



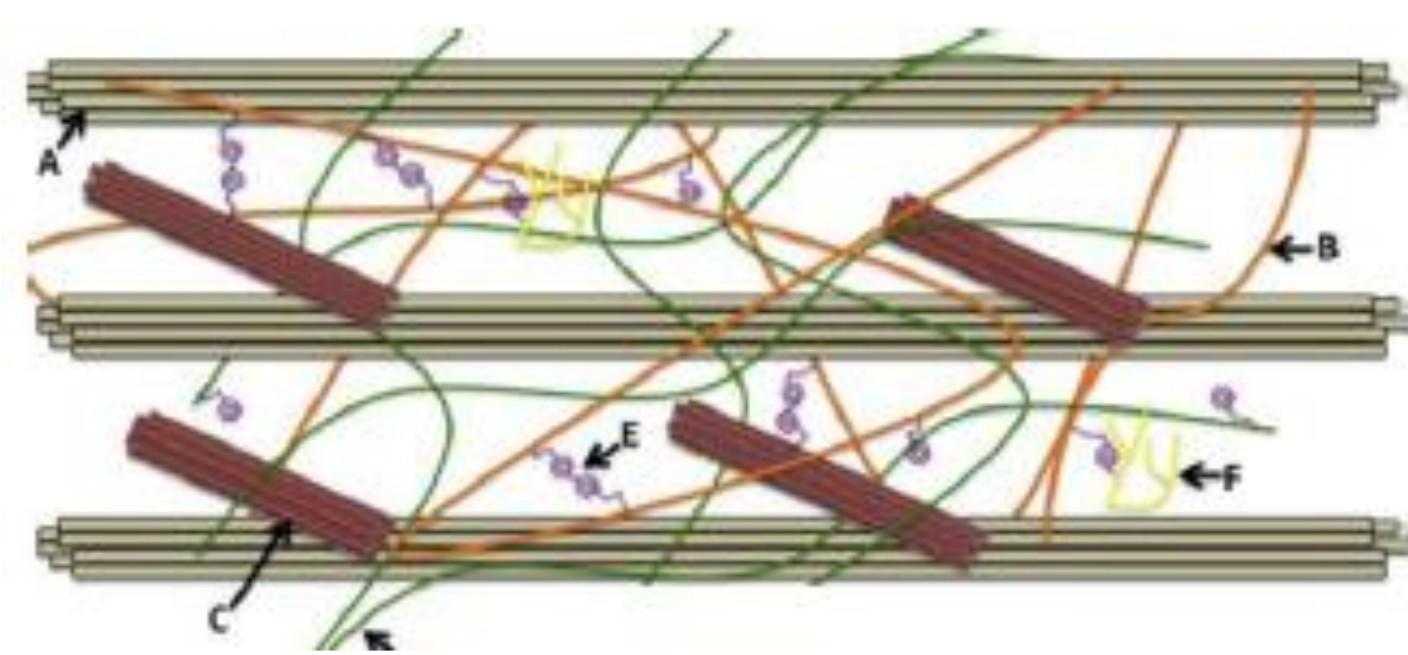
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# HYDROLYSIS AND FRACTIONATION OF PHENOLIC COMPOUNDS FROM BREWER'S SPENT GRAIN BY SUBCRITICAL WATER

