CATÓLICA
FACULTY
OF BIOTECHNOLOGY
PORTO

Serpa PDO cheese: towards identification of chemical markers involved in organoleptic attributes

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Serpa PDO cheese

Raw ovine milk

No starter cultures

Cynara cardunculus L.

→ High microbial biodiversity

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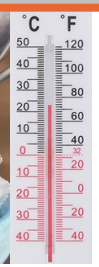
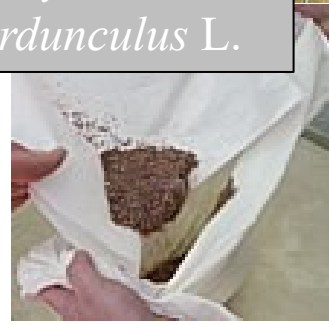
- strong and exquisite flavor
- semi-soft and creamy texture

Serpa PDO cheese manufacture



Cyanara cardunculus L.



Milk colection and filtration → Milk heating → Vegetable rennet addition → Milk coagulation → Cutting and breaking of the curd → Curd placed in perforated moulds → Ripening process







Traditional cheeses issues

Feeding systems

Climatic conditions

Milking conditions

Manufacturing methods

- High heterogeneity in the final organoleptic characteristics

+

- Safety risks associated to the raw milk

Serpa PDO cheese

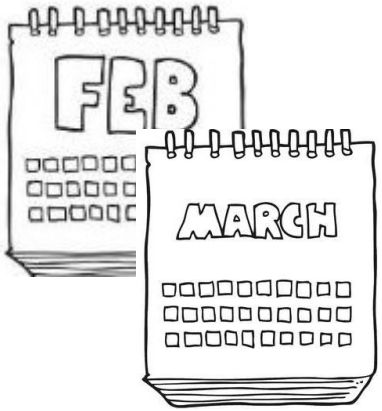
Screening of flavor and texture related compounds:

- Free amino acids (FAAs)
- Organic acids
- Volatile compounds

Towards the identification of chemical markers involved in the specificity of Serpa cheese

4 PDO certified industries

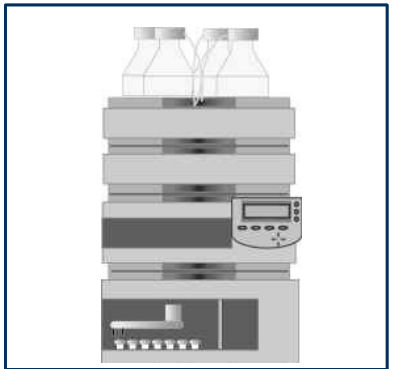
Core of 30 days-old cheeses



Organic acid profile

Free amino acid profile

Volatile compounds screening



HPLC analysis

SPME GC-MS analysis

Organic acid profile

Concentration of organic acids (mg/100g) in Serpa cheeses (n=4)

		Lactic	Acetic	Propionic	Butyric
MONTH 1	A	1881.26±60.35^{a}	170.66±8.71^{a}	5.87±2.05^{a}	4.37±4.38^{a}
	B	992.72±471.86^{b}	212.76±30.04^{a,b}	22.58±7.81^{b}	21.95±6.28^{b}
	C	1668.12±724.20^{a,b}	198.72±50.40^{a,b}	7.09±1.73^{a}	2.65±2.97^{a}
	D	1268.02±97.92^{b}	120.92±12.50^{b}	9.74±1.81^{a}	21.03±2.19^{b}
MONTH 2	A	946.09±6.25^{a}	318.62±19.26^{a,b}	6.96±2.05^{a}	5.40±1.26^{a}
	B	645.03±160.41^{a}	359.44±82.31^{b}	77.01±16.83^{b}	41.82±29.40^{b}
	C	1700±348.81^{b}	238.27±41.03^{a}	5.87±1.07^{a}	BDT
	D	1185.88±507.73^{a,b}	265.05±29.86^{a,b}	10.76±3.74^{a}	19.93±10.52^{a,b}

*BDL- Below the detection threshold.

Means in the same column and corresponding to the same month of production with different superscript letters differ significantly ($p<0.05$).

Free amino acid profile

Concentration of FAAs (mg/100g) in Serpa cheeses (n=4)

