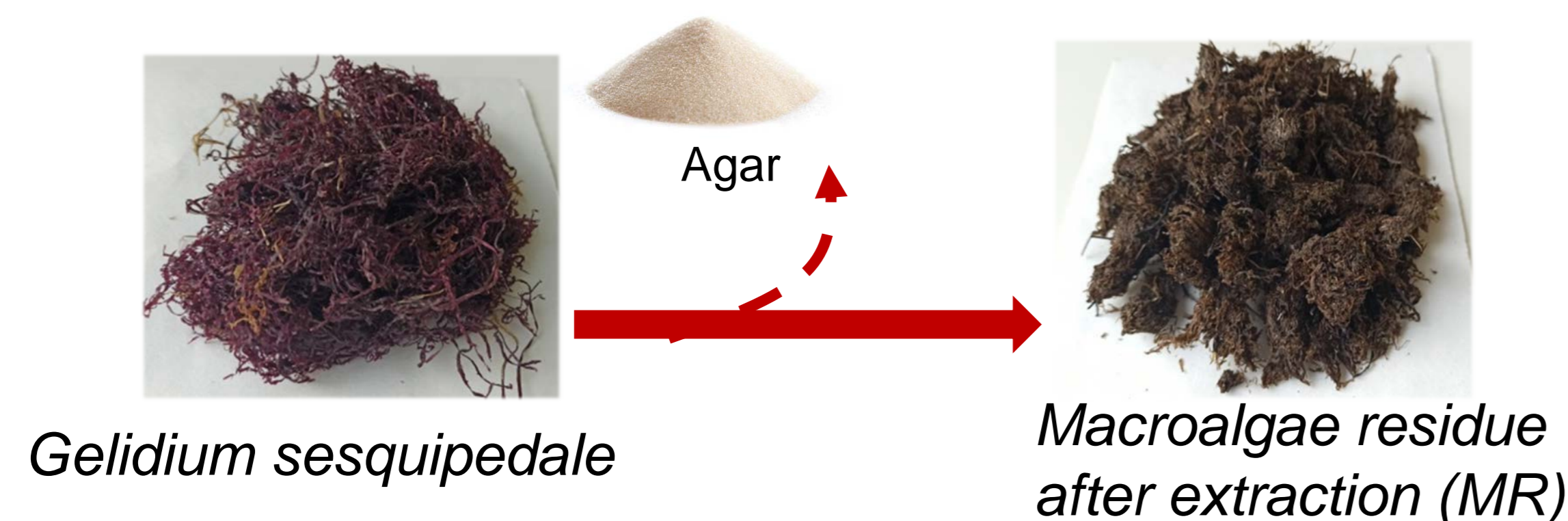


Characterization of byproduct after agar extraction

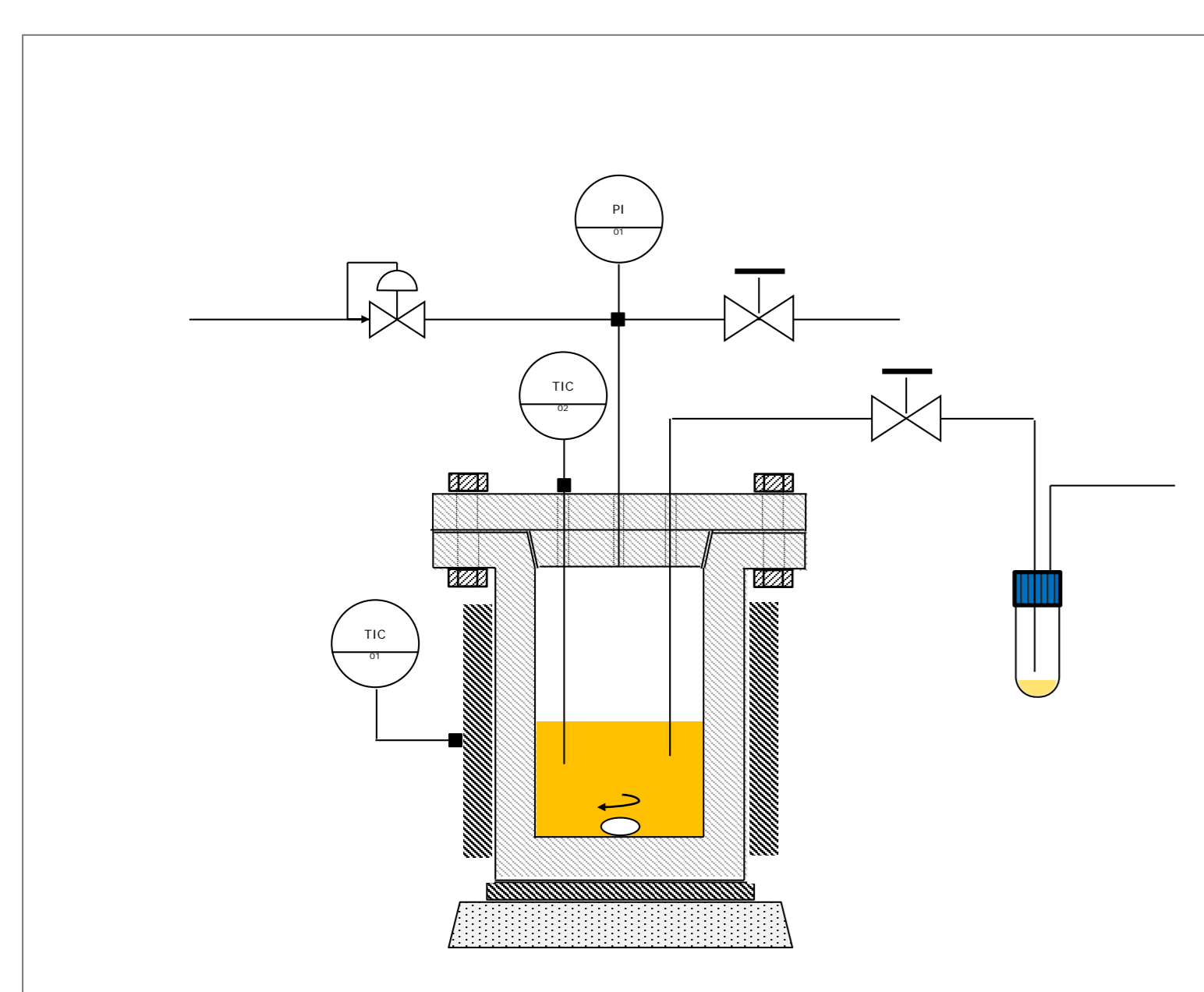
The industrial process to produce agar from the red algae *Gelidium sesquipedale* generates a solid residue that most of it is disposed of



