QUARANTINE ORGANISMS POSING A THREAT TO THE TREE NURSERY INDUSTRY

There are several quarantine organisms that pose a threat to export-oriented tree nurseries. Because there is a lot of confusion and concern about these organisms, the PCS, AVBS, ILVO, pcfruit and FAVV have joined forces to communicate this problem in a clear way to the sector within the framework of the project 'Summary of quarantine organisms posing a threat to the tree nursery sector'.

Joachim Audenaert, Ruth Verhoeven

Project

This project will look at how the different partner organisations can work together, in the event of an outbreak, to ensure that the problem can be resolved smoothly and efficiently, taking into account the economic impact for the sector, for the affected nursery, for the nurseries in the neighbourhood and for export. An important aspect of this is effective communication between the various parties involved. Through the consultations that were held within the framework of this project, the different partners got to know each other, and the possible obstacles for an effective approach and unambiguous dissemination of information to the sector in case of an outbreak were discussed.

Information sheets

It is also an important part of this project to inform the sector clearly about the different organisms that might pose a threat to the tree nursery sector. Therefore, to move forwards, a series of information sheets will be generated in which the various quarantine organisms that can present a risk to tree nurseries are discussed in a practical way. These information sheets will appear in each subsequent issue, and will provide an overview of the symptoms, the host plants, possible preventive measures that can be taken, and the legislation in force for each organism. This issue contains introductory information that gives a general overview of the issue of quarantine organisms, as well as of those of importance to tree nurseries. In the following issues, these organisms will be discussed in detail, one by one. It is also important to note that the legislation surrounding quarantine organisms is something that may vary over time. That is why it is always important to consult the FASFC website for the most up-to-date information (www.favv.be).■

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LEGAL FRAMEWORK

What is a quarantine organism?

A quarantine organism is a **regulated harmful organism** for which **statutory emergency measures** are imposed by law if found. These organisms are listed on an official list of the FASFC (www.favv.be --> professionals --> and under 'notification limits' by search engine). A list of harmful organisms per plant can be found in the ornamental plant sector guide (www.avbs.be --> and when searching, enter 'download sector guide' in the search field) and on the Vegaplan website (www2.vegaplan.be) --> Specifications and sector guides --> Vegaplan Standard plant production --> G-040 Module D). The list below shows the main quarantine organisms of relevance for tree nurseries, and the countries in which they have already been detected.

	Present in Belgium	Present in a neighbouring country	Present in EU	Present outside the EU
INSECTS				
Longhorn beetles: Citrus long-horned beetle (*Anoplophora chinensis*)	No	No	HR, IT	CH AS
Chestnut gall wasp *(Dryocosmus kuriphilus*)	Yes	DE, FR, NL	AT, ES, HR, HU, IT, PT, SI, UK	TR AS, NA
Oak Processionary Moth *(Thaumetopoea processionea*)	Yes	DE, FR, NL	AT, BG, DK, ES, HR, HU, IT, PL, RO, SE, SL, UK	MD, UA AS
PALM WEEVILS South American palm weevil (*Rhynchophorus palmarum*)	No	No	No	SA
Jewel beetles: Bronze birch beetle (*Agrilus anxius*)	No	No	No	NA
Bark beetles: European spruce bark beetle (*Ips typographus*)	Yes	DE, FR, LU, NL	AT, BG, CZ, DK, EE, FI, GR, HU, HR, IT, LT, LV, PL, RO, SE, SI, SK	BA, CH, GE, NO, RS, RU, TR, UA, AS
NEMATODES				
Columbia root-knot nematode (*Meloidogyne chitwoodi*)	Yes	FR, NL	PT	TR AF, NA, SA
False Columbia root-knot nematode (*Meloidogyne fallax*)	Yes	FR, NL	UK	CH OC
Pine wood nematode (*Bursaphelenchus xylophilus*)	No	No	PT	AS, NA, SA

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Neighbouring countries: DE: Germany, FR: France, LU: Luxemburg, NL: Netherlands

EU countries: AT: Austria, BG: Bulgaria, CY: Cyprus, CZ: Czech Republic, DK: Denmark, EE: Estonia, ES: Spain, FI: Finland, GR: Greece, HR: Croatia, HU: Hungary, IE: Ireland, IT: Italy, LT: Lithuania, LV: Latvia, PL: Poland, PT: Portugal, RO: Romania, SE: Sweden, SI: Slovenia, SK: Slovakia, UK: United Kingdom

Non-EU countries: AL: Albania, AM: Armenia, AZ: Azerbaijan, BA: Bosnia and Herzegovina, BY: Belarus, CH: Switzerland, GE: Georgia, MD: Moldova, MK: Macedonia, ME: Montenegro, NO: Norway, OO: Kosovo, RS: Serbia, RU: Russia, TR: Turkey, UA: Ukraine

Continents: AF: Africa, AS: Asia, NA: North America, SA: South and Central America, OC: Oceania

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	Present in Belgium	Present in a neighbouring country	Present in EU	Present outside the EU
BACTERIA				
Fire blight (*Erwinia amylovora*)	Yes	DE, FR, LU, NL	AT, BG, CY, CZ, DK, EE, ES, FI, GR, HR, HU, IE, IT, LT, PL, RO, SE, SI, SK, UK	AL, AM, BA, BY, CH, LE, MD, ME, MK, NO, RS, RU, TR, UA AF, AS, NA, OC, SA
Leaf spot disease on *Prunus* (*Xanthomonas campestris pv. pruni*)	Yes	DE, FR, NL	ES, IT, RO, SI	CH, MD, ME, RU, UA AF, AS, NA, OC, SA
Xylella fastidiosa	No	No	IT	AS, NA, SA
FUNGI				
Poplar rust (*Melampsora medusae*)	Yes	FR	PT	AF, AS, NA, OC, SA
Sudden oak death (*Phytophthora ramorum*)	Yes	DE, NL	DK, ES, GR, HR, IE, LT, PL, PT, SE, SI, UK	CH, NO, RS NA
Chestnut blight (*Cryphonectria parasitica*)	Yes	DE, FR	AT, BG, ES, GR, HR, HU, IT, PL, PT, RO, SK, SI	AZ, BA, CH, GE, MK, RS, RU, TR, UA AF, AS, NA, OC
Red band needle blight *(Dothistroma septosporum*)	Yes	DE, FR, NL	AT, BG, CZ, DK, EE, ES, FI, GR, HR, HU, IT, LT, LV, PL, PT, RO, SI, SK, UK	CH, GE, NO, RS AF, AS, NA, OC, SA
Pitch canker (*Gibberella circinata*)	No	No	ES, PT	AF, AS, NA, SA
VIRUSES AND PHYTOPLASMAS				
Apple proliferation (*Apple proliferation phytoplasma (AP)*)	Yes	DE, FR, NL	AT, BG, CZ, ES, FI, GR, HR, HU, IT, PL, RO, SI, SK	AL, BA, CH, MD, NO, RS, TR, UA AF, AS, NA
Pear decline disease (*Pear decline phytoplasma (PD)*)	Yes	DE, FR, NL	AT, BG, CZ, ES, GR, HR, HU, IT, PL, PT, SI, SK, UK	AL, BA, CH, MD, RS, TR AF, AS, NA, OC
Sharka virus (*Plum pox virus*)	Yes	DE, FR, LU, NL	AT, CY, CZ, ES, GR, HR, HU, IT, LT, LV, PL, PT, RO, SI, SK, UK	AL, AZ, BA, BY, CH, MD, ME, NO, RS, RU, TR, UA AF, AS, NA, SA
Strawberry latent ring spot virus	Yes	DE, FR, LU, NL	CZ, ES, FI, HU, IE, IT, PL, PT, UK	AL, BY, CH, RS, TR AF, AS, NA, OC, SA
Raspberry ring spot virus	Yes	DE, FR, LU, NL	BG, CZ, FI, GR, IE, IT, LV, PT, UK	AL, BY, CH, NO, RS, RU, TR AS
Spiroplasma citri	No	FR	CY, ES, IT	TR AF, AS, NA, OC, SA

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What should you do if you find a quarantine organism?

