SAFFIC PROJECT

Methodologies for implementing International Standards for Saffron Purity and Quality

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Luana Maggi
Ana Mª Sánchez
Manuel Carmona

Krokos, 22 May, 2009

SAFFIC PROJECT

- ✓ **Type of Project:** European
- ✓ **Type of Programme:** 6th Framework Programme

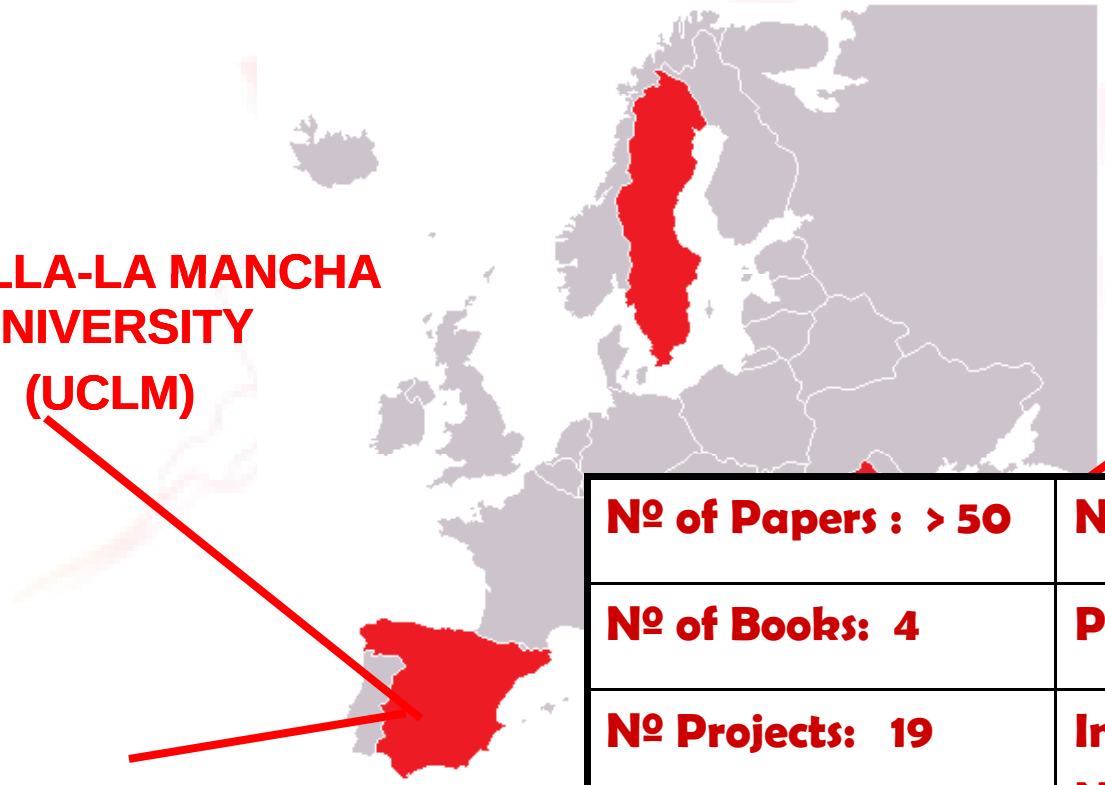
  Horizontal research activities involving SMEs: Collective research
- ✓ **Duration:** 1st October 2006 to 30th September 2009
- ✓ **Budget:** 2.762.312€

  EC funding: 1.868.139€

SCIENTIFIC TEAM EXPERTISE IN SAFFRON SUBJECT

CASTILLA-LA MANCHA UNIVERSITY (UCLM)

AGRICULTURAL UNIVERSITY OF ATHENS (AUA)



ALCALÁ DE HENARES UNIVERSITY (AUH)

Nº of Papers : > 50	Nº of Papers (SCI): > 35
Nº of Books: 4	PhD thesis: 8
Nº Projects: 19	International: 6 National: 6 Regional: 7

✓ CASTILLA-LA MANCHA UNIVERSITY (UCLM)


Gonzalo L. Alonso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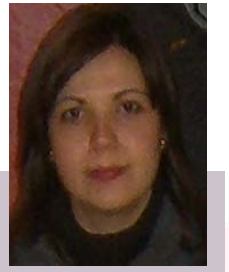

Priscila del Campo


Manuel Carmona

✓ AGRICULTURAL UNIVERSITY OF ATHENS (AUA)


Moschos, Polissiou


Tarantilis, Petros


Pappas, Christos

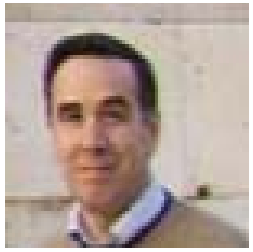

Kanakis, Charalabos


Anastasaki Eirini


Eleftherios, Petrakis


Konstantina, Astraka

✓ UNIVERSITY OF ALCALA DE HENARES (UAH)


