1. PaDIL Species Factsheet

Scientific Name:
*Ophiostoma* spp.
Ascomycetes, Ophiostomatales

Common Name
Dutch elm disease

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- Museum Victoria
- CRC National Plant Biosecurity
- Plant Health Australia
- Department of Agriculture, Fisheries and Forestry
- Department of Agriculture and Food, Western Australia
2. Species Information

2.1. Details

**Specimen Contact:** Dr Jose R. Liberato - jose.liberato@nt.gov.au  
**Author:** Liberato JR, Scott Cameron R, Dick MA & Inglis C  
**Citation:** Liberato JR, Scott Cameron R, Dick MA & Inglis C (2006) Dutch elm disease (*Ophiostoma*) Updated on 7/19/2016 Available online: PaDIL - http://www.padil.gov.au  
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2.2. URL


2.3. Facets

**Status:** Exotic Regulated Pest - absent from Australia  
**Group:** Fungi  
**Commodity Overview:** Forestry  
**Commodity Type:** Timber, Ornamentals  
**Distribution:** USA and Canada, Europe and Northern Asia, Australasian - Oceanian

2.4. Diagnostic Notes

The Dutch elm disease is caused by three fungal species: a) Ophiostoma ulmi (Buisman) Nannf. sensu stricto, initially termed the non-aggressive subgroup of *O. ulmi* sensu lato (= Ceratocystis ulmi), a more weakly pathogenic fungus, responsible for the first pandemic of the disease in Europe and North America in the 1920s—1940s; b) *Ophiostoma novo-ulmi* Brasier was initially termed the aggressive subgroup of *O. ulmi* sensu lato. It is responsible for the current second pandemic, killing most mature elm trees across Europe, North America and central Asia. As *O. novo-ulmi* spreads it is replacing *O. ulmi* sens. str. It comprises two subspecies: *O. novo-ulmi* subsp. *novo-ulmi* and *O. novo-ulmi* subsp. *americana*; c) *O. himal-ulmi* Brasier & M.D. Mehrotra was recorded on *Ulmus wallichiana* in the Indian Himalayas and is able to infect *U. procera* (English elm) (Brasier 1991, Brasier & Mehrotra 1995, Brasier & Kirk 2001).

**Symptoms:**

Elm bark beetles (*Scolytus* spp. and *Hylurgopinus rufipes*) carry spores of the pathogen in their bodies. When the insects feed on vascular tissues on branches of the tree, the fungus is inoculated and colonizes the xylem vessels causing its clogging and producing a vascular wilt. The first symptom is a wilting at the end of one branch, which progress downward in the crown. Symptoms may progress throughout the whole tree in a single season. When the fungus spreads from diseased to healthy trees through grafted roots, the entire crown may be affected very rapidly. Branches and stem of infected plants develop dark streaks of discoloration in the sapwood. The disease caused by *O. novo-ulmi* usually progresses much faster than that caused by *O. ulmi* sens. str.

**The pathogens:**

*Ophiostoma novo-ulmi*: Colonies on malt extract agar after 7 days in darkness at 20 oC and 10 days in diffuse daylight greyish-white to cream-white ranging from regular striate petaloid forms to irregular lobed forms;
commonly with moderate aerial mycelium aggregated into ropes to give a fibrous striate appearance or occasionally with less aerial mycelium and frosty to smooth colonies. Diurnal zonation moderate to strong. Growth on malt extract agar at 20 °C in darkness ranging from (2.8–) 3.1–4.8 (–5.7) mm day⁻¹; growth optimum 20–22 °C; maximum 32-33 °C. Hyphae septate, 1—6 µm in diameter, submerged hyphae sometimes to 10 µm in diameter; aerial hyphae often aggregated into strands. Mycelial conidia usually abundant, Sporothrix: conidiophores mostly lateral, 10—30 (—50) µm; conidia holoblastic, borne on short denticles of 0.5—1 µm, single-celled, hyaline, very variable, ellipsoid to elongate, often tapering and slightly curved, with a small attachment collar, 4.5—14 x 2—3 µm. Mycelial conidia often aggregated into mucilaginous droplets, also budding in a yeast-like fashion; Synnematal anamorph (Graphium or Pesotum) usually absent on malt agar, generally produced only on sterilised elm sapwood (but abnormal synnemata may be produced on malt agar by degenerate colonies); single or multiple, brown-black, slender, up to 1—2 mm tall. Attached to substratum by brown rhizoid-like hyphae and composed of parallel bundles of brown septate hyphae, flaring at the top to branched hyaline hyphae producing holoblastic single-celled hyaline ovoid to ellipsoid conidia 2—6 x 1—3 µm, aggregating into a cream-white mucilaginous spore drop. The holoblastic budding yeast-like anamorph is produced in liquid cultures, and on the surfaces of solid media. Heterothallic with two compatibility types, ‘A’ and ‘B’. A-types producing brown-black protoperithecia, occasionally to frequent on on malt agar and frequent to abundant on elm sapwood agar. B-types producing ascogonia sporadically on malt agar and ascogonia or protoperithecia occasionally to frequently on elm sapwood agar. Perithecia, superficial to partially immersed, attached to the substratum by brown rhizoid-like hyphae; the base globose, black 75—140 µm wide, sparsely to moderately bristly, the bristles brow

2.5. References

3. Diagnostic Images

Winged elm dying.
**Host Symptoms:** R Scott Cameron (www.forestryimages.org) International Paper

Cut stems showing staining.
**Host Symptoms:** R Scott Cameron (www.forestryimages.org) International Paper

Branch with bark peeled showing cambium streaking.
**Host Symptoms:** R Scott Cameron (www.forestryimages.org) International Paper

Tree dying from *Ophiostoma novo-ulmi* infection (copyright, for use contact Chris.Inglis@maf.govt.nz).
**Host Symptoms:** C. Inglis Biosecurity New Zealand

Tree dying from *Ophiostoma novo-ulmi* infection (copyright, for use contact Chris.Inglis@maf.govt.nz).
**Host Symptoms:** C. Inglis Biosecurity New Zealand
Tree dying from Ophiostoma novo-ulmi infection (copyright, for use contact Chris.Inglis@maf.govt.nz).

**Host Symptoms:** C. Inglis Biosecurity New Zealand

Galleries of bark beetle, vector of the pathogen, on the stem (copyright, for use contact Chris.Inglis@maf.govt.nz).

**Host symptoms - stem:** C. Inglis Biosecurity New Zealand
Results Generated:
Tuesday, October 8, 2019

Culture of Ophiostoma novo-ulmi (copyright, for use contact Margaret.Dick@ensisjv.com).

Pathogen: M. Dick Ensis Forest Biosecurity and Protection

Bark beetle, vector of the pathogen (copyright, for use contact Margaret.Dick@ensisjv.com).

Pathogen: M. Dick Ensis Forest Biosecurity and Protection