



EUROCAROTEN

*European network to advance carotenoid research
and applications in agro-food and health*

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REPÚBLICA
PORTUGUESA

SAÚDE

Instituto **Nacional de Saúde**
Doutor Ricardo Jorge



Profile

Photo



Name

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Affiliation

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Expertise

Analytical Chemistry
Food Composition Tables

Field of Interest

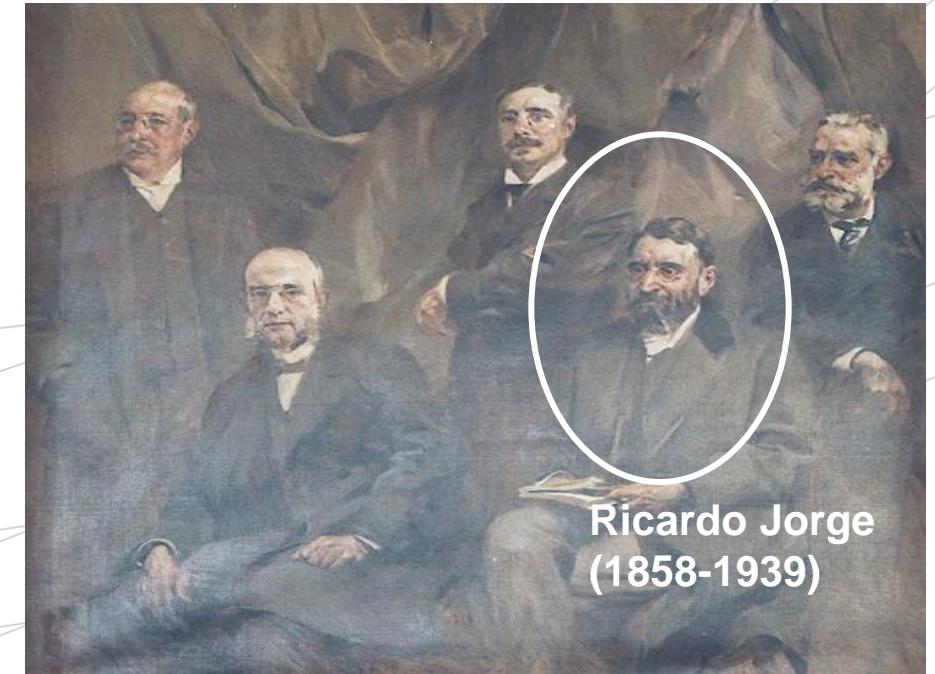
Carotenoids and liposolubles vitamins analysis by HPLC
Carotenoids bioaccessibility
Data quality evaluation
Nutrients/contaminants exposure assessment
Food sampling plans for data to FCT
Data compilation and Databases

Infrastructure

INSA

What is it?

- Centenary Public Institute - 1899
- State Laboratory in the Health Sector
- National Reference Laboratory
- National Health Observatory
- Dedicated to Public Health Gains



Ricardo Jorge
(1858-1939)

