

# Study of genetic diversity of six populations of the leaf spot and canker agent *Septoria musiva*.

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**Poplar trees are quite susceptible to a wide range of pathogens :**

Leaf and shoot blight, *Venturia spp.*

Poplar leaf rust, *Melampsora spp.*

Canker and poplar leaf spot, *Septoria musiva*



**Total resistance for *M. larici-populina* :**  
**« The European Experience »**

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**Virulence**

**Year**

**Cultivar**

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**2**

**1986**

**Luisa  
Avanzo**

**7**

**1994**

**Beaupré**

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# 1969 = poplar breeding program (MRNQ)

Objectives :

1) hybrids well-adapted to different bioclimatic domains including the St. Lawrence River valley



2) Selection and deployment of durable resistance to *S. musiva*

Requires :

**Knowledge about genetic diversity of *S. musiva* populations**



Canker of young stem and trunk



Leaf spots



Stem breakage

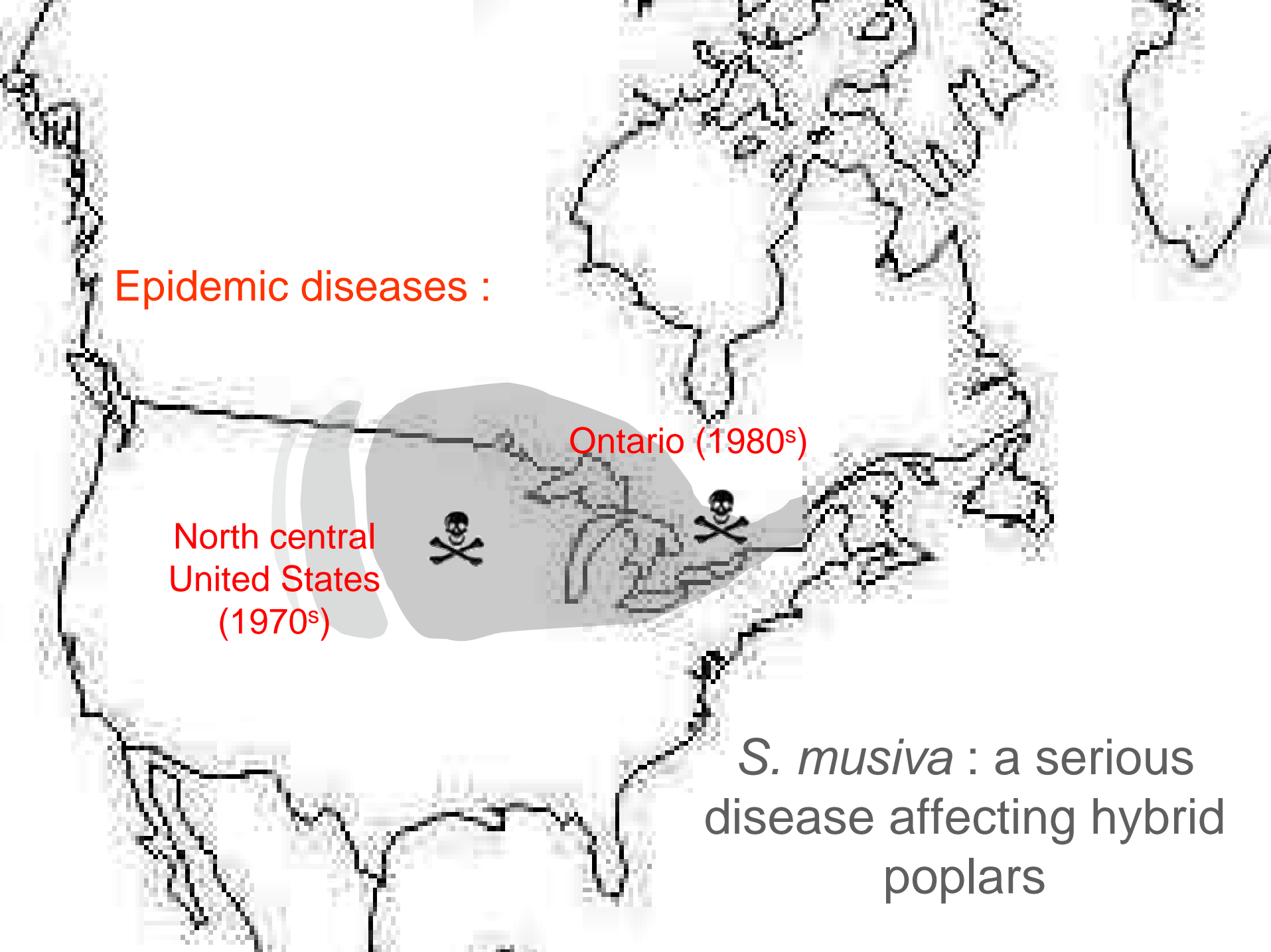
*Photo Jerry Weiland*

Epidemic diseases :

