



VII WORLD AVOCADO CONGRESS 2011  
VII CONGRESO MUNDIAL DEL AGUACATE 2011

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CAIRNS - AUSTRALIA

# *Phytophthora heveae* causing basal rot of avocado fruit in Mexico

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# Background

In summer of 2010, severe basal rot of Hass avocado fruit was observed in the states of Nayarit and Michoacan.



# Symptoms

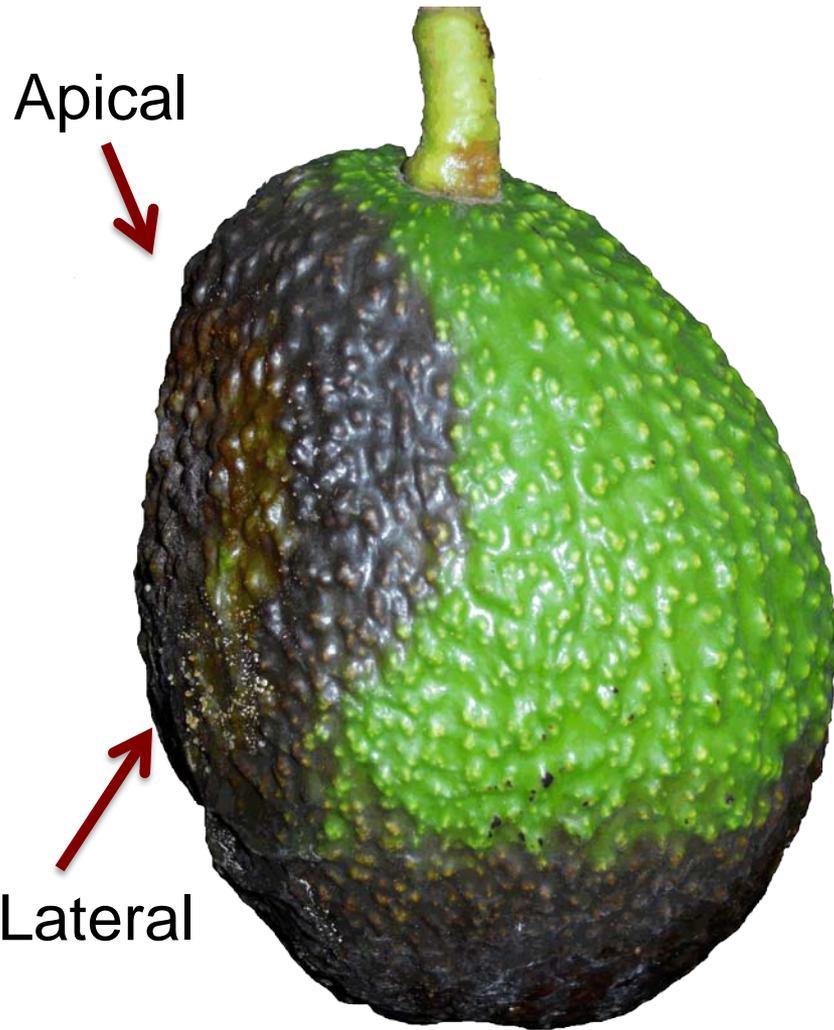


Large black lesions



Flesh darkening

# Symptoms



The whole fruit is affected

# Symptoms



Young twigs located near the affected fruit, can show wilt and cankers.



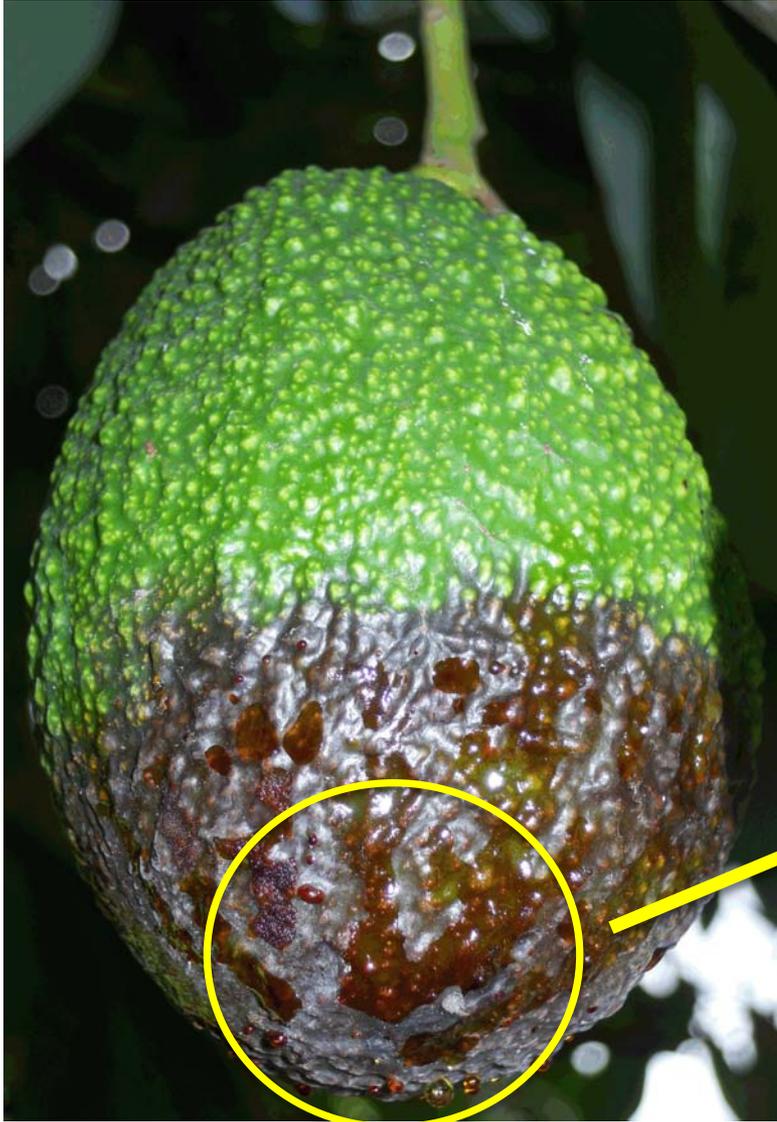
# Disease may become epidemic



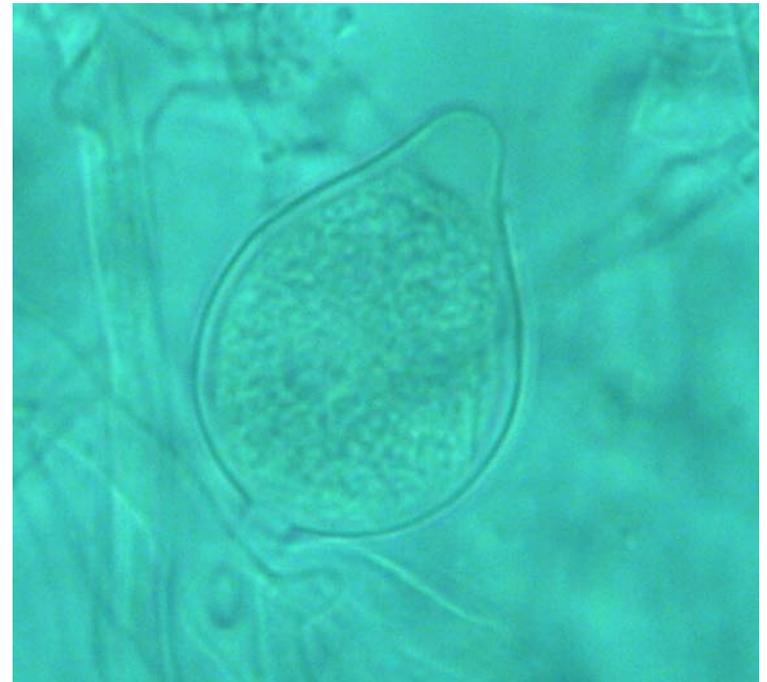
# Previous reports

- Associated with basal rot three *Phytophthora* species have been reported:
  - *P. boehmeriae* (México, Solís, 1982).
  - *P. cactorum* (Spain, López-Herrera et al., 2005).
  - *P. menzei* (USA, Hong et al., 2009)

