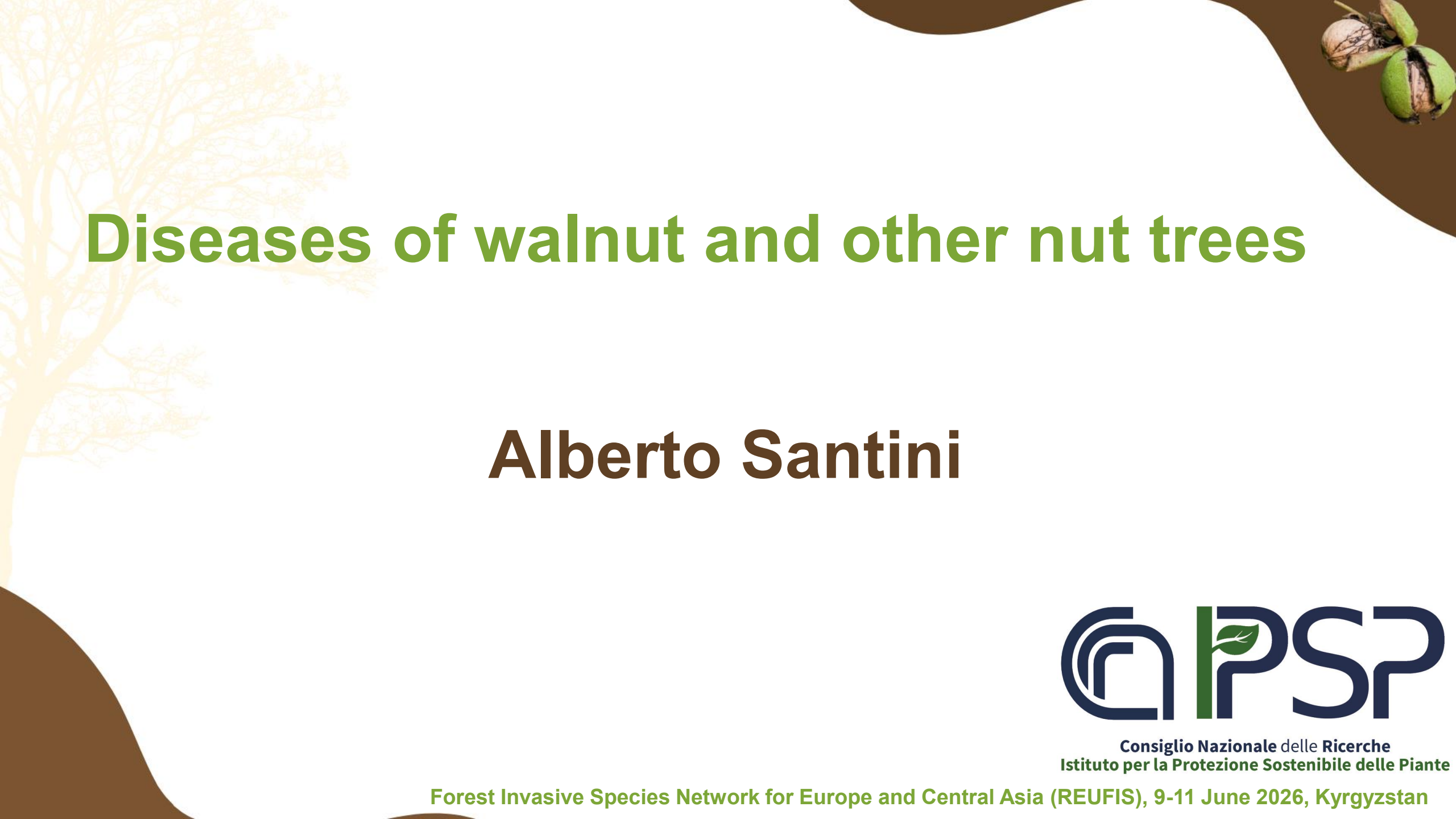




Diseases of walnut and other nut trees

Alberto Santini



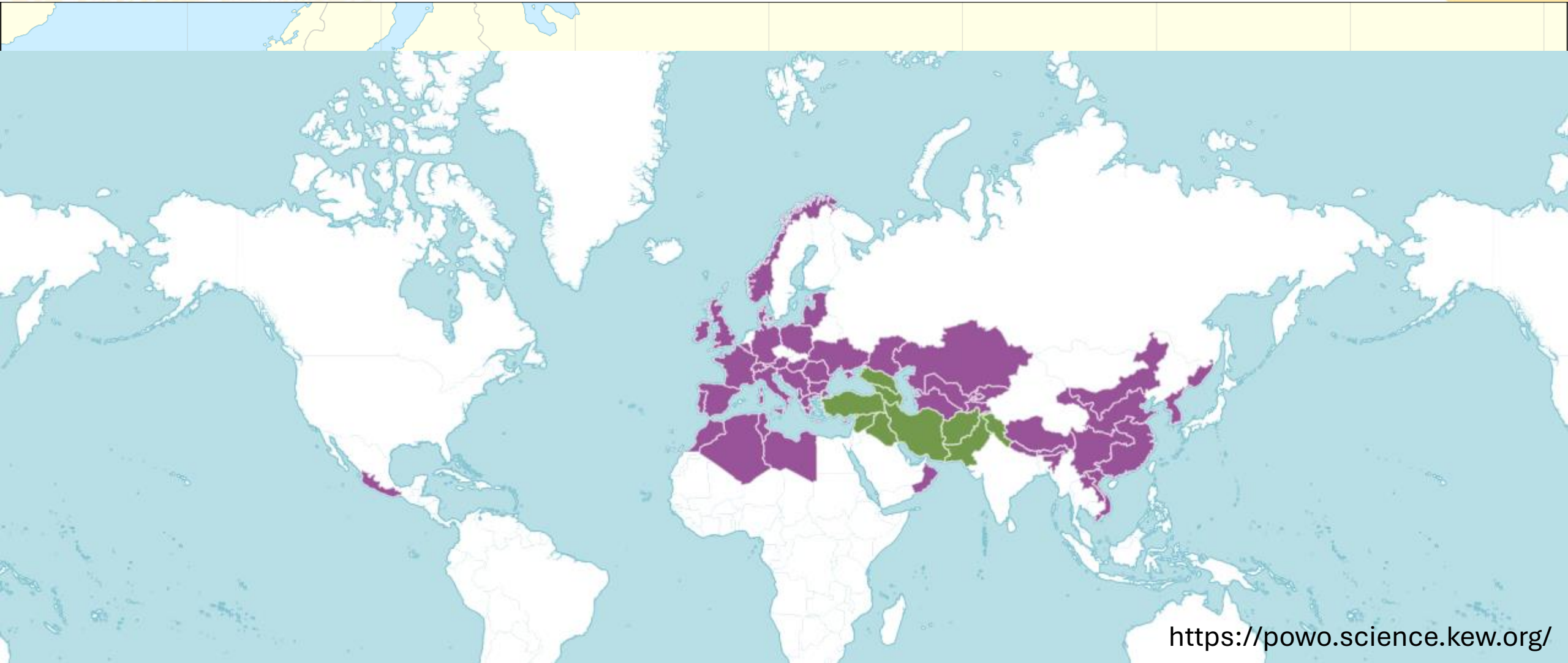
Consiglio Nazionale delle Ricerche
Istituto per la Protezione Sostenibile delle Piante

Forest Invasive Species Network for Europe and Central Asia (REUFIS), 9-11 June 2026, Kyrgyzstan



Juglans regia
(Walnut)

Native and cultivation range

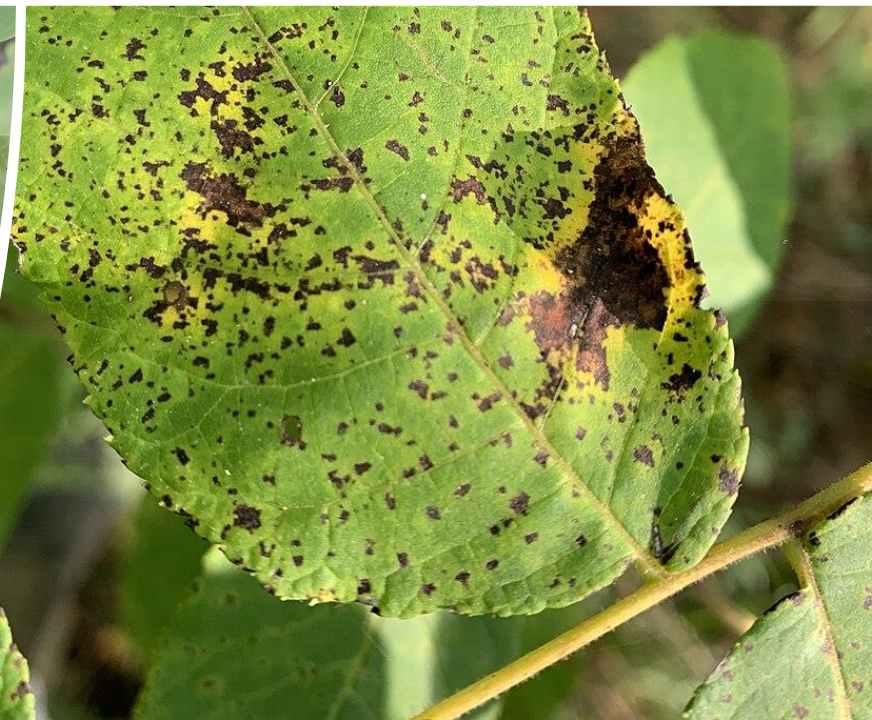
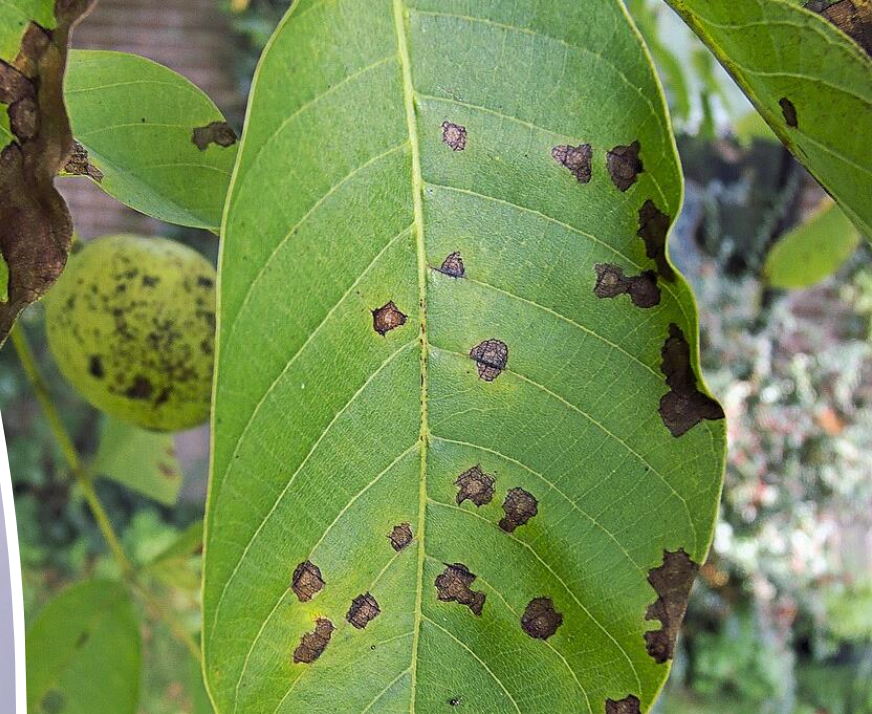