North central  
United States  
(1970<sup>s</sup>)

Ontario (1980<sup>s</sup>)

*S. musiva* : a serious  
disease affecting hybrid  
poplars



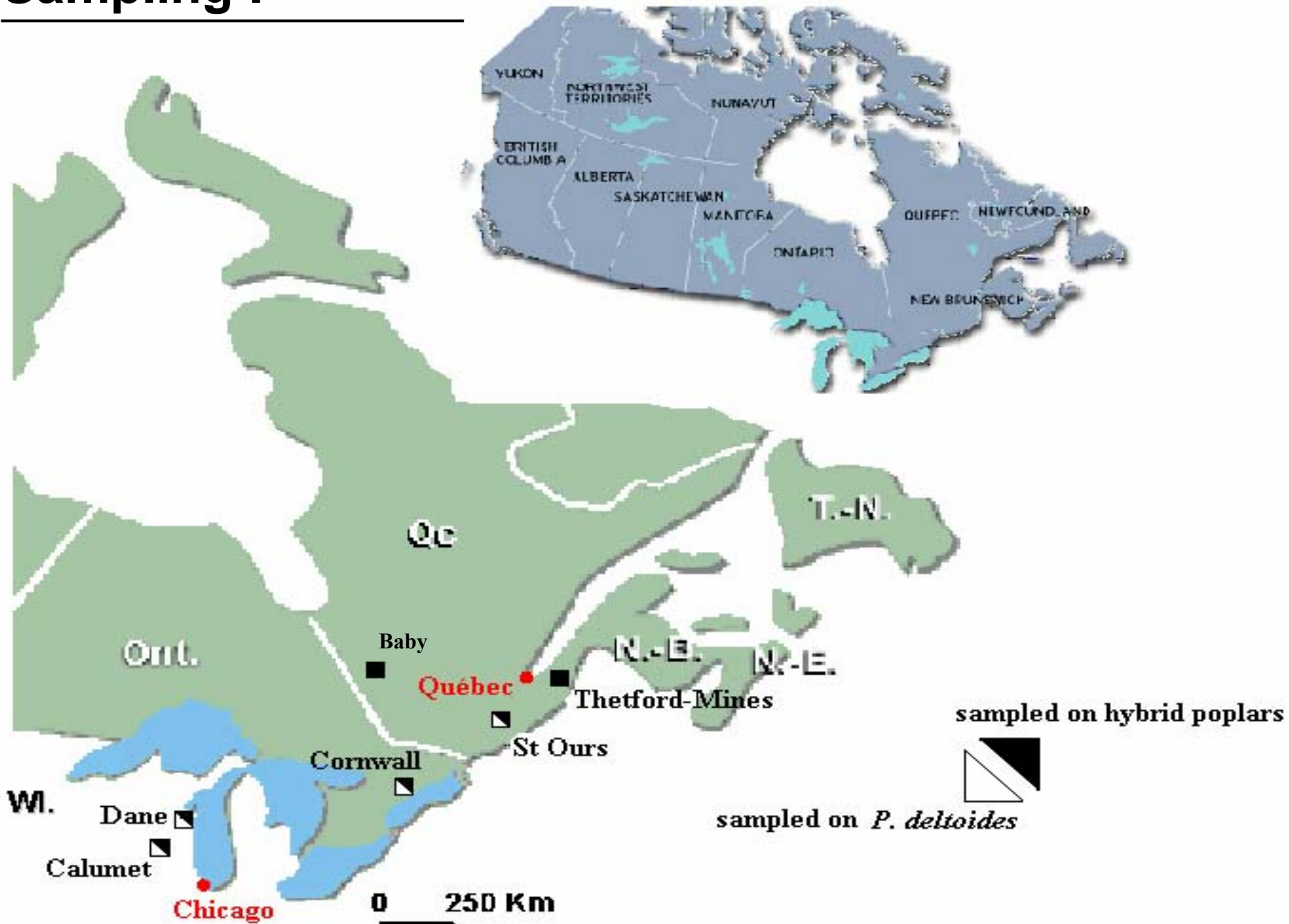
# Our Study :

