Workshop Plant-based food – Taste it!

Introduction plant based food with a focus on legumes

OEYE Workshop 1.9.2022 Luca Müller Bio Suisse, Ivraina Brändle FiBL, Ursula Kretzschmar FiBL
# Program

<table>
<thead>
<tr>
<th>Time</th>
<th>Subject</th>
<th>Presenter</th>
</tr>
</thead>
<tbody>
<tr>
<td>9:30 – 9:50</td>
<td><strong>Part I:</strong> Introduction plant based food with a focus on legumes</td>
<td>Ivraina</td>
</tr>
<tr>
<td>9:50 – 10:50</td>
<td><strong>Part II:</strong> Degustation and presentation of milk alternatives</td>
<td>Luca</td>
</tr>
<tr>
<td>10:50 – 11:20</td>
<td>Coffee break</td>
<td></td>
</tr>
<tr>
<td>11:20 – approx.12:15</td>
<td><strong>Part III:</strong> Presentation and discussion of meat alternatives</td>
<td>Ursula</td>
</tr>
</tbody>
</table>
Overview

• Plant based food / Plant based substitutes
• Legumes
• Example lupins
Raw material of plant-based substitutes

- Soy, pea or lupin
- Wheat
- Fungal spores

Process:
- Protein isolate and/or concentrate
- Wheat gluten
- Mycoprotein

- e.g. pea protein isolate
- Seitan
- Quorn
Grain legumes, pulses

- Pea (*Pisum sativum*)
- Chickpea (*Cicer arietinum*)
- Field bean (*Vicia faba*)
- Soybean (*Glycine max*)
- White/blue lupin (*Lupinus albus/angustifolius*)
- Lentil (*Lens culinaris*)
Legumes = nitrogen collector

Symbiosis with bradyrhizobia and other microorganisms
Legumes - diverse range of products

- Sweet lupin coffee
- Miso (soy or pea or beans plain or with grains)
- Chickpea snack
- Edamame cream (unripe soy)
- Tofu from chickpeas
- Tempeh from lupins
Legume Hub – European knowledge platform

Food

Our articles about: Food (9)

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Agro-economic prospects for expanding soybean production beyond its current northerly limit in Europe

Soybean is one of the five crops that dominate global agriculture, along with maize, wheat, cotton and rice.

Edamame: Soybeans fresh from the garden

For centuries, soy was used exclusively for direct human nutrition. Tofu, miso, tempeh, natto and many other traditional soy dishes form an elementary part of Eastern cuisine. Nowadays, however, soy is used in a broad array of products ranging from biotech feed to biodiesel.

Soya, soya isoflavones and health effects

Soya foods are very popular not only in Asia but now also in Europe and the USA – not least because of the trend towards vegan and vegetarian diets as well as for sustainability reasons. Isolating more...
FiBL Project: LUPINNO SUISSE
<table>
<thead>
<tr>
<th></th>
<th>Breeding white lupin for anthracnose resistance, Marker development</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Breeding white lupine for alkaloid poverty, Marker development</td>
</tr>
<tr>
<td>3</td>
<td>Develop breeding program for market varieties</td>
</tr>
<tr>
<td>4</td>
<td>Variety tests</td>
</tr>
<tr>
<td>5</td>
<td>Identify market potential and network partners</td>
</tr>
</tbody>
</table>
### Stakeholder analysis in LUPPINO SUISSE

<table>
<thead>
<tr>
<th>Quality requirement</th>
<th>Incentives for lupin cultivation</th>
<th>Challenges</th>
</tr>
</thead>
<tbody>
<tr>
<td>• low alkaloid content</td>
<td>✓ attractive for feed as well as for food</td>
<td>– partly poor yields</td>
</tr>
<tr>
<td>• anthracnose resistance</td>
<td>✓ better hail resistance compared to soybean</td>
<td>– wheat pressure</td>
</tr>
<tr>
<td>• high protein content</td>
<td>✓ drought resistance</td>
<td>– susceptible to limestone content in soil</td>
</tr>
<tr>
<td>• uniform yields</td>
<td>✓ plant-based proteins = food trend</td>
<td>– high alkaloid analysis costs</td>
</tr>
<tr>
<td>• conformity of grains, uniform taste</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• stability of seeds</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Lupin «milk» as leader product?
Overview