José Luis Novella

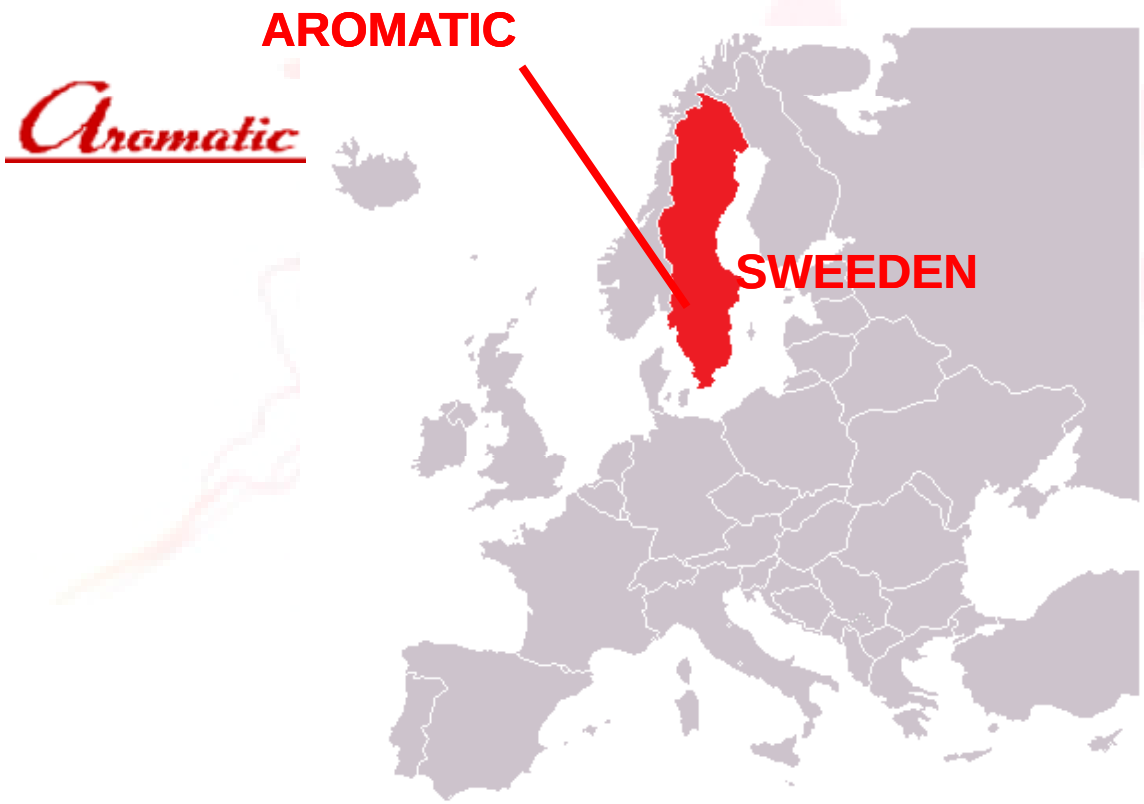
SAFFIC SMEs PARTNERS

KROKOS

ELOT

BAKATZOUNIS

SAFFIC SMEs PARTNERS



SAFFIC SMEs PARTNERS

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Laore

Agenzia regionale
per lo sviluppo in agricoltura

REGIONE AUTONOMA DELLA SARDEGNA

SU ZAFFERANU

Maria Carmine ENNAS
Franco SANNA

SAFFIC SMEs PARTNERS

VERDÚ · CANTÓ
SAFFRON SPAIN

AEC

CARMENCITA®

azafrán
DE LA MANCHA

C.E.A.E.

DIPUTACIÓN DE ALBACETE
ITAP
INSTITUTO TÉCNICO AGRONÓMICO PROVINCIAL S.A.

AENOR

SAFFIC SAMPLING

✓ **Number of saffron samples:** 456

Coming from:

- Iran
- Greece
- Spain
- Italy
- India
- Morocco

SAFFIC: Analytical determinations

- Moisture and volatile content

SAFFIC: Analytical determinations

- Moisture and volatile content
- UV-Vis spectrophotometry
  - Colouring strength $E^{1\%}_{1cm}$ 440nm
  - $E^{1\%}_{1cm}$ 250nm
  - $E^{1\%}_{1cm}$ 330nm

SAFFIC: Analytical determinations

- Moisture and volatile content
- UV-Vis spectrophotometry
- FT-IR/ FT-NIR / FT-RAMAN
  - Moisture and volatile content
  - Crocetin esters
  - Picrocrocin
  - Safranal and others volatiles
  - Adulterants : 26 colorants

SAFFIC: Analytical determinations

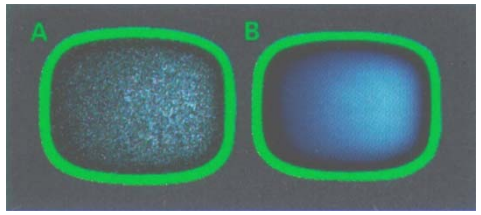
- Moisture and volatile content
- UV-Vis spectrophotometry
- FT-IR/ FT-NIR / FT-RAMAN
- HPLC-DAD
  - Crocetin esters profile
  - Picrocrocin and related compounds
  - Flavonoids
  - Colorants (polar and non polar): 26

