AgriFutures Australia

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Theme 1 – Project 4

Creating a sustainable hazelnut industry: understanding the impact of diseases

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Creating a sustainable hazelnut industry: understanding the impact of diseases

- **2023 Survey by ABARES**

  In various tree nuts in Australia, one third of the crop loss per farm is attributed to pests and diseases.

- **Possible causes are many. Top two are:**

  climate change & expansion of horticultural crops to less suitable areas

- **Changing scenario in other hazelnut growing regions**
  - Increasing susceptibility of hazelnuts to climate change
  - Significant increase in the number of pests and fungal diseases
  - New disease outbreaks of previously un-associated pathogens
  - Pathogens that cause minimal damage becoming aggressive

AUSHAZ Project 4 of Theme 1 addresses this new and changing scenario…

This presentation will focus on one of the outcomes of that project namely

- To provide growers and nurseries relevant information on potential disease management strategies

Emerging disease threats

Bacterial diseases

1. Bacterial blight
2. Bacterial canker and dieback **
3. Crown gall

Fungal diseases (affecting roots)

4. Armillaria root rot
5. Phytophthora root rot
6. Texas root rot **

Emerging disease threats (continued)

Fungal diseases (affecting above-ground plant parts)

7. Eastern filbert blight **
8. Powdery mildew *
9. Sudden oak death **
10. Trunk cankers and dieback

Fungal diseases (affecting kernels)

11. Kernel defects
12. Aspergillus infection and aflatoxin contamination

Viral disease

13. Hazelnut mosaic

1. Bacterial blight

HGA has published a technical bulletin.

Noticeable spots on leaves
(Photo: L. Snare, 2006)

Blight spots on bracts
(Photo: Nicoletti et al., 2022)

Galls at the crown of a walnut tree (Photo: S. Antony, 2017)

3. Crown gall

- caused by soil-borne bacteria
- emerging problem in Iran and reported in Chile (*Agrobacterium tumefaciens*)
- not yet in Australian hazelnuts

BUT

common in walnuts, almonds, stone fruit, and roses, and recently in grapevines

Crown gall (continued)

Galls at the crown of a walnut tree

Gall on the trunk of a walnut tree

Galls in the root of an apple tree

Symptoms

rough, woody abnormal swellings called galls

Where to look for

roots or crown of infected plants

Impact

- galls block flow of water and nutrients
- plants become weak and unproductive
- young trees are affected the most

Galls in the root of an apple tree (Photo: The Royal Horticultural Society, UK)

Crown gall (continued)

Disease spread

Entry through wounds or natural openings. Spread through:

- contaminated soil and water
- infected planting material
- orchard tools and people movement

Disease management

- No chemical control
- Prevention – site selection, disease free plant material
- Orchard hygiene
- Soil treatment?
- Biological control?
- Hot water treatment?

Almond orchard with dead trees infected by Armillaria root rot
(Photo: D. Doll, 2017)

4. Armillaria root rot

- caused by *Armillaria* species
- common in forests
- reported in almond and walnut orchards
- can infect hazelnuts

- *Armillaria luteobubalina* (Australian honey fungus) - indigenous species in Australia
- kills trees over several years
- steady decline in orchard productivity
- spreads through root contact

