



# A Toxic Mushroom



**Dalal Alzabi**

Introduction to Genomics (485)

29 June 2021

# Outline

- Fun facts
- Genome paper
- General genomic information
- Biological sample
- Sequencing strategy
- Sequencing method
- Genome assembly
- Genome biological outcome



# Fun Facts

## *Moniliophthora perniciosa*

- *Perniciosa* = dangerous



# Fun Facts

- *M. perniciosus* is the causal agent of Witches Broom Disease (WBD) in cacao (*Theobroma cacao*)



# Fun Facts

- The distribution map of *M. perniciosus*



# Fun Facts

- It is a hemibiotrophic pathogen:



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- It is a hemibiotrophic pathogen:
  1. Biotrophic phase
    - Minimum damage of the host cells



# Fun Facts

- It is a hemibiotrophic pathogen:
  1. Biotrophic phase
    - Minimum damage of the host cells
  2. Necrotic phase
    - The host cells die





# Genome Paper

**BMC Genomics**



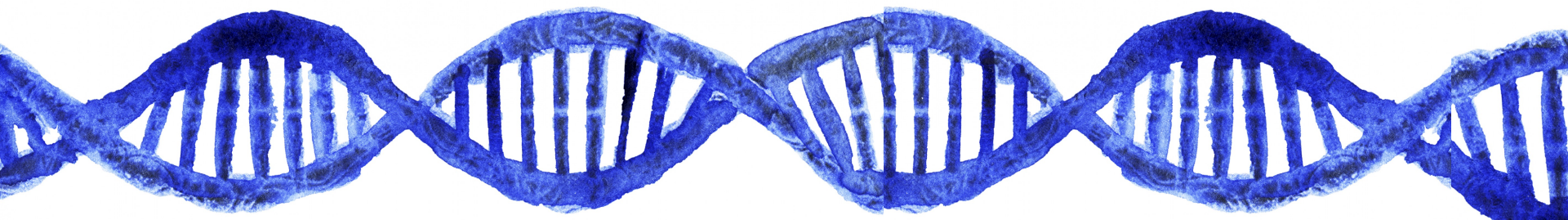
Research article

**Open Access**

## **A genome survey of *Moniliophthora perniciosa* gives new insights into Witches' Broom Disease of cacao**

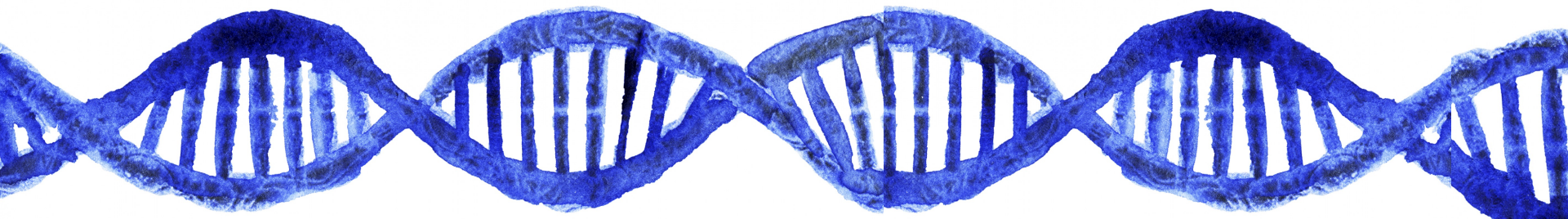
Jorge MC Mondego<sup>†1</sup>, Marcelo F Carazzolle<sup>†1</sup>, Gustavo GL Costa<sup>1</sup>, Eduardo F Formighieri<sup>1</sup>, Lucas P Parizzi<sup>1</sup>, Johana Rincones<sup>1</sup>, Carolina Cotomacci<sup>1</sup>, Dirce M Carraro<sup>2</sup>, Anderson F Cunha<sup>3</sup>, Helaine Carrer<sup>4</sup>, Ramon O Vidal<sup>1</sup>, Raíssa C Estrela<sup>1</sup>, Odalys García<sup>1</sup>, Daniela PT Thomazella<sup>1</sup>, Bruno V de Oliveira<sup>1</sup>, Acássia BL Pires<sup>5</sup>, Maria Carolina S Rio<sup>1</sup>, Marcos Renato R Araújo<sup>1</sup>, Marcos H de Moraes<sup>1</sup>, Luis AB Castro<sup>6</sup>, Karina P Gramacho<sup>7</sup>, Marilda S Gonçalves<sup>8</sup>, José P Moura Neto<sup>8</sup>, Aristóteles Góes Neto<sup>9</sup>, Luciana V Barbosa<sup>10</sup>, Mark J Gultinan<sup>11</sup>, Bryan A Bailey<sup>12</sup>, Lyndel W Meinhardt<sup>†12</sup>, Julio CM Cascardo<sup>†5</sup> and Gonçalo AG Pereira<sup>\*1</sup>

