ZETADEC

SCALIBUR

LEADING A REVOLUTION
IN BIOWASTE RECYCLING

Extraction, characterization and functional properties of proteins from black soldier fly larvae (BSFL) reared on canteen waste

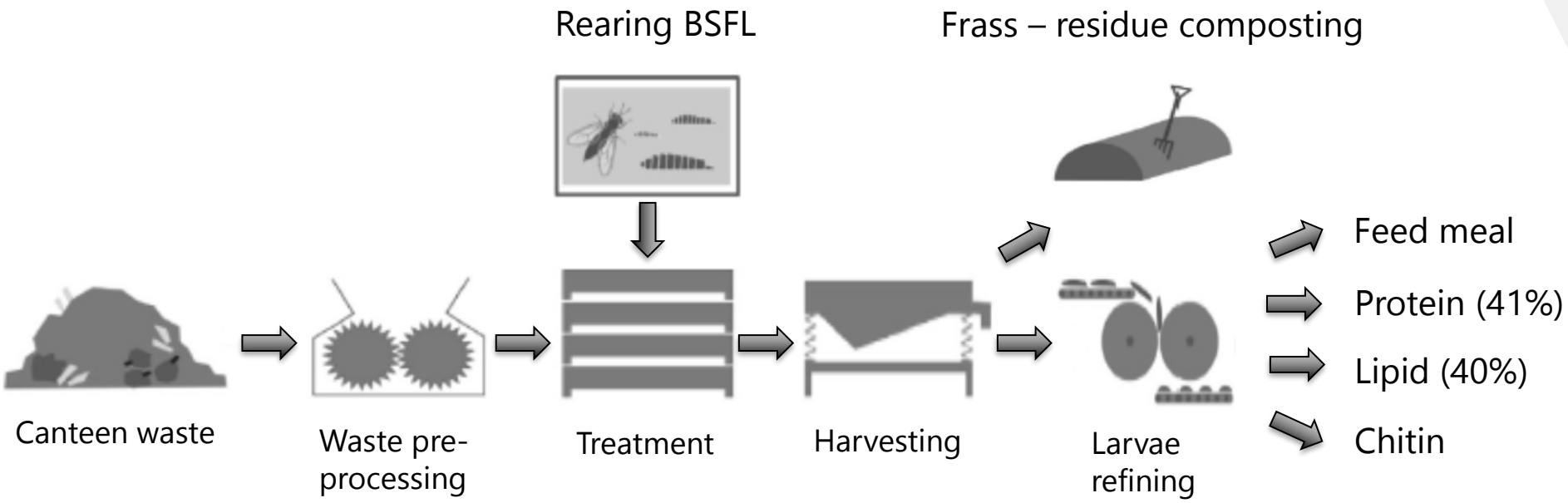
Lucian Miron
Process & Product Development Scientist, Zetadec, Wageningen, The Netherlands
9th International Conference on Sustainable Solid Waste Management, 15-18 June 2022

This project received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement Nº 817788

Contents

- Rearing of insects (BSFL) on canteen waste
- Issues
- Protein extraction
- Amino acid profile
- Techno-functionalities of BSFL proteins
- Application of BSFL in dog food
- Conclusions

