InDIRECT

Evaluation of insect derived functional feed ingredients in poultry diets

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BIO-BASED INDUSTRIES
Bio-based Industries Consortium
Horizon 2020 European Union Funding for Research & Innovation

Outline

- InDirect: frame, objectives and expected results
- Insects and their derivatives: fractions and outcomes

Outline

- **InDirect: frame, objectives and expected results**
- Insects and their derivatives: fractions and outcomes

Fact sheet InDIRECT

Title:

Direct and indirect biorefinery technologies for conversion of organic side-streams into multiple marketable products

Acronym: InDIRECT

Project partners: 2 research partners; 7 industrial partners (5 SMEs)

Funding scheme: Research & Innovation Action

BBI.R10-2015-call on 'Innovative efficient biorefinery technologies'

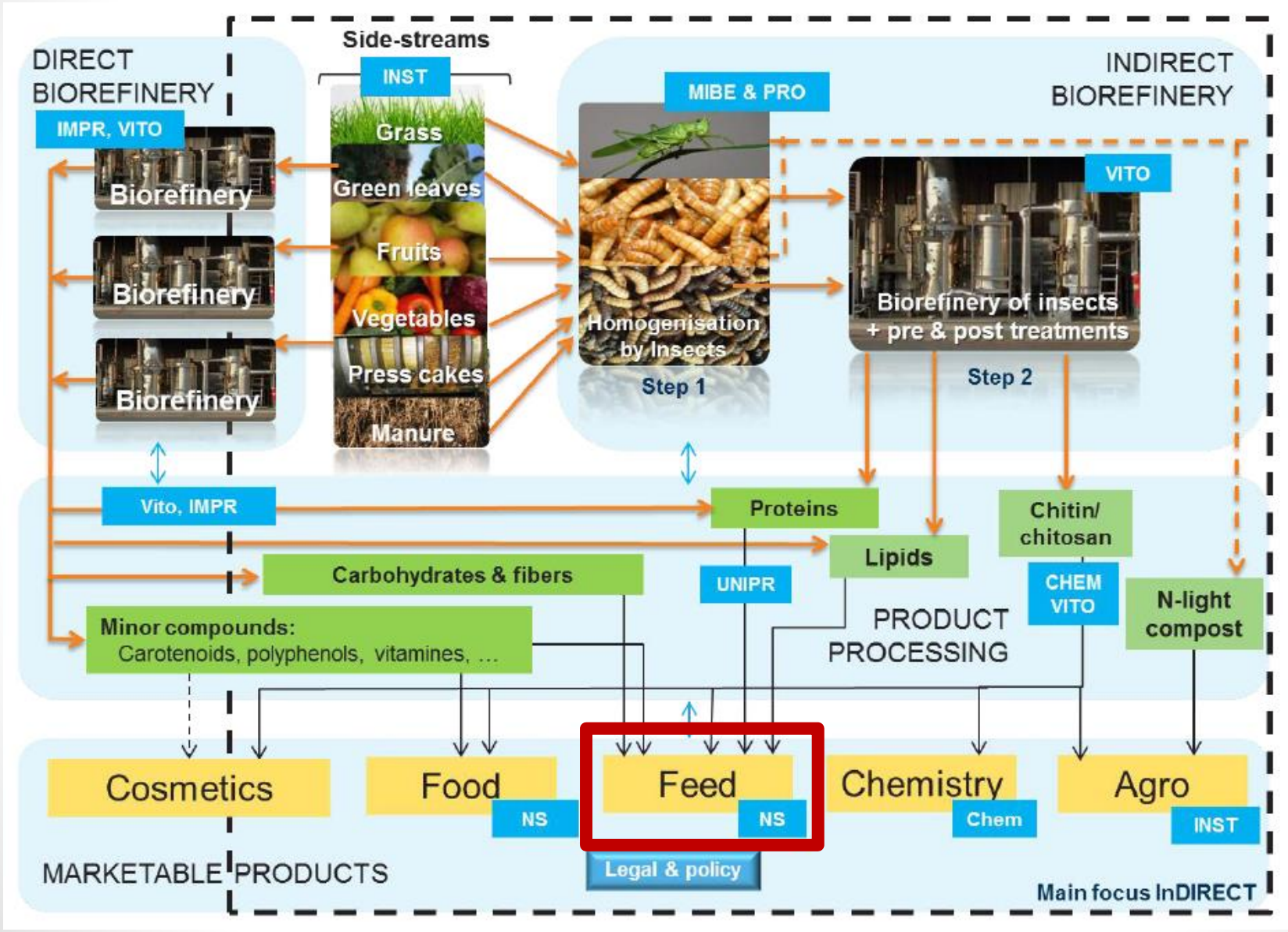
Total project costs: 2,089,670 euro

Grant: 1,347,948 euro

Duration: 36 months (official start 1/11/2016)

Coordination: VITO (Belgium)

