



**EVALUATION OF COLOUR
IN SERRA DA ESTRELA CHEESE
PRODUCED IN DIFFERENT DAIRIES**

Raquel P. F. Guiné

Luísa Fontes

Maria João Lima

Introduction

“Serra da Estrela” cheese is a Portuguese traditional cheese, with a major importance in the national cheese making history.

It has particular sensory characteristics: intense flavour, taste and aroma allied with a smooth texture.

Is one of the most valued products in Portugal and abroad.

It has the PDO (Protected Designation of Origin), according to European regulation

Introduction

This cheese is made only from ewe's milk, salt and dried thistle flower (*Cynara cardunculus* L.), used as vegetable coagulant.

The cheese manufacture followed the traditional process:

- Heat the milk to 28-32 °C
- Add salt and the thistle flower
- Wait 60 min. for coagulation
- Manually cut the curd
- Filter to remove the serum
- Put into the molds for ripening



Objectives

Compare the colour of Serra da Estrela Cheese manufactured in different dairies
&
Evaluate the evolution of the colour along the milking season.



Methods

Evaluation of colour with a colorimeter CR-400 (Konica Minolta, Japan):

- Cartesian coordinates: L^* , a^* , b^*
- Cylindrical coordinates: Value, Chroma, Hue

- Colour difference:
$$\Delta E = \sqrt{(L - L_0)^2 + (a - a_0)^2 + (b - b_0)^2}$$



Statistical analysis

Samples

- 4 distinct times:
March, April, May
and June

- 6 dairies

- 5 cheeses



30 cheeses in each
month

March (Month 1)

June (Month 4)

Sabores &
Ambientes
(SA)



Casa Agrícola dos
Arais
(CA)



Casa da Ínsua
(CI)



Queijaria de
Germil
(CG)



Quinta de São
Cosme
(QC)