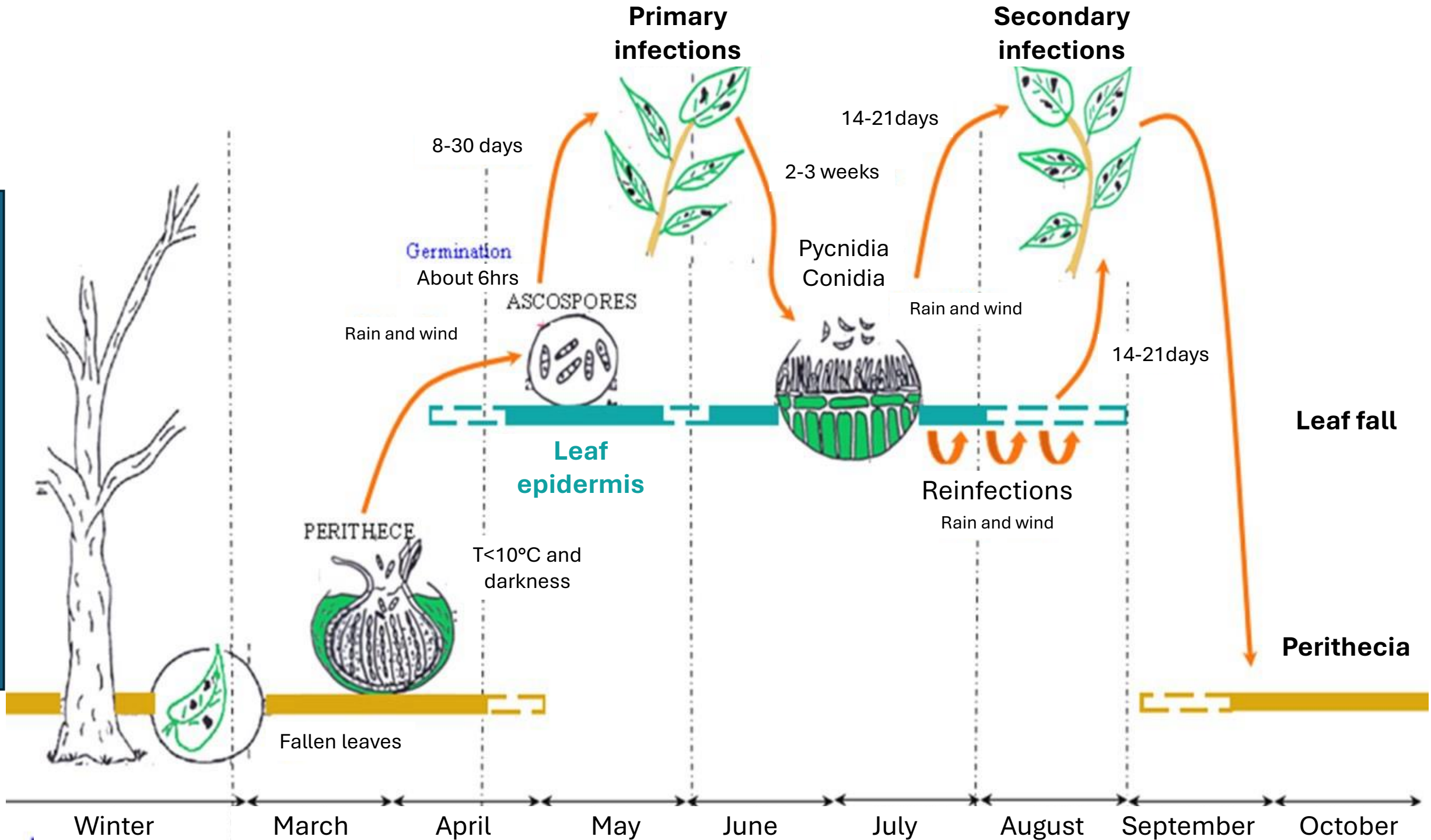
<https://powo.science.kew.org/>

Gnomonia leptostyla

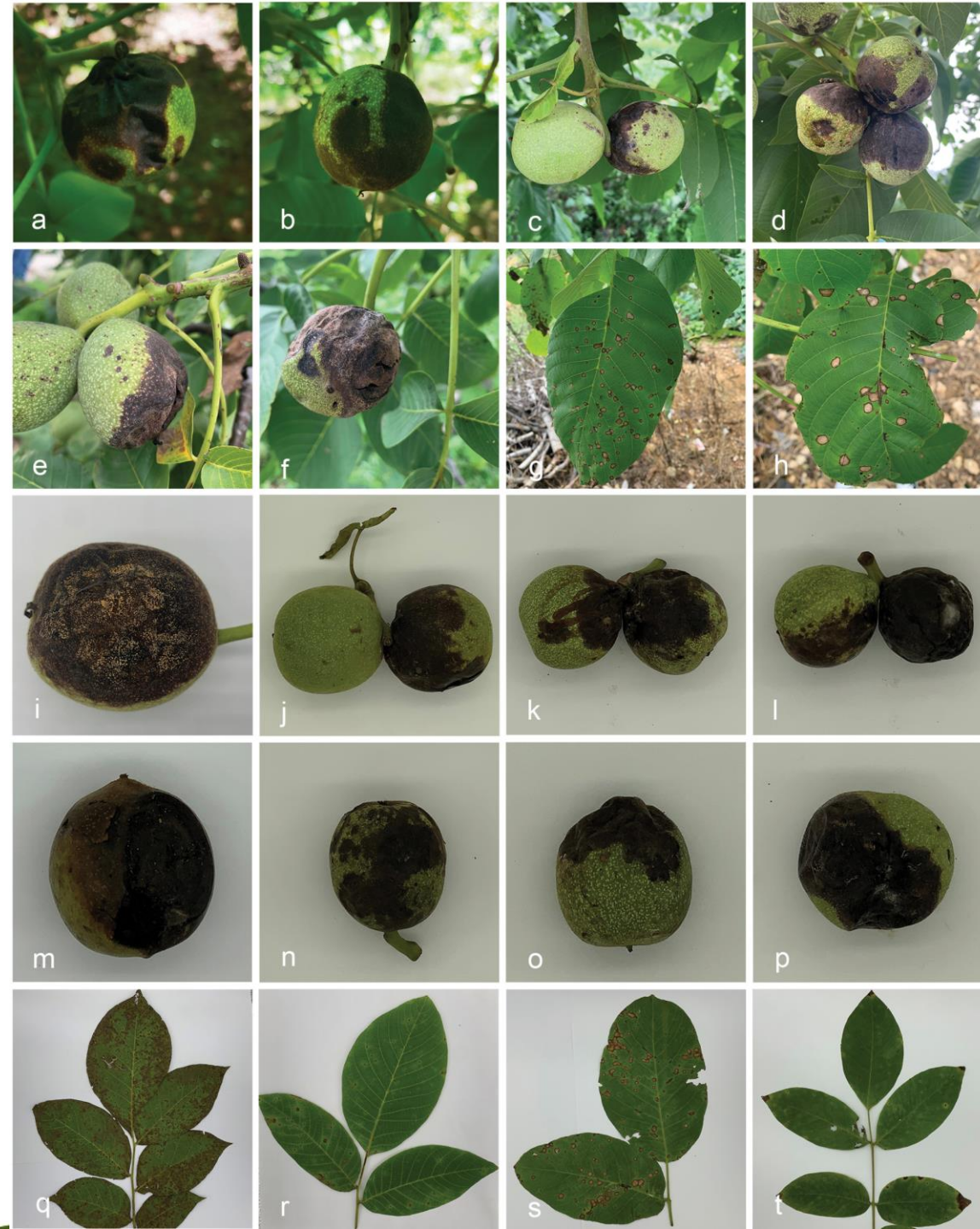
Causal agent of:

Anthracnose





***Colletotrichum*
fioriniae
and *C. nymphaeae***
Causal agent of:
Anthracnose



Part of: Zhang L, et al.,
(2024) MycoKeys 108: 95-
113. [https://doi.org/10.3897/myco
keys.108.127734](https://doi.org/10.3897/mycokeys.108.127734)

REUFIS), 9-11 June 2026, Kyrgyzstan



June
Late spring



August
Summer



September
Late summer



Acervuli

Part of: Da Lio, D., et al., *Sci Rep* **8**, 10765 (2018). <https://doi.org/10.1038/s41598-018-29027-z>

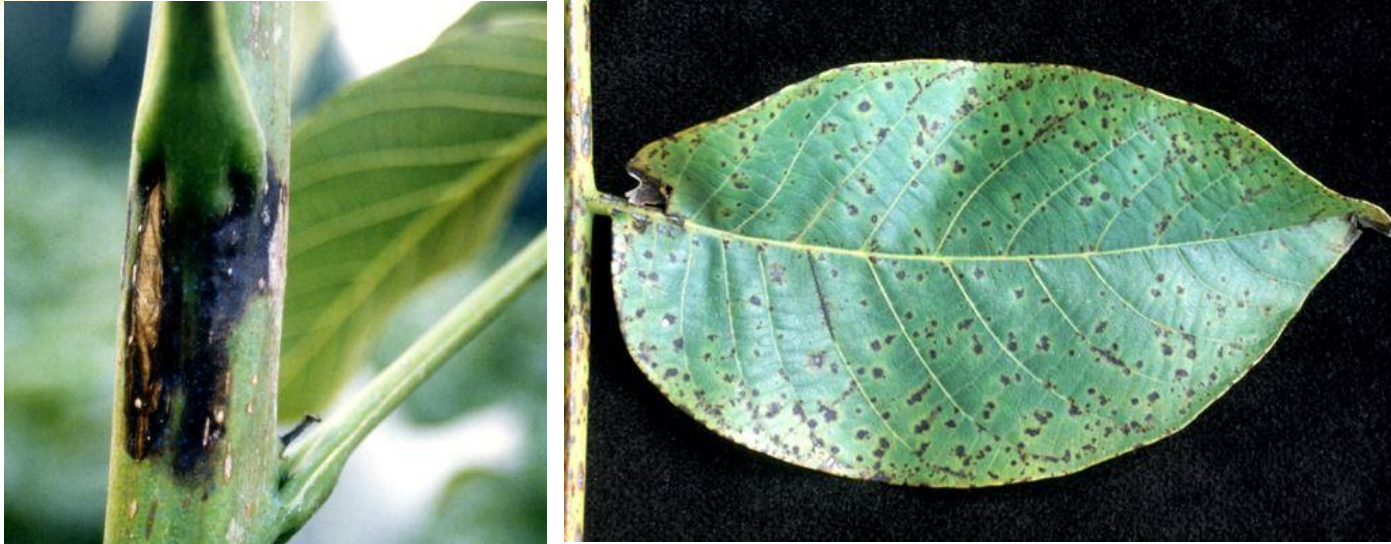
Forest Invasive Species Network for Europe and Central Asia (REUFIS), 9-11 June 2026, Kyrgyzstan

***Colletotrichum*
fioriniae
and *C. nymphaeae***
Causal agent of:
Anthracnose

Bacterial blight: *Xanthomonas arboricola* pv. *juglandis*



Spring



CABI.org *Xanthomonas arboricola* pv. *juglandis* (walnut blight). Available from: https://www.researchgate.net/publication/368637870_Xanthomonas_arboricola_pv_juglandis_walnut_blight [accessed Jun 02 2026].

Summer



Monitoring and cointainment measures



	J	F	M	A	M	J	J	A	S	O	N	D
Bacterial canker												
Anthraxnose												
Colletotrichum												



53



Microstroma juglandis

Causal agent of:

Downy leaf spot

basidiomycete in the order
Exobasidiales



Phytophthora sp.

TABLE 1. Species of <i>Phytophthora</i> Causing Root and Crown Rots and Aerial Cankers of Nut Trees					
<i>Phytophthora</i> sp.	Known Distribution	Almond	Pecan	Pistachio	Walnut
<i>P. cactorum</i>	Temperate zones	×	...	...	×
<i>P. cambivora</i>	Cosmopolitan	×	...	...	×
<i>P. capsici</i>	Western Hemisphere, Asia, Europe	...	...	×	...
<i>P. cinnamomi</i>	Cosmopolitan	×	×	...	×
<i>P. citricola</i>	Cosmopolitan	×	...	×	×
<i>P. citrophthora</i>	Cosmopolitan	×	...	×	×
<i>P. cryptogea</i>	Temperate zones	×	...	×	×
<i>P. drechsleri</i>	Cosmopolitan	×	...	...	×
<i>P. megasperma</i>	Cosmopolitan	×	...	...	×
<i>P. nicotianae</i> var. <i>parasitica</i>	Temperate and warm regions	×	...	×	×
<i>P. syringae</i>	Temperate zones	×	...	...	...
Unidentified species	Unknown	×	×	...	×
<i>P. plurivora</i>					×
<i>P. cactorum</i>					×
<i>P. nicotianae</i>					×

Thousand canker disease (TCD)

- Host – *Juglans spp.*
- Fungal pathogen-*Geosmithia morbida*
- Insect vector-*Pityophthorus juglandis* (Walnut Twig Beetle)
- Economical, social and environmental importance
- Standing value of black walnut in the eastern U.S. at \$569 billion
- European introductions: Italy (2013) and France (2022)