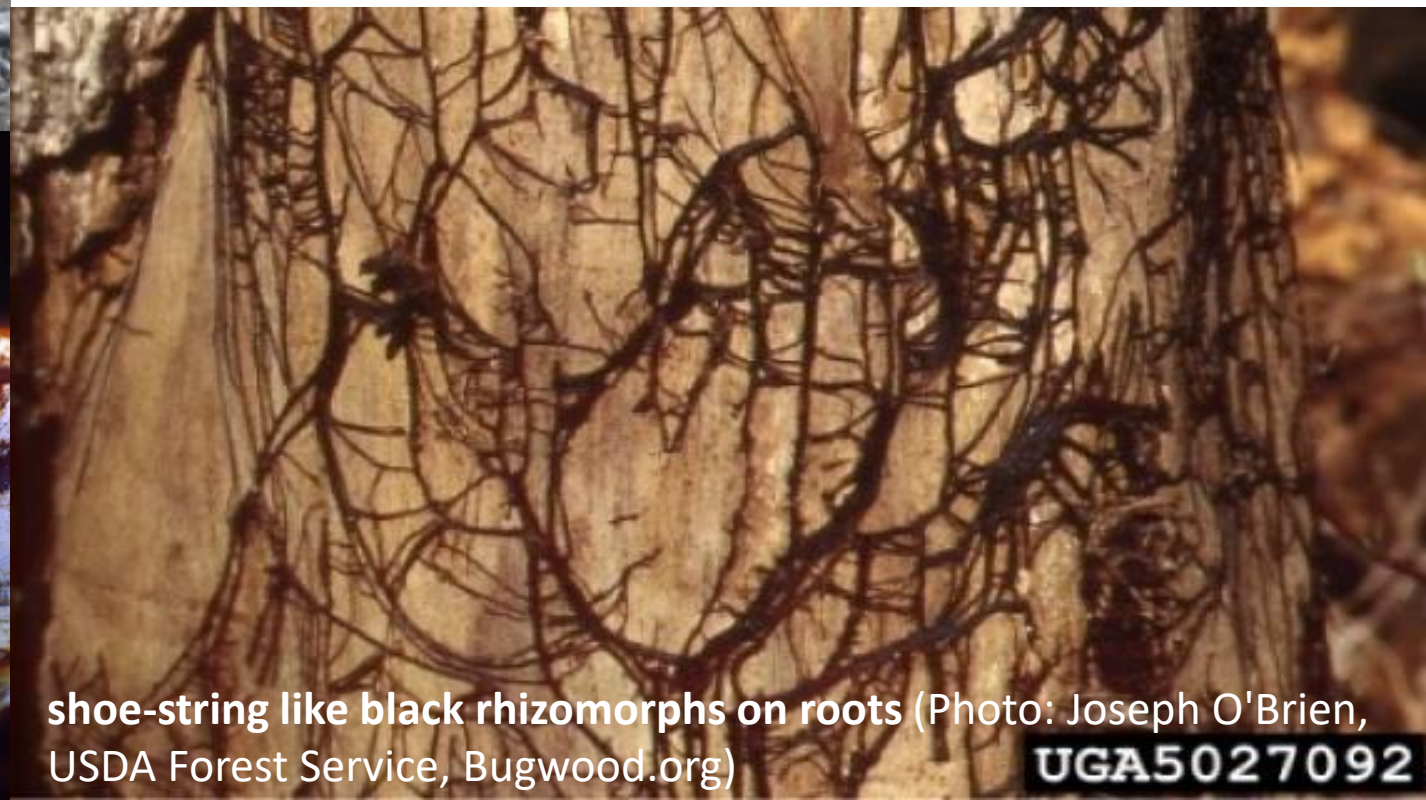
Armillaria root rot (continued)

Symptoms

- yellow leaves, poor shoots, dead branches, premature leaf-drop
- white fungal fans under bark
- white fungal fans under outer layer of infected root
- shoe-string like black rhizomorphs on roots

(Photo: Steve Renquest, 2012)

(Photo: R. Robinson, 2008)



shoe-string like black rhizomorphs on roots (Photo: Joseph O'Brien, USDA Forest Service, Bugwood.org)

(Photo: Agriculture Victoria)

(Photo: Department of Environment and Conservation, WA)

Armillaria root rot (continued)

In severe infections,

honey-coloured mushrooms appear at base

Management

- No chemical control
- Prevention is key
- Avoid planting on recently cleared forest land
- Remove stumps/roots, burn infected material
- Use 2–3-year pasture break before planting
- Remove infected trees
- Trenches and plastic barriers around infected areas may slow spread

6. Texas root rot

- caused by soil-borne fungus *Phymatotrichum omnivorum*
- caused root rot of cotton in Texas
- Other major hosts are lucerne, woody fruit and nut trees including almond, chestnut, hazelnut, pecan, pistachio, and walnut
- occurs in soils that are calcareous, highly alkaline, low in organic matter, and are exposed to high summer temperatures
- not yet found in Australia
- National Priority Plant Pests
- Exotic Pest to Monitor for the Australian hazelnut industry

Texas root rot (continued)

Symptoms

- sudden wilting
- bronzed leaves
- Decayed roots covered with fuzzy, tan-coloured mycelial growth
- circular patches of white spore mats on the soil surface near the dead trees

Survives in soil through long-lived tiny seed like structures called ‘sclerotia’

Sclerotia germinate and invade nearby roots

Also spreads when infected roots touch the roots of a healthy plant

Texas root rot (continued)

Disease management

- No cure.
- Avoid importing infected material.
- Improve soil health.