Rearing of insects (BSFL) on organic waste

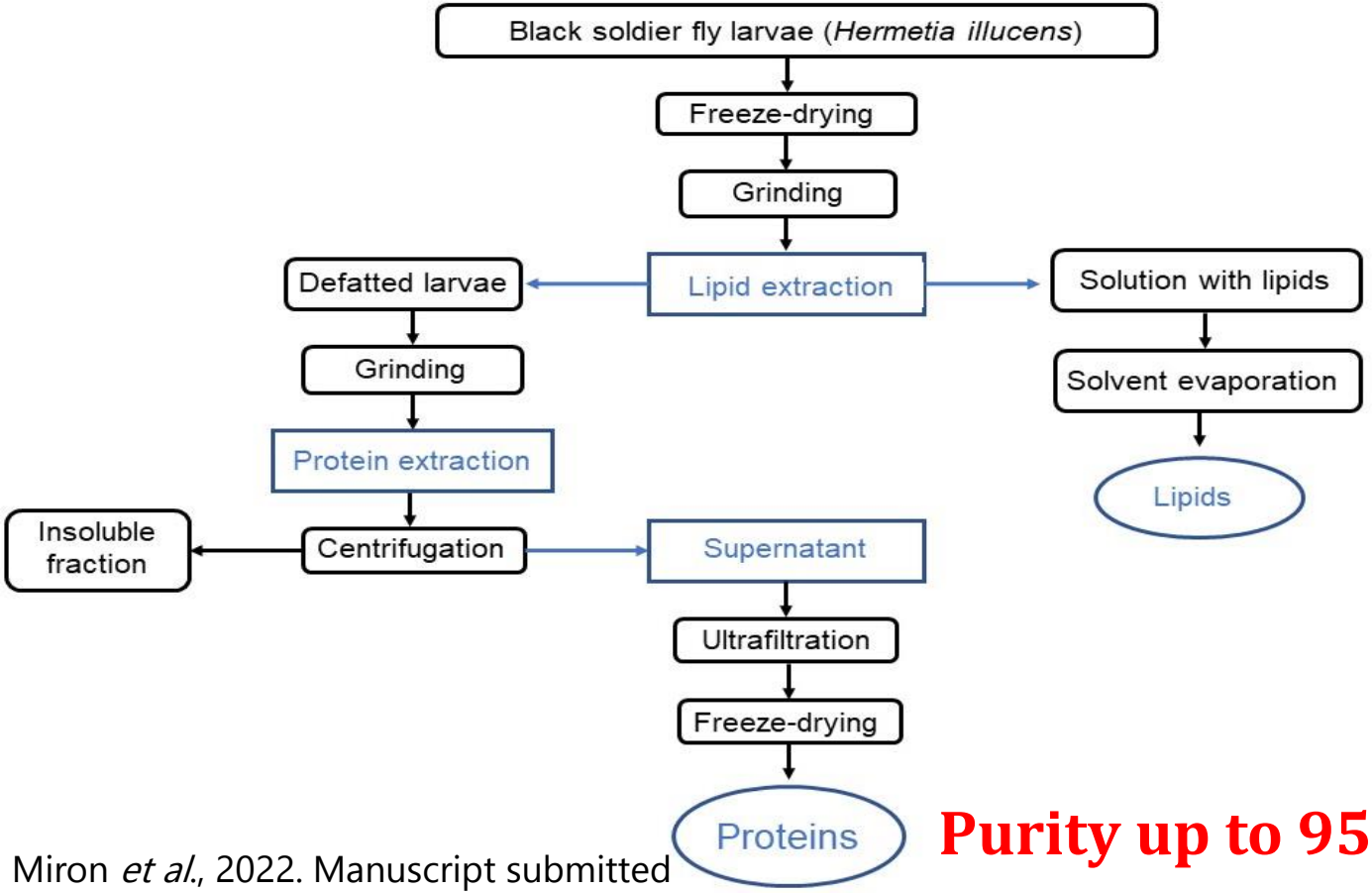


Issues

- The use of insect meal as feed and food is limited by the **legislation in Europe**
  - Novel Food according to the guidelines for market authorization of products by EFSA
  - Documents of safety demonstration of certain insect

- **Consumer acceptance** - the largest barrier to the adoption of insects as viable sources of protein in many Western countries

Protein extraction

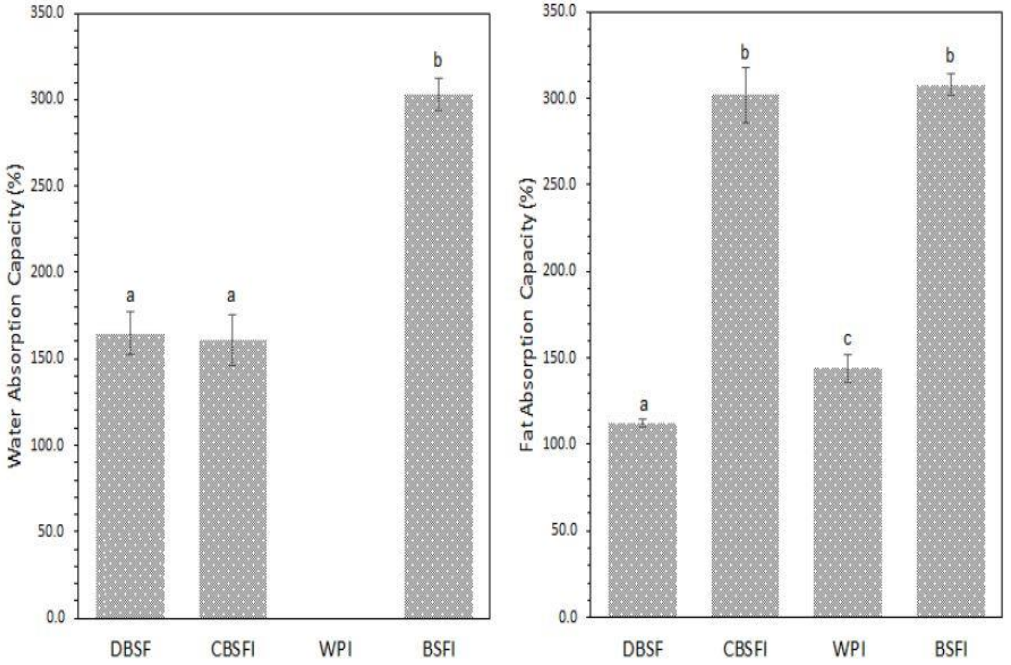


Purity up to 95%

Miron *et al.*, 2022. Manuscript submitted

Techno-functionalities of BSFL proteins

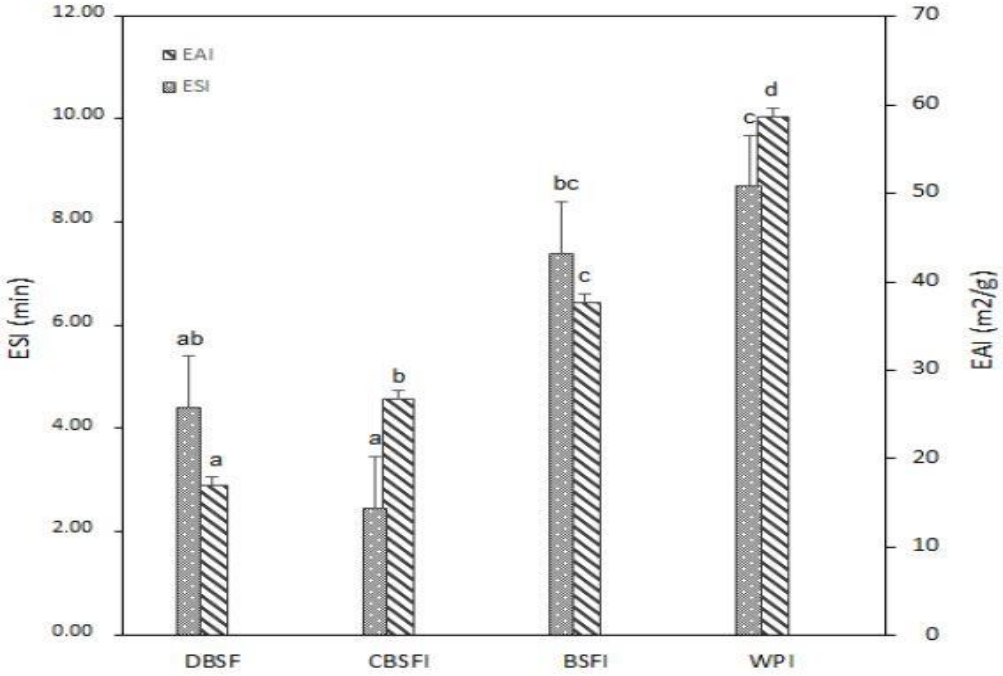
	Techno-functional property	Food system
High solubility	Solubility	Beverages
	Emulsification	Sausages, sauces, soups, cakes, salad dressings, ice-cream, yogurt
	Foaming	Whipped toppings, desserts, cakes
	Gelation	Meats, curds, cheese, meat analogues
Intermediate solubility	Cohesions-adhesion	Meats, sausages, baked goods, pasta
	Elasticity	Meats, bakery, cheese
	Viscosity	Soups, gravies, low-fat products
Low solubility	Fat adsorption	Meats, sausages, cakes, bakery
	Flavour binding	Meat analogues, bakery
	Hydrophobic films	Food coatings



- Defatted larvae (DBSF),
- Commerical BSF protein isolate (CBSFI)
- Organic waste BSF protein isolate (BSFI) and
- Whey protein isolate (WPI)

Techno-functionalities of BSFL proteins

	Techno-functional property	Food system
High solubility	Solubility	Beverages
	Emulsification	Sausages, sauces, soups, cakes, salad dressings, ice-cream, yogurt
	Foaming	Whipped toppings, desserts, cakes
	Gelation	Meats, curds, cheese, meat analogues
Intermediate solubility	Cohesions-adhesion	Meats, sausages, baked goods, pasta
	Elasticity	Meats, bakery, cheese
	Viscosity	Soups, gravies, low-fat products
Low solubility	Fat adsorption	Meats, sausages, cakes, bakery
	Flavour binding	Meat analogues, bakery
	Hydrophobic films	Food coatings



- Defatted larvae (DBSF),
- Commerical BSF protein isolate (CBSFI)
- Organic waste BSF protein isolate (BSFI)
- Whey protein isolate (WPI)

Application of BSFL in dog food

Dog food formulation used for extrusion

Raw material	Composition without insect (%)	Composition with insect (%)
Rice flower	50	50
Poultry meal	19	15
Greaves's meal	8	5
Brewer's yeast	15	15
Rapeseed oil	5	
Bone meal	1	
Premix	2	2
BSFL		13

Application of BSFL in dog food

Extrusion trial

APV Baker extruder used for producing dog food kibbles

PARAMETER	SETTING 1	SETTING 2
FEEDER (RPM) (OR%)	20	20
SCREW (%)	40	40
KNIFE (RPM)	100	100
WATER PUMP STAND (L/H)	12	12
DIE OPENING	2x3.5	2x3.5
TEMP ZONE 1 (°C)	30	30
TEMP ZONE 2 (°C)	40	40
TEMP ZONE 3 (°C)	50	50
TEMP ZONE 4 (°C)	60	60
TEMP ZONE 5 (°C)	80	100
TEMP ZONE 6 (°C)	105	125
TEMP ZONE 7 (°C)	120	140
TEMP ZONE 8 (°C)	125	145
TEMP ZONE 9 (°C)	130	150

Application of BSFL in dog food

Dog food kibbles

Conventional (130 ℃)

With insects (130 ℃)

Conventional (150 ℃)

With insects (150 ℃)

Conclusions

- Insects can be a sustainable source of proteins
- Legislation and consumer acceptance are the main issues for scaling up insect production
- BSFL proteins show good fat binding capacity and emulsification activity
- BSFL can successfully replace conventional sources of proteins and oils in dog food kibbles.
- BSFL does not have any influence on the texture, energy consumption (KWh/tonne), degree of expansion and bulk density of dog food kibbles.
- BSFL has a positive influence on the durability of dog food kibbles when processes at 130 ℃.

Thank you!

Lucian Miron
lucian.miron@zetadec.com
www.zetadec.com
Zetadec, The Netherlands

@SCALIBUR_H2020 SCALIBUR project **www.scalibur.eu**

This project received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement Nº 817788