InDIRECT


DIRECT BIOREFINERY
IMPR, VITO
Biorefinery
Biorefinery
Biorefinery
Side-streams
INST
Grass
Green leaves
Fruits
Vegetables
Press cakes
Manure
MIBE & PRO
Homogenisation by Insects
Step 1
INDIRECT BIOREFINERY
VITO
Biorefinery of insects + pre & post treatments
Step 2
Vito, IMPR
Proteins
Lipids
Carbohydrates & fibers
Minor compounds:
Carotenoids, polyphenols, vitamines, …
UNIPR
Chitin/ chitosan
CHEM VITO
N-light compost
PRODUCT PROCESSING
Cosmetics
Food
NS
Feed
NS
Chemistry
Chem
Agro
INST
Legal & policy
MARKETABLE PRODUCTS
Main focus InDIRECT

Outline

- InDirect: frame, objectives and expected results
- **Insects and their derivatives: fractions and outcomes**

Samples for feed application

Insect type: Black soldier fly

- 100 kg reared on standard feed

Fraction generated lab scale tests (5- 100 g DW):

- Mechanical/chemical approach:
  - Lipid enriched fraction (74 % crude lipids)
  - Protein enriched fraction 1 (48 % crude proteins)
  - Protein enriched fraction 2 (71 % crude proteins)
  - Chitosan
- Enzymatic approach:
  - Peptides (about 50 % crude proteins)

Selection to be made for animal trial

Feed application tests

Step 1: tests with 2-100 g DW extract

- Bioactive properties
- Git simulation test (in vitro test)

Step 2: upscaling (> 10 kg DW fractions) → animal tests

- Poultry test - ongoing

Feed application tests

Step 1: tests with 2-100 g DW extract

- **Bioactive properties**
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Feed application tests

Results lab scale trials – bioactive properties

Fraction	Antimicrobial		Agglutination potential	Prebiotic power	
	Kill of E. coli K 88 (%)	Kill of S. Suis (%)		Carbon	Nitrogen
Lipid enriched	0	86	-	2	2
Protein enriched 1	80	0	-	2	2
Protein enriched 2	26	35	potential	2	2
Chitosan	29	52	Potential	1	3
Peptides	30-64	0	Potential	2	2

Escherichia coli K88
Streptococcus suis

1 = low prebiotic power
2 = moderate prebiotic power
3 = Prebiotic power

Selected for git simulation test (in vitro test) based on:

- Bioactive properties &
- upscaling production to > 10 kg DW

Feed application tests

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- **Git simulation test (in vitro test)**

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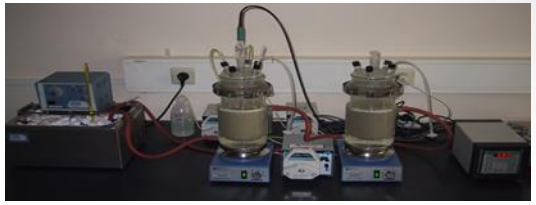
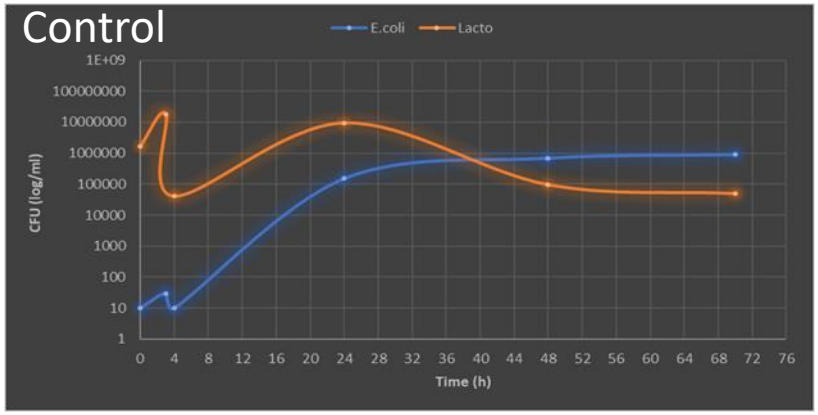
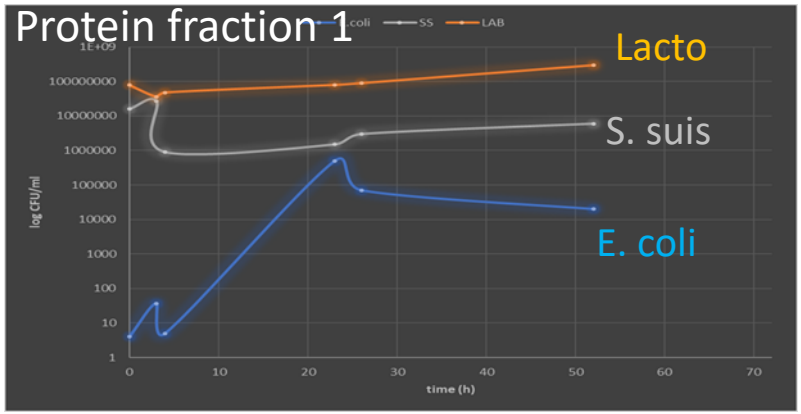
Feed application tests

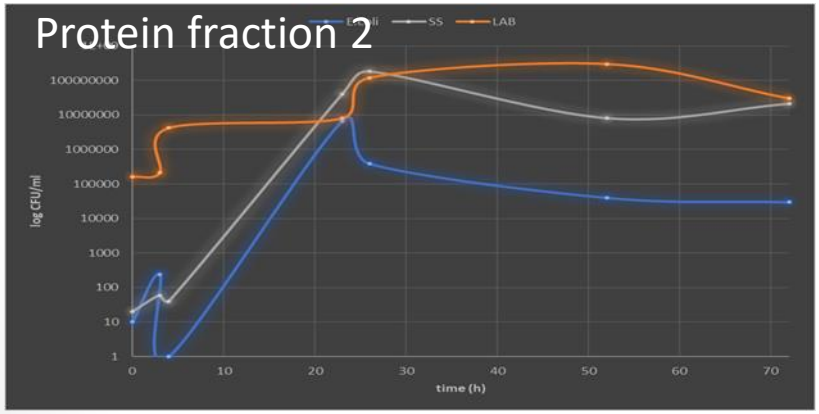


In vitro git simulation trials

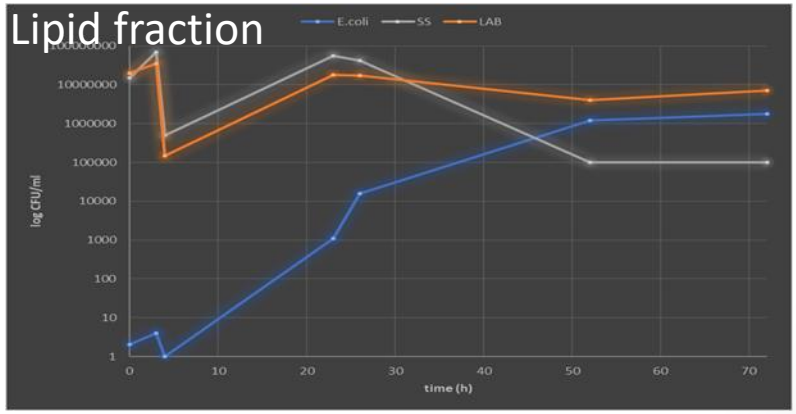




Antimicrobial against E. coli;
Beneficial flora (lactic acid bacteria)



Agglutination potential against E. coli at neutral pH
Beneficial flora (lactic acid bacteria)



High antimicrobial activity against S. Suis; not E. coli
Beneficial flora (lactic acid bacteria)

Bioactivity properties confirmed!

Feed application tests

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Step 2: **upscaling** (> 10 kg DW fractions) → animal tests

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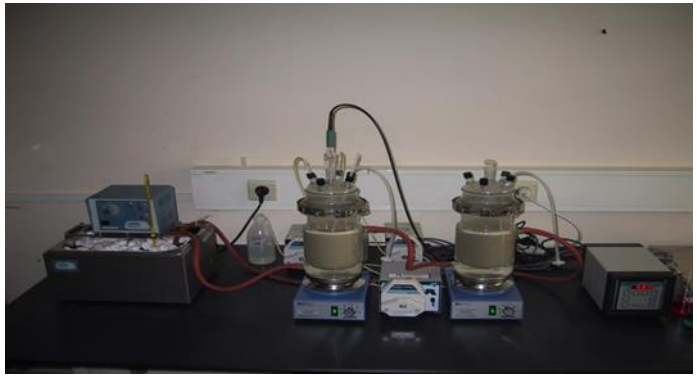

Samples for feed application

Insect type: Black soldier fly

- 500 kg reared on side-stream mixture

Fraction generated for animal trial:

- Mechanical/chemical approach (upscaled procedure):
  - Lipid enriched fraction (90 % crude lipids)
  - Protein enriched fraction 1 (45 % crude proteins)
  - Protein enriched fraction 2 (49 % crude proteins)

Frozen lipid fraction

Homogenized protein rich fraction
→ packed in 1 kg bags

Animal trial preparation

Feed preparation

Feed production @ site

- 4 treatments:
  - A: NC (conventional feed)
  - B: NC + InDIRECT component 1: BSF lipid enriched fraction
  - C: NC + InDIRECT component 2: BSF protein enriched fraction 1
  - D: NC + InDIRECT component 2: BSF protein enriched fraction 2
- Monitoring:
  - Zootechnical performance (DWG, DFI, FCR)

Animal trial Infrastructure

InDIRECT consortium

InDIRECT

vito vision on technology

nutrition sciences

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Coordinator: leen.bastiaens@vito.be

www.BBI-indirect.eu

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BIO-BASED INDUSTRIES Public-Private Partnership

Bio-based Industries Consortium

Horizon 2020 European Union Funding for Research & Innovation