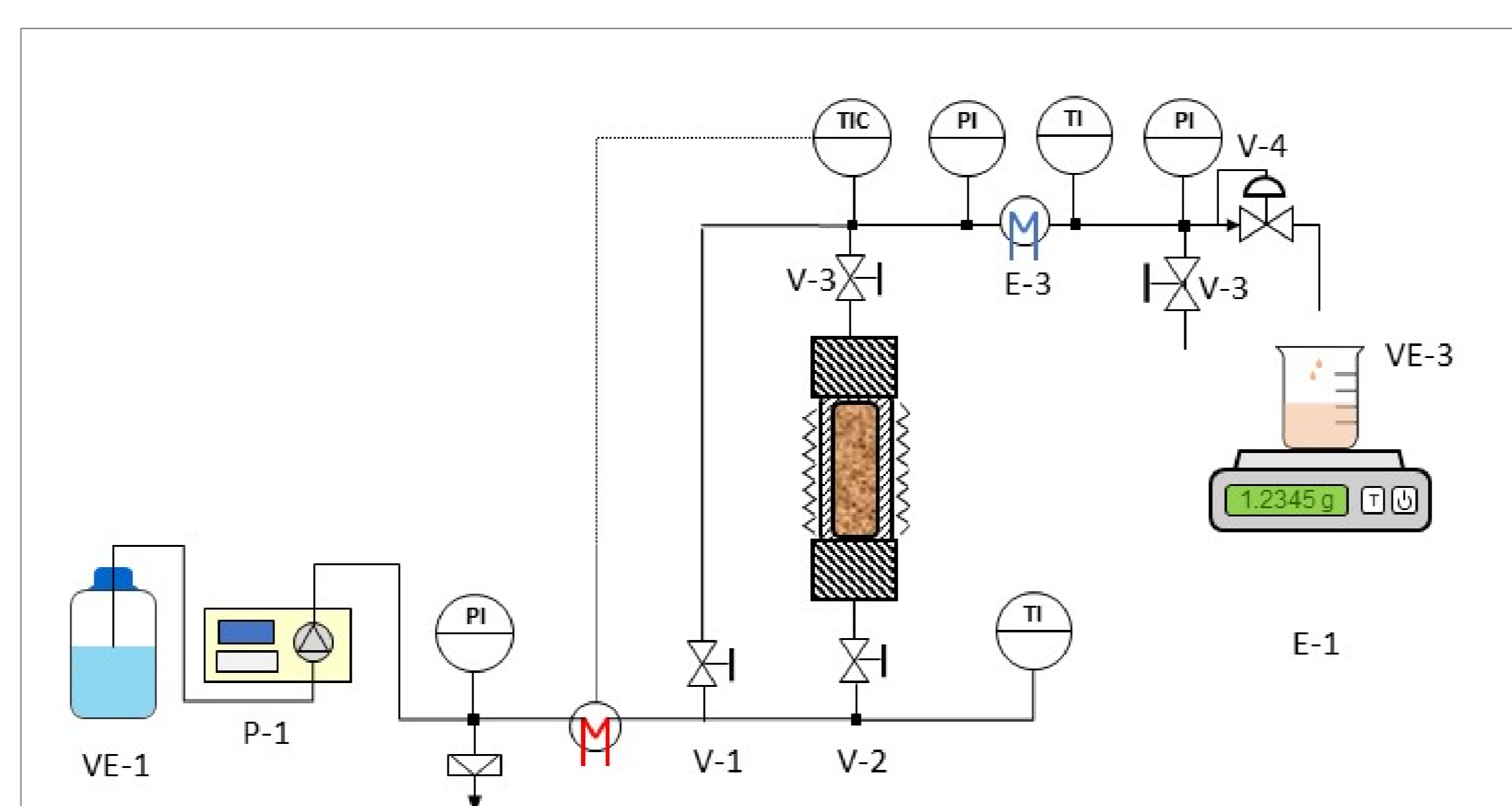
Composition of MR (NREL protocols)

Extractives (%)	11.5 ± 0.9	Proteins (%)	21 ± 1
Carbohydrates (%)	42 ± 2 (Glucans, 23.4 and galactans 10.9)	Lipids (%)	0.87 ± 0.09
Lignin (%)	12 ± 1 (soluble 8.7 and insoluble 3)	Ashes (%)	22 ± 2

