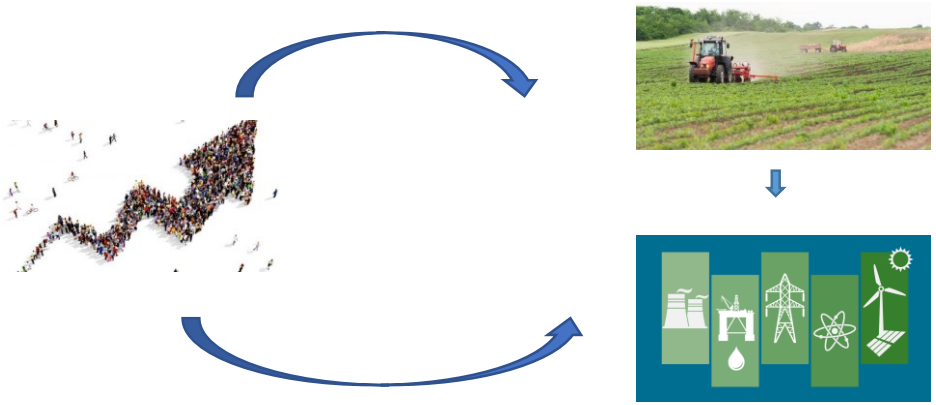
Bio-refineries as a sustainable tool to simultaneously address energy and food security: A Jerusalem artichoke perspective