**Genetic structure of *S. musiva*  
populations in central and eastern  
North America**

Sampling = 6 populations

Molecular markers = Polymerase Chain  
Reaction-RAPD

# Sampling :

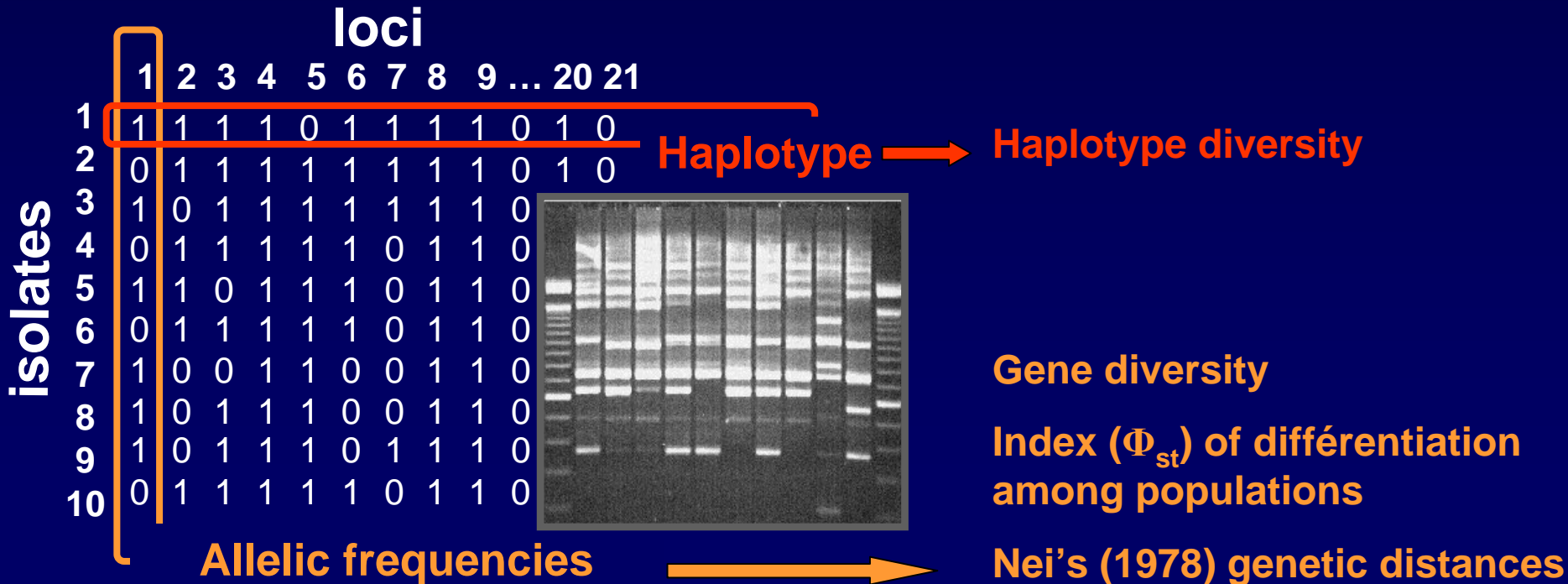
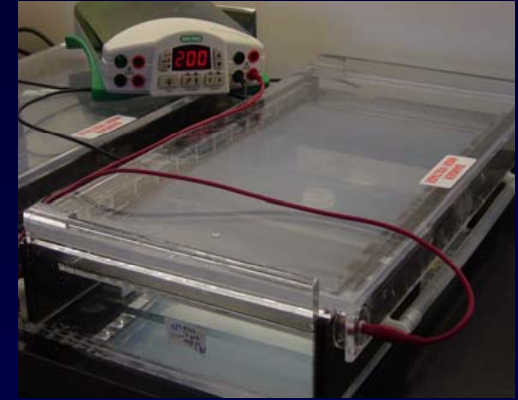


