

Green Extraction of Lipids from Sewage sludge: Towards Efficient Production of Sustainable Biolubricants

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Background

Sewage sludge, a by-product of wastewater treatment, poses significant challenges due to its massive production volume and its potential environmental hazards. Within this challenging waste lies potential for resource recovery and biorefinery applications, contributing to the development of a **Circular economy** obtaining from this waste valuable products with diverse industrial applications.



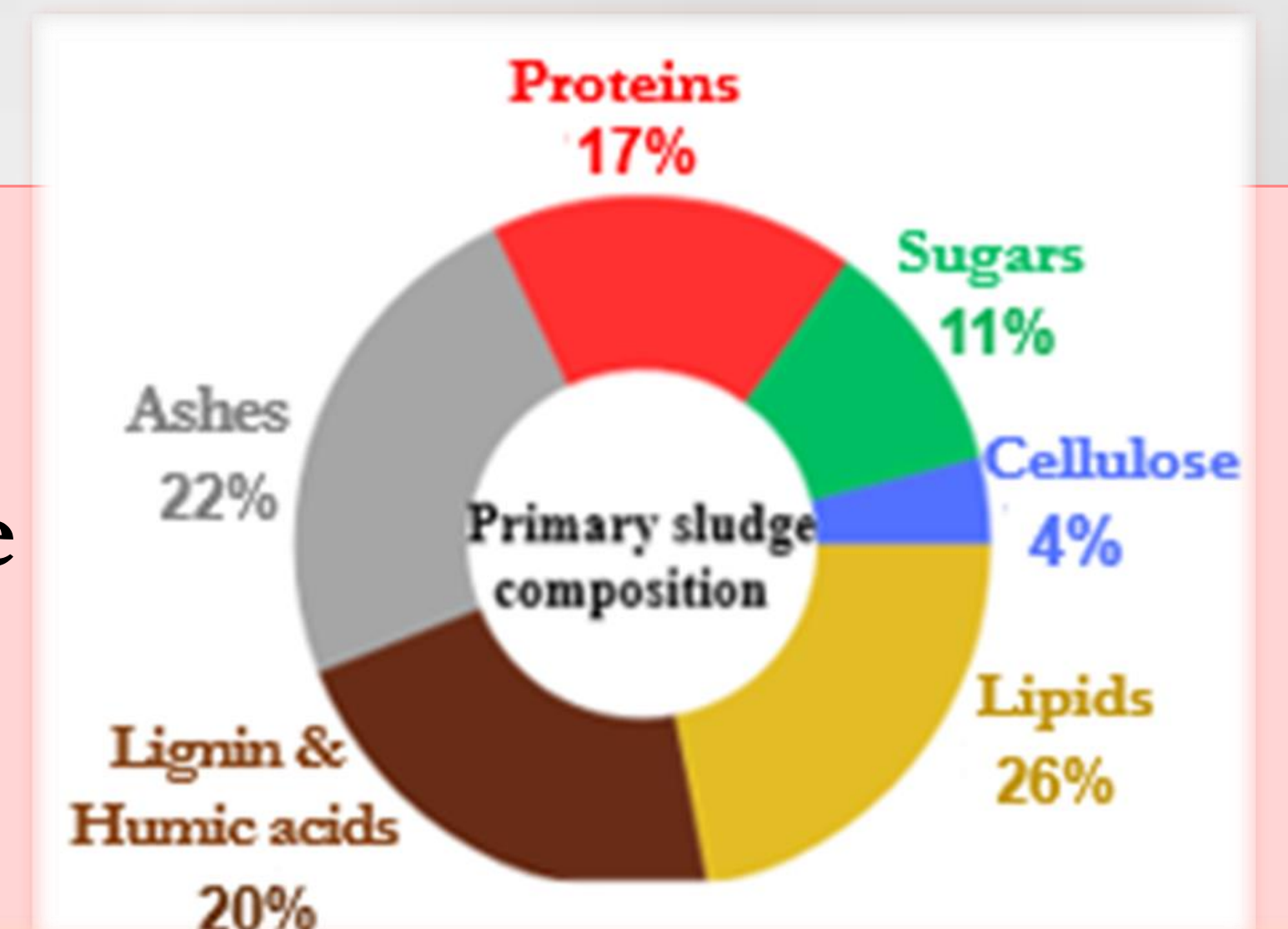
- Energy production
- **Valuable chemicals production**
- Recovery of nutrients



Results and discussion

Primary sewage sludge is rich in esterifiable lipids, mainly **Fatty acids** and **Calcium soaps**, which can make up to 26 wt.% of the sludge's dry matter.

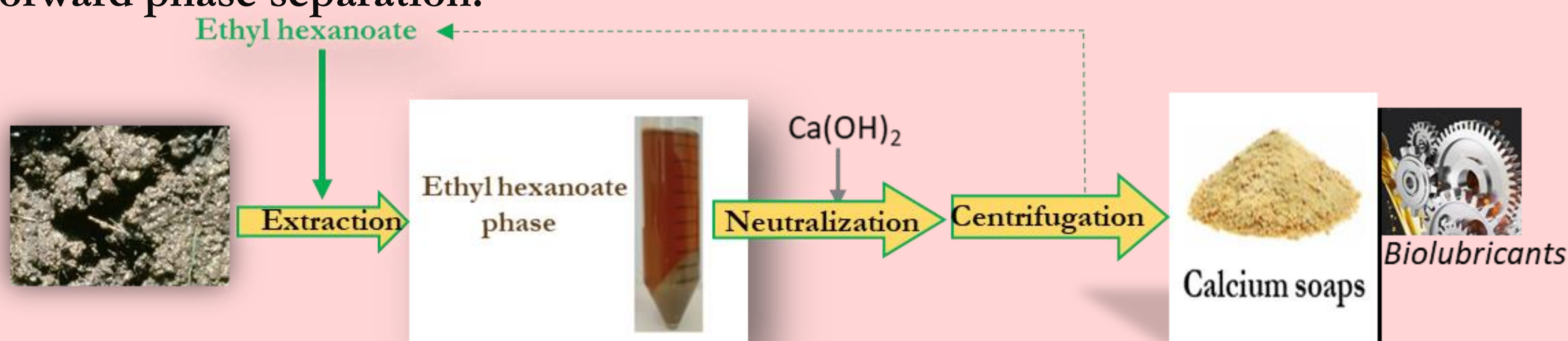
In this work, the extraction of these compounds from dewatered primary sewage using a green solvent, namely **Ethyl hexanoate**, was investigated.



Best extraction conditions
Ethyl hexanoate: wet sludge weight ratio=1
70 °C; 3 h, magnetic stirring.

Esterifiable lipids recoverability
100 ± 3%

Under the best extraction conditions, fatty acids and insoluble calcium soaps were completely recovered from the sludge. Considering the industrial potential of calcium soaps serving as solid lubricants, also fatty acids were converted in calcium soaps, adding Ca(OH)_2 to the ethyl hexanoate phase. Fatty acids were fully neutralized and recovered alongside the pre-existing calcium soaps from the ethyl hexanoate phase through a straightforward phase separation.



Calcium soaps yield
34.9 ± 1.5 wt.%

Conclusions

This study explores a green process for obtaining solid lubricants from primary sewage sludge. The exhaustive green extraction of esterifiable lipids achieved using ethyl hexanoate, along with the complete conversion of fatty acids into calcium soaps and their straightforward recovery in high yields, offers a promising path towards the sustainable valorization of sewage sludge for solid biolubricants production.

Aknowledgements

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BIOLUBRICANTS FROM URBAN SEWAGE SLUDGE