Extraction/hydrolysis of macroalgae residue by subcritical water



Discontinuous reactor



Semi-continuous reactor

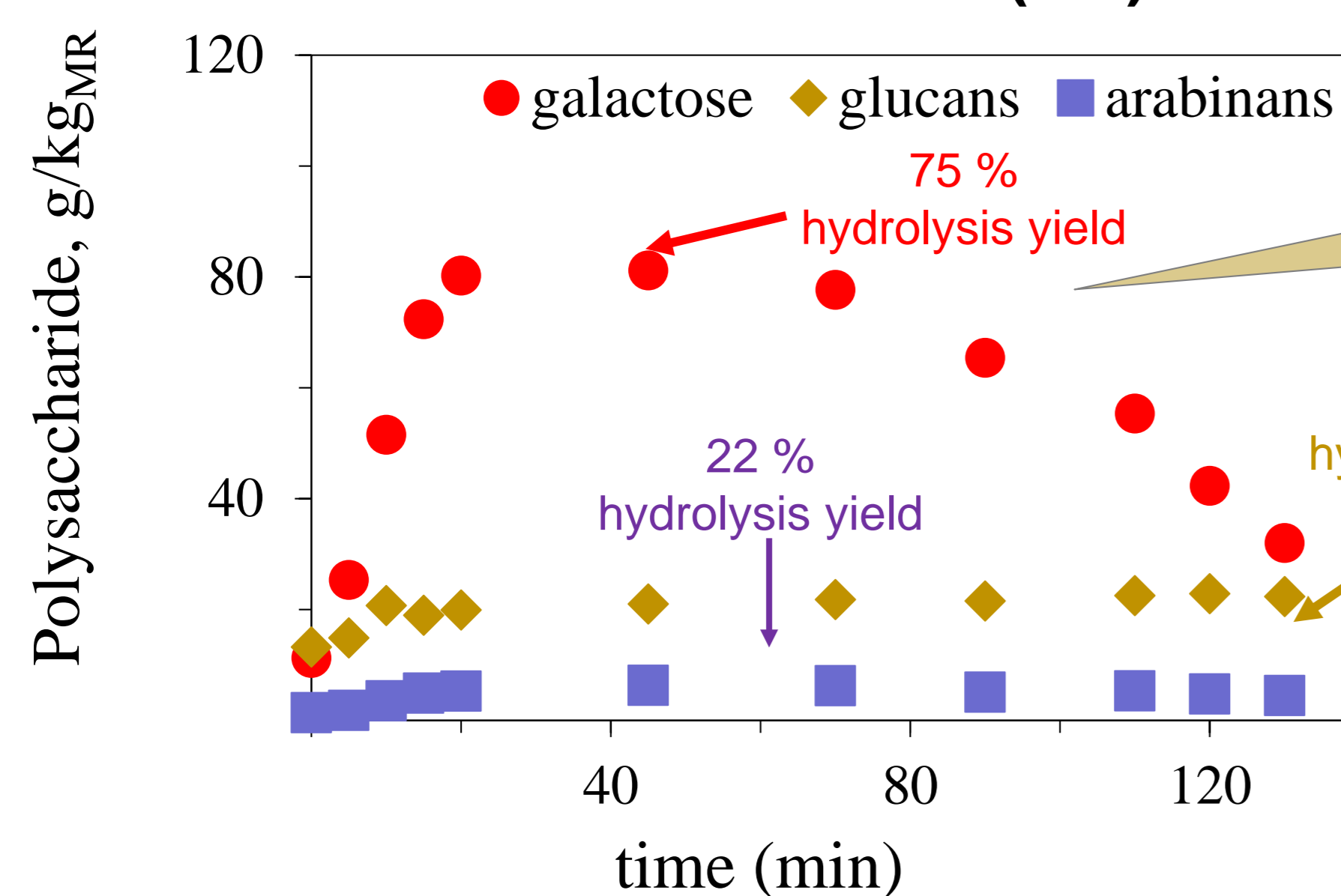
Hydrolysis conditions

p, MPa	20
T, °C	175-185

- Determination of **extraction/hydrolysis curves**
- Analysis of **protein fraction and free amino acids**
- Analysis of **mono and oligosaccharides**
- Other determinations: **TOC, TPC, color**