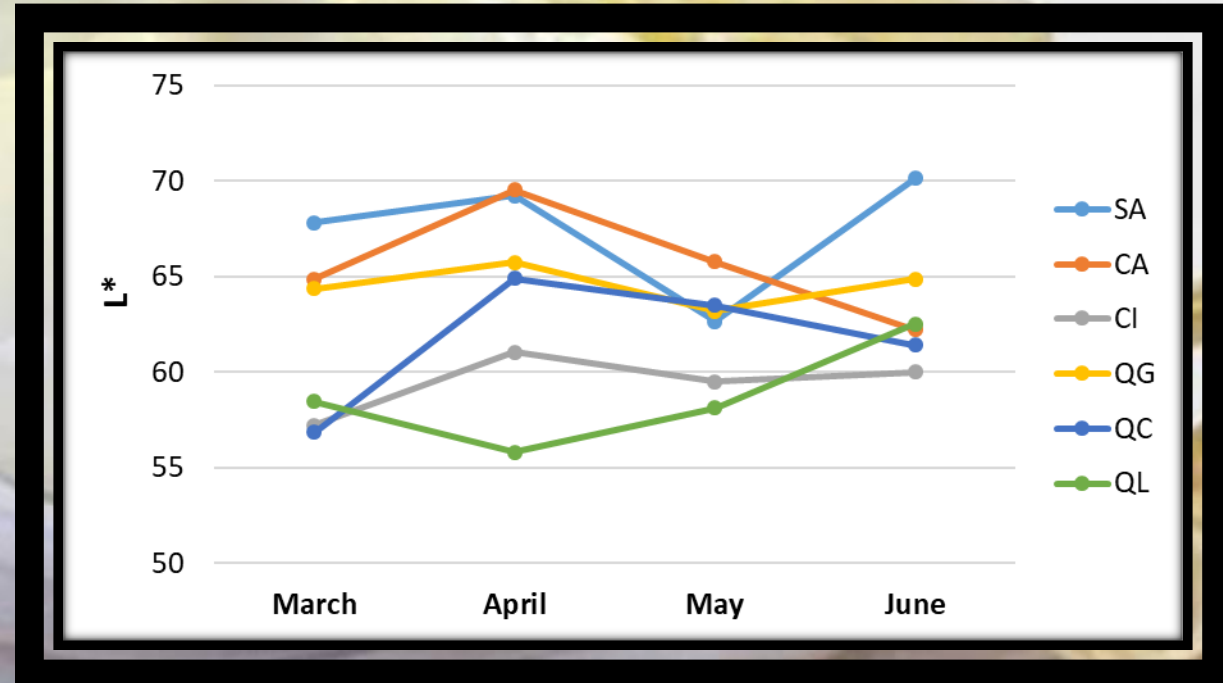


Quinta da Lagoa
(QL)



Results

Sample QL showed
different trend in
April

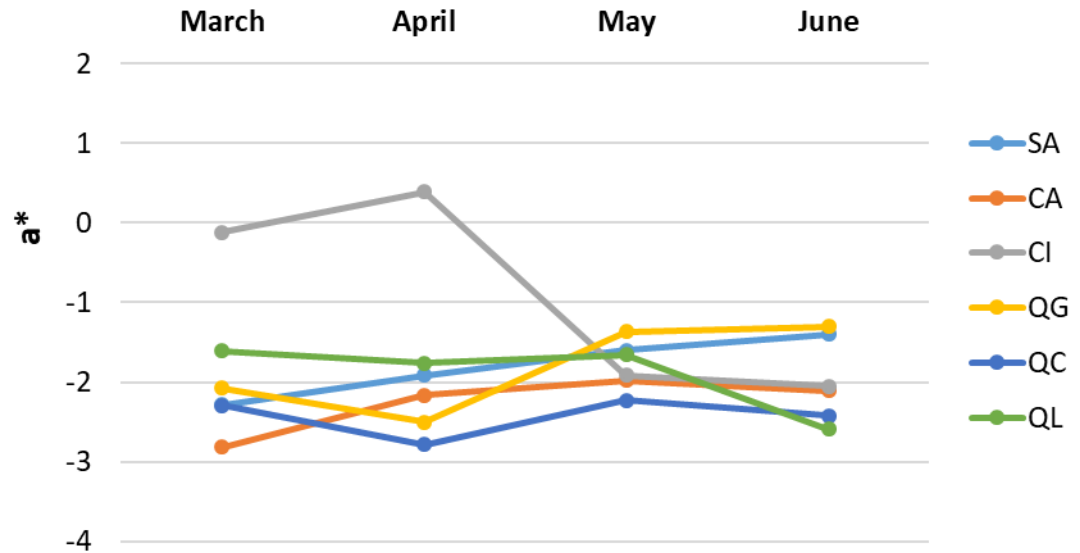


For most dairies the global trend is to increase lightness along milking season (March → June), except for CA and QG