• Tasting
• Review tasting results
• Product description and comparison
Guide tasting

• Preference Test – describe the samples and choose your favorite

• You will receive 3 different samples of oat-drinks

• Describe the odour, taste and texture/mouth feeling

• Sensory vocab – How would you describe cow milk? What are typical attributes?
Tasting
Evaluation of preference test

• what were the attributes that led to your choice?
## Product ingredients

<table>
<thead>
<tr>
<th>Product</th>
<th>1.</th>
<th>2.</th>
<th>3.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ingredients</td>
<td>Water, Oat (11.9%), Sunflower oil, Agave fibres, Sea salt</td>
<td>Water, Oat (13.6%), Sunflower oil, Sea salt</td>
<td>Water, Oat (16%), Sunflower oil, Gum arabic, locust bean gum, pea protein, Lecithin, natural vanilla flavor</td>
</tr>
</tbody>
</table>

**BIO**
## Nutritional value in 100ml

<table>
<thead>
<tr>
<th>Product</th>
<th>Energy</th>
<th>Fat</th>
<th>Carbohydrates</th>
<th>Protein</th>
<th>Salt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product 1</td>
<td>199kJ/47kcal</td>
<td>1.3g</td>
<td>8.1g</td>
<td>0.3g</td>
<td>0.09g</td>
</tr>
<tr>
<td>Product 2</td>
<td>233kJ/56kcal</td>
<td>2.1g</td>
<td>8.4g</td>
<td>0.8g</td>
<td>0.07g</td>
</tr>
<tr>
<td>Product 3</td>
<td>331kJ/79kcal</td>
<td>3.4g</td>
<td>9.8g</td>
<td>1.5g</td>
<td>0.1g</td>
</tr>
</tbody>
</table>

- Energy
- Fat, of which saturated
- Carbohydrates, of which sugar
- Protein
- Salt
manufacturing process

- Pretreatment (rolled oat)
- Extraction
- Hydrolyse (Alpha- als auch Beta-Amylase)
- Filtration
- Addition of ingredients (sunflower oil, salt)
- Homogenization
- Heat treatment
- Nutrient fortification
- Packaging
## Oat drink vs. Cow milk

<table>
<thead>
<tr>
<th>Benefit</th>
<th>Oat drink</th>
<th>Cow milk</th>
</tr>
</thead>
<tbody>
<tr>
<td>processing</td>
<td>similar to cow milk</td>
<td>similar to oat drink</td>
</tr>
<tr>
<td>fibers</td>
<td>ß-Glucane</td>
<td>-</td>
</tr>
<tr>
<td>source of protein</td>
<td>low but protein have a good amino acid balance</td>
<td>high bioavailability</td>
</tr>
<tr>
<td>allergen</td>
<td>lacto free and no milk proteins</td>
<td>gluten free 100%</td>
</tr>
<tr>
<td>vitamins (B &amp; A) and minerals</td>
<td>must be added</td>
<td>contains</td>
</tr>
<tr>
<td>ecobalance and animal welfare</td>
<td>high</td>
<td>low</td>
</tr>
</tbody>
</table>
### Nutritional value in 100ml

<table>
<thead>
<tr>
<th>product</th>
<th>1.</th>
<th>2.</th>
<th>3.</th>
<th>Cow milk</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>energy</strong></td>
<td>199kJ/47kcal</td>
<td>233kJ/56kcal</td>
<td>331kJ/79kcal</td>
<td>282kJ/68kcal</td>
</tr>
<tr>
<td><strong>fat</strong></td>
<td>1.3g</td>
<td>2.1g</td>
<td>3.4g</td>
<td>3.9g</td>
</tr>
<tr>
<td>of which saturates</td>
<td>0.5g</td>
<td>0.2g</td>
<td>0.4g</td>
<td>2.3g</td>
</tr>
<tr>
<td><strong>carbohydrates</strong></td>
<td>8.1g</td>
<td>8.4g</td>
<td>9.8g</td>
<td>4.9g</td>
</tr>
<tr>
<td>of which sugar</td>
<td>3.9g</td>
<td>5.7g</td>
<td>6.4g</td>
<td>4.9g</td>
</tr>
<tr>
<td><strong>protein</strong></td>
<td>0.3g</td>
<td>0.8g</td>
<td>1.5g</td>
<td>3.2g</td>
</tr>
<tr>
<td><strong>salt</strong></td>
<td>0.09g</td>
<td>0.07g</td>
<td>0.1g</td>
<td>0.1g</td>
</tr>
<tr>
<td><strong>calcium</strong></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>120mg</td>
</tr>
</tbody>
</table>
Coffee break
10:50-11:20 Uhr
Title