Infrastructure

Food and Nutrition Department

Units

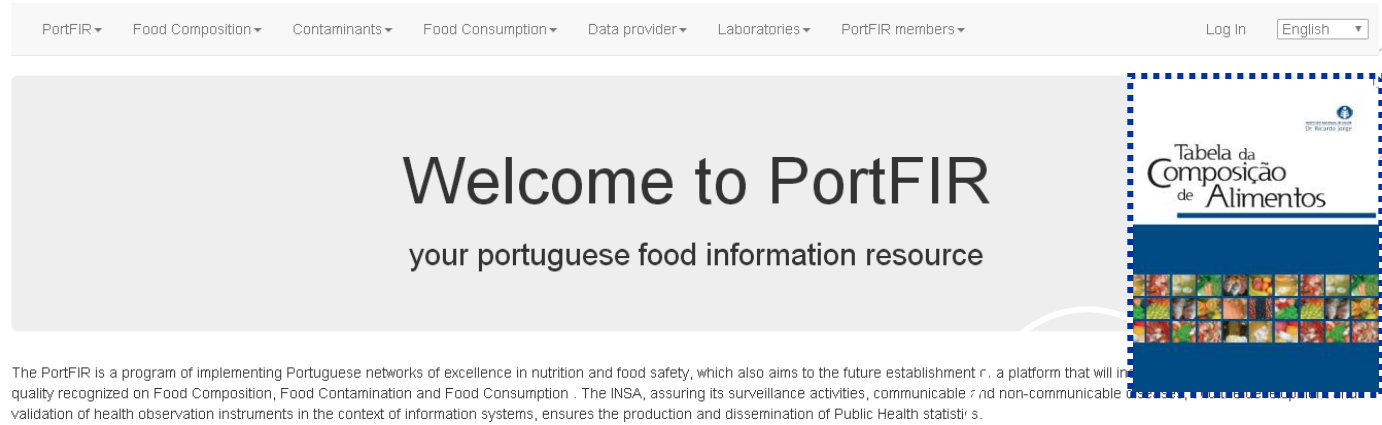
Reference

Accredited assays: 82
 Microbiology: 52
 Chemistry: 30

Proximates
 Vitamins
 Minerals
 Micronutrients
 Mycotoxins
 Additives

Monitoring and Surveillance

Research & Development



HPLC-DAD-UV/Vis/Fluorescence
 UPLC-DAD-UV/Vis/Fluorescence
 HPLC-MS/MS
 UPLC-MS/MS
 Gas chromatography
 ICP-MS/MS
 Spectrophotometers
food analysis



Research Questions Addressed

Carotenoids

Food analysis

Why?

❖ Health

- Possible risk reduction of cancer, cardiovascular diseases, eye degeneration
- Population groups depending on carotenoids to obtain vitamin A

❖ Chemical analysis

- Data reliability and completeness need improvement
- Controversial results from bioavailability studies and food processing

Contribution to the phytochemical characterization of Portuguese Fruits and Vegetables

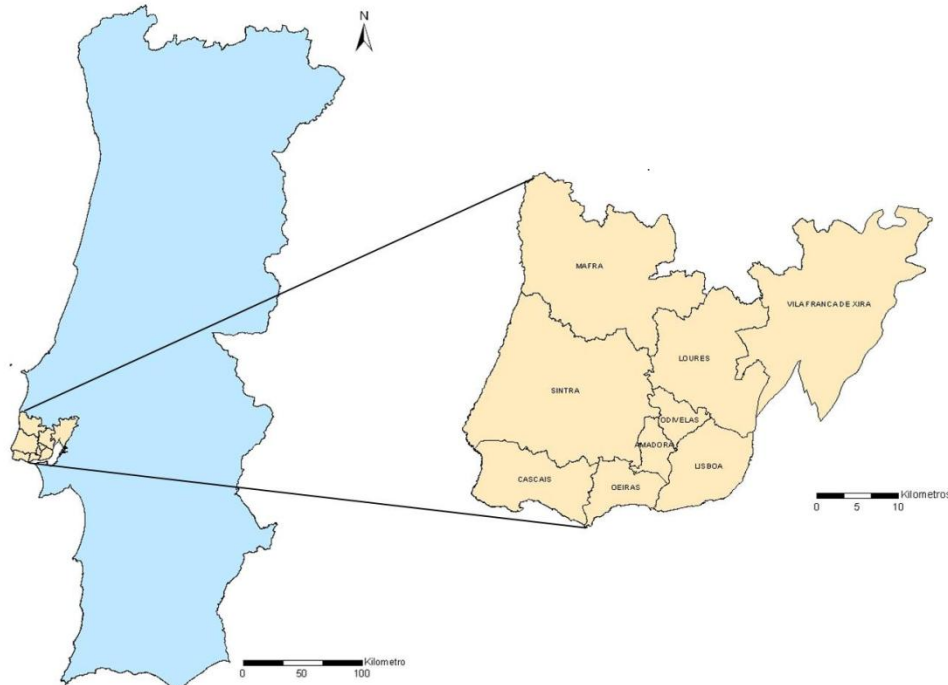
- Method for Food Chemical Analysis for carotenoids determination by a HPLC-RP – DAD/UV-Vis method with quantification using external standards and an internal standard
Method validation
Uncertainties evaluation
- Study of different fruits and vegetables, including the natural variability among species/varieties/cultivars
- Retention factors and yields for cooked food
- Accredited by ISO 17025 for α -carotene, β -carotene, β -cryptoxanthin, lycopene, lutein, zeaxanthin