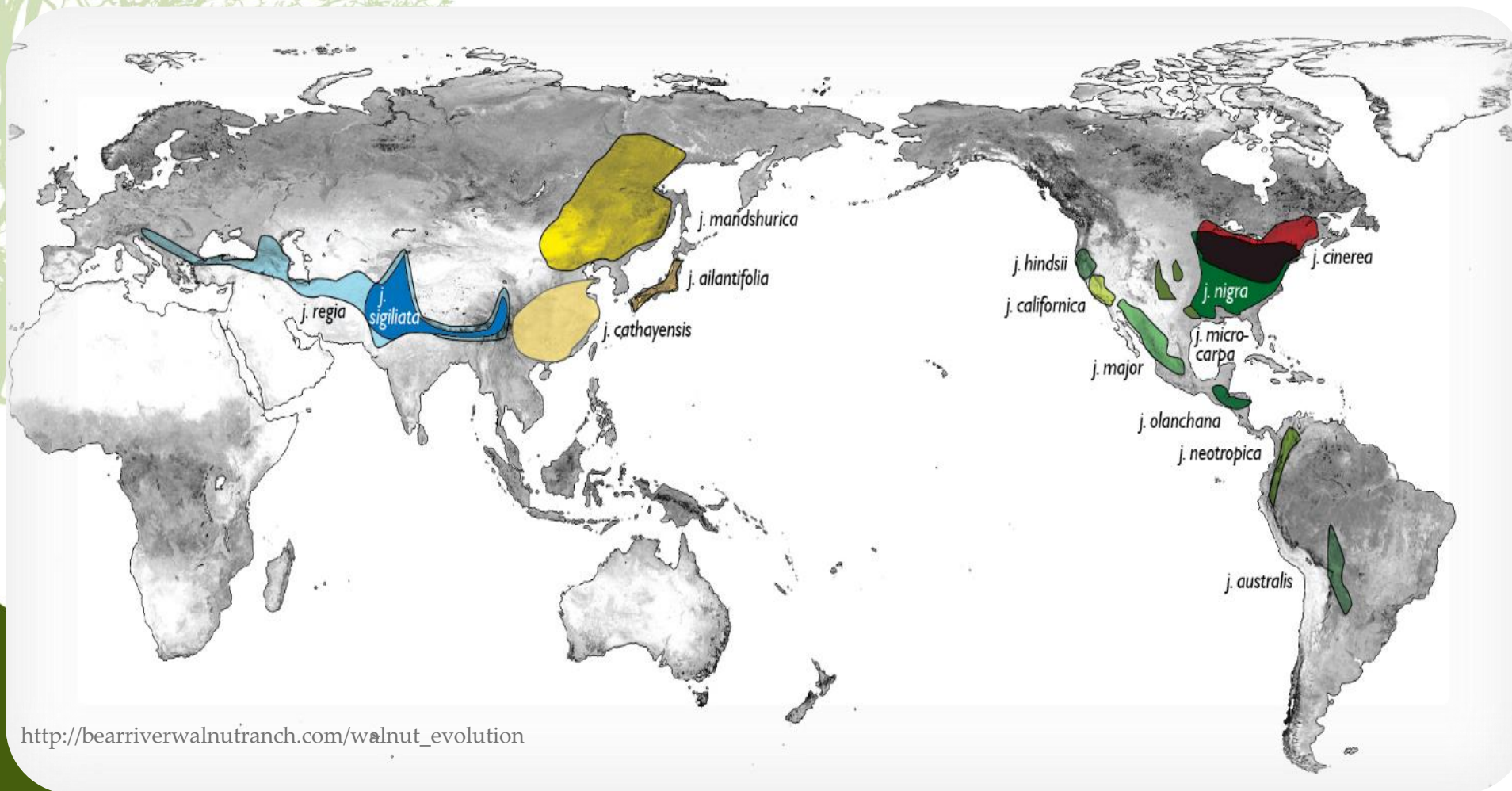


Daniels et al. (2016) Forests, 7:260.

Thousand canker disease

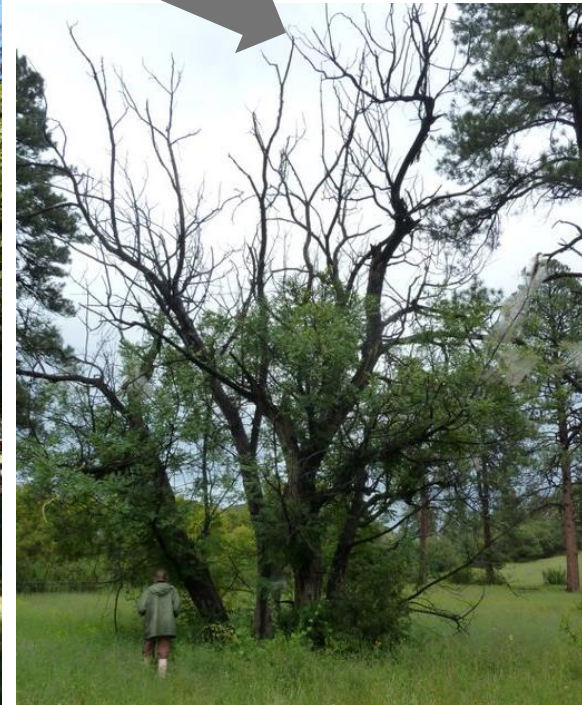


Thousand canker disease



TCD is a global concern, nearly all *Juglans* spp. are susceptible.

TCD SEVERITY IN THE INTRODUCED RANGE

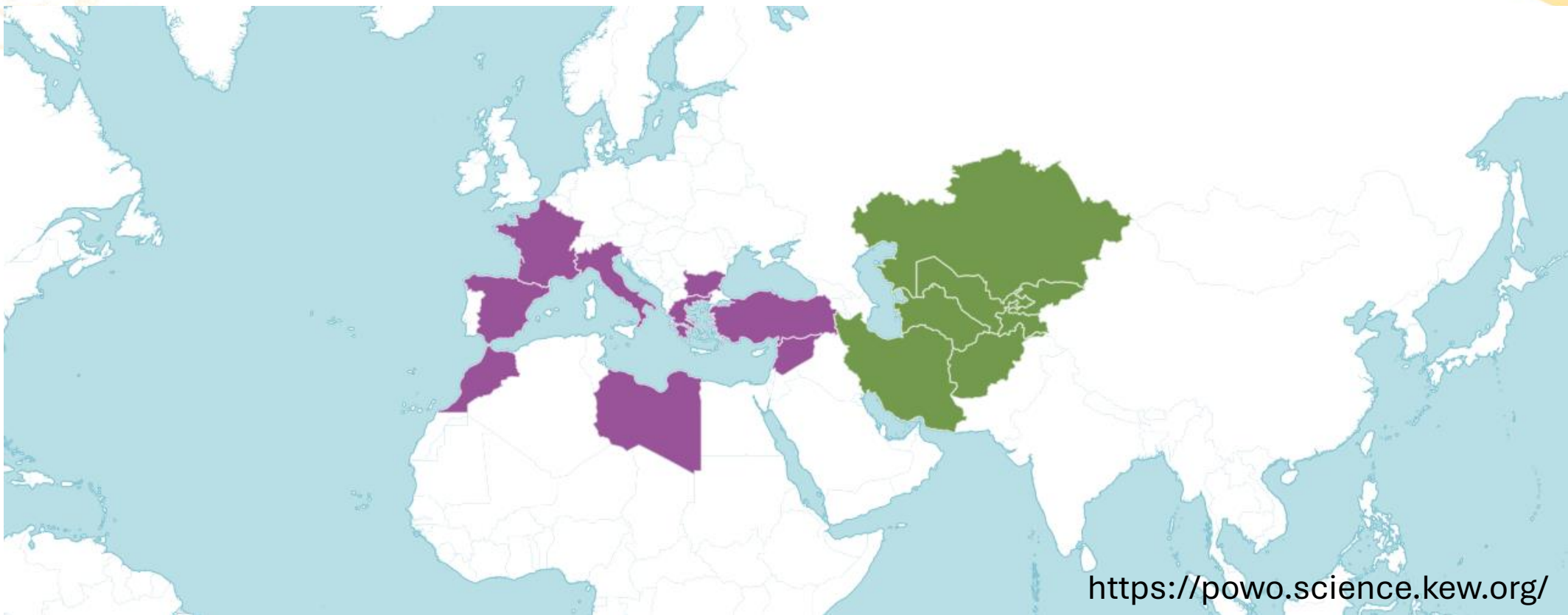


Photos: D. Hadziabdic



Pistacia vera
(Pistachio)

Native and cultivation range



<https://powo.science.kew.org/>

Panicle and shoot blight:

Botryosphaeria dothidea, *Neofusicoccum hellenicum*, *N. mediterraneum*



5606492



5606493

5606497



Early summer



Late summer

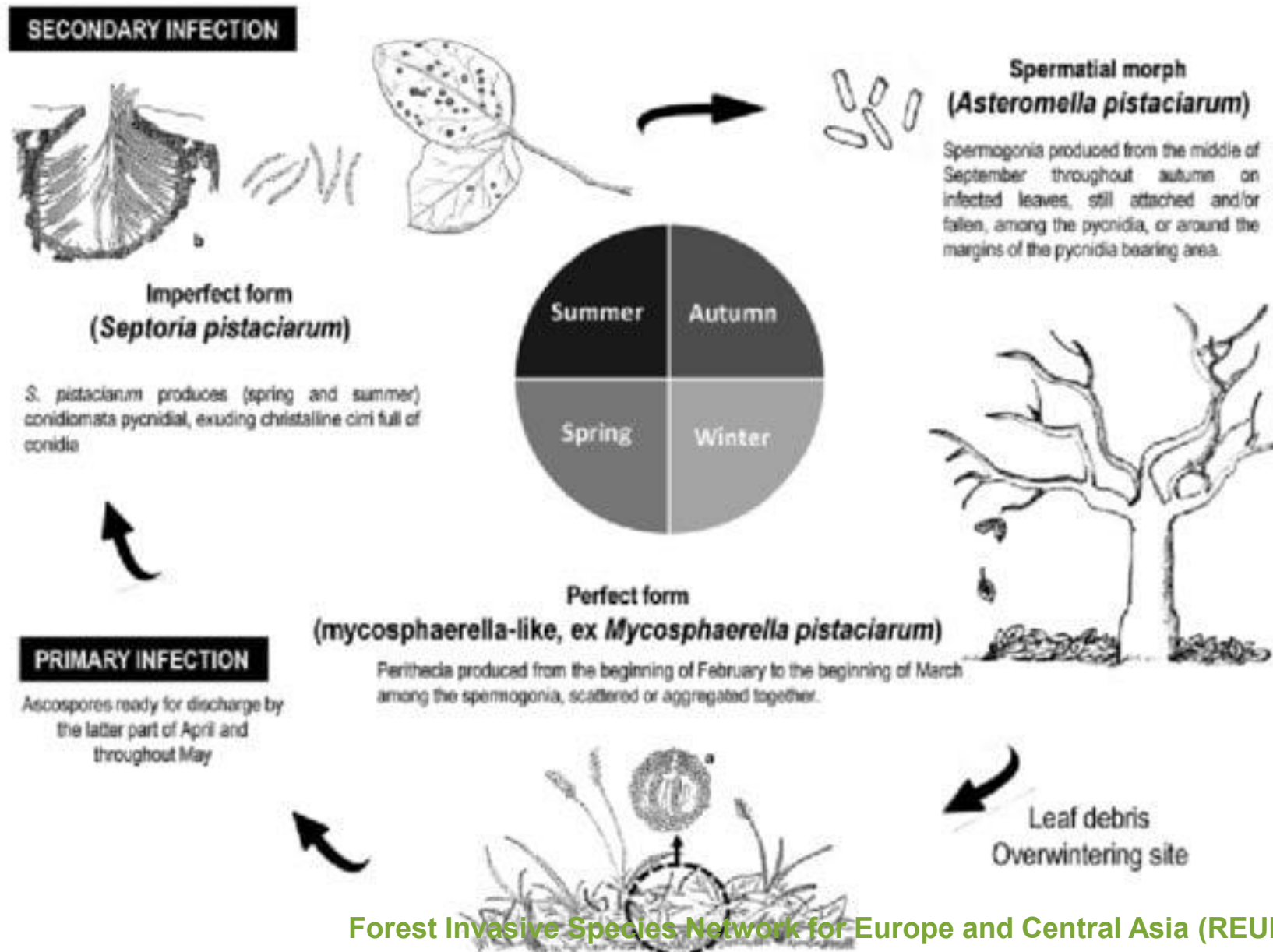
Autumn



RHOUMA et al. 2024. *J. Phytopathol. D Man.*, 12-18. DOI [10.5281/zenodo.14511057](https://doi.org/10.5281/zenodo.14511057)

Pistachio leaf spot: *Septoria pistaciarum*

Pistachio leaf spot: *Septoria pistaciarum*



RHOUMA et al. 2024. *J. Phytopathol. Dis. Man.*, 12-18. DOI [10.5281/zenodo.14511057](https://doi.org/10.5281/zenodo.14511057)

