

## Background – *Sporisorium scitamineum*

- *Sporisorium scitamineum* is a fungus which systemically infects sugarcane tissue.
- Sugarcane smut is one of the main diseases of sugarcane, causing significant losses in productivity of this perennial crop.
- However, it has been observed that *S. scitamineum* excretes useful products, including different glycolipid biosurfactants.
- Traditionally, vegetable oils are required for glycolipid production. However, vegetable oils are expensive and complicates the downstream processing.
- *S. scitamineum* is well adapted to growth on sugars, the main carbon source available in sugarcane tissue.
- Therefore, this project investigated the production of glycolipid biosurfactants by cultivating *S. scitamineum* on various sugars.

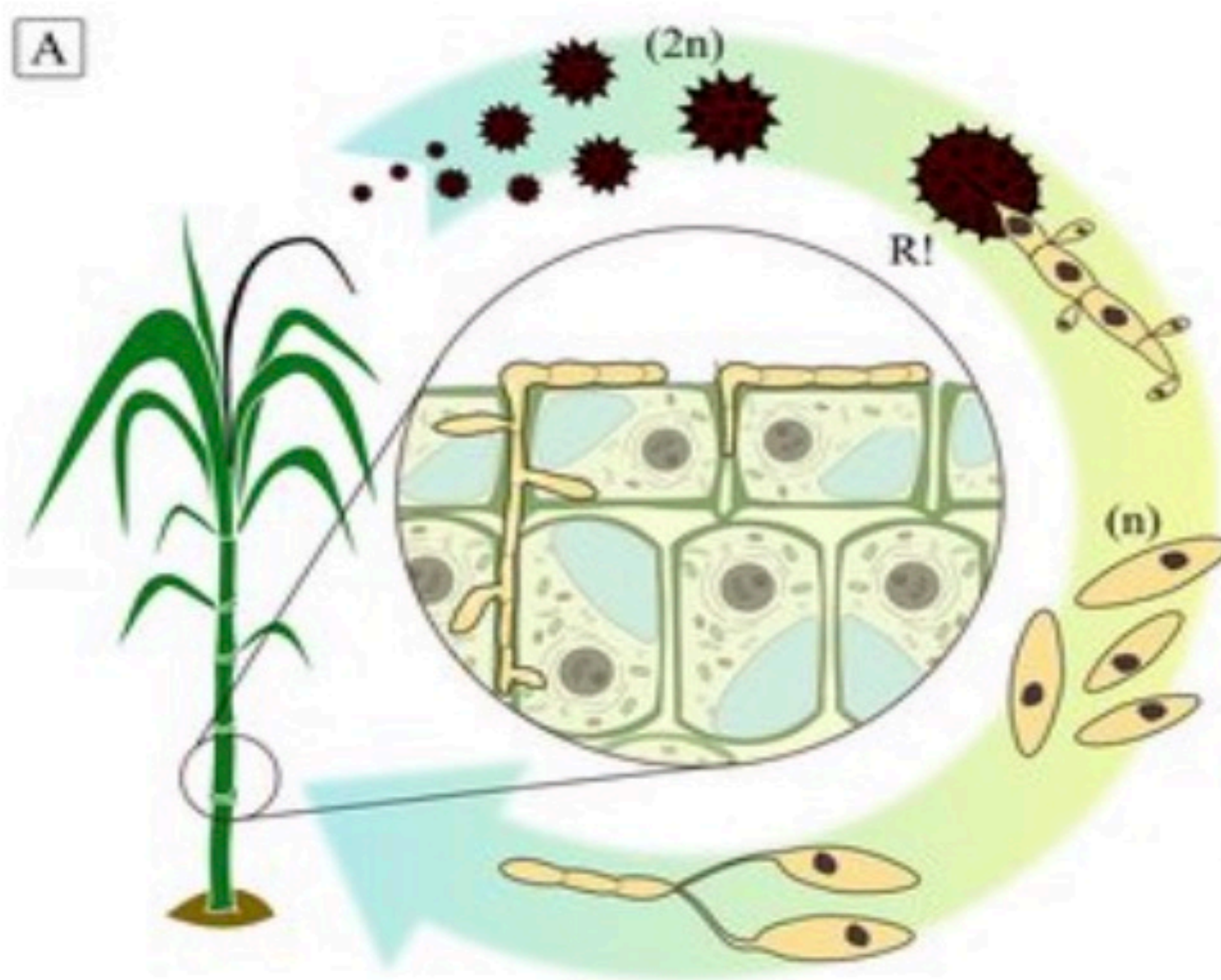


Figure 1: Life cycle of *Sporisorium scitamineum* (Taniguti et al., 2015)

## Background – Glycolipid biosurfactants

### Mannosylerythritol lipids:

- MELs possess a hydrophilic moiety, consisting of 4-O-β-D-mannopyranosyl-D-erythritol, attached to various fatty acids.
- MELs are ideal for cosmetic applications.

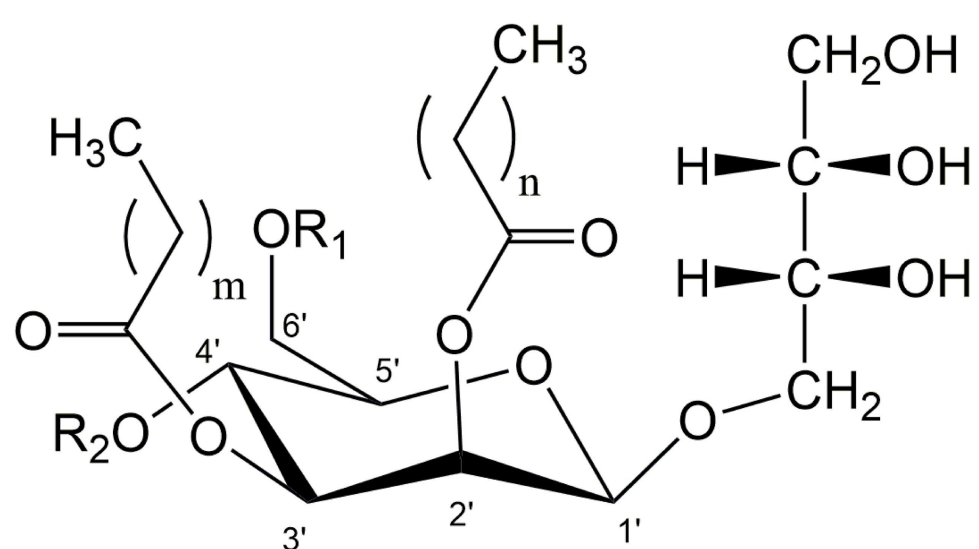


Figure 2: General structure of MELs (Beck et al., 2020)

### Cellobiose lipids:

- CBLs possess a cellobiose moiety, consisting of two glycosidically linked glucose molecules, attached to a fatty acid chain.
- CBLs have excellent antifungal properties.

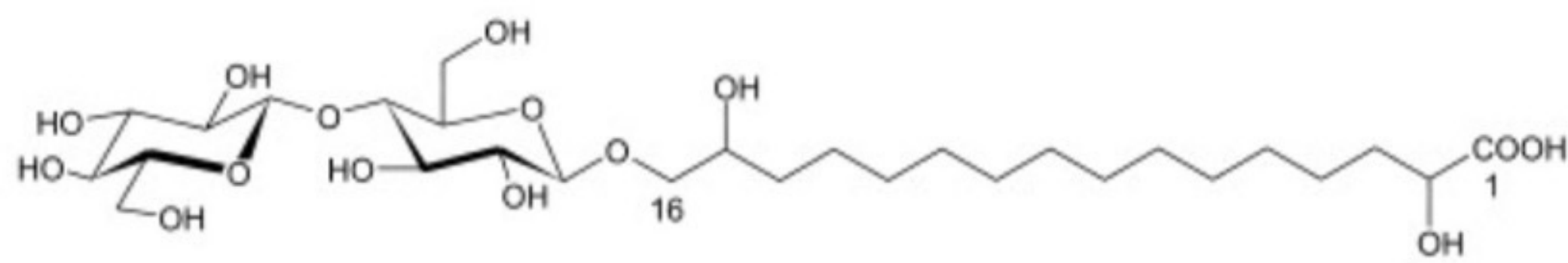


Figure 3: General structure of CBLs (Oraby et al., 2020)

