

HYDROTHERMAL LIQUEFACTION OF THESSALY’S AGRICULTURAL WASTES TARGETING HIGH QUALITY BIO-CRUDE PRODUCTION

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Objectives

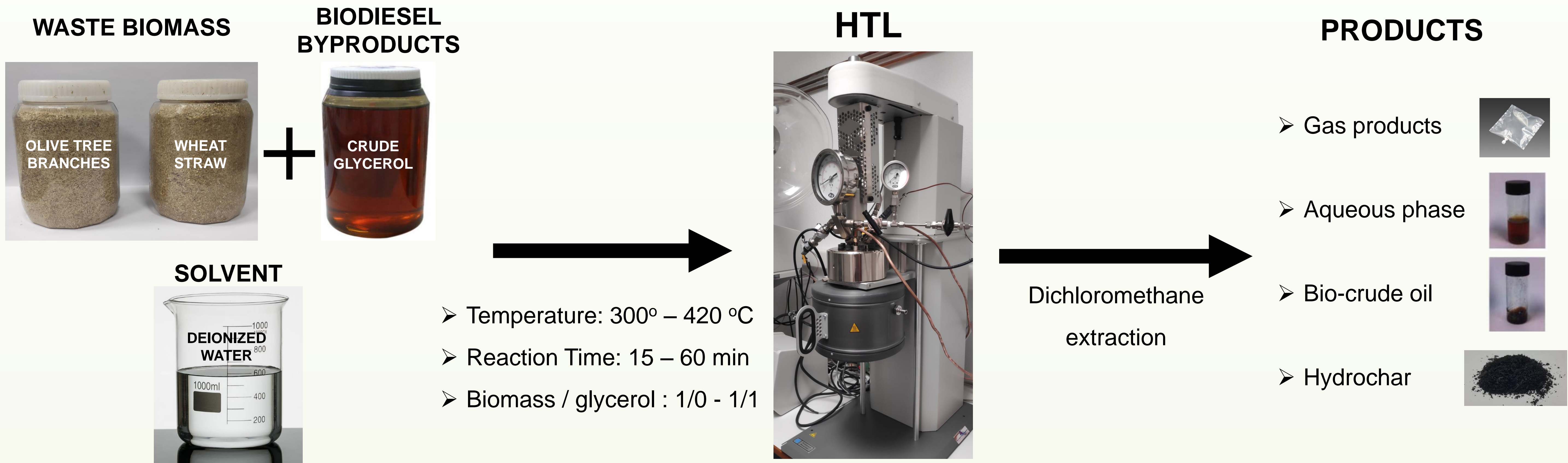
- Optimization of agricultural wastes upgrading via hydrothermal liquefaction (HTL) for maximum bio-crude production.
- Valorization of crude glycerol (biodiesel production by-product) as co-feed.
- Examination of HTL main parameters (temperature, reaction time, biomass/glycerol ratio) effect in bio-crude yield and quality.

Feedstock Properties

	Units	Olive Tree Branches	Wheat Straw
Cellulose	wt%*	36.45	33.08
Hemicellulose	wt%*	15.10	25.76
Lignin	wt%*	31.45	35.22
Ash	wt%*	3.01	3.04
Moisture	wt%	7.00	7.23

*Based on dry mass

Methodology



Results & Discussion

NOVELTY GOALS:

- 1) **Comparison between crop residues and woody biomass bio-crude yield.**
- 2) **Investigation of minerals proportion transferred to hydrochar during HTL.**
- 3) **Crude glycerol valorization in biomass HTL process towards liquid fuels.**

EXPECTED RESULTS (Literature)

- **Enhanced** biocrude yield in high subcritical temperature – **Lower quality.**
- **Higher** hydrochar yield due to repolymerization at high temperature.
- **Supercritical (SC)** conditions → easier liquefaction → **Boosted** biocrude yield.
- Crude Glycerol – agricultural biomass → Synergistic Effect → Higher oil yield. Lignin depolymerization to small oligomers – monomers (especially at SC HTL)

BIO-CRUDE OIL PROPERTIES EXPECTATIONS

- **Low** heteroatom content (Oxygen – Nitrogen)
- High **H/C ratio** → High proportion of hydrocarbons → Higher **HHV****
- Chemical Composition:

- Acids
- Furans
- Ketones
- Phenolics
- Oxygenated Aromatics

6 – 10 Carbon atoms (C₆ – C₁₀)
derived from **carbohydrates** and **lignin**

** Compared to pyrolysis bio-oil

Conclusions

Study is expected to assist in:

- 1) Understanding HTL reactions.
- 2) Behavioral comparison between two types of residual biomass HTL.
- 3) Optimizing HTL process (oil yield) – Valorization of biodiesel industry byproducts.

References

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2. T.H. Pedersen, L. Jasiunas, L. Casamassima, S. Singh et al. (2015), «Synergistic hydrothermal co-liquefaction of crude glycerol and aspen wood», Energy Conversion and Management 106, 886-891

