Doctorate in Agri-Food Sciences, Technologies and Bio-Technologies
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Development of chemometrics methods for fast and non-destructive charachterization of complex food matrices

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Outline

- Introduction:
  - The importance of colour for food
  - RGB images
- Ⅰ Section:
  - A Graphical User Interface for the standardization of RGB images (POSTER PRESENTATION)
- Ⅱ Section:
  - An Electronic Eye and Tongue for monitoring the grape ripening
- Conclusions

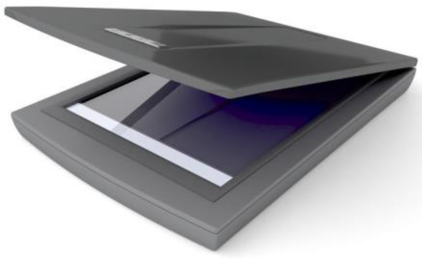
The importance of colour for food

- ✓ The very first evaluation of food is often based on its visual aspect.
- ✓ Color is related to food chemical composition.

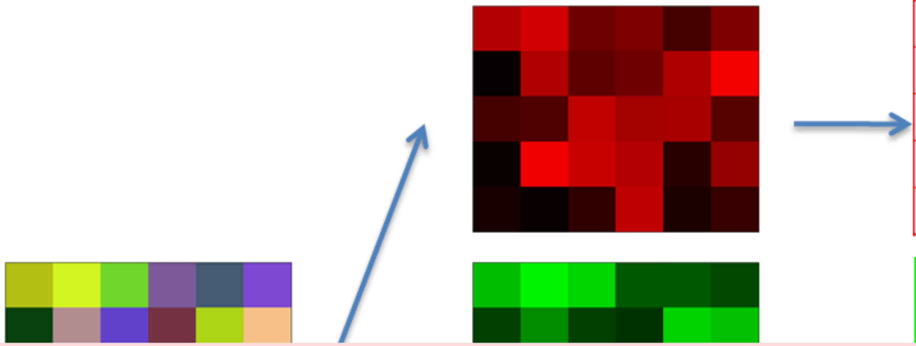
From human to electronic eye

ELECTRONIC EYE:

- ✓ Fast
- ✓ Cheap
- ✓ Objective
- ✓ Reliable
- ✓ Transferable
- ✓ Sensitive
- ✓ Quantitative



RGB images



180	210	112	125	70	127
8	177	97	114	173	245
71	81	195	165	167	87
12	242	203	181	41	149
25	9	48	192	30	57

192	245	214	89	90	73
65	140	65	50	212	193

PhD School of Agri-Food Sciences, Technologies and Biotechnologies
XXXI Cycle
II Year

Development of chemometric methods for fast and non-destructive characterization of complex food matrices:

Graphical User Interface for the standardization of RGB images

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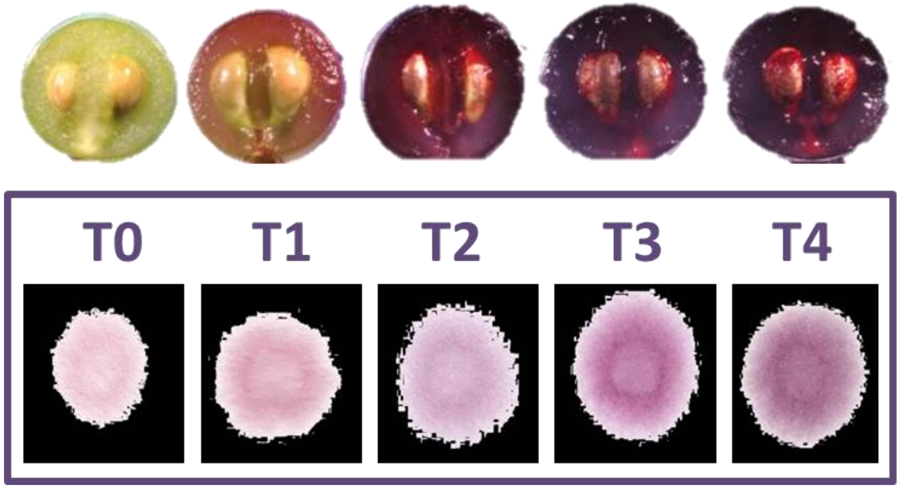
- ✓ The three R,G,B channels correspond to three matrices (tables of numbers) containing the R, G and B values, which are used as analytical measurements.
- ✓ The standardization of images is an important preprocessing step in order to guarantee the reproducibility of images.

An Electronic Eye and Tongue for monitoring the grape ripening

AIM OF THE WORK:

to develop a device based on the combination of Electronic Eye and Tongue technologies to easily assess the maturity levels of grapes:

- content of pigments (total anthocyanins, total flavonoids, Malvidin, Petunidin, Peonidin, Delphinidin, Cyanidin)
- colour attributes (colour index, tonality, colour composition, OD420%, OD520%, OD620%)



An Electronic Eye and Tongue for monitoring the grape ripening

90 samples (3 grape varieties × 3 grapevines × 5 harvest time × 2 measurement session) were analysed by means of an Electronic Eye and Tongue.

Data Fusion techniques were used to extract the information from the two matrices of signals.

HPLC and Vis spectrophotometry were used to determine the grape ripening parameters (i.e., Total Anthocyanins, Total Flavonoids, Colour Index….).

Calibration models were built on the fused dataset for quantification of the parameters.

Y variable	LVs	N° variables	RMSEC	RMSECV	RMSEP	R^2 cal	R^2 cv	R^2 pred
TF (mg/L)	3	1522	16,09	20,45	24,68	0,895	0,83	0,687
TAnt (mg/L)	3	927	17,26	27,77	27,02	0,961	0,899	0,902
Ton	5	1287	0,07	0,11	0,09	0,969	0,922	0,935
CI	3	1866	0,85	1,35	1,02	0,938	0,842	0,913
OD420	4	735	2,27	2,58	3,82	0,965	0,954	0,897
OD520	5	1499	3,1	3,81	4,67	0,949	0,923	0,863
Df-3-glc (mg/L)	5	2244	2,69	4,28	8,1	0,868	0,665	0,631
Cn-3-glc (mg/L)	4	1051	1,18	2,18	6,44	0,881	0,593	0,2
Pt-3-glc (mg/L)	4	1586	4,03	5,58	5,51	0,892	0,792	0,858
Pn-3-glc (mg/L)	2	1231	6,6	6,83	11,31	0,678	0,654	0,512
Mv-3-glc (mg/L)	5	2024	12,78	27,16	27,49	0,978	0,902	0,865

Conclusions

- The results obtained by merging the information contained in the images of must and the information captured using amperometric sensors show the possibility to develop an **easy-to-use**, **inexpensive** and **eco-friendly method** not requiring any specific preparation of the sample **for monitoring grape ripening**.

- **Work in progress**: implementation of new data analysis tools in the “Colourgrams_GUI”, which is a software developed by my research group in order to easily handle the colourgrams approach.

THANKS FOR YOUR ATTENTION!