## Aim & Objectives

### Aim:

- Investigate the potential of producing glycolipid biosurfactants by cultivating a wild strain of *S. scitamineum* on hydrophilic carbon sources.

### Objectives:

- Isolate a wild strain of *S. scitamineum* from infected sugarcane samples provided by the South African Sugarcane Research Institute (SASRI).
- Investigate the growth of *S. scitamineum* on pure hydrophilic carbon sources, as well as sugarcane molasses.
- Investigate the production of glycolipids from the hydrophilic carbon sources.

## References

- Beck, A., & Zibek, S. (2020). Growth Behavior of Selected Ustilaginaceae Fungi Used for Mannosylerythritol Lipid (MEL) Biosurfactant Production – Evaluation of a Defined Culture Medium. *Frontiers in Bioengineering and Biotechnology*, 8, 555280. <https://doi.org/10.3389/fbioe.2020.555280/BIBTEX>
- Oraby, A., Werner, N., Sungur, Z., & Zibek, S. (2020). Factors Affecting the Synthesis of Cellobiose Lipids by *Sporisorium scitamineum*. *Frontiers in Bioengineering and Biotechnology*, 8. <https://doi.org/10.3389/fbioe.2020.555647>
- Taniguti, L.M. et al. (2015) 'Complete genome sequence of sporisorium scitamineum and biotrophic interaction transcriptome with sugarcane', *PLOS ONE*, 10(6). <https://doi.org/10.1371/journal.pone.0129318>

## Methodology

### Isolate

- Drop spores from infected sugarcane samples on a specifically formulated agar solution.
- Sub-culture fungal growth spots.
- Verify the isolation by sequencing the genes of the isolated fungus.

### Grow

- Grow *S. scitamineum* wild-type on various pure hydrophilic carbon sources.
- Grow *S. scitamineum* on sugarcane molasses.

### Produce

- Investigate the production of MELs from the various hydrophilic carbon source-based growth mediums.

## Results

### Isolation:

- *S. scitamineum* wild-type was successfully isolate from sugarcane samples provided by SASRI.
- The genes were amplified with a MyTaq Plant PCR kit. and
- The amplified genes were sequenced and imported into the Basic Local Alignment Search Tool (BLAST) to verify the presence of *S. scitamineum*.

