

Lactic Acid Bacteria as Natural Markers for the Authentication of Swiss Raw Milk Cheeses

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Abstract

In Switzerland most of the traditional cheese varieties are made from raw milk. Their manufacture adheres to strict rules, so as to guarantee quality and purity of the end product. This raises production costs and means consumers pay more. It also opens the door to cut-rate forgeries claiming to be made to the stringent standards and causing considerable economic losses to the entire dairy sector. In order to combat product counterfeiting, Agroscope has developed proof-of-origin cultures that allow the identification of copycats. The proof-of-origin cultures are used for the protection of several traditional Swiss-cheese varieties, such as Emmentaler PDO, Tête de Moine PDO, and Appenzeller®. A market survey showed that the system is effective in revealing fraud and has the power to enforce corrective measures.

Now it has been possible to develop proof-of-origin cultures that are also working for extra-hard cheeses with an elevated cooking temperature and an extended ripening period up to 26 months such as Sbrinz AOP. From over 2000 strains tested, three strains (2 strains *Lactobacillus paracasei*, 1 strain *Lactobacillus rhamnosus*) could be identified that met all requirements.



Ripening of Sbrinz AOP (Photo from Switzerland Cheese Marketing)

Proof-of-origin cultures

- Carefully selected lactic acid bacteria isolated from the cheese dairy environment
- Proliferated by fermentation and added into the vat milk either as liquid or lyophilized cultures
- They sustain production process and maturation
- Their naturally uniquely gene sequences can be traced using polymerase chain reaction (PCR) methods
- Authentication is possible even if the cheese is cut into pieces or grated
- The culture does not lead to any alteration of the cheese's taste or texture
- Compatible with the strict 'protected designation of origin' (PDO) specifications

It is well conceivable to also establish the system in other (fermented) foods, such as e.g. meat products or vegetable oils.

Outlook

Other Swiss raw milk cheeses will also introduce the system in the next years.

Agroscope's next goals are

- to further optimize the production and detection of the proof-of-origin cultures
- to validate detection in specific cheese products (such as processed cheese, fondue blends or grated cheese mixes)
- to evaluate a portable rapid test for field analysis



The proof-of-origin cultures for Emmentaler PDO, Tête de Moine PDO, and Appenzeller® (Photo from Agroscope)

Hygienic safety

Lactic acid bacteria have a long history of safe use. Nevertheless, the strains for the proof-of-origin cultures are extensively studied for their ability

- to confer transmissible antibiotic resistance genes
- to form critical virulence factors or
- to produce biogenic amines.