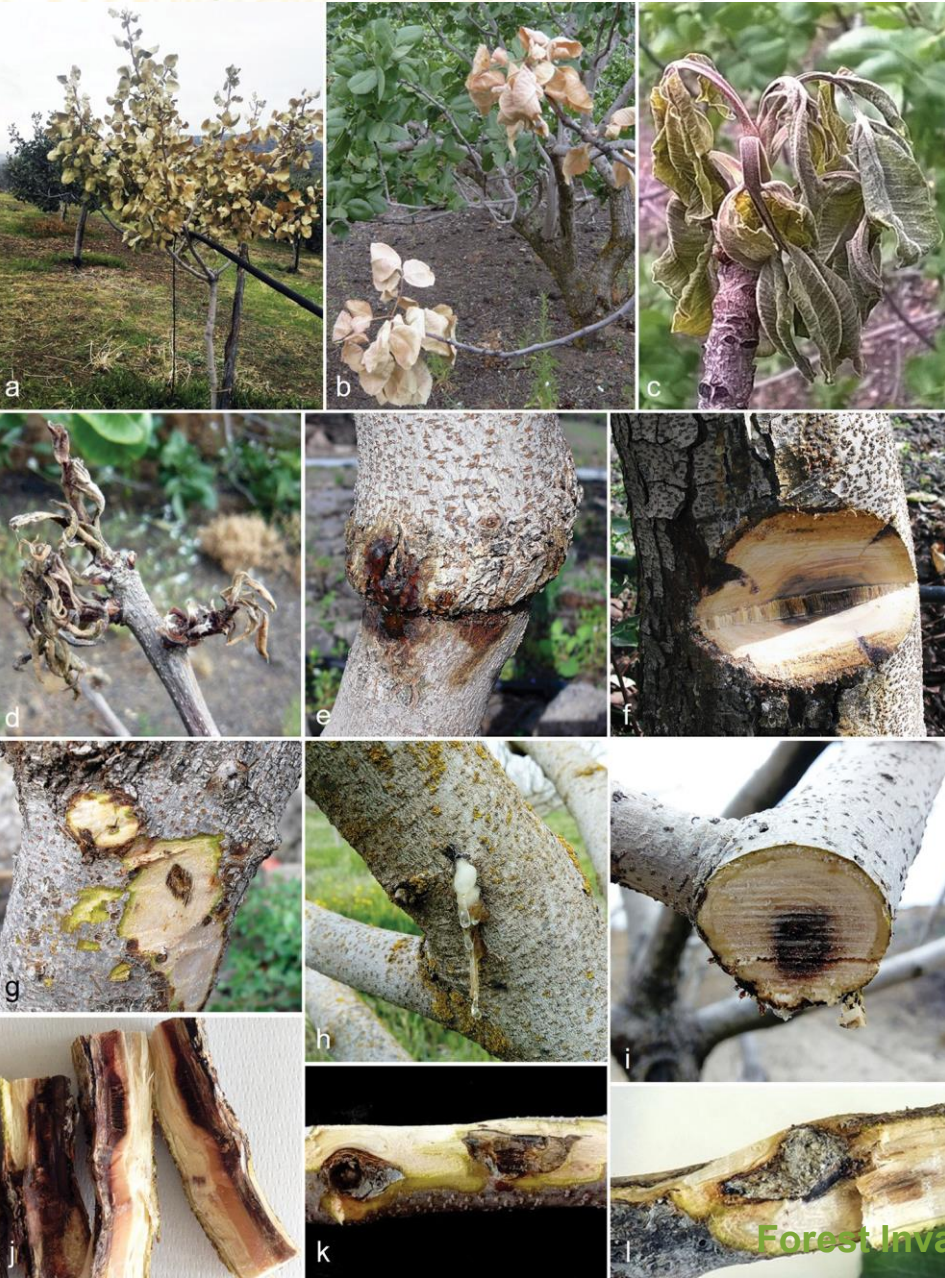


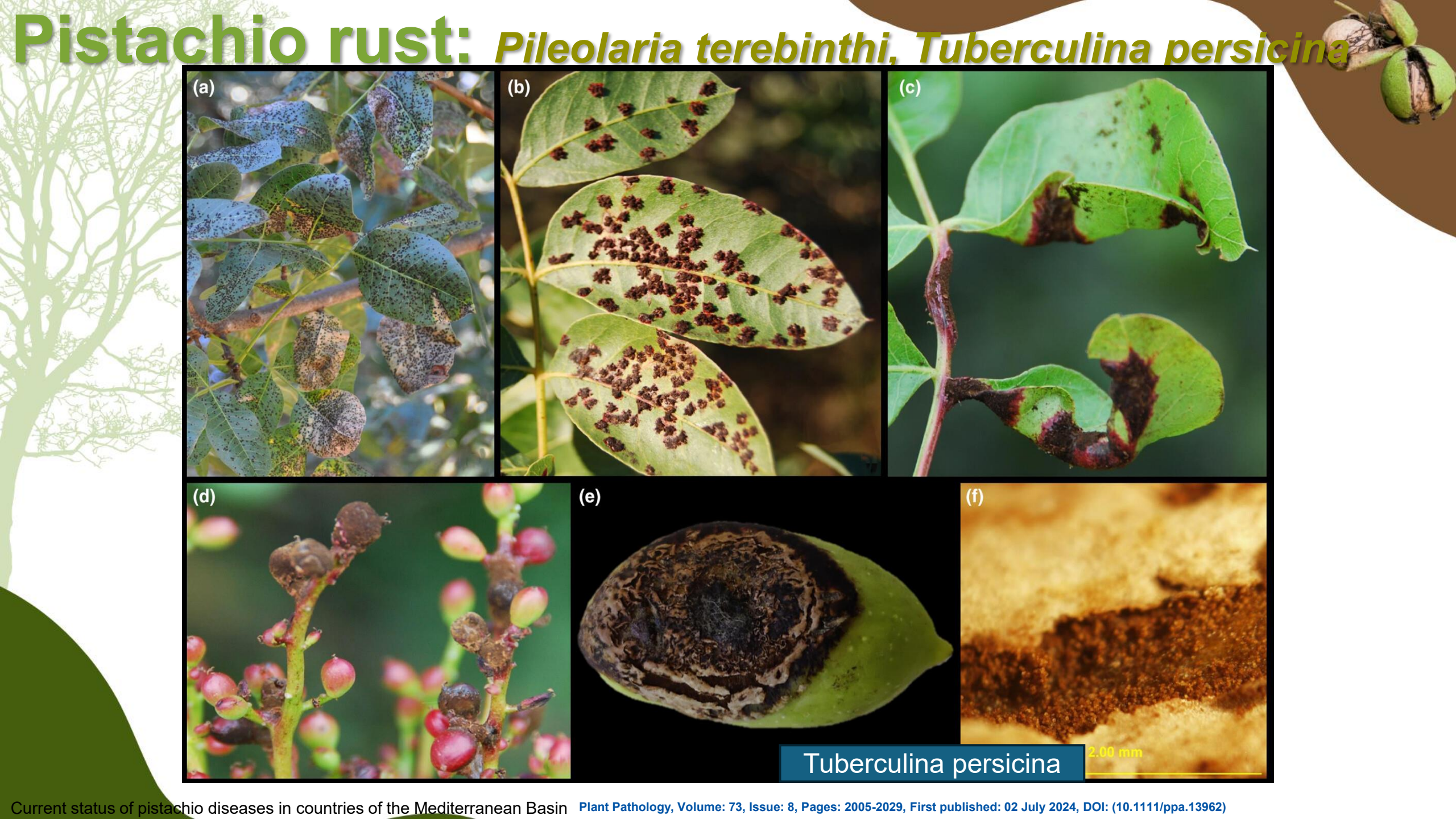
Alternaria late blight: *Alternaria alternata*

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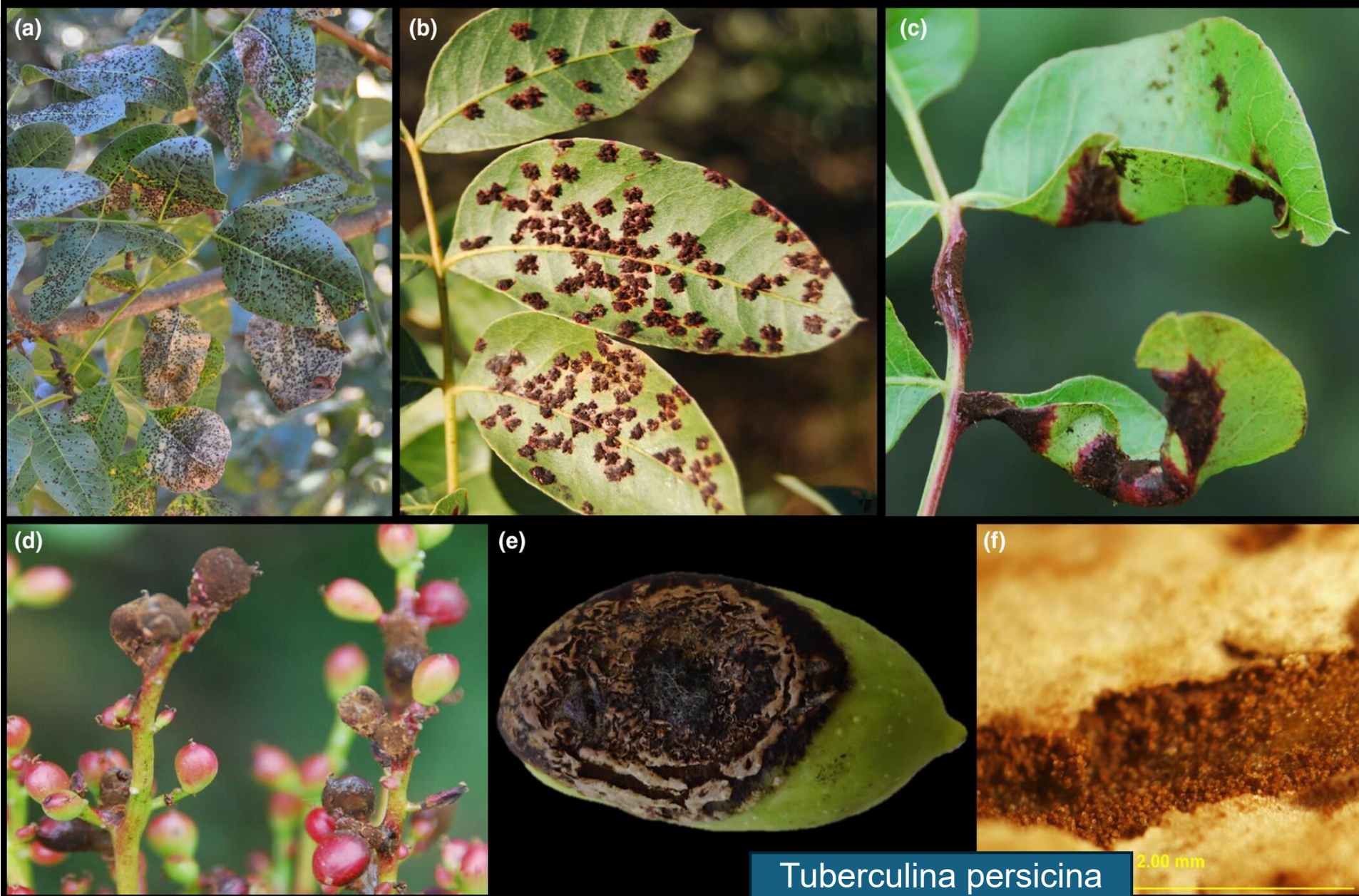
5606502