Polysaccharide hydrolysis

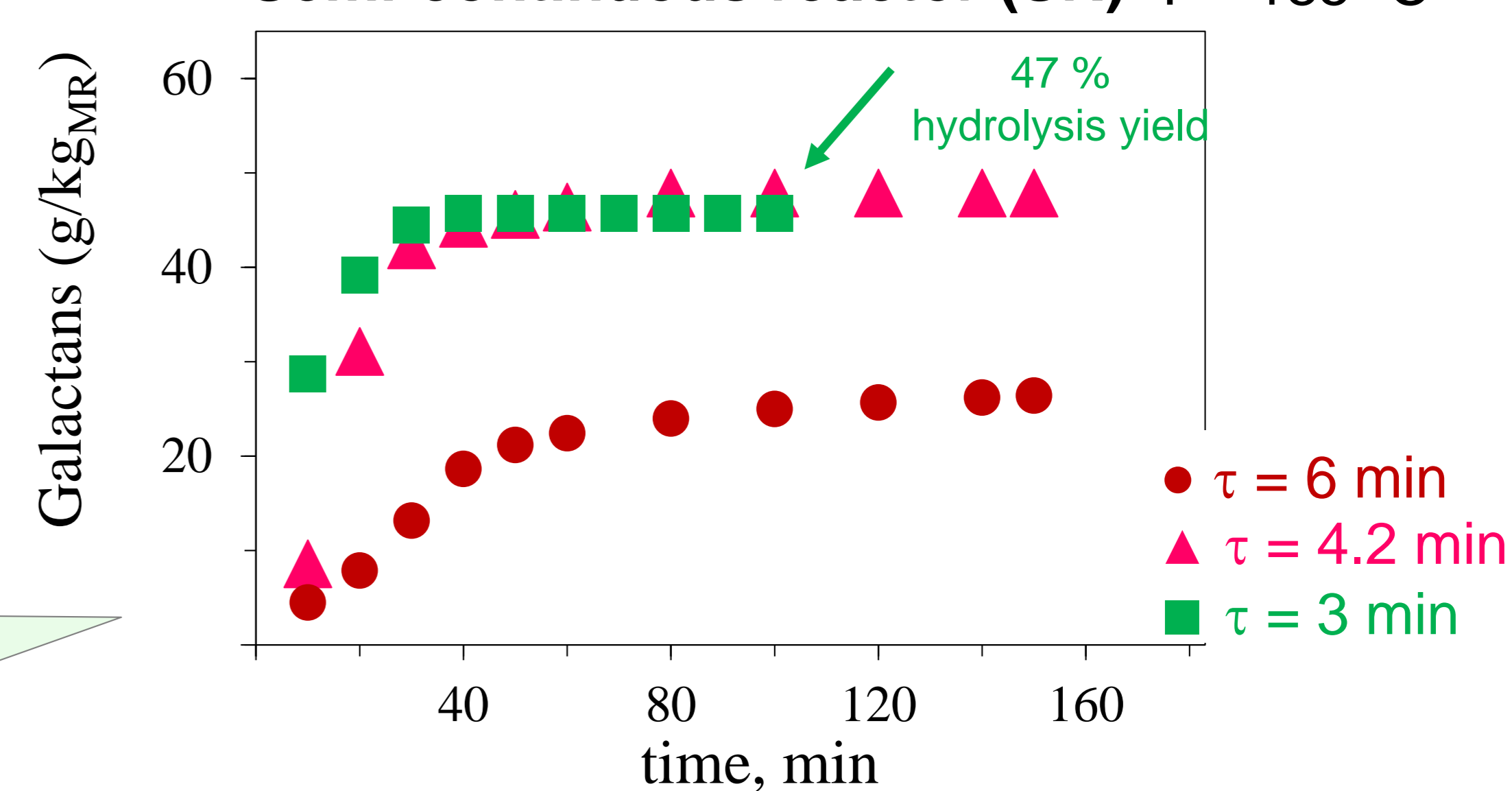
Discontinuous reactor (DR) T = 175 °C



DR: There is a maximum in polysaccharide hydrolysis due to degradation at long exposure times