Introduction

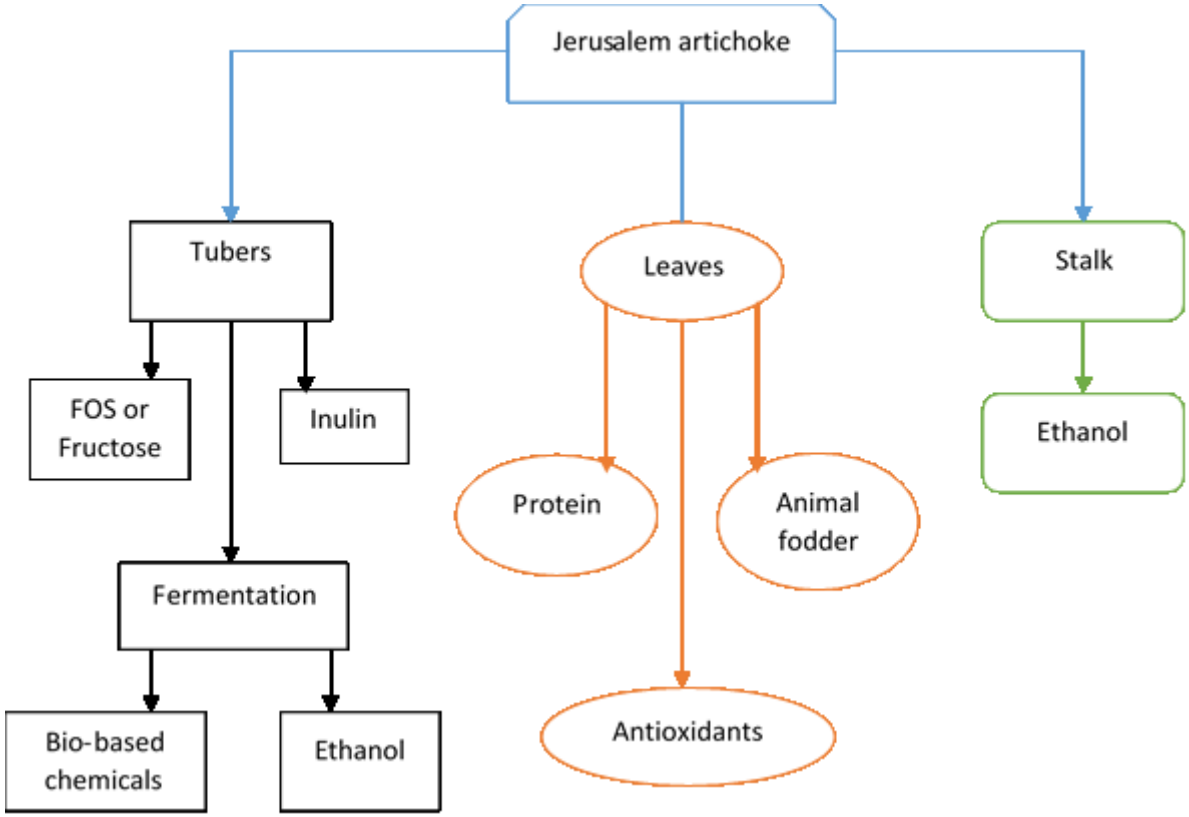


- The increase in population and income growth lead to competition for resources to meet food, water and energy security
- The complex interactions among population growth, food, water and energy security further complicates efforts to curb climate change

Biorefining as a sustainable tool to food, water and energy security

- Alternative/Renewable resources and valorisation methods are important to simultaneously curb climate change and meet the increasing food and energy demand
- Biorefining offers an integrated solution to exploit biomass for food, feed and energy production
- JA tubers are one such feedstock option for biorefining
- JA is suitable due to good agronomic traits such as minimal water, fertiliser and pesticides requirements

Possible approaches to JA exploitation



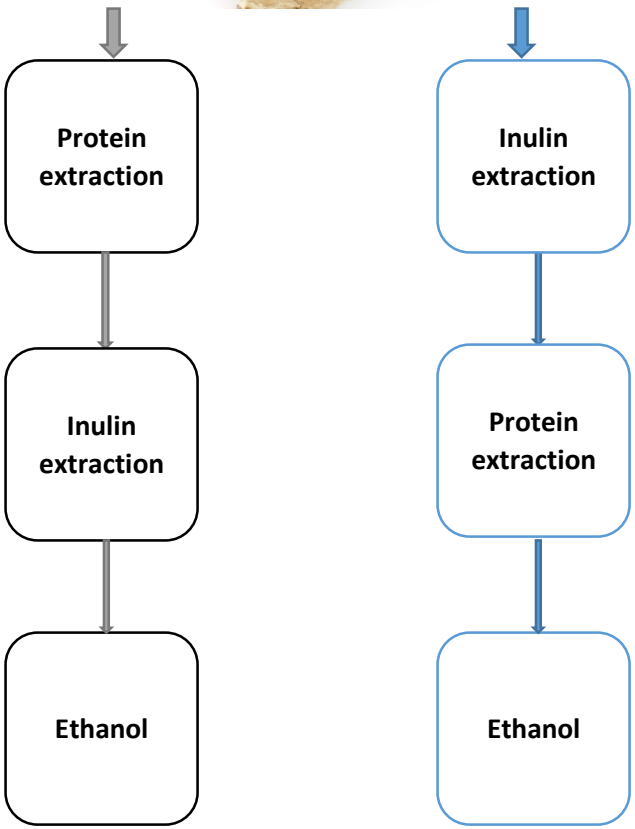
Shortfalls to currently proposed approaches to JA exploitation

- Stalk composed of lignocelluloic fibres which are highly recalcitrant
- The use of tubers for ethanol production may be seen as a threat to food security
- Currently there is no experimental data on integrated approaches for JA bio-refining

Justification for tubers as choice of feedstock

- JA tubers have a higher yield/ha compared to leaves and stalks
- Tubers have a more diverse composition of potential high-value components
- Tubers are largely composed of inulin which is easily accessible compared to the LCF from the stalks
- Tuber composition makes them a better candidate to simultaneously solve food, feed and energy security threats