Research Questions Addressed

Carotenoids/vitamin A

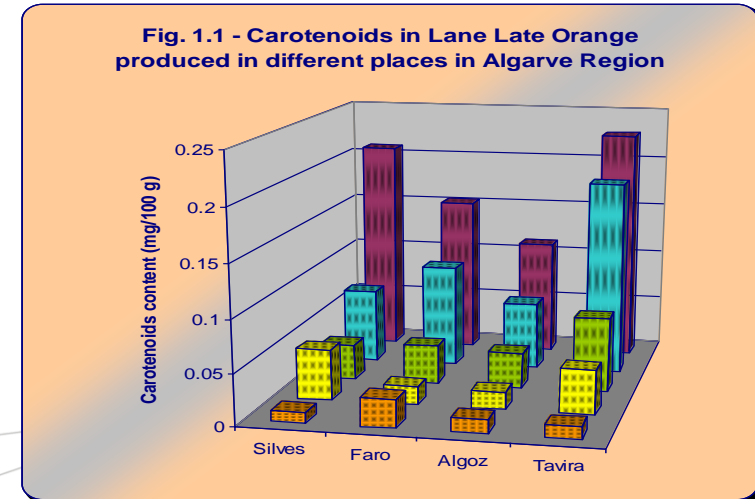
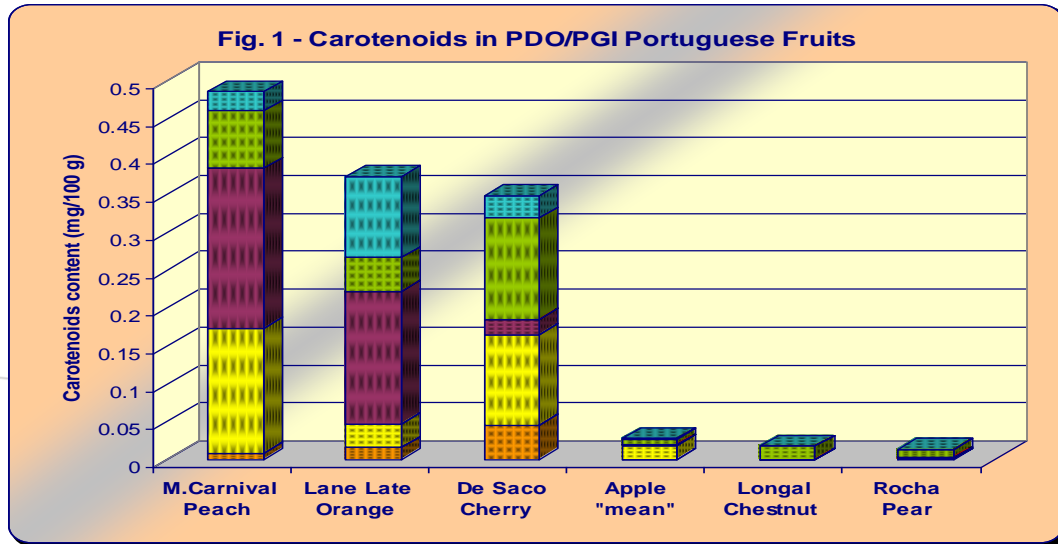
Evaluation of ingestion by Portuguese Population

Total Diet Studies Exposure: 2012-2016
 (FP7, GA n^o 289108)

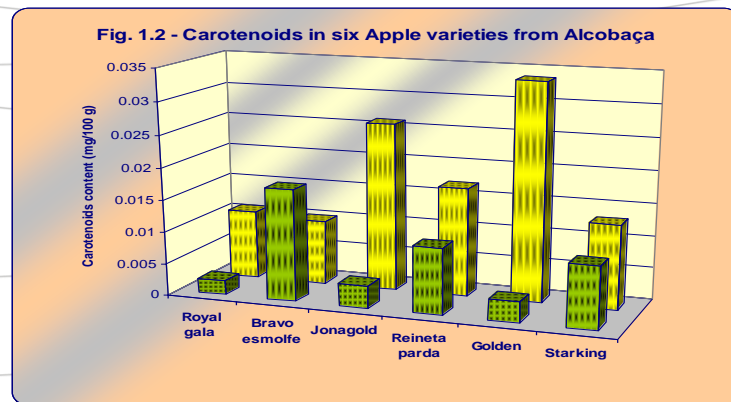


- Food items selected from the consumption survey.
- Sampling started on April 2014 and finished in March 2016.
- Samples were collected in 4 campaigns (spring, summer, autumn, winter). Each composite sample (total 169) is composed by 12 sub-samples prepared as eaten (total 2018 samples purchased).
- At least 48 shops were visited all in the Great Lisbon area. Besides, all food items were prepared/cooked as ingested.