# Who is causing the disease?



- RH > 85%
- Temperature > 25°C

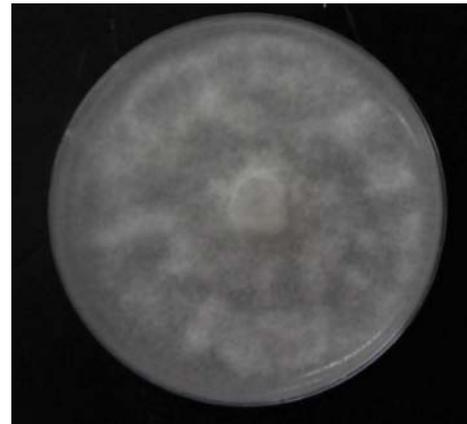
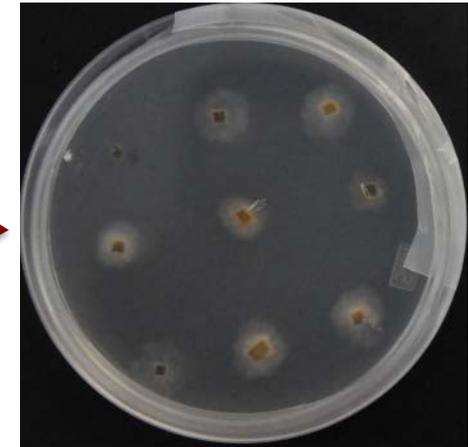
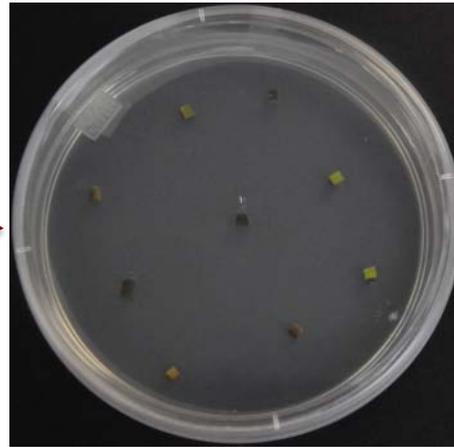


# Objective

1. Identify the causal agent of basal rot of avocado fruit in Mexico.



# Isolation

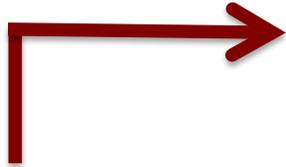


- 30 samples from six commercial orchards.
- PDA (difco)
- Incubation at 25°C in darkness.

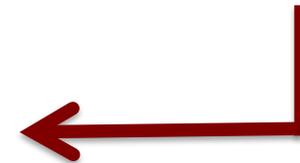
# Pathogenicity testing



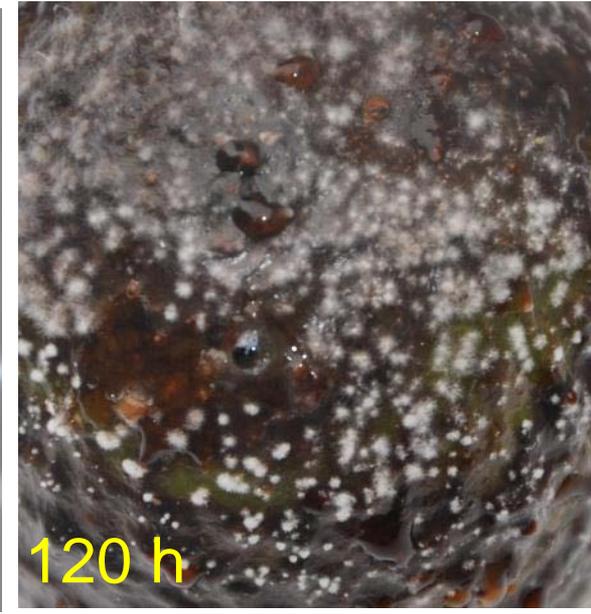
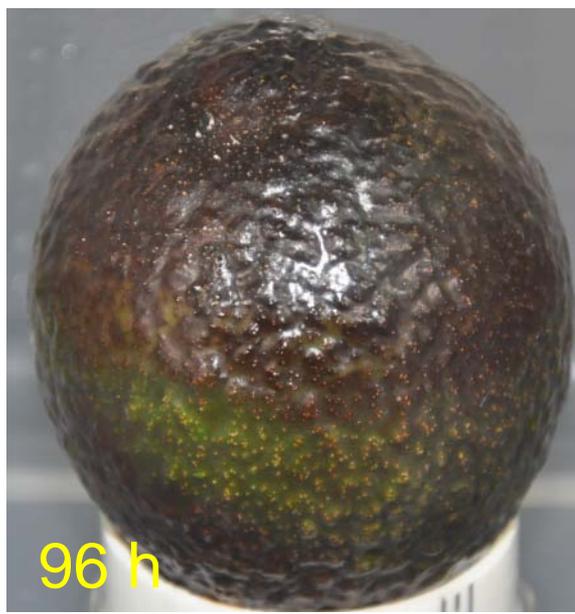
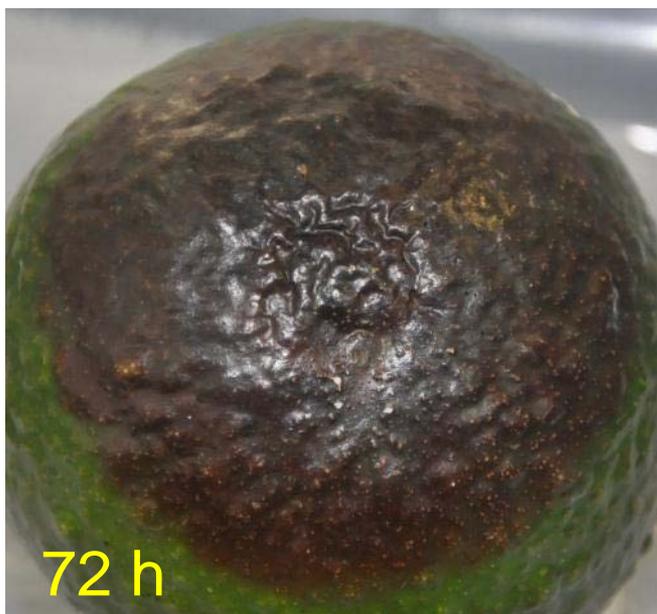
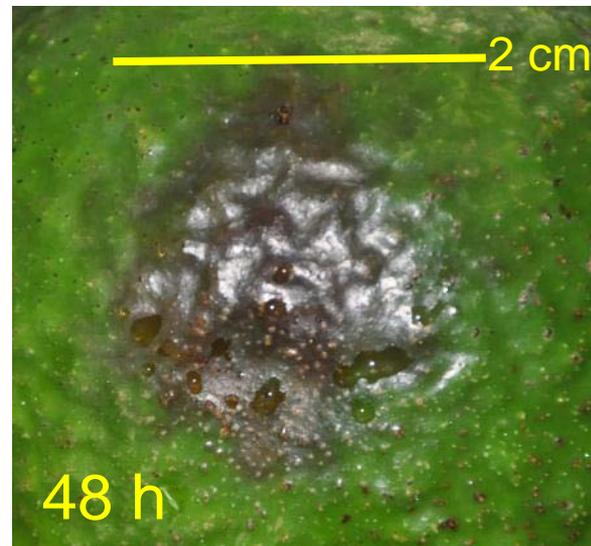
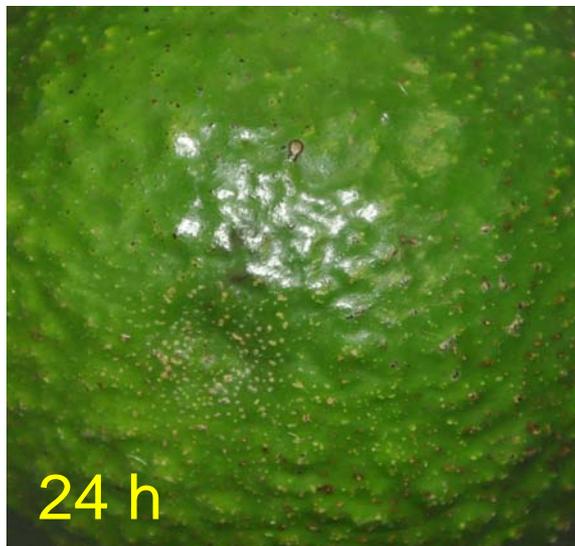
28 isolates



