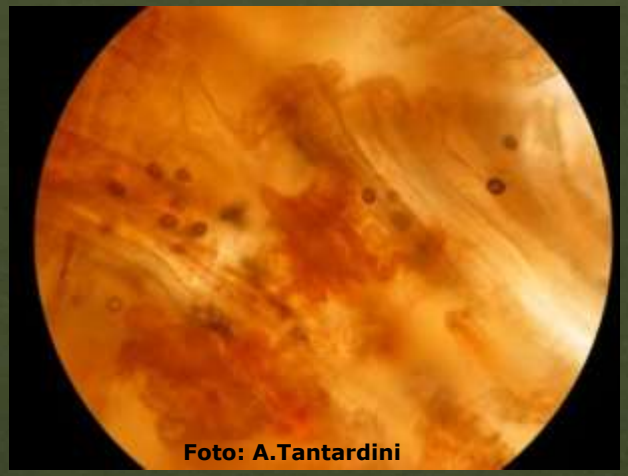
Examples of samples suitable for analysis for *C. platani*

Foto: A.Tantardini

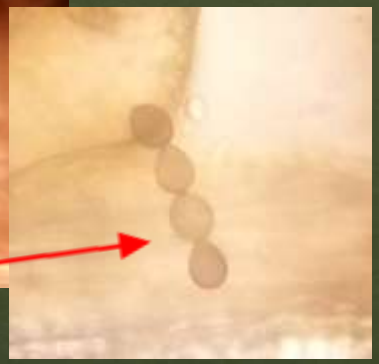

Foto: A.Tantardini

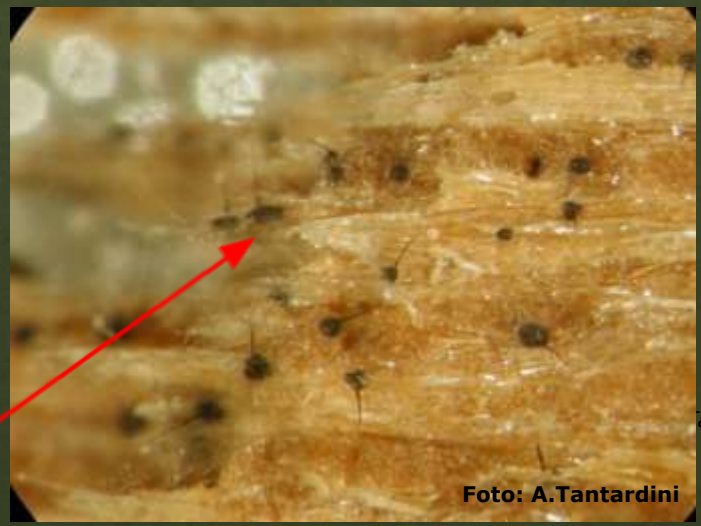
Colored plane canker: diagnosis

Detection of chlamydospores in wood evasion of perithecia after incubation in a humid chamber



