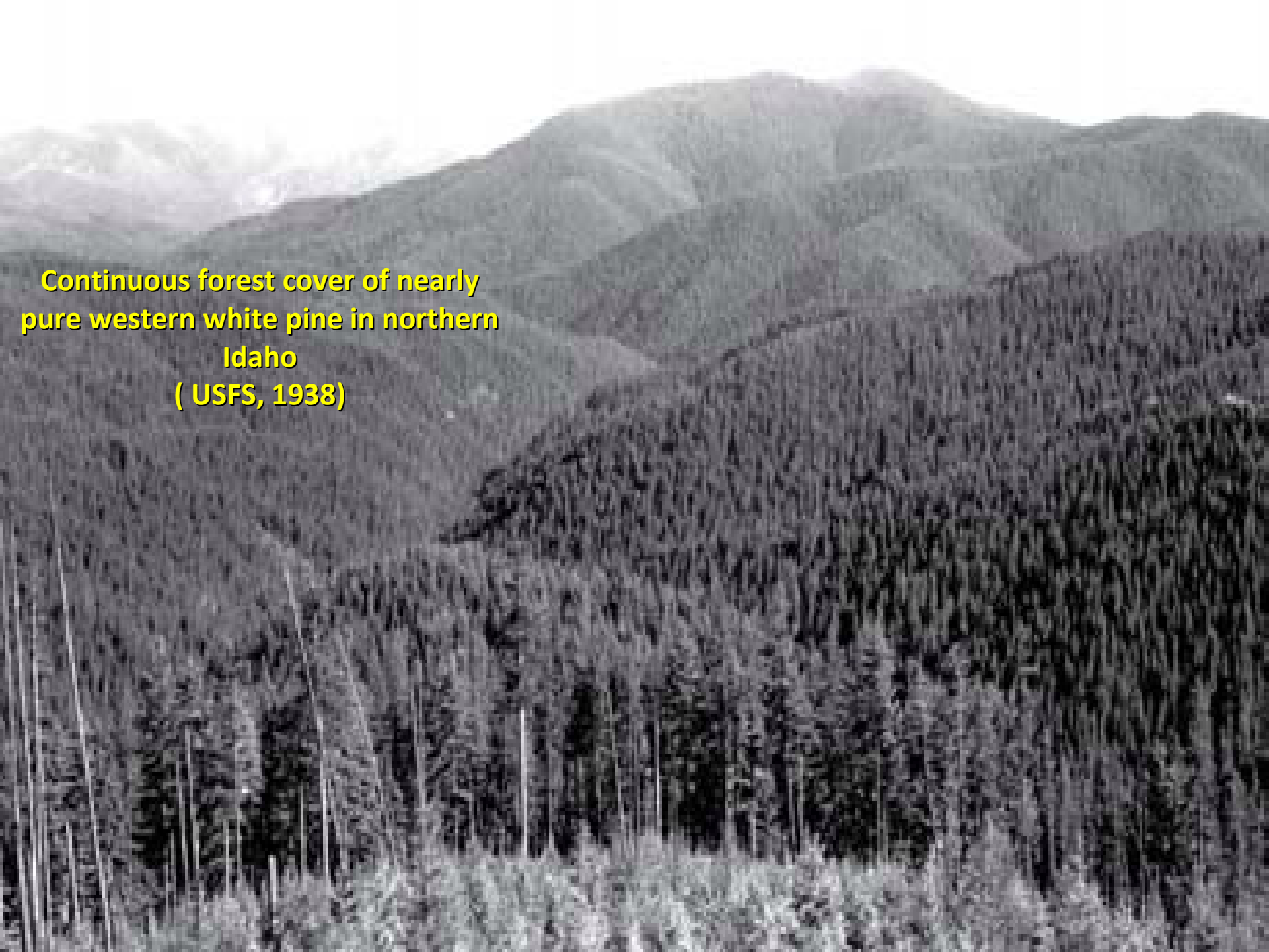
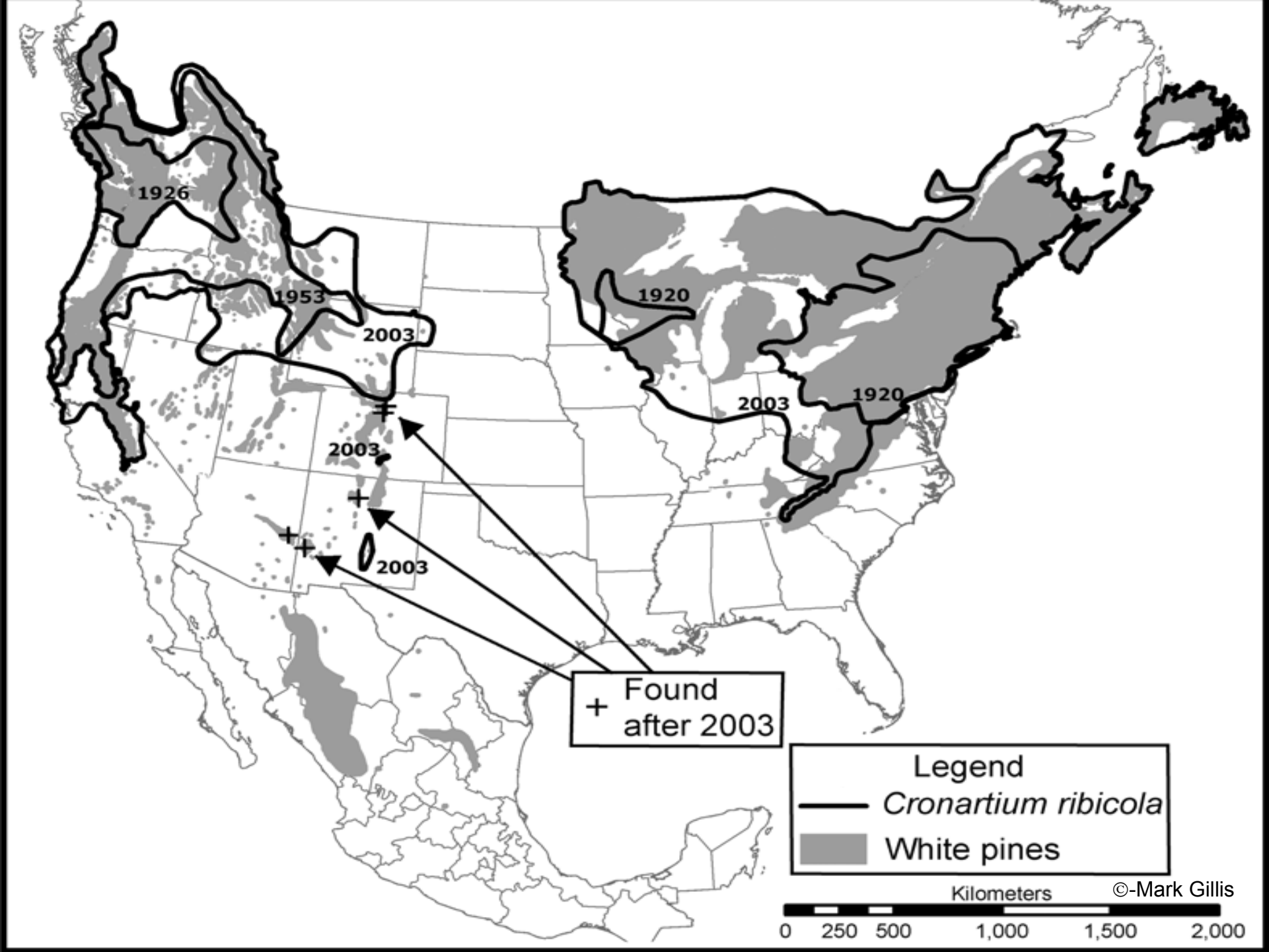
In vitro Evaluation of White Pine Trees for Resistance against Blister Rust