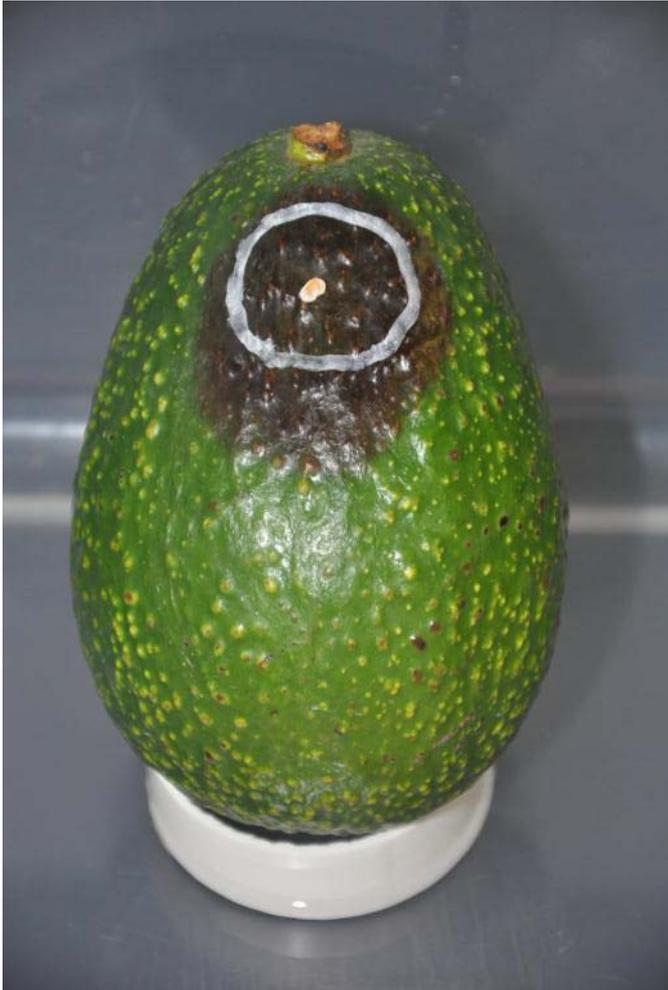
5 fruits/isolate



# Pathogenicity testing



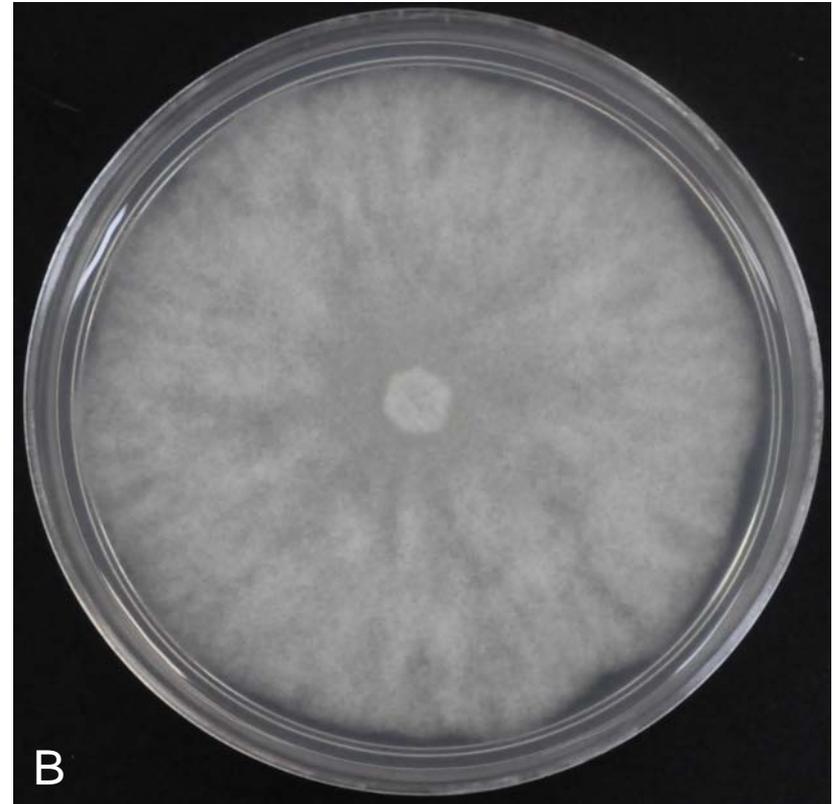
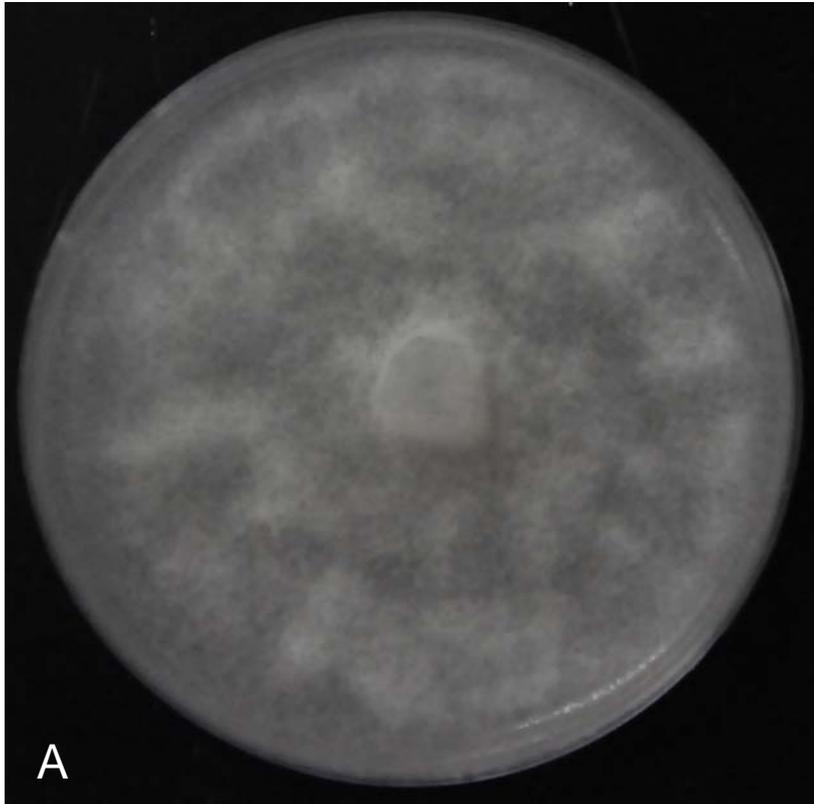
# Pathogenicity testing



Diameter of lesion 72 h post inoculation.

