

Fabiola - fractionation of biomass using low-temperature acetone

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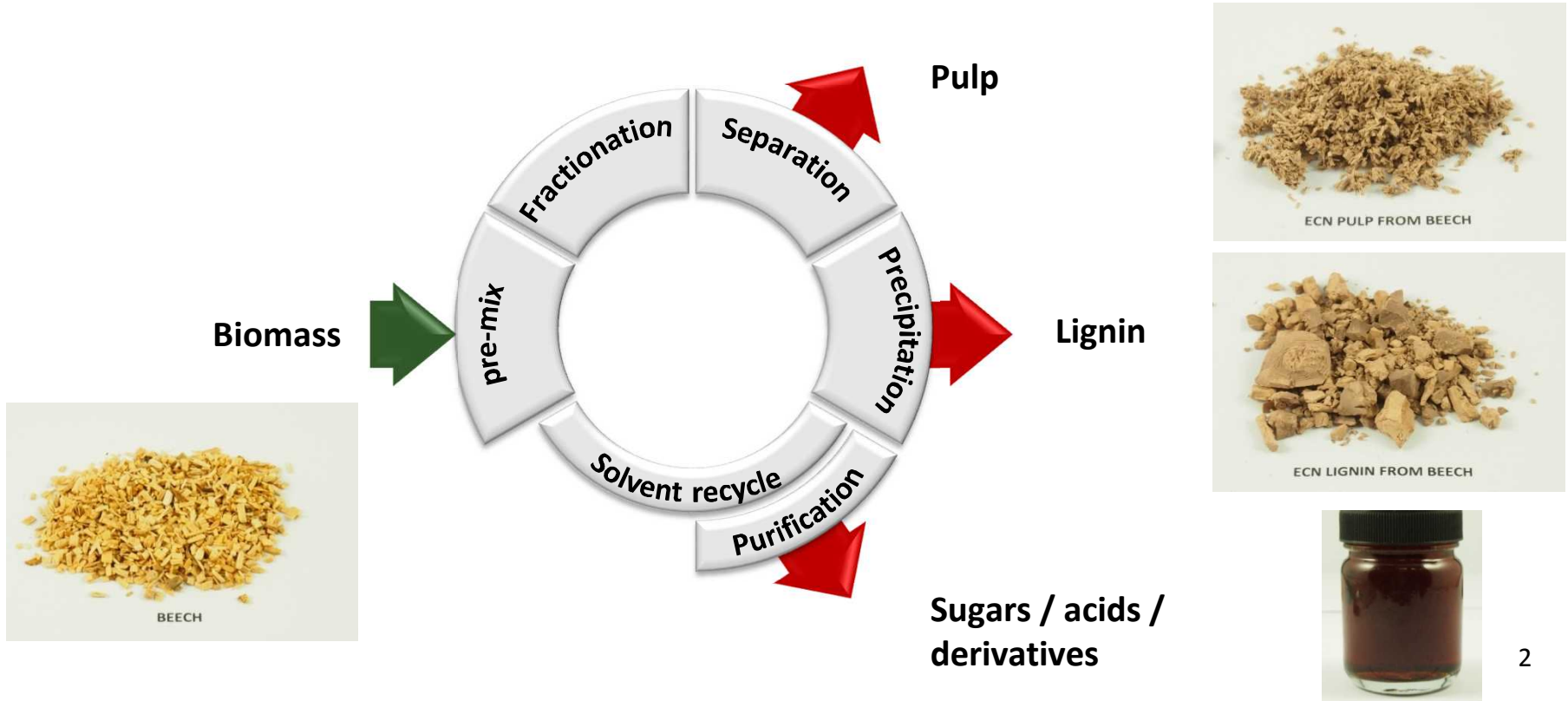
Fabiola

