

Detection, seed transmission, and chemical control of *Hyaloperonospora camelinae* on *Camelina sativa* (L.) in Washington State

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Introduction

- Camelina (*Camelina sativa* [L.] Crantz) is an oilseed crop in the mustard family that has great potential as a rotation crop for wheat in the low and intermediate rainfall regions of the Pacific Northwest (PNW).
- Camelina can be attacked by a number of diseases, including downy mildew.
- Both *H. camelinae* and *H. parasitica* have been reported on camelina.
- Since spring 2010, there was an increase in incidence and severity of downy mildew disease in different locations in Washington State.
- The distinction of *Hyaloperonospora* species based on morphological characteristics is laborious, time consuming and less reliable than molecular analyses.
- The incidence of downy mildew in fields with no previous history of camelina raises the question of whether the pathogen is seed transmitted or not.

Approach

- Design of *H. camelinae* and *H. parasitica* specific primers**
 - ✓ ITS1-5.8S-ITS2 region of *H. camelinae* and *H. parasitica*
- PCR assays using *H. camelinae* specific primer**
 - ✓ Samples of diseased plants were collected from 3 locations in WA State
 - ✓ DNA extraction and PCR with HC and HP primer pairs
 - ✓ Cloning and sequencing
- Detection and transmission of *H. camelinae***
 - ✓ Seeds from infected plants were planted in cones filled with potting mix
 - ✓ Cones were maintained in a growth chamber programmed for 12°C
 - ✓ At the flowering growth stage, plants were inspected for symptoms of downy mildew
 - ✓ Leaf samples were collected from infected and healthy plants for DNA extraction
- Effect of mefenoxam seed treatment on incidence of downy mildew**
 - ✓ Seeds from infected plants were treated with mefenoxam (3 g a.i. per kg of seed) or rinsed with 0.5% NaOCl, stirred for 5 minutes and then treated with mefenoxam.
 - ✓ Treated seeds were planted in containers filled with potting mix
 - ✓ Control containers were planted using non-treated seeds
- Inoculation of canola with *H. camelinae***
- Light and Field Emission Scanning Electron Microscopy (FESEM)**

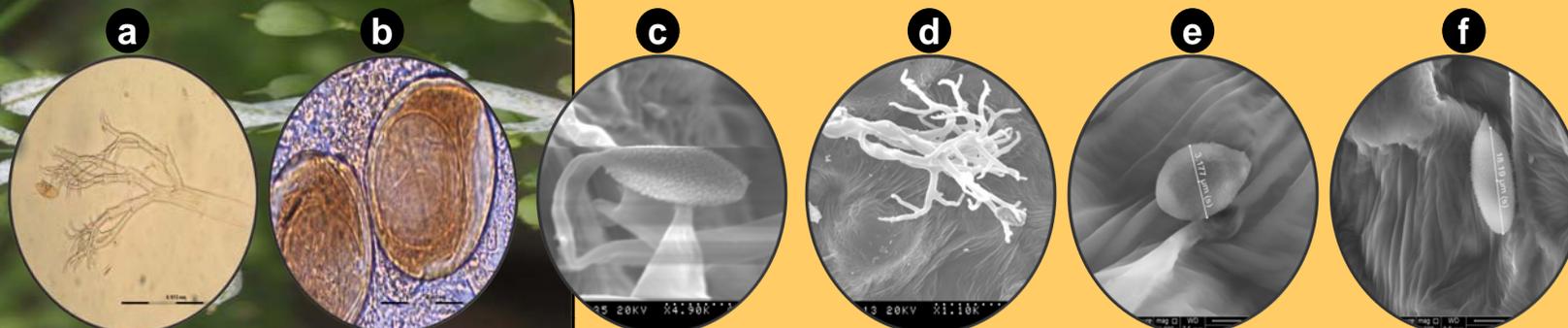


Figure 1. Light micrograph of conidiophore (a) and oospores (b) of *H. camelinae* in camelina leaf tissue. Field emission scanning electron micrograph of conidiophores bearing conidia of *H. camelinae* (c), surface of camelina seed colonized by conidiophores (d), conidia of *H. camelinae* (e-f)

Objectives

- The objectives of this study were to:
 - identify the downy mildew pathogen of camelina in Washington State
 - develop a reliable PCR based assay to detect the presence of the pathogen in the seeds
 - determine whether *H. camelinae* is a seed transmitted pathogen
 - test the efficacy of mefenoxam as a seed treatment for controlling downy mildew of camelina

Outcome

- Based on PCR and sequencing, the causal pathogen was identified as *H. camelinae*
- The PCR primers consistently amplified 699 bp bands from the infected plants only
- FESEM revealed the presence of conidia and conidiophores on the seed surface and light microscopic revealed the presence of oospores in the infected leaves (Fig. 1)
- H. camelinae*, is a seed-transmitted pathogen
- Seeds treatment with mefenoxam significantly reduced the incidence of the disease