Bark canker: *Leptosillia pistaciae*, *Eutypa lata*, *Cytospora pistaciae*





Pistachio rust: *Pileolaria terebinthi*, *Tuberculina persicina*



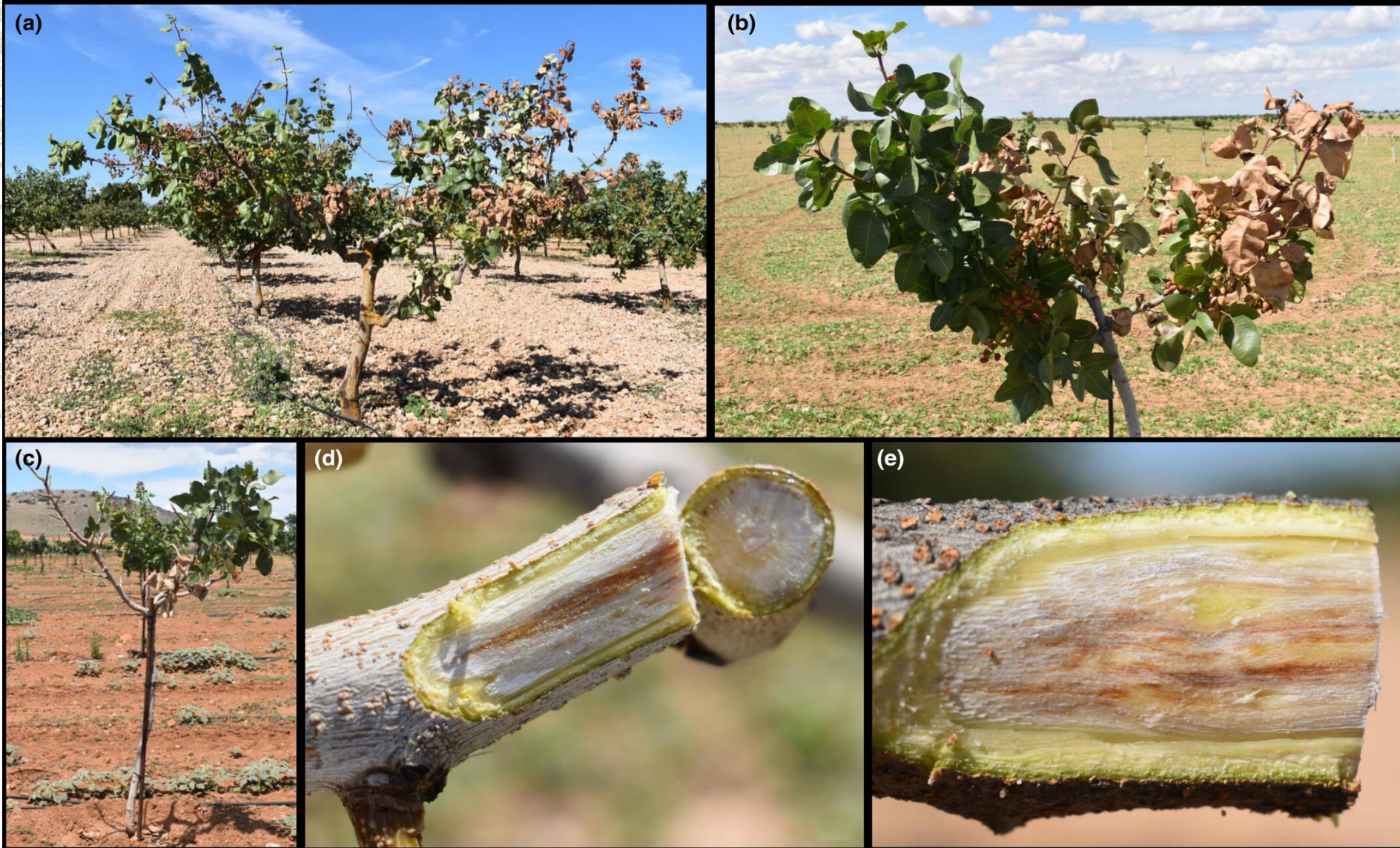
Phytophthora crown and root rot



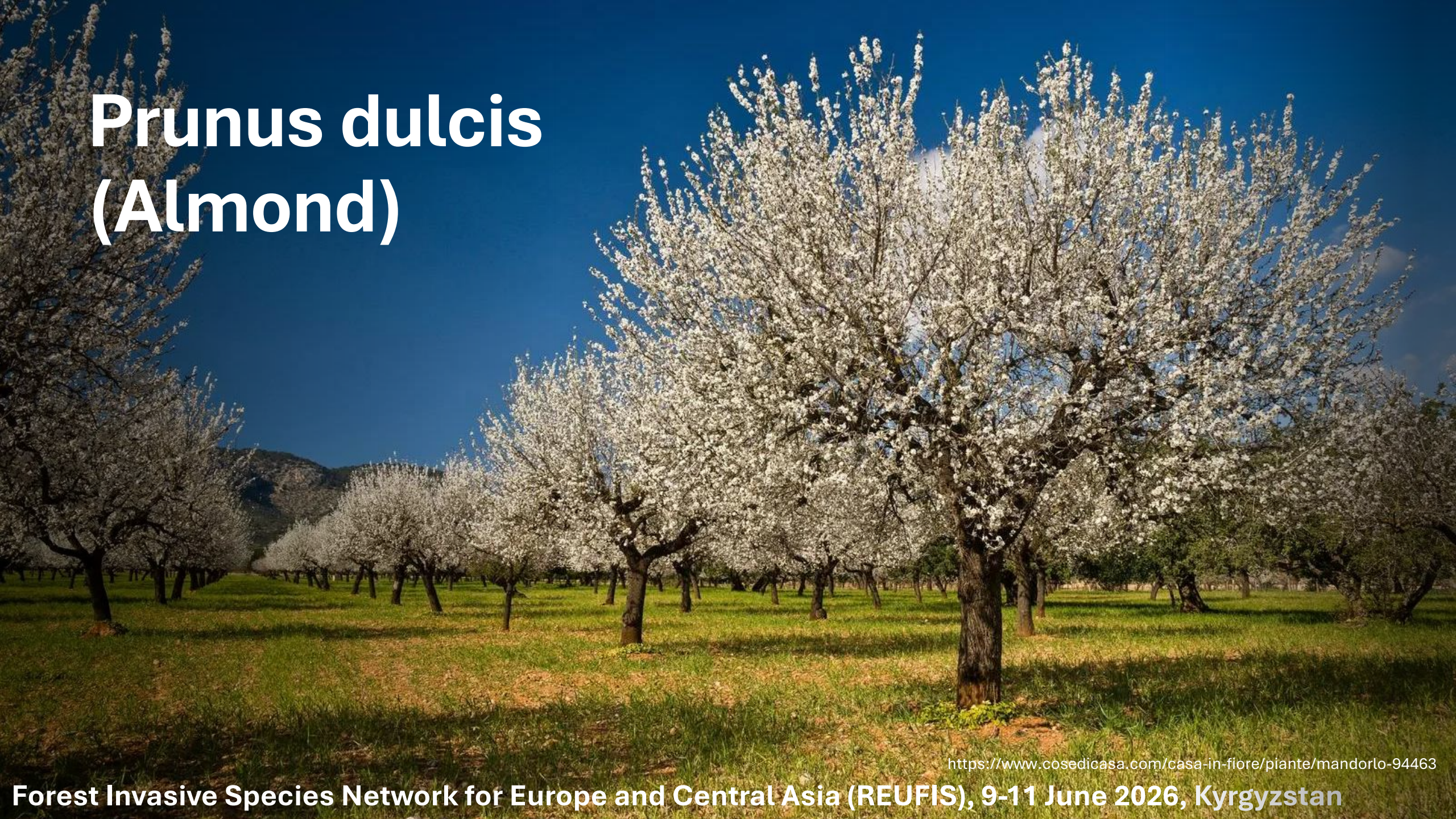
<https://www.wcngg.com/2022/04/18/phytophthora-issues-on-the-rise-in-pistachios/>

Forest Invasive Species Network for Europe and Central Asia (REUFIS), 9-11 June 2026, Kyrgyzstan

Verticillium wilt of pistachio



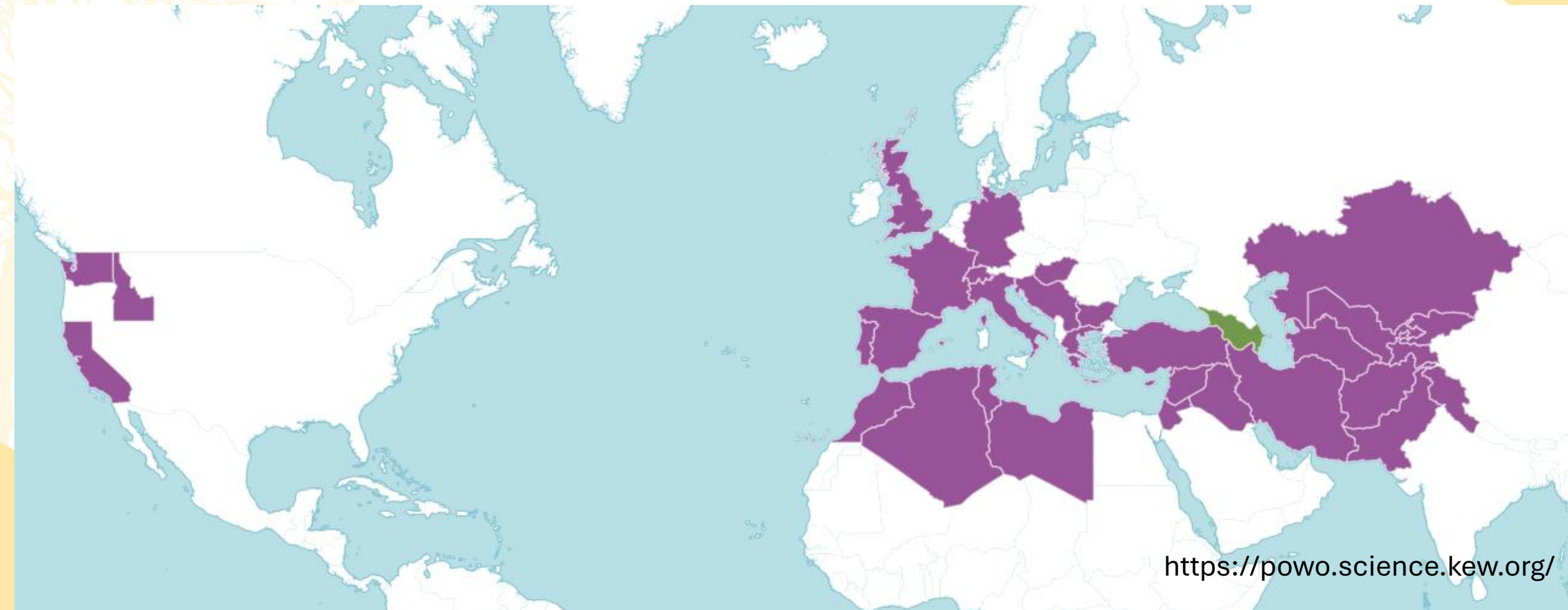
Prunus dulcis (Almond)



<https://www.cosedicasa.com/casa-in-fiore/piante/mandorlo-94463>

Forest Invasive Species Network for Europe and Central Asia (REUFIS), 9-11 June 2026, Kyrgyzstan

Native and cultivation range



Brown rot: *Monilinia fructicola*



561046



56104



5610565



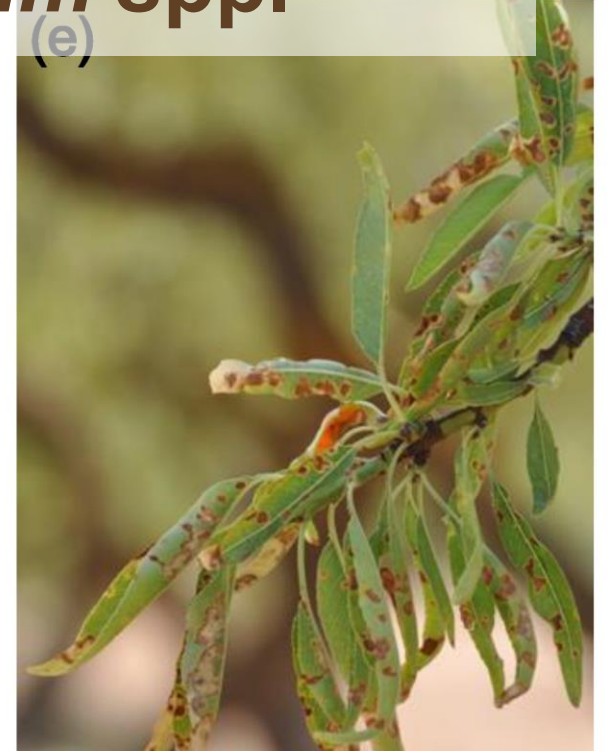
Shot Hole

Wilsonomyces carpophilus

<https://www.sjvtandv.com/blog/february-2022-almond-orchard-tasks>



Almond anthracnose: *Colletotrichum* spp.