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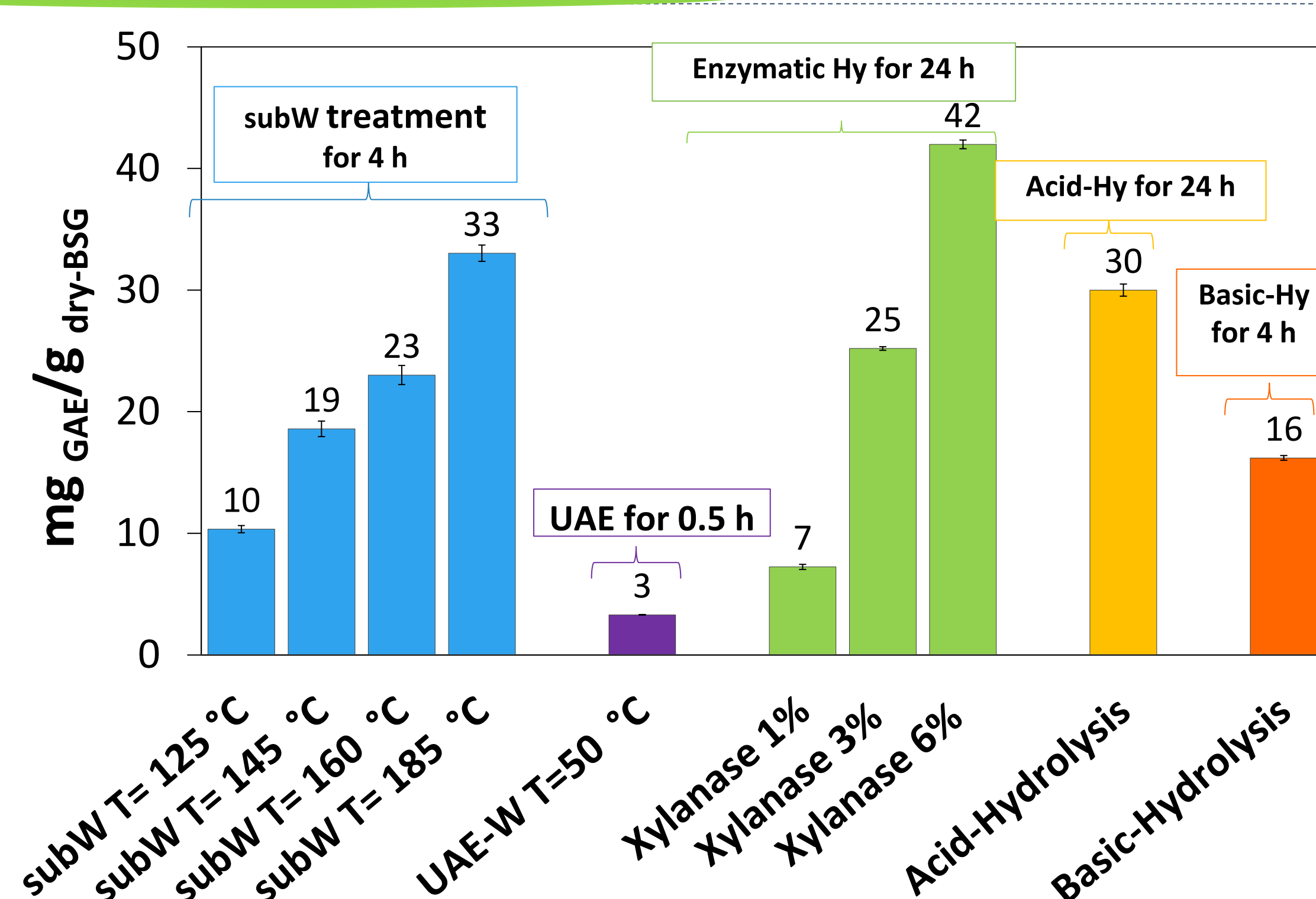
## Phenolic Compounds (PC)



Lignin is connected to the cell wall polysaccharides by phenolic acids, being necessary a hydrolytic method to release them

## Different Hydrolytic Methods

subW treatment at 185 °C led to higher amount of TPC than acid and basic hydrolysis and UAE-W



TPC determined by Folin-Ciocalteu in different extracts  
UAE-W= Ultrasonic Assisted Extraction with water at 50 °C

## Comparison between the different hydrolytic methods

- SW at 185 °C: the best to release vanillin
- Basic hydrolysis: the best to release hydroxycinnamic acids (ferulic and p-coumaric)
- Enzymatic hydrolysis: higher ferulic acid than by SW at 160 °C (10 %) but lower p-coumaric acid and aldehyde phenolics

### Optimal subW T:

- Hydroxycinnamic acids : 160 °C
- Phenolic Aldehydes: 185 °C

P, mg <sub>GAE</sub> /(g <sub>dry-BSG</sub> ·min)	
subW 185 °C	0.28
Xylanase 6%	0.087

TPC initial productivity (P) was higher by subW than by enzymatic hydrolysis

## Phenolic compounds identified by HPLC-DAD (μg<sub>compound</sub>/g<sub>BSG,dry</sub>)

Compound	Formula	SubW T= 160 °C	SubW T= 185 °C	UAE-W	Acid-Hy	Basic-Hy	Xylanase 6 %
p-Coumaric Acid		191 ± 3	60 ± 1	n.d.	n.d.	538 ± 4	5.3 ± 0.4
Ferulic Acid		250 ± 3	144 ± 7	10.7 ± 0.3	54.4 ± 0.3	1305.7 ± 0.5	292 ± 3
Vanillin		254 ± 5	306 ± 10	n.d.	n.d.	217 ± 1	203 ± 10
Protocatechuic aldehyde		162 ± 2	268 ± 1	n.d.	n.d.	n.d.	n.d.
Syringic aldehyde		34 ± 5	39 ± 2	n.d.	n.d.	n.d.	n.d.

