



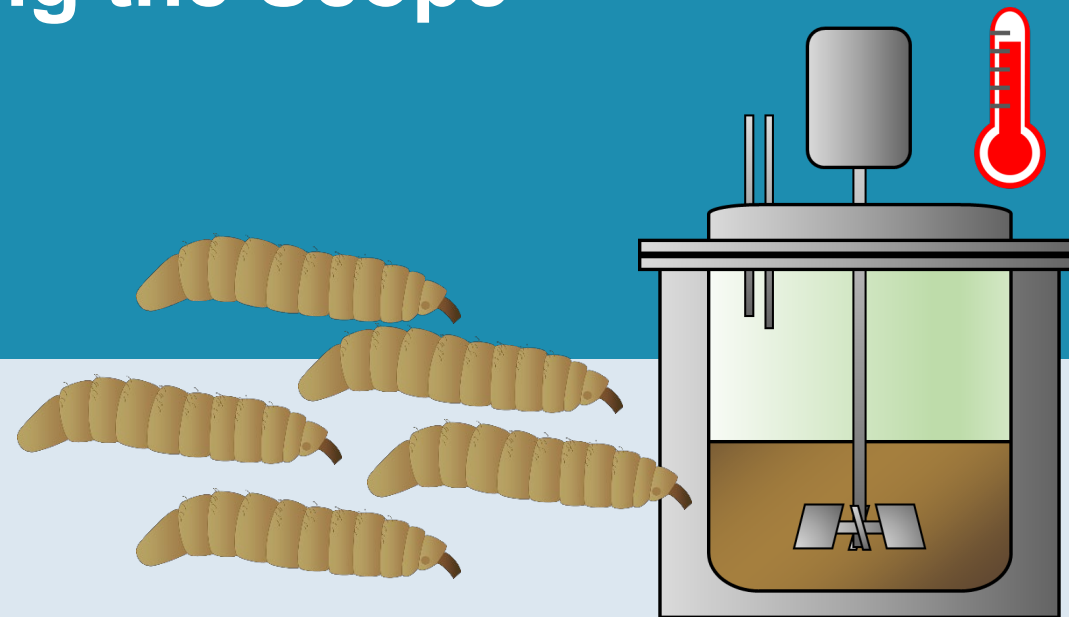
Subcritical Solvents for the Biorefinery of Chitin from Black Soldier Fly Larvae (*Hermetia illucens*) – Expanding the Scope towards other Insect Biomass