If a quarantine organism is found, it is legally obligatory to report this to the FASFC in accordance with the Royal Decree of 14/11/2003:

Every operator must immediately inform the FASFC if they believe or have reason to believe that a product they have imported, produced, grown, processed, manufactured or traded, may be harmful to human, animal or plant health. For non-edible horticultural production, ornamental plant growers are obliged to report the presence of plant quarantine organisms to the FASFC. If the operator is not in a position to carry out his own risk analysis, the notification limits included in the document 'NOTIFICATION OBLIGATION & NOTIFICATION LIMITS' (http://www.favv.be/meldingsplicht/meldingslimieten) apply.

In order to determine whether or not the organism found is a quarantine organism, it can be examined by the recognised ILVO laboratory:

Plant Diagnostic Centre

ILVO - Plant Protection Unit
Burgemeester Van Gansberghelaan 96 9820 Merelbeke
09/272.24.42
diagnosecentrum@ilvo.vlaanderen.be

The person submitting the report must:

1. Notify the provincial control unit (PCE) of his province by telephone (Table 1)
2. Fax or e-mail the report form to the PCE. A notification form can be found at: www.favv.be -→ notification obligation -→ appendix 2: Form for operators of the primary plant production sector.

Table 1: Contact details of provincial control units (PCE) (http://www.favv.be/pce)

Province	Tel.	Cellphone (*)	notification e-mail	info e-mail	Fax
East Flanders	09 210 13 00	0478 87 62 20	Notif.OVL@favv.be	Info.OVL@favv.be	09 210 13 13
West Flanders	050 30 37 10	0478 87 62 21	Notif.WVL@favv.be	Info.WVL@favv.be	050 30 37 12
Limburg	011 26 39 84	0478 87 62 18	Notif.LIM@favv.be	Info.LIM@favv.be	011 26 39 85
Antwerp	03 202 27 11	0478 87 62 19	Notif.ANT@favv.be	Info.ANT@favv.be	03 202 28 11
Flemish Brabant	016 39 01 11	0478 87 62 17	Notif.BRU@favv.be	Info.VBR@favv.be	016 39 01 05

(*) Mobile phone numbers are to be used only in case of emergency, and after working hours

Consequences of infection with a quarantine organism?

If a quarantine organism is detected, quarantine measures will follow as described in the R.D. of 10/08/2005. These measures aim to protect agricultural production as well as public green spaces, to limit the use of pesticides, and to safeguard exports. The person in charge has to control harmful organisms as soon as their presence is detected, or when it is reported to them by a public official. If the person in charge does not commence with control or takes insufficient or ineffective measures to do so, the FASFC will have the necessary measure carried out at the expense of the person in charge.

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APPLE PROLIFERATION (AP)

IDENTIFICATION

AP is a phytoplasma, which is a polymorphic bacterium without rigid cell walls. AP causes witches broom growths on *Malus*, narrower leaves with enlarged stipules, longer flower stems, summer flowering and smaller, rather colourless fruits with long, narrow fruit stalks. The symptoms are most prominent in the first three to six years, and then decrease gradually. Sometimes there are no symptoms for several years, and then they suddenly reappear.

LIFE CYCLE

Phytoplasms can be spread in various ways:

- Through propagating material, such as infected rootstocks or scions (important in fruit production)
- Through psyllids of the genus *Cacopsylla*, which pierce the tree with their mouth parts, thus transmitting the disease
- Through the intertwining of the roots of a healthy and infected tree (a problem for public parks and fruit production farms).

Phytoplasms cannot be transferred mechanically by pruning, for instance. Pollen, fruits and seeds do not play a role in its spread either.

HOST PLANTS

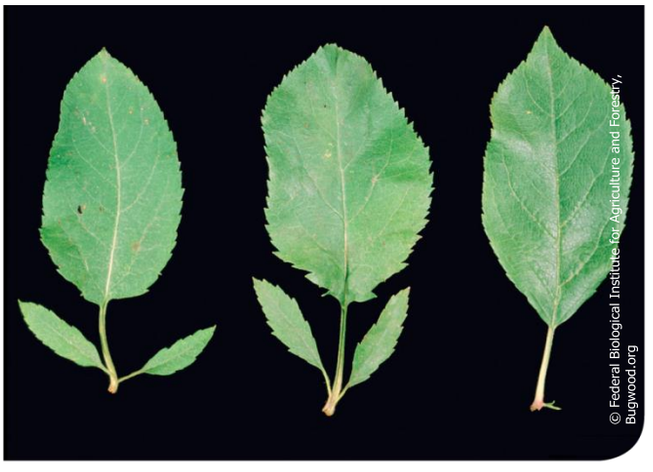
Apple trees (*Malus* spp.) are the main host plants. *Crataegus monogyna* is also a host plant, but its role as inoculum is still unclear.

PREVENTIVE MEASURES

Planting material for potting must either be sourced from areas free from AP, or it must have been certified and there may not have been any planting at the production site during the last three growing seasons.

MEASURES IN CASE OF DISCOVERY

- This disease cannot be controlled with plant protection products.
- Infected trees remain carriers, and cutting away diseased parts is not a solution.
- In tree nurseries: immediately remove infected and adjoining trees. Roots must also be removed completely. Afterwards, do not place host plants in the same place or in the immediate vicinity.



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CHESTNUT BLIGHT

(Cryphonectria parasitica)

IDENTIFICATION

This fungus causes cankers on the trunk and branches of mature trees, and is usually fatal to chestnut. Small yellow-orange-red warts can often be found on the bark in the necrotic areas. Fan-shaped beige discolourations and necrotic spots can be seen when the bark is removed. On young trees, the trunk discolours orange. The tree reacts by forming water shoots around the infected area. Above the diseased areas, the branches die, while those below the dead areas shoot again. The leaves remain long after the branches have died, so that diseased trees can be recognised from afar. On nurseries, the fungus is often found at the level of the graft. The fungus can also survive on the bark of dead wood, e.g. on chestnut fencing poles.

LIFE CYCLE

Cryphonectria parasitica is a parasitic fungus (ascomycetes) that infects its host plant through injuries in the wood caused by cracks, splits or insects. The fungus produces two types of spores from the orange-red warts on the bark: conidia (asexual spores) and ascospores (sexual spores). The asexual spores are produced from May to July.

They are spread over short distances by rain, and over longer distances by insects and birds. Sexual spores develop between April and October, and can travel for kilometres on the wind, but are rarely formed.

HOST PLANTS

- Chestnut varieties (*Castanea* spp.) and specifically *C. dentata*, as well as *Quercus* spp., *Castanopsis*, *Acer*, *Rhus typhina* and *Carya ovata* can be host plants.

PREVENTIVE MEASURES

- It is best to plant in the spring. Preferably use healthy trees from disease-free areas, and check the graft area of planting stock beforehand, inspect for wounds, infection symptoms, cankers, etc. Continue checking for two years after planting, preferably during the growing season. Pruning should only be done in the second year after planting, and not between April and October (spore release).
- When importing logs, fencing poles, etc. made from chestnut wood, they must be debarked.

MEASURES IN CASE OF DISCOVERY

- Infected plants must be destroyed on nurseries.
- Outside nurseries, the felling of infected trees is recommended.

IMPACT

- Shipments of *Castanea* spp. from Belgium to protected areas in the EU are not permitted. ■

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CHESTNUT GALL WASP (*Dryocosmus kuriphilus*)

IDENTIFICATION

Insect: The chestnut gall wasp belongs to the gall wasp family (Cynipidae). The adults are small, membranous-winged insects, 2.5-3 mm long and have a typical wasp waist. The larvae are 2.5 mm in size, and white.

