



VALORIZATION OF WHEAT BRAN (WB) BYPRODUCT IN THE PRODUCTION OF *BTK* BASED BIOPESTICIDES



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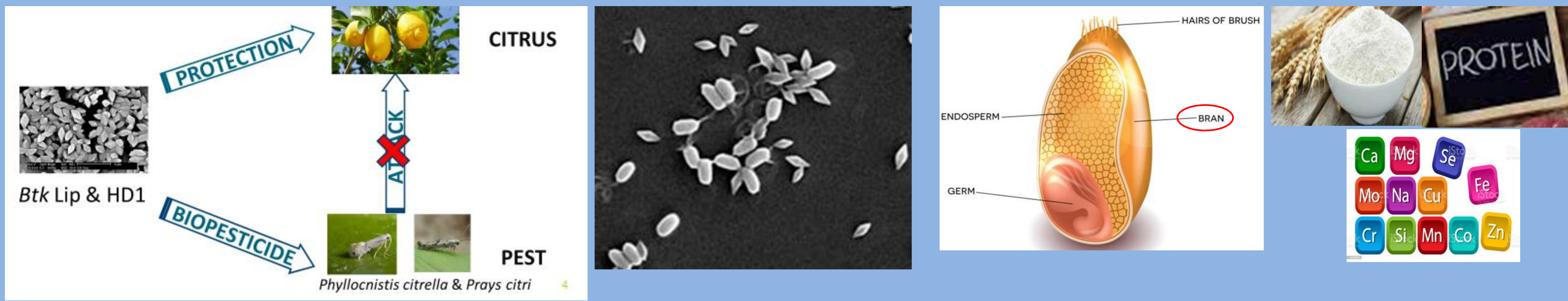
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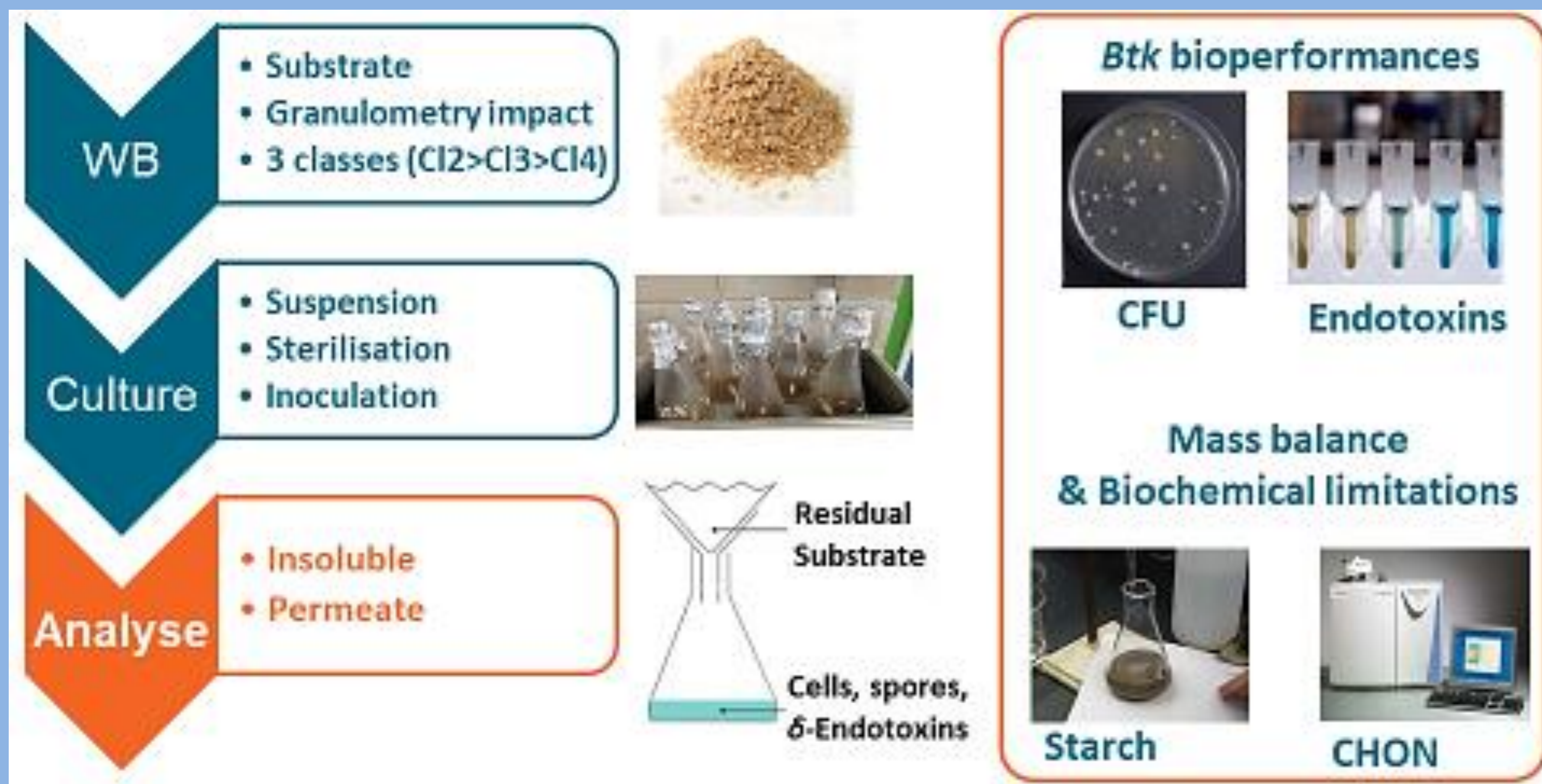
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Aims & context