By

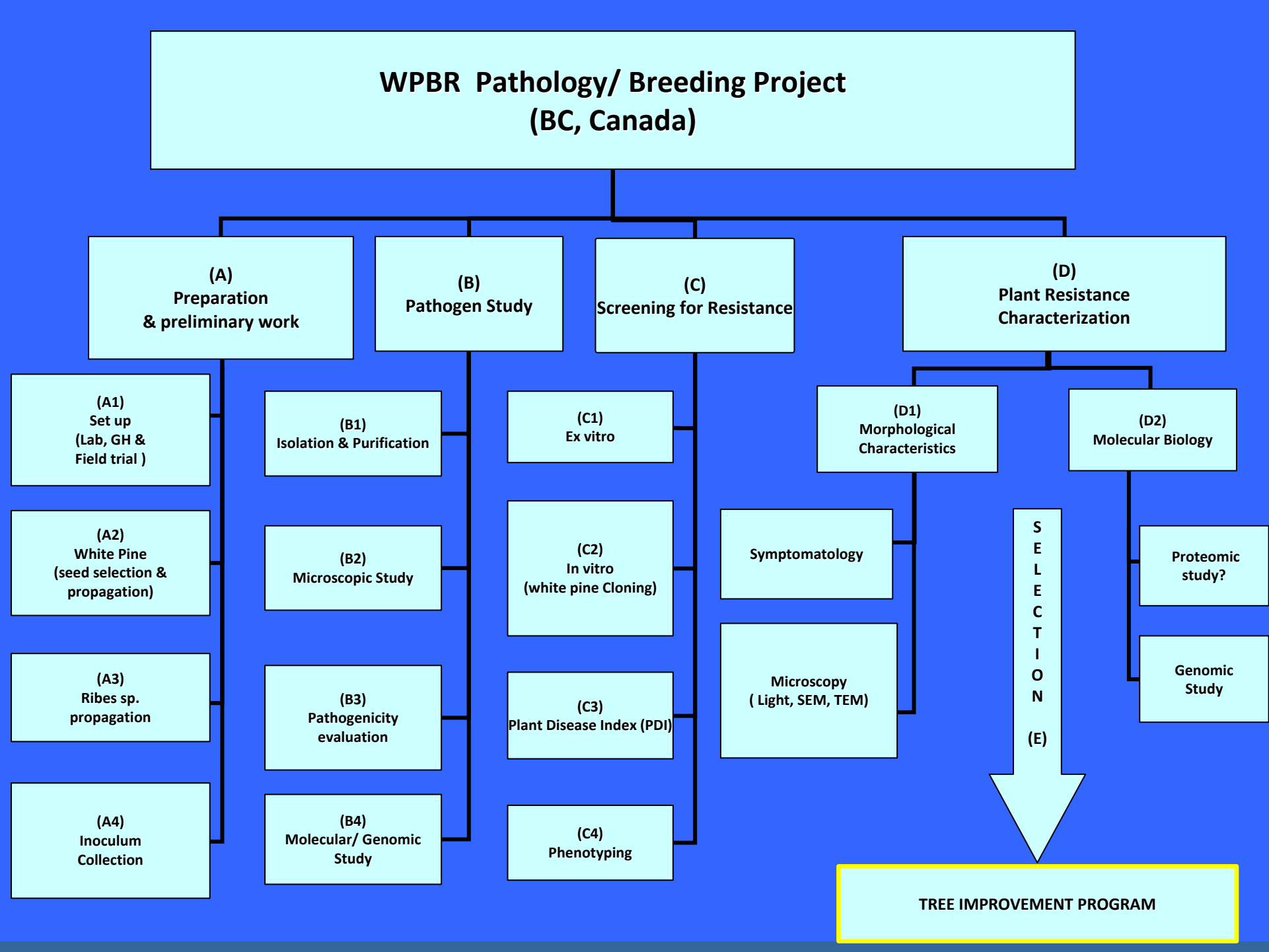
David Noshad`


Continuous forest cover of nearly pure western white pine in northern Idaho
(USFS, 1938)


1926
1953
2003
1920
2003
1920
2003
2003
+ Found after 2003
Legend
Cronartium ribicola
White pines
Kilometers
0 250 500 1,000 1,500 2,000
©-Mark Gillis

Field Resistance Assessment in F1 Trials

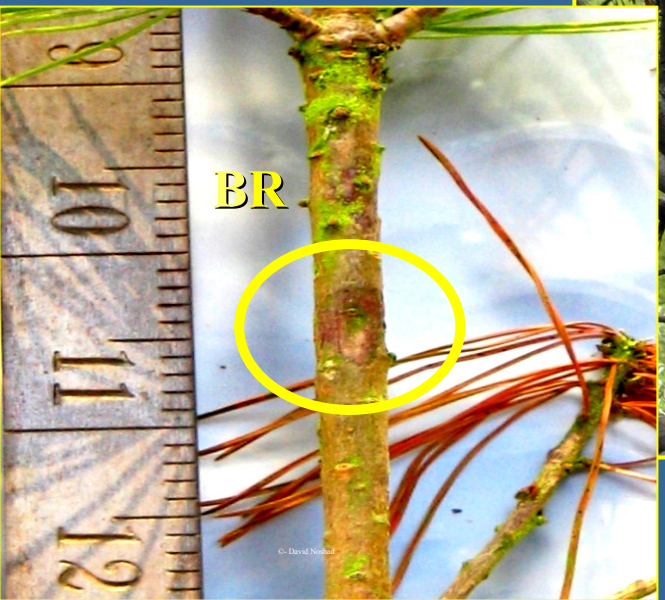
Environment
Pathogen
(Cronartium ribicola
J.C. Fisch. ex Rabenh.)
White Pine
Blister Rust
Host plants
(White pine, Ribes, ...)
Time