# General Genomic Information



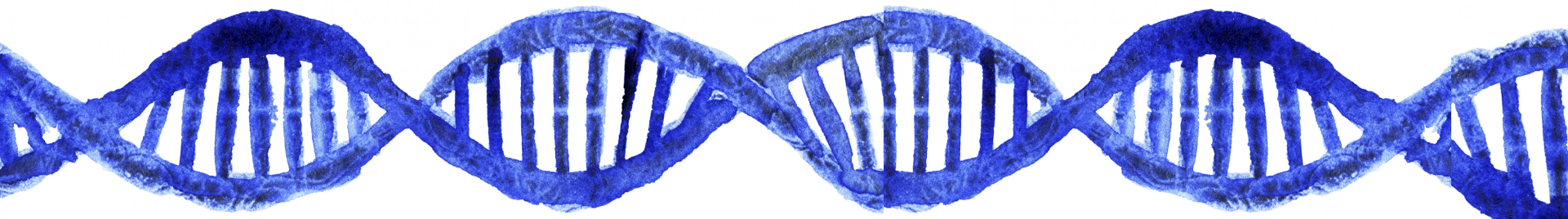
# General Genomic Information

- 39 Mb



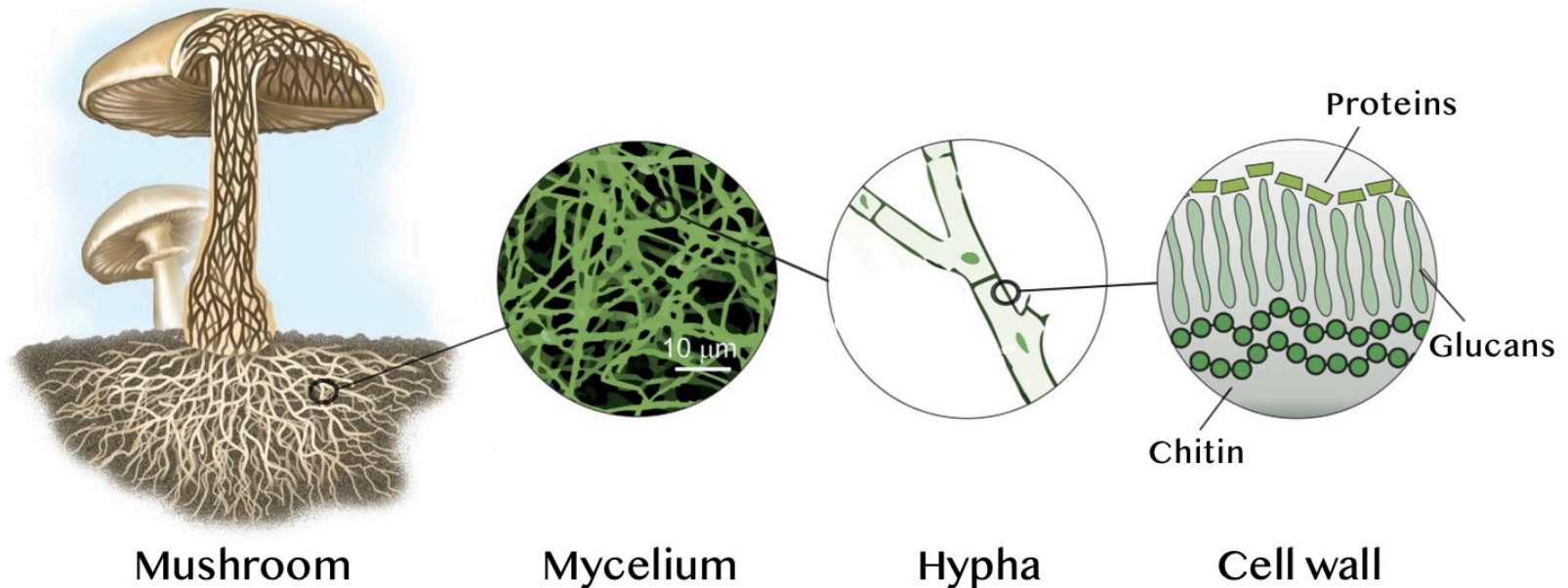