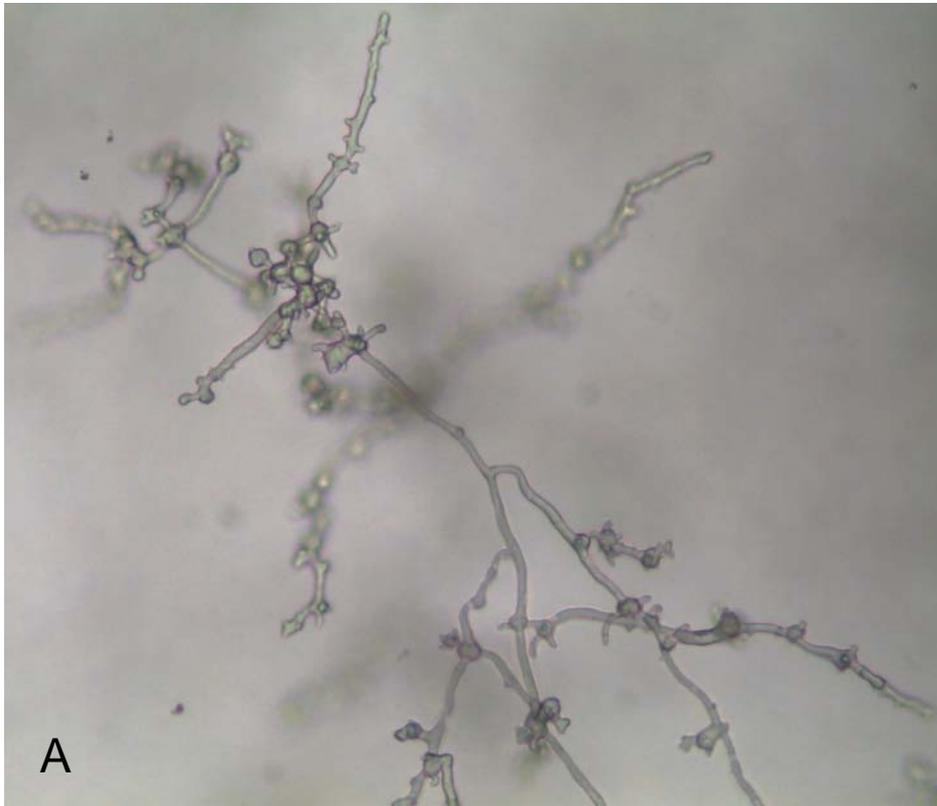


# Colony



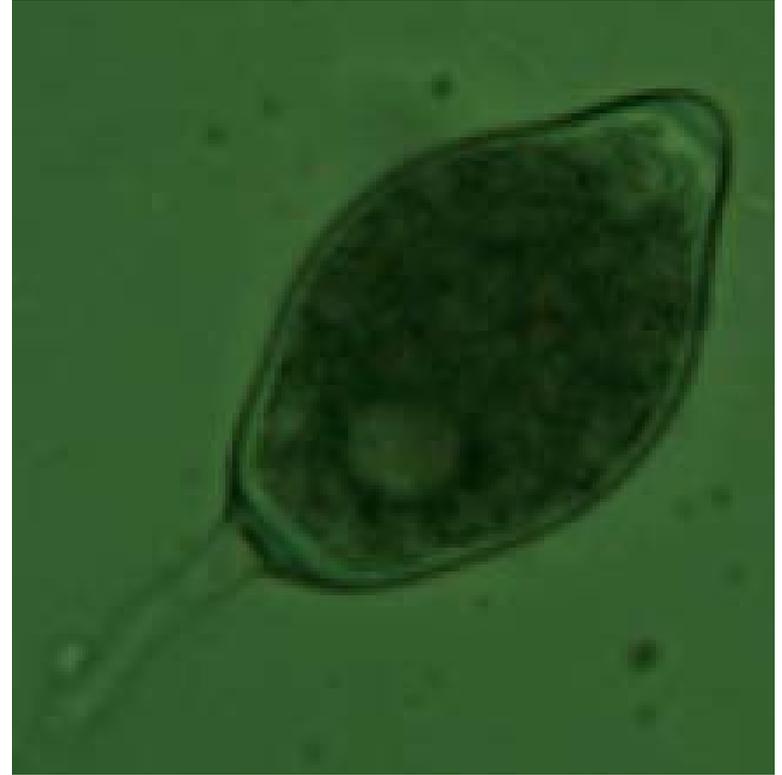
Colony developed in PDA after 7 days at 25°C. Petaloid (A) and radial (B).

# Mycelium



Mycelium with notorious hyphal swellings, small (A) or large (B), resembling abortive reproductive organs.

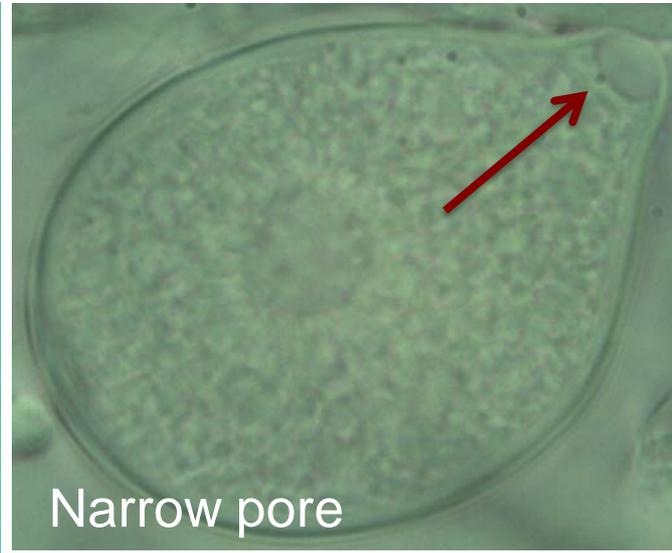
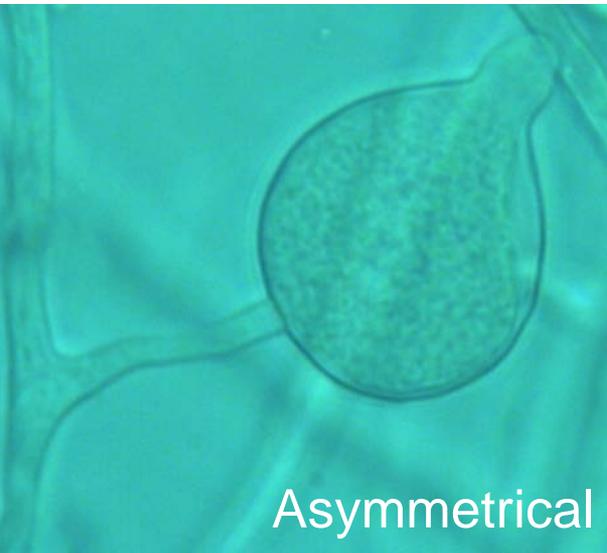
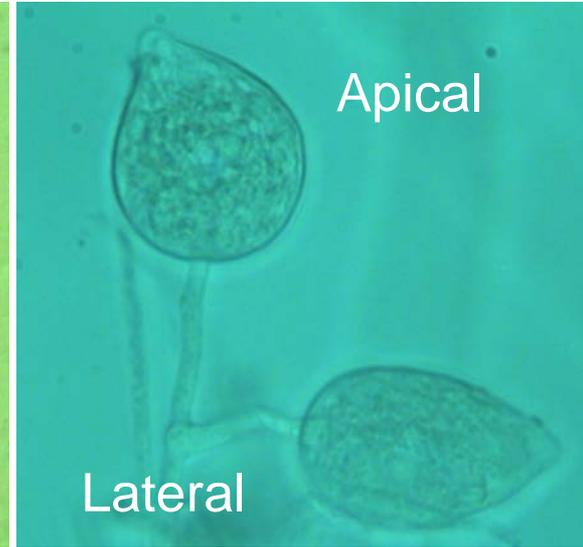
# Sporangia production