To reduce disease pressure:

- beneficial microbes
- soil fumigation
- green manure cover crop
- correcting soil alkalinity
- chemical barriers using sulphur in trenches

7. Eastern filbert blight (EFB)

- caused by *Anisogramma anomala*
- not in Australia yet
- high-priority pest

Rows of raised bumps on branches

(Photo: Joseph O'Brien, USDA Forest Service, bugwood.org)

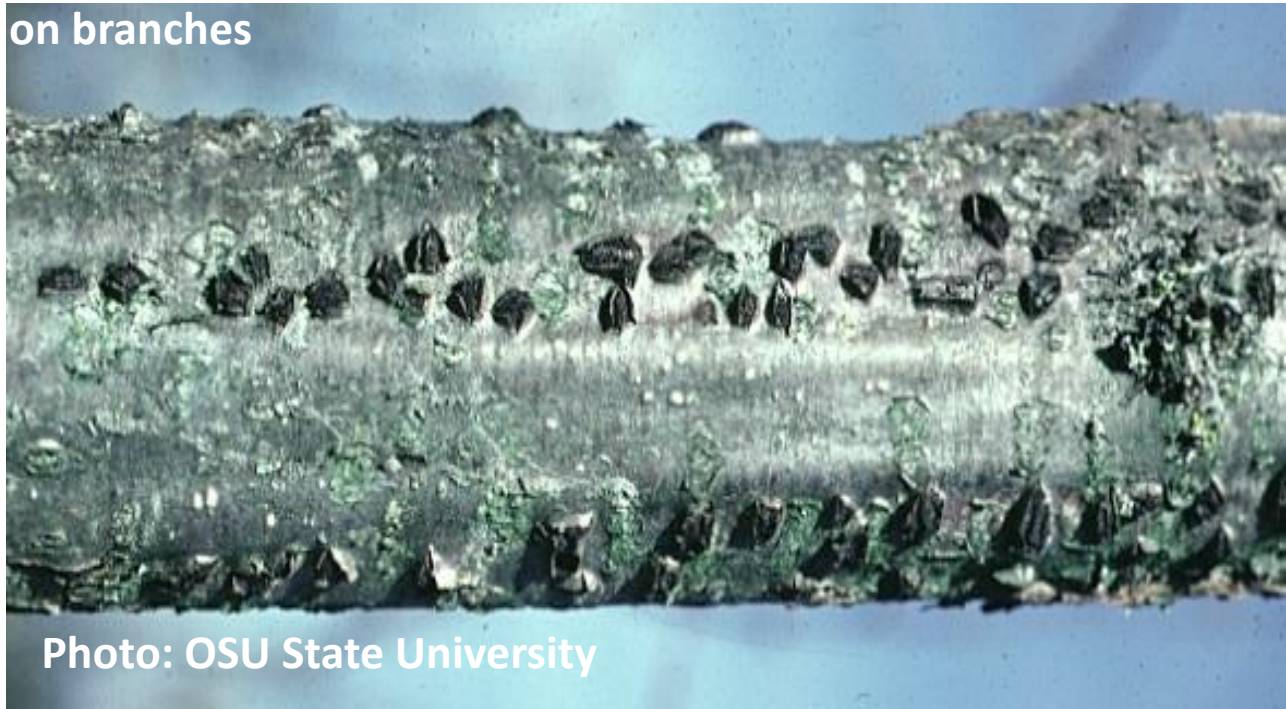


Photo: OSU State University

Eastern filbert blight (continued)

Rows of fungal stromata running along the length of branches (Photo: Molnar, 2022)