# General Genomic Information

- 39 Mb
- 8 chromosomes



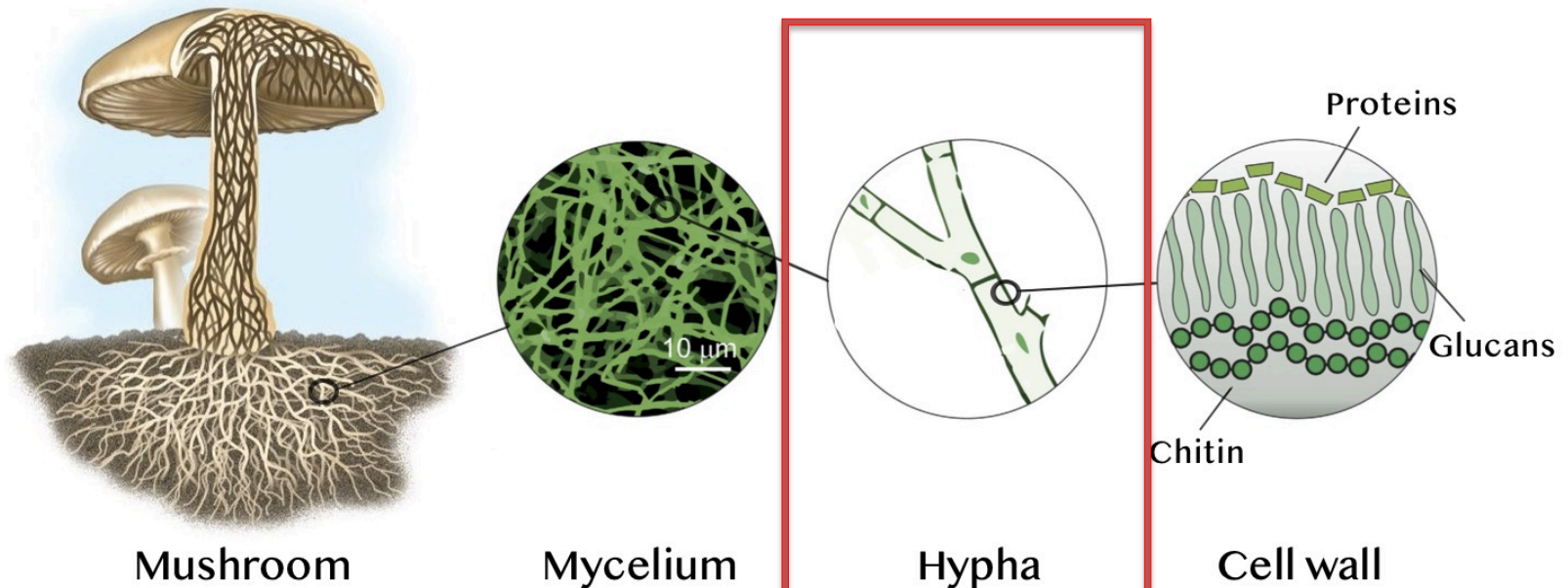
# Biological Sample

- Hyphae