Symptoms: During development, galls with hard shells develop to protect the larvae. These galls, measuring 5-20 mm in diameter, are green and often have pink tinges. After the gall wasp hatches, the gall becomes brown and woody, and remains on the tree for up to two years or more.

LIFE CYCLE

The chestnut gall wasp reproduces asexually, and has one generation per year. The insect overwinters as a larva in the winter buds. When the buds emerge in spring, the larvae induce gall formation by secreting toxins during food intake. Pupation takes place after 20-30 days, and the adults remain in the galls for 10-15 days. The females leave the galls through small, round exit openings in from mid-June to the beginning of August, after which laying begins immediately.

HOST PLANTS

- Different species of sweet chestnuts can serve as host plants: European chestnut (*Castanea sativa*), Japanese chestnut *(Castanea crenata*), American chestnut (*Castanea dentata*), Chinese chestnut *(Castanea mollissima*) and their hybrids.
- The North American wild species *Castanea pumila* and *Castanea alnifolia* are not host plants.

PREVENTIVE MEASURES

- There are chestnut cultivars that are resistant to the chestnut gall wasp.

MEASURES IN CASE OF DISCOVERY

- No measures are imposed by the FASFC.

IMPACT

- No movements are allowed of *Castanea* spp. from Belgium to protected areas in the EU.

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COLUMBIA ROOT-KNOT NEMATODE (*Meloidogyne chitwoodi*)
FALSE COLUMBIA ROOT-KNOT NEMATODE (*Meloidogyne fallax*)

IDENTIFICATION

M. chitwoodi and *M. fallax* are very similar in terms of symptom expression and host plants, but *M. fallax* does not reproduce on maize, which is why it is called 'false' Columbia root-knot nematode. Both types of root-knot nematode cause small to miniscule nodules on the roots of the crop. In tuber and root crops, the tuber and/or taproots are also affected. Under warmer conditions the root-knot nematodes usually cause large(r) nodules.

LIFE CYCLE

The eggs are deposited in egg sacs in a gelatinous substance on the surface of the roots. The juveniles emerge from the eggs when there is sufficient moisture and a favourable temperature, and move freely in the soil. They look for a host plant, and usually enter it at the root tip. By feeding, they stimulate the plant to form "macro cells" around which the plant tissue swells, the so-called nodules or galls. After moulting, adult spherical females and worm-shaped males are distinguished. However, reproduction does not require fertilisation (parthenogenesis). Two to three generations are possible a year.

HOST PLANTS

- These root-knot nematodes have a very large number of host plants, including both mono- and dicotyledon and annual and perennial plants.
- Important host plants include potato, carrot, salsify, tomato, as well as grasses and weeds.
- These nematodes can be found in planting material consisting of tubers or roots, for example dahlias, gladioli and seed potatoes.

PREVENTIVE MEASURES

- Use inspected planting material or propagating material that are free from symptoms. Soil adhering to plant material can also be infected.
- Clean machinery, tools, footwear and such between different fields.
- Do not apply soil from other areas or industries onto the field.

MEASURES IN CASE OF DISCOVERY

- If a contaminated field is found, production of plants intended for planting out or root and tuber crops (beet, potato, salsify, etc.) is prohibited until the field is declared free again.
- All soil and harvest waste originating from the field must be disposed of, and treated in a controlled manner.

In addition, the tropical root-knot nematode *M. enterolobii* (on the EPPO A2 list) also poses a threat, and is sometimes found when importing plant material. This nematode is known to be very aggressive, and can cause serious damage. *M. mali* is a root-knot nematode that uses trees as host plants (e.g. elm and apple). As far as is known, within Europe, it has only been found on a limited scale in the Netherlands and Italy to date.

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FIREBLIGHT (*Erwinia amylovora*)

IDENTIFICATION

The damage symptoms caused by this bacterium varies from host plant to host plant. The infection usually starts in the blossom (flower infection) or in young twigs (shoot infection) with a typical brown-black discolouration (bacterial 'fire'). The tips of affected shoots curl inwards (bishop's staff or flags), and the bacterium finally establishes in the main branches whose cambium turns reddish brown. Mucus droplets are present on the affected parts, which can be various shades of colour, from white to orange. The leaves above the infection turn bronze, and the shoots dry out. Diseased blossoms and fruits remain on the plant, even after the winter. In autumn, the infection slows down, and the disease edge is marked by a reddish-purple, slightly sunken bark, with a scaly edge.

LIFE CYCLE

Fireblight infections can occur on different parts of a plant. Thinning with pruning tools is an important cause of spread. Transmission also occurs due to insects, wind, rain, hail damage, mechanical damage, field operations between the plants, walking or riding through the crop, etc. Infection is worse in warm, humid and stormy weather in spring and summer. Transmission is very limited in winter. Mild winters are favourable for the survival of the bacteria in cankers.

HOST PLANTS

Shrubs and trees of the Rosaceae family are host plants: *Amelanchier* (serviceberry), *Chaenomeles* (Japanese quince), *Cotoneaster* (dwarf medlar), *Crataegus* (hawthorn), *Cydonia* (quince), *Eriobotrya* (Japanese medlar), *Malus* (apple), *Mespilus* (medlar), *Photinia davidiana* (Chinese photinia), *Pyracantha* (firethorn), *Pyrus* (pear) and *Sorbus* (rowan).

PREVENTIVE MEASURES

- Winter pruning is better to prevent infection. When pruning during the growing season, use a wound paste and disinfect pruning tools. Hawthorn hedges should be pruned annually between 1 November and 1 March to moderate flowering.
- Remove secondary bloom in fruit production.
- Check for infections on and around the farm or nursery.
- Preferably plant less or non-susceptible species and cultivars.

MEASURES IN CASE OF DISCOVERY

- Infected plants on nurseries must be destroyed under official supervision.
- Cut away infections outside nurseries during dry weather conditions and burn immediately.

IMPACT

Host plants intended for protected areas in the EU must originate from buffer zones subject to special control measures.

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JEWEL BEETLES (Buprestidae)
BRONZE BIRCH BORER (*Agrilus anxius*)

IDENTIFICATION

Insect: The bronze birch borer belongs to the order of beetles (Coleoptera). It is a small, narrow, dark beetle about 12 mm long, with a bronze shiny colour. The larvae are whitish and relatively long (19-25 mm). They are flat, strongly segmented, and have a highly developed flattened head.

Symptoms: Initially, leaves turn yellow and the branches die in the crown of the tree. D-shaped exit holes of about 5 mm in diameter can be observed. Damage is caused by the larvae feeding under the bark, forming a tangle of tunnels, which eventually leads to the death of the tree. Adult beetles feed on leaves of *Alnus*, *Betula*, *Populus*, but this damage is negligible.

LIFE CYCLE

Females lay their eggs (in clusters or singly) in trunk crevices. They lay up to 75 eggs during their lifetime. After the larvae hatch, they immediately bore a tunnel into the trunk. The insect overwinters as a larva in the wood. Pupation takes place in the cells of the xylem. Adults fly out from May to mid-July. The life cycle can last from one to two years. Because it is a small insect, and because the holes in the wood are small, they are able to survive processing and transport of the wood.

HOST PLANTS

- Many of the native and imported species of birch in North America and their hybrids (*Betula* spp.) are host plants, such as *B. pubescens* and *B. pendula*.
- *B. nigra* and *B. nana* have never been found to be host plants.

PREVENTIVE MEASURES

- Set pheromone traps to check for the presence of adults.

- Specific measures when importing wood chips, plants, wood (with or without bark), and furniture made of untreated birch wood from the US and Canada.

MEASURES IN CASE OF DISCOVERY

- When detected, the infected plants must be destroyed.