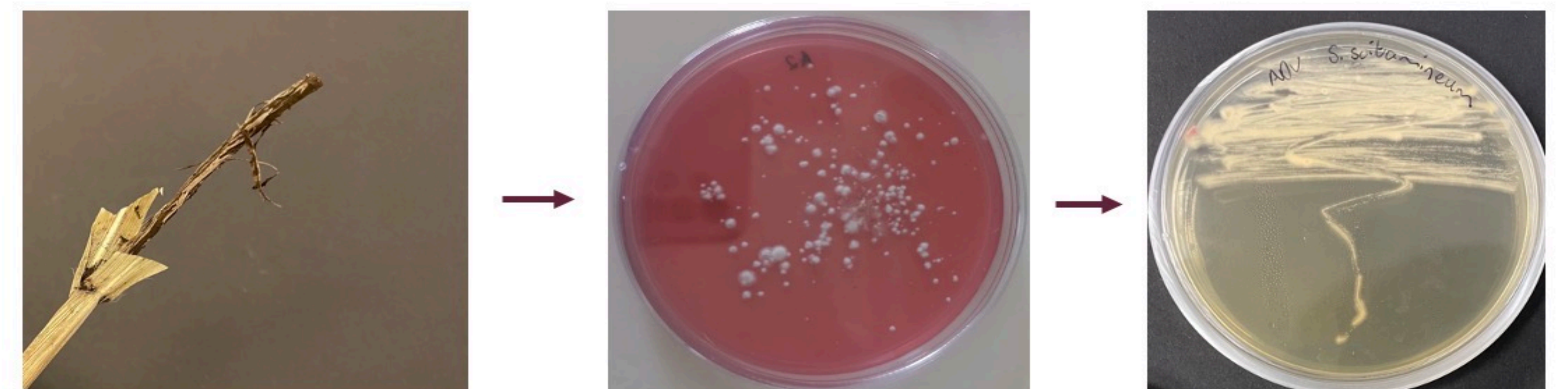
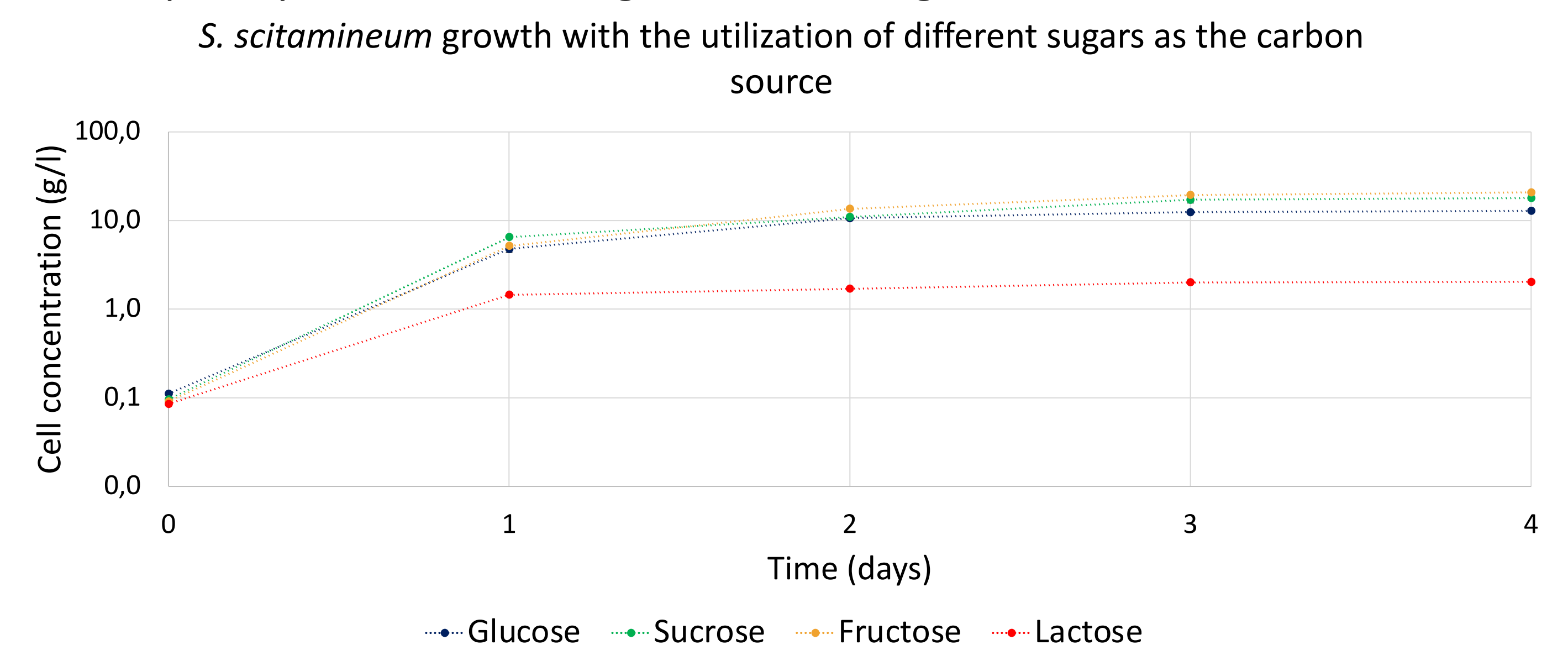