JA-tubers biorefinery concept

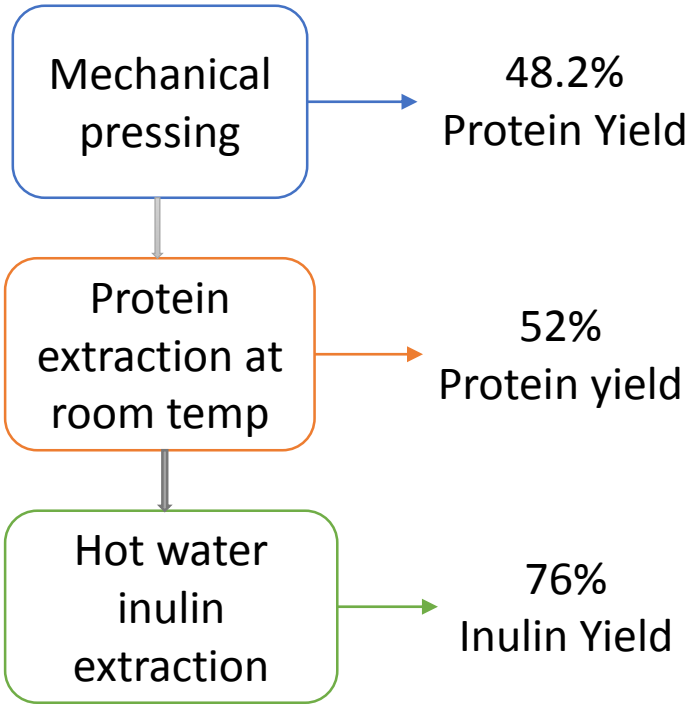


Objectives of the study

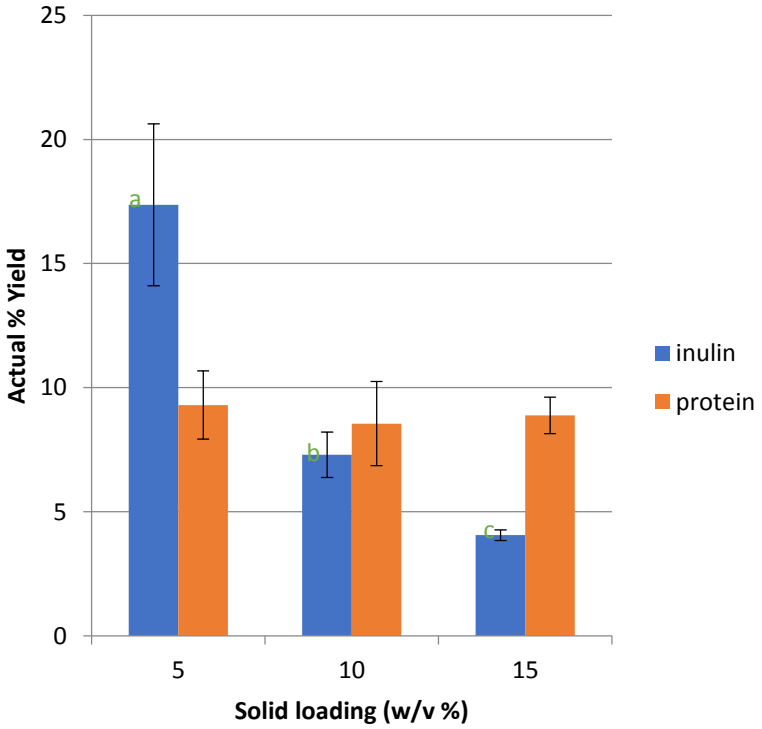
- Integrate protein extraction into the conventional inulin extraction process,without compromising the yield and quality of both products
- To valorize the protein-inulin extraction residues into bioethanol