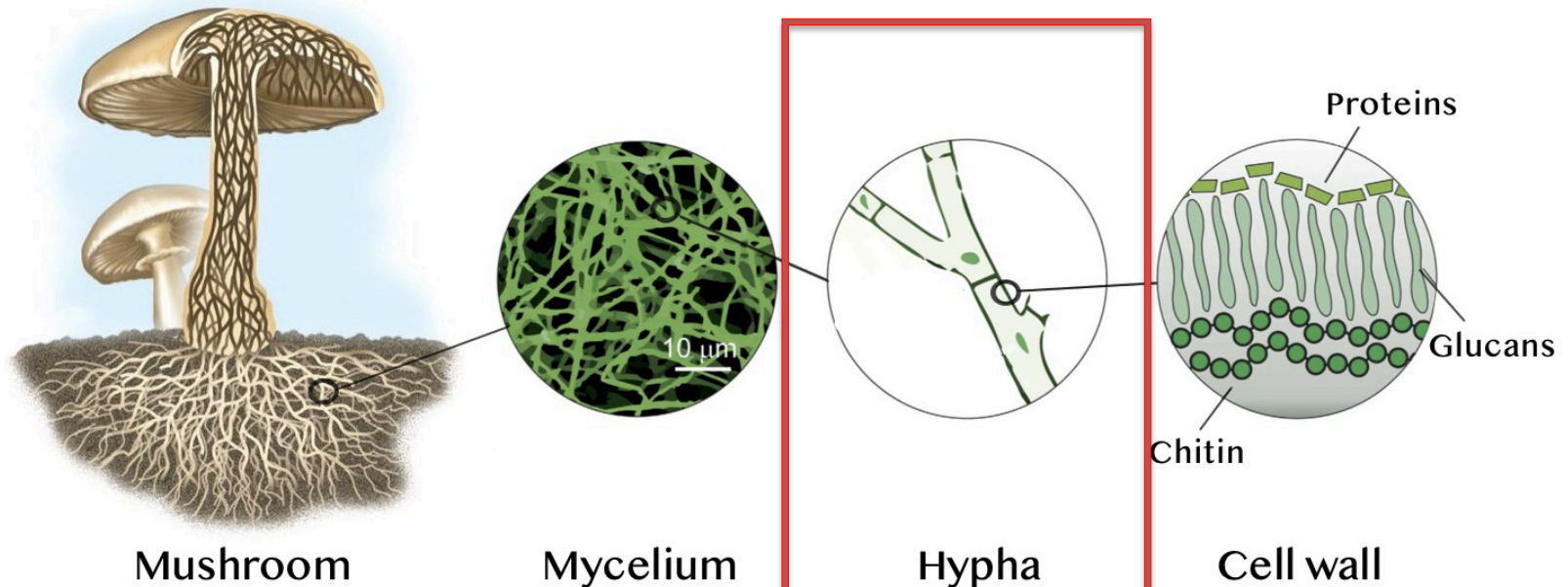
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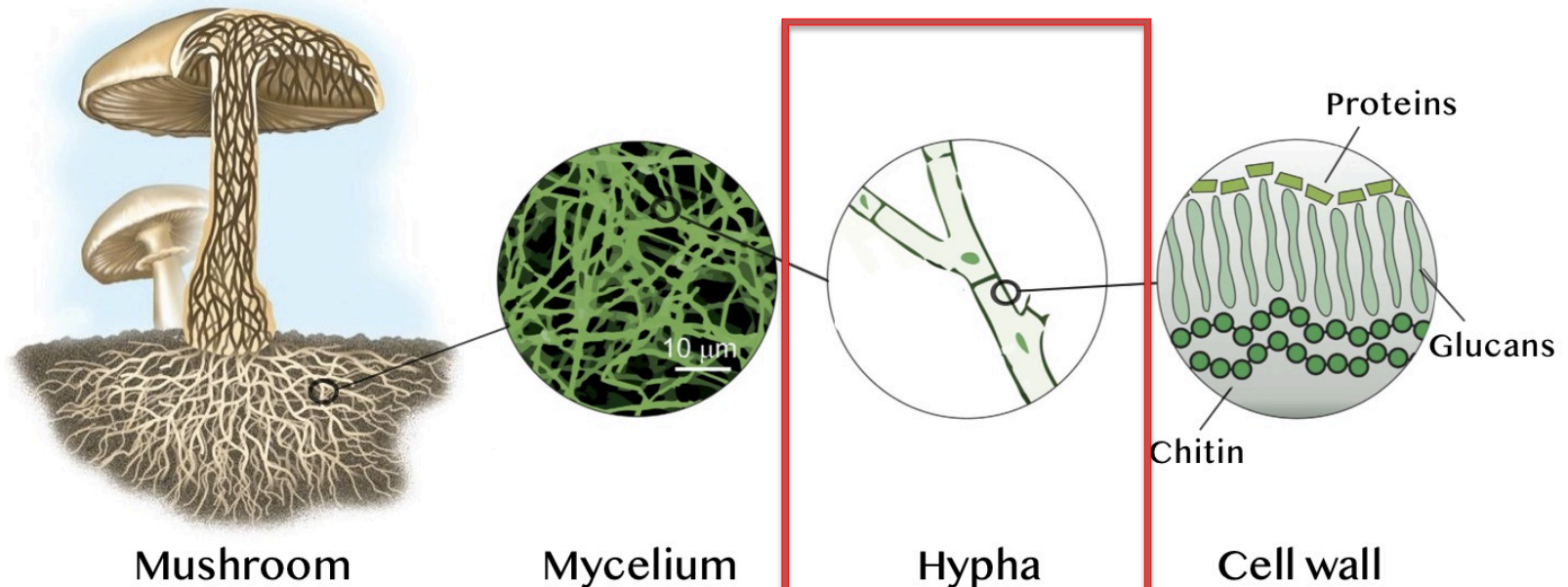
# Biological Sample

