The Food & Environment Research Agency

Rapid Pest Risk Analysis for

Stegophora ulmea

This document provides a rapid assessment of the risks posed by the pest to the UK in order to assist Risk Managers decide on a response to a new or revised pest threat. It does not constitute a detailed Pest Risk Analysis (PRA) but includes advice on whether it would be helpful to develop such a PRA and, if so, whether the PRA area should be the UK or the EU and whether to use the UK or the EPPO PRA scheme.

STAGE 1: INITIATION

1.What is the name of the pest?

Teleomorph: Genus, species, var., f.sp.	*Stegophora ulmea*
Synonym(s): Genus, species, var., f.sp.	*Gnomonia ulmea*
Anamorph: Genus, species, var., f.sp.	*Gloeosporium ulmicolum*[1], *Cylindrosporella ulmea*[2]
Synonym(s): Genus, species, var., f.sp.	*Asteroma ulmeum*[2], *Gloeosporium ulmeum*[2]
Common name for disease	black spot of elm

Special notes on taxonomy or nomenclature

The fungus has two anamorphic states, macroconidia[1], (*Gloeosporium ulmicolum*) and microconidia[2] (*Cylindrosporella ulmeum*, synonyms *Asteroma ulmeum* and *Gloeosporium ulmeum*).

2. What is the pest's status in the EC Plant Health Directive (Council Directive 2000/29/EC[1]) and in the lists of EPPO[2]?

EPPO A1 list (2003 addition): EU Annex II/A1 (2009 addition)

The pest was placed on the EPPO Alert List in April 2000 and deleted in 2003 when added to the EPPO A1 list

3. What is the reason for the rapid assessment?

An update to the summary pest risk assessment prepared by CSL in 2000 (Sansford, 2000) is required to help inform the decision on whether statutory action against future interceptions is justified.

STAGE 2: RISK ASSESSMENT

4. What is the pest's present geographical distribution?

North America, USA widespread (Sinclair *et al*., 1987), Canada.

[1] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CONSLEG:2000L0029:20100113:EN:PDF
[2] http://archives.eppo.int/EPPOStandards/PM1_GENERAL/pm1-02(21)_A1A2_2012.pdf

Europe: Russia (restricted distribution), Russia Far East (present, no details) (EPPO PQR, accessed December 2013).
The single record from Romania (Peace, 1962) had no further supporting data and is therefore considered doubtful (EPPO, 2005). In 2000, *S. ulmea* was found on glasshouse bonsais (*Ulmus* and *Zelkova*) imported from China in the Netherlands but it was successfully eradicated (EPPO, 2000).

Asia: China suspected (due to interceptions)

5. Is the pest established or transient, or suspected to be established/transient in the UK? *(Include summary information on interceptions and outbreaks here).*
Not recorded before 1999 in UK. No records of occurrence in UK but intercepted on bonsai *Ulmus* and *Zelkova* from China.

First interception was made on plants (bonsai) that first arrived in UK, 9 April 1999; inspected by PHSI 24 April 1999.

Between the first interception and the most recent record (16/4/2007), there have been 30 interceptions all on bonsai of both *Ulmus* (27) and *Zelkova* (3) originating predominantly from China or in transit via the Netherlands.

The initial diagnostic symptoms are distinct yellow and/or black spots on leaves (0.5 – 5 mm diam.) and secondary symptoms can include blight of leaves, petioles, stems, fruits, and defoliation. Therefore, it is unlikely that these symptoms would go undetected in the UK, especially in nursery stock.

6. What are the pest's natural and experimental host plants; of these, which are of economic and/or environmental importance in the UK?

Natural hosts are elm (*Ulmus*) species and Japanese zelkova (*Zelkova serrata*) (elm-like cultivated ornamental (bonsai) and also used for timber).

Major host - *Ulmus americana*

Most species of elm grown in North America are susceptible but the pathogen is most virulent and conspicuous on *U. americana.*

McGranahan and Smalley (1981) ranked nine Ulmus species for resistance using a descriptive rating and a score based on number and size of leaf lesions. The species were placed in the following order of increasing susceptibility:
U. thomasii, U. laciniata, U. parvifolia, U. pumila, U. carpinifolia, U. japonica, U. americana, U. glabra, U. laevis.

In North America, it is the second most important disease of elm after Dutch elm disease. The disease is described as rarely being fatal, even for very small elms defoliated repeatedly, but it was observed in most years throughout the natural range of elms. It is described as widespread from the Great Plains to the Atlantic Ocean (Sinclair *et al.,* 1997).

Several of the *Ulmus* cultivars produced for the UK/EU with resistance to *Ophiostoma ulmi* are F_1 hybrids of species susceptible to *S. ulmea.* For example, the elm cultivar "Regal" (*U. pumila* × *U. carpinifolia*) has been on sale in the UK since 1988 (Burdekin & Rushforth, 1988). Both parent species have been named as susceptible to black spot (McGranahan & Smalley, 1981). However, other hybrids may not be so susceptible, for example, a survey of Chinese elm hybrids revealed that the gene controlling resistance to Dutch elm disease is likely to confirm a high level of resistance to black leafspot in specific elm hybrids (Benet et al., 1995).

