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N°6, NOVEMBER 2017

# NEWSLETTER

# EUROCAROTEN

EUROPEAN NETWORK TO ADVANCE CAROTENOID RESEARCH AND APPLICATIONS IN AGRO-FOOD AND HEALTH

## WELCOME

**We are pleased to welcome you to the sixth issue of the EUROCAROTEN Newsletter.**

Last October EUROCAROTEN 4th MC & 3rd WG Meetings together with Workshop "Sustainable Production of Carotenoids" were held in Trogir, Croatia. In this issue we present a summary of the event as well as Early Career Investigators activities and information about Conference Grants.

In March 2018, Training School „Bioavailabity of Carotenoids" will be held in Newcastle, United Kingdom. Please, check page 4 to find information about application and selection process for trainees.

You may check our News from the Action rubric to find accomplished STSMs during last period, followed by "STSM experience report" from one of the applicants, Marina Christofi.

Also, in this issue, read more about most known carotenoid, β-carotene, and importance of carotenoids in elderly.

You can find more information about EUROCAROTEN COST Action on COST website http://www.cost.eu/COST_Actions/ca/CA15136 and on our website www.eurocaroten.eu.

*Yours sincerely,*
*Kristina Kljak*
*Mohammed Iddir*
*Ludmiła Bogacz-Radomska*

*Subscription to the newsletter e-mailing is available via the EUROCAROTEN website (www.eurocaroten.eu).*
*For further information, please contact us via our e-mail info@eurocaroten.eu.*
*You can also send us your comments and proposals.*

# SUMMARY FROM PAST EVENTS

## EUROCAROTEN 4rd MC and 3nd WG MEETINGS WORKSHOP „SUSTAINABLE PRODUCTION OF CAROTENOIDS"

16th – 18th October 2017
Trogir I Croatia

Organizers:

- COST Action EUROCAROTEN
- Faculty of Food Technology and Biotechnology, University of Zagreb, Zagreb, Croatia
- Faculty of Agriculture, University of Zagreb, Zagreb, Croatia

EUROCAROTEN Workshop "Sustainable Production of Carotenoids: From Biosynthesis to Biotechnology" was held on 16 – 17 October and 86 researchers and industry representatives from 32 countries participated. The workshop was organized by Working Group 1 and supported by local members of EUROCAROTEN.

Mladen Brnčić, (Chair of the Organizing Committee), Antonio J. Meléndez-Martínez (Chair of the Action), and Damir Jeličić (Croatian representative in COST) inaugurated the workshop.

Workshop lectures were presented by experts in the field and Early Career Investigators. The subject matter of the presentations concerned the process in the area from fundamental discoveries in carotenoids research to their translation and validation to products. A great attention among presenters was given to the β-carotene biosynthesis, while from other carotenoids, presentations were focused on phytoene, zeaxanthin, astaxanthin, β-xanthophyll, β-cryptoxanthin, fucoxanthin and lycopene.

The workshop was a great chance for experience exchange and a possibility to share the latest achievements in carotenoids research. After the sessions, all participants could admire the beautiful Trogir and Split, and learn the history of the region.

During afternoon on 17th October, Working Group (WG) meetings were held. While in WG4 plenary meeting, recent progress in dissemination has been presented and discussed, in WG1, 2 and 3 parallel meetings, participants discussed and planned deliverables.

The Management Committee (MC) meeting was held on the last day of the event. Chair of the Action, Antonio J. Meléndez-Martínez, presented the report for the first grant period and second grant period approved budget. Conference grants, new networking tool for PhD students and ECIs from participating Inclusiveness Target Countries were presented, as well as application process and evaluation criteria for training schools.

Furthermore, the Workshop "Carotenoids in Food Science and Health" was announced to take place during next annual meeting in fall of 2018 in Valencia, Spain.

For more photos from the event, please visit our Facebook www.facebook.com/eurocaroten. More information about workshop you can find at https://eurocaroten.eu/?q=node/115.

# NEWS FROM THE ACTION

# CONTRIBUTION FROM THE NETWORK & FINISHED STSMs

## CONTRIBUTION FROM THE NETWORK

### PUBLICATION BY EUROCAROTEN MEMBERS

Publication by George Manganaris has been published in the BMC Plant Biology and listed as featured article on journal main webpage. The aim of the research was to monitor the carotenoid composition in peel and flesh tissue an orange-fleshed loquat cultivar, in correlation with the progress of fruit maturity. For this purpose, high-resolution temporal expression profiles of carotenoid biosynthetic genes in both tissues were determined and linked with individual carotenoid contents. Publication is available at https://bmcplantbiol.biomedcentral.com/.