In addition to the bronze birch borer, there are a few other non-native and regulated jewel beetles, such as the emerald ash borer (*Agrilus planipennis*) and the gold spotted oak borer (*Agrilus auroguttatus*). The complete list is available on www.eppo.int.

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LONGHORN BEETLES (Cerambycidae)
CITRUS LONG-HORNED BEETLE (*Anoplophora chinensis*)

IDENTIFICATION

Insect

The citrus long-horned beetle belongs to the order of beetles (Coleoptera). An adult is up to 5 cm long, has 6 legs, a black carapace with white spots, and black and white striped antennae that are as long or longer than the longhorn beetle itself.

Symptoms

Round exit holes (9-15 mm) on the trunk base (lower 50 cm) and above-ground roots. Wood dust at the base of trees and on branches. Bleeding from the bark, bark damage on thinner branches in the crown of the tree.

LIFE CYCLE

The adult longhorn beetle lays its eggs just under the bark of trees or bushes. After 1-2 weeks, the larva hatches from it, and bores itself deeper and deeper into the wood. These tunnels cause damage to the trees. In our temperate regions, the development of larvae takes two to three years, after pupation the beetles gnaw a round exit hole in the wood, and fly out.

HOST PLANTS

- All deciduous trees and shrubs can be host plants.
- Plants from China, Japan and Korea are most at risk, especially Chinese maples and bonsai.

PREVENTIVE MEASURES

- There is a ban on the import of certain sensitive plants (e.g. *Citrus*, etc.).
- Susceptible plant species from China may only be imported from companies on an approved list.
- Special requirements (ISPM-15 mark) apply for wooden packaging material imported into the EU.

MEASURES IN CASE OF DISCOVERY

- A demarcated area must be set out. This consists of a contaminated zone, and a buffer zone. Contaminated plants must be destroyed under official supervision.
- A defined area remains under official surveillance for at least four years. This is monitored intensively. Trade in certain host plants is only allowed provided that a plant passport is used, and provided that the place of production has been found to be free for two years following official inspections.

Apart from the citrus long-horned beetle, a dozen other non-native and regulated longhorn beetles can be introduced through wooden packing material, such as *Anoplophora glabripennis*. The complete list is available on www.eppo.int.

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OAK PROCESSIONARY MOTH

(*Thaumetopoea processionea*)

IDENTIFICATION

Insect: The oak processionary moth belongs to the order of butterflies (Lepidoptera) and the family of tooth moths (Notodontidae). The larva (caterpillar) measures up to 3 cm and is blue-grey at the top, with light-coloured sides. A fully-grown caterpillar has up to 700,000 defensive bristles. These come off and can cause an allergic reaction of the skin, eyes and mucous membranes of the upper respiratory tract.

Symptoms: Nests are formed in trees on the sunny side against the trunk, and these can contain thousands of caterpillars. During the day, the caterpillars remain in the nests, but at night, they move in procession to the tops of the trees where they cause feeding damage. They can eat the leaves of an entire tree, and weaken it.

LIFE CYCLE

The eggs of the oak processionary moth overwinter on twigs. The larvae hatch from mid-April to the beginning of May. The larvae undergo five moults, and pupate in the nest during July-August. The adults appear from July, and remain active until September, with a main flight period in August. Females deposit their eggs in the immediate vicinity, where they emerged from the pupae. Adults live for about three days. There is one generation per year.

HOST PLANTS

- The main host plant is *Quercus*, and especially the pedunculate oak, *Quercus robur*.
- In case of high pest populations, other *Quercus* species and deciduous trees may also become host plants, but damage to these species is only sporadic.

PREVENTIVE MEASURES

- Place pheromone traps or UV lamps to check for the presence of moths, and trap them if necessary.
- Control the pest with *Bacillus thuringiensis* when no irritating bristles are yet present (1st larval stage).
- The temporary closure of (part of) the forest or the nature or recreation area.
- Designate oak tree lanes along roads and houses as risk zones.

MEASURES IN CASE OF DISCOVERY

- No measures are imposed by the FASFC.
- Control is undertaken from a public health point of view. If both old and new nests are found, please contact the municipality or the fire brigade. Do not clean up the nests yourself!

IMPACT

- Request a FASFC inspection for batches of *Quercus* spp. sold to protected areas in the EU.

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PEAR DECLINE DISEASE

(Pear decline (PD))

IDENTIFICATION

PD is a phytoplasma, which is a polymorphic bacterium without rigid cell walls. In *Pyrus,* PD causes early autumn colouration (yellow, red or burgundy, depending on the variety), curled leaves, retarded growth, and necrosis at the grafting point. Since many other factors can cause similar symptoms, it is not always that easy to recognise a PD infection.

LIFE CYCLE

Phytoplasms can be spread in various ways:

- via propagating material such as infected rootstocks or scions (important in fruit production),
- through psyllids of the Cacopsylla genus, which pierce the phloem of the tree, thus transmitting the disease,
- through the intertwining of the roots of a healthy and an infected tree (a problem for public parks and fruit production farms).

Phytoplasmas cannot be transferred mechanically, by pruning for instance. Pollen, fruits and seeds do not play a role in its spread either.

HOST PLANTS

Pear trees *(Pyrus* spp.*)* and quince *(Cydonia oblonga)* are the main host plants.

PREVENTIVE MEASURES

Planting material of *Cydonia oblonga* and *Pyrus* spp. and their hybrids must be sourced from areas free from PD or from a production site where PD-infected trees have been removed for three growing seasons.

MEASURES IN CASE OF DISCOVERY

- This disease cannot be controlled with plant protection products.
- Infected trees remain carriers, so cutting away diseased parts is not a solution.
- In tree nurseries: immediately remove infected and adjacent trees, and remove roots completely too. Afterwards, do not plant host species in the same place or in the immediate vicinity.

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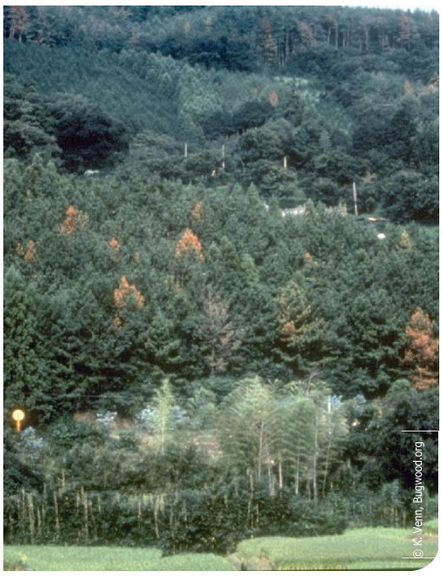
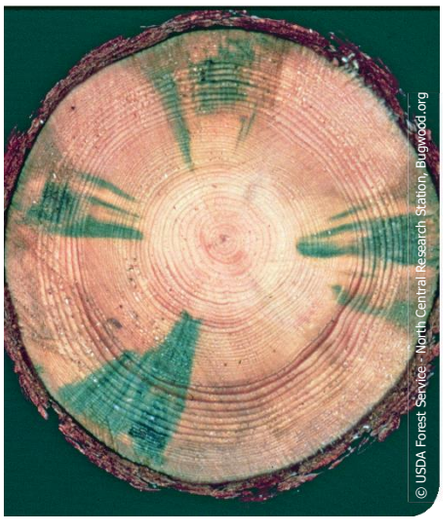
PINE WOOD NEMATODE *(Bursaphelenchus xylophilus)*

IDENTIFICATION
The pine wood nematode multiplies in the resin ducts of the tree, causing wilting. Millions of nematodes colonise the entire tree (trunk, branches, roots), eventually leading to its death. Initially, about three weeks after infection, the tree shows signs of dehydration. After 30-40 days, the tree is completely yellow, dried out and dies. Symptoms of beetle damage or the presence of blue mould can be an indication of the presence of these nematodes.