The pathogen is a foliar disease that would reduce the market value of nursery elm saplings and could possibly result in infected stock becoming unmarketable.

Infection in bonsai elms or Japanese *Zelkova* would result in 100% loss due to reduction in quality. Production figures are not available.

In the UK, elms dominated many lowland landscapes until successive attacks by Dutch elm disease in the 1920s and 30s and then again in the early 1970s. In the 1970s it was estimated that more than 25 million elms had died. Since then elms are predominantly represented by small thickets of saplings although some resistant elm clones survive as a mature trees (Milner, 2011).

Japanese zelkova is a medium-size deciduous tree planted as an attractive ornamental tree in parks and gardens but is also used for bonsai.

There is no evidence concerning experimental hosts.

7. If the pest needs a vector, is it present in the UK?
No vector required

8. What are the pathways on which the pest is likely to move and how likely is the pest to enter the UK? (*By pathway*):
Plants - the most likely route of introduction is on bonsai plants from Asia, previous interceptions demonstrate this as a pathway. The pathogen may overwinter in small twigs with no visual symptoms observable on dormant young plants (e.g. bonsai).
Although the number of interceptions (approximately 15 since 2001) suggests a moderate likelihood of entry, the last finding was in 2007 and transfer to living elm trees via this pathway (dwarfed *Ulmus* and *Zelkovia* plants directly from China or indirectly via the Netherlands) is unlikely.

	Very unlikely	Unlikely	Moderately likely	Likely	Very likely
Plants:		✓			

–Although the pathogen is known to be seed borne (McGranahan, 1982), it is presumed that there is little if any trade.

	Very unlikely	Unlikely	Moderately likely	Likely	Very likely
Seeds:		✓			

9. How likely is the pest to establish outdoors or under protection in the UK?
Outdoors: the initial infection from airborne ascospores occurs in North America during cool weather in the spring and is more severe during wet conditions. Secondary infections, by macroconidia, occur during spring and early summer and these are presumed to be splash-dispersed from lower to upper leaves. There are only experimental records of temperature ranges for spore germination: 8°C optimum for ascospores and a wide range of 4-28°C for macroconidia (McGranahan & Smalley, 1984). These temperatures can occur in the UK during the spring and summer respectively. Although temperatures for infection and disease development are not specified, spring and summer rainfall in the UK would favour infection.

Under protection: Nursery stocks of *Ulmus* saplings may be at risk from infection as well as the Japanese *Zelkova* if placed in proximity to an inoculum source, i.e. infected leaf debris from bonsai elms. Airborne primary inoculum could easily spread within a nursery. Splash dispersal of secondary inoculum, the macroconidia, could occur during watering. Effective husbandry within the nursery, i.e. clearing away all leaf debris, would reduce the risk of infection. The effect of *S. ulmea* on bonsai elm has not been recorded. However, once in the leaf, disease symptoms are quite visible and it remains likely that in the future symptoms would be detected. The successful eradication of the outbreak in Dutch glasshouses on *Ulmus* and *Zelkova* bonsai in 2000 (EPPO, 2000) suggests that symptoms were clearly visible.

	Very unlikely	Unlikely	Moderately likely	Likely	Very likely
Outdoors:				✓	
Under protection:				✓	

10. How quickly could the pest spread in the UK?
The fungus produces airborne ascospores permitting localised spread from the point of infection but also long distance dispersal in air currents. Elm, as suckers if not mature trees are very widespread in the landscape and thus suitable hosts are unlikely to limit spread.

	Very slowly	Slowly	Moderate pace	Quickly	Very quickly
Natural spread:			✓		
In trade:			✓		

11. What is the area endangered by the pest?
The endangered area would be any areas where susceptible hosts of elm and Japanese zelkova are grown. The pathogen may be damaging to both ornamental bonsai trees as well as trees in the natural environment.

12. What is the pest's economic, environmental or social impact within its existing distribution?
Although prevalent in North America, it causes only foliar damage which may occur repeatedly over many years. It is not described as fatal in North America but would be expected to reduce vigour.

The pathogen is much more damaging to bonsai trees which are grown for their aesthetic quality which may lead to economic loss to individual growers as some bonsai trees are very valuable.

Very small	Small	Medium	Large	Very large
	✓	✓		

13. What is the pest's potential to cause economic, environmental or social impacts in the UK?
The potential risks posed by *S. ulmea* are two-fold; one is the threat to ornamental trees (garden and amenity elms, bonsai elm and Japanese *Zelkova*) as well as the risk to native wild elms where these exist.

The results of infection are likely to be disfiguring leaf, twig and fruit symptoms ultimately with defoliation, but the disease is rarely fatal. Foliar blight caused by the fungus is a potential threat to quality and therefore poses a particular risk to bonsai elm and Japanese *Zelkova*.