fractionation of biomass using low-temperature acetone

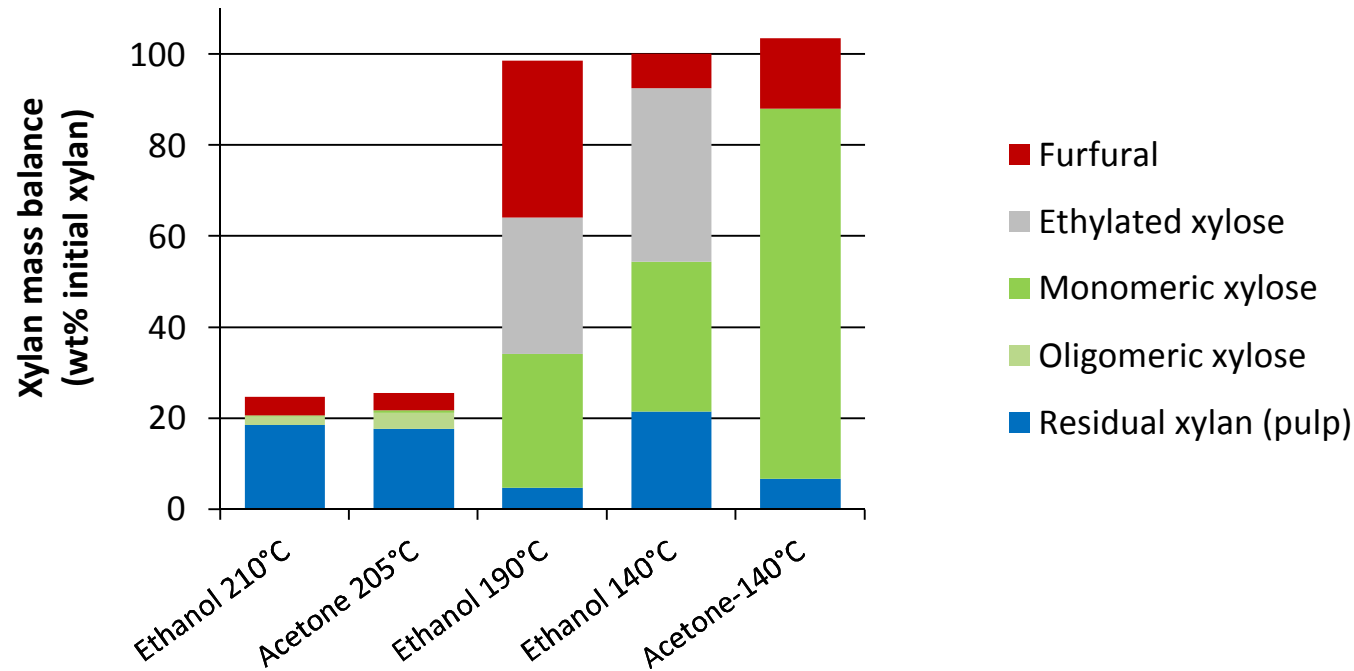
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RRB 13, Wroclaw
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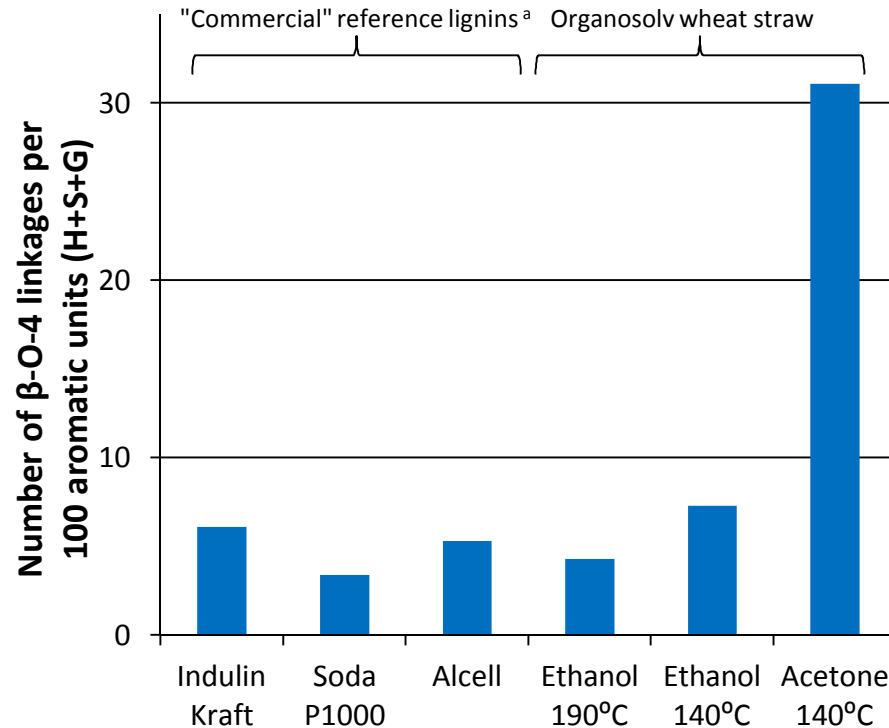
Organosolv process