Results

a^* is negative 
green

Very similar trend
for all samples,
except CI

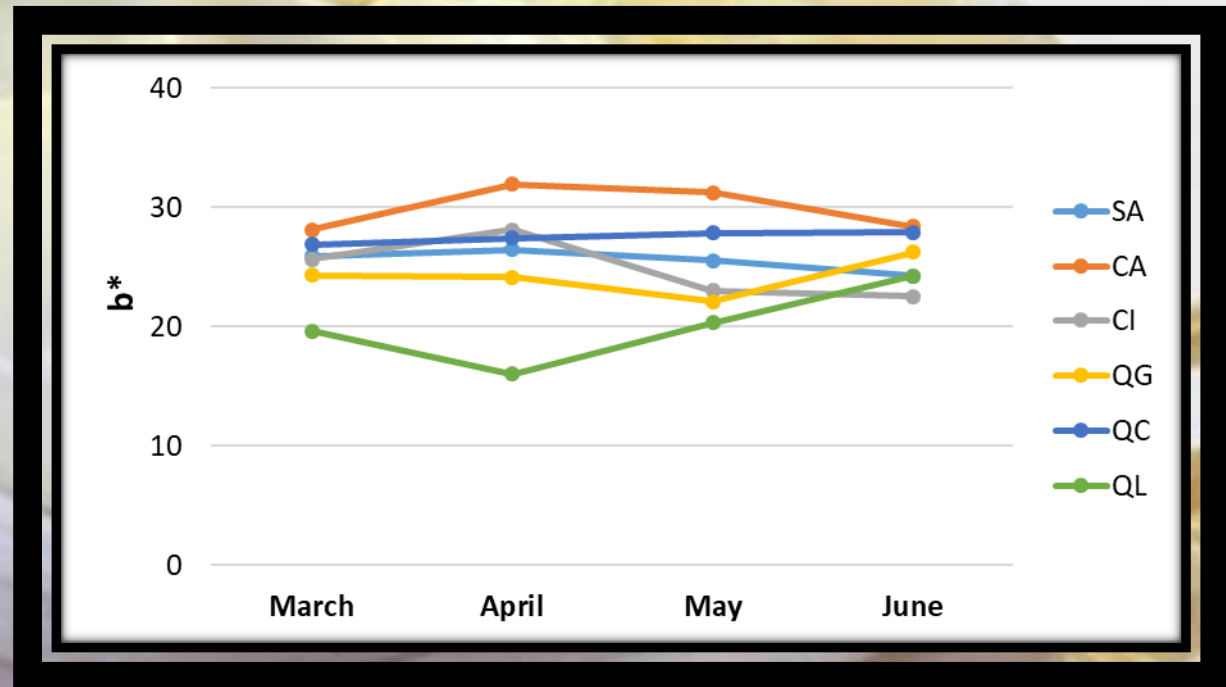


Greenness remains pretty much the same, or increases just slightly with time

Results

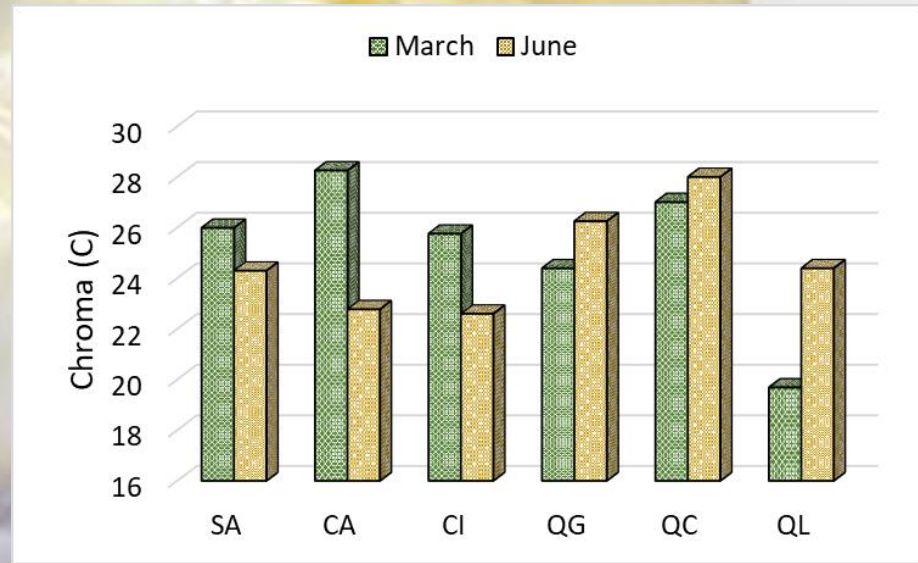
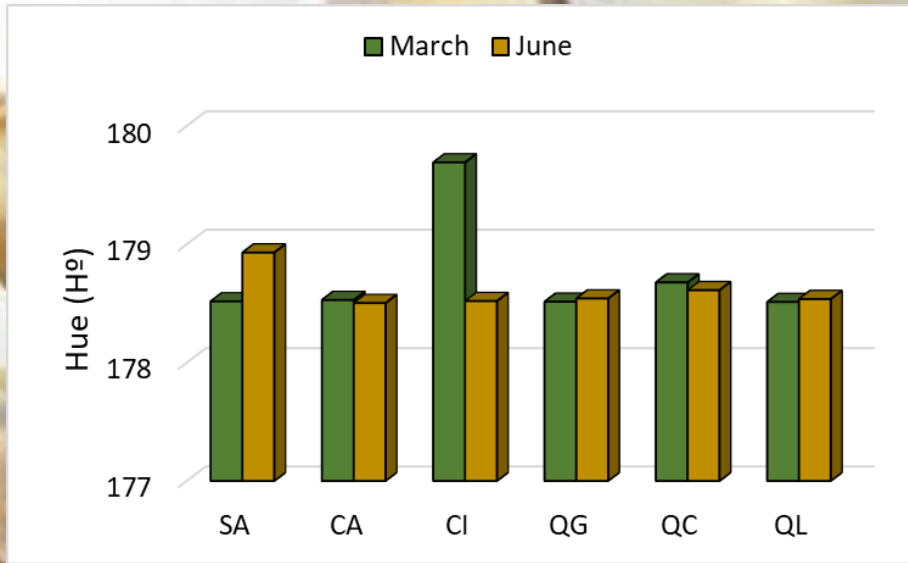
b^* is positive 
yellow

