CALIFORNIA DEPARTMENT OF FOOD & AGRICULTURE

California Pest Rating Proposal for

Hymenoscyphus fraxineus (T. Kowalski) Baral, Queloz & Hosoya 2014

ash dieback

Pest Rating: A

Kingdom: Fungi, Phylum: Ascomycota,
Subphylum: Pezizomycotina, Class: Leotiomycetes,
Order: Helotiales, Family: Helotiaceae

Comment Period: 05/31/2024 through 07/15/2024

Initiating Event:

This pathogen has not been through the pest rating process. *Hymenoscyphus fraxineus* is listed as a National Priority Pest for survey in the United States for 2024 (Cooperative Agricultural Pest Survey (CAPS) program, Plant Protection Act 7721). The risk to California from *Hymenoscyphus fraxineus* is described herein and a permanent rating is proposed.

History & Status:

Background:

Beginning in the mid-1990s, severe dieback symptoms on European ash (*Fraxinus excelsior*) were observed in Poland (Kowalski, 2006). Since then, a significant epidemic called "ash dieback" has been expanding in Europe. Under the rules for the naming of fungi with pleomorphic life cycles adopted in July 2011, the nomenclaturally correct name for the fungus responsible for this disease was determined to be *Hymenoscyphus fraxineus*, with the basionym *Chalara fraxinea*, and *Hymenoscyphus pseudoalbidus* as a taxonomic synonym. Members of the genus *Hymenoscyphus* are small discomycetes that form their ascomata on dead plant material. Literature about the disease has been published under all three names (CABI, 2024).

The pathogen was introduced into Europe, most probably from East Asia, where it occurs as a pathogen or endophyte on *Fraxinus mandshurica* and *F. rhynchophylla* (Zhao et al., 2012; Gross et al., 2014). Its spread within Europe is thought to be mainly by wind-blown ascospores, but infected nursery saplings may carry the fungus to distant new areas. In Europe, the disease affects many ash

species but most severely, *Fraxinus excelsior* (European ash). It infects trees of all ages, but the dieback progresses faster in young trees than in stands of older age groups. *Hymenoscyphus fraxineus* causes necrosis on leaves, branches, stems, and occasionally also on roots or root collars (Gross et al., 2014). Mortality is high in infected seedlings. The entire natural range of its known hosts, including in North Africa, Russia, and southwest Asia, is currently threatened by ash dieback, with large areas already affected (Pautasso et al., 2013). It is not known to be in the Americas.

Ash trees in the United States are already under severe attack from the introduced emerald ash borer, *Agrilus planipennis* (Coleoptera: Buprestidae) (Kovacs et al., 2010). Should North American species of *Fraxinus* be equally susceptible to ash dieback as the European trees, the introduction of this pathogen to North America would have a significant negative effect on *Fraxinus* populations in natural forest ecosystems and urban areas. There are currently no effective strategies for managing ash dieback in Europe, and efforts to control its spread have failed in various countries. Even tree removals have little effect on epidemics as the fungus survives on leaf litter on the forest floor (CABI, 2024).

Knowledge regarding the level of susceptibility of North American *Fraxinus* species to this pathogen is limited. Nielsen et al. (2017) observed North American ash trees growing in Denmark where this disease occurs widely. They rated *F. latifolia* (Oregon ash) and *F. velutina* (Arizona ash) growing in an arboretum as having moderate disease susceptibility and clear crown symptoms based on the levels of shoot dieback. Both had brown lesions on leaf petioles and apothecia forming frequently on their leaves. When direct stem inoculations were done, both developed stem lesions of 5-13 cm.

Hosts: Chionanthus virginicus (fringe tree), *Fraxinus americana* (white ash), *F. angustifolia* (narrow-leafed ash), *F. bungeana* (Bunge's ash), *F. chinensis* subsp. *rhynchophylla* (Chinese ash), *F. excelsior* (European ash), *F. latifolia* (Oregon ash), *F. mandshurica* (Manchurian ash), *F. nigra* (black ash), *F. ornus* (flowering ash), *F. pennsylvanica* (green ash), *F. quadrangulata* (blue ash), *F. sogdiana* (Tianshan ash), *F. velutina* (Arizona ash), *Phillyrea angustifolia* (narrow-leaved mock privet), and *P. latifolia* (mock privet) (EPPO, 2024).