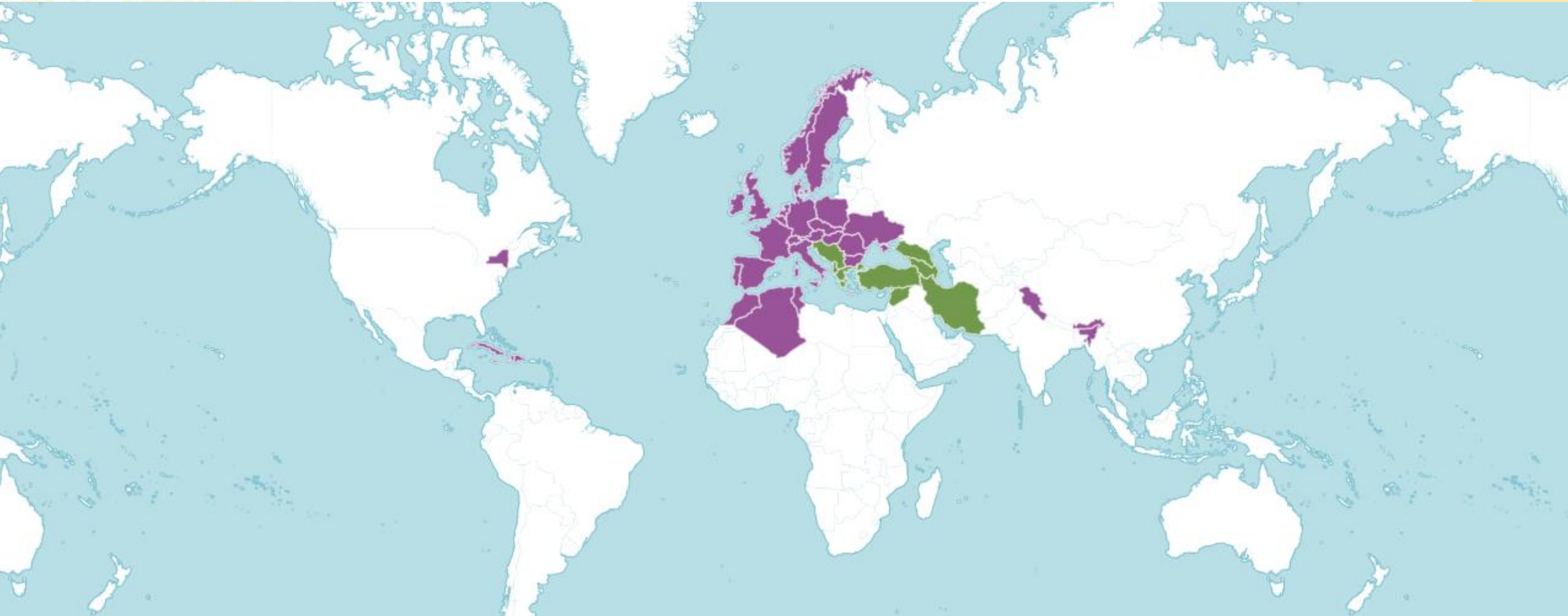
Almond leaf scorch: *Xylella fastidiosa*

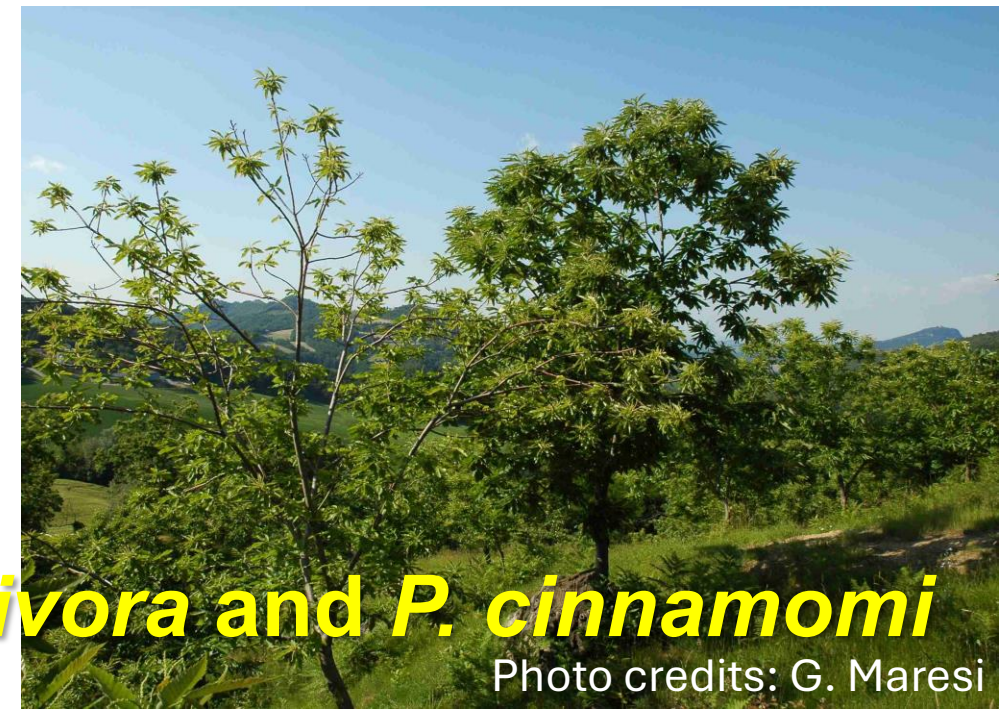
<https://www.wcngg.com/2020/12/22/almond-leaf-scorch-on-the-rise-in-parts-of-california/>

Castanea sativa (Chestnut)



Native and cultivation range

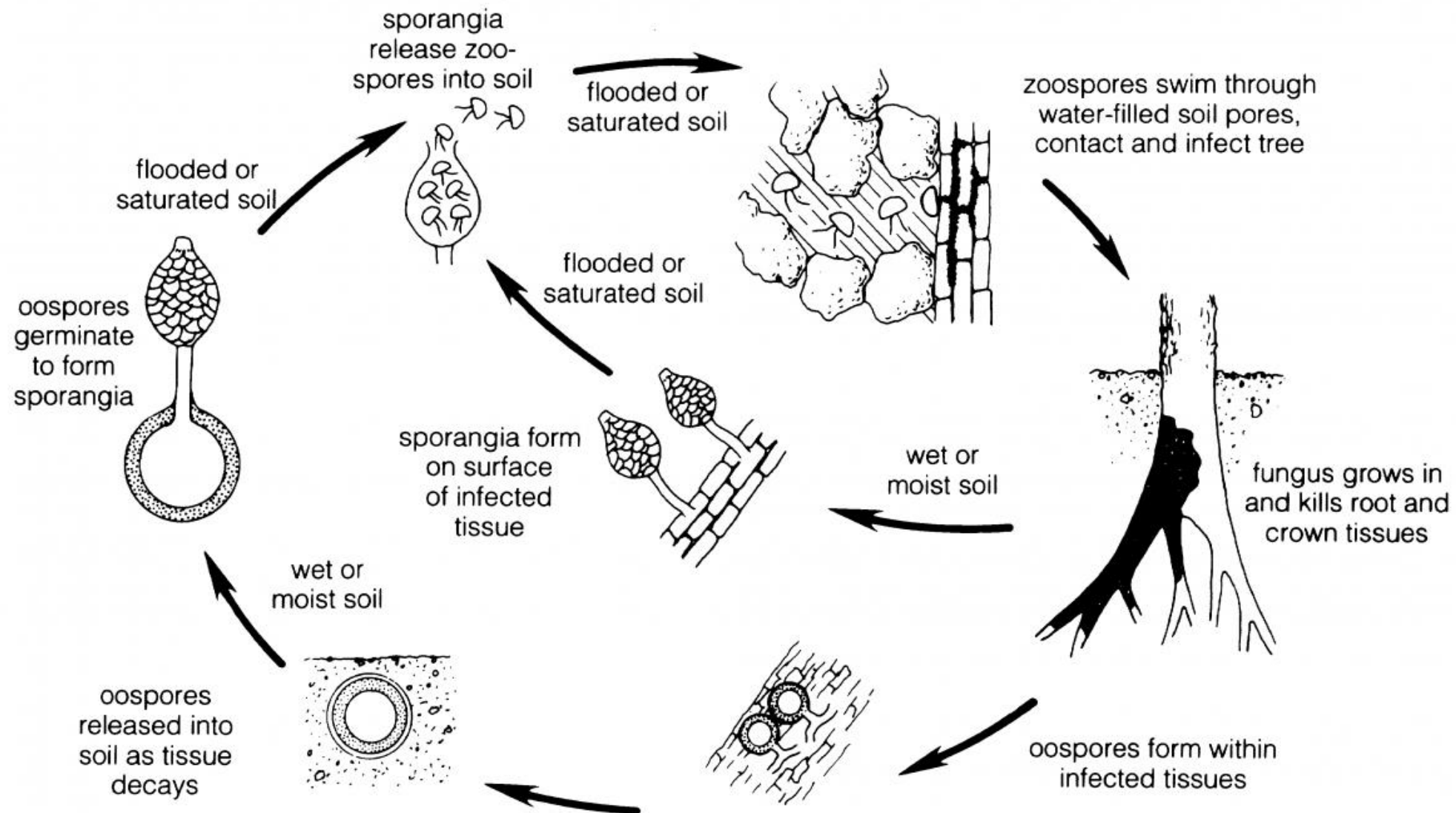




Ink disease: *Phytophthora cambivora* and *P. cinnamomi*

Photo credits: G. Maresi

Phytophthora life cycle

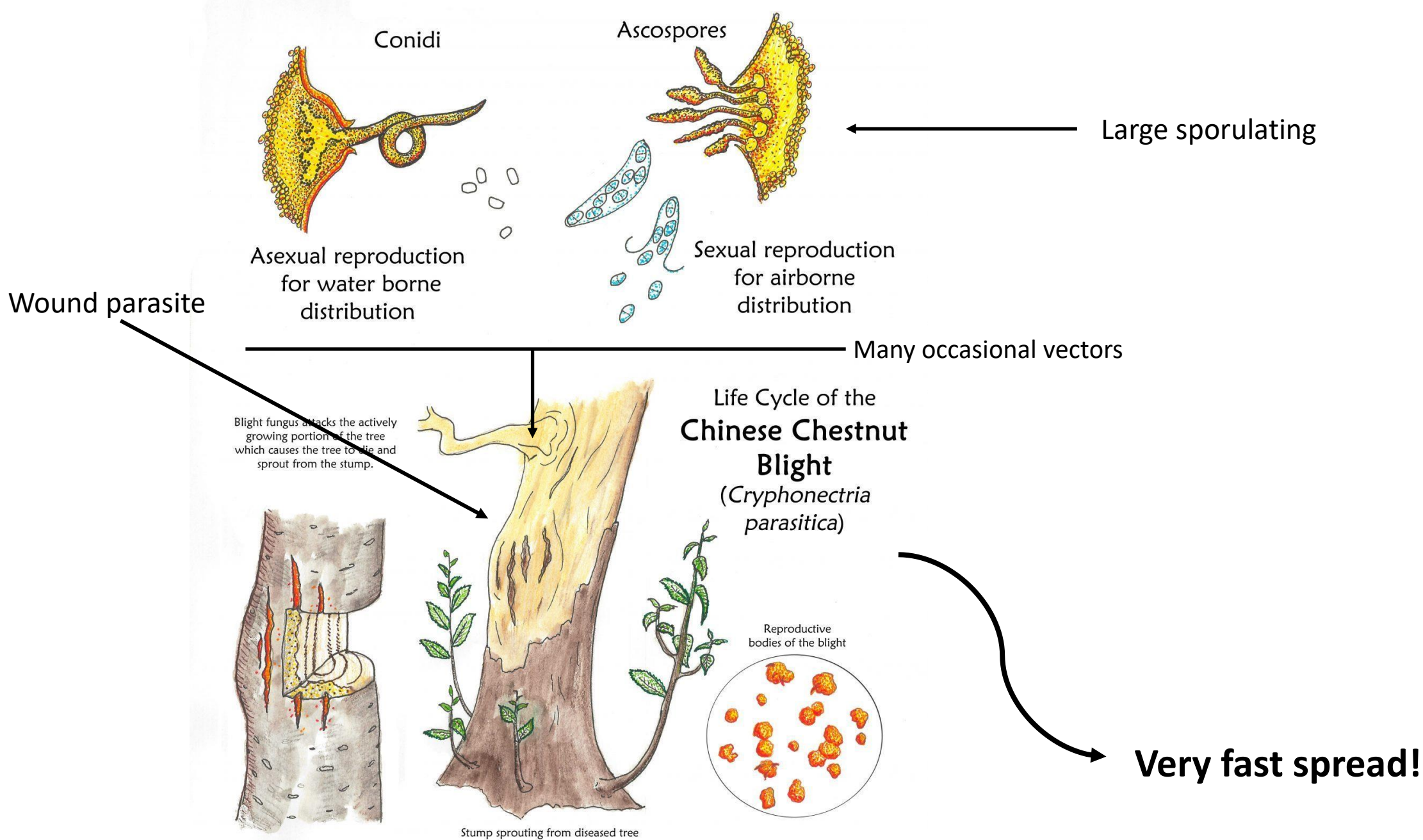


A low-angle photograph looking up at the canopy of several trees against a pale blue sky. The trees have dark trunks and branches. Some leaves are green, while others are yellowed or brown, indicating the effects of chestnut blight. The text "Chestnut blight: *Cryphonectria parasitica*" is overlaid in white at the bottom.

