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ProxIMed

PRIMA PARTNERSHIP FOR RESEARCH AND INNOVATION IN THE MEDITERRANEAN AREA

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Waste streams from tomato cultivation and production

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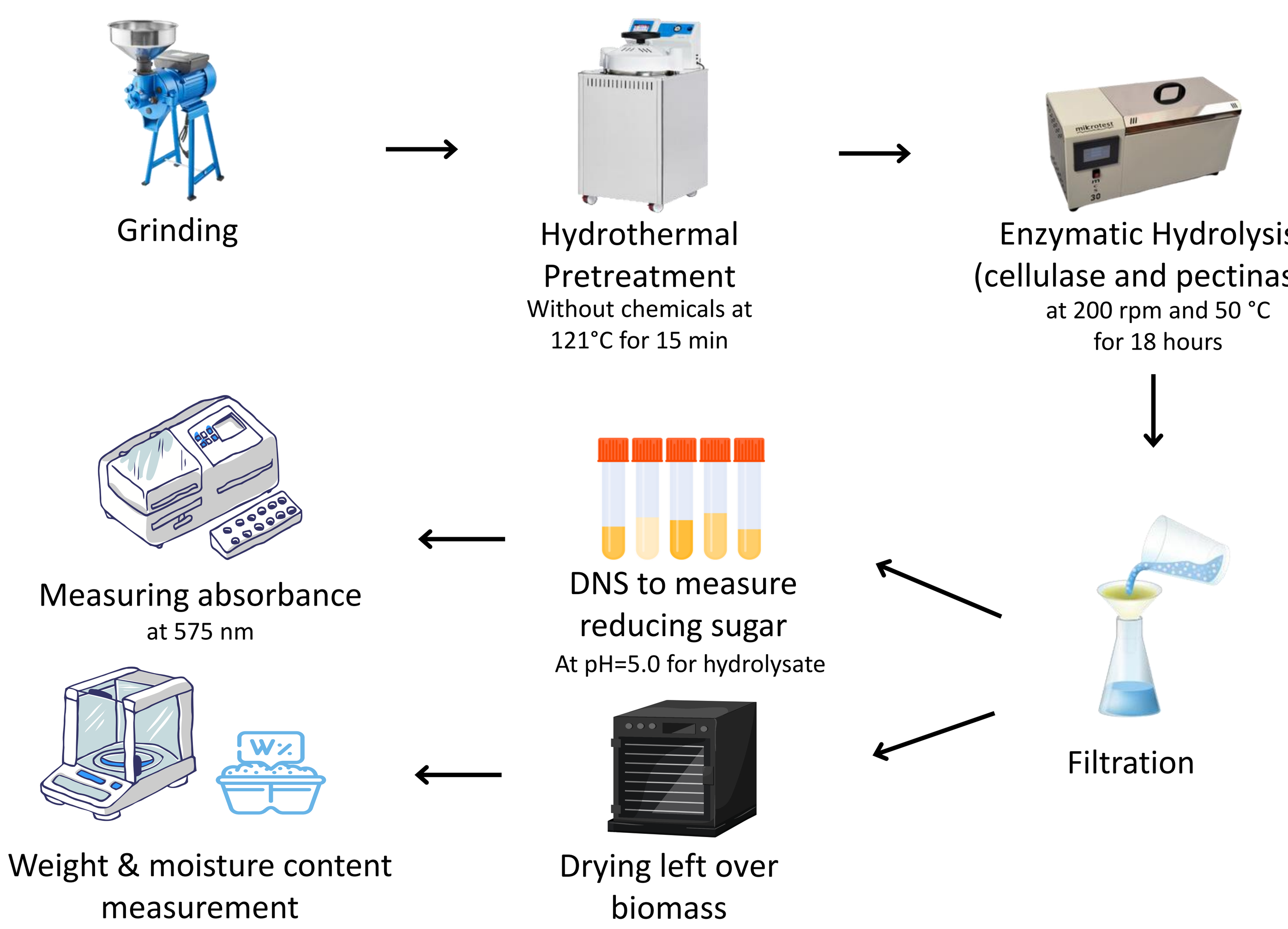
Introduction

Tomato plays a pivotal role in the Mediterranean diet. The by-product of tomato processing, known as tomato pomace, has garnered attention for its nutritional and textural qualities, making it suitable for both feed and food applications. Despite its potential, there is currently a lack of defined technologies for scaling up the production of these products for widespread use. Due to its protein content, tomato pomace presents an opportunity to serve as a valuable protein source. Additionally, tomato leaves yield a relevant amount of protein to be processed into protein powder. While both raw materials show a high potential for converting a waste material in a valuable substance, studies are hardly found or still non-existent. Within the project ProxIMed, various technologies to extract proteins from tomato pomace and tomato leaves are tested on their technological feasibility but also on their ecological sensibility. For this purpose, a Life Cycle Assessment (LCA) of the process schemes is conducted.

Tomato pomace

On a food technical level, the transformation of tomato pomace into a fermentable substrate using various hydrolysis methods is explored. This involves examining the impact of the type of hydrolysis, solvent concentration, and pretreatment duration on process efficiency. By quantifying biomass conversion, the reduction in tomato pomace waste through effective valorisation can be assessed. The fermentable sugars derived from tomato pomace are then used in subsequent fermentation to produce single-cell protein and other valuable bioproducts, highlighting the potential for waste reduction and sustainable product generation in the tomato processing industry.