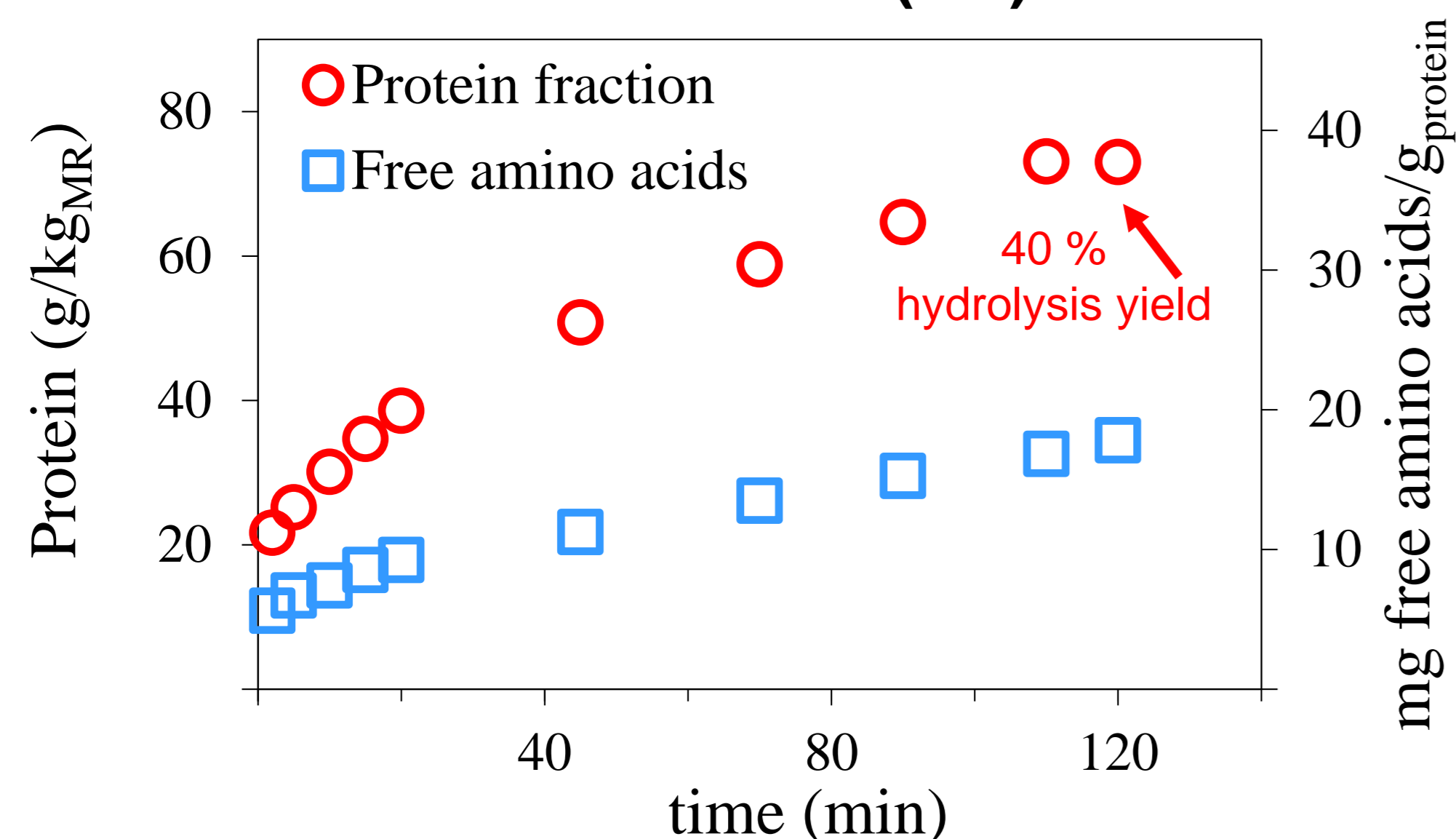
SR: At lower residence times (higher flow rates), higher initial hydrolysis rates were obtained.