WPBR Pathology/ Breeding Project
(BC, Canada)
(A)
Preparation
& preliminary work
(B)
Pathogen Study
(C)
Screening for Resistance
(D)
Plant Resistance
Characterization
(A1)
Set up
(Lab, GH &
Field trial)
(A2)
White Pine
(seed selection &
propagation)
(A3)
Ribes sp.
propagation
(A4)
Inoculum
Collection
(B1)
Isolation & Purification
(B2)
Microscopic Study
(B3)
Pathogenicity
evaluation
(B4)
Molecular/ Genomic
Study
(C1)
Ex vitro
(C2)
In vitro
(white pine Cloning)
(C3)
Plant Disease Index (PDI)
(C4)
Phenotyping
(D1)
Morphological
Characteristics
(D2)
Molecular Biology
Symptomatology
Microscopy
(Light, SEM, TEM)
Proteomic
study?
Genomic
Study
SELECTION
(E)
TREE IMPROVEMENT PROGRAM

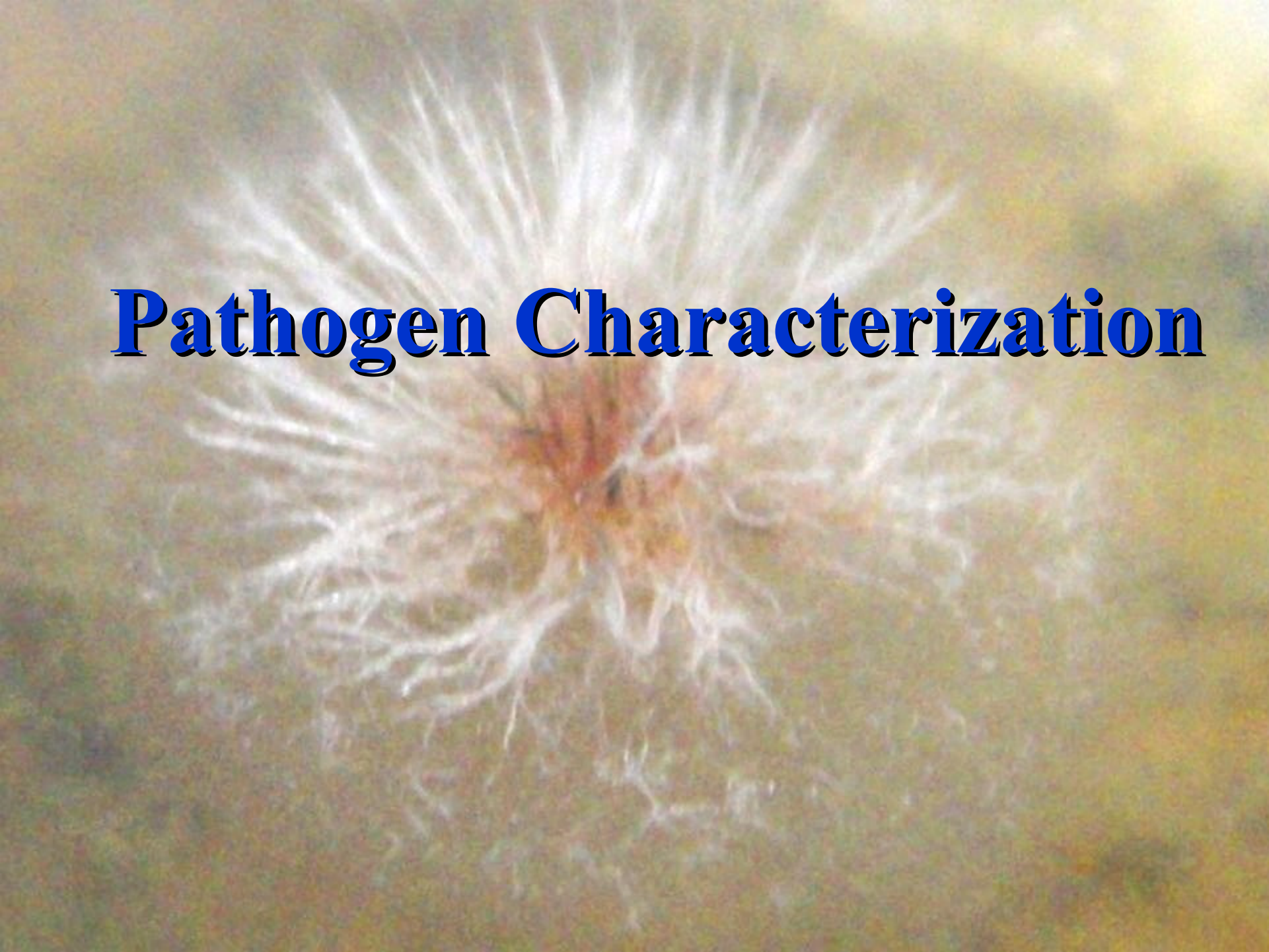
Labs

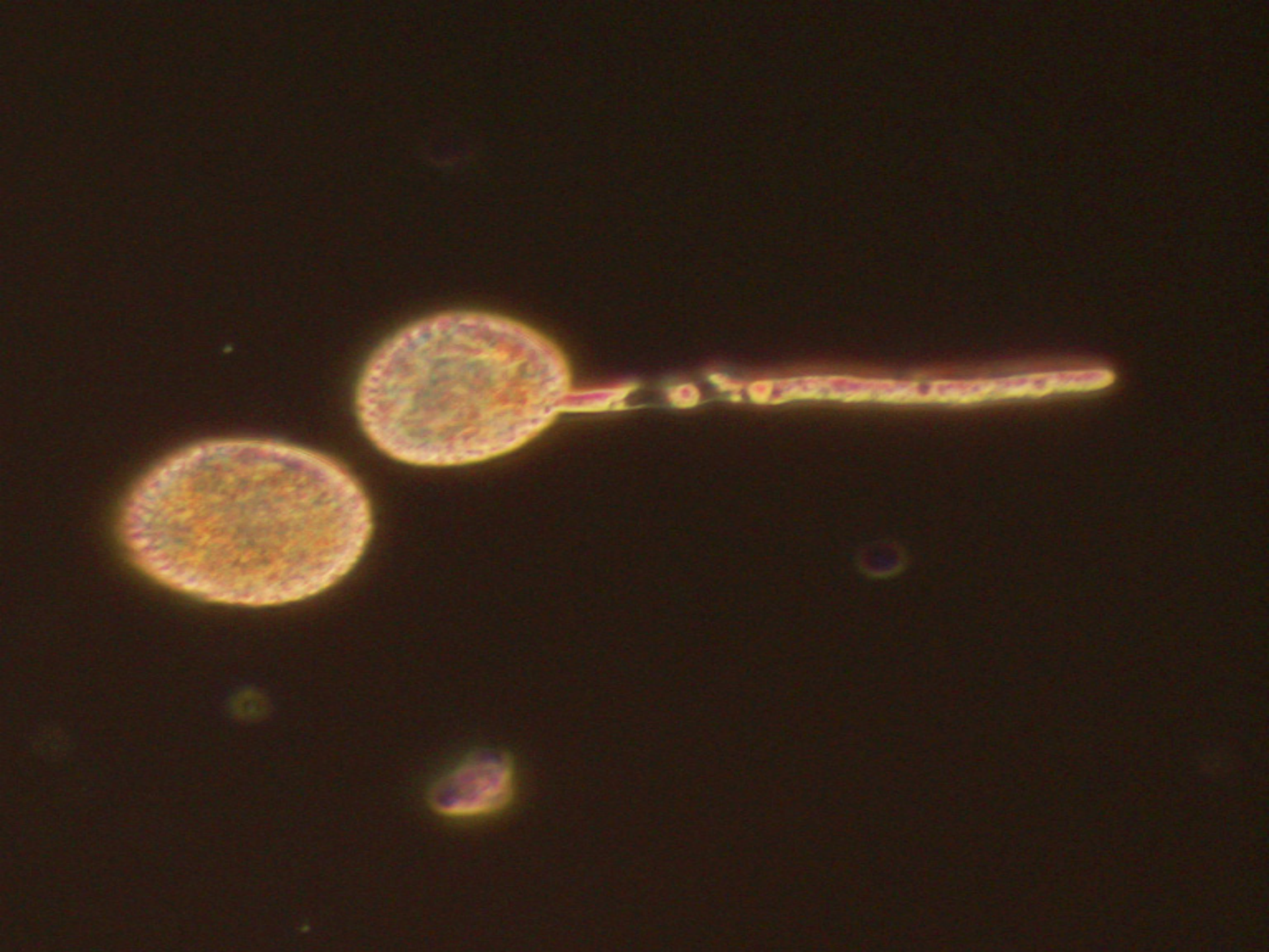
Field Screening

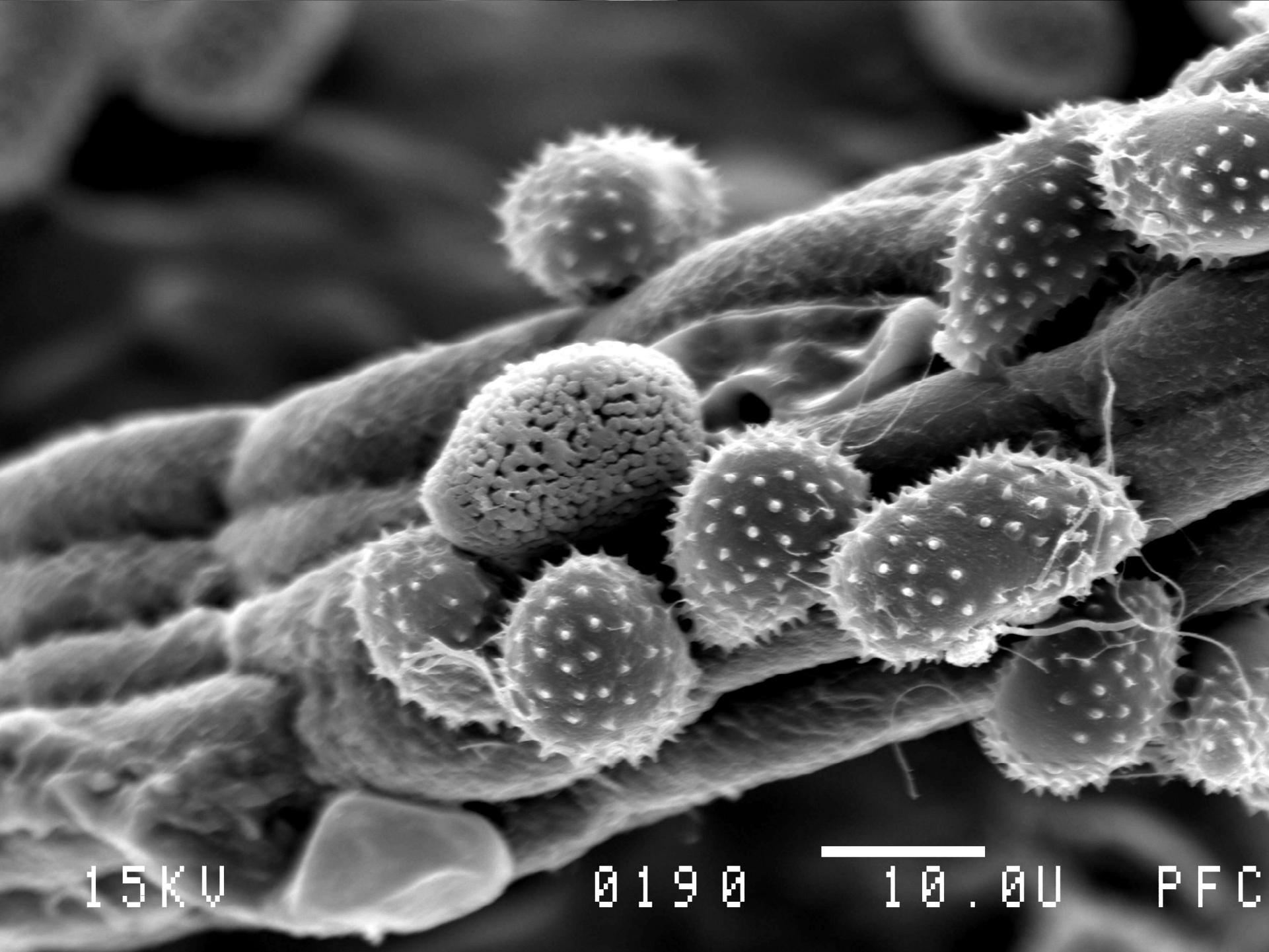
Different Types of Partial Resistance / Tolerance