Publication by Selma Ben Abdelaali, María-Jesús Rodrigo, and Lorenzo Zacarías has been published in the Scientia Horticulturae. Tunisian oranges are recognized globally for their high organoleptic qualities, however, some cultivars are threatened by extinction due to their substitution by others more productive, the urbanization, scarcity and low quality of irrigation. The aim of the research was to study the coloration diversity of twenty-five Tunisian orange cultivars, belonging to navel, acidless, common and blood groups, by analyzing their total and individual carotenoids content and the relationship with CIELab color coordinates.Publication is available at http://www.sciencedirect.com/science/article/pii/S0304423817305745.

## ACCOMPLISHED STSMs

### PHYTOCHEMICAL ANALYSIS IN FRESH AND PROCESSED (CANNED) PEACH FRUIT

**Grant Holder**

Marina Christofi,
Cyprus University of Technology, Cyprus

**Period**

28th June – 1st October 2017

**Host Institution**

Faculty of Agriculture, Forestry and Natural Environment, Aristotle University of Thessaloniki, Greece

### TRANSCRIPTIONAL REGULATION OF CAROTENOID METABOLISM IN TOMATO UNDER HEAT STRESS

**Grant Holder**

Dr. Juliana Almeida Barros da Silva,
Royal Holloway University of London, United Kingdom

**Period**

15th September – 2nd October 2017

**Host Institution**

Genomics and Biotechnology of Fruit laboratory, UMR 990 INRA/INP-ENSAT, France

# FUTURE EVENTS

## SAVE THE DATE

### TRAINING SCHOOL

### BIOAVAILABILITY OF CAROTENOIDS

19th – 22nd March 2017
Newcastle I United Kingdom

## Training School

Training school "Bioavailability of Carotenoids" will be held at School of Medicine, University of Newcastle, Newcastle (United Kingdom) from 19th to 22nd March 2018.

## The organizers

- Dr. Georg Lietz
  (University of Newcastle, United Kingdom)
- Dr. Antonio J. Meléndez-Martínez
  (Universidad de Seville, Spain)

## The topics

The topics are related to the bioavailability of carotenoids, the training is divided into theoretical and practical part!


## Trainees grants

A maximum of 30 grants will be offered in amounts of 400€, 550€ and 800€ for selected trainees from UK, Ireland and other eligible countries, respectively.

## Eligibility of the candidate

Applications from PhD students and Early Career Investigators are expected. Candidates can be from:

- all COST Countries,
- approved NNC institutions,
- approved European RTD Organizations,
- industries working in the field.

## How to Apply?

Candidates are requested to fill in the application form and provide at least one open letter of reference. Applications must be sent to the Training School Coordinator and Vice Coordinator: Drs. Irina Milisav (irina.milisav@mf.uni-lj.si) and Gianfranco Diretto (giandiretto@gmail.com), respectively.
Please note that the deadline for application is 31st December 2017.

## Selection process

The selection of candidates will be based on information available from the submitted application according to their achievements, motivation and interests while taking gender and geographical balance into account.

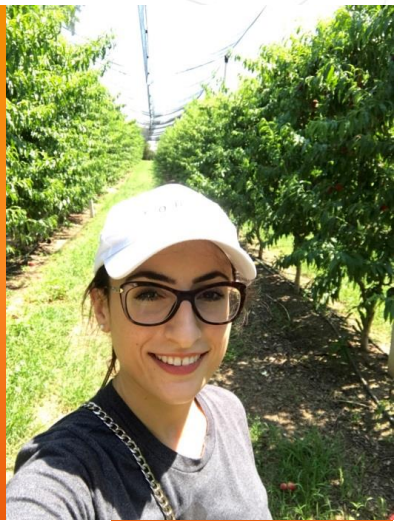
For more information, please refer to our website: https://www.eurocaroten.eu/?q=node/31.