Current treatment process flow:

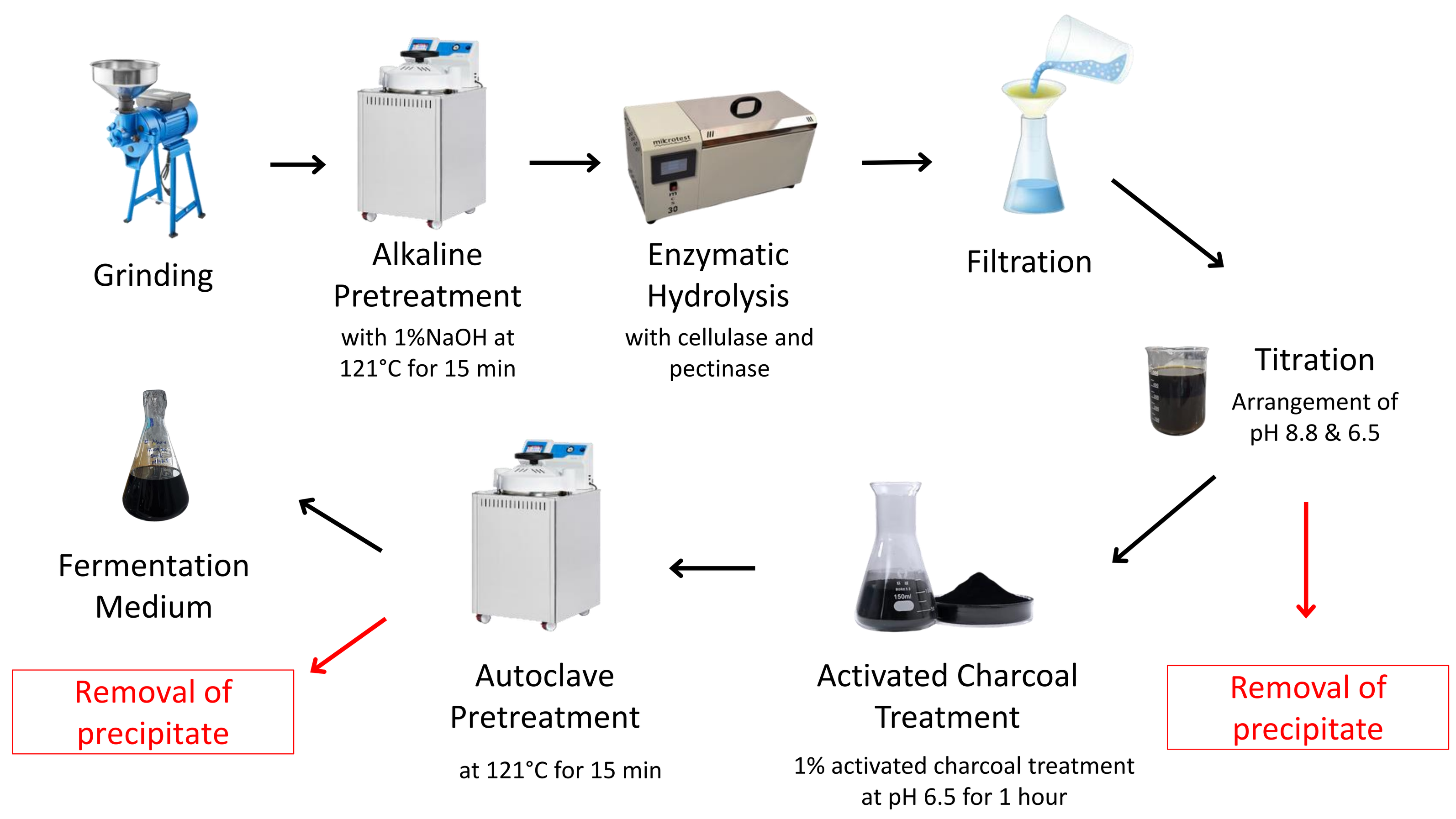


Tomato stems and leaves

The by-products of tomato plantation, majorly tomatoes parts, stems, and leaves mostly left on the fields after the harvest, forms the largest quantity of any agricultural biomass residues. Up to now tomato stems and leaves are not used. The challenges are to create:

- **A clear fermentation medium**
  → titration to clear impurities along with pectinase enzyme to prevent turbidity.
- **A toxin-Free medium**
  Tomato leaves contain bioactive metabolites, such as steroidal alkaloids and phenolics → activated charcoal treatment
- **Medium with reduced sugar content**
  Determined through HPLC analysis.

Current treatment process flow:



Benefits and effects on the LCA impacts

LCA consists of the four phases goal & scope, inventory collection, impact assessment and interpretation. All environmental impacts are calculated per amount of created product, i.e. the functional unit of a production system. If waste streams are used two effects can arise:

1. The waste doesn't need to be treated, so the overall impacts are lowered. Further, the **waste** is viewed as **burden-free** and products made from often have low impacts.
2. The waste is transformed into a by-product and the impacts are then **allocated to both the main product and the by-product**, meaning lower impacts for both products.

In general, **using waste closes production circles**, which is a central encouragement provided by the application of LCA and has effect on all four phases, especially on interpretation as system outline have to be re-thought when wastes become useable resources The use of tomato waste streams is further investigated in the ProxIMed project.

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