Disease symptoms

- raised bumps on branches
- shape of elliptical balls
- wood below bumps in chocolate brown
- perennial cankers and branch dieback
- “flagging” leaves

Spread

- spores released in wet spring
- spread by rain and wind
- does not need wounds or natural opening
- spores germinate and penetrate the young tissues

Eastern filbert blight (continued)

Photos: OSU State University

Disease management

- plant resistant varieties
- remove infected wood before bud-break
- use fungicide sprays to protect susceptible trees during bud-swell to bud-break

dead leaves on infected branches

8. Powdery mildew

- minor in Australia but damaging outbreaks overseas
- caused by *Phyllactinia guttata* (recorded in Australia) or *Erysiphe corylacearum* (not present in Australia)
- *P. guttata* appears late in summer, mainly on the lower side of leaves, and causes little harm.
- *E. corylacearum* appears early in the season, mainly on the upper side of leaves, and causes serious damage.

Powdery mildew (continued)

Symptoms

- white, powdery patches on the upper side of leaves
- crinkled and curled leaves that may fall off early
- change in leaf colour to purple-bronze before falling
- fungal growth on shoots and nut clusters,
- small spore-filled bodies on infected leaves and twigs

Spread by wind or rain

Survives on debris

Powdery mildew (continued)

Disease management

Early detection and orchard hygiene are key.

To reduce disease risk:

- prune for an open canopy to improve air flow and reduce humidity
- remove infected leaves and husks from the orchard floor after harvest to reduce overwintering spores
- monitor symptoms for early signs of white patches on leaves, especially in spring
- apply fungicides before infection spreads.

13. Hazelnut mosaic

- caused mainly by Apple Mosaic Virus (ApMV)
- up to 36% reduction in yields reported in Turkey and Spain
- not yet common in hazelnut orchards in Australia but mosaic symptoms in variety trials
- could make orchards less profitable

- spreads via infected plant stock
- no known insect vector
- spread by pollen - at very low levels

Hazelnut mosaic (continued)

Symptoms in spring:

- chlorotic or bright yellow discolouration of the leaves
- yellow mosaic pattern on leaves
- yellow rings or lines on the leaf surface
- broad yellow bands along leaf veins
- leaves with an “oak leaf” pattern

- Symptoms tend to fade away as the season progresses
- Infected plants can also be symptomless.
- Over time, infected trees may have fewer nuts, smaller nut clusters, and more empty shells.