- Hyphae
  - Thread-like filaments made up of fungal cells



# Biological Sample

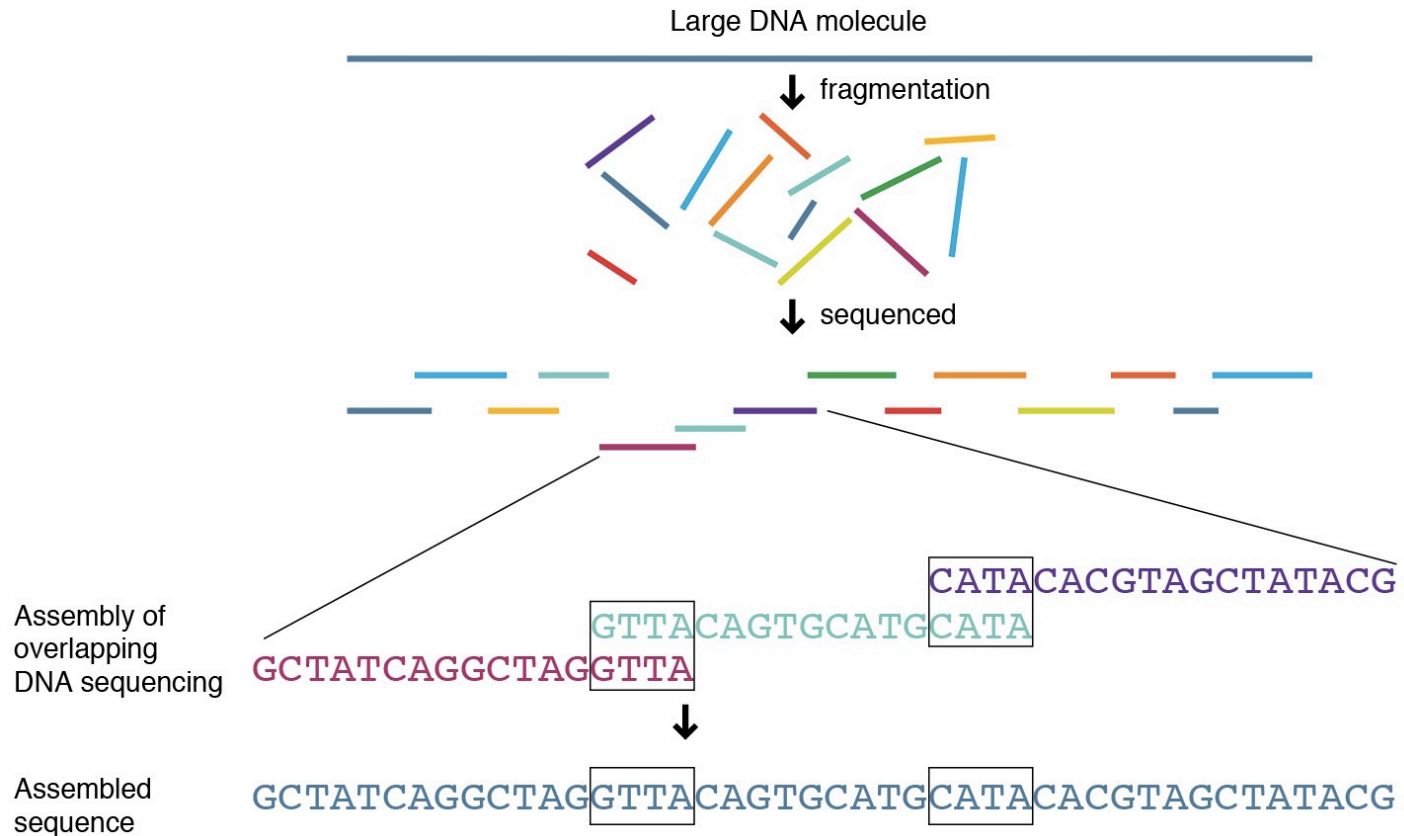
- Hyphae
  - Thread-like filaments made up of fungal cells
  - Building blocks of the fungus





