Processing of Insects

A new competition to Fish Meal?

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Executive Summary

Insect Processing - A new competitor to fish meal?
Insect Processing - A new competitor to fish meal?

Content

• Introduction
• Insects for meal production
• Process description
• End products
• Economic Aspects
• Outlook
Introduction

Direct Food/ Food Processing

- Beetles: 31%
- Caterpillars: 18%
- Bees, wasps and ants: 14%
- Grasshoppers, locusts, and crickets: 13%
- Cicadas, plant-hoppers, scale insects and other true bugs: 10%
- Termites: 3%
- Dragonflies: 3%
- Flies: 2%
- Other orders: 6%

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Popularity in % by order, Source: Food and Agriculture of the United Nations

Food and Agriculture of the United Nations
Introduction

Direct Food/ Food Processing
- long tradition world wide
- legal within the EU and most of the countries

Fractionation of Insects
- new application
- not approved yet in the EU for food grade
  (approval expected soon)
- approved for feed purpose
  (EU) 2017/893)
Direct Food/ Food Processing

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Insects for Meal Production

Popularity in % by order, Source: Food and Agriculture of the United Nations

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Insects for Meal Production

Black Soldier Fly (BSF)
*Hermetia Illucens*

Lesser Mealworm (Little Beetle)
*Alphitobius diaperinus*
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Insects for Meal Production

Feed-Management  Breeding & Rearing  Processing  Distribution of Final Products

Waste
1. Breeding and Rearing

Live Cycle of BSF (estimations):

Breeding: 5 days

Rearing: 20 – 30 days
- feeding with organic material
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- Life cycle 25 – 35 days
- 365 day/a production
- 7 kg of (wet) feed for 1 kg larvae
- Foot Print of 20,000 m² for 50,000 t/a
- Investment of 10 – 30 Mio €
1. Breeding and Rearing

Feed Management
350,000 t/a
1,030 t/d
50 Trucks per day

Breeding & Rearing

Larvae (estimated)
50,000 t/a
7,700 h/a production
6,5 t/h capacity

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2. Processing

- Larvae (estimated)
  - 50,000 t/a
  - 7,700 h/a production
  - 6.5 t/h capacity

- Processing

- Endproducts (estimated)
  - 1.1 - 1.5 t/h Meal
  - 0.5 - 0.7 t/h Fat

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Insects for Meal Production

**Feed-Management**
- 350,000 t/a
- 1,030 t/d
- 50 Trucks per day

**Breeding & Rearing**

**Processing**
- Waste
- 8,500–11,500 t/a
  - 1.1 - 1.5 t/h Meal
- 3,800–5,400 t/a
  - 0.5 - 0.7 t/h Fat

**Distribution of Final Products**
# 2. Processing

## Insect Processing - A new competitor to fish meal?

<table>
<thead>
<tr>
<th>Composition</th>
<th>BSF</th>
<th>Salmon (H&amp;BB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dry Substance</td>
<td>28 – 30 %</td>
<td>28 – 30 %</td>
</tr>
<tr>
<td>Fat</td>
<td>9 – 11 %</td>
<td>16 – 25 %</td>
</tr>
<tr>
<td>Protein</td>
<td>10 – 12 %</td>
<td>9 – 11 %</td>
</tr>
</tbody>
</table>
# 2. Processing

<table>
<thead>
<tr>
<th>Process</th>
<th>Feed Grade</th>
<th>Food grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Whole Fish/ Wet rendering</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Dry Rendering</td>
<td>yes</td>
<td>-</td>
</tr>
<tr>
<td>Hydrolyse</td>
<td>(yes)</td>
<td>yes</td>
</tr>
</tbody>
</table>
Whole fish proces

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High Temperature Rendering

Insect Processing - A new competitor to fish meal?
Enzymatic Hydrolysis Process

Insect Processing - A new competitor to fish meal?
Example 2: Recovery of Protein and Fat from Larvae
Insect Processing - A new competitor to fish meal?

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- Introduction
- Insects for meal production
- Process description
- **End products**
- Economic Aspects
- Outlook
### Composition

<table>
<thead>
<tr>
<th></th>
<th>Fish Meal</th>
<th>BSF Meal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moisture</td>
<td>6 – 10 %</td>
<td>6 – 10 %</td>
</tr>
<tr>
<td>Protein (on DS)</td>
<td>60 – 72 %</td>
<td>54 – 64 %</td>
</tr>
<tr>
<td>Fat (on DS)</td>
<td>8 – 12 %</td>
<td>8 – 12 %</td>
</tr>
</tbody>
</table>

Composition and quality are strongly reflect to the quality of feed!
BSF Meal

Nutritional value of insect proteins

Source: Bühler, Networking days 2016
Fat from Black Soldier Fly:
- low in unsaturated fatty acids
- nutty taste and smell

Composition and quality are strongly reflect to the quality of feed!
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2. Processing

Larvae (estimated)

Capacity
6,5 t/h

Processing

Endproducts (estimated)

1,2 t/h Meal
0,6 t/h Fat

Energy

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1. Breeding and Rearing

- **Feed Management**
  - 350,000 t/a
  - 1,030 t/d
  - 50 Trucks per day

- **Breeding & Rearing**
  - 50,000 t/a
  - 7,700 h/a production
  - 6.5 t/h capacity

- **Larvae (estimated)**

**Breeding & Rearing Plant**
- 20,000 m²
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Outlook

Pros:
• Availability (365 d/a)
• Amino Acid profile
• Sustainability
• Waste to feed transfer

Cons:
• Low value of the fat
• New application
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Aquaculture partners: developing Protein X, Lipid X and Chitin X as core ingredients for salmonids

AGRIPROTEIN TO BUILD 20 FLY FARMS IN US AND CANADA

AgTech pioneer sets up North American team to bring insect protein into mainstream of animal feeds

San Francisco, Tuesday March 28 2017
Summary: Raw Material

- Raw material has been selected
Summary: Technologies

- Breeding process has been developed
- Process for meal production can be adapted
Summary: End Products

• Market for end products has been identified
Summary: Economy

- Cost for feed supply chain not clear yet
- Processing cost for Breeding are available
- Processing cost for meal production similar to fish meal
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Thanks for your attention