Relatively similar
trend for all
samples, except QL



Yellowness varied little along the season

Results



The nature of the colour, Hue, remained practically unchanged for most samples, just with exception for sample SA (increased) and sample CI (decreased).

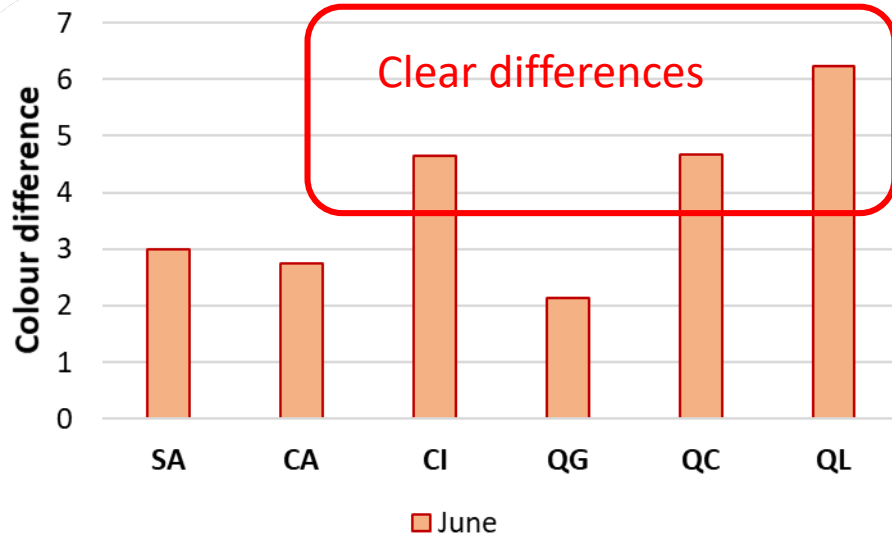
The saturation or colour, Chroma, decreased for samples SA, CA and CI, while for QG, QC and QL it increased along the season.

Results

[0.0 – 2.0] unrecognizable differences

[2.0 – 3.5] recognized by an experienced observer

> 3.5 clear differences of colour



**Dairies QG, SA and CA
produced cheeses with more
uniform coloration along the
milking season**

**Important for the
commercialization**

Conclusion

- The colour characteristics of the Serra da Estrela Cheeses are quite different depending on the dairy where they are manufactured
- Along the milking season very important changes in colour took place
- The maintenance of the cheese characteristics along time is important having in mind the expectations of the consumers

Acknowledgments

The authors thank the FCT (Portuguese Foundation for Science and Technology), the Polytechnic Institute of Viseu and CI&DETS for their support under project UID/Multi/04016/2016.

This work was prepared in the ambit of the project approved and financed by FCT with reference 02/SAICT/2016/23290, titled “QClasse: Caracterização e Valorização da autenticidade do QSE DOP e sua vocação para a promoção da Saúde”.

