



N°5, AUGUST 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 fifth issue of the EUROCAROTEN Newsletter.

In this issue we are presenting EUROCAROTEN 4th MC & 3rd WG Meetings and Workshop "Sustainable Production of Carotenoids". Topics and selected complementary presentations of Early Career Investigators (ECIs) are presented in Think Thank Information rubric.

This July the 18th International Symposium on Carotenoids was held in Lucerne, Switzerland, and in this issue of the newsletter we present a summary of the symposium. In addition, we would like to introduce you to Professor John Landrum, President of International Carotenoid Society.

Please check our News from the Action rubric to find finished STSMs during last period, followed by "STSM experience report" from one of the applicants, Clara Pons.

Also, in this issue, read more about colourless carotenoids phytoene and phytofluene and their importance in health promotion and cosmetic purposes.

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,
Ludmila Bogacz-Radomska
Mohammed Iddir
Kristina Kljak*



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.

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20th & 21st September

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Clara Pons - Exploring natural colour diversity in the traditional European tomato: Phenotyping and sampling

"The aim of my project was to explore the natural variation in colour mutants within a large collection of traditional European tomatoes and to identify new mutations related to carotenoid metabolism."

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Talking with: John Landrum

"We have been engaged understanding the identity, distribution, and function of the macular pigments for the past thirty years."

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Carotenoids of the Month: Phytoene and Phytofluene

"Phytoene and phytofluene can be considered as rarities among carotenoids as they are colourless."

Importance of Colourless Carotenoids?

[...] they have exhibited antioxidant capacity, anticarcinogenic and anti-inflammatory properties in a variety of studies.

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EUROCAROTEN Workshop on Sustainable Production of Carotenoids – From Biosynthesis to Biotechnology

Topics and selected complementary presentations

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Working Group 4. Transfer, Dissemination and Exploitation

"WG4 ensures the cross-talk between WGs and Action participants to integrate and transfer the Action outcomes, disseminate our results and to make sure efficient implementation and exploitation of the Action findings."



SUMMARY FROM PAST EVENTS



09th – 14th July 2017

Kultur-und Kongresszentrum Luzern,
Switzerland

Last July the 18th International Symposium on Carotenoids took place in the city of Lucerne (Switzerland). This event brought together around **300 participants** from all over the world including: the United States, Europe, Asia, Australia and Africa.

Also, this year was the first that a **Young Investigators Forum** was organized, with the goal of giving the opportunity to Early Career Investigators to present their work and have a space for discussion.

Among the many internationally renowned researchers and industrial representatives from the field of carotenoids, there was a **significant contribution from several members of the EUROCAROTEN COST Action** whom have given oral presentations or presented a poster, chaired sessions, and **were honoured** with a Fellow of the Society Honorary Award.

Prof. Volker Böhm, Prof. Jozsef Deli, Prof. Georg Lietz, Prof. Antