Are the specific sensory properties of pasture cheeses linked to milk fat composition and bacterial dynamics?

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<table>
<thead>
<tr>
<th>Forages and cheese sensory properties</th>
<th>General trends</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maize silage</td>
<td>Hay</td>
</tr>
<tr>
<td>Curd colour</td>
<td></td>
</tr>
<tr>
<td>yellow</td>
<td></td>
</tr>
<tr>
<td>→ Milk β carotene</td>
<td>++</td>
</tr>
<tr>
<td>Texture</td>
<td></td>
</tr>
<tr>
<td>Texture ferme</td>
<td></td>
</tr>
<tr>
<td>→ Fatty acid melting point</td>
<td>→ Protéolysis?</td>
</tr>
<tr>
<td>→ ???, μorga raw milk?, fatty acids?, enzymes?, plant 2nd metabolites?</td>
<td></td>
</tr>
<tr>
<td>Flavour</td>
<td></td>
</tr>
<tr>
<td>Diversité / intensité</td>
<td></td>
</tr>
<tr>
<td>→</td>
<td></td>
</tr>
</tbody>
</table>

### Objectives

How can we explain the effect of pasture on cheese?
- Role of milk fat composition?
- Interactions with the bacterial dynamics in cheese?
Experimental design

2 groups of cows

2 creams

Grazing (mountain grassland)

Pasteurised cream (grass cream)

Maize silage

pasteurisation 78°C, 10 s

Pasteurised cream (maize cream)

Milk fat composition

<table>
<thead>
<tr>
<th></th>
<th>Σ Saturated FA</th>
<th>60,2</th>
</tr>
</thead>
<tbody>
<tr>
<td>5,8</td>
<td>Σ polyunsaturated FA</td>
<td>69,2</td>
</tr>
<tr>
<td>24,1</td>
<td>C16:0</td>
<td>3,3</td>
</tr>
<tr>
<td>22,4</td>
<td>cis9 C18:1</td>
<td>34,1</td>
</tr>
<tr>
<td>1,7</td>
<td>C16:0/cis9 C18:1</td>
<td>18,9</td>
</tr>
</tbody>
</table>

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Experimental design

- **2 groups of cows**
  - **2 creams**
  - **Same process**
  - **Same ripening conditions**

**Grazing** (mountain grassland)
- **Pasteurised cream** (grass cream)
  - **Raw skimmed milk** (microorganisms)
  - **Pasturisation** 78°C, 10 s
  - **Grass cream**
    - Lait écrémé cru
    - 3 raw cheeses
    - 3 pasteurised cheeses

**Maize silage**
- **Pasteurised cream** (maize cream)
  - **Skimmed milk**
  - **Maize cream**
    - Lait écrémé cru
    - 3 raw cheeses
    - 3 pasteurized cheeses

Same skimmed milk (chemical & microbio) and 2 creams with different fatty acid composition.
### Cheese sensory properties (raw)

<table>
<thead>
<tr>
<th></th>
<th>Grass cream</th>
<th>Maize cream</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Texture</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Firm</td>
<td>5, 3</td>
<td>6,6</td>
</tr>
<tr>
<td>Melting</td>
<td>5,0</td>
<td>3,8</td>
</tr>
<tr>
<td><strong>Curd aspect</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intensité de la couleur</td>
<td>5,7</td>
<td>5,3</td>
</tr>
<tr>
<td><strong>Flavour</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intense taste</td>
<td>5,7</td>
<td>6,1</td>
</tr>
<tr>
<td>Persistent aroma</td>
<td>5,0</td>
<td>5,4</td>
</tr>
</tbody>
</table>

11 trained panellists – scores /10

* P<0.05 **P<0.01 ***P<0.001

**Texture**
- Confirms the role of fat composition on cheese texture (pt de fusion des AG)

**Curd aspect**
- Confirms the role of milk β-carotene

**Flavour**
- Minor role of the milk fat composition

Same results with pasteurised cheeses

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# Cheese rind aspect (raw - 150 days)

Rind development is linked to ripening microorganisms.

<table>
<thead>
<tr>
<th></th>
<th>Grass cream</th>
<th>Maize cream</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spot quantity (/10)</td>
<td>7.1</td>
<td>7.9</td>
</tr>
<tr>
<td>Spot salience (/10)</td>
<td>6.2</td>
<td>7.3</td>
</tr>
</tbody>
</table>

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**P<0.01

**Smaller differences with pasteurised cheeses**

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Rind microbial balance of raw cheeses

- 90 days ripening
- metabar coding 16S RNA

Proportions of OTUs assigned to Actinobacteria and Firmicutes differ according to milk fat composition

« Maize cream » rind:
OTUs assigned to Lactococcus sp.
(Firmicutes / lactic bacteria)

« Grass cream » rind:
OTUs assigned to Yaniella sp. and Brevibacterium sp.
(Actinobacteria / ripening bacteria)
Conclusion

Perspective: Dynamics of moulds and yeast in the rind during ripening

Milk fat composition

Texture & curd colour

Flavour

Microbial balance in the curd

Rind aspect

Bacterial balance of the rind

In practice, other milk constituents vary according to feeding: Microbiote – Enzymes?

Oiling-off of unsaturated FA?
Antibacterial effect of free unsaturated FA?