Plant based food – Taste it; meat alternatives

OEYE Workshop 1.9.2022 Luca Müller Bio Suisse, Ivraina Brändle FiBL, Ursula Kretzschmar FiBL
From organic raw material to organic plant based meat alternatives
Meat substitutes unrestricted good?

• What are for you meat substitutes?
• What kind of do you know?
• Is there a need of meat substitutes as protein source?
• If yes, what are the advantages, what is important for you with regard of the quality?
• If no, why not? What are the disadvantages?
Principles of organic processing

- Organic raw materials and a **restricted list of additives** and **processing aids** can be used.

- **Processing** should be done **with care**, preferably by using biological, mechanical and physical methods.

- Regulation 2018/848 Art. 16 (3): The **Commission** may adopt implementing acts laying down the techniques authorised in the processing of food products -> **the use of processing methods can be restricted if necessary**.

- The overall process must be certified
Let’s have a look on different products

• Please discuss with your neighbour the ingredient list (in English see the separate document)

• Do you think this is suitable for organic?

• Is it what you are expecting from a meat substitute?

• How high is the protein content in % per 100g?
What are the technologies behind the meat substitutes; one example: extrusion

Planted

Soy cutlet
How does an extruder work, what types are there?

How extrusion works:

- **Extrusion** is a shaping process
- Solid to viscous masses are continuously pressed out of a shaping opening (nozzle, mouthpiece or dies) under high pressure and usually also high temperature.
- With the pressure, the water evaporates and thus formed and dried products, so-called extrudates, emerge.
- A distinction is made between
  - Cold extrusion
  - Hot extrusion
How does an extruder work, what types are there?

Plant protein based products have to be produced by **hot** extrusion:

**Advantages**

- **Product diversity:**
  - ‹low moister› such as soy cutlet
  - ‹high moister› like planted chicken

- **Use of the whole bean for human nutrition**
  
  Ex: soy; soy oil and press cake for soy pulp
  
  → no by-products
Example extruder screws for dough conveying and pressure build-up
Example Extruder Screws installed
Example extruder nozzle outlet
Is the same the same?

Planted

Ingredients:
water, pea protein (33%), pea fibre, rapeseed oil and vitamin B12.

Proteins: 24% cooked

Soy cutlet

Ingredients:
Soja beans partly degreased
Protein: 52% uncooked
Is the same the same?

**Planted**

- **Ingredients:**
  - water, pea protein (33%), pea fibre, rapeseed oil and vitamin B12.
  - Proteins: 24% cooked

**Soy cutlet**

- **Ingredients:**
  - Soja beans partly degreased
  - Protein: 52% uncooked

- **By products from the extratcion go to animal feeding**
- **Aminoacids are comparable**
- **Vitaminisation is not allowed in organic**
- **All products: soy cutlet, soy oil, soy lecithin go to human diet**

**FiBL**
Is the same the same?

• Discussion are the products made by extrusion still organic?
Conclusion – open for discussion

1. the less processed the meat substitute the better!

2. The less side streams the better!
Conclusion

• There is a high diversity of plant based meat alternatives on the market.

• The nutrient values with regard to the protein content are quite different.

• Only to focus if the ingredient is organic and/or the processing technology suitable for the organic production is insufficient.

• Product development should implement also the production process of the single ingredient to minimize the production of by products.
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Thank you for the attention