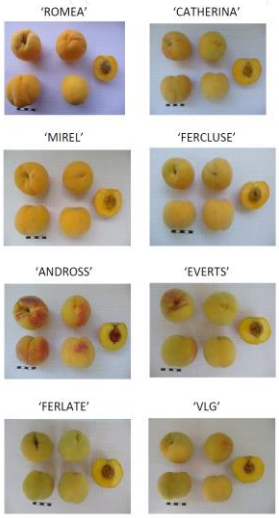
# ACCOMPLISHED STSMs
# EXPERIENCE REPORT

## MARINA CHRISTOFI

### PHYTOCHEMICAL ANALYSIS IN FRESH AND PROCESSED (CANNED) PEACH

| | |
|---|---|
| Affiliation | Cyprus University of Technology, Department of Agricultural Sciences, Biotechnology and Food Sciences, Cyprus |
| Position | PhD Student |
| Host Institution | Prof. Costas Biliaderis, Aristotle University of Thessaloniki, Faculty of Agriculture, Department of Food Science & Technology, Greece |
| Industrial partner | Venus Growers – Agricultural Cooperative of Veria |
| E-mail | Man.christofi@edu.cut.ac.cy |






During my STSM, I spent 12 weeks in the laboratory of Professor Costas Biliaderis at the Food Science and Technology Department (School of Agriculture, Aristotle University of Thessaloniki). The ultimate goal of this project was to assess the bioactive profile of eight commercially important clingstone peach cultivars both at harvest (fresh) and after processing (canned); aiming at the evaluation of the thermal processing effect on the composition of bioactive compounds in peach fruit, with special reference to carotenoids content.

Reflecting back to the STSM in Thessaloniki, it was one of the most memorable days of my life. I was fortunate enough to have experienced first-hand and learnt many different aspects of my project. Initially, I had the opportunity to work with well-known agronomists and fruit producers specialized in fresh and canned fruits, where eight clingstone peach cultivars with scalar ripening (spanning from beginning of July to mid of September) were harvested and were subsequently processed at the premises of 'Venus Growers'. Following that, I was implicated on the daily activities in the laboratory, mainly dealing with sensorial attributes, mechanical and qualitative properties of different peach cultivars. A substantial part of my STSM was also spent in the laboratory of Dr. Pavlina Drogoudi (Naoussa, Greece), where quality evaluation of fresh fruit was carried out.

Working in advanced research protocols for the following weeks was enjoyable for me, as I had the chance to meet new people sharing common research facilities and interests as well as I had useful discussions with other Faculty members. […] I performed routine techniques and I am confident that in the near future I may render myself independent also in state-of-the-art analytical techniques related to the quality/phytochemical (carotenoids) evaluation of fresh and canned fruits.

Throughout my stay, I took the opportunity to explore the city centre and surrounding places of Thessaloniki. Being a unique mosaic of different cultures and civilizations, I was marvelled walking and discovering the city. […] Besides that, I really loved the countless options of food and delicious popular food such as gyros, souvlaki, mpougatsa and tsoureki!

I would like to take the opportunity to thank all the contributors individually for the support they gave me to accomplish this significant and great part of my work. Special thanks to EUROCAROTEN committee for their financial support, Professor Costas Biliaderis including all the members of his research group, Mr Stelios Theodoulides; CEO of 'Venus Growers' and Dr. Pavlina Drogoudi for her invaluable help and collaboration.

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# EUROCAROTEN INTERVIEW

## TALKING WITH:

### Carmen Socaciu

**Affiliation** Department of Agri-food Chemistry and Biochemistry, University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca

**Position** Professor

**Country** Romania

**Area of Interest** Agri-food biochemistry, Analytical biochemistry, Cellular biochemistry, Bioprocessing natural resources.

### Please tell us a bit about your lab and what you work on?

The Department of Chemistry and Biochemistry has a long lasting tradition and experience in many areas of research and education connected to Natural Products. Since more than 75 years, the carotenoid research was continuously developed and diversified. Since 2001, I am coordinating the research activity of our group, as a director of the authorised "Research Centre of Biochemistry and Agrifood Biotechnology". The group infrastructure is an outstanding one, included in the Institute of Life Sciences where eight labs and many equipment are available due to many international projects (NATO Joint Research, FP5-6-7, H2020, four COST actions, ERASMUS collaborations, etc.) and more than 35 national grants.