# Molecular markers :

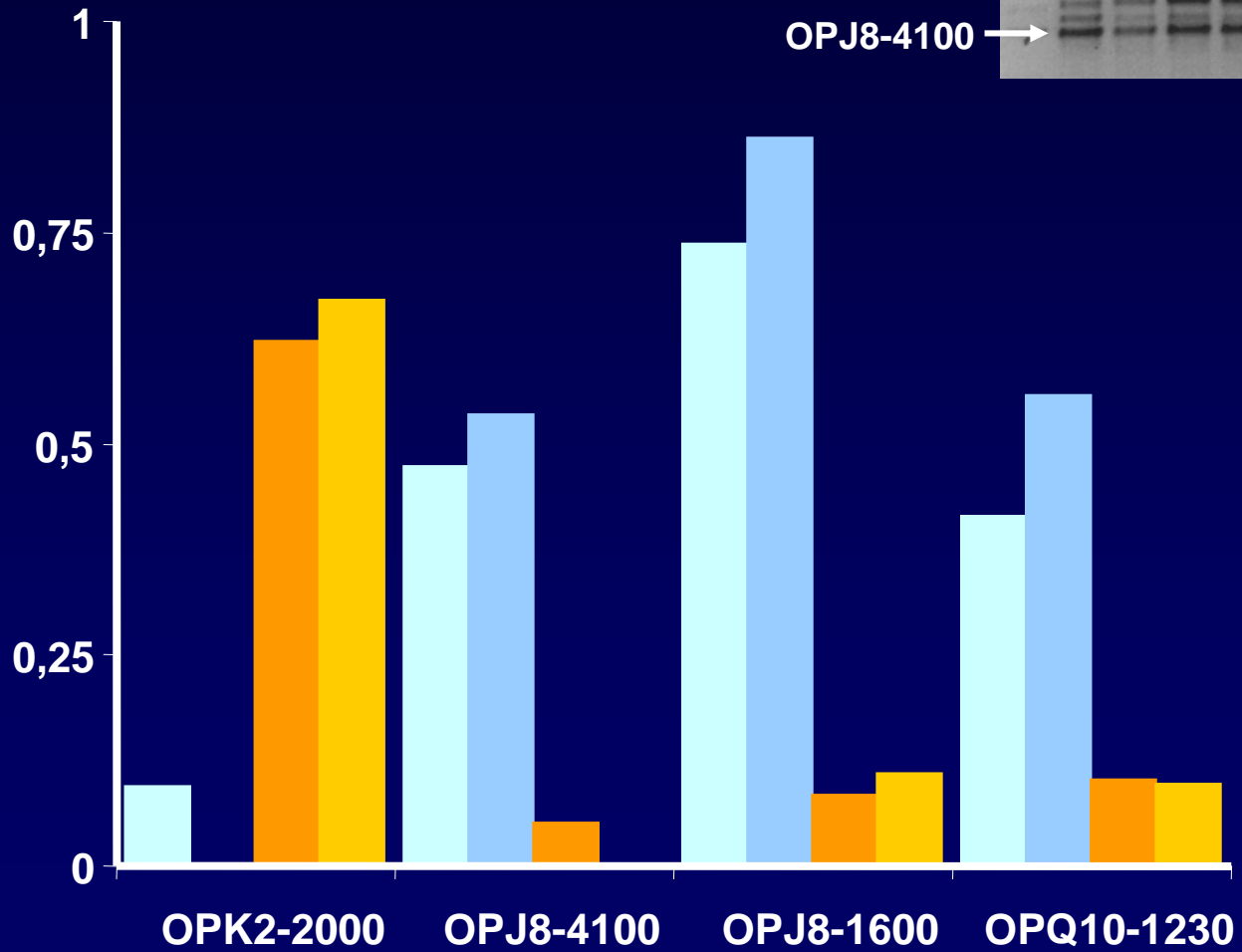
DNA extraction



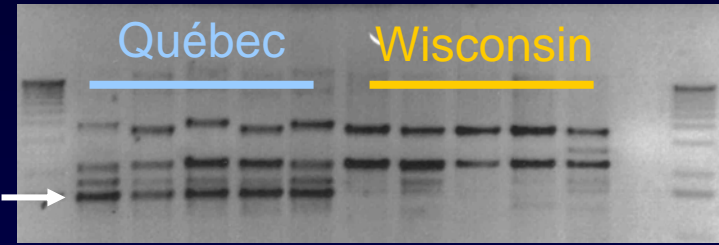
amplification  
of DNA by PCR-RAPD



Allele «1» frequency



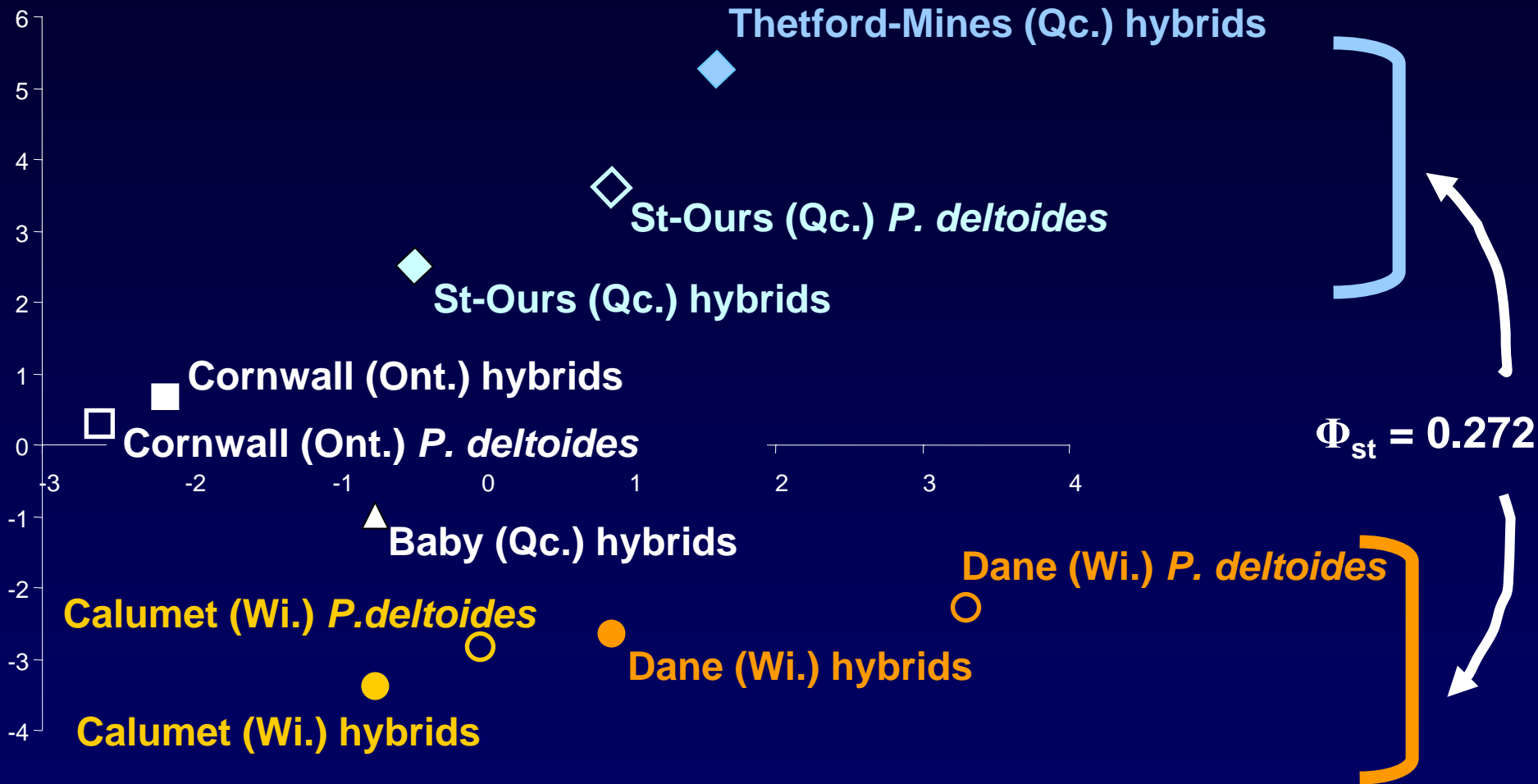
OPJ8-4100 →



- St. Ours
- Thetford-Mines
- Dane
- Calumet

# Structure of populations ?

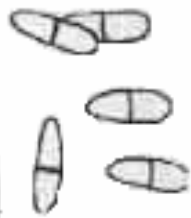
Results



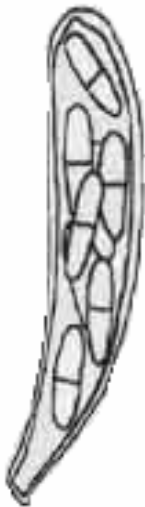
High differentiation between populations from  
Southern Québec and Wisconsin