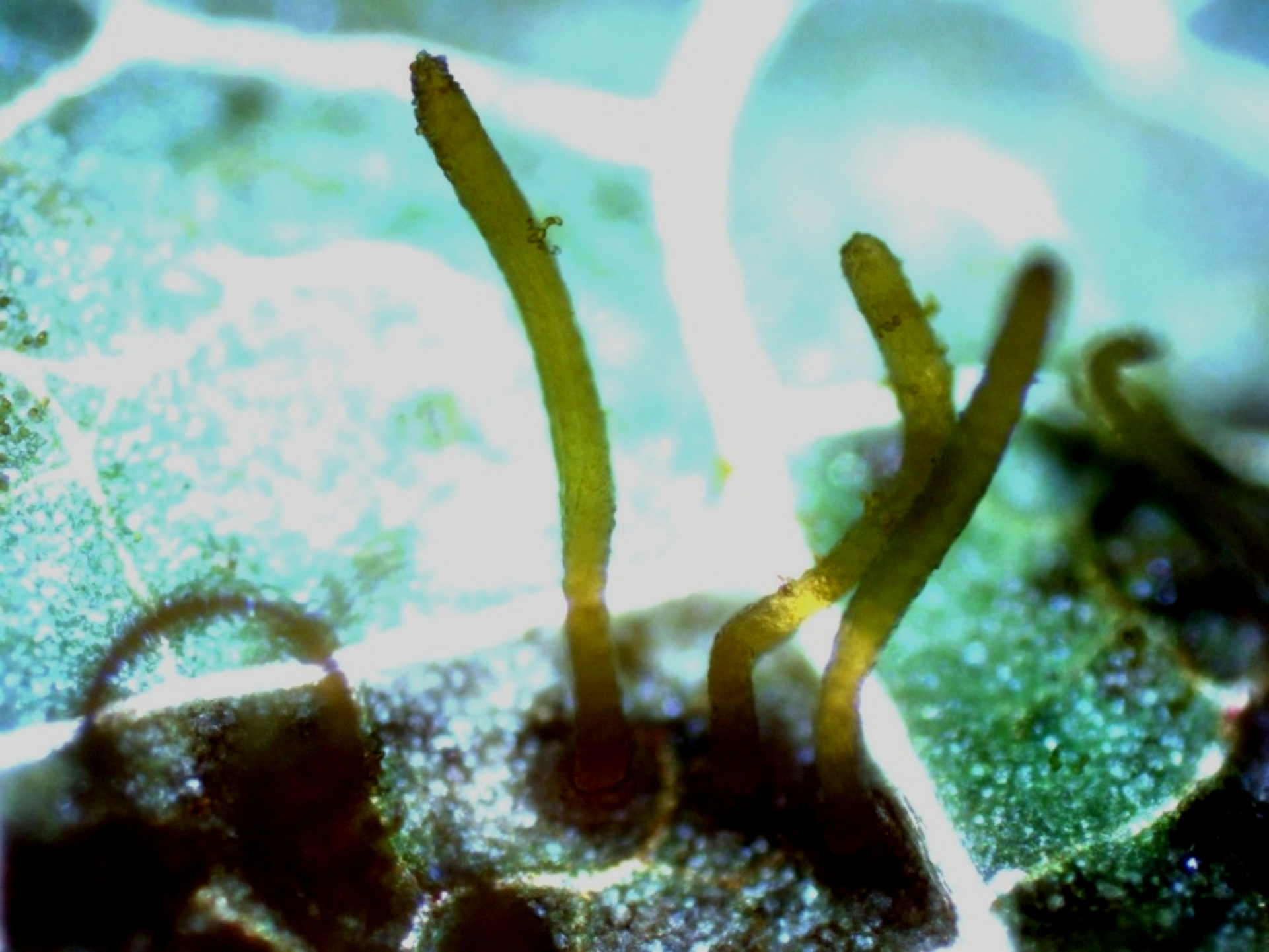


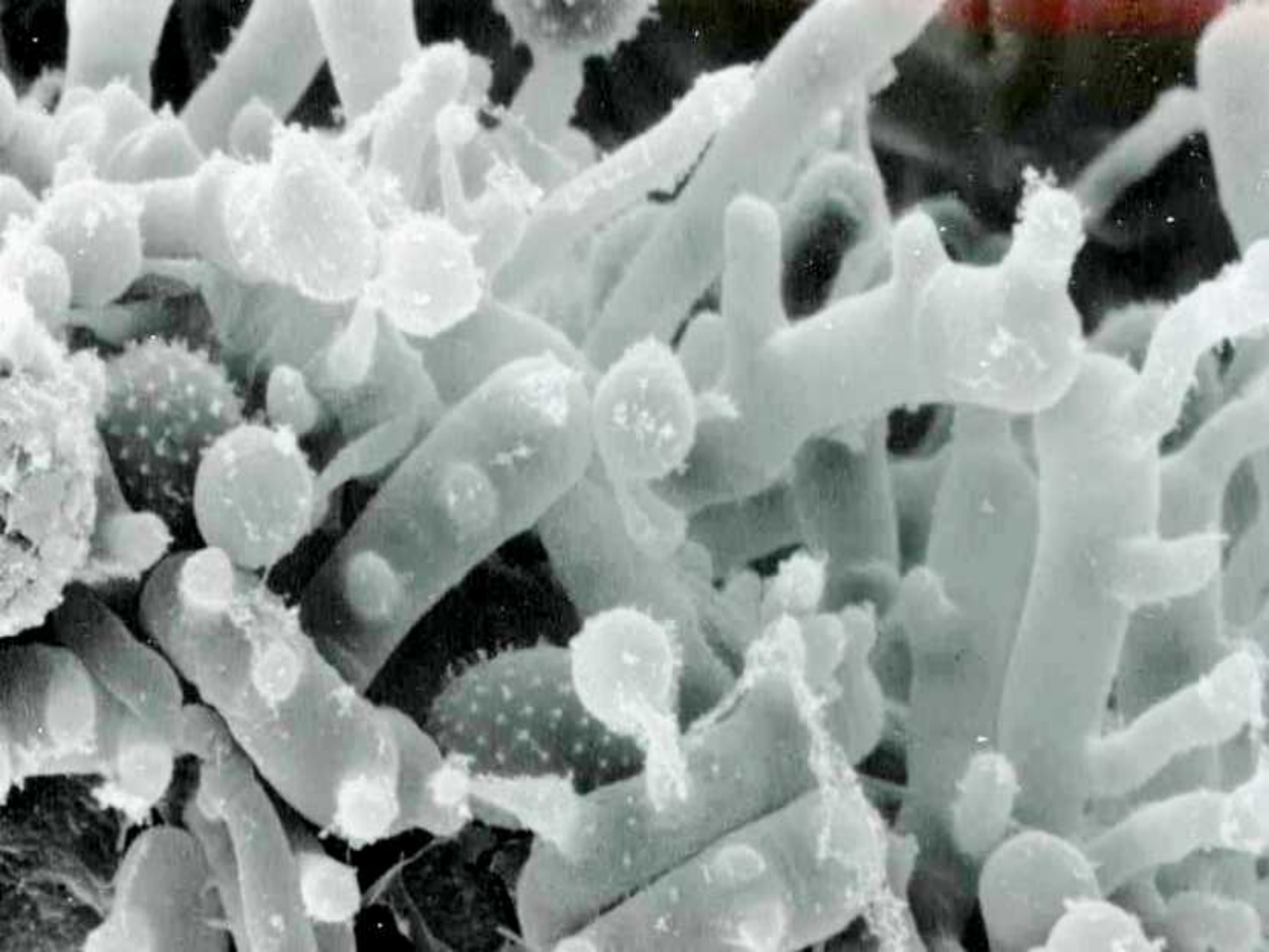
Pathogen Characterization

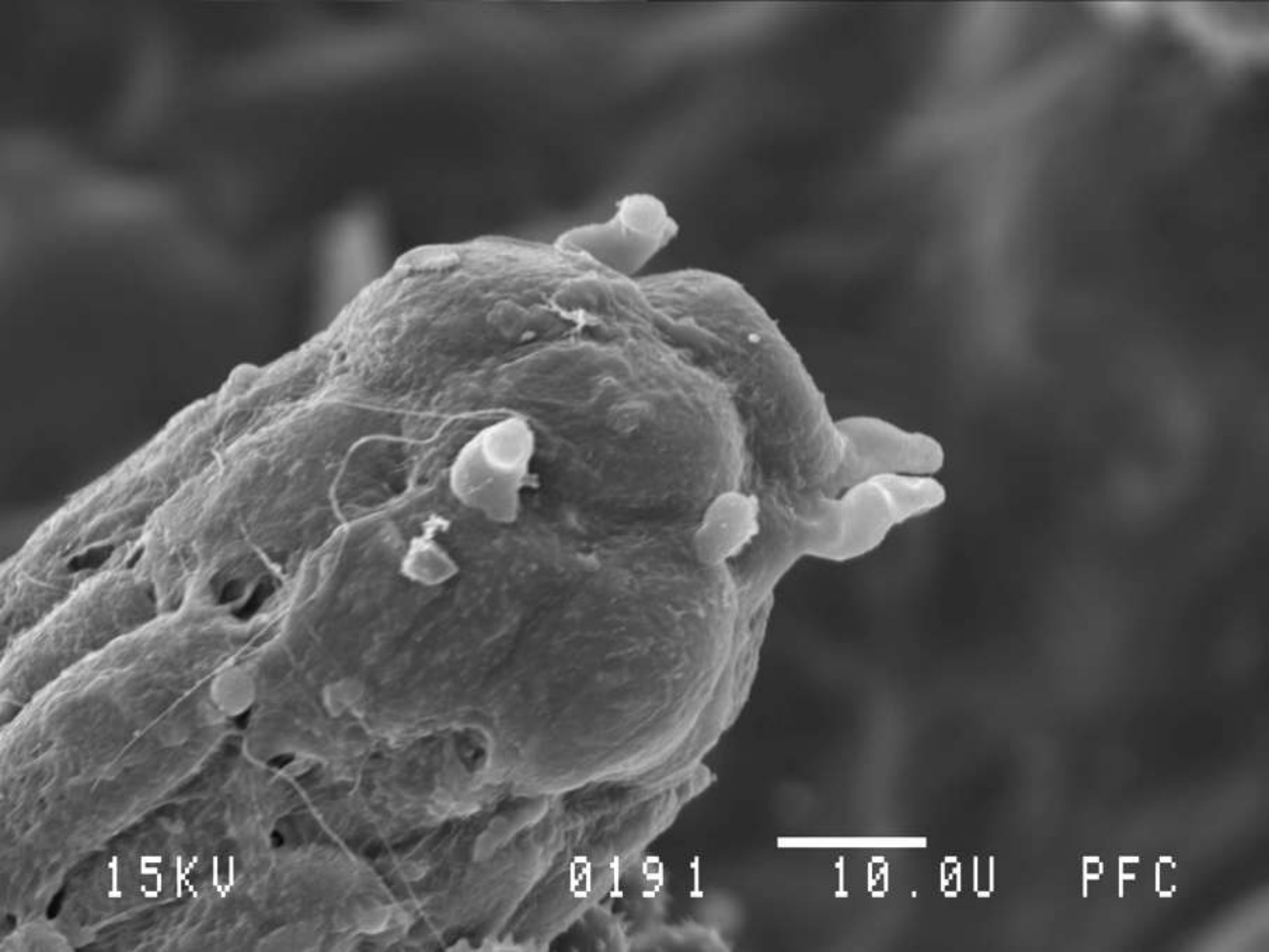





15KV