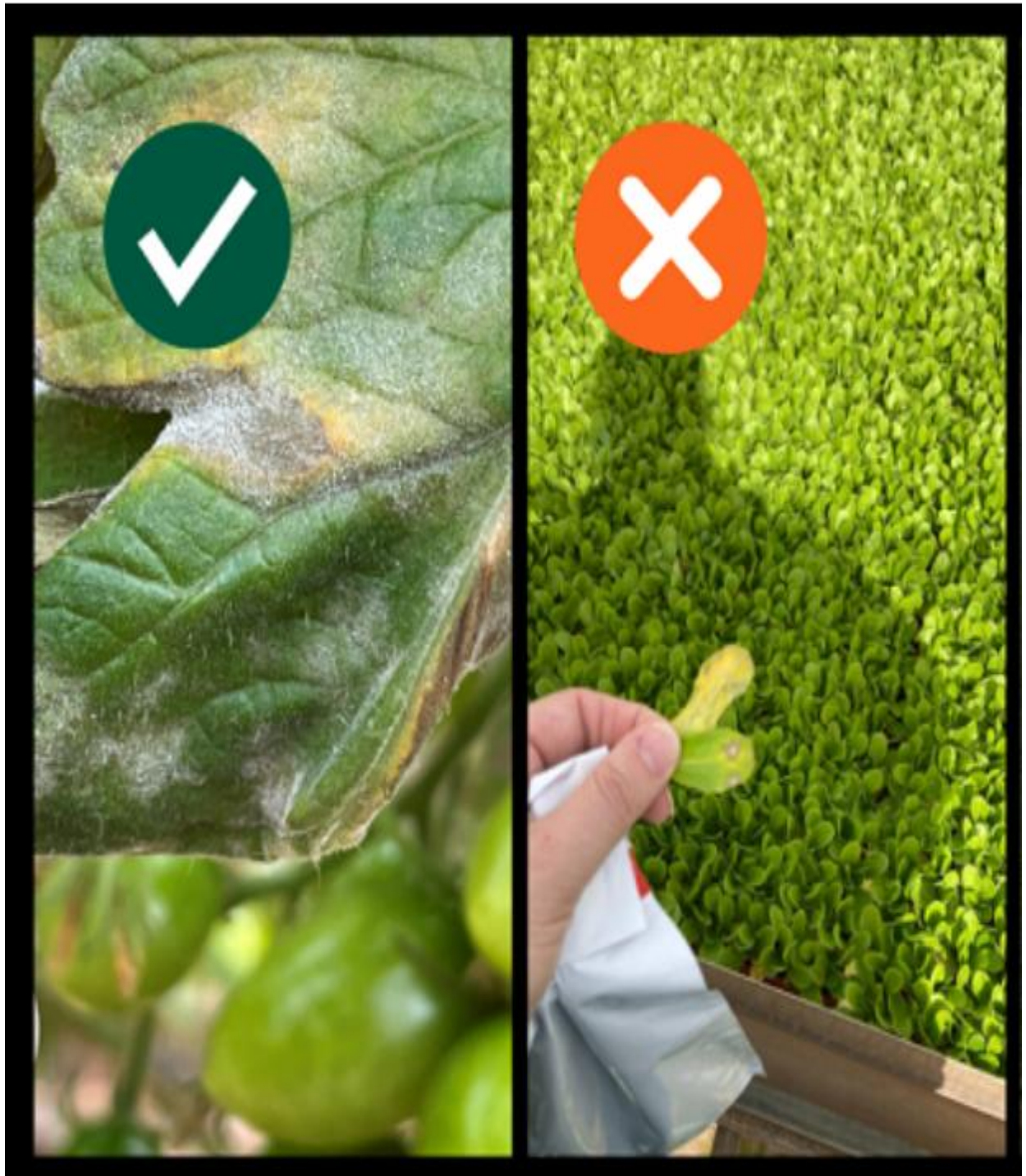
Hazelnut mosaic (continued)

Disease management

- No chemical cure

To reduce risk:

- Do not propagate with suckers from trees showing symptoms.
- Use plant material tested and confirmed free of virus.
- Remove infected trees early to limit its spread.



Reporting unusual symptoms

Early detection and reporting are crucial

How to report:

- Phone Exotic Plant Pest Hotline on 1800 084 881
- Online: DAFF website has a reporting form.
- Email State or territory biosecurity department.

What to do next

- Note the location and the date of discovery.
- Cordon off the area.
- Do not handle or move the plants.
- Record symptoms; Take high-resolution photos
- Inspect if there is a pest present.
- Inspect other plants for symptoms
- Sanitise your clothes and boots.
- Do not apply any chemical controls
- Avoid the use of overhead watering.

Common theme in the management strategies

- preventive, cultural, and orchard hygiene-based management
- focusing on reducing infection sources and improving plant health rather than curing the disease.

Common management strategies

1. **Use of disease-free or resistant planting material** – prevents introducing pathogens.
2. **Good site selection and drainage** – avoids waterlogging, which favours root rots (like *Phytophthora* and *Armillaria*).
3. **Proper spacing and pruning** – improves air circulation and reduces humidity, limiting fungal and bacterial spread.
4. **Removal and destruction of infected plant parts** – prevents disease spread from infected debris.
5. **Sanitation of tools and equipment** – stops pathogen transmission during pruning or propagation.

Common management strategies

6. **Avoidance of wounding and stress** – reduces entry points for pathogens.
7. **Monitoring and early detection** – allows for timely control before diseases spread widely.
8. **Maintaining tree vigour through proper nutrition and irrigation** – helps plants resist infection.
9. **Application of beneficial microbes** – helps to boost the plant's natural defence system.
10. **Use of chemical treatments only as a supplement** – such as fungicides or bactericides when necessary, but not as the main control method.

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