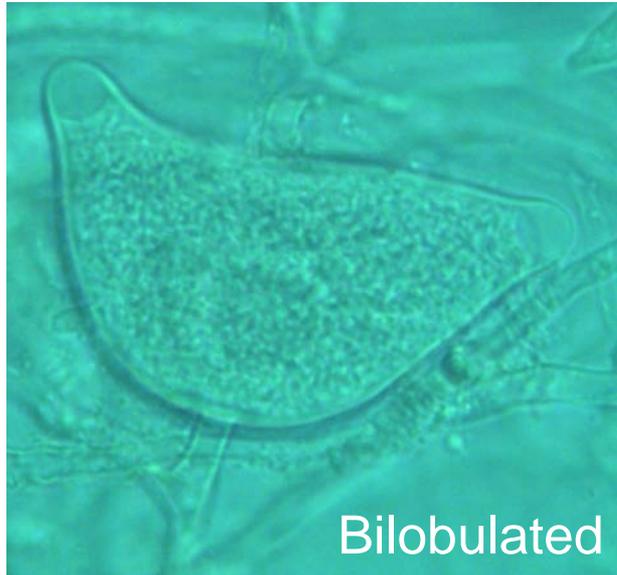
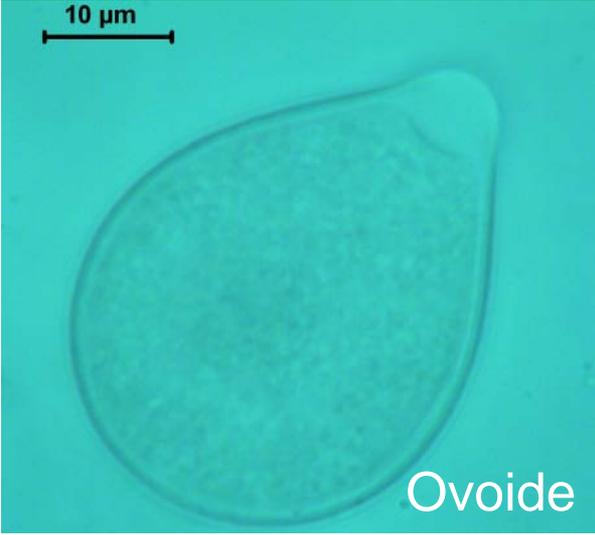
Sporangia produced directly on diseased fruit.