0190
10.0U
PFC



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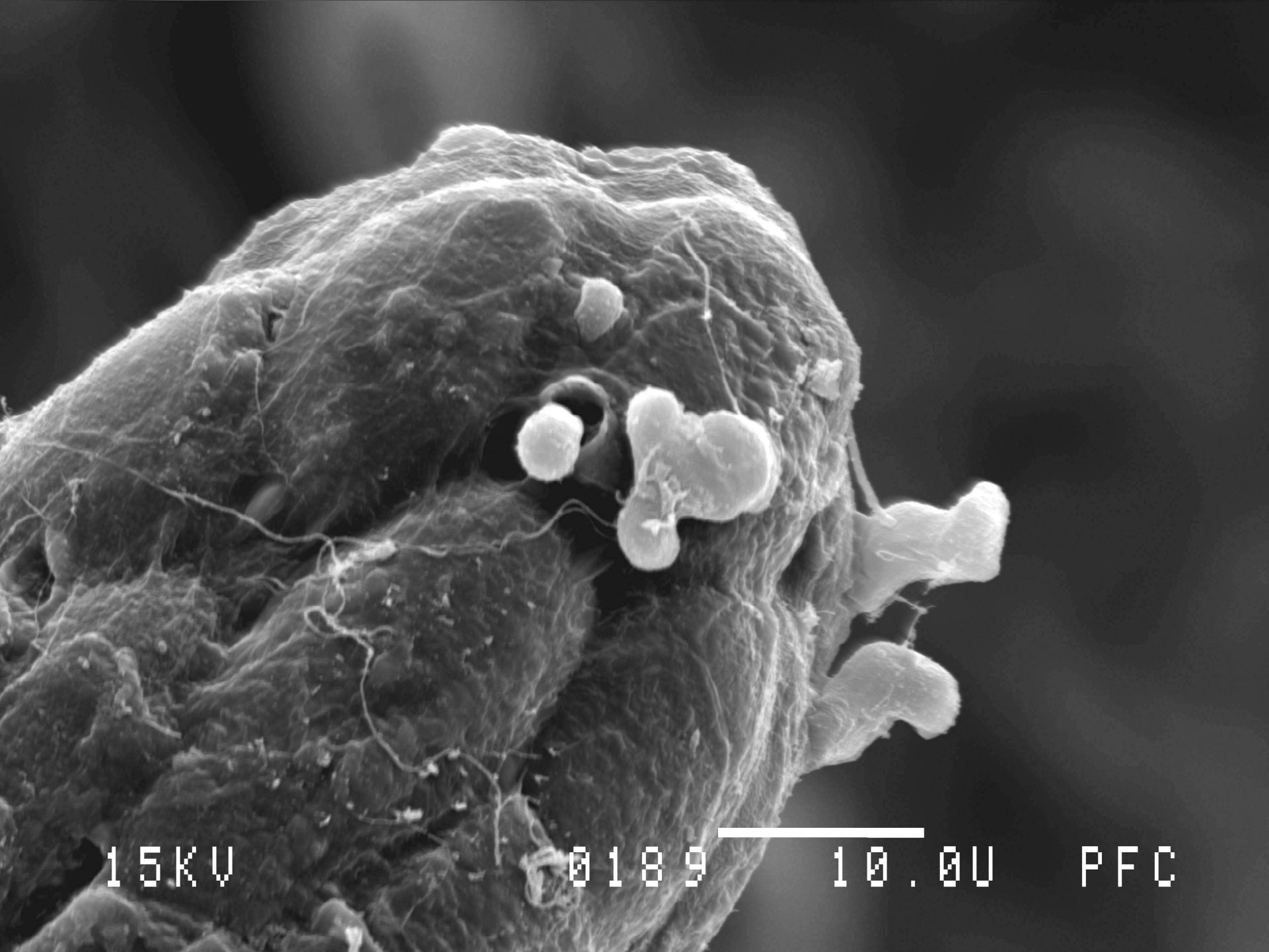
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