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Forest Biosecurity and Protection

**Ecology and epidemiology of  
*Nectria fuckeliana* on radiata  
pine: a research proposal**

## I. Background work

- Literature search
- Preliminary isolations
- Identification of fungi
- Familiarity with spore states of *N. fuckeliana*
- Microscopy of infected and healthy wood

## II. Infection mechanism and disease development in host

- **Purpose:** To understand the cause of the disease and how it spreads.

## **A. Organisms associated with the disease**

- **Isolate organisms from infected and healthy wood**
- **Compare with previous isolations**
- **Compare with DNA data collected by T. Ramsfield**

## Preliminary results

- **Isolations:**

*N. fuckeliana*  
strongly assoc.  
with discolored  
wood, not with  
clear wood



- **Some discrepancy between DNA data and isolations**
- **More systematic comparisons needed between isolations and DNA**

## **B. Environmental conditions associated with spore production, release, and germination**

- **Methods**

- ▶ Lab (produce ascospores, macroconidia), using paired cultures
- ▶ Role of pine resin
- ▶ Spore trapping near infected trees in the field OR regular collection, microscopy, and spore germination

## **C. Does *Nectria* cause the disease?**

- **Reproduce disease artificially**
- **Preliminary inoculation trials (Quarantine facility?). Determine:**
  - ▶ nature of the inoculum source (conidia, ascospores)
  - ▶ most effective inoculation method
  - ▶ entry points: injured, healthy bark / living or dead wood



- **Study interactions between *Nectria* and *Sphaeropsis* and compare early disease symptoms**
- **Study interactions between *Nectria* and other organisms isolated from radiata pine**

## Expanded study

- **For field-inoculated trees**

Observe disease progress using regular harvesting, reisolation of pathogen, anatomical studies

### III. Effect of pathogen on host

- **Purpose**

To determine location of pathogen in the wood, cause of cambial death (fluting symptom), cause of “pathological white wood”

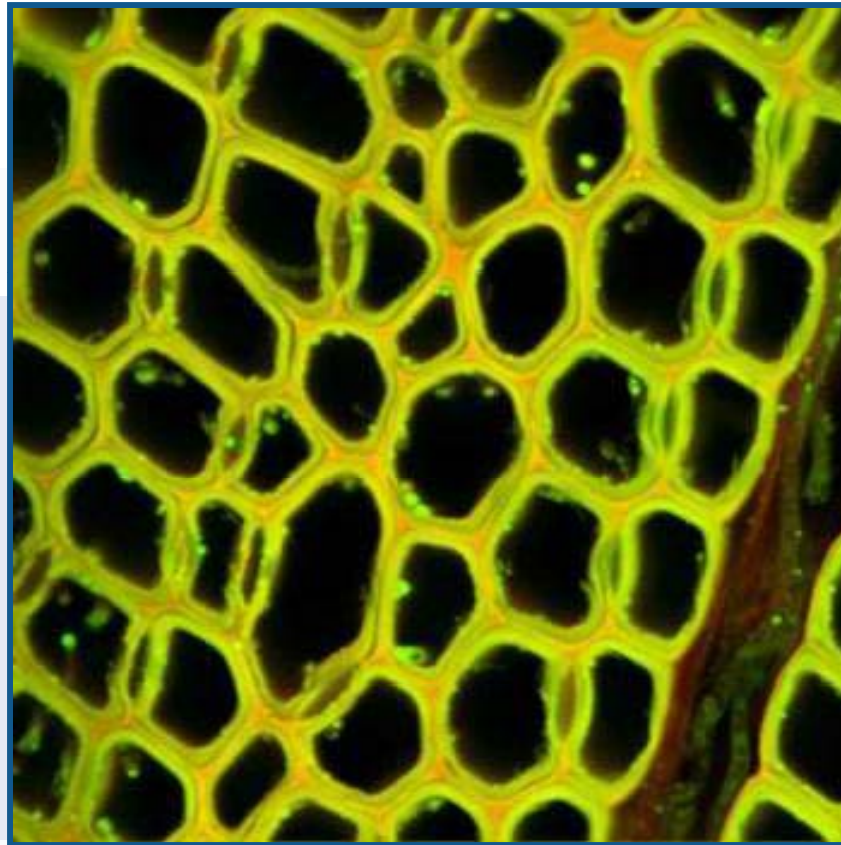
## **A. Anatomy of diseased wood**

- **Methods**

- ▶ Compare healthy and infected wood (confocal microscopy, SEM)
- ▶ Observe early stages of infection in cambium and wood using SEM or other methods

## Infected wood by confocal microscopy

From pruned  
stub trial: a  
tree that  
became  
infected after  
pruning (no  
artificial  
inoculation)



## IV. Relationship of disease incidence to environmental conditions (with others)

- **Purpose**

To understand the risk of disease development in new areas, the reasons for the current disease distribution, and how it is influenced by plantation management.

## **A. Do certain environmental conditions promote disease?**

- **Methods**

### **Field Studies**

- ▶ Observe fruiting bodies in different seasons (trap spores?) and weather conditions
- ▶ Correlate disease incidence with specific environmental factors (rainfall, temperature, humidity, prevailing winds, thinning practices)

## **Logistic challenges**

- **Getting samples to the lab in a timely manner**
- **Quarantine facility for preliminary inoculation studies**
- **Lab facilities near field sites to store/produce inoculum, to do isolation work**
- **Collecting weather data within plots**
- **Monitoring spore traps**