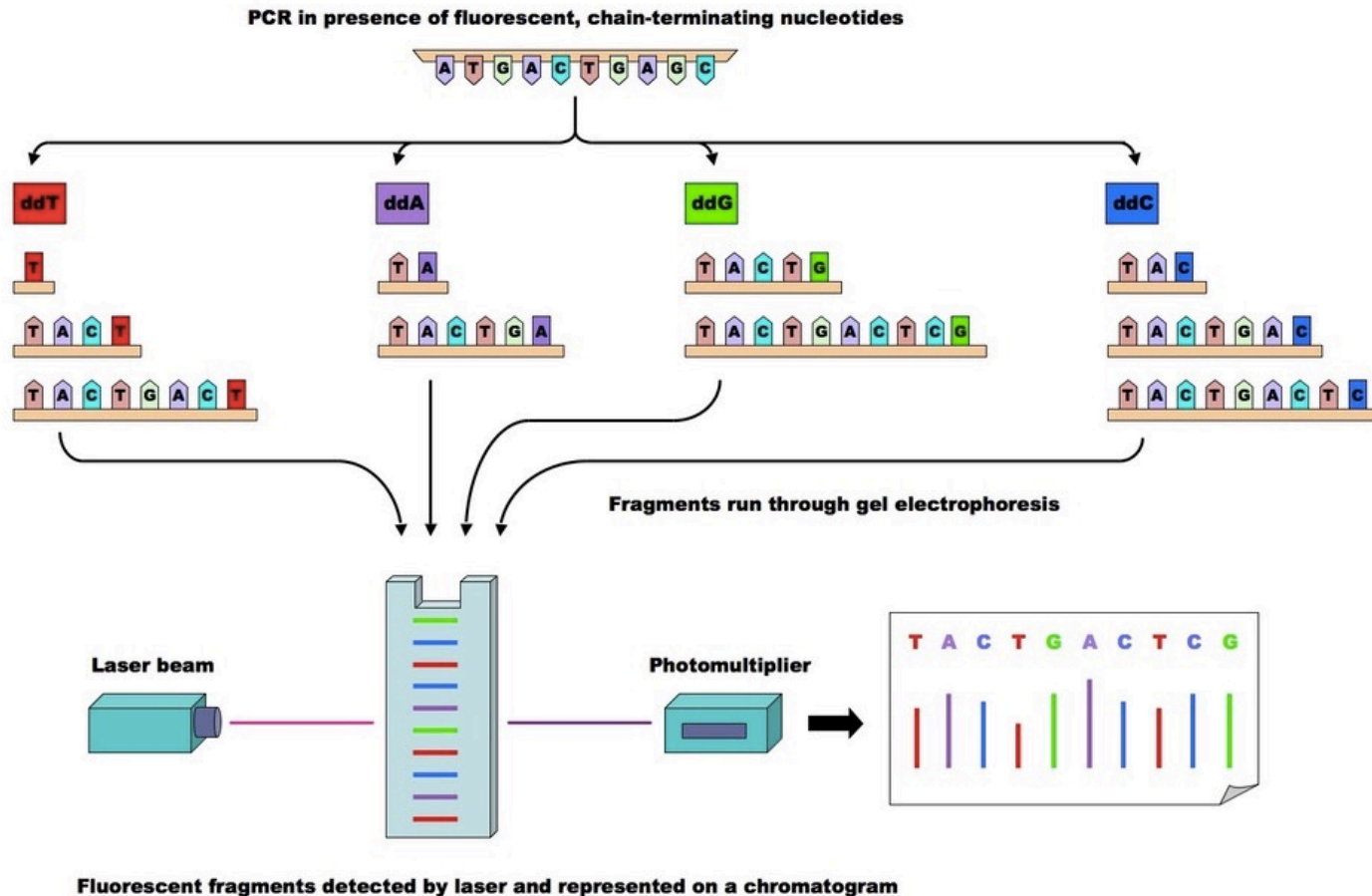
# Sequencing Strategy

- Whole genome shotgun



# Sequencing Method

- Sanger sequencing method



# Genome Assembly

- Genome coverage: 1.92X
- 124,000 reads were obtained
- The reads were assembled into 17,991 contigs using PHRAP assembly
  - Average contig length: 1,300 bp
  - Largest contig length: 25,400 bp



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# Genome Biological Outcome

- *M. pernicioso* has high genetic variability due to the presence of **retrotransposons** and this variability makes it more resistant to the cacao genotypes