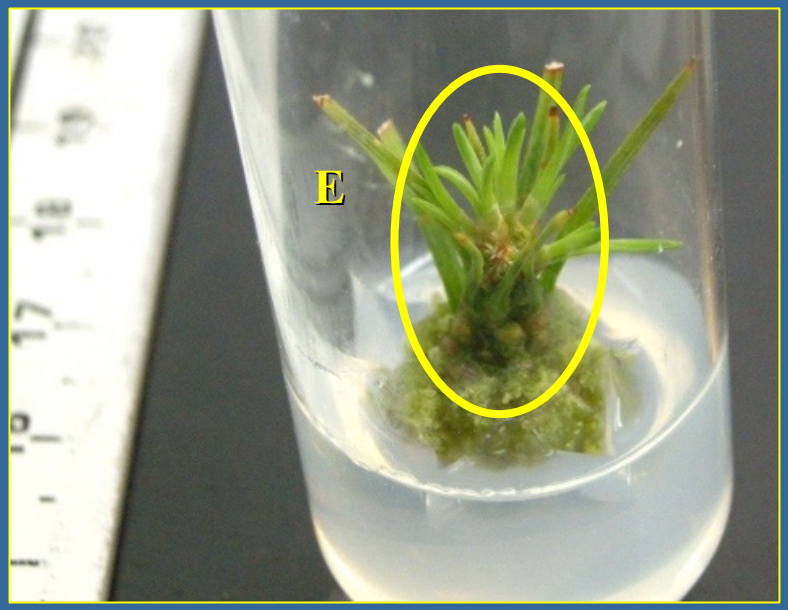
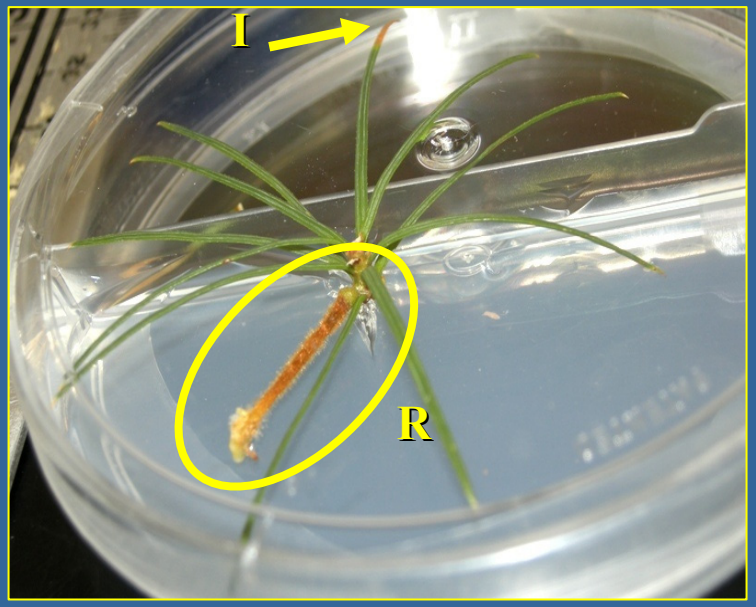
White pine *in vitro* Screening using tissue culture techniques

(A)