SAFFIC: Analytical determinations

- Moisture and volatile content
- UV-Vis spectrophotometry
- FT-IR/ FT-NIR / FT-RAMAN
- HPLC
- GC/MS and GC/FID/MS
  - Volatiles extraction by TD, USAE
  - 22 volatiles related to saffron fingerprint

SAFFIC: Analytical determinations

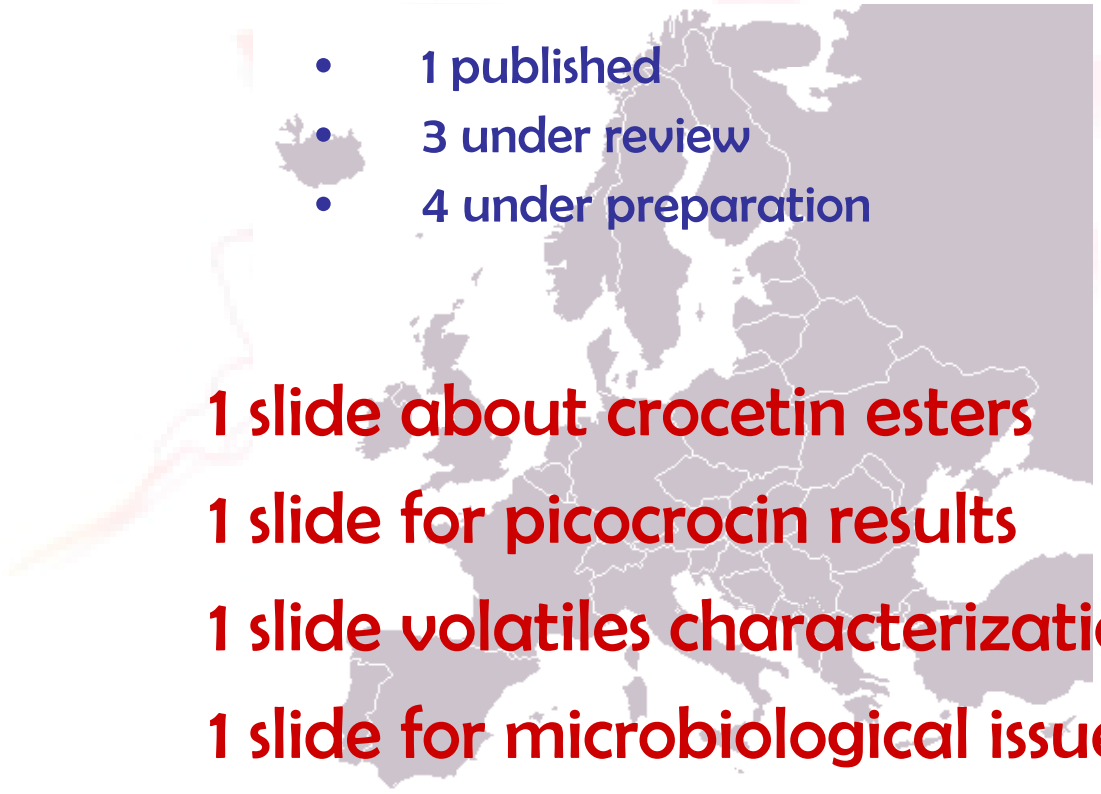
- Moisture and volatile content
- UV-Vis spectrophotometry
- FT-IR/ FT-NIR / FT-RAMAN
- HPLC
- GC/MS and GC/FID/MS
- Microbiology
  - Classical and PCR methods
  - *Salmonella, E. coli*