LIFE CYCLE
The pine wood nematode is transmitted from tree to tree by a longhorn beetle in the family Cerambycidae of the genus *Monochamus*. A dead tree can contain millions of nematodes that feed on fungi living on the dead wood. The female adult longhorn beetle lays her eggs in cavities in the bark of an infected, weakened or dead tree. After 4-12 days, the larvae hatch. They develop in the tree, and form boreholes. The larvae of the longhorn beetle then pupate (the pupal stage lasts 19 days) and, just before the adult emerges from the pupa, the nematodes migrate to the pupa, where they nestle under the elytra of the beetle. After hatching, for 10 days the young infested beetles will feed on young twigs in the crown of healthy trees, and thus transmit the nematodes, after which the cycle can begin again. Adult females carrying nematodes may also transfer them to weakened trees or pieces of dead wood during egg laying.





HOST PLANTS
- All *Pinus* spp. are very susceptible host plants.

  Larix, Abies, Picea, Cedrus, Tsuga, Pseudotsuga menziesii, Taxus and *Thuja* can also be host plants.

PREVENTIVE MEASURES
- The import of conifer plants from non-European countries is prohibited; cones and seeds are allowed.
- The import of conifer wood and bark is allowed only if it has a phytosanitary certificate.
- Wooden packing material of goods must be treated and marked according to ISPM15. If this is not the case, the consignment will be destroyed (incinerated), treated or returned.

MEASURES IN CASE OF DISCOVERY
- Contaminated material (plants, trees, wood and bark) must be destroyed.
- When the nematodes are detected, the FASFC will define an area that consists of the contaminated zone and a buffer zone. Control measures, transport restrictions for susceptible material, and intensive monitoring are put into place in the defined area.

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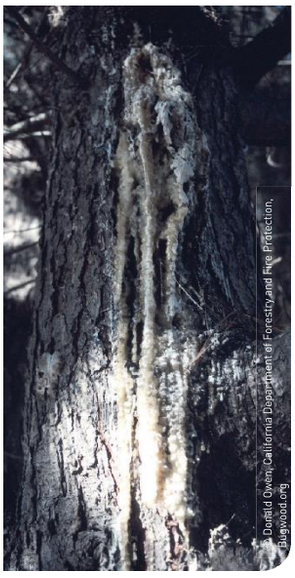
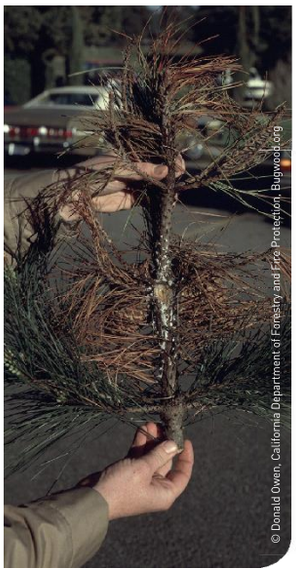
PITCH CANKER (*Gibberella circinata*)

IDENTIFICATION

The fungus affects seedlings as well as roots, twigs and the trunks of trees. It causes damping off in seedlings. In the case of root damage, the symptoms are resin deposits and brown discolouration under the bark, and afterwards the plants turn dull green, yellow to brown. In twigs and trunks, the first symptoms are cankers and dieback of smaller twigs, then the needles become dull green, yellow to reddish brown, and fall off. Under the bark, there is a yellow-brown to black discolouration, and on the surface of the twig there is are resin deposits. Larger twigs and the stem show larger cankers and extensive resin production. Once the entire trunk is girdled, the tree dies.





LIFE CYCLE

The infection occurs only through the asexual spores (macroconidia and/or microconidia), which are transmitted by the wind or by insects to healthy host plants. Bark-feeding insects (*Pityophthorus*, *Ips* and *Conophthorus*) reproduce in infected branches, and emerging adults are usually carriers of the fungus. They also cause injury along which infection can take place. Infections occur in places and seasons where the relative humidity is high, because moisture is necessary for infection. Cold temperatures limit disease development.

HOST PLANTS

- *Pinus* species are host plants.
- Infestation in *Pseudotsuga menziesii* causes limited damage.

PREVENTIVE MEASURES

- Use healthy starting material (seeds and plants), check for symptoms, and if in doubt have a laboratory analysis carried out.
- Phytosanitary requirements in EU Member States: plant passport for trade of seeds, pine cones, plants intended for planting of *Pinus* spp. and *Pseudotsuga menziesii* (issued by the phytosanitary service of the country (Belgium): FAVV)).
- Phytosanitary requirements for non-EU countries: only imports of production material of *Pinus* spp. and *Pseudotsuga menziesii* with a certificate guaranteeing the absence of *G. circinata.* Ban on imports of plants of the *Pinus* spp. and *P. menziesii* intended for planting (RD 10/8/2005, Annex III, A,1).

MEASURES IN CASE OF DISCOVERY

- Infected plants must be destroyed.
- When the fungus is detected, the FASFC defines an area that consists of the contaminated zone and a buffer zone. Control measures, transport restrictions for susceptible material and intensive monitoring are put into place in the defined area.

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MELAMPSORA POPLAR RUST

(*Melampsora medusae*)

IDENTIFICATION

Several types of fungus can cause poplar rust. Rust usually forms yellow spots on the underside of the leaves in June. The infestation starts at the bottom of the crown, and slowly moves upwards. In autumn, brownish-black scabs appear on the top of infected leaves. In the case of severe infestation, the leaves wither and fall off prematurely, which is sometimes followed by the formation of new leaves in the same year. Severe infestation causes a reduction in growth and vigour, which can lead to secondary infestations and possibly the death of the tree. The most common poplar rust fungus in our regions is *Melampsora laricis-populina*. It is not regulated. *Melampsora medusae* is a quarantine organism.

LIFE CYCLE

Rusts are strictly bound to one or more host plants. The life cycle of *M. medusae* takes place on two different host plants (host-plant alternation), a poplar and a conifer. There are five occasions on which a different spore type is formed. This rust survives on the ground as teliospores on dead poplar leaves. The spores germinate in spring, producing wind-dispersed basidiospores. These infect the needles of conifers. Pycnidiospores are formed on the underside of the needles that look like droplets. After about two weeks, these germinate and form masses of yellow-orange aeciospores on the conifer needles. These spores cause the infection of living poplar leaves in summer, but cannot infect other conifers. After about another two weeks, urediniospores (yellow-orange spore clusters) are formed on the poplar leaves. These spores ensure the further infection of other poplar trees during summer. In late summer, teliospores (hibernating spores) are again formed on dead poplar leaves, thus completing the life cycle.

HOST PLANTS

- Poplar rust requires two types of host plants, a poplar (*Populus* spp.) and a conifer (mainly *Larix* spp. and *Pinus* spp.).
- In regions with mild winters, the entire life cycle can be completed on poplar because the asexual stage can then overwinter in the buds and bark.

PREVENTIVE MEASURES

- Plant susceptible cultivars of *Populus* a few kilometres away from *Larix*.
- Plant passport: plant material intended for plantations of *Abies, Larix, Picea, Pinus, Populus, Pseudotsuga* and *Tsuga* must be grown in an area where *M. medusae* does not occur, and the place of production must have been disease-free during the last growing season.
- Clean up fallen (infected) leaves.
- Plant protection products are not used in Flanders.

MEASURES IN CASE OF DISCOVERY

- Infected plants must be destroyed on nurseries.
- Outside nurseries, felling of infected trees is recommended.

IMPACT

European rust species are not aggressive, and do not tend to spread. They are therefore of little risk to other European countries. There is a risk of importing an aggressive species, especially in regions with mild winters where host plant alternation is unnecessary.