FAA	February				March			
	A	B	C	D	A	B	C	D
Asp	8.6±1.4^{a}	5.9±1.3^{a}	8.6±4.8^{a}	7.8±3.1^{a}	5.4±2.5^{a}	7.7±2.4^{a}	11.2±3.0^{b}	9.3±2.9^{a}
Glu	**64.4±9.5^{a}**	**43.9±10.7^{a}**	**47.8±27.1^{a}**	**51.3±6.6^{a}**	**54.1±10.98^{a}**	**22.7±6.4^{b}**	**53.8±6.4^{a}**	**55.7±12.4^{a}**
Cys	0.1±0.1^{a}	0.05±0.01^{a}	0.05±0.04^{a}	0.05±0.04^{a}	0.9±1.4^{a}	0.2±0.1^{a}	0.1±0.1^{a}	0.2±0.1^{a}
Asn	0.6±0.2^{a}	0.4±0.2^{a}	0.8±0.5^{a}	0.3±0.04^{a}	4.5±4.8^{a}	0.6±0.1^{a}	0.3±0.07^{a}	0.4±0.4^{a}
Ser	0.5±0.1^{a}	1.0±0.6^{a}	2.2±1.4^{a}	1.8±1.2^{a}	5.8±6.4^{a}	0.6±0.2^{a}	1.5±0.2^{a}	0.5±0.2^{a}
His	0.4±0.5^{a}	1.7±0.4^{a}	4.9±4.8^{a}	3.8±3.6^{a}	4.7±4.6^{a}	4.2±1.5^{a}	4.5±0.8^{a}	7.8±1.1^{a}
Gln	1.5±0.3^{a}	1.3±0.4^{a}	1.7±1.1^{a}	2.2±1.1^{a}	1.8±1.3^{a}	2.1±0.7^{a}	3.8±0.4^{a}	3.4±1.8^{a}
Thr	4.5±0.6^{a}	4.1±1.1^{a}	7.1±4.2^{a}	4.4±1.4^{a}	5.6±0.8^{a}	2.6±0.6^{b}	12.2±2.2^{c}	4.3±1.5^{a,b}
Arg	3.2±0.5^{a}	6.4±4.9^{a}	9.9±8.5^{a}	10.5±9.3^{a}	6.2±8.8^{a}	1.8±0.8^{a}	1.2±0.4^{a}	3.3±1.7^{a}
Ala	**13.1±1.1^{a}**	**14.2±8.4^{a}**	**14.4±8.5^{a}**	**20.9±3.3^{a}**	**21.8±1.8^{a}**	**14.3±4.1^{b}**	**13.9±2.6^{b}**	**14.8±2.2^{b}**
Tyr	0.4±0.03^{a}	5.4±3.9^{a}	2.5±1.6^{a}	5.7±3.9^{a}	3.3±2.8^{a}	1.6±1.6^{a}	1.0±0.2^{a}	0.8±0.9^{a}
Val	**26.4±5.3^{a}**	**34.8±13.3^{a}**	**46.3±25.6^{a}**	**46.6±9.9^{a}**	**42.9±6.8^{a}**	**65.0±23.5^{a}**	**55.6±8.9^{a}**	**82.4±19.2^{b}**
Met	2.0±0.2^{a}	4.62±3.1^{a,b}	6.0±4.1^{a,b}	7.9±2.4^{b}	11.6±3.2^{a,d}	5.7±2.0^{a,c}	3.8±0.9^{c}	13.3±5.2^{d}
Trp	0.6±0.01^{a}	1.3±0.7^{a}	1.3±0.2^{a}	1.8±1.0^{a}	1.5±0.02^{a}	B D T	B D T	0.1±0.2^{a}
Phe	**14.3±0.9^{a}**	**21.8±5.0^{a,b}**	**31.0±17.1^{b}**	**27.1±7.5^{a,b}**	**22.3±5.1^{a}**	**22.9±5.9^{a}**	**25.9±6.3^{a}**	**22.8±3.6^{a}**
Ile	2.5±0.2^{a}	9.3±6.0^{a,b}	12.4±10.1^{a,b}	16.0±4.7^{b}	10.2±0.9^{a,b}	9.6±5.6^{a,b}	6.6±1.2^{a}	15.2±2.6^{b}
Leu	**41.3±1.8^{a}**	**54.8±13.6^{a,b}**	**72.6±36.1^{b}**	**71.1±13.6^{b}**	**56.0±7.6^{a}**	**67.1±5.9^{a,b}**	**83.5±17.8^{b}**	**81.0±9.5^{b}**

Free amino acid profile

Concentration of FAAs (mg/100g) in Serpa cheeses (n=4)

February				
FAA	A	B	C	D
Glu	64.4±9.5^{a}	43.9±10.7^{a}	47.8±27.1^{a}	51.3±6.6^{a}
Ala	13.1±1.1^{a}	14.2±8.4^{a}	14.4±8.5^{a}	20.9±3.3^{a}
Val	26.4±5.3^{a}	34.8±13.3^{a}	46.3±25.6^{a}	46.6±9.9^{a}
Phe	14.3±0.9^{a}	21.8±5.0^{a,b}	31.0±17.1^{b}	27.1±7.5^{a,b}
Leu	41.3±1.8^{a}	54.8±13.6^{a,b}	72.6±36.1^{b}	71.1±13.6^{b}
March				
FAA	A	B	C	D
Glu	54.1±10.98^{a}	22.7±6.4^{b}	53.8±6.4^{a}	55.7±12.4^{a}
Ala	21.8±1.8^{a}	14.3±4.1^{b}	13.9±2.6^{b}	14.8±2.2^{b}
Val	42.9±6.8^{a}	65.0±23.5^{a}	55.6±8.9^{a}	82.4±19.2^{b}
Phe	22.3±5.1^{a}	22.9±5.9^{a}	25.9±6.3^{a}	22.8±3.6^{a}
Leu	56.0±7.6^{a}	67.1±5.9^{a,b}	83.5±17.8^{b}	81.0±9.5^{b}

Means in the same line with different superscript letters differ significantly ($p<0.05$).

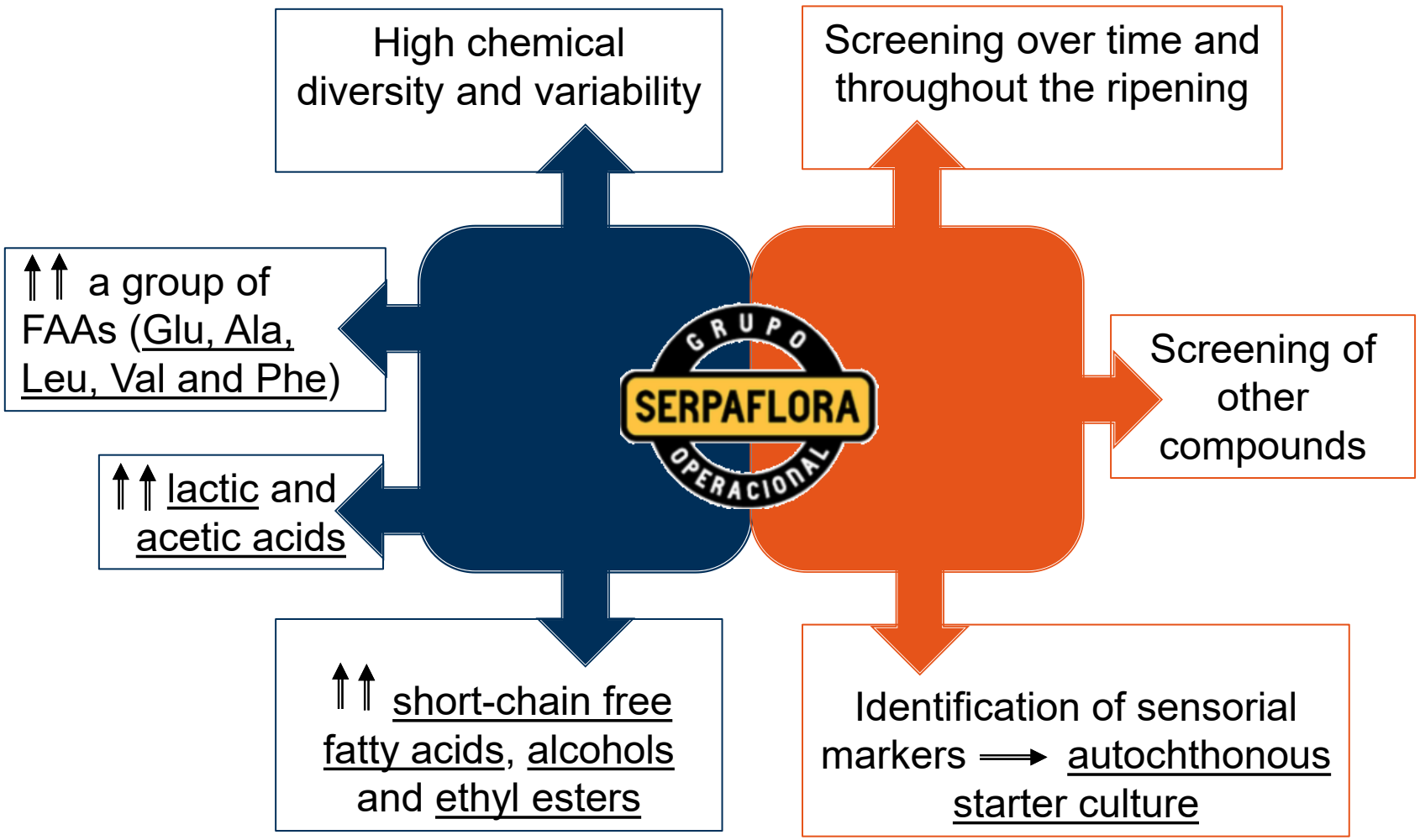
Volatile compounds screening

More incident groups	Volatile compound
Short-chain free fatty acids	Acetic acid
	Butyric acid
	Valeric acid
	Propionic acid
Alcohols	Ethanol
	1-Propanol
	1-Butanol
	1-Octanol
Ethyl esters	Ethyl hexanoate
	Ethyl octanoate
	Ethyl decanoate

Other groups	Volatile compound
Ketones	2-Octanone
	2-Butanone
Medium-chain free fatty acids	Hexanoic acid
	Octanoic acid
Terpenes	Limonene
	3-Carene
Aromatic compound	Benzene methanol
	Phenol
Sulfur coumpounds	Dimethyl sulphide

Present

Future



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