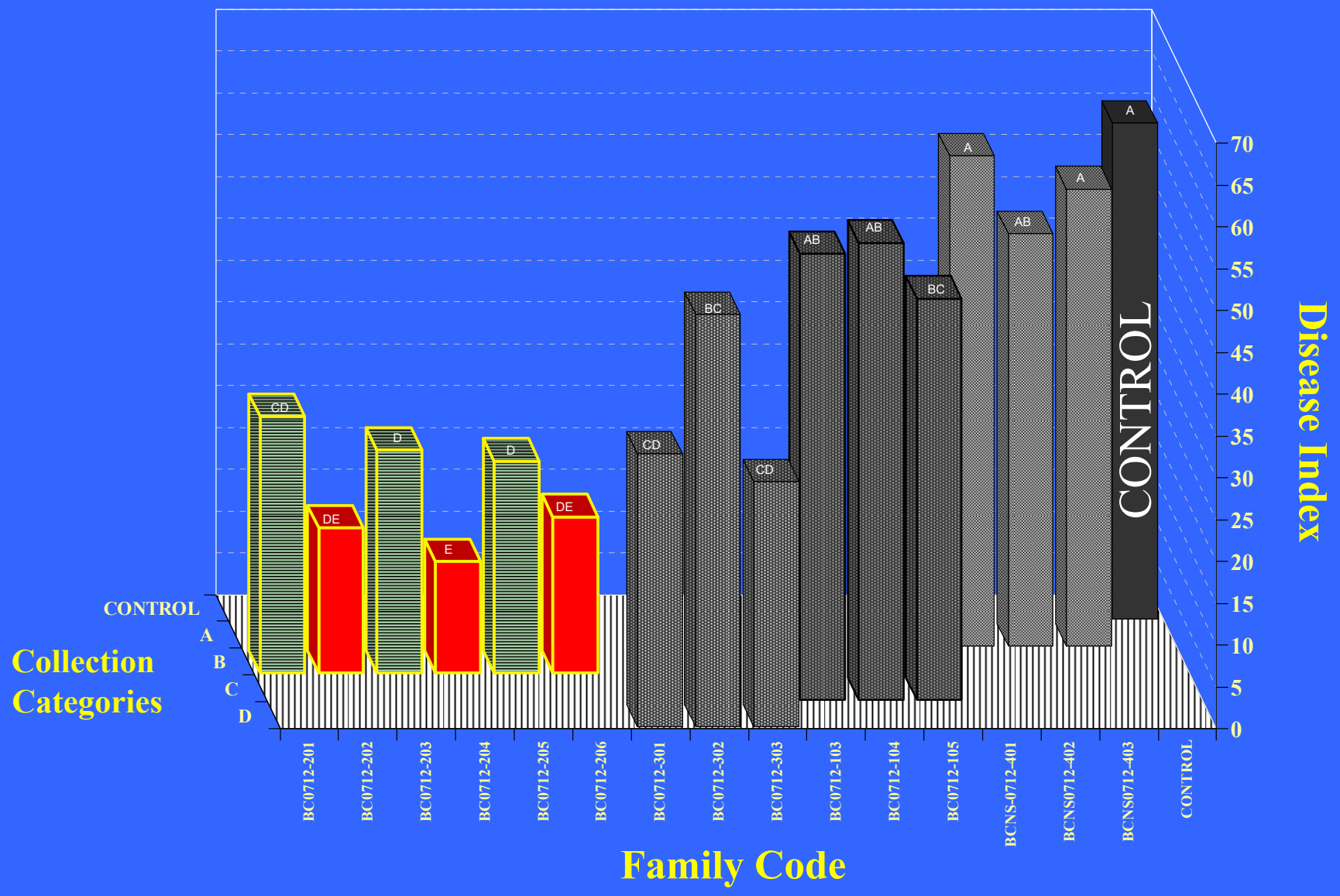


(B)

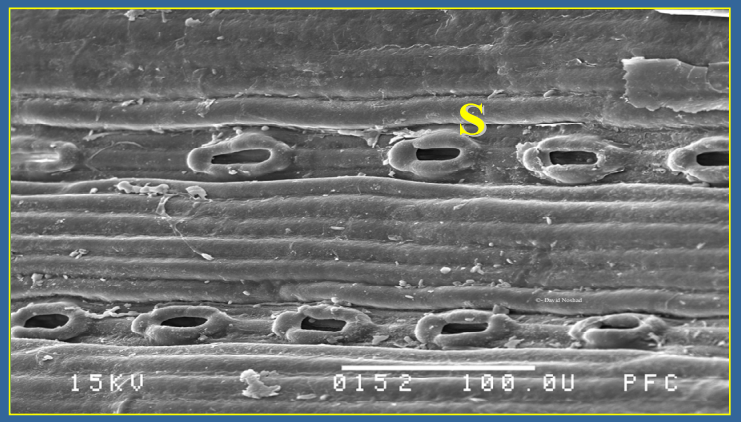


A& B. White pine cloning for *in vitro* screen
E: adventitious embryo; I: inoculation spot; R: adventitious root

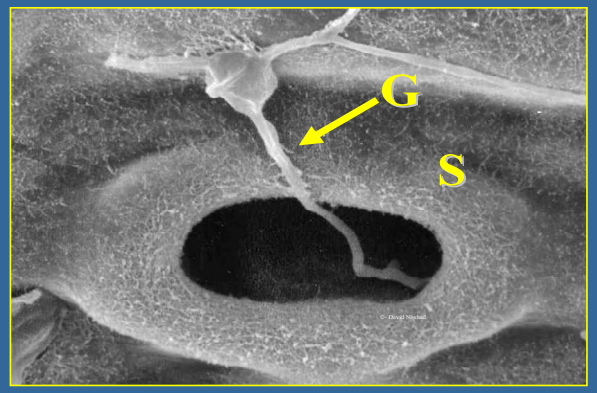
Western White Pine *In vitro* Screening



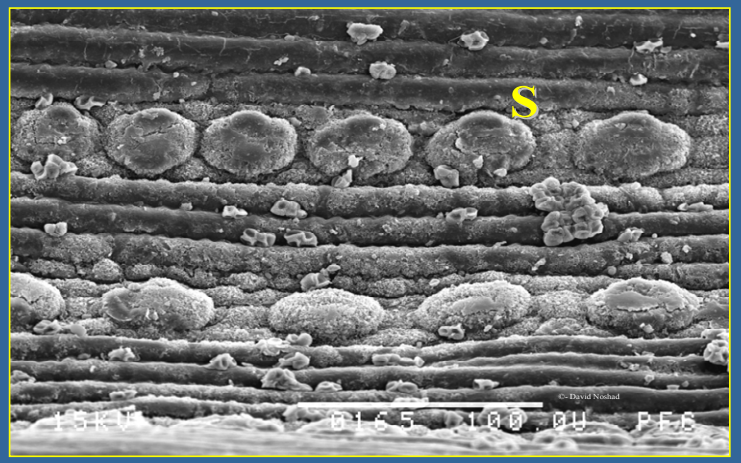
Control

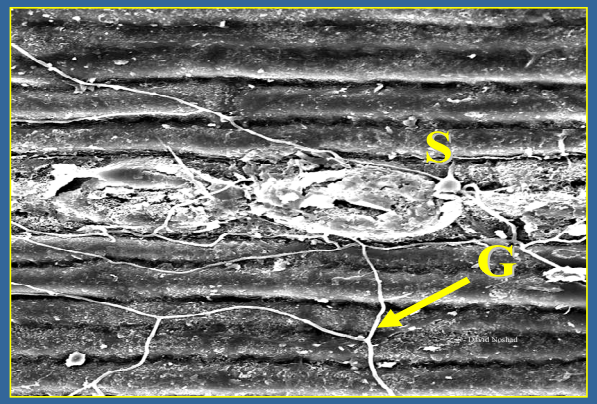


After Inoculation



Structural Defence Mechanism (SDM)





G: Germ tube; S: Stoma

Conclusions

- Axenic evaluation can minimize unwanted variations
- *In vitro* propagation can provide a large number of clones in a short period of time
- *In vitro* screening is a fast and cost effective method
- Other applications in the future e.g. transformation