- Shape, size, papilla
- Caducity
- Sporangiophores

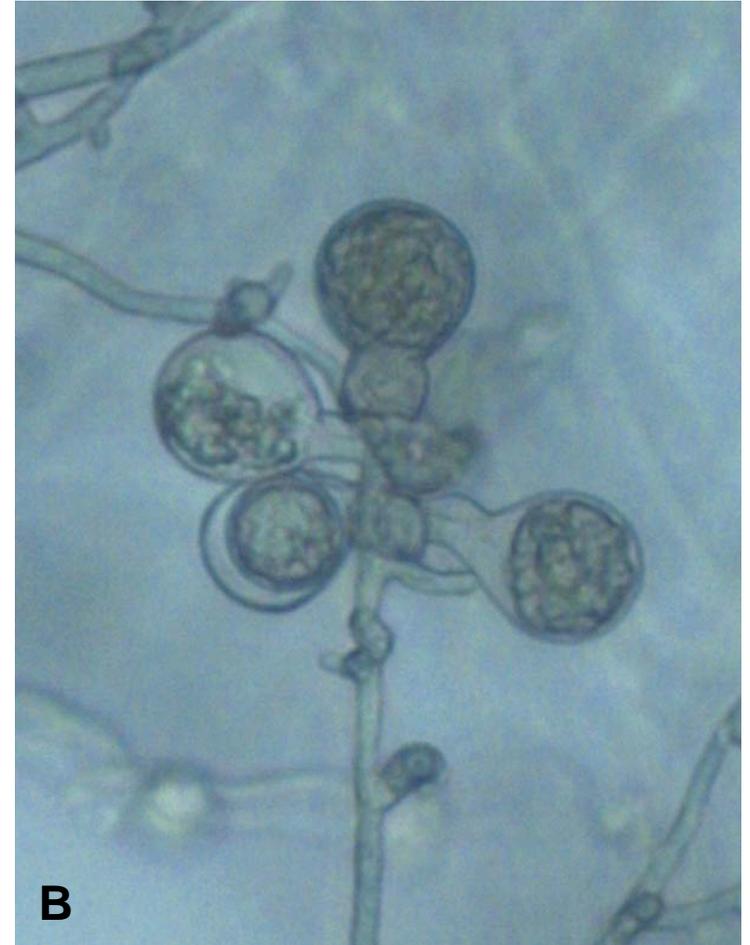
# Sporangia



# Sporangia shape

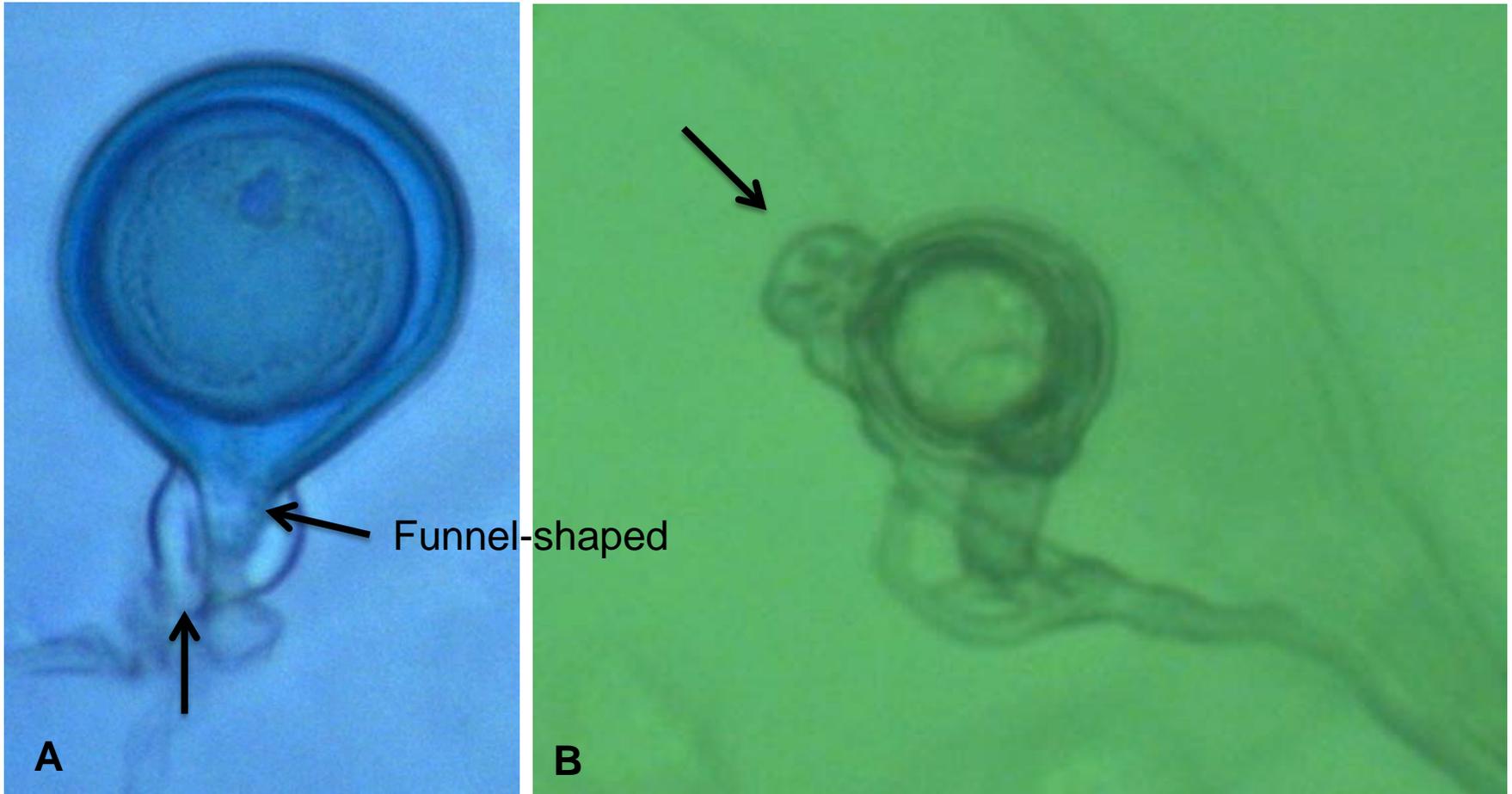


# Homothallic



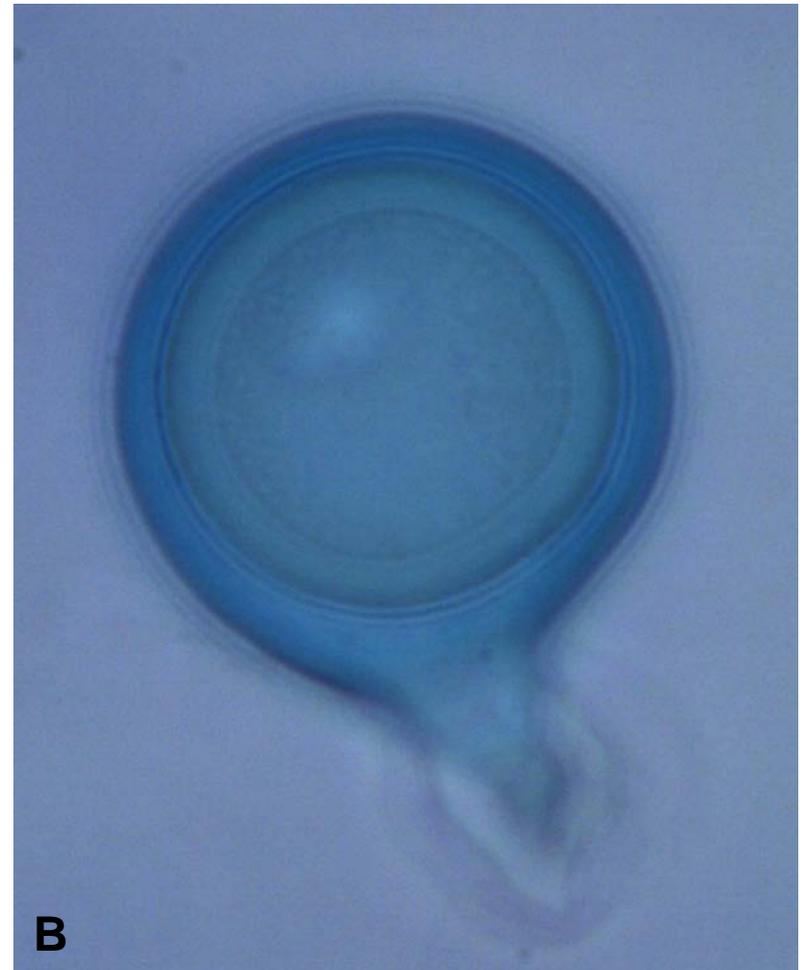
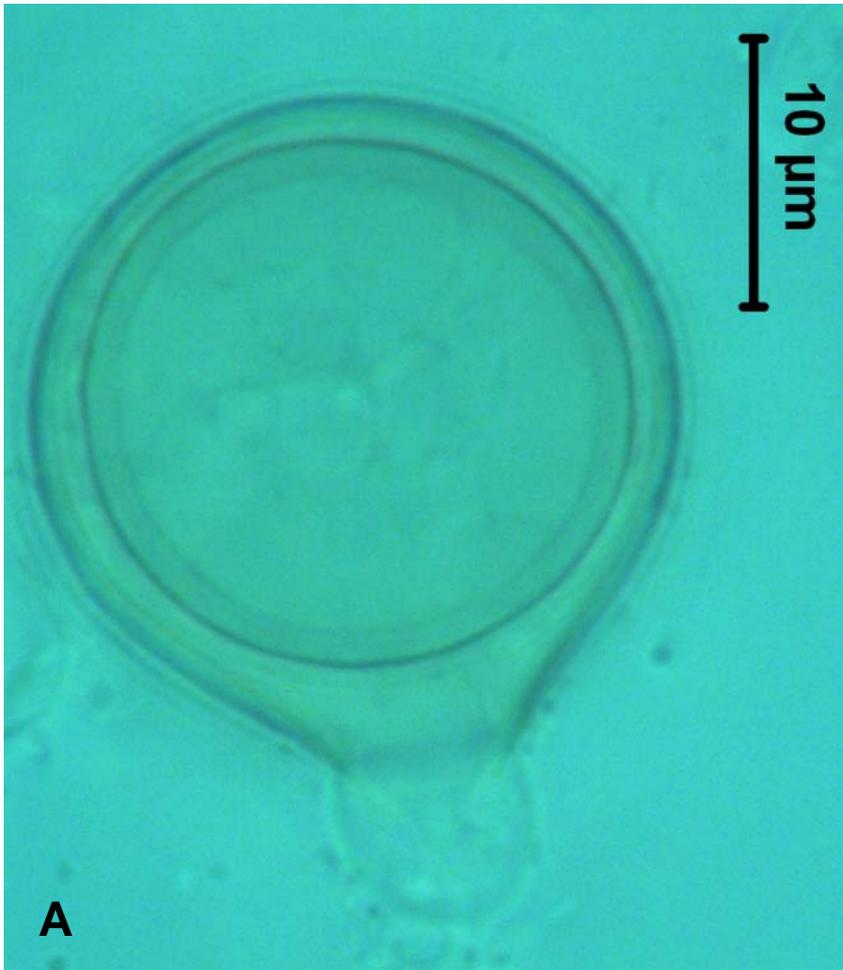
Antheridia and oogonia are formed readily in culture (A); often in close groups (B).

# Antheridia and Oogonia



Antheridia spherical or cylindrical; amphigynous (A); some paragynous antheridia can be noted (B).