Maximising C₅ sugars (wheat straw)



Lignin characteristics



^a Constant et al., *New insights into the structure and composition of technical lignins: a comparative characterisation study*

Fabiola feedstock screening experiments

140°C, 120 min, 50% w/w aqueous acetone, 40mM “Free” H₂SO₄

Wheat straw: 10 mm particles, L/S 10 l/kg

Hard and softwoods: 2 mm particles, L/S 5 l/kg

Wheat straw



Corn stover



Birch



Beech



Poplar



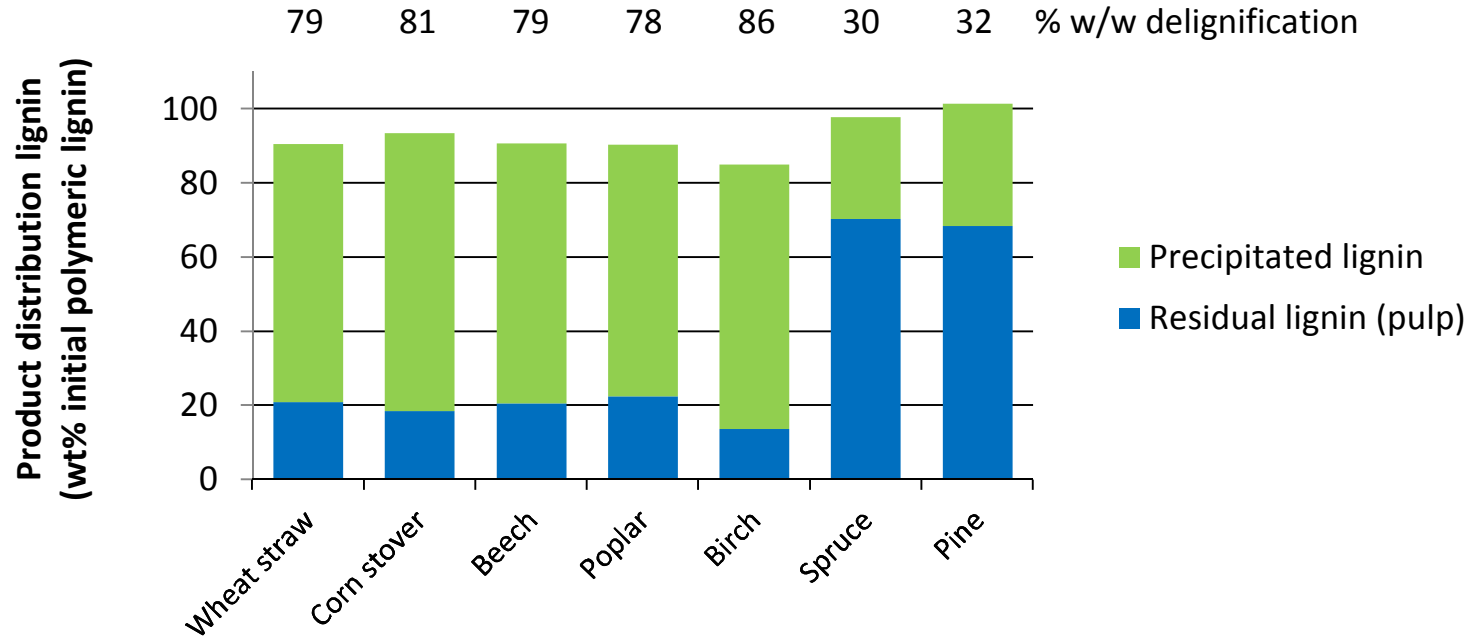
Spruce



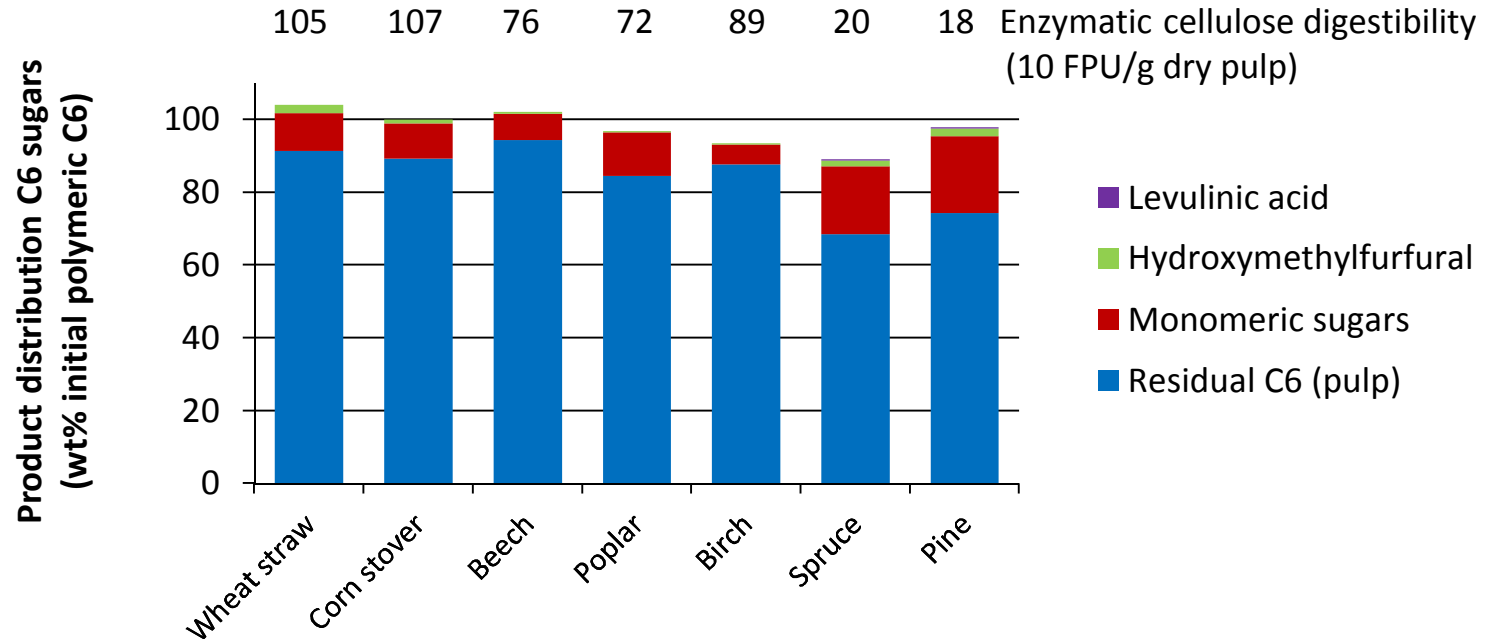
Pine



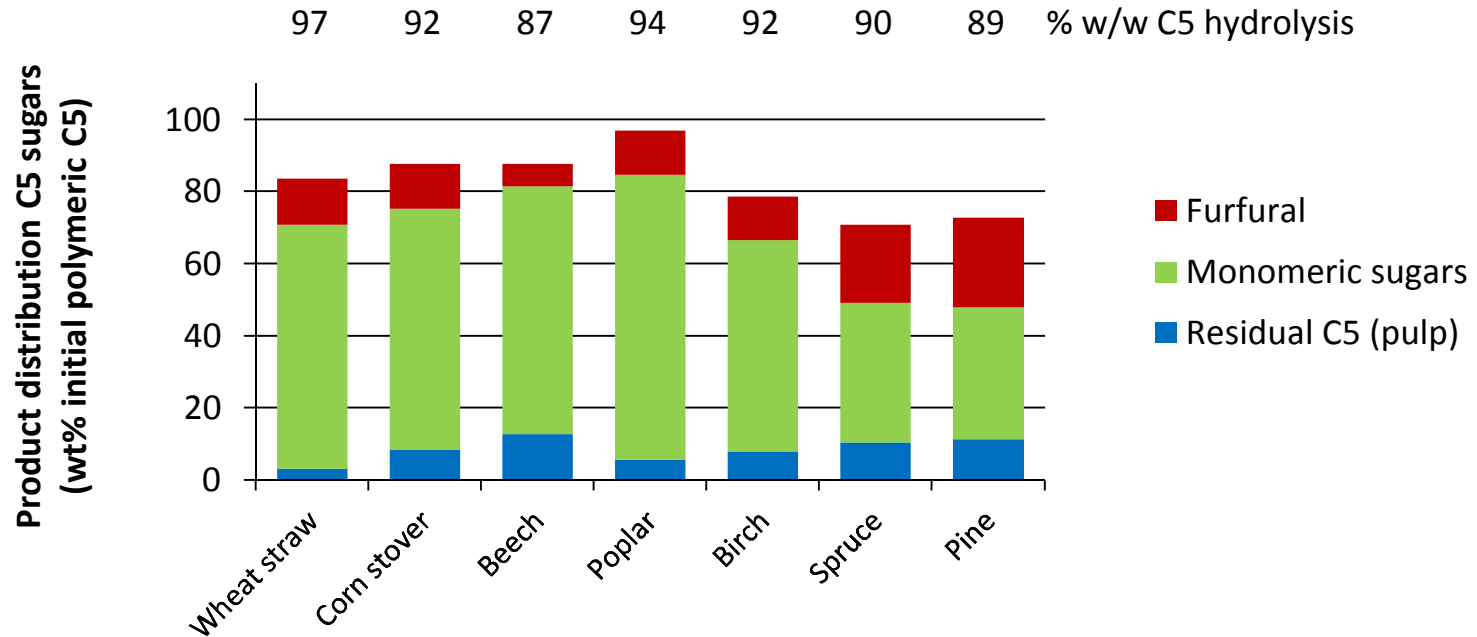
Lignin mass balance