Chlamydospores





Peritecia with spore evasion

Plane Tree Colored Canker


Foto: A.Tantardini


Foto: A.Tantardini

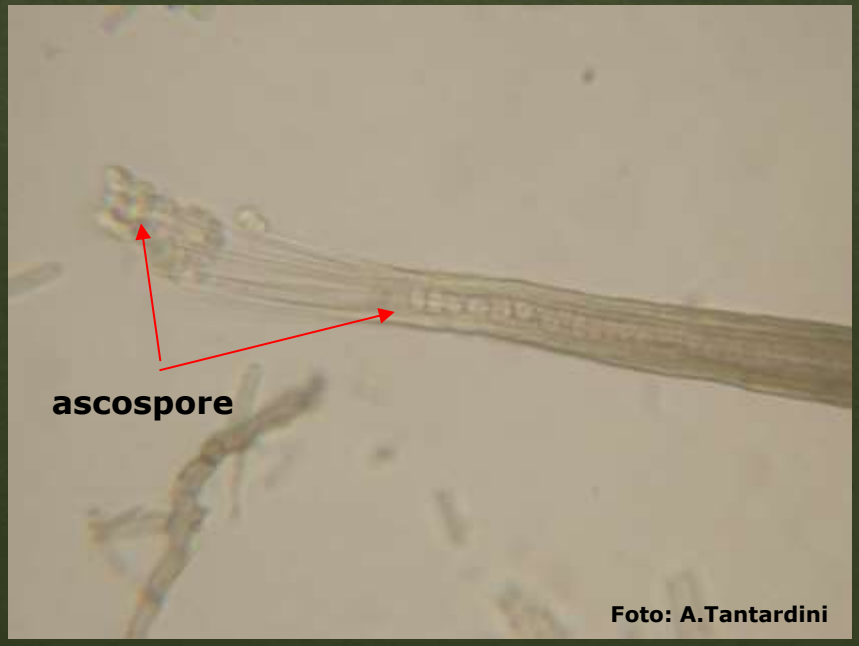


Foto: A.Tantardini

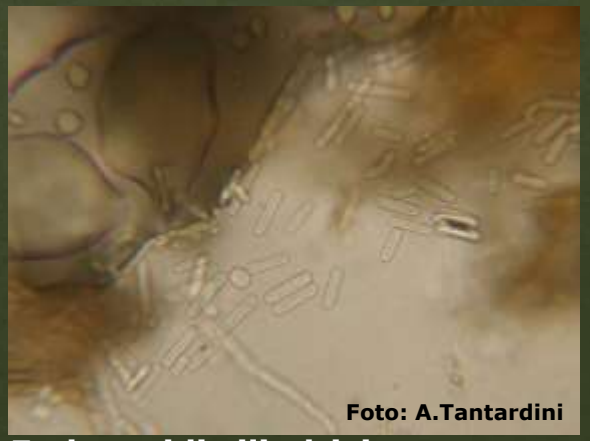


Foto: A.Tantardini

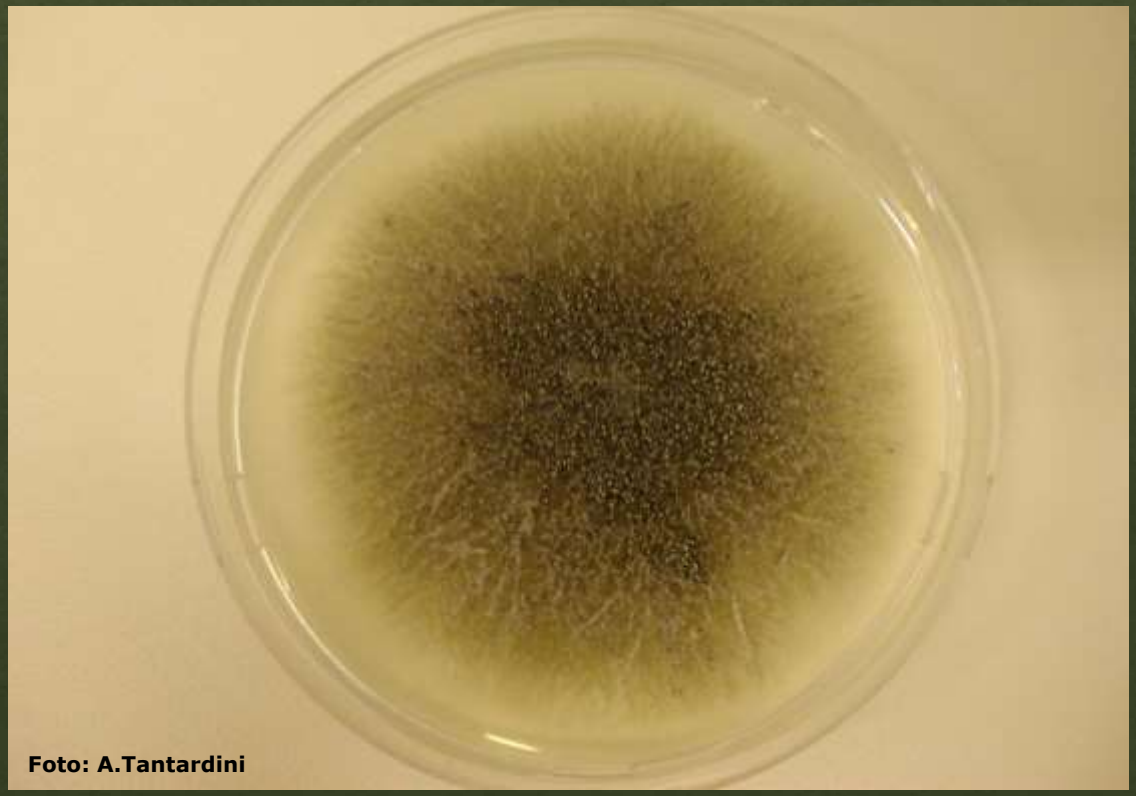
Endoconidi cilindrici

Plane Tree Colored Canker: Diagnosis

Isolation on agar substrate (PDA –MA)

Diagnosis and identification *Ceratocystis platani*

Colony on PDA



Fusarium solani

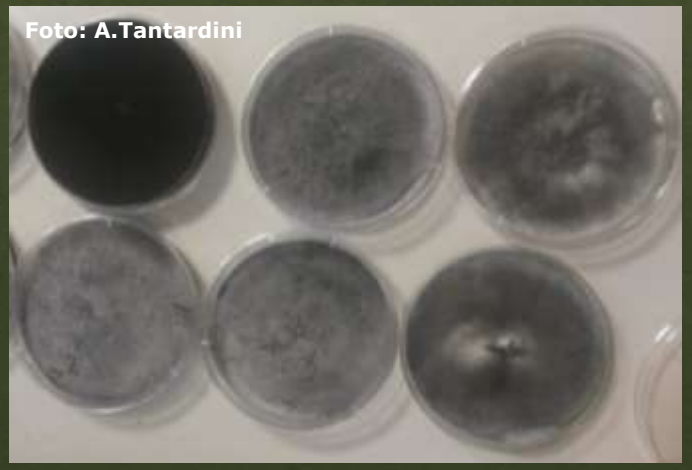
Target cankers

Closed cancers caused by *Fusarium solani*

Source and photos M.Pilotti et al (2002) Informatore fitopatologico n.6/2002 pag. 9-24,.

Twig dieback and cankers caused by
Botryosphaeriaceae
Botryosphaeria dothidea
(Moug.:Fr.) Ces. & De Not.
(*Dothiorella platani F.conidica*)
Dark triangular cankers, often there is plant reaction

Other Agents of Cancers:
Diplodia mutila
Dothiorella sp.
Diplodia seratia
Neofusicoccum parvum



Twig dieback and cankers from *Massaria platani*

Splanchnonema platani M.E. Barr [1982] [1]

Causes tooth decay and cancers desiccation and breakage

The damages intensifie as a result of strong stress: pathogen of weakness.

Twig dieback caused by
Phomopsis sp.

Foto: A.Tantardini

Foto: A.Tantardini

It causes elongated cankers and desiccation of young plants. Pycnids on the bark with evasion of conidia (alpha and beta) in cirrus clouds.

Hypoxylon mediterraneum
(syn. *Biscognauxia mediterranea*)

On *Platanus acerifolia*

Fam.: *Xylariaceae*

Symptoms

Crusty-shaped, black fruiting bodies associated with cancers and decays appear in autumn from degraded areas

Apiognomonia veneta
(Sacc. & Speg.) Höhn., 1920
(Discula platani f.con.)