SAFFIC SCIENTIFIC HIGHLIGHTS RESULTS

8 FULL PAPERS

- 1 published
- 3 under review
- 4 under preparation



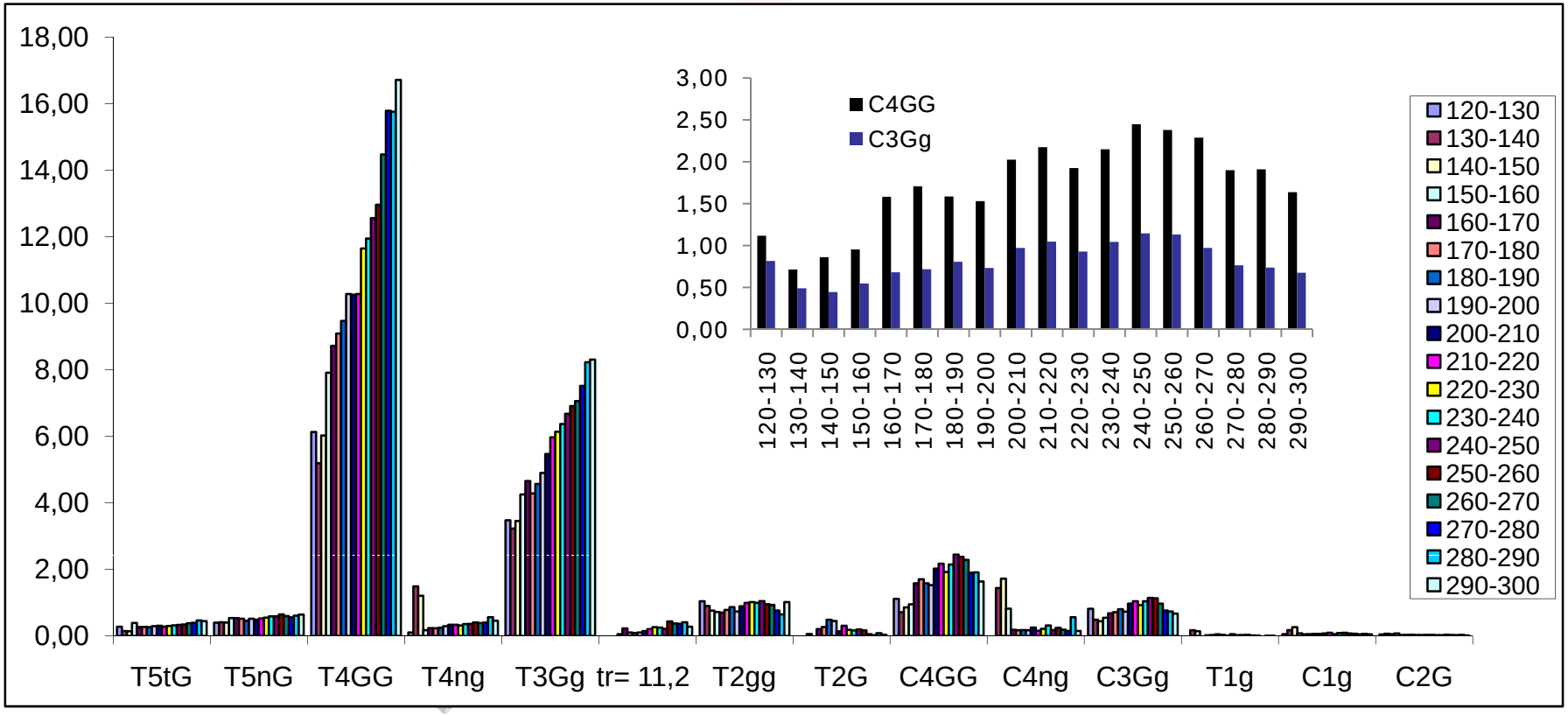
1 slide about crocetin esters

1 slide for picocrocin results

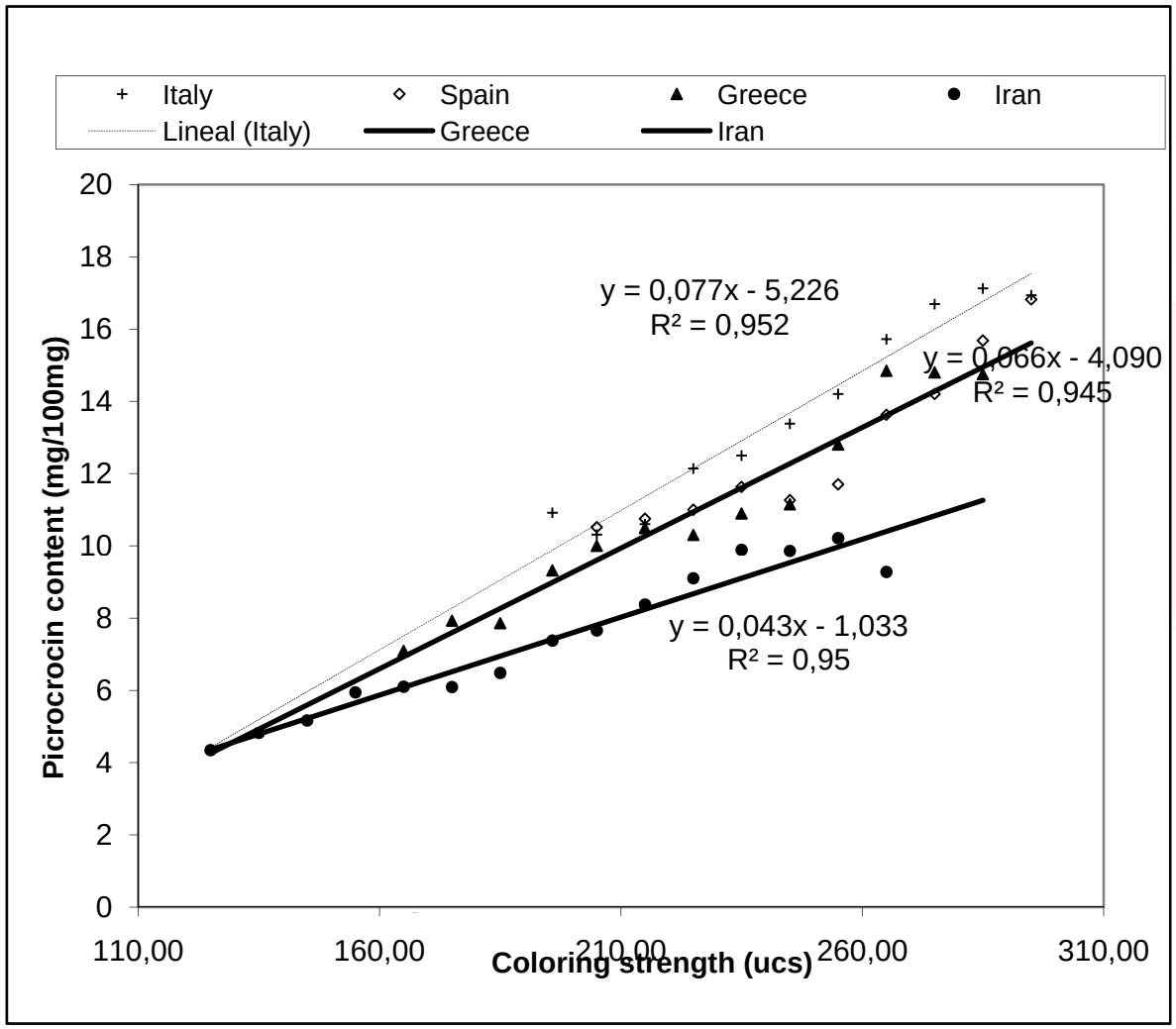
1 slide volatiles characterization

