



CATÓLICA
FACULTY
OF BIOTECHNOLOGY

PORTO



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

Helena Araújo-Rodrigues, Freni K. Tavora, Maria Teresa P.G. dos Santos, Nuno Alvarenga, Manuela M. Pintado

8th November 2018

Serpa PDO cheese



Raw ovine
milk

No starter
cultures

*Cynara
cardunculus* L.



High microbial
biodiversity



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



Serpa PDO cheese manufacture



Cyanara cardunculus L.



Milk collection and filtration

Milk heating

Vegetable rennet addition

Milk coagulation

Ripening process

Curd placed in perforated moulds

Cutting and breaking of the curd



Traditional cheeses issues



Feeding systems



Milking conditions



Climatic 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

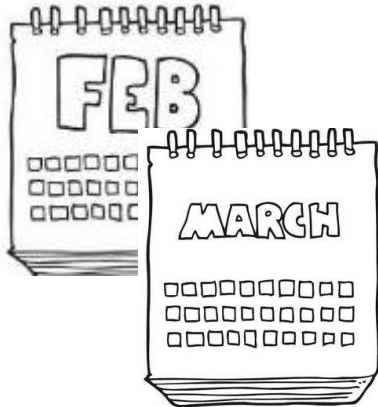




4 PDO certified industries



Core of 30 days-old cheeses



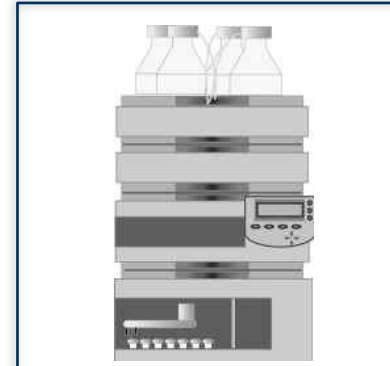
Organic acid profile



Free amino acid profile



Volatile compounds screening



HPLC analysis



SPME GC-MS analysis

Background

Aims

Materials and methods

Results and discussion

Conclusions and future perspectives

Organic acid profile

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

		Lactic	Acetic	Propionic	Butyric
M O N T H 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
M O N T H 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)

F A A	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	BDT	BDT	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).

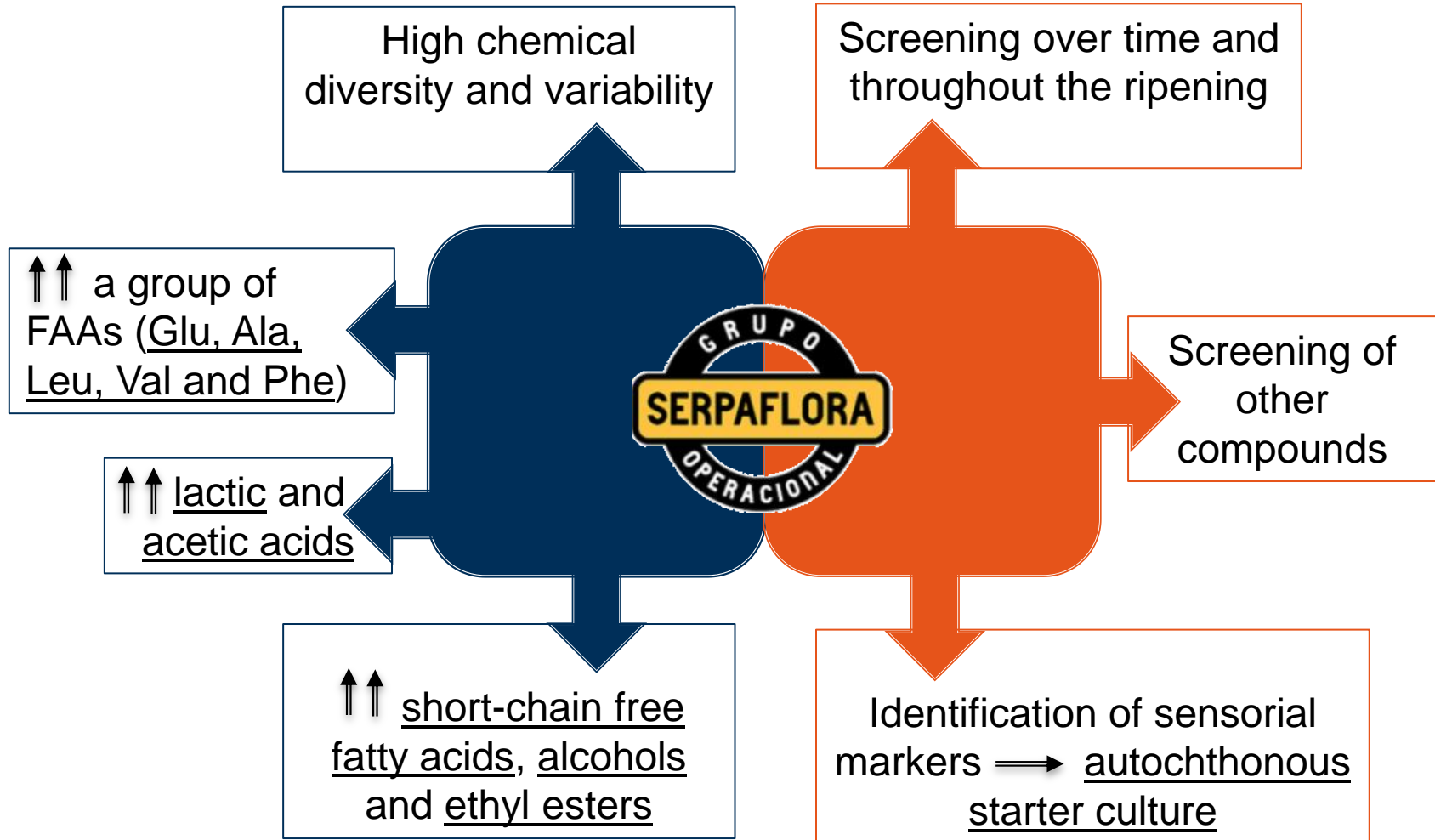
Volatile compounds screening

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 compounds	Dimethyl sulphide

Present

Future



Background

Aims

Materials and methods

Results and discussion

Conclusions and future perspectives

Acknowledgements



**Manuela Pintado
Freni Tavaría**

**Maria Teresa Santos
Maria João Carvalho
Manuela Costa
João Dias
Célia Lampreia
Olga Amaral
António Miguel Floro
Antónia Macedo**

**Nuno Alvarenga
António Pedro Martins**



PDR2020-101-031017



UID/Multi/50016/2013





XIV
ENCONTRO DE QUÍMICA
DOS ALIMENTOS
6-9 NOVEMBRO, 2018 | VIANA DO CASTELO



THANK YOU
FOR
YOUR
ATTENTION!

hrodrigues@porto.ucp.pt