Based on the results, fractionation of phenolic compounds can be achieved by subW, working under different conditions

## Brewer's Spent Grain (BSG)

✓ Candidate to be incorporated into the concept of bioeconomy and circular economy

- 20 kg/100 L of beer
- Lignocellulosic material
- A valuable source of phenolic compounds (PC)

## Subcritical Water (subW)

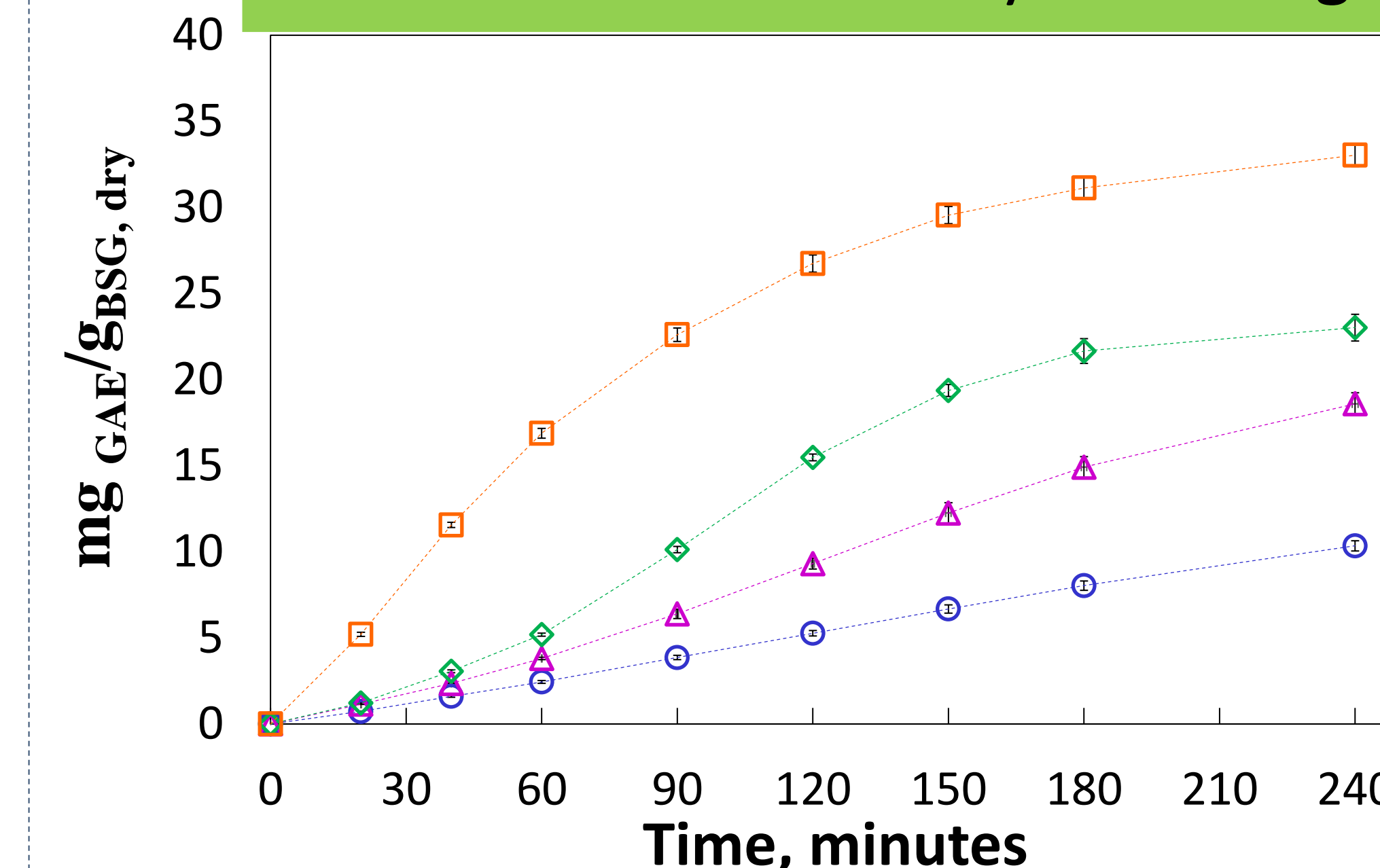
### Advantages of subW

- Water is the greenest solvent
- ✓ Selective fractionation (T, τ)
- ✓ Unique properties with T

- Fixed conditions: F= 4 mL/min, P=50 bar
- Effect of T: 125 -185 °C

An alternative technology to chemical and enzymatic hydrolysis to release PC from lignocellulosic materials

### TPC release increased by increasing T



Effect of temperature on SW extracts of BSG at:  
○ 125 °C, △ 145 °C, ◇ 160 °C, □ 185 °C

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