Semi-continuous reactor (SR) T = 185 °C



Protein hydrolysis

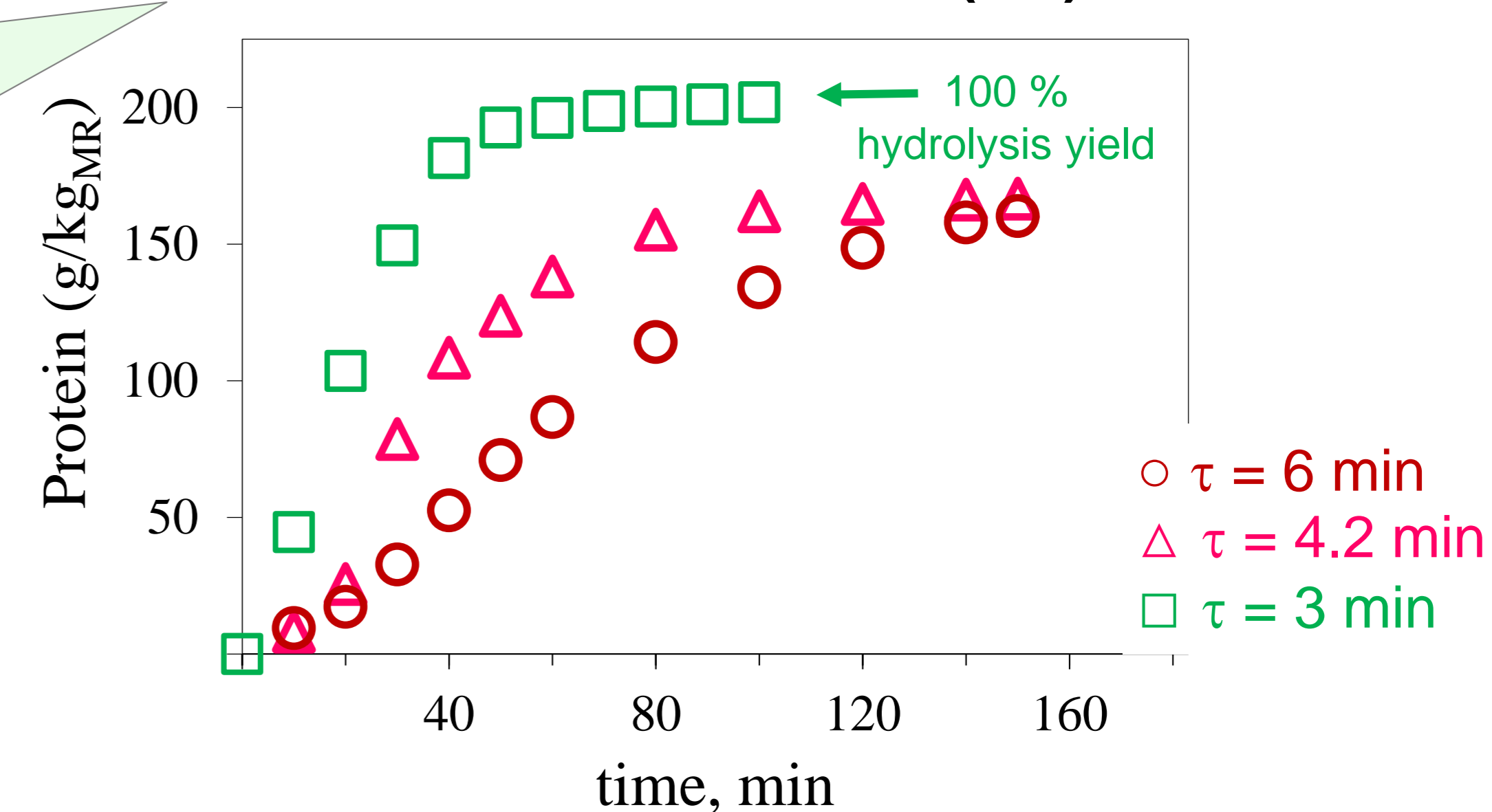
Discontinuous reactor (DR) T = 175 °C



SR: Nearly 100 % of hydrolysis yield of the protein fraction was obtained in a SR with 13 mg of free amino acids/ g_{protein}

DR: Lower protein hydrolysis yield was obtained in a DR than in a SR probably due to degradation at long operating times at high T.

Semi-continuous reactor (SR) T = 185 °C



CONCLUSIONS

Subcritical water has been successfully used to hydrolyze the residue generated after agar extraction from *Gelidium sesquipedale*. Combination of temperature and time played an important role on final hydrolysis yield. Long exposure times led to degradation of components present in the subcritical water hydrolysates.

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