Very small	Small	Medium	Large	Very large
	✓	✓		

14. What is the pest's potential as a vector of plant pathogens?
None reported in the scientific literature

STAGE 3: PEST RISK MANAGEMENT

15. What are the risk management options for the UK? *(Consider exclusion, eradication, containment, and non-statutory controls; under protection and/or outdoors).*

The 11 interceptions of the asexual stage of *Stegophora ulmea*, on Chinese bonsai *Ulmus* and *Zelkova* imported via the Netherlands and Belgium since April 1999 pose a risk to *Ulmus* and *Zelkova* in the UK. Each interception has been dealt with by destruction of affected plants and treatment of the remaining susceptible stock on the nurseries concerned, with 3 applications of prochloraz (at manufacturers recommended rate and spray intervals), followed by reinspection. In addition, where overhead watering has normally been practised, this has ceased.

Exclusion would be possible if the diagnostic symptoms were apparent e.g. leaf spots. However, dormant buds can contain the fungus so latent infection could be missed by visual inspection.

Eradication could be achieved if the trees show typical symptoms on the recipient nursery (yellow or black leaf spots, leaf, petiole, stem and fruit blight, defoliation). Visual inspection and subsequent destruction of infected trees and those in an 'at risk' surrounding buffer could eradicate the fungus. A period of quarantine may be required, especially where trees have dormant buds, to determine if the stock has latent infection. A systemic fungicide could be used on trees during the quarantine period. All leaf debris associated with the trees could be removed and destroyed which would effectively eliminate inoculum in senesced leaves.

Eradication would be achieved by destruction of the infected 'lot' of trees with visual symptoms upon arrival in the UK. Any leaf debris associated with the stock should also be destroyed. Trees with dormant buds should be maintained in quarantine conditions, in cool damp conditions, until leaves are exposed. This would encourage development of visual diagnostic symptoms from latent infections in buds. A systemic, eradicant fungicide could also be used during the quarantine period. If the fungus became established on large mature trees in a "natural" forest or urban environment, eradication is unlikely to be possible.

In 2009, it was listed in Annex IIAI on Plants of *Ulmus L. and Zelkova L.,* intended for planting, other than seeds but there are no Annex IV requirements, indicating a weakness in the regulations for *S. ulmea*. Annex IIAI is for organisms absent from the EC so this does not regulate movement within the EU, for example, on Chinese plants originally imported by the Netherlands except by MS taking Article 16 emergency action.. EPPO (2005) recommends that "plants for planting imports of *Ulmus* should be dormant and free from leaves and either originate from a pest-free area, or else from a pest-free place of production where the plants were fungicide-treated". However these requirements would not be wholly appropriate for this pathogen. Importing dormant plants would offer no protection as it is known to overwinter in symptomless twigs. Additionally pest free place of production and the use of fungicides would provided only limited protection due to the production of airborne spores and because fungicides are unlikely to provide complete protection. Therefore it would seem appropriate to add specific requirements to Annex IVAI for plants for planting of Ulmus and Zelkova requiring that they have originated in an area free from S. *ulmea.*

16. Summary and conclusion of rapid assessment.
(Highlight key uncertainties and topics that will require particular emphasis in a detailed PRA) General / overall summary and conclusion and then specific text on each part of assessment...

This rapid assessment shows:

Risk of entry

Although the 15 interceptions since 2001 suggests a moderate likelihood of entry, the last finding was in 2007 and transfer to living elm trees via the bonsai pathway (dwarfed *Ulmus* and *Zelkovia* plants directly from China or indirectly via the Netherlands) is unlikely.

Risk of establishment
Establishment is likely both outdoors and in protected cultivation. An outbreak occurred in Dutch glasshouses on *Ulmus* and *Zelkova* bonsai in 2000 but was successfully eradicated.

Economic impact
It is likely to have a small to medium impact in the UK, the main risk being the loss of quality in bonsais. The fungus produces spores that permit airborne dispersal so spread could occur at a moderate pace.

Endangered area
Ulmus is very widespread in the UK and all populations are at risk.

Risk management

As *S. ulmea* can survive in leaves, petioles, stems and fruits only destruction of infected hosts would be effective in eradicating the pathogen. It is listed in Annex IIAI on Plants of *Ulmus L. and Zelkova L.,* intended for planting, other than seeds but there are no Annex IV requirements. To strengthen the regulations it would seem appropriate to add specific requirements to Annex IVAI for plants for planting of *Ulmus* and *Zelkova* requiring that they have originated in an area free from S. *ulmea.*

17. Is there a need for a detailed PRA? If yes, select the PRA area (UK or EU) and the PRA scheme (UK or EPPO) to be used. *(for PH Risk Management Work stream to decide)* ✓ *(put tick in box)*

No	✓

Yes		PRA area: UK or EU		PRA scheme: UK or EPPO	

18. IMAGES OF PEST

Photo 1 (pest)	*Photo 2 (e.g. symptoms?)*
Source/ copyright owner	*Source/ copyright owner*

19. Given the information assembled within the time scale required, is statutory action considered appropriate / justified?

Yes Statutory action	✓	No Statutory action	

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