# Does sexual recombination occur in *S. musiva* populations ?

## Yes !



Ascus and Ascospores



Sexual Stage :

[*Mycosphaerella populorum*]



Pseudothecium

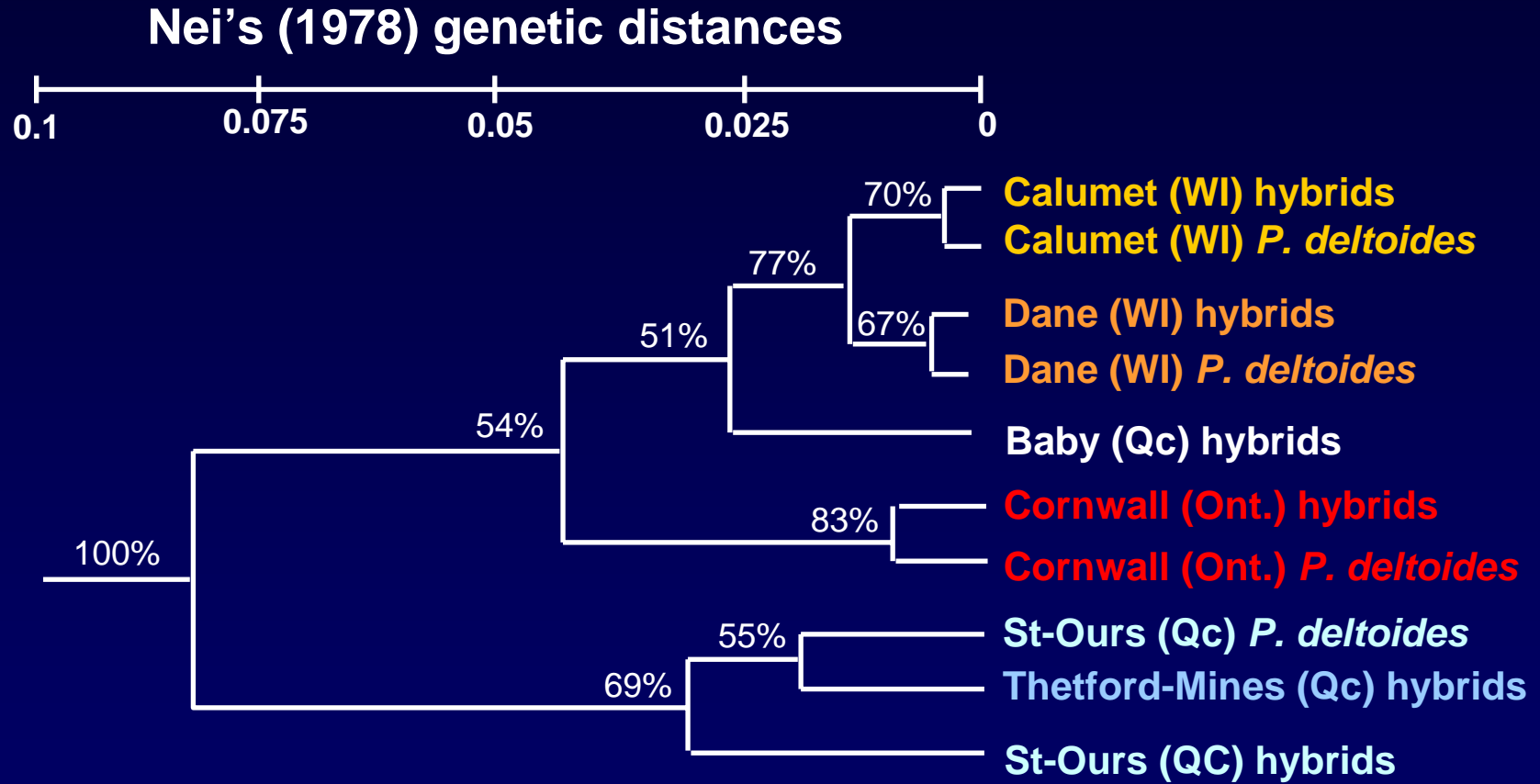
Population	No. Isolates	No. Haplotypes
StOurs	53	50
Thetford	43	40
Baby	18	17
Cornwall	29	29
Dane	66	59
Calumet	66	59