1 slide for microbiological issues

HIGHLIGHTS RESULTS (Crocetin esters)



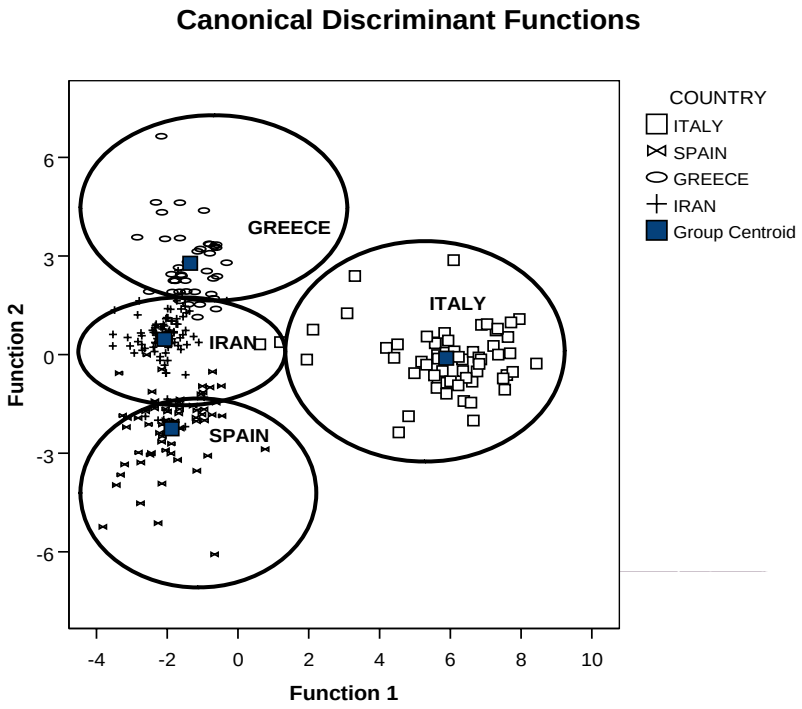
HIGHLIGHTS RESULTS (Picocrocin)



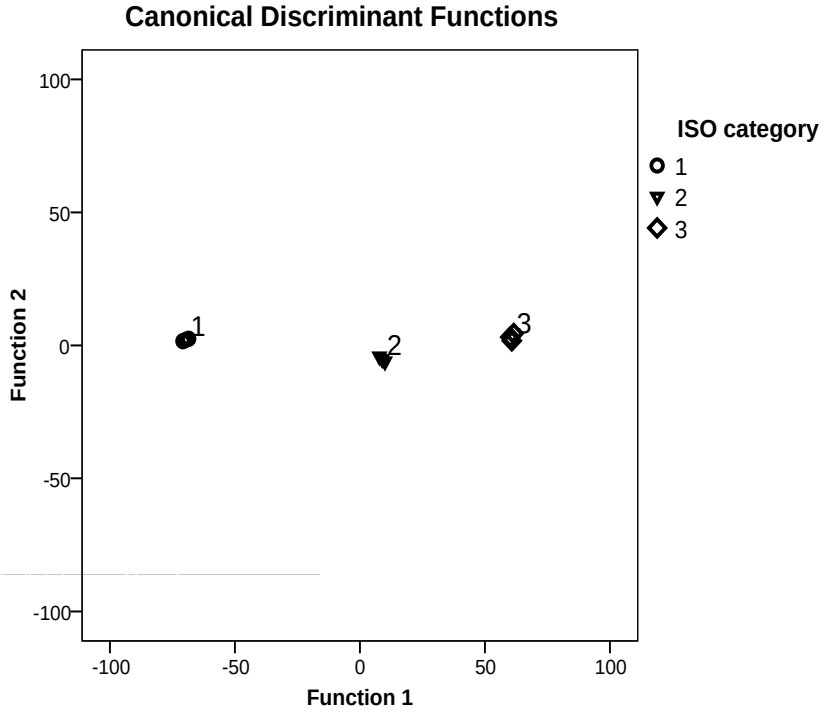
Quality categories of picocrocin

HIGHLIGHTS RESULTS (Volatiles)

