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Penicillium roqueforti in blue cheeses

Final degree project

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OBJECTIVES

- To know the blue cheese making process and its characteristics.
- To identify the *P. roqueforti* role in blue cheese and its effects.

Penicillium roqueforti

- Filamentous mould.
- It can be inoculated into the milk or the curd, or it can colonize the cheese in the maturation cave.
- It has very good adaptation to pH levels, low temperature or low oxygen levels that are found during ripening.

Table 1: *characteristics of P. roqueforti strains marketed by Chr. Hansen for making blue cheese.*

Name of the strain	PR-1	PR-3	PR-4	PRG-3
Storage and handling	2°C - 8°C			
Shelf life	At least 15 months	At least 12 months	At least 15 months	At least 14 months
Growth temperature	min: 2°C-5°C, max: 30°C, opt: 20°C-30°C			
Colour of the veins	Dark blue	Dark green	Dark green	Very pale blue
Effect of Lipolysis	Low	High	High	Medium to high
Effect of Proteolysis	Medium	High	High	Medium
Flavour profile	Mild / Aromatic	Strong / Aromatic	Medium / Aromatic	Mild / Aromatic High methyl ketones
Texture	Firm	Creamy	Creamy	Creamy
Applications	Small size Long shelf life cheeses	Large size Traditional blue cheese		All sizes Gorgonzola or mild blue cheese
	Danablu, Roquefort, Stilton and other blue cheese types			Gorgonzola

Source: *own elaboration based on data provided by the company Chr. Hansen.*

BLUE CHEESE RIPENING

- Final stage of the blue cheese elaboration.
- Each cheese has its own ripening time.
- During this period the cheese develops the blue-green veins characteristic of the conidia of *P. roqueforti.*
- It is very extensive and several **microorganisms** are involved.
- Lipolysis and Proteolysis have an important paper in the production of **flavour.**

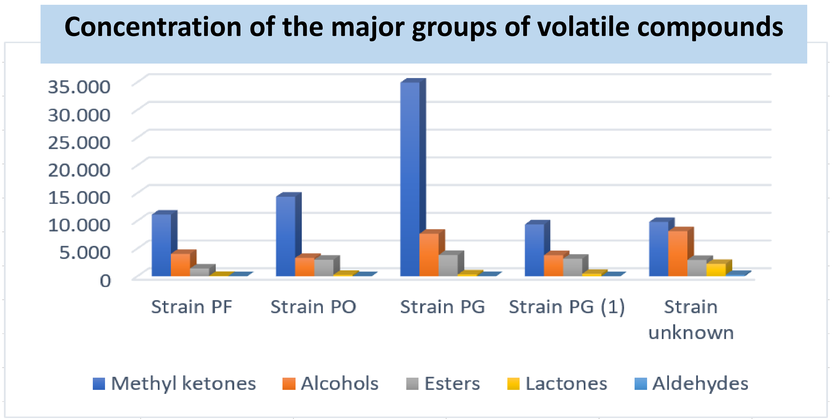

Figure 1: *concentration of the major groups of volatile components in blue cheese produced by different strains of P. roqueforti.*
Source: *own elaboration based on Cantor et al. 2017.*

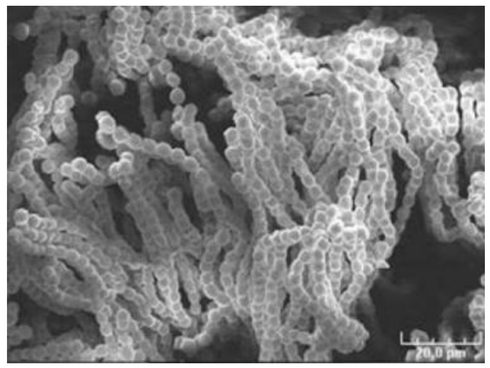

Figure 2: *P. roqueforti developing through the veins of the blue cheese.*
Source: *Martin and Coton, 2017.*

- ✓ Lactic acid bacteria
- ✓ Non-starter lactic acid bacteria
- ✓ *P. roqueforti*
- ✓ Yeasts

CONCLUSIONS

The diversity of *P. roqueforti* strains helps to explain the diversity of blue cheeses, together with the differences in processing methods. In addition to *P. roqueforti*, the maturation of blue cheese involves microorganisms such as lactic acid bacteria as the primary starter culture, non-starter lactic acid bacteria and yeasts that interact with *P. roqueforti*. The processes of lipolysis and proteolysis give rise to various components that contribute to the characteristic flavour of blue cheeses, for example, methyl ketones and alcohols. *P. roqueforti* produces secondary metabolites such as roquefortins, PR toxins and andrastins, among others.

- Cantor MD, van den Tempel T, Hansen TK, Ardö Y. 2017. Blue Cheese. En : McSweeney LH, Fox PF, Cotter PD, Everett DW, editors. Fourth edition. Cheese: Chemistry, Physics and Microbiology. Vol. 1. Elsevier. p. 929–954.
- Martín JF, Coton M. 2017. Blue Cheese: microbiota and fungal metabolites. En: Frias J, Martínez-Villaluenga C, Peñas E, editors. Fermented Foods in Health and Disease Prevention. 275–303.