Total Heterozygosity = 0.28

Linkage disequilibrium in populations =  $7.3 < LD < 16.9$

# Differentiation between hybrid and wild populations ?

Results



Low differentiation between hybrid and its adjacent *P. deltoides* population

# Conclusion

- High differentiation between populations
- Sexual recombination occurs in each population

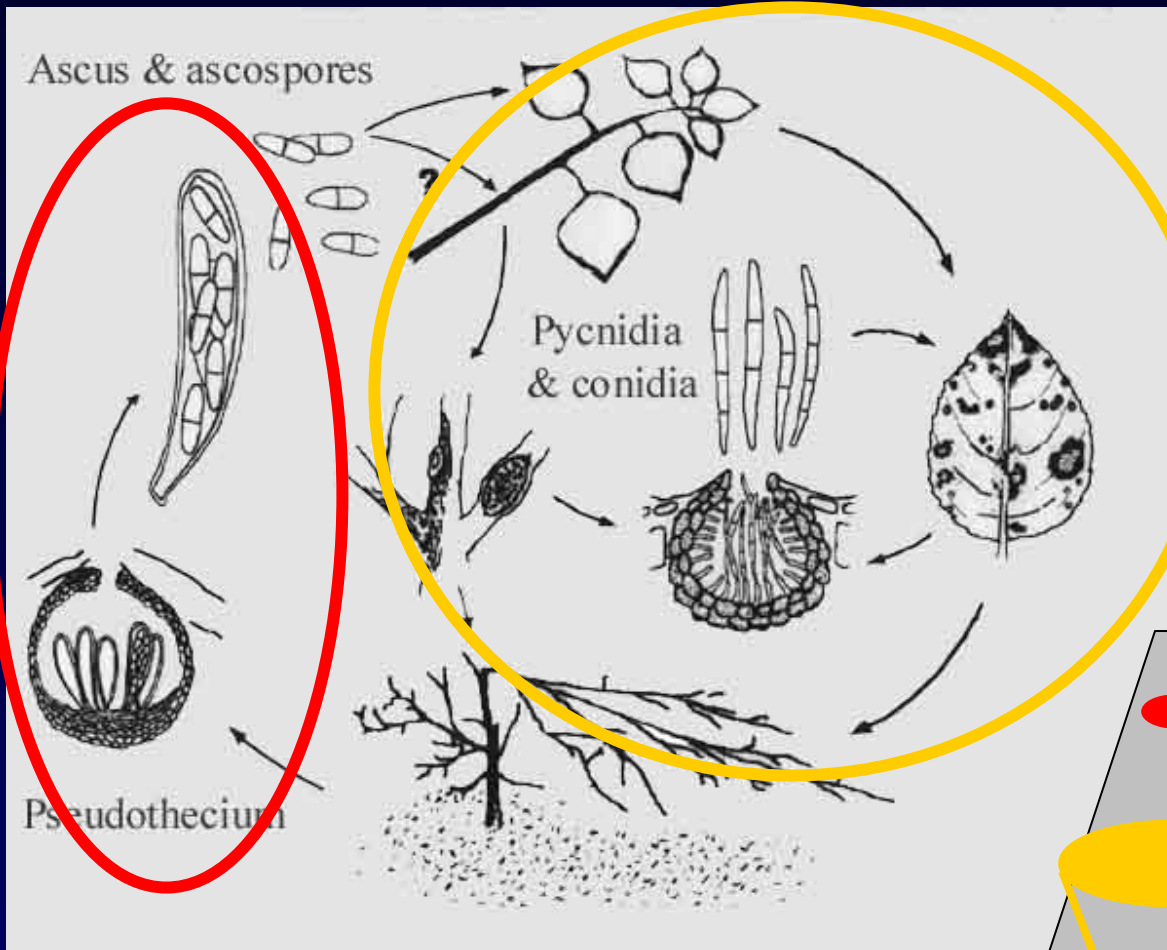
The concept of epidemiological units (Maynard Smith *et al.*, 2000) clearly applies to *S. musiva* populations

- Low differentiation between hybrid population and it adjacent *P. deltoides* population