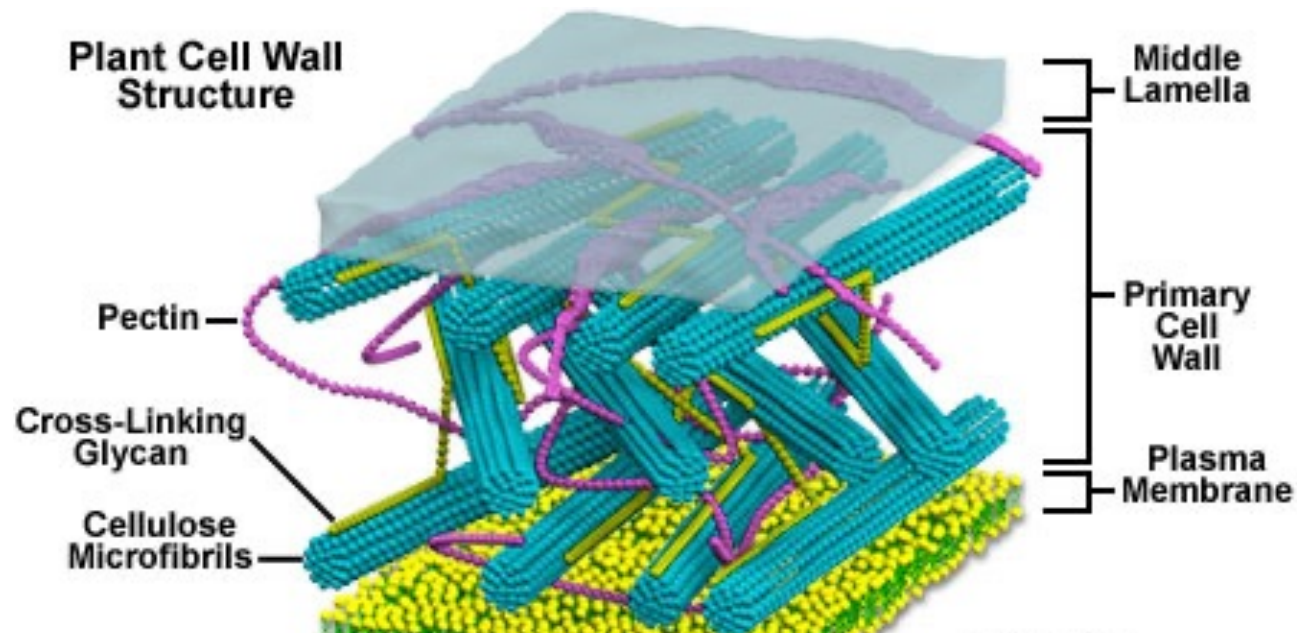
# Genome Biological Outcome

- After analyzing the genome of *M. perniciosus* we found that there are 70 small proteins containing secretion signals and at least two cysteines which is a common trait of many proteins that are delivered into the host apoplast by phytopathogens



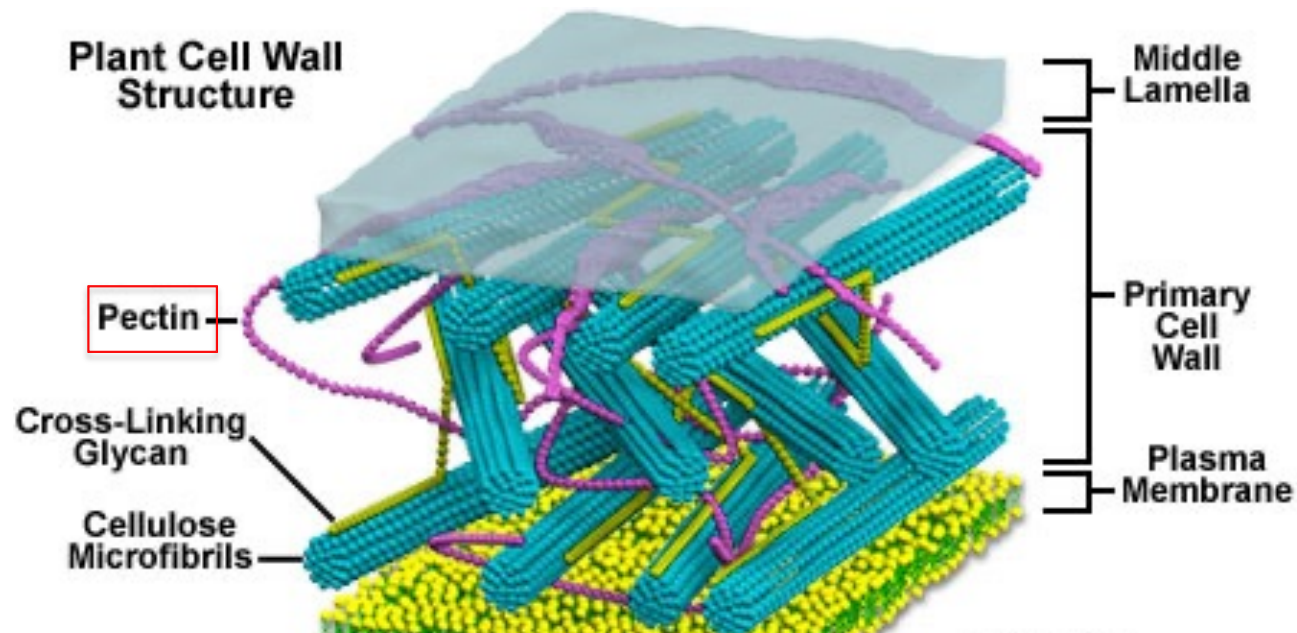
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- Genes encoding for plant cell wall degrading enzymes (PCWDE) were identified in the *M. perniciosus* genome
  - Pectate lyases cleaves pectin which is an essential component of plant cell walls



# Questions

- Explain Sanger sequencing method
- What is the importance of **retrotransposons** ?