R. Smets¹, **E. Vervoort**¹, B. Sels², M. Van Der Borgh¹

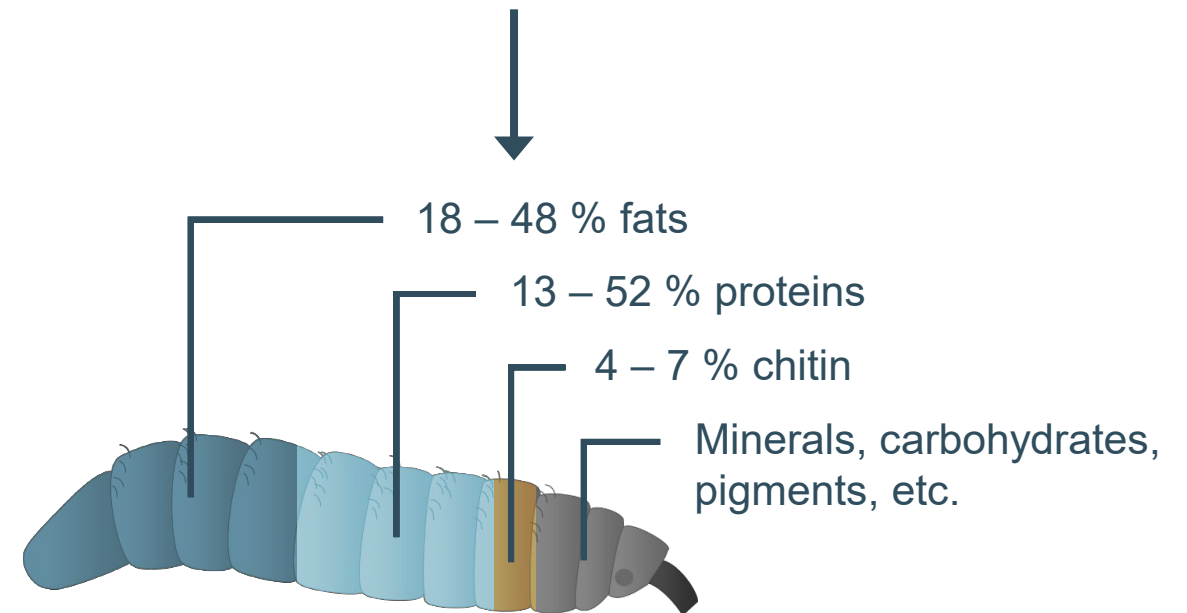
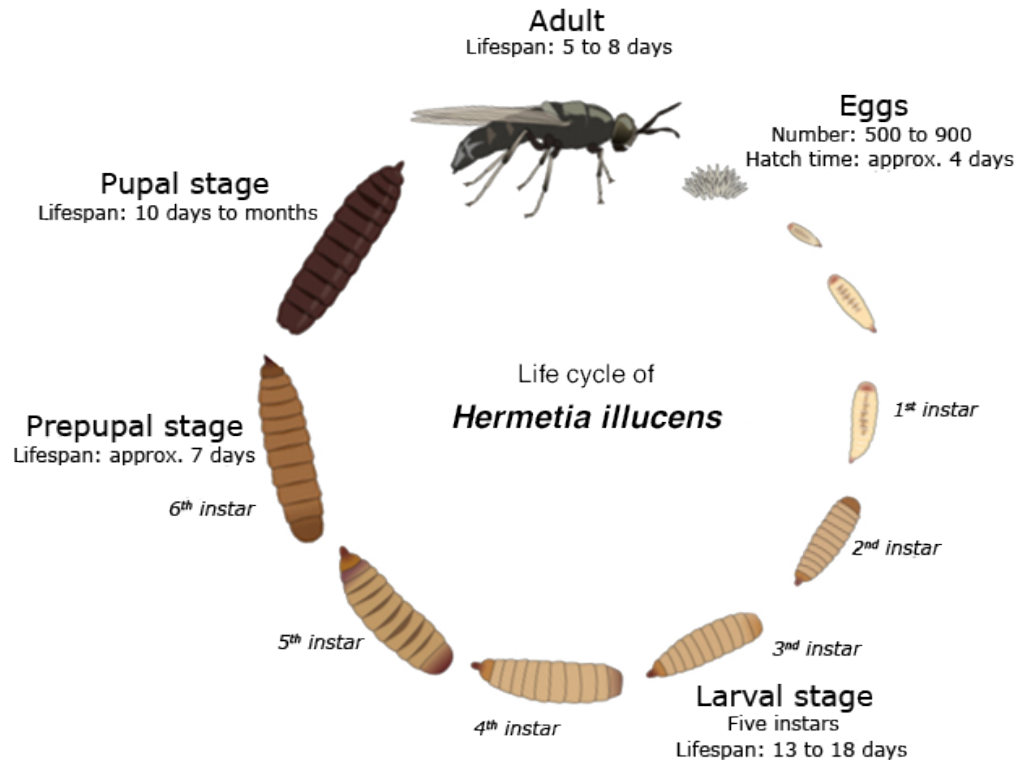
¹Research Group for Insect Production and Processing

²Center for Sustainable Catalysis and Engineering

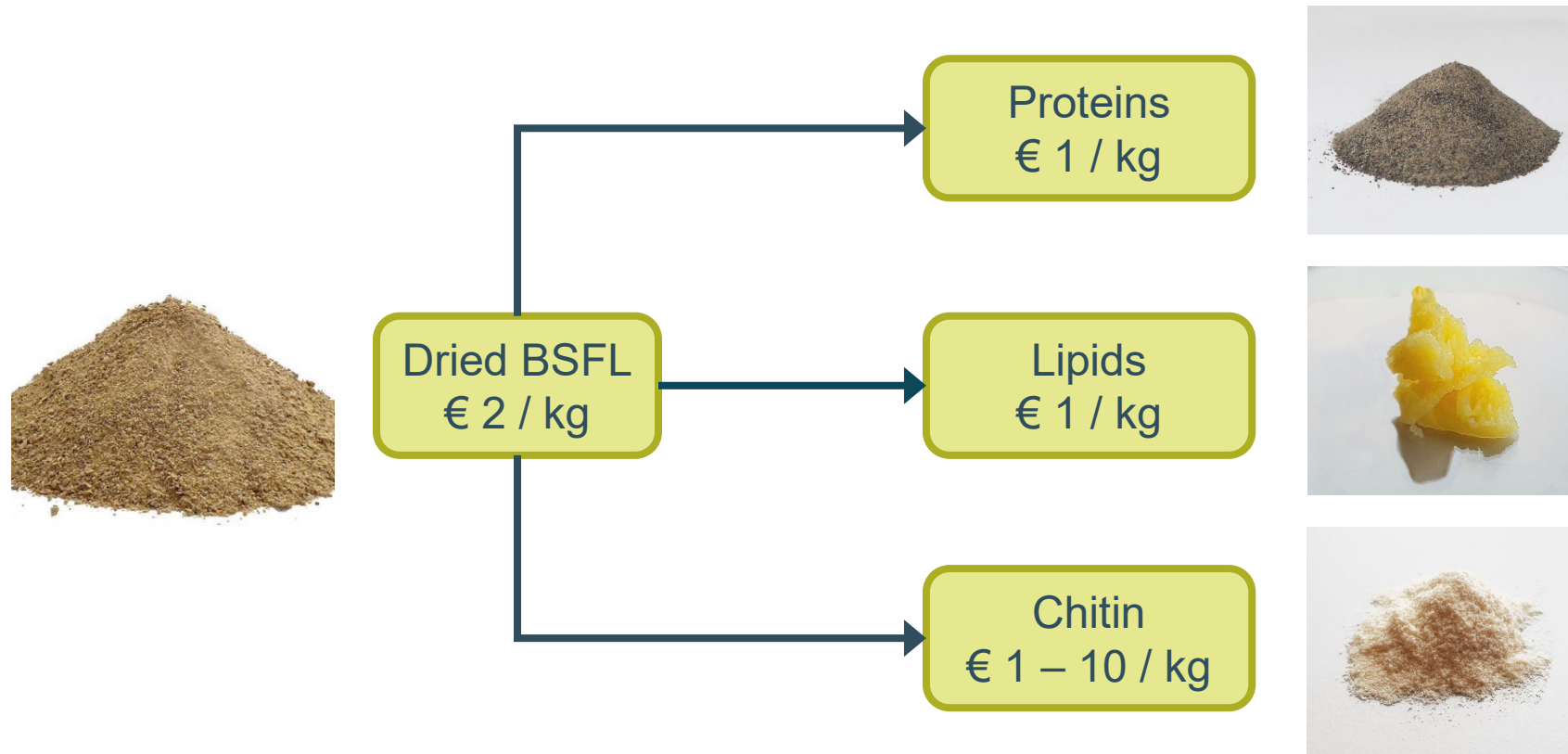
KU Leuven, Belgium



Black soldier fly (*Hermetia illucens*)



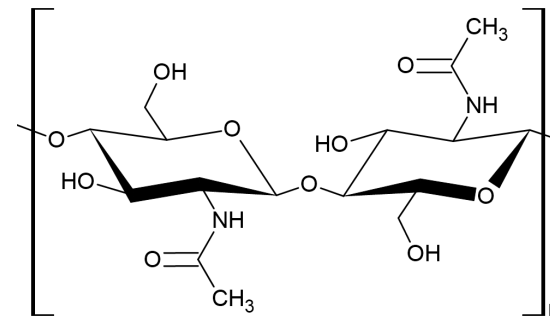
Increasing the economic value of BSFL



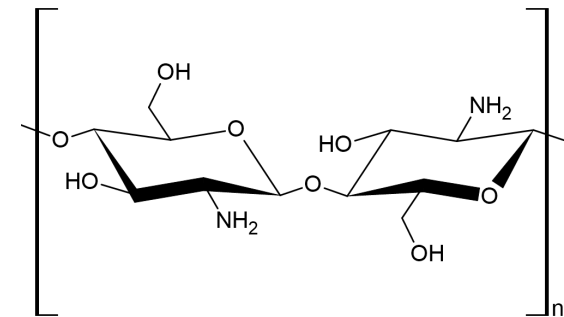
Increasing the economic value of BSFL



Dried BSFL
€ 2 / kg



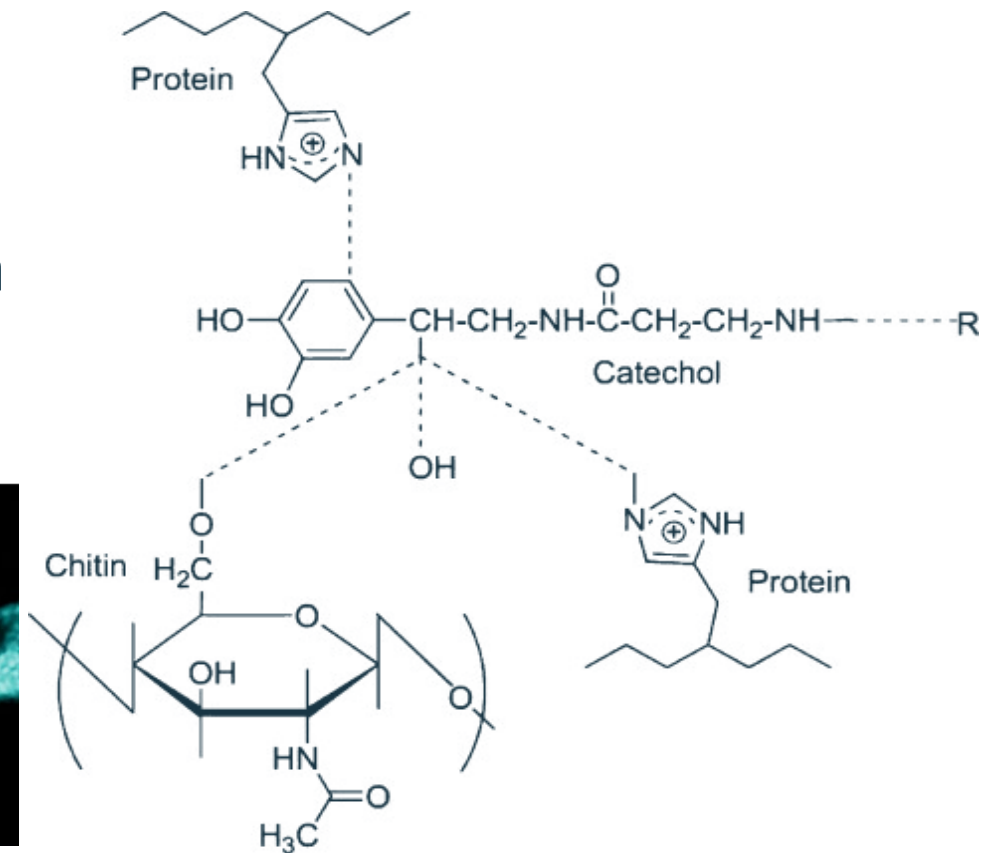
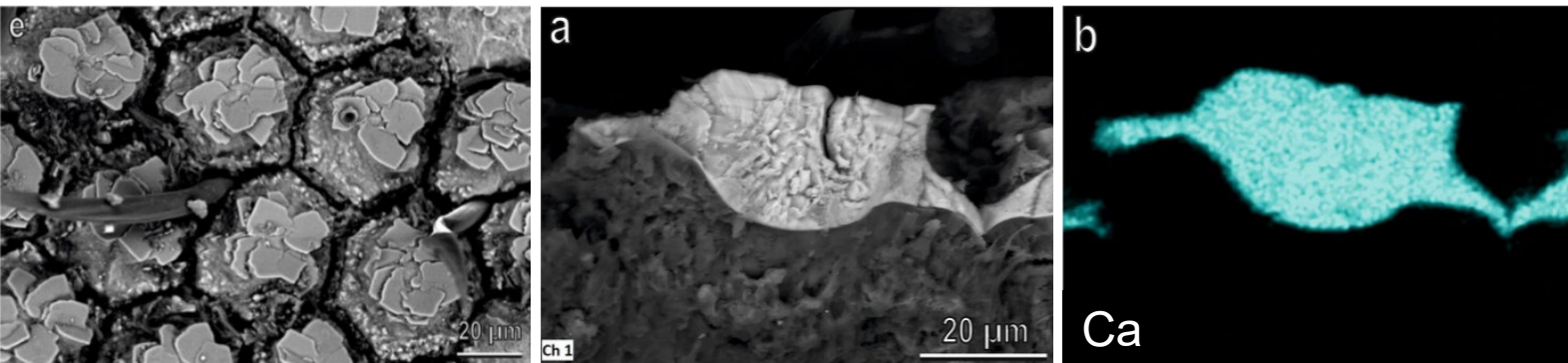
Chitin
€ 1 – 10 / kg



Chitosan
€ 12 – 54 / kg

State-of-the-art chitin isolation

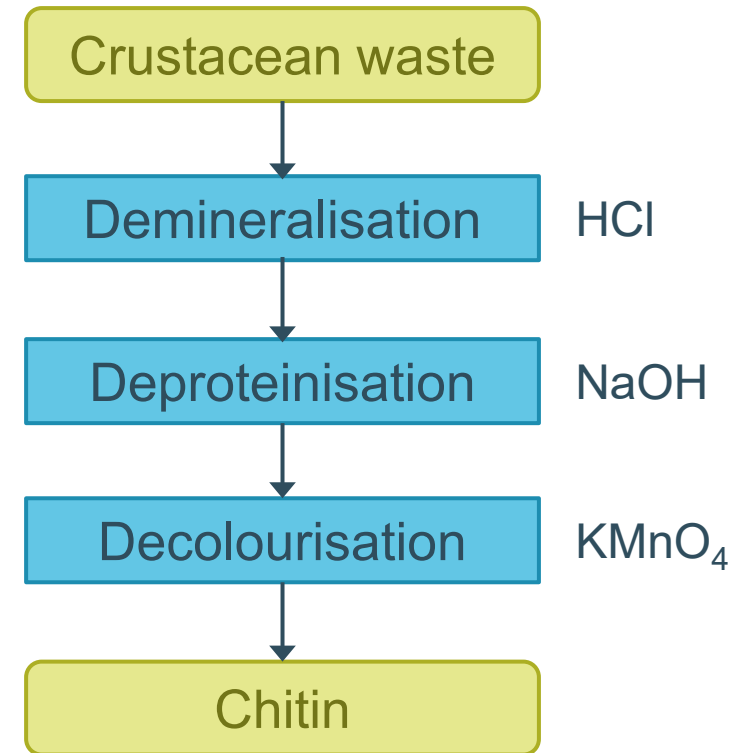
- Lipids
- Minerals, mainly CaCO_3 (calcite)
- Proteins and pigments chemically bound to chitin



State-of-the-art chitin isolation

Chemical processes

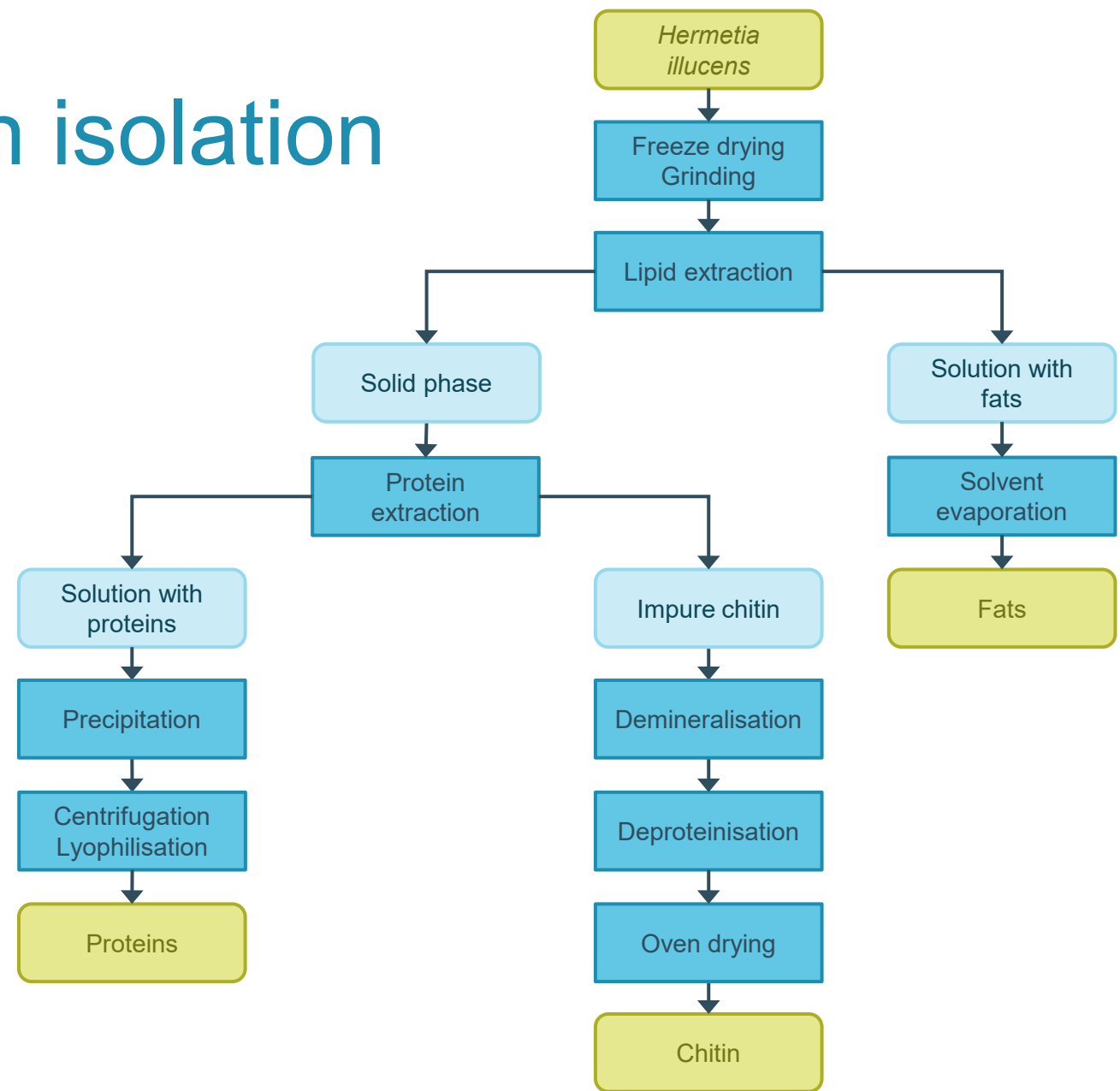
- Resource & energy intensive
 - 100 kg crustacean waste to < 20 kg chitin
 - 25 kg HCl, 100 kg NaOH
 - 800 kWh
- Impact on
 - Environment (caustic waste)
 - Product (degradation of properties & quality)
 - Profit (valuable proteins → waste)



State-of-the-art chitin isolation

- Chitin:
 - purity: 75 %
 - yield: 59 %

Chemical waste



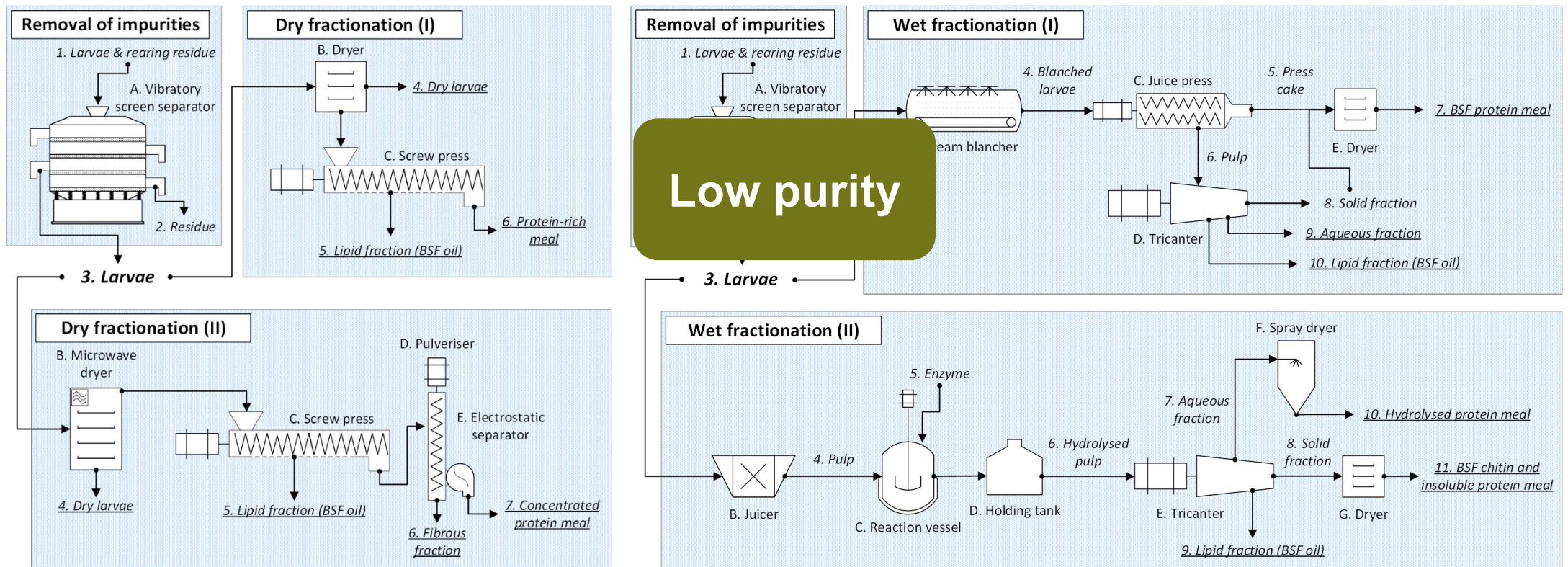
State-of-the-art chitin isolation

- Mechanical processes

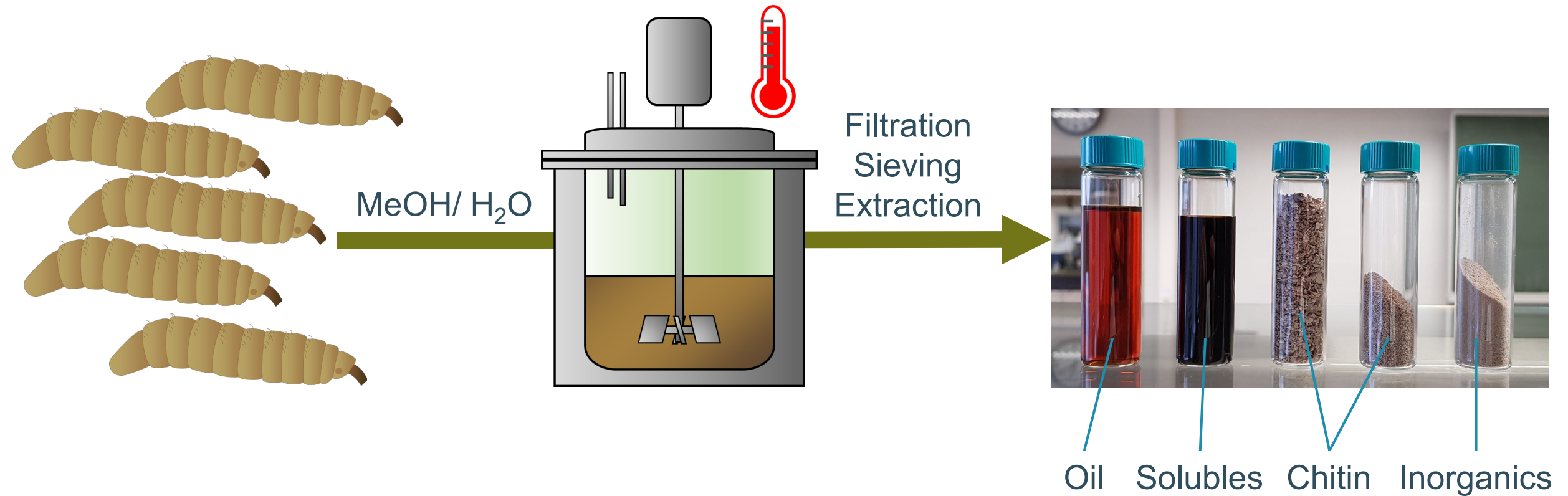
- Pressing, sieving, centrifugation...