Symptoms: Symptoms of ash dieback on leaves include black blotchy leaf spots, often at the leaf base and midrib. Affected leaves wilt. On stems and branches, lenticular lesions or necrotic spots appear on the bark of stems and branches. These often have a characteristic elongated-diamond shape centered on the joints between branches, or where branches join the trunk. The lesions typically, but not always, spread upwards and downwards from the joint as the infection spreads in both directions. Lesions can eventually girdle the whole trunk, cutting off the tree's supply of water and nutrients from the roots. Lesions can enlarge to form perennial cankers. The infection may kill the stem rapidly. The wood underneath the diseased bark has a brownish-to-grey discoloration. Some trees affected by the disease develop dark lesions at the bottom of the trunk (known as basal lesions), sometimes in the absence of leaf symptoms or lesions higher up the tree. These basal lesions can cause a rapid decline of the tree and can also make trees susceptible to failure. Affected trees commonly show extensive crown dieback of shoots, twigs, and branches. Trees often have prolific epicormic shoots (shoots produced from previously dormant buds) (CABI, 2024).

Transmission:

Hymenoscyphus fraxineus is pleiomorphic; the anamorphic stage produces prolific asexual conidiospores. The conidia are not thought to have a role in the spread of the fungus, being released in slimy spore droplets, occasionally in chains, and unlikely to become airborne, however, they can germinate on ash leaves and infect seedlings. They are instead assumed to act as spermatia (male gametes) during ascospore formation by the teleomorphic stage. Once the leaves of ash trees fall in autumn, the fungus produces a blackened pseudosclerotial plate on the rachises (Gross and Holdenrieder, 2013). This is an overwintering structure. The anamorph sporulates at the edge of the pseudosclerotial plate from which the apothecia emerge (Kowlalski and Bartnick, 2010). Additionally, *H. fraxineus* colonizes ash debris and even grows in soil in the absence of ash tissues. (Fones et al., 2016). The fungus overwinters in leaf litter, particularly on ash leaf stalks, and the teleomorphic stage produces small white apothecia between July and October which release ascospores into the surrounding atmosphere. Ascospores are carried in the air and land on healthy leaves where they germinate. They can travel as much as 75 km from the original source per year (Gross et al., 2013).

There is also a risk of introducing the disease into new areas by moving diseased ash seeds or plants, especially as nursery stock. However, movement of larger-diameter ash logs from infected areas is considered to be a lower risk as long as phytosanitary measures are implemented including ensuring the larger-diameter logs have no evident signs of the disease (e.g. lesions or staining) and that all leaves and foliage (whether living or dead) are completely removed on site before transportation (CABI, 2024).

Damage Potential: Ash dieback is a lethal disease, causing crown dieback and root collar necrosis affected trees in a woodland setting, usually leading to tree death. It affects all age classes of its hosts from saplings to mature trees (Gross et al., 2013). In Europe, ash dieback has become a major problem with the fungus moving within and across the continent rapidly. It is becoming a significant threat to biodiversity in forest ecosystems and the economic and aesthetic impacts are immense. It has been estimated that ash dieback will kill at least 60% and possibly 90% of ash trees across the UK. The cost is estimated in the billions, and the effects will be staggering. It will change the landscape forever and threaten many species that rely on ashes for food and shelter (Evans, 2019).

Worldwide Distribution: Asia: *China, Japan, Republic of Korea, Russia*. Europe: *Austria, Belarus, Belgium, Bosnia and Herzegovina, Croatia, Czech Republic, Denmark, Estonia, Finland, France, Germany, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Montenegro, Netherlands, Norway, Poland, Romania, Russia, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, Ukraine, and the United Kingdom* (Farr and Rossman, 2024; EPPO, 2024).

Official Control*: Hymenoscyphus fraxineus* is on the EPPO's A1 list for Kazakhstan and the Eurasian Customs Union and is a quarantine pest in Canada and China (EPPO, 2024). It is on the USDA PCIT's harmful organisms list for Canada, China, and the Eurasian Customs Union (USDA PCIT 2024).

California Distribution: none

California Interceptions: none

The risk *Hymenoscyphus fraxineus* that would pose to California is evaluated below.

Consequences of Introduction:

1) **Climate/Host Interaction:** This pathogen is likely to be found wherever its hosts can grow.

   Evaluate if the pest would have suitable hosts and climate to establish in California.

   Score: **2**
   - Low (1) Not likely to establish in California; or likely to establish in very limited areas.
   - Medium (2) may be able to be established in a larger but limited part of California.
   - High (3) likely to establish a widespread distribution in California.

2) **Known Pest Host Range:** Hosts are all in the family Oleaceae, including several genera.

   Evaluate the host range of the pest.

   Score: 2
   - Low (1) has a very limited host range.
   - Medium (2) has a moderate host range.
   - High (3) has a wide host range.

3) **Pest Reproductive Potential:** The fungus reproduces with multiple spore types, including ascospores that can travel long distances by wind.

   Evaluate the natural and artificial dispersal potential of the pest.

   Score: 3
   - Low (1) does not have high reproductive or dispersal potential.
   - Medium (2) has either high reproductive or dispersal potential.
   - High (3) has both high reproduction and dispersal potential.