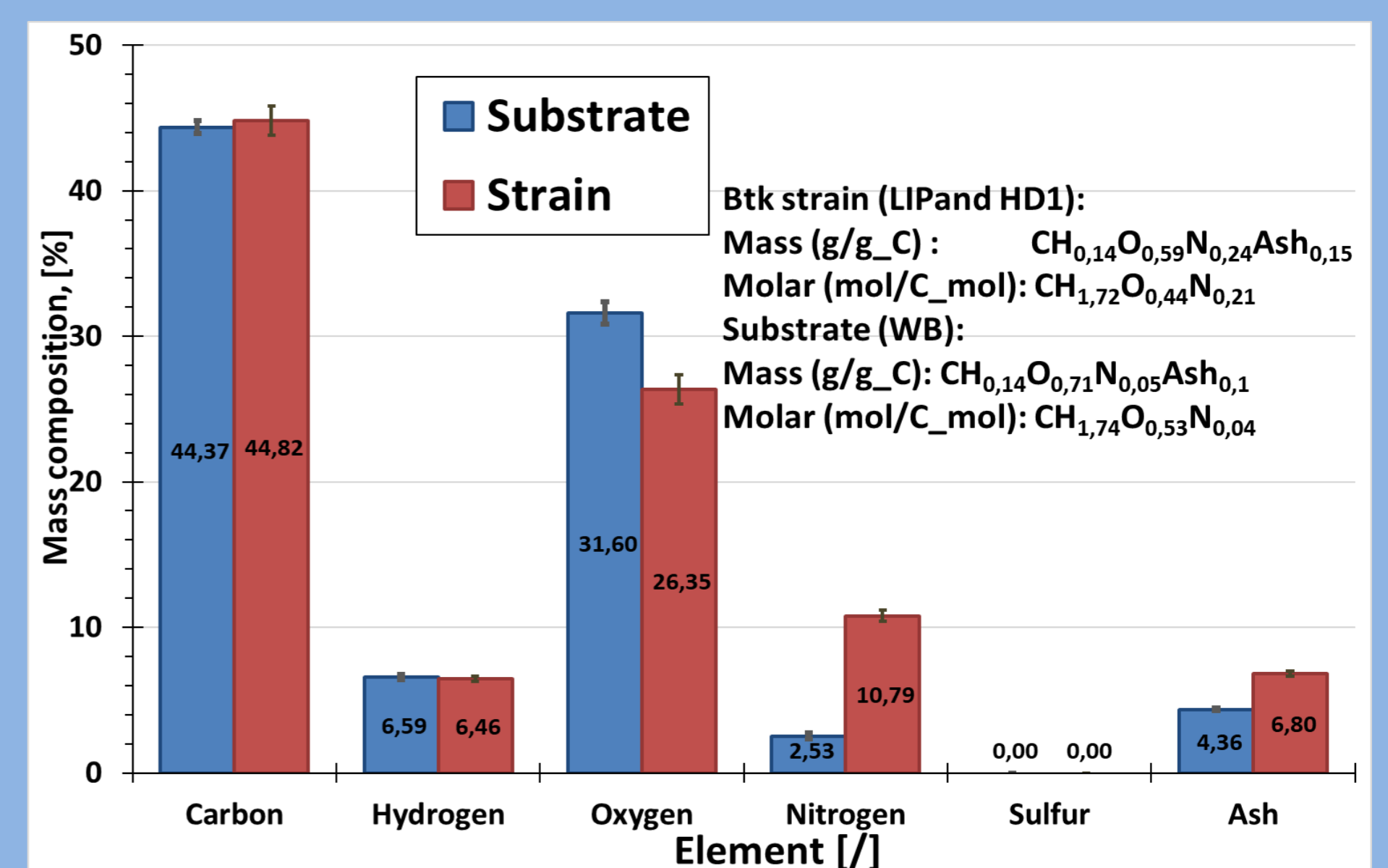
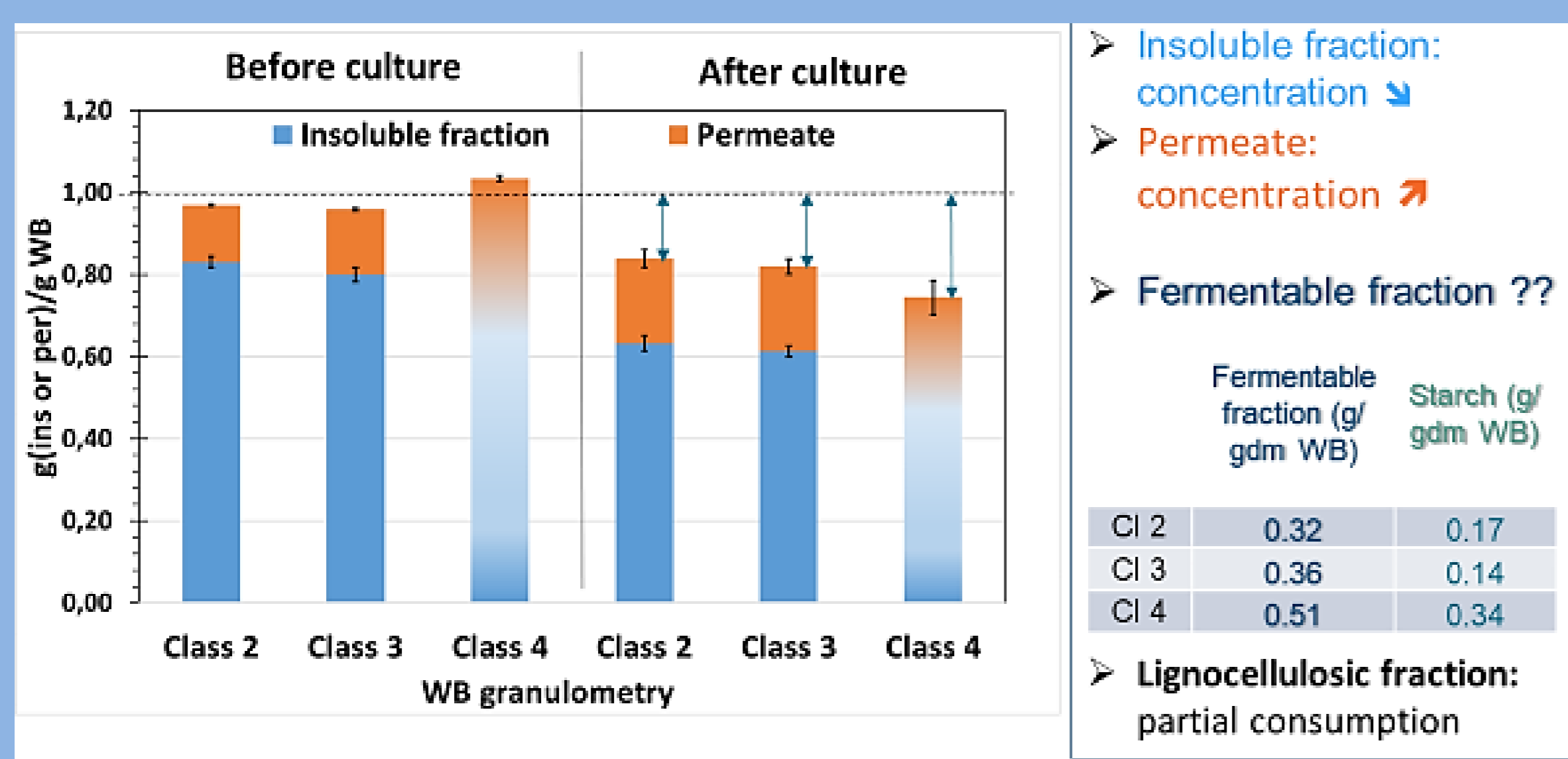
- Bacillus thuringiensis* (*Bt*), is a spore-forming Gram-positive bacterium recognized for its insecticidal activity. This latter is due to its capacity to produce crystals formed by a mix of δ - endotoxins.
- Wheat bran is a by-product of milling that is treated as industrial waste and is used only in small quantities in human nutrition, and it is rich in essential nutrients necessary for bacterial development and sporulation.
- In this context, the European project IPM-4-Citrus aims to optimize biopesticide production by *Btk* Lip in a wheat bran (WB) based culture medium.