Results 1



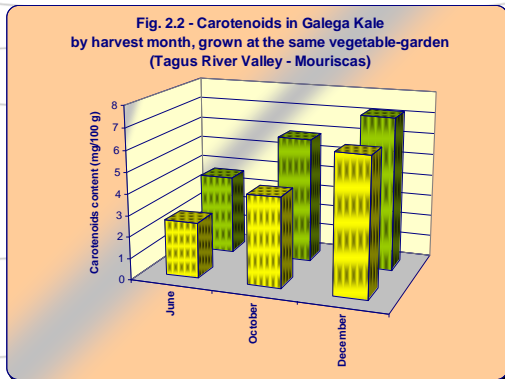
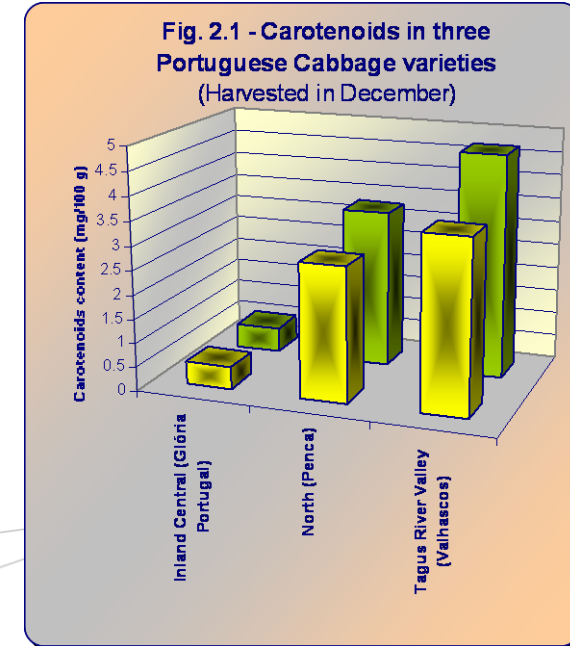
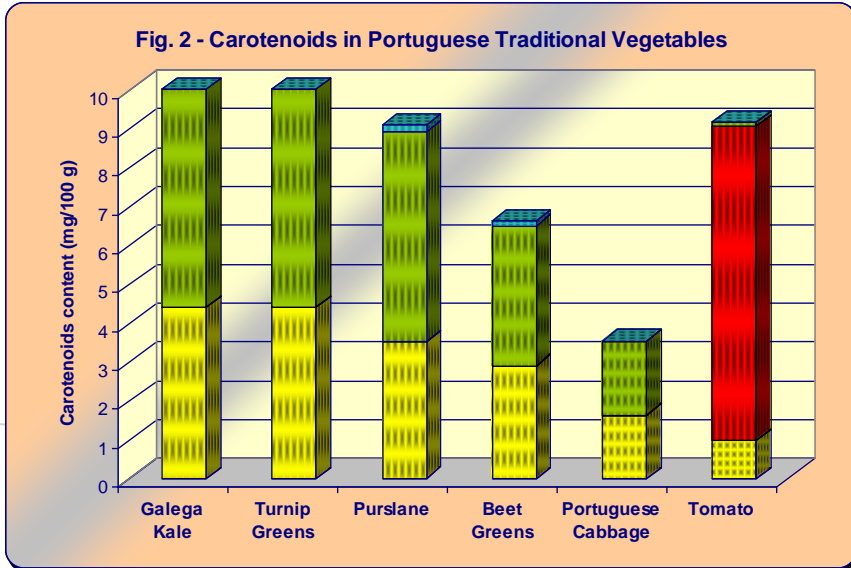
Different Places
Same Region, Variety, Harvest Time