4) **Economic Impact:** Losses of native ash species could be damaging at the ecosystem level. Direct costs will be from clean-up felling and replacement of dead and dying trees.

   Evaluate the economic impact of the pest on California using the criteria below.

   Economic Impact: A, C, D

   A. The pest could lower crop yield.
   B. The pest could lower crop value (including increasing crop production costs).
   C. The pest could trigger the loss of markets (including quarantines).
   D. The pest could negatively change normal cultural practices.
   E. The pest can vector, or is vectored, by another pestiferous organism.

F. The organism is injurious or poisonous to agriculturally important animals.
G. The organism can interfere with the delivery or supply of water for agricultural uses.

Economic Impact Score: 3
- Low (1) causes 0 or 1 of these impacts.
- Medium (2) causes 2 of these impacts.
- High (3) causes 3 or more of these impacts.

5) **Environmental Impact:** *Fraxinus latifolia* (Oregon ash) is native to western North America on the west side of the Cascade Range from southwestern British Columbia to central California. *Fraxinus velutina* (Arizona ash) is native to coastal southern California, extending into the Southern Sierra Nevada. (Calflora, 2024). Both are proven hosts of ash dieback. The host status of native *Fraxinus dipetala* (California ash) is unknown. Ornamental plantings of native and exotic *Fraxinus* spp. could also be affected.

Evaluate the environmental impact of the pest on California using the criteria below.

Environmental Impact: A, E
A. The pest could have a significant environmental impact such as lowering biodiversity, disrupting natural communities, or changing ecosystem processes.
B. The pest could directly affect threatened or endangered species.
C. The pest could impact threatened or endangered species by disrupting critical habitats.
D. The pest could trigger additional official or private treatment programs.
E. The pest significantly impacts cultural practices, home/urban gardening, or ornamental plantings.

Environmental Impact Score: 3
- Low (1) causes none of the above to occur.
- Medium (2) causes one of the above to occur.
- High (3) causes two or more of the above to occur.

Consequences of Introduction to California for *Hymenoscyphus fraxineus:* High

Add up the total score and include it here. **13**
-Low = 5-8 points
-Medium = 9-12 points
-High = 13-15 points

6) **Post-Entry Distribution and Survey Information**: Evaluate the known distribution in California. Only official records identified by a taxonomic expert and supported by voucher specimens deposited in natural history collections should be considered. Pest incursions that have been eradicated, are under eradication or have been delimited with no further detections should not be included.

Evaluation is 'Not established'.

Score: 0

-Not established (0) Pest never detected in California or known only from incursions.

-Low (-1) Pest has a localized distribution in California or is established in one suitable climate/host area (region).

-Medium (-2) Pest is widespread in California but not fully established in the endangered area, or pest established in two contiguous suitable climate/host areas.

-High (-3) Pest has fully established in the endangered area, or pest is reported in more than two contiguous or non-contiguous suitable climate/host areas.

7) **The final score is** the consequences of the introduction score minus the post-entry distribution and survey information score: (Score)

Final Score: *Score of Consequences of Introduction – Score of Post Entry Distribution and Survey Information* ***= 13***

Uncertainty:

The susceptibility of native ashes in environments similar to where they grow in California has not been evaluated.

Conclusion and Rating Justification:

Based on the evidence provided above the proposed rating for ***Hymenoscyphus fraxineus*** **is A.**

References:

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Responsible Party:

Heather J. Martin, Primary Plant Pathologist/Nematologist, CDFA/PHPPS ECOPERS, 1220 N St Rm 221, Sacramento, CA 95814 Phone: (916) 654-1017, permits[@]cdfa.ca.gov.

***Comment Period: 05/31/2024 through 07/15/2024**

***NOTE:**

You must be registered and logged in to post a comment. If you have registered and have not received the registration confirmation, please contact us at permits[@]cdfa.ca.gov.

Comment Format:

- Comments should refer to the appropriate California Pest Rating Proposal Form subsection(s) being commented on, as shown below.

  Example Comment:

  Consequences of Introduction: 1. Climate/Host Interaction: [Your comment that relates to "Climate/Host Interaction" here.]

- Posted comments will not be able to be viewed immediately.
- Comments may not be posted if they:

  Contain inappropriate language which is not germane to the pest rating proposal;

  Contains defamatory, false, inaccurate, abusive, obscene, pornographic, sexually oriented, threatening, racially offensive, discriminatory or illegal material;

  Violates agency regulations prohibiting sexual harassment or other forms of discrimination;

  Violates agency regulations prohibiting workplace violence, including threats.

- Comments may be edited prior to posting to ensure they are entirely germane.
- Posted comments shall be those which have been approved in content and posted to the website to be viewed, not just submitted.

Pest Rating: A