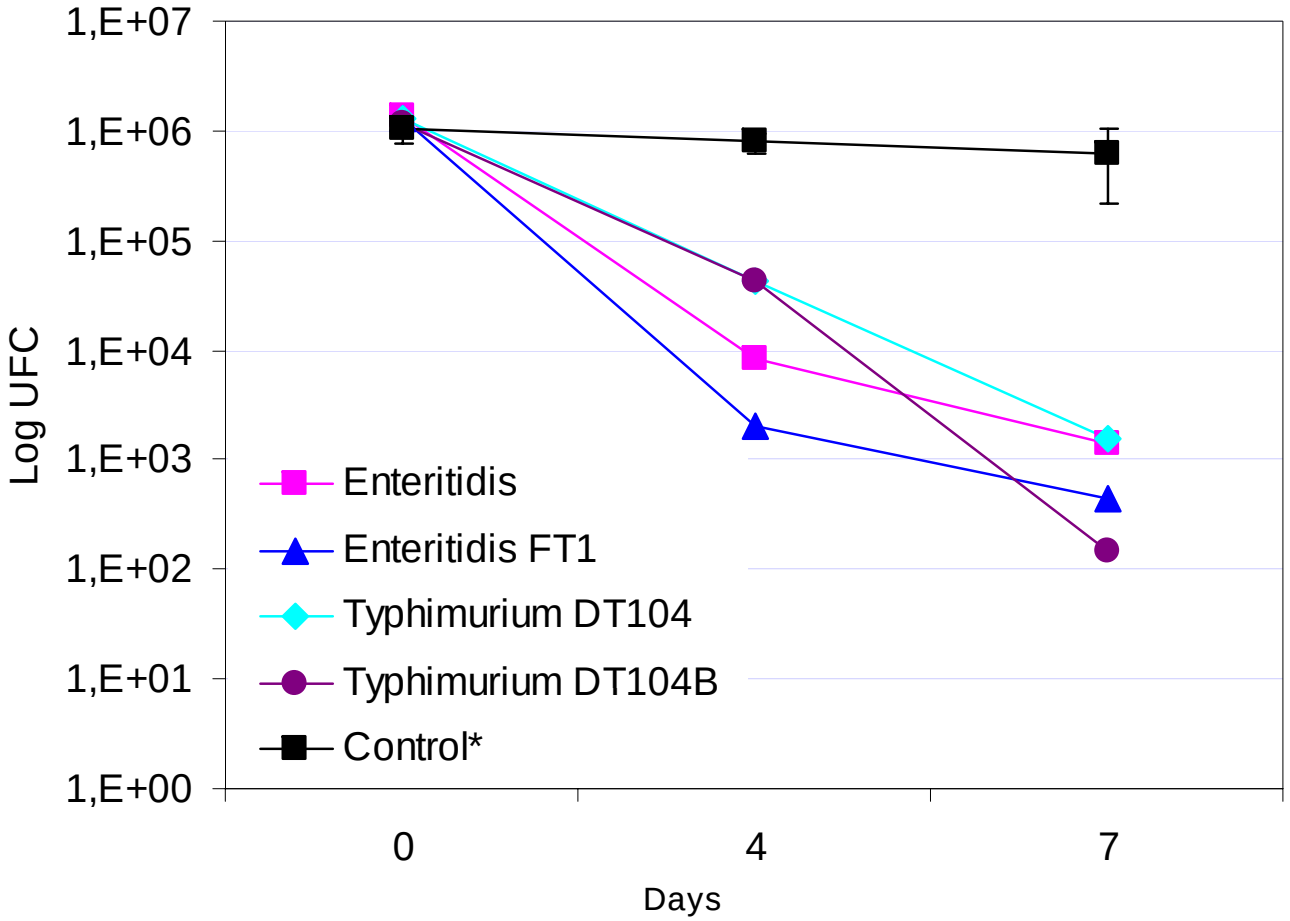
FT-IR



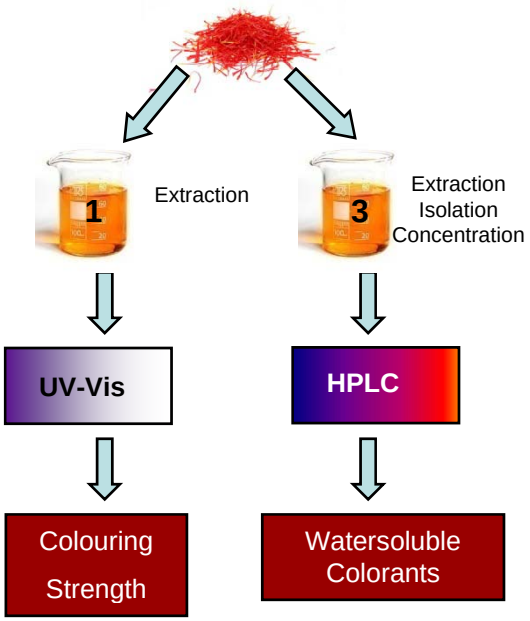
GC/MS



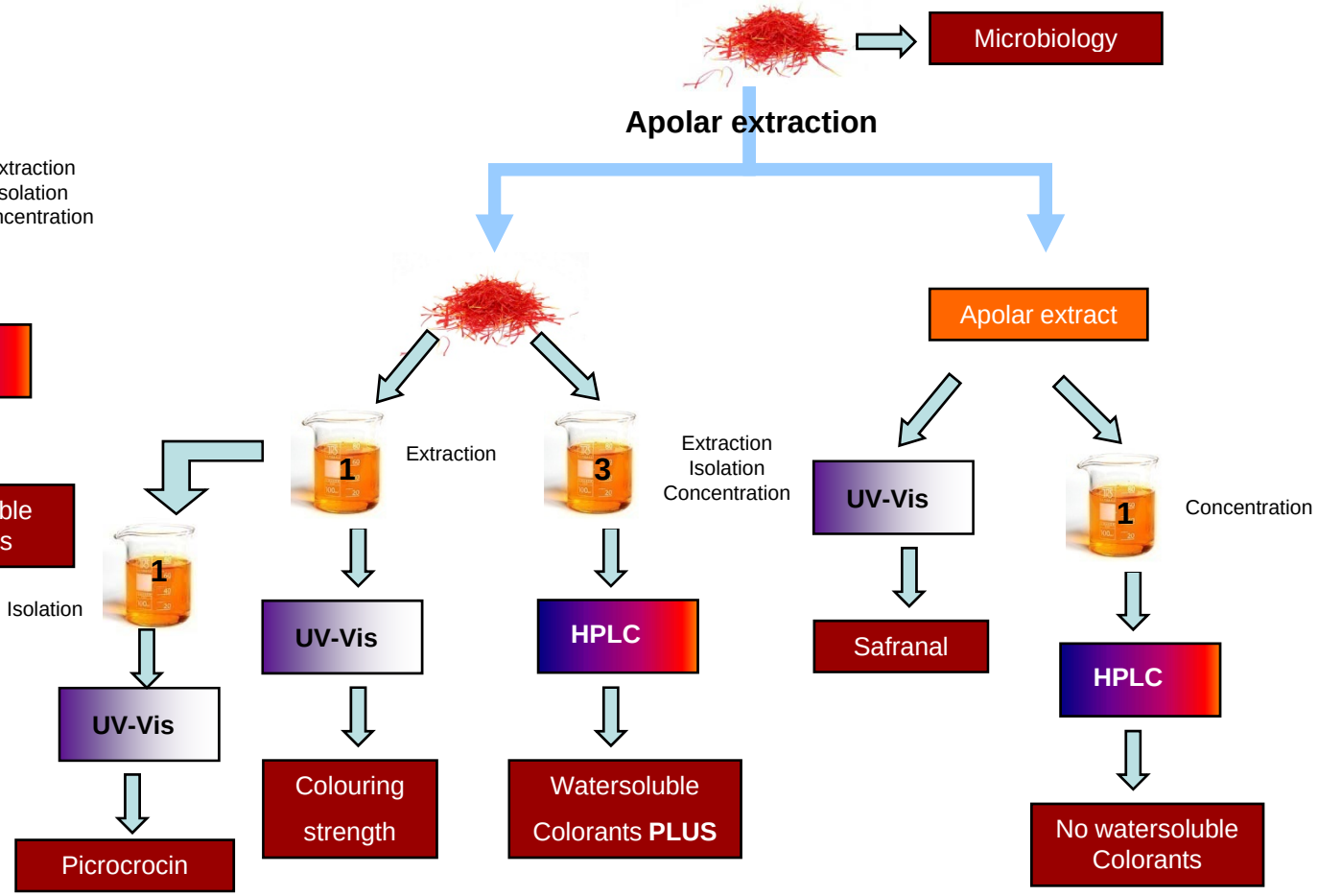
HIGHLIGHTS RESULTS (Microbiological tests)



CURRENT ISO 3632



PROPOSED MODIFICATIONS



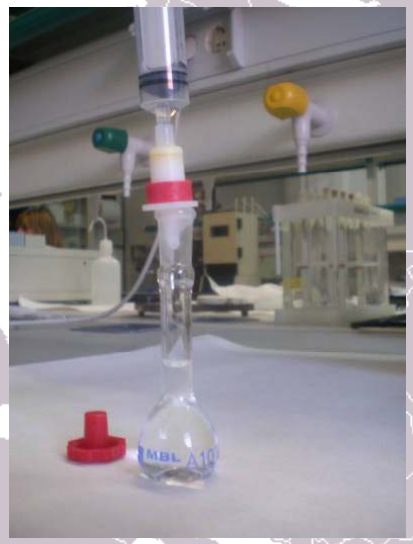
✓PICOCROCIN by UV-Vis TECHNIQUE

Weigh exactly 500 mg of saffron.

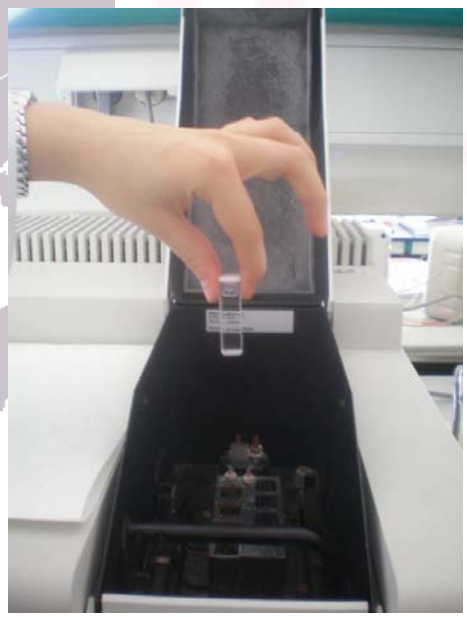
Transfer quantitatively the test portion into a 1.000 ml volumetric flask and add about 900 ml of distilled water. Stir with a magnetic stirrer for 1 h, away from light.