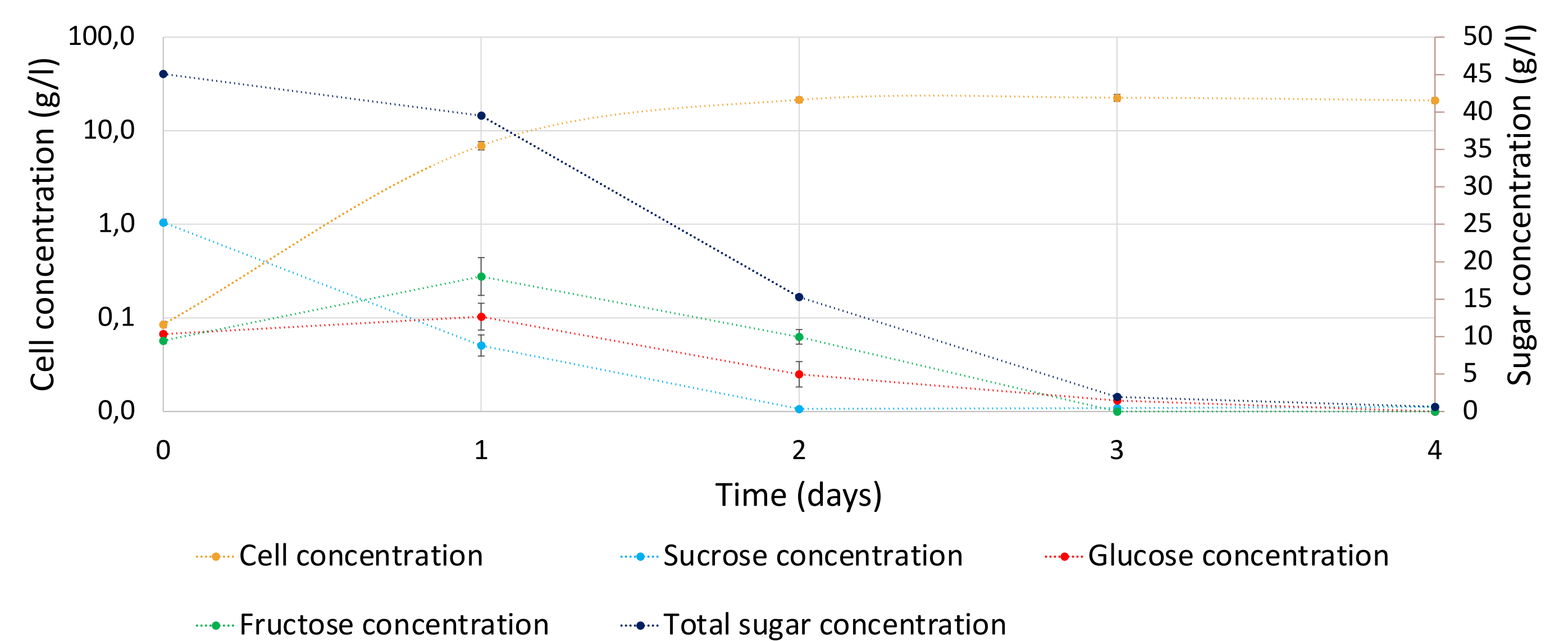
Figure 3: Experimental procedure implemented for the isolation of *S. scitamineum* wild-type

### Growth:

- *S. scitamineum* grew well on glucose, fructose and sucrose. Lactose didn't perform well.
- Subsequently, *S. scitamineum* grew well on sugarcane molasses



### *S. Scitamineum* growth with sugarcane molasses as the sole carbon source



### Production:

- So far, significant glycolipid production (< 0.5 g/l) could not be achieved on production mediums reported in literature.
- We are currently exploring different medium compositions and operating conditions.