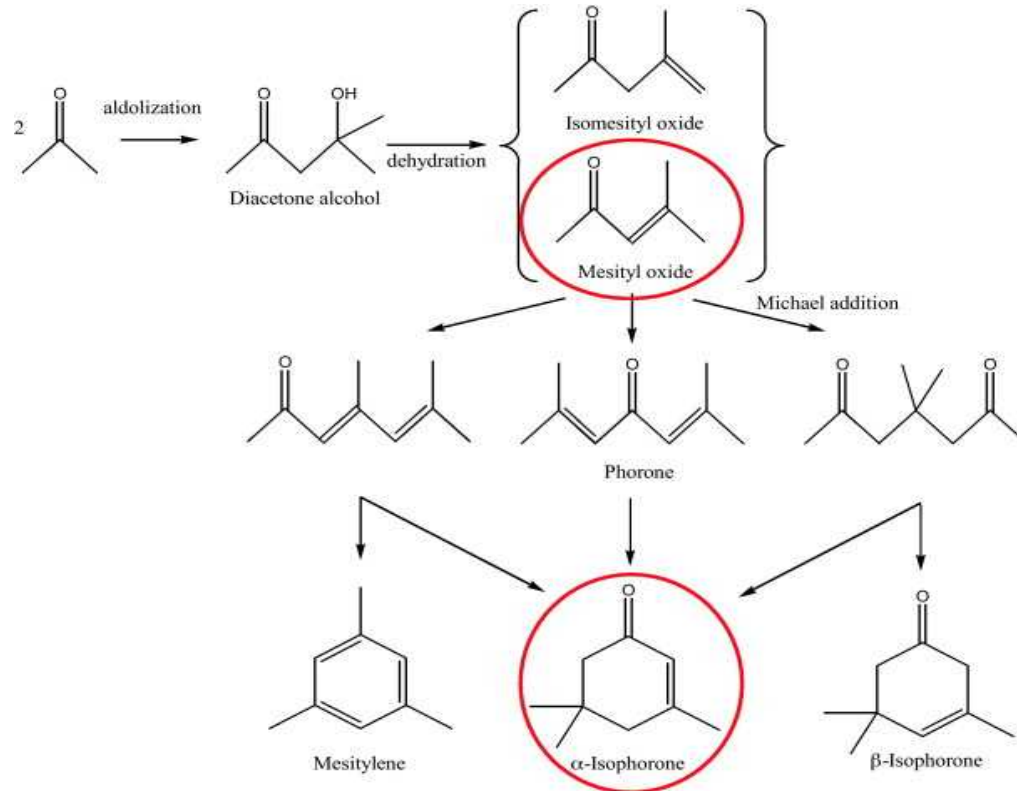
C6 mass balance



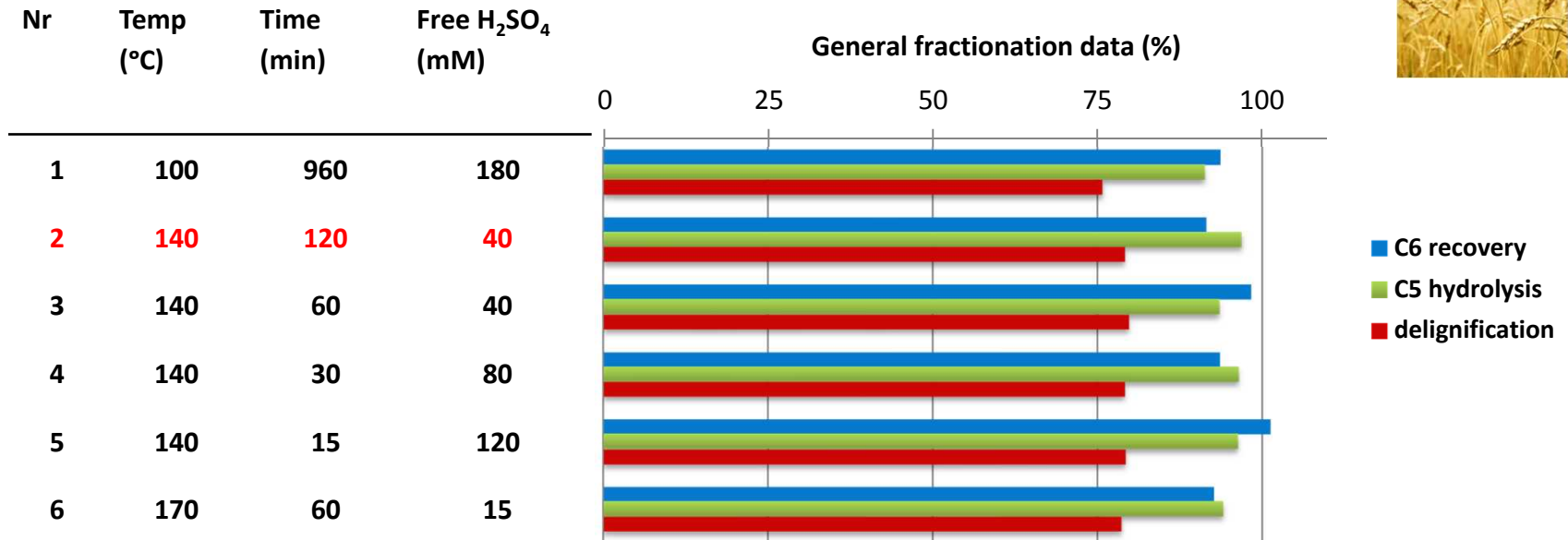
C5 mass balance



Acetone condensation reactions



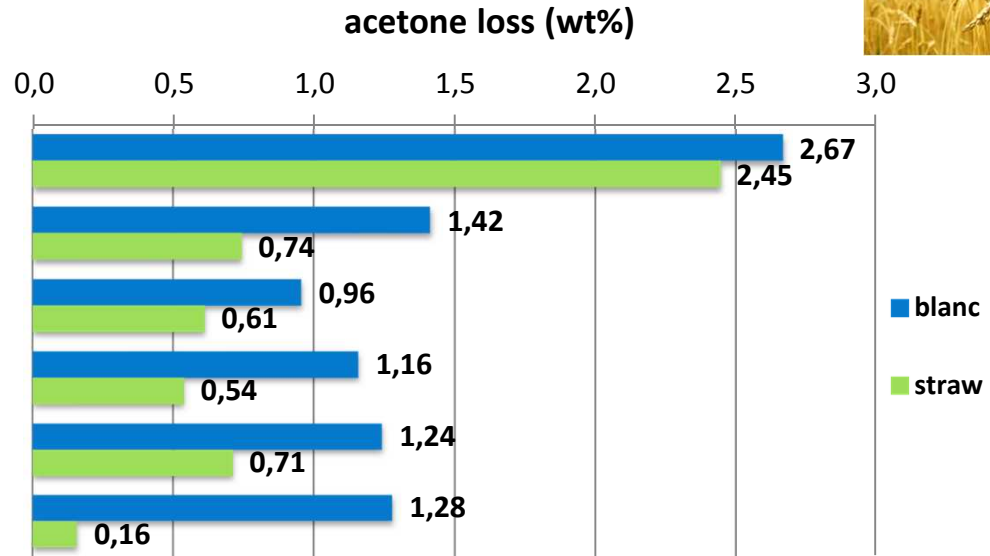
DoE acetone condensation



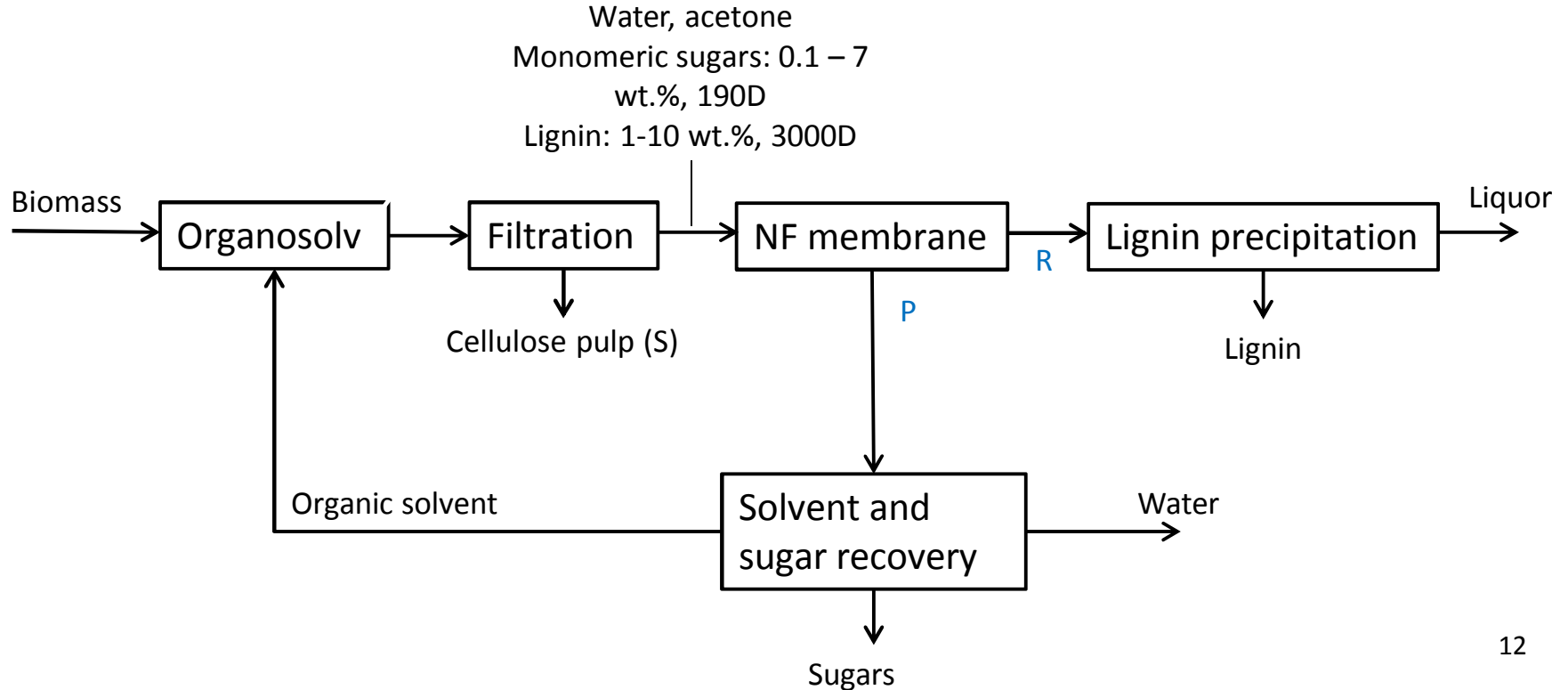
Acetone losses



Nr	Temp (°C)	Time (min)	Free H ₂ SO ₄ (mM)