Materials & methods



- WB was sieved into 3 classes, suspended in water, sterilized & inoculated at flask & bioreactor scale. Culture contents were filtered & separated into 2 fractions: the insoluble fraction (substrate) & the permeate fraction (biomass).
- To optimize bioproduction, we analyzed: the CFU (colony forming unit) & the δ -endotoxins concentration, the dry matter and starch content & WB elemental composition.

Results

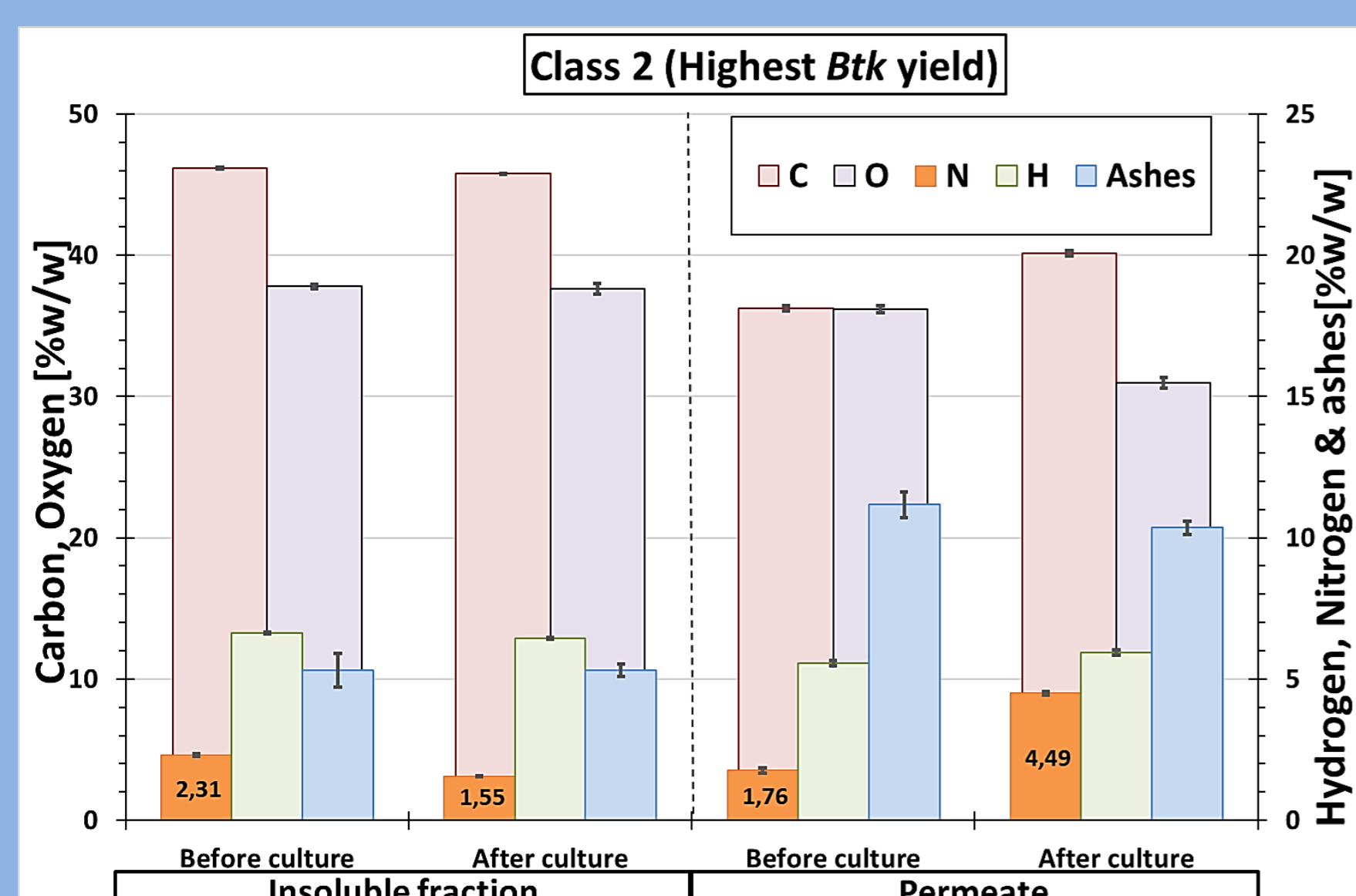


Determination of the fermentable fraction across classes

Btk consumed the starch & partially digested the lignocellulosic matrix.

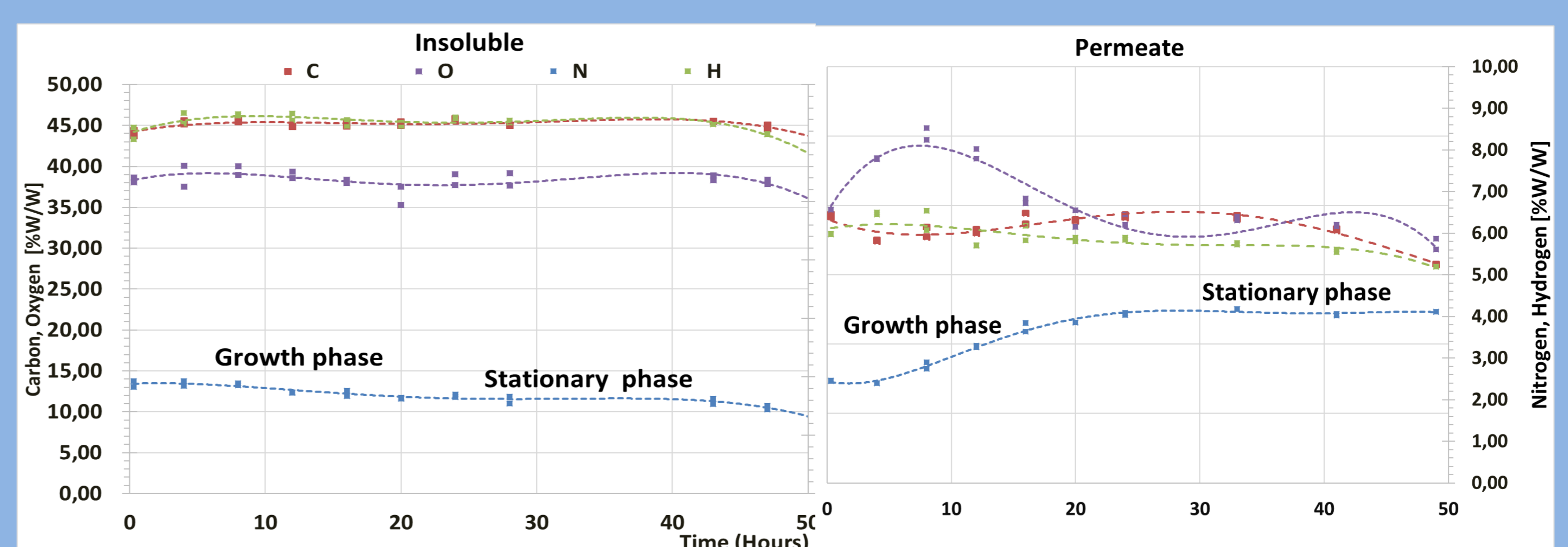
The strain vs the WB elemental composition

The strain is richer in Nitrogen compared to the WB.



Biochemical limitations (flask)

Nitrogen is the culture limiting nutrient



Analyze of the culture biokinetics (bioreactor)

The same behavior is observable on the flask & bioreactor scale.

Growth phase of *Btk* (0-20 h), stationary phase (20-48 h)

Conclusion: Wheat bran is a very interesting byproduct for biopesticide production at small and large scale.

Bibliographic references :

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- Loutfi et al., 2021. Morphological Study of Bacillus thuringiensis Crystals and Spores. Appl. Sci. 11, 155.
- Popovic et al., 2019. Thermodynamic properties of microorganisms: determination and analysis of enthalpy, entropy, and Gibbs free energy of biomass, cells and colonies of 32 microorganism species. Heliyon 5, e01950.



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