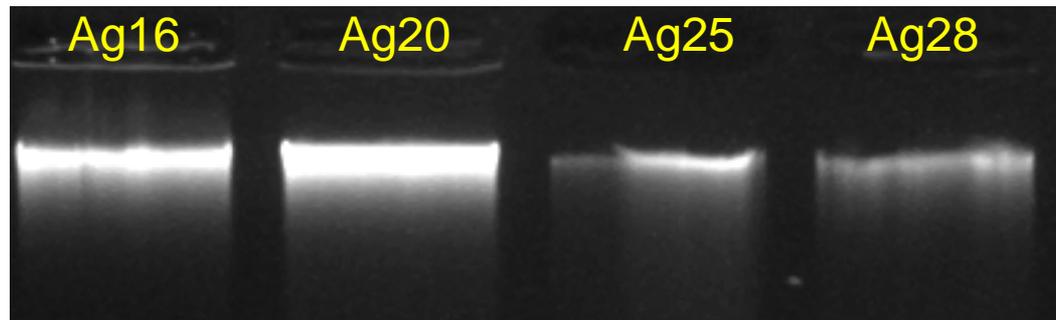
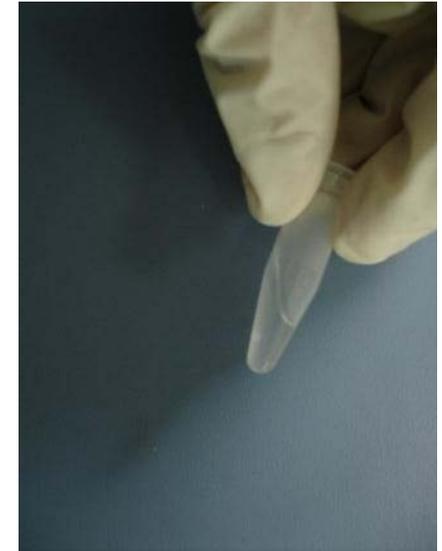
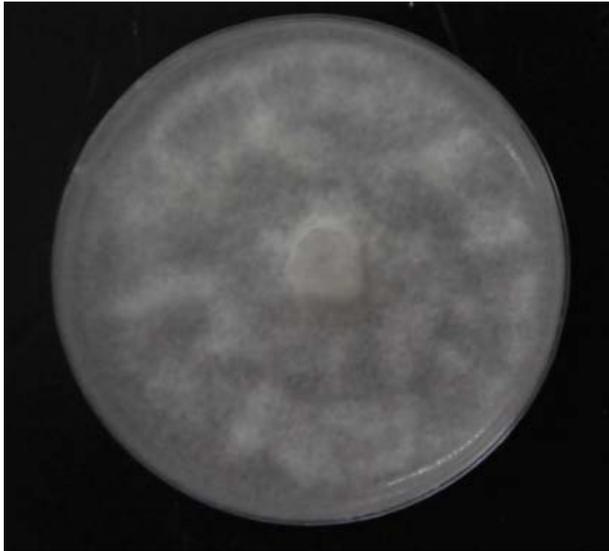
# Oospore



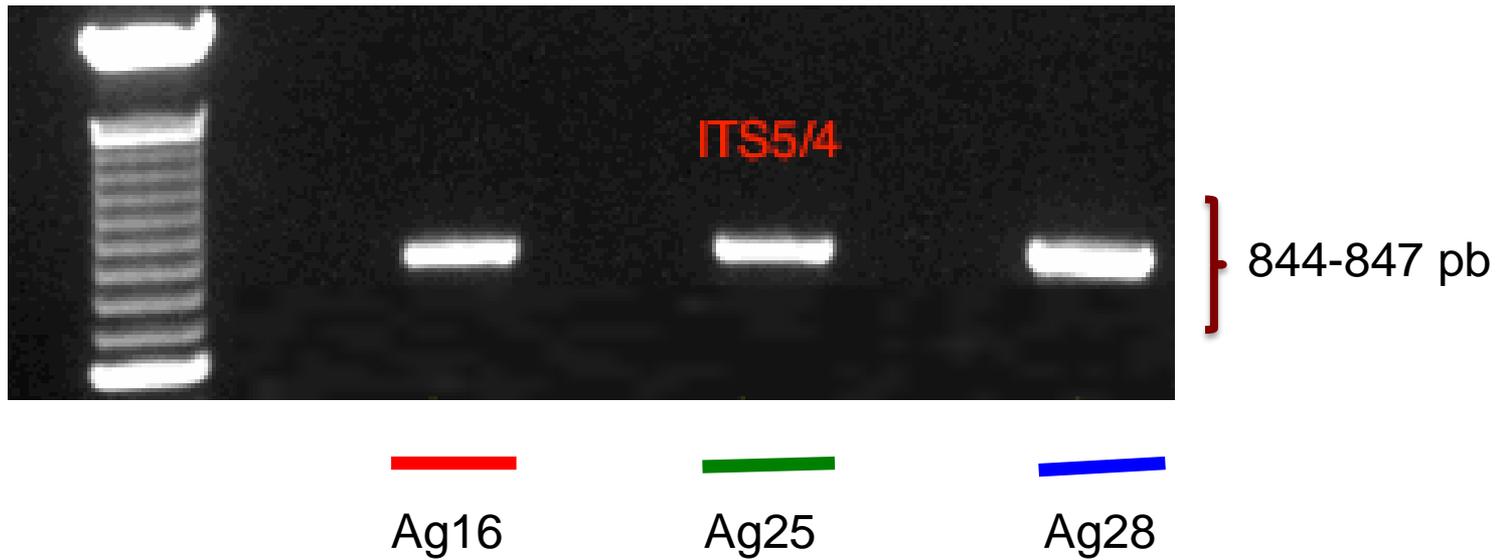
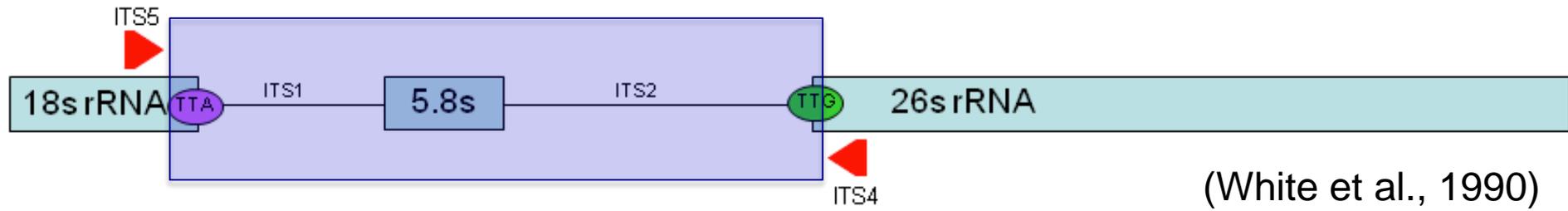
Round oospore, smooth, thick walled and markedly aplerotic produced on host (A) and PDA (B).

# Molecular identification

## DNA extraction (Cenis, 1992)



# ITS amplification



# Phytophthora database blast search

PD_00117_ITS [ <i>Phytophthora heveae</i> ]	774	766 / 766 (100%)	999.99	0	Plus/Plus
33	aaaaactttccacgtgaaccgtaacaaaccaatagttggggcgagtttggcggctgctgctgctggacgagctctatca				112
9	aaaaactttccacgtgaaccgtaacaaaccaatagttggggcgagtttggcggctgctgctgctggacgagctctatca				88
113	tggcgagcgtttggacttcggtctgaactagtagcccttcttttaaacccattcctaattactgattatactgtggggac				192
89	tggcgagcgtttggacttcggtctgaactagtagcccttcttttaaacccattcctaattactgattatactgtggggac				168
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569	tcgattcgggtatggttggcttcggctgaacaatgcgcttattggatgtgttctcctggttggcggtaatggctgggtgt				648
673	accgtagctatgtggtgcttggcttttgaatcggctttgctgttgtgaagtagagtggcggcttcggctgtcaggggtcg				752
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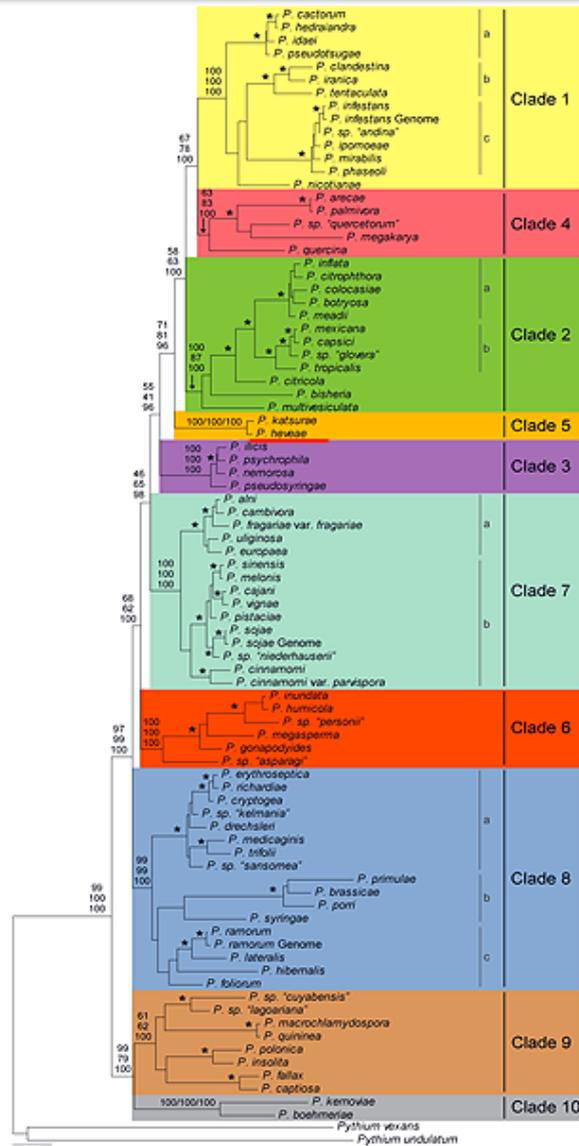
# Neighbor-joining tree