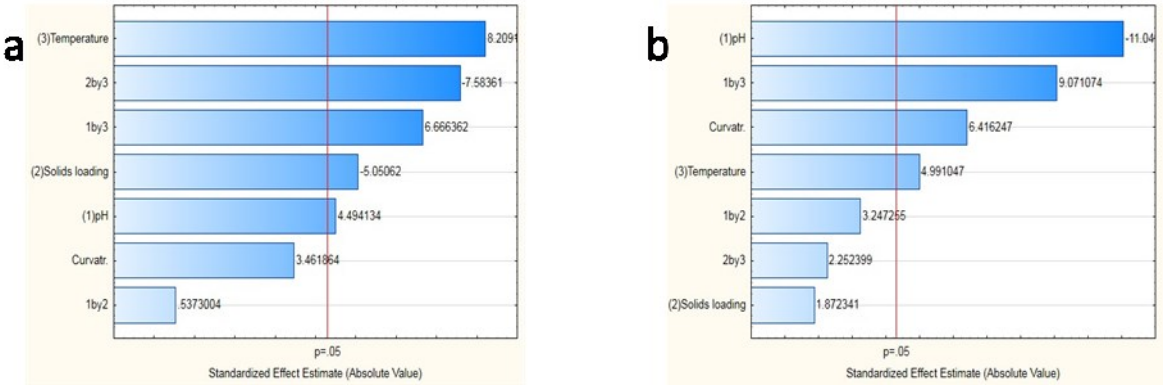
Sequential and selective extraction

A three-step approach was adopted



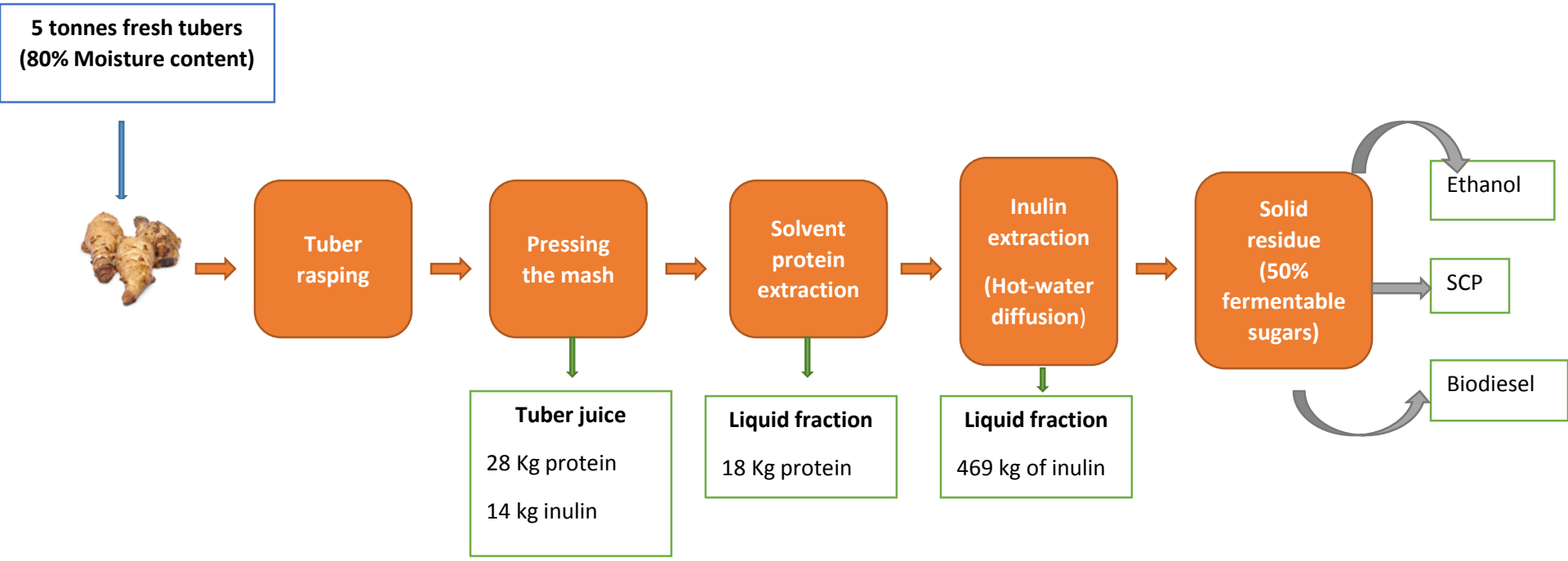
Achieving selective extraction





- Differential solubility relative to temperature
- Differential mass transfer relative to solids loading

Conceptual JA biorefinery



Concluding remarks

- Solvent-free protein extraction was essential for selective fractionation of proteins from inulin
- Moreover, it is a significant component in minimizing water usage and waste water generation
- JA based biorefinery has a potential to provide a food/feed and energy products
- The biorefinery also has potential for socioeconomic development in rural economies due to the low inputs demand and skills requirement for JA cultivation

Q &A