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LEAF SPOT DISEASE ON PRUNUS (*Xanthomonas arboricola* pv. *pruni*)

IDENTIFICATION
This bacterium causes leaf spots as a damage symptom. Initially, the spots are small, light green to yellowish green, and visible on the underside of the leaf. With increasing infection, the upper surface of the leaf also shows clearly visible yellowish-green spots, the centre of which becomes necrotic brown. This usually results in a fracture line around the leaf spot on the border with the healthy-looking leaf tissue, so that the leaf spot in its entirety becomes loose in the leaf. The leaf spot then falls out of the leaf, creating holes ('shot hole' symptom). Branches and twigs can also be affected.

LIFE CYCLE
The bacterium infects the leaf and/or branches through natural openings and damage. New infections can arise from these infections. The symptoms develop mainly in autumn, but can also occur in early summer. In cherry laurel, there is usually a 3-4 week interval between initial infection and the ability to re-infect. The bacteria can be introduced with infected plant material, and spread from spots and cankers by water, mist and aerosols.

Another important source of spread is contact transmission while working in the crop. Bacteria can be transferred from diseased to healthy plants on tools, clothes, hands and all kinds of materials.

HOST PLANTS
- All plant species belonging to the *Prunus* genus are host plants.

PREVENTIVE MEASURES
- No plant protection products are allowed, and control is only possible through phytosanitary and hygienic measures:
  - Disinfection of tools, machines, work areas and packaging material.
  - Healthy plant material and hygiene measures to prevent introduction and spread on the nursery.

MEASURES IN CASE OF DISCOVERY
- Contaminated plants must be destroyed under official supervision.
- All plants of the *Prunus* genus in the infected area must be recorded. Infected plants and all host plants within a radius of 2 m must be destroyed. In case of container-grown crops, the container beds must be disinfected. *Prunus*-waste from infected plants should be kept in a covered container, and disposed of.

IMPACT
- Plant passport: No symptoms of the disease must have been observed at the place of production since the beginning of the previous season.

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RASPBERRY RINGSPOT (NEPO)VIRUS (RRSV)

IDENTIFICATION

The symptoms caused by *Raspberry ringspot (nepo)virus* (RRSV) are different on different host plants and also cultivars and season dependent. In very susceptible raspberry cultivars, the canes (partially) die off in winter, or they first produce immature, brittle shoots with rolled leaves, and then die off. In less susceptible cultivars, yellow-green, ring-shaped spots (oak leaf pattern) develop on the leaves of new shoots in spring, but (almost) never on the leaves of fruit-bearing shoots. In strawberry, the symptoms vary according to the season and the strain of the virus. In general, stunted growth occurs and eventually death results. In cherries, the disease shows 'raspberry leaf' symptoms. The leaves of affected trees are usually smaller, narrower, tough, and have abnormally coarse teeth.

LIFE CYCLE

The (nepo)virus is transmitted over short distances by two nematode species of the genus *Longidorus (L. elongatus* and *L. macrosoma*), which means several sources of infection can occur in one crop. Both larvae and adults spread the virus, but it is not transmitted to the offspring, and the virus is not preserved following larval moulting. It spreads over long distances via seed (wind, animals) and trade of plant material (including nematodes in the soil). Pollen from infected plants does not cause transmission.

HOST PLANTS

- The main host plant is raspberry *(Rubus idaeus*).
- Other *Rubus* species and many species of wild and cultivated plants are also host plants (such as *Fragaria*, *Ribes*, *Vitis* and *Prunus*).

PREVENTIVE MEASURES

- Disinfectants to control the nematodes ensure proper treatment of the virus on raspberry farms.
- When shipped, *Rubus* plants for replanting must be sourced from a field that was free of RRSV during the previous growing season.
- Use certified plant material.

MEASURES IN CASE OF DISCOVERY

- There is no anti-viral treatment.
- Contaminated planting material must be destroyed.

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RED BAND NEEDLE BLIGHT

(Dothistroma septosporum)

IDENTIFICATION

The fungus *D. septosporum* first appears on the older needles as yellow spots. Generally, a red pigment develops around the reproductive organs of the fungus. On very susceptible host plants, red bands are formed, and on other host plants almost the entire needle is reddish-brown, but the base remains green. As the disease develops, needle necrosis spreads from the older to the younger needles. The tree is chronically diseased when the lower branches have become bare, and the upper branches bear infected needles. Unfortunately, the red bands are not always obvious, and the needles can generally turn reddish-brown, making it difficult to distinguish the disease from other needle diseases.

LIFE CYCLE

The fungus reproduces by forming small, black fruiting bodies on the needles. A red pigment is observed, around these fruiting bodies, which develops into red bands. Asexual spores are released from the fruiting bodies and, when they land on a host plant, germinate on the needle surface, entering the needle through the stomata. Infection usually occurs between late spring and late summer. The spores need moisture to germinate, and a temperature of between 12°C and 24°C. During a wet spring with above-average rainfall, mass infection will occur. Once the spores are released, the tree drops its infected needles. The first symptoms of yellowing and red spotting can be observed on the newly infected needles. The fungus overwinters in the needles, the following spring fruiting bodies will form on the needles, which in turn produce spores, and the life cycle will repeat itself.

HOST PLANTS

The main host plants are *Pinus* spp. (mainly *Pinus nigra* ssp. *laricio*), and *Pseudotsuga menziesii and Larix decidua* are also possible host plants.

PREVENTIVE MEASURES

Plant passport: plant material of *Pinus* should originate in an area free from *D. septosporum* and the production site must be free from this fungus.

MEASURES IN CASE OF DISCOVERY

- Infected plants must be destroyed on nurseries.
- Outside nurseries, felling of infected trees is recommended

IMPACT

This fungus has been present in the EPPO region for many years without major impact, and its preference for subtropical climates leads one to believe that its presence poses only a small phytosanitary risk.

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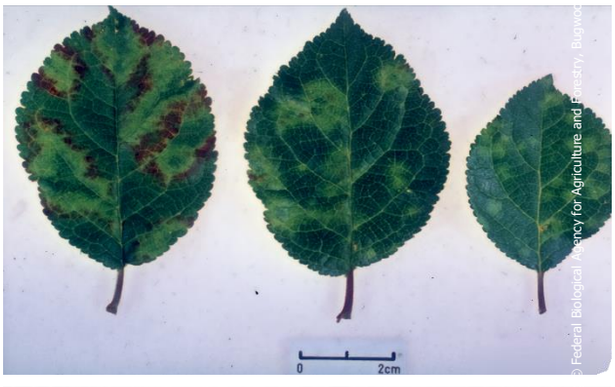
SHARKA VIRUS (Plum pox virus)

(*Plum pox (poty)virus* (PPV))



IDENTIFICATION

The symptoms caused by this virus are manifested in the leaves or fruits, and are particularly noticeable in spring. The leaves develop chlorosis, rings, discolouration of the veins or even leaf malformation. Infected fruit also show chlorosis or rings. In plums and apricots, the fruit is misshapen, with internal browning of the flesh and pale rings or spots on the stones. The symptoms are highly dependent on location, season, *Prunus* spp. and their cultivars, and the plant organ (leaf or fruit).

LIFE CYCLE

Plum pox virus is spread over long distances by propagating and trading infected material (rootstock, scions) or over short distances by transmission through aphids such as *Aphis spiraecola* and *Myzus persicae*. Other aphid species can also transmit the virus, but to a lesser extent. *Aphis hederae* and *Rhopalosiphum padi* transmit the virus to herbaceous plants. The number of trees infected during a growing season can be traced directly to the number of winged aphids. These aphids feed on infected leaves, and then fly to other trees (or shrubs) to feed there as well, thus transmitting the virus. The virus is not seed-transmissible.

HOST PLANTS

- *Prunus* species are the main host plants, especially fruit-producing species (peach, apricot and plum), wild species and ornamental species (Japanese cherry and cherry laurel).
- In addition to *Prunus* spp., it has also emerged that *Clematis*, *Ligustrum vulgare*, *Juglans regia* and *Euonymus europaeus* are host plants.