Anthracnose of the plane tree
Leaf disease and on young twigs

Syn. *Gnomonia platani* Kleb., 1914

Anthracnose of the plane tree: symptoms on the leaves and twigs

Powdery mildew of the plane tr

Microsphaera platani.
(Erysiphe platani)

Anthracnose of the plane tree: symptoms on the leaves and twigs

Guignardia aesculi

Possibility of confusion

Damages on horse chesnut caused by *Popillia japonica* and *Cameraria horidella* (insects)

Turf grass diseases

Pythium
Rhizoctonia
Sclerotinia
Fusarium
Microdochium
Latisaria
Drechslera


FOTO:Tantardini

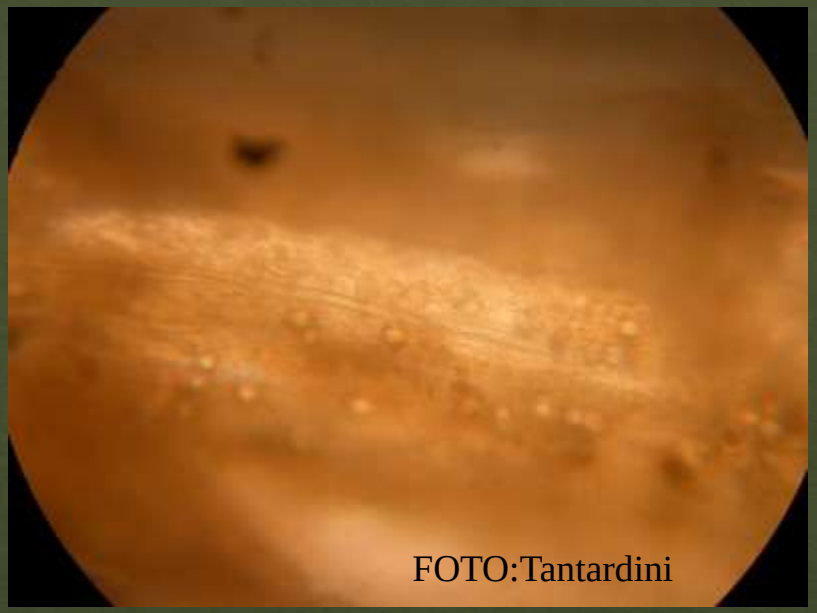


FOTO:Tantardini

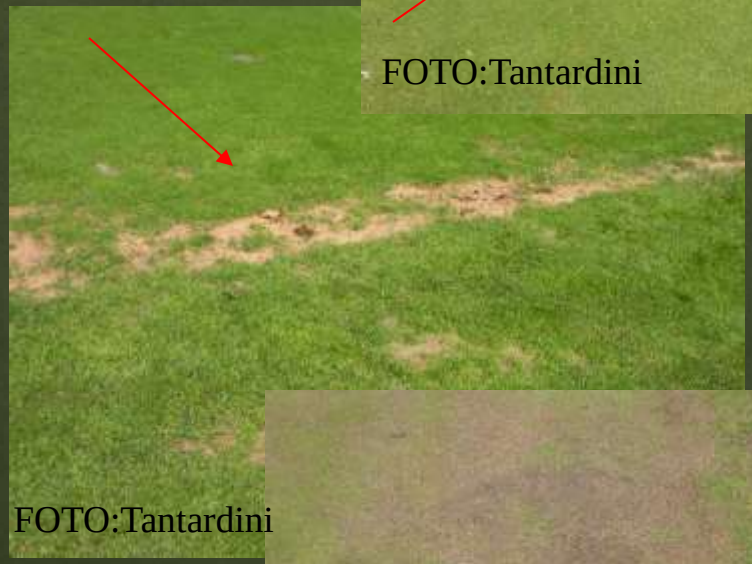


FOTO:Tantardini


FOTO:Tantardini


FOTO:Tantardini

Diagnosis of turf diseases

Observation of symptoms in the field

Sample and information collection

Stereoscopic and microscopic observation of samples

Photos of spores

Diagnosis of turf diseases

Spore recognition

Shrub and tree plant samples

Microscopic analysis

Dottore agronomo Andrea Tantardini
COMO - ITALY
E-mail: andreatantardini@libero.it
Cell. 0039-347-7441908