- Biochemical procedures

- Microorganisms, enzymes



Novel biorefinery process



Comparison

Traditional, sequential process

- Dried biomass
 - 17 h defatting (petroleum ether)
 - 1 h demineralisation (1 M HCl)
 - 3 x 4 h deproteinisation (1 M NaOH)
- Chemical waste + time consuming

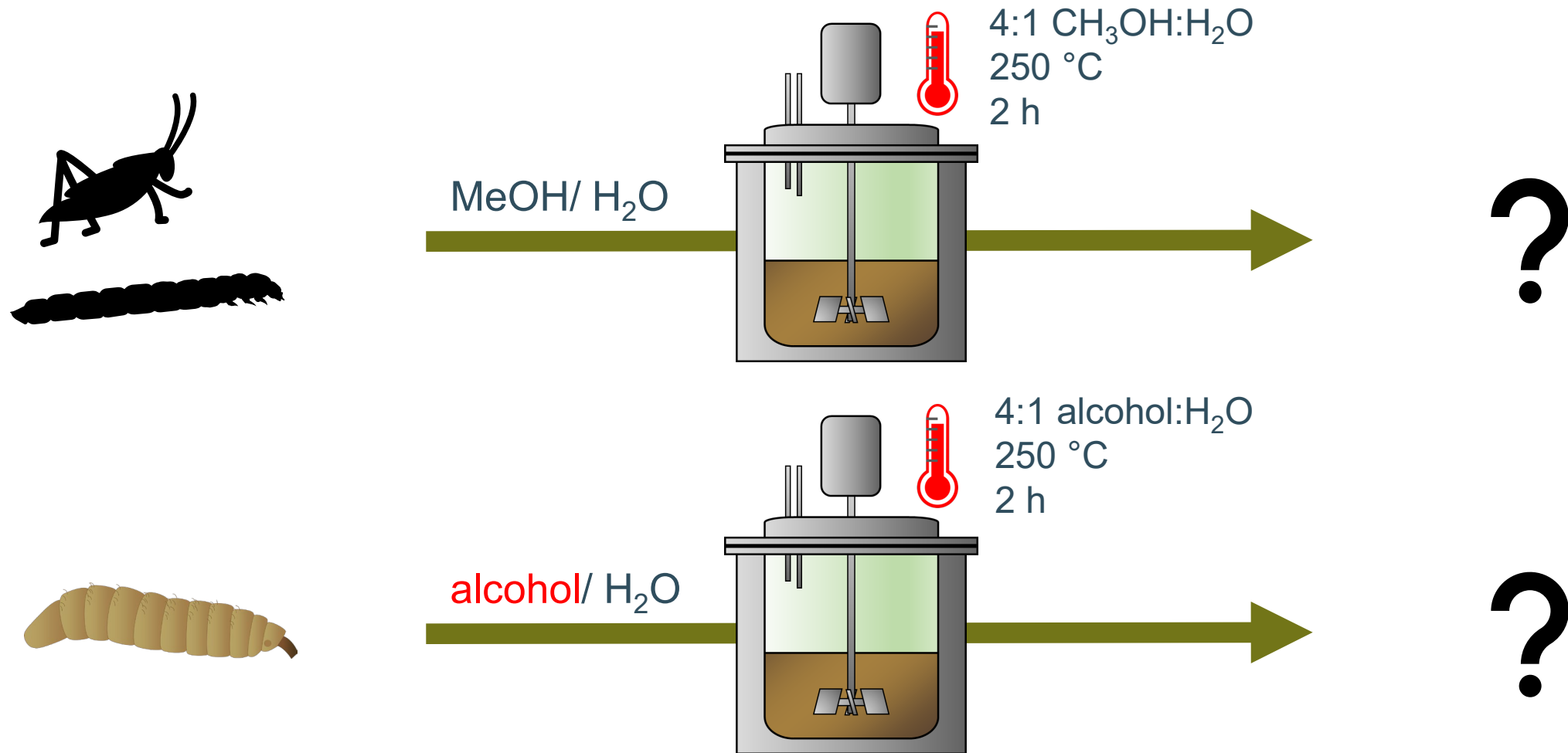
- Chitin:
 - purity: 75 %
 - yield: 59 %