PREVENTIVE MEASURES

- Producing virus-free material (rootstock, scion, trees) according to a certification scheme.
- Planting resistant cultivars.
- Eradication of aphids.

MEASURES IN CASE OF DISCOVERY

- There is no anti-viral treatment.
- Do not plant host plants in infected areas.
- Infected plants must be destroyed on nurseries.

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PALM INSECTS

SOUTH AMERICAN PALM WEEVIL *(Rhynchophorus palmarum)*

IDENTIFICATION

Insect: The South American palm weevil belongs to the weevil family (Curculionidae). Adults are black, 4-5 cm in size, with a rounded head and typical snout. The larvae are 5-6 cm long, and cream-coloured.

Symptoms: Primary damage is caused by the larvae as they gnaw tunnels in the heart of the palm. The palm initially shows yellowing of the youngest leaves, which then die off. Secondary damage is caused by (bacterial) infections and by the nematode *Bursaphelenchus cocophilus*, a parasite of the larvae, which causes red ring disease in coconut, among others.

LIFE CYCLE

Adult females can lay more than 600 eggs, which hatch after 3-5 weeks. The larval stage lasts 7-8 weeks. The larva moves from the heart of the plant to the base of the palm leaf or plant, where it spins a cocoon from palm fibres or fallen leaves. Pupation takes place in it, lasting 1-3 weeks. The adult weevil lives for 5-8 weeks.

HOST PLANTS

- The South American palm weevil can be found in more than 35 species of plants, from 12 different families.
- The main host plants are coconut, oil palms and date palms; occasionally sugar cane too.
- To a lesser extent, it can occur in citrus, banana and cocoa plants.

PREVENTIVE MEASURES

- Chemical control should be directed at the adults as the larvae cannot be reached.
- Use pheromone traps to check for the presence of adults.

MEASURES IN CASE OF DISCOVERY

- Contaminated plants must be destroyed under official supervision.
- Depending on the circumstances, a demarcated area can be set.

Besides the South American palm weevil, there are a few other non-native and regulated palm insects, such as the red palm weevil *(Rhynchophorus ferrugineus)* and the palm moth (*Paysandisia archon*). The complete list is available on www.eppo.int.


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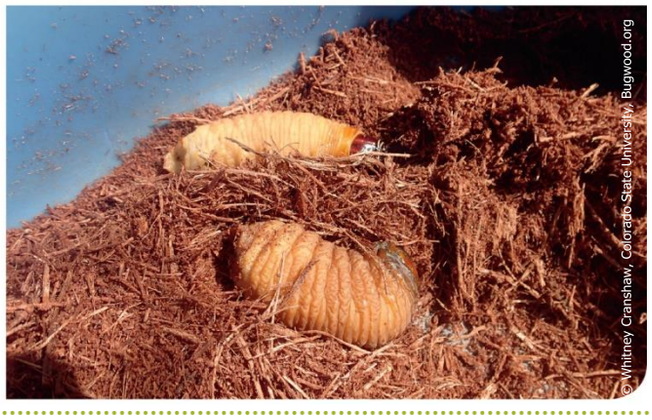
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SPIROPLASMA CITRI

IDENTIFICATION

Spiroplasma citri is a bacterium without a cell wall which causes (moderate) growth retardation. Leaves of infected plants are shorter, broader, cup-shaped, abnormally erect, and sometimes mottled or chlorotic. Under very hot conditions, leaves are deformed with blunt or heart-shaped yellow tips (a very typical feature). Shoots abnormally proliferate into witches' brooms from the many axillary buds. Fruit initiation is suppressed and the fruits are immature, crooked or acorn-shaped and may show colour inversion.

LIFE CYCLE

S. citri infects the phloem sieve elements of its host plant and proliferates in infected trees, causing them to decline. It is an obligate parasite that is spread in nature by leafhoppers (Cicadellidae). Seven species are known to transmit the disease, of which only three occur in Europe *(Circulifer tenellus, C. haemoteps* and *C. opacipennis*). These insects have no preference for *Citrus* and probably pick up *S. citri* via other host plants (e.g. weeds). *S. citri* multiplies in the insect 10-20 days after ingestion through feeding, and the insects can remain infected throughout their lives, but it is not transmitted to the offspring. Other homoptera can be carriers of the spiroplasma, but do not transmit it to plants. The bacterium develops most rapidly in *Citrus* under warm conditions (28-32°C), and symptoms may not show at lower temperatures.

HOST PLANTS

- The main host plants include *Citrus* spp.
- Many other cultivated plants are also host plants, including tree nursery subjects such as *Prunus avium*, *P. persica* and *Pyrus communis*.

PREVENTIVE MEASURES

- Use officially *Spiroplasma-free* certified scion material as much as possible.
- Place decoy plants (not being host plants) near the orchard to attract insects.

MEASURES IN CASE OF DISCOVERY

- Insecticide treatments directed against the vectors are not effective because the spread is very fast.
- Infected plants must be destroyed

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STRAWBERRY LATENT RINGSPOT (NEPO)VIRUS (SLRSV)

IDENTIFICATION

The disease is usually latent in strawberry and other fruit plants. In most cases, no symptoms are observed, but some cultivars may display spots and growth retardation. Symptoms are highly cultivar-dependent.

LIFE CYCLE

As a nepovirus *Strawberry latent ringspot virus* (SLRSV) is mechanically transmissible, especially in herbaceous host plants. It can be spread over long distances through trade. It is transmitted locally by the nematode *Xiphinema diversicaudatum*. Both adults and larvae of the nematode transmit the virus. The virus can survive up to 84 days in the nematode. Sometimes the virus is found in soil, where it is often found in a mixed infection with the *Arabis mosaic nepovirus*, which is also transmitted by *X. diversicaudatum*.

HOST PLANTS

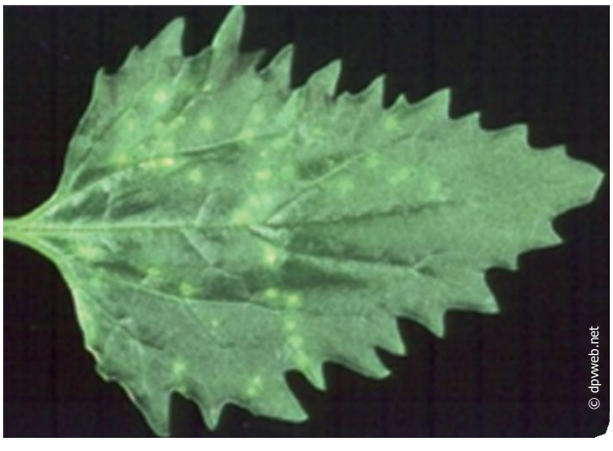
- Strawberries, raspberries and other fruit crops (blackberry, blackcurrant, redcurrant, cherry, grape, plum, peach) are the primary hosts of *Strawberry latent ringspot (nepo)virus*.
- The virus has a wide range of host plants (olive, *Robinia*), and occurs in many types of wild plants, ornamental plants (rose, gladiolus, narcissus) and herbaceous plants.

PREVENTIVE MEASURES

- Grow only virus-free plants.
- Traded strawberry planting material must be produced in accordance with the conditions of an EPPO virus-free certification scheme.
- The SLRSV-free plant material that qualifies for a certificate can be acquired through selection.

MEASURES IN CASE OF DISCOVERY

- There is no anti-viral treatment.
- Contaminated plant material must be destroyed and, if possible, the soil fumigated.



