

Feedstock pre-treatment and production of precursor efficiency for production of biobased chemicals from agricultural residues

Agricultural waste and by-products such as brewery spent grains, tomato pomace and potato peels could be a sustainable source of fermentable carbohydrates to produce biobased chemicals such as polyhydroxyalkanoates (PHAs). However, their carbohydrates are mainly complex polymers that currently require treatment with high temperatures and strong acids to be released. AgriLoop is developing more efficient and cost-effective pretreatment and extraction technologies for these residues, namely.

Project activity

Three thermophilic fungi were grown on brewery spent grains and their enzymes recovered and used for hydrolysing and solubilising this residue. A subcritical water pre-treatment was developed, and tested on tomato pomace, brewery spent grains and potato peel residues. Supercritical CO₂ extraction was evaluated for recovering high-value components (i.e., carotenoids, polyphenols, and flavonoids) from all three residues at different temperatures (between 40 and 80°C), pressures and contact times. The characterisation and quantification of all extracted components is in progress.

Key findings and recommendations

These technologies have shown promising results and should be considered as possible routes to more efficient and cost-effective pretreatment of agricultural residues for the subsequent production of biobased chemicals.

- Thermophilic enzymatic hydrolysis is effective for the treatment of brewery spent grains. This process can convert up to 34% of brewery spent grain waste into soluble compounds (probably complex carbohydrates, polymers and/or proteins) within just three days.
- Subcritical water treatment options show potential for processing residual materials, with best results obtained with brewery spent grains and potato peels at 190°C.
- Supercritical CO₂ extraction can be used to recover high-value compounds (carotenoids, polyphenols, and flavonoids) from agricultural residues before further processing.



References

- **Agriloop project deliverable 3.1:** Feedstock pre-treatment and production of precursor efficiency https://www.agriloop-project.eu/wp-content/uploads/2023/12/Deliverable-D3.1_AgriLoop.pdf

Contact

For more information about the AgriLoop Project, visit:

agriloop-project.eu



Funded by
the European Union



中华人民共和国科学技术部
Ministry of Science and Technology of the People's Republic of China



UK Research
and Innovation

Project funded by



Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Confederation

Federal Department of Economic Affairs,
Education and Research EAER
State Secretariat for Education,
Research and Innovation SERI

This project has received funding from the European Union's Horizon Europe research and innovation programme under the grant agreement No. 101081776, the UK Research and Innovation (UKRI) fund under the UK government's Horizon Europe funding guarantee, the Swiss State Secretariat for Education, Research and Innovation (SERI) and from the National Key Research and Development Program supported by the Ministry of Science and Technology of the People's Republic of China (No. 2023YFE0104900). Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of neither of the aforementioned Funding authorities. Neither the European Union, the United Kingdom, the Swiss Confederation or the People's Republic of China nor the European Commission, UKRI, SERI or NKRDP can be held responsible for them.