Epidemiological unit = hybrid population + adjacent wild population

- high diversity and genetic recombination

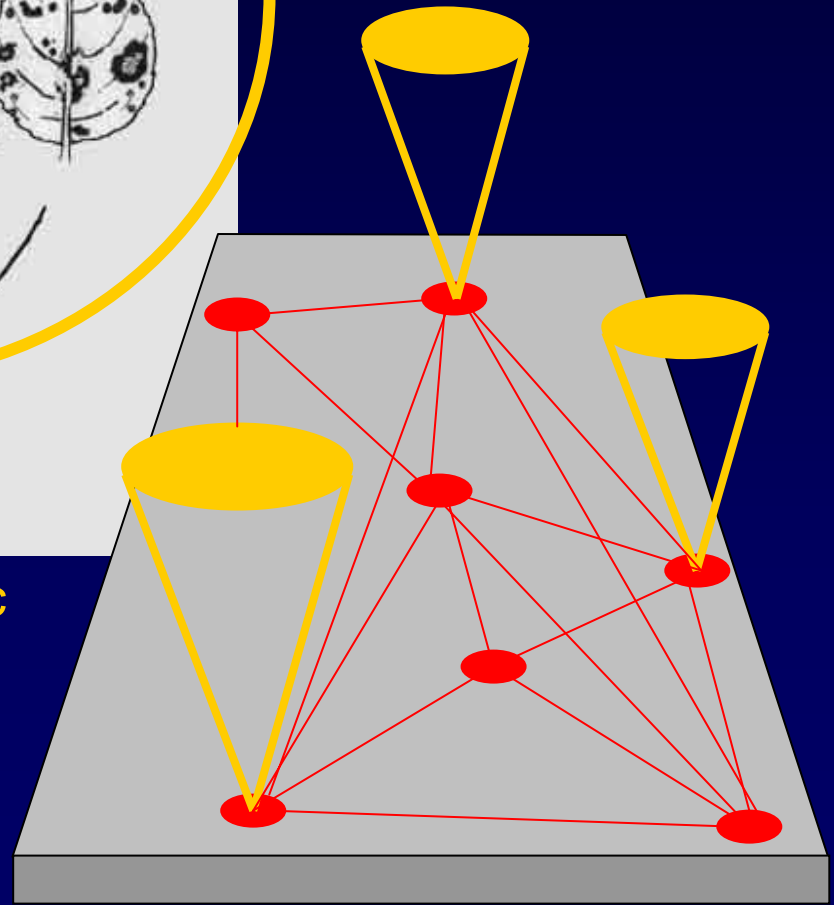
*S. musiva* have a high potential to evolve rapidly



« One epidemiological unit »

Sexual recombination

Asexual epidemic disease

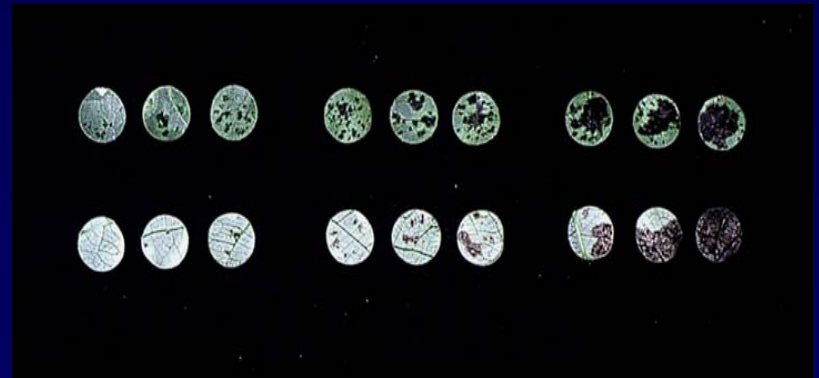


(Maynard Smith et al., 2000)

# Presence of epidemiological units imply :

- Deployment of well-adapted clones

- To asses other important characteristics such as virulence and agressiveness



# Conclusion

- High differentiation between populations
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The concept of epidemiological units (Maynard Smithe *et al.*, 2000) clearly applies to *S. musiva* populations

- **Low differentiation between hybrid population and it adjacent *P. deltoides* population**

**Epidemiological unit = hybrid population + adjacent wild population**

- **high diversity and genetic recombination**

***S. musiva* have a high potential to evolve rapidly**

# Acknowledgements

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