1	100	960	180
2	140	120	40
3	140	60	40
4	140	30	80
5	140	15	120
6	170	60	15

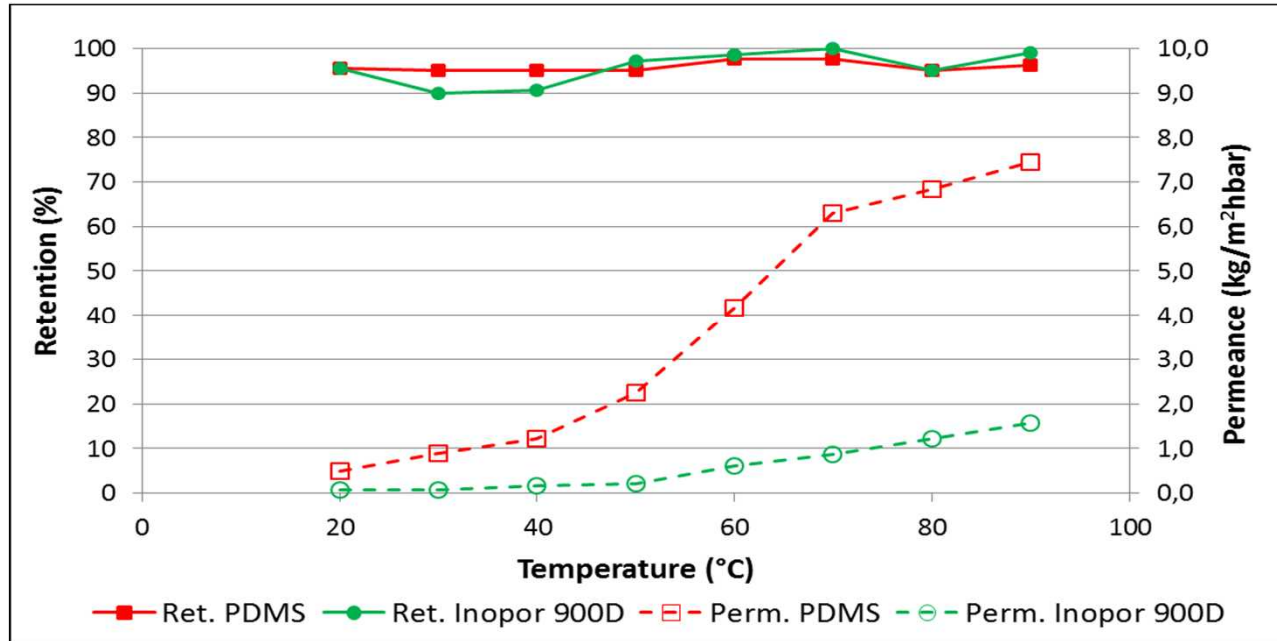


Lignin sugar separation



Nanofiltration membrane first tests

H₂O+acetone+PEG900, $\Delta P = 10$ bar



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Conclusions

- Fabiola, ECN's patented fractionation process based on low-temperature acetone, enables maximum valorization of lignocellulosic biomass by producing high yields of sugars and lignin for herbaceous biomass and hardwoods.
- Due to improved process conditions CAPEX and OPEX are reduced versus conventional ethanol-based Organosolv:
 - Lower reactor pressure
 - Reduced solvent loss
 - Reduced energy consumption for solvent recovery
- R&D focus on DSP (a.o. nanofiltration for lignin – sugar separation) and lignin applications.

Thank you for your attention



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