Take an aliquot part with the 10 ml pipette. Transfer to a centrifuge tube and centrifuge for 5 min at 4.000 rpm.

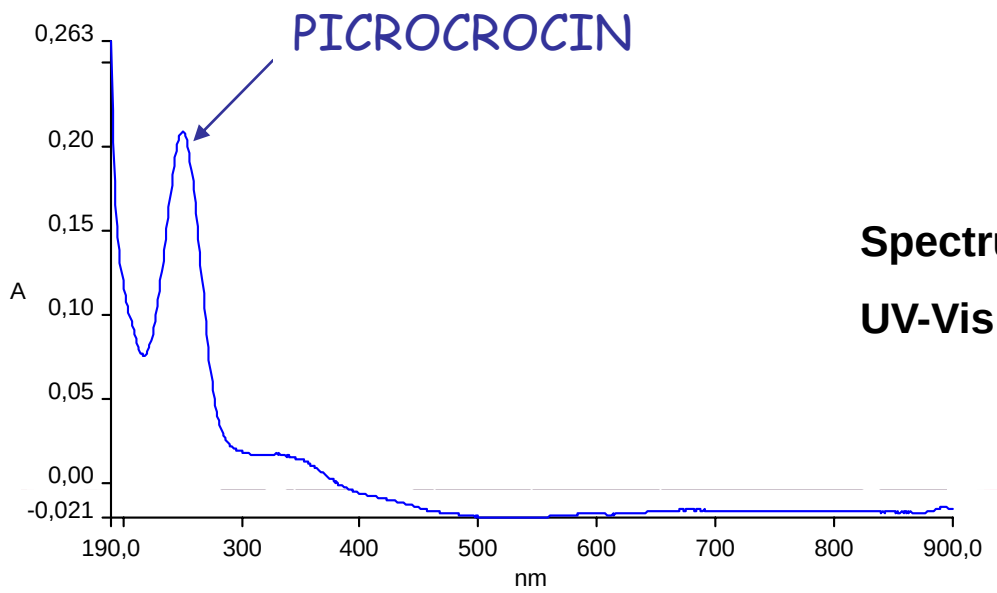
Prepare the cartridge and introduce the sample.



Then recover in a volumetric flask the first 10 ml of eluted.



Measure the absorbance at 250 nm in a 1 cm path length cell in the UV-VIS spectrometer.



Spectrum obtained by UV-Vis analysis.

Linearity: $R^2 = 0.9998$

Range: 0.6 – 60 mg/L

Repeatability: < 6%

Reproducibility: < 10%

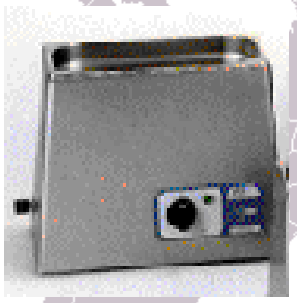
LOD: 0.30 mg/L

LOQ: 0.63 mg/L

✓SAFRANAL by UV-Vis TECHNIQUE

100 mg of saffron

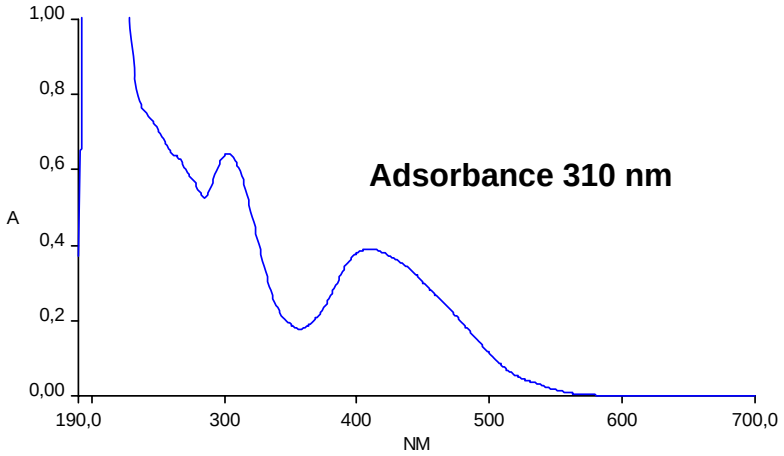
5 mL of Chloroform



Extraction by ultrasound for 15 min away from light exposure at room T

UV-Vis analysis

✓SAFRANAL by UV-Vis TECHNIQUE



Linearity: $R^2 = 0.992$

Range: 2 – 60 mg/kg

Repeatability: 2.6%

Reproducibility: 3.4%

LOD: 1 mg/kg

LOQ: 3 mg/kg

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Thank you very much

for your attention

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Manuel Carmona