Novel biorefinery process

- Fresh biomass
 - common solvent
 - heat
 - $\pm$ 3 h
- No waste

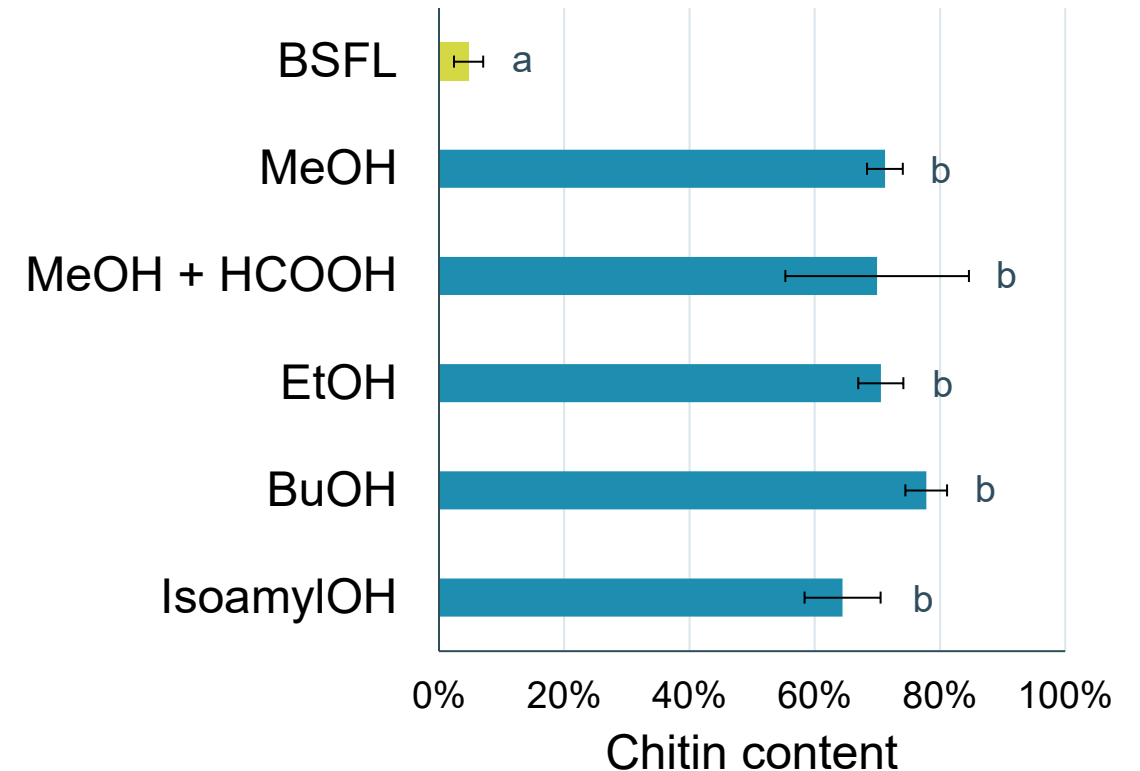
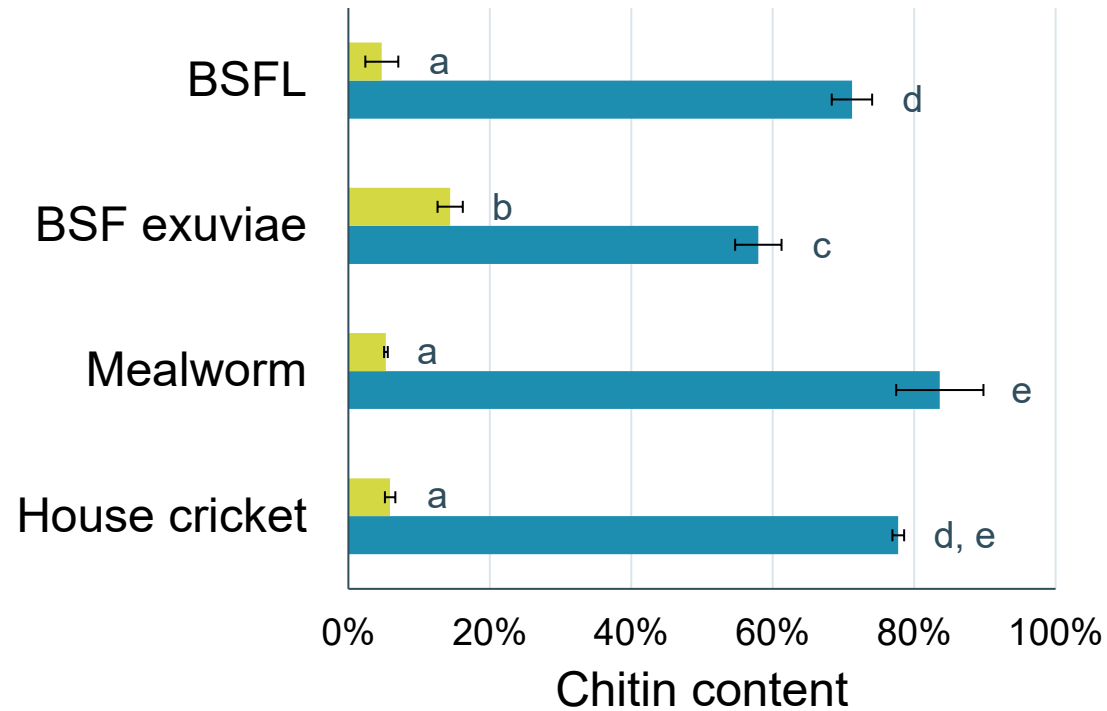
- Chitin:
 - purity: 77 %
 - yield: 79 %

Novel biorefinery process



Insect biomass

Subcritical alcohols



4:1 alcohol:H₂O 250 °C 2 h

■ Before reaction ■ After reaction

Conclusions

Sustainable novel process

No chemical waste

Reduced energy consumption

Versatile chitin biorefinery process

Various feedstocks

Various solvents



Research Group for

Insect Production & Processing



Contact:



evelynn.vervoort@kuleuven.be
ruben.smets@kuleuven.be
mik.vanderborght@kuleuven.be



Follow us on LinkedIn for more
updates on our research!



SCAN ME



<https://iiw.kuleuven.be/onderzoek/ResearchGroupforInsectProductionandProcessing>
<https://www.linkedin.com/company/ip-and-p/>