### Which area of carotenoids research do you find most interesting?

First of all, considering our long lasting experience in the field, the biodiversity of Romanian/European bio resources, we keep interested in bioprospecting and discovery of interesting carotenoids, their extraction applying biorefinery concepts, their characterization using HPLC-DAD-MS or GC-MS coupled with FTIR and Raman spectrometry (1). A new and interesting area for us is under development, e.g. application of different innovative procedures to improve the stability and bioaccessibility of isolated molecules or enriched fractions (microencapsulation, fluidized bed drying) (2). Some group members are more interested to elaborate new formulas containing carotenoids and to test their action *in vitro* on different targeted cell lines (normal or tumour ones) looking to the involvement in cell signalling and proliferation (3).

### As a STSM hosting lab, what type of collaborative projects would you envision?

Considering our competences and expertise in carotenoid chemistry and bioanalytical investigations, as well in generating new formulations based on green technologies (e.g. microencapsulation), we are keen to host PhD students for joint research projects. To mention some general topics: fingerprinting carotenoid biodiversity of some plants/fruits from different European regions by advanced analytics, innovative formulations with improved carotenoid stability and *in vitro* evaluation of their effects with relevance for their bioavailability, with nutritional and biomedical applications.

### In your eyes, how can the EUROCAROTEN COST Action contribute to carotenoid research?

EUROCAROTEN COST Action surely will enhance the existing collaborations between carotenoid-related groups of scientists and create new networks not only inside Europe but including other non-European countries. Clearly, such connections bring added-value knowledge in the carotenoid research and new ideas for their (bio)technological and biomedical valorisation.

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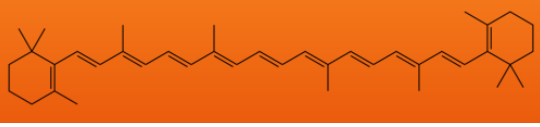
# CAROTENOIDS IN OUR DAILY LIFE

## CAROTENOID OF THE MONTH

Name: β-carotene

Chemical Formula: $C_{40}H_{56}$

Molecular Weight: 536.89 g/mol



## β-CAROTENE

β-carotene, is one the most known carotenoids and with bearing relevance, in terms of health benefits and industrial applications. This carotenoid has antioxidant, antibacterial, anti-inflammatory, and immunity stimulatory effects. Additionally, besides being a precursor to vitamin A, β-carotene is frequently included in the formulation of healthy foods, used as a food colorant or in aquaculture to aid in fish colour development.

Natural β-carotene is preferred by the health market due the mixture of *cis* and *trans* isomers, that hardly can be obtained via chemical synthesis. Production of this carotenoid by microorganism, such as microalgae, is a reality since the 1980s. Indeed, among all natural sources known to date, *Dunaliella* possesses the highest content of 9-cis β-carotene. In fact, this microalga, together with *Haematococcus pluvialis*, are the focus of a number of companies around the world.

**Text by Helena Melo Amaro**
PhD at University of Porto, Portugal
E-mail: lena.amaro@gmail.com

## CAROTENOIDS IN THE ELDERLY

Carotenoids have been proposed to be protective in terms of age-related diseases such as cardiovascular diseases, atherosclerosis, age-related macular degeneration, cancers, and cognitive disorders.

Recent work from our research group has shown that plasma lycopene and α-carotene were inversely correlated with age, whereas β-cryptoxanthin, lutein, zeaxanthin were positively correlated with age in age-stratified participants aged 35-75 from the European Mark-Age study (n = 3,200). These observations may reflect age-related changes in the diet due to altered preferences or intolerances. Also, different storage patterns of carotenoids in various organs (e.g. in adipose tissue), or psychological changes such as depression may play a role. Finally, lifestyle factors must be considered: since lycopene is only derived from tomato products it is likely that some groups (e.g. men, young persons) consume higher amounts of lycopene-rich – but perhaps unhealthy – products such as pizza, ketchup or tomato sauce. Another reason may be an altered bioavailability of carotenoids during aging due to the physical/chemical conditions of the gastrointestinal tract. In fact, it has been shown that the bioavailability of lycopene is significantly reduced in older adults whereas α-carotene, β-carotene and lutein were not significantly changed.

It is important to keep in mind that even more factors besides those mentioned above influence the bioavailability and blood concentrations of carotenoids, including metabolism, energy intake, food preparation, fat intake, and interactions with other nutrients or drugs which all may be influenced by aging.