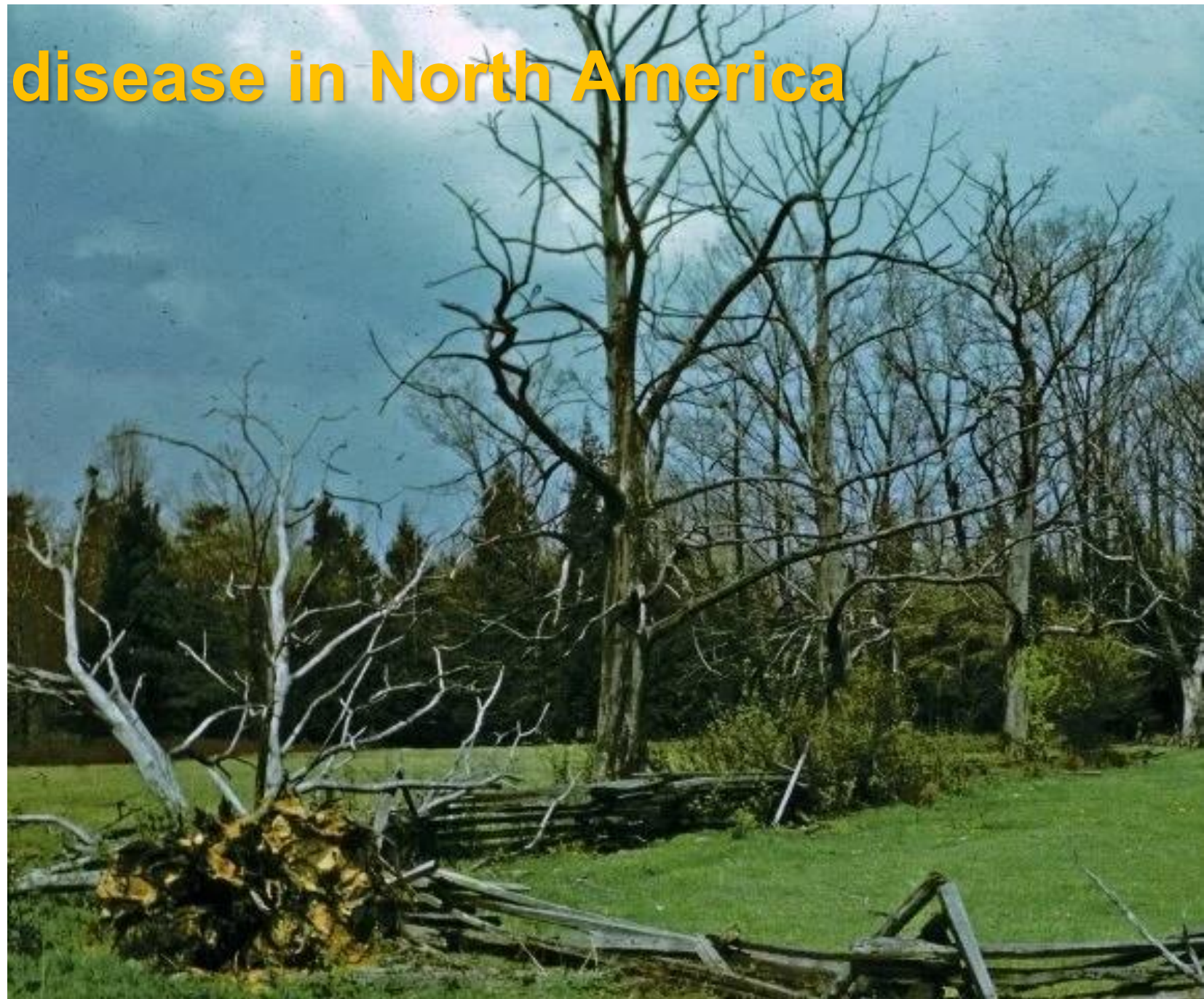
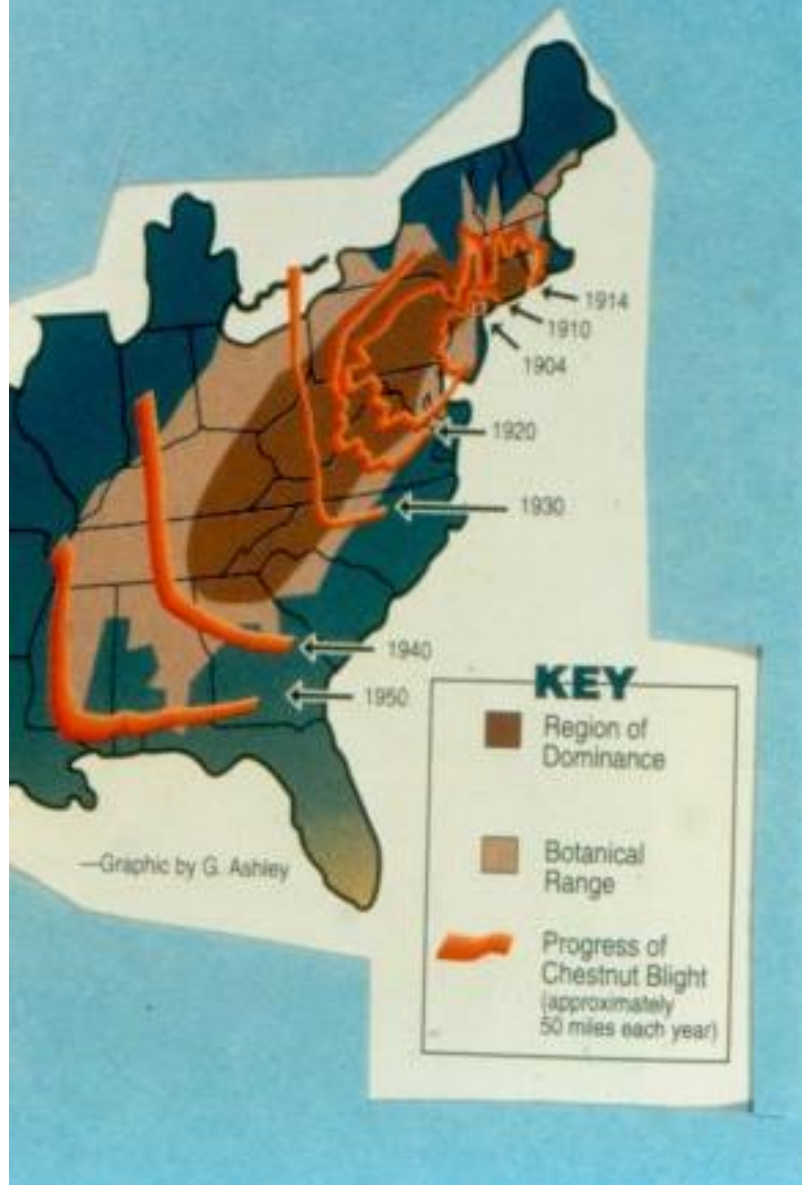
Chestnut blight: *Cryphonectria parasitica*

Photo credit: Andrej Kunka





The state of the disease in North America



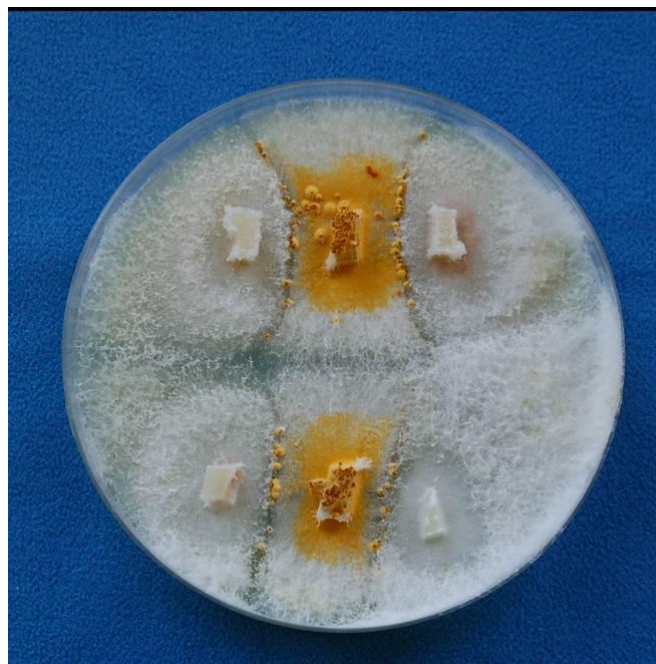


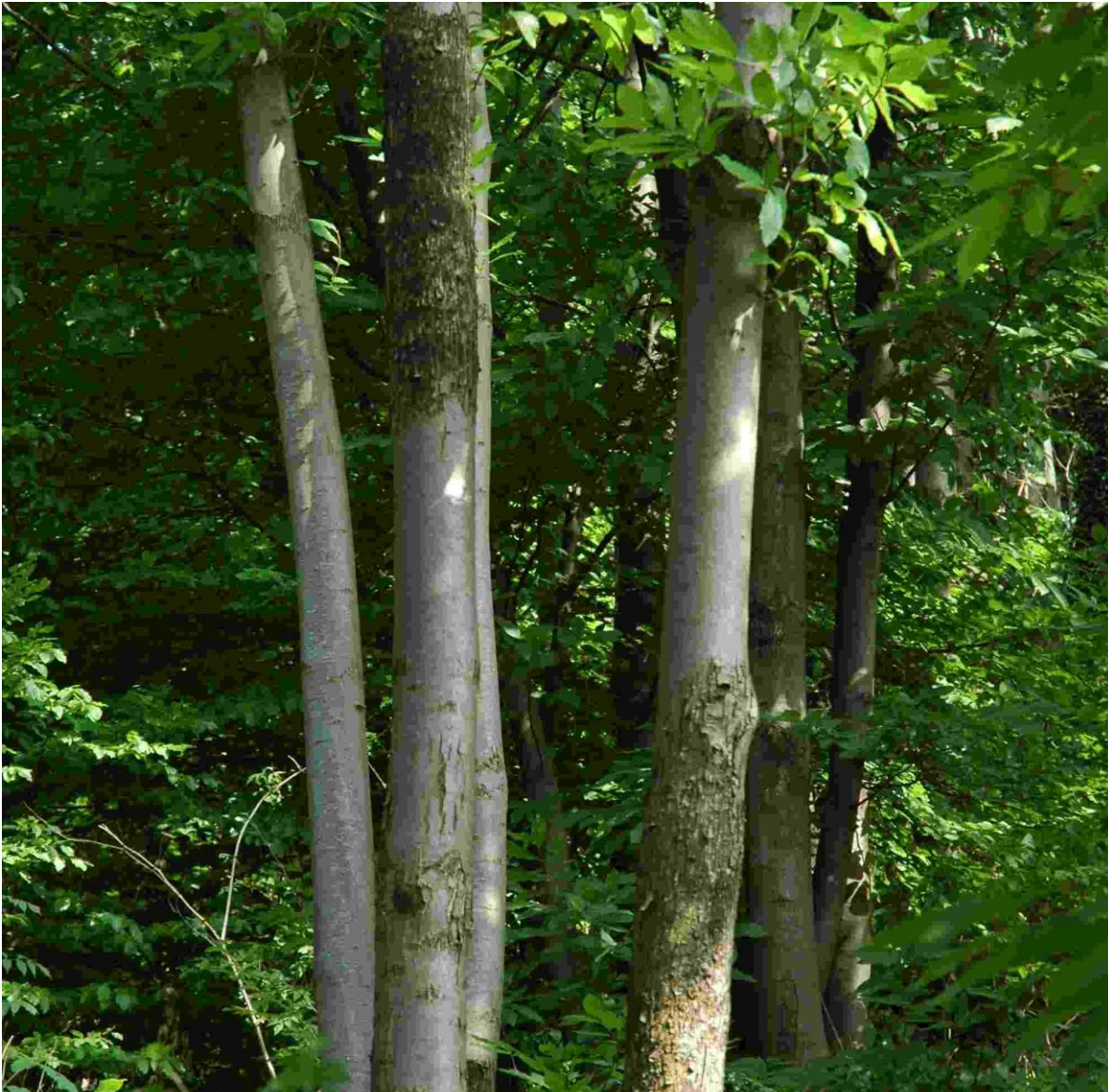
...while in Europe

Hypovirulence established!