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SUDDEN OAK DEATH (*Phytophthora ramorum*)

IDENTIFICATION

The fungus *Phytophthora ramorum* causes three different damage symptoms, depending on the host plant:

Rhododendron	***Viburnum***	**Deciduous trees such as *Quercus, Fagus* and *Larix***
Leaf and shoot death	Diseased base of the stem	Cankers and bleeding from the trunk
• Shoots: turn brownish-black, die off • Leaves: turn reddish-brown - black, no clear border between diseased and healthy tissue, then fall off • Part of the plant dies	• Canker impedes the sap flow • All plant parts above the canker die • Often fatal	• Black fluid from small, dark spots on stem • Discolouration of the underlying bark • Clear border between diseased and healthy tissue

LIFE CYCLE

Spores are formed on affected leaves under moist conditions. The sporangia can germinate directly, or develop zoospores (swimming spores), which can actively swim in water with their flagella. In extreme drought, heat or cold, *P. ramorum* survives by forming chlamydospores (resting spores).

HOST PLANTS

- There is a whole range of host plants for *Phytophthora ramorum*, but in Europe, a passport requirement only applies for *Rhododendron* spp. (except *R. simsii*), *Viburnum* spp. (especially *Viburnum bodnantense* 'Dawn') and *Camellia*.

PREVENTIVE MEASURES

- Inspect new plant material, and keep it separate from existing batches for six weeks.
- Plant less susceptible cultivars.
- Minimise leaf dampness, disinfect recycled water (U.V., slow sand filter) and check irrigation water using the water bait test.
- Regular inspection of susceptible crops, and removal of suspect plants.
- Fungicides can be used preventively, but they can suppress symptom expression.
- Import ban on certain host plants with leaves (e.g. *Castanea* and *Quercus*) from non-European countries, and on susceptible bark from the USA.
- Susceptible plants, cleared in forests or parks, are best kept on the nursery for at least one year before marketing.

MEASURES IN CASE OF DISCOVERY

- Infected plants and susceptible plants within a radius of 2 m around the infected plants, must be destroyed. Susceptible plants within a radius of 10 m around the infected plants must be kept in quarantine for three months, and are subject to two official inspections.
- Take appropriate measures in the infected production area in the 2 m zone.

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Q-ORGANISMS
OF IMPORTANCE TO TREE NURSERIES

WOOD-BORING OR SHORT-BEAKED BEETLES (Ipidae)
EUROPEAN SPRUCE BARK BEETLE *(Ips typographus)*

IDENTIFICATION

Insect: The spruce bark beetle belongs to the order of beetles (Coleoptera). It is a 4-5.5 mm bark beetle. It is shiny reddish brown to black in colour, and its body is covered with yellow to brownish hairs. The beetle has a large curved neck shield, making the head almost invisible.

Symptoms: The spruce bark beetle is a secondary pest, i.e. it will attack trees that have already been weakened (by drought, feeding damage, storms or fungi). Healthy trees can counteract the attack of some beetles by forming resin. However, in the case of high pest population pressure, resin formation stops, and even healthy trees can die. Infested trees can be recognised by small exit openings, wood dust on the trunk, yellow-brown discoloured tree crowns, loss of needles, woodpecker visits and bark loss.

LIFE CYCLE

In the spring (April), the male spruce bark beetle bores through the bark of the (usually weakened) tree. Once inside, it digs a mating chamber and then excretes a substance to lure the females. A male mates with 3 females on average. The females dig a tunnel 7-15 cm long from the mating chamber. The female lays dozens of eggs in this tunnel. When the larvae emerge, they create a tunnel perpendicular to the original tunnel, which causes the characteristic tunnel pattern. After pupation, the new beetles bore out and fly to the next tree. There are usually two generations per year.

HOST PLANTS

- In Europe, *Picea abies* is the main host plant, but other species of *Picea* (*P. orientalis* and *P. yezoensis*) are host plants in Asia.
- Occasionally, the insect multiplies in *Pinus* and *Abies* species.

PREVENTIVE MEASURES

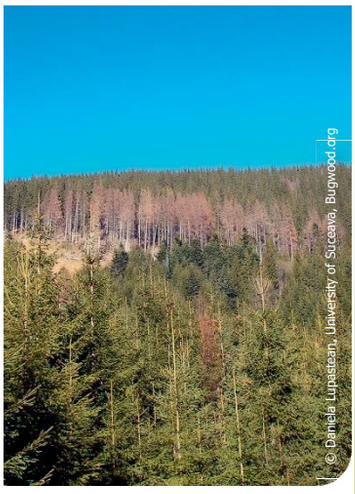
- Wood or stumps of conifers for export are best stripped of bark, oven-dried or subjected to some other effective treatment.

MEASURES IN CASE OF DISCOVERY

- Remove affected trees before the next generation of beetles emerge.
- Use pheromone traps or decoys.

IMPACT

- Special requirements apply to the transport of plants and wood of conifers to protected areas in the EU (ZP plant passport).



In addition to the spruce bark beetle, a dozen other non-native and regulated bark beetles can be found, such as *Ips amitinus*. The complete list is available on www.eppo.int.

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Q-ORGANISMS
OF IMPORTANCE TO TREE NURSERIES

XYLELLA FASTIDIOSA

IDENTIFICATION

The damage caused by the bacterium *Xylella fastidiosa* includes autumn discolouration of the leaves with withering of the leaf edge, often with a clearly delineated border. This is followed by leaf and stem desiccation and withering, growth retardation, and finally complete death of the plant. Specific diseases are 'Pierce's disease' in grapes, 'Variegated chlorosis' in citrus, and 'Phony peach' in peach. Some plant species show clear symptoms, but many remain symptomless after infection.

LIFE CYCLE

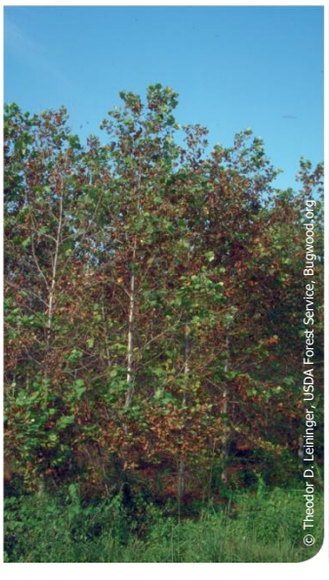
Xylella fastidiosa is only found in the transport vessels of the plant. The bacterium prefers to roam as free cells (planktonic cells) through the xylem, and the plant does not show any external symptoms at that stage. It is only when the bacteria form aggregates, that the xylem will gradually clog up and the leaf edge withering will commence.
The bacterium is spread by a wide range of sap sucking insect species that pierce the xylem to feed, mainly leaf hoppers and spittle bugs. The bacterium establishes itself in their oral parts, allowing the insect to transmit *X. fastidiosa* for life.

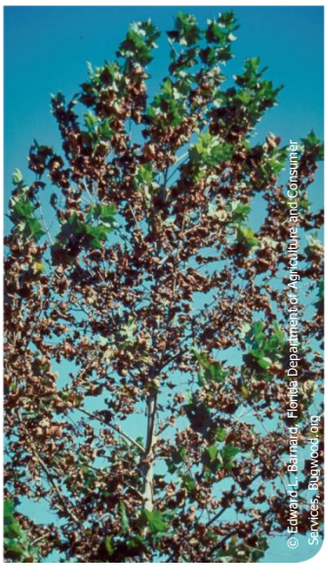
HOST PLANTS

The bacterium is mainly found in woody plants, but it is not very selective, with over 300 plant species from more than 60 botanical families.

PREVENTIVE MEASURES

- There are strict import conditions in the EU for a wide range of host plants.
- Import into the EU of coffee plants from Costa Rica and Honduras is prohibited.





MEASURES IN CASE OF DISCOVERY

- Contaminated plants must be destroyed under official supervision.
- An area is defined, consisting of the infected area and a buffer zone of 10 km around it, in which an intensive survey is carried out.

IMPACT

Trade in host plants from demarcated areas is subject to strict conditions.

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