Phy. CL5

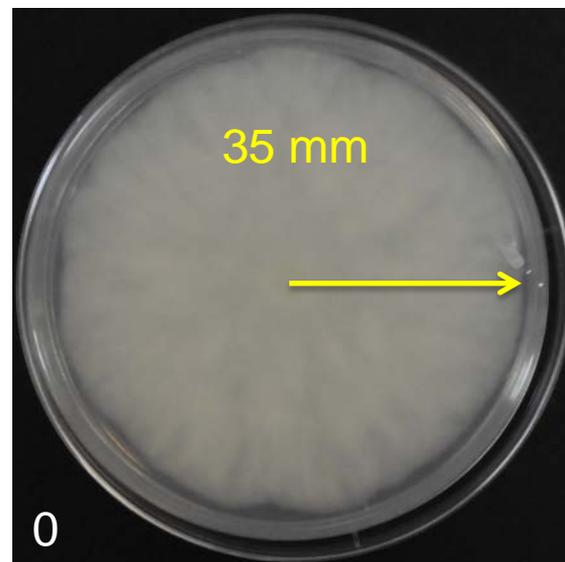
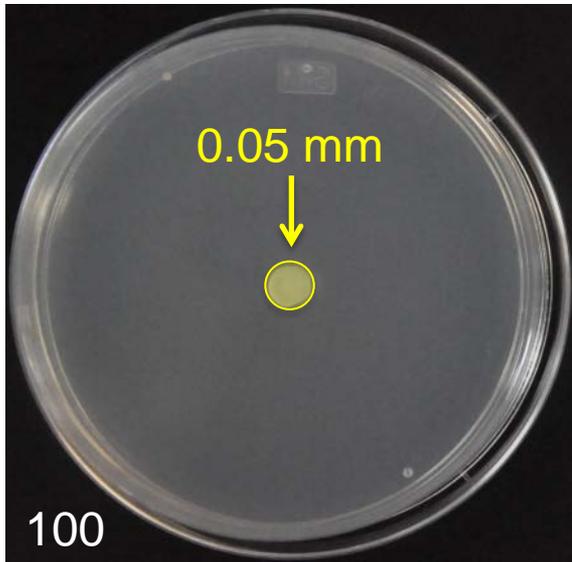
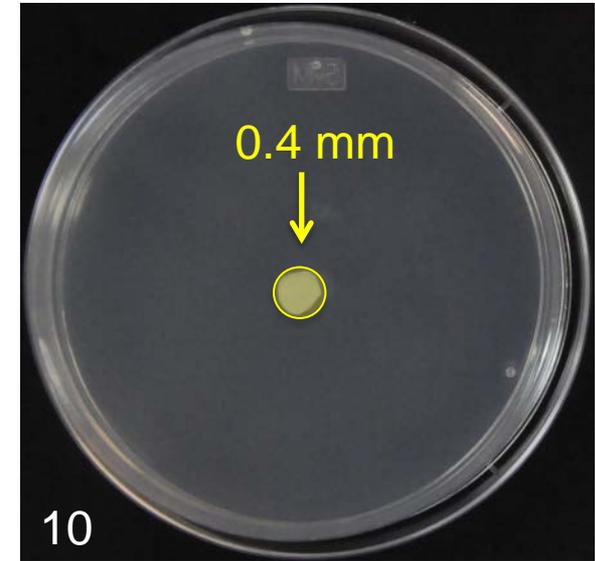
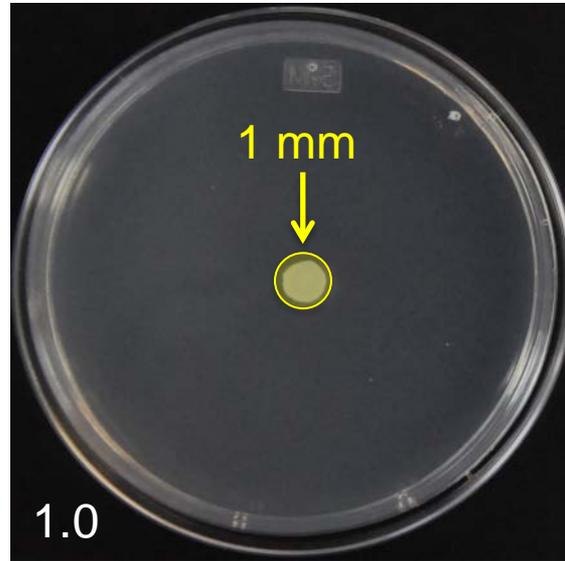
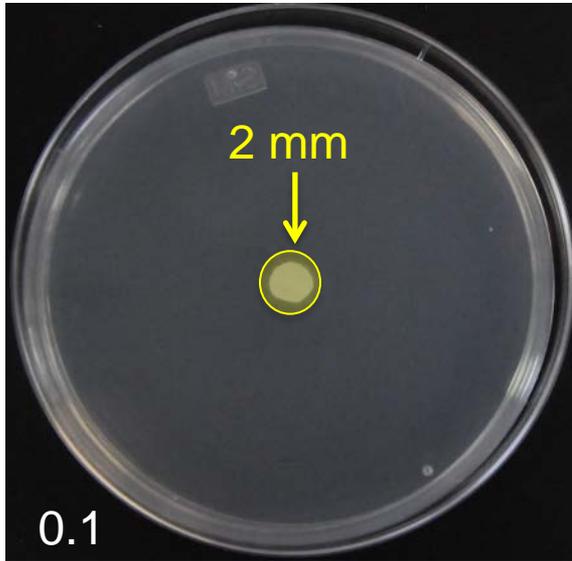


*P. heveae* isolate P3428 from Coffey and Peiman, 2007

# *P. heveae* on Phytophthora clade 5



# *In vitro* sensibility to mefenoxam



Colony growth was inhibited by all mefenoxam concentrations.

# Conclusions

1. Based in pathogenicity testing, morphological characteristics and ITS sequencing, we concluded that *Phytophthora heveae* is the causative agent of basal rot of avocado fruit in Mexico.
2. This is the first report of *P. heveae* affecting avocado fruit.

# Importance of our findings



# Acknowledgments

To Gloria Abad Ph. D., from USDA/APHIS/MDL who confirmed the identity of isolates.

# Acknowledgments