**Text by Daniela Weber**
Post-Doc at the German Institute of Human Nutrition Postdam-Rehbruecke (DIfE), Nuthetal, Germany
E-mail: Daniela.Weber@dife.de

# THINK TANK INFORMATION

## EUROCAROTEN Workshop on Sustainable Production of Carotenoids: From Biosynthesis to Biotechnology – successful event

**16th - 17th October 2017**
**Trogir | Croatia**

EUROCAROTEN Workshop "Sustainable Production of Carotenoids: From Biosynthesis to Biotechnology" was platform for experience exchange between Early Career Investigators (ECIs) and experts. Mainly, young scientists presented the outcomes of their research and as feedback got a constructive and motivating critic from more experienced colleagues. The idea of workshop dedicated mainly to ECIs should be developed in coming events, thus it has supporting and promoting emphasis to ECIs.

## Early Career Investigators meeting

Think Tank Committee is glad to have a possibility to meet other interesting young scientists and to share the experience. We hope that our late discussions had brought us together and we can start an efficient cooperation. Please do not hesitate to contact us if you have any suggestion.

We would like to involve Early Career Investigators in Think Tank work, which is creating the network between experienced and young scientists, creating a space for dialogue and debate amongst ECIs, promoting the leadership among ECIs and many others. The main goal of Think Tank Committee is helping and promoting the career development of Early Career Investigators (ECI).

## Conference Grants – increase your mobility and visibility of your research outcomes

Think Tank Committee remind all PhD students and Early Career Investigators about conference grants, that enable the funding of the international science and technology related conferences not specifically organized by the COST Action. For more information please visit https://www.eurocaroten.eu/?q=node/118.

Conference Grants Coordinator:
Dr Milan Certik
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Conference Grants Vice-Coordinator
Dr Jolanta Sereikaite
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THINK TANK
OF EARLY CAREER INVESTIGATORS AND OTHER YOUNG RESEARCHERS

**Representatives for 2nd grant period:**

* Mohammed Iddir
mohammed.Iddir@lih.lu

* Ludmiła Bogacz-Radomska
Ludmila.bogacz-radomska@ue.wroc.pl

**ECI spokesperson:**

* Kristina Kljak
kkljak@agr.hr

# WORKING GROUP NEWS

Leaders of WG1, Paul Fraser, and WG2, Nora O'Brien, gave us insight in progress done so far, as discussed during WGs meetings in Trogir.

WG1 delivered an informative workshop in Trogir as part of there activities. The meeting brought industrial and academic expertise together and provided a forum for young scientist to present their excellent work. Several key areas such as apocarotenoids and intraorganellar transport of carotenoid derivatives were highlighted. In addition the implications arising from new plant breeding techniques prevailed. Other activities such as a data base of protocols for carotenoid analysis is well advanced. Finally WG1 will host a training school in 2018 linked to methodologies for carotenoid analysis.

WG leader: Paul Fraser (paul.fraser@rhul.ac.uk )

WG vice-leader: Pauline Snoeijs-Leijonmalm (Pauline.snoeijs-leijonmalm@su.se)

The major review on carotenoid content of food and feeds is in progress, moreover 14 SOPs have been complete to-date. Progress on inter-laboratory studies was discussed and decisions were made regarding which foods to analyse, and the laboratories who are willing to participate in this analysis will now be sought. A detailed discussion took place on developing a database regarding carotenoid content of foods produced and/or consumed in Europe. Finally, E-questionnaire will be distributed in different countries among schoolchildren between 6-15 years old, to gain an insight of their knowledge about carotenoids.

WG leader: Nora O'Brien (nob@ucc.ie)

WG vice-leader: Anamarija Mandić (anamarija.mandic@fins.uns.ac.rs)

## ACKNOWLEDGEMENTS

**We would like to thank everyone who has so kindly contributed with the content present in this newsletter:**

**Antonio J. Meléndez Martínez and Cristina L. M. Silva** for their guidance and supervision during the development of the EUROCAROTEN Newsletter.

**Marina Christofi** who has kindly given her testimony.

**Carmen Socaciu** for her contribution to our EUROCAROTEN Interview.

**Helena Melo Amaro** and **Daniela Weber** for their contribution to the Carotenoid of the Month rubric.

**Paul Fraser** and **Nora O'Brien** for their contribution in WG News.

This newsletter is part of dissemination strategy of COST Action EUROCAROTEN, supported by COST (European Cooperation in Science and Technology).

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