Different Varieties
Same Region, Place, Harvest Time



Results 2



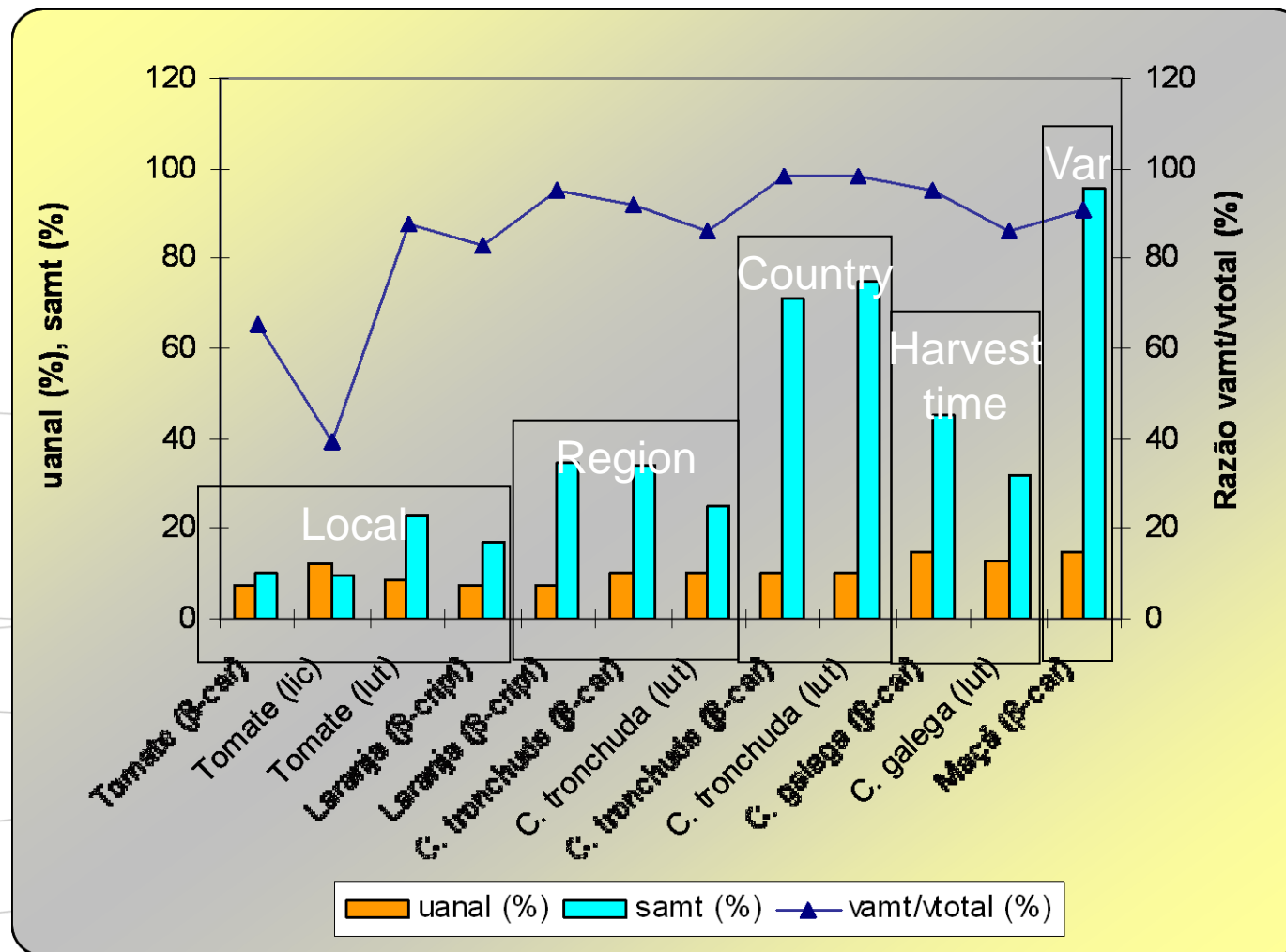
- α -carotene
- β -carotene
- β -cryptoxanthin
- Lutein
- Lycopene
- Zeaxanthin

**Different Regions
Same Variety, Harvest Time**

**Different Harvest Time
Same Region, Place, Variety, Plants**

Results 3

Total uncertainty components (analytical and sampling)



Conclusions

- **Portuguese traditional leafy vegetables** are a **very good source of lutein** (1.9 to 7.2 mg/100 g) and **β -carotene** (1.6 to 6.4 mg/100 g); fruits (consumed in larger quantities than vegetables), despite having lower carotenoid content, **contain other carotenoids as β -cryptoxanthin**.
- Fruits and vegetables **carotenoid content may differ considerably** depending on **species, varieties, geographical site of production (region, place) and time of harvest**, which **should be taken in account in sampling plans**.
- Studied **samples** and **standard** solutions appear to be **stable for at least 6 months**, when stored at **-70 °C**.
- The great majority of food items showed results with **measurement relative uncertainties between 0.050 and 0.15**, but relative uncertainties of 0.50 may occur near quantification limits.
- **Cooking** vegetables in water **did not conduct to (E)/(Z) carotenoid isomerisation**, and for the great majority of matrices **80-90% carotenoid retentions** were obtained.
- **High carotenoid content of traditional green vegetables** and carotenoid physiological activities may contribute to the **health effects of the Mediterranean diet**.

Additional Notes

Needs...Interests....Carotenoids

- **Improvement** of the analytical **methods** - **faster, environment friendly** and more **accurate** when **saponification** step is necessary.
- **Proficiency/interlaboratory** tests.
- Adequate **reference materials**.
- More **studies** about **bioaccessibility/bioavailability**.
- More studies addressing **variability among varieties** for the same species.
- Data production about **yields** and **retention factors** during cooking.
- Promotion of the inclusion of the **nutritional value** of food as a factor to consider in **plants improvement**.

Thank you for your Attention



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