Virulent vs.	Hypovirulent
All tissue above the lesion (canker) will die	All tissue above the lesion (canker) will survive and grow
No reaction	Strong reaction
Resprout of epicormic shoots	No resprouts
Orange mycelium	White mycelium





Blight doesn't destroy the chestnut woods anymore



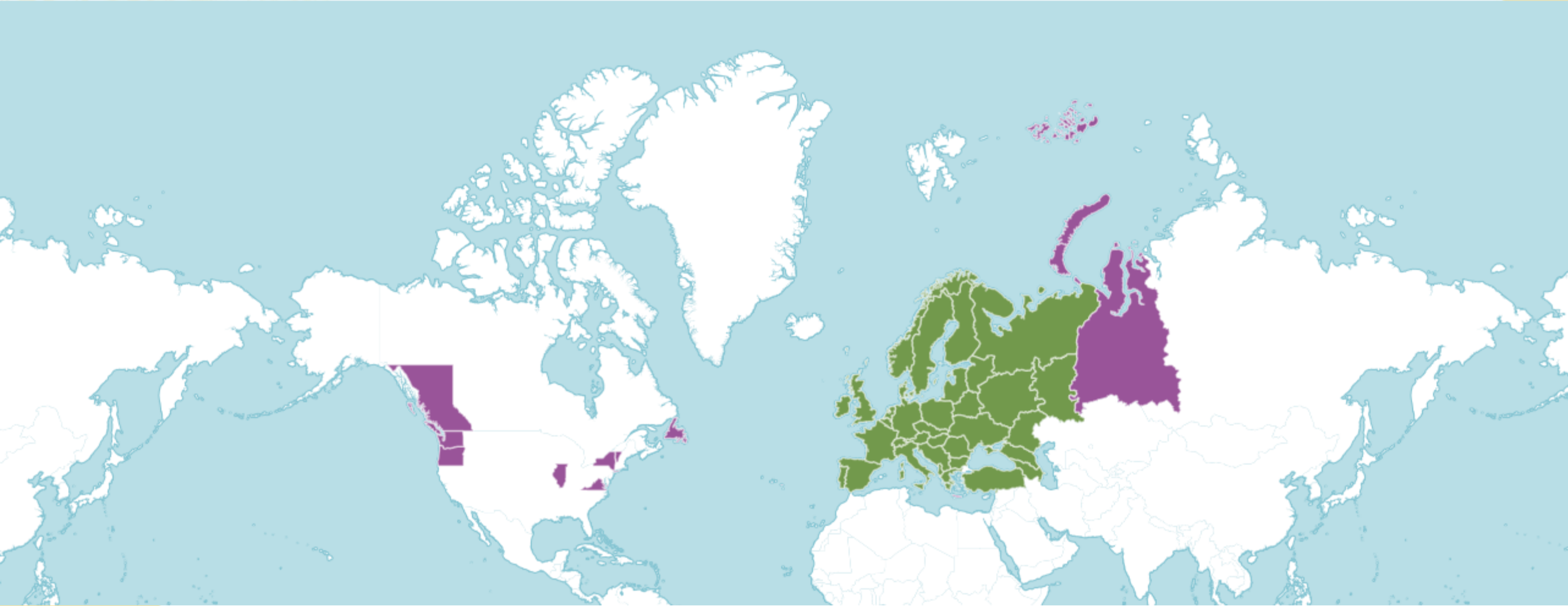
Photo: Chiara Mazzoni

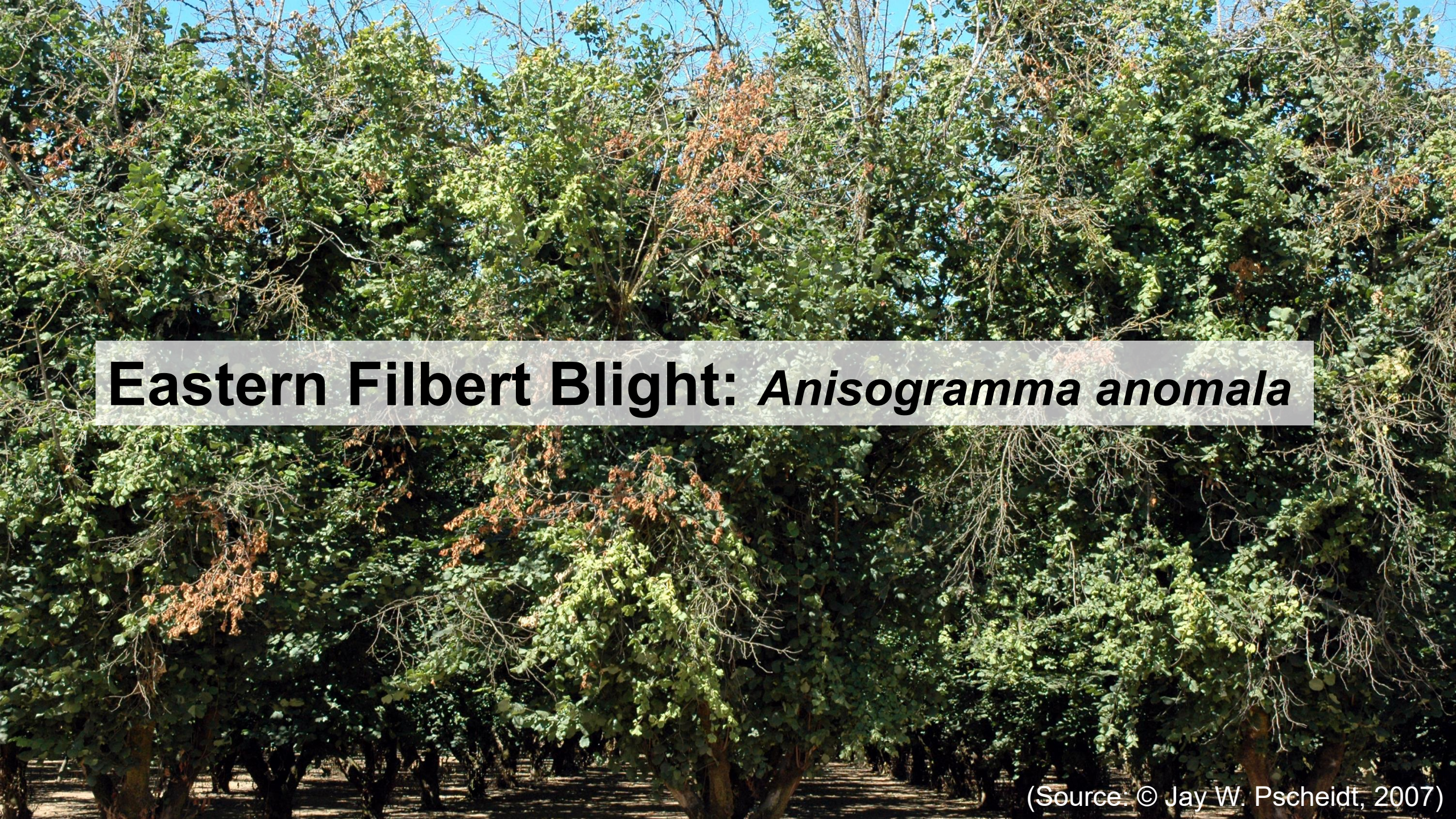
Brown rot: *Sirococcus smithogilvyi* (syn. *Gnomoniopsis smithogilvyi*, *G. castaneae*)

A large, dense, green hazelnut tree with a small building visible in the background.

***Corylus avellana* (Hazelnut)**

Native and cultivation range





Eastern Filbert Blight: *Anisogramma anomala*

(Source: © Jay W. Pscheidt, 2007)



(Source: © Jay W. Pscheidt, 2013)



Source: © Tom Creswell, Bugwood.org



Source: © Tom Creswell, Bugwood.org



Black stroma within the sunken canker
(Source: © Jay W. Pscheidt, 1990)

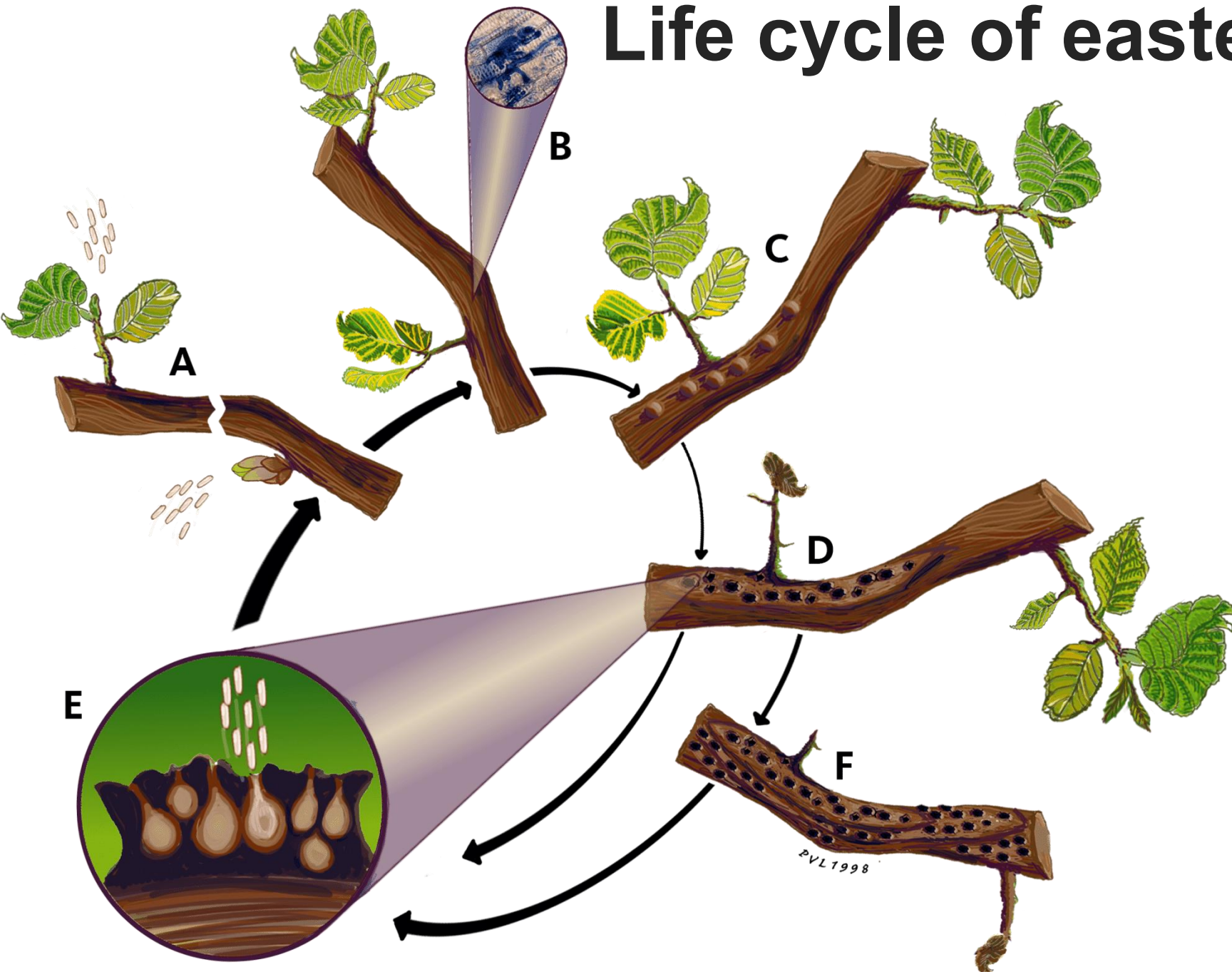


Source: © Jay W. Pscheidt, 2007



Bruce Watt, University of Maine, Bugwood.org

Life cycle of eastern filbert blight



- **A.** Spores infect breaking buds and young shoot tips.
- **B.** 15-month latent period.
- **C.** Stromata first visible during the spring and early summer.
- **D.** Stromata with mature spores in early fall.
- **E.** Spores actively discharged during rainy periods.
- **F.** Expansion of perennial cankers.

Credit: © Oregon State University

Bacterial Blight: *Xanthomonas arboricola* pv. *corylina*

Source: <https://encyclopedia.pub/entry/39827>



Credit photo: Kévin Lanoue-Piché - Cultur'Innov

P4P is the
main
pathway of
introduction

Leaves are susceptible until are fully expanded



Infected planting materials
(maybe symptomless)



Infection of leaf and stems



Invasion of susceptible host
(via stomata and wounds)

$T > 20^{\circ}\text{C}$
favors the
infection



Bud infection



Oily lesions
Infection of fruit involucre



Canker formation where the
bacterium overwinters



Natural (wind, rain and watersplash)
and man-made dispersal (pruning)

Main
pathway of
spread



Bacterial canker: *Pseudomonas avellanae*



Source: Marco Scortichini

A light green silhouette of a tree with many branches, located on the left side of the slide.A small cluster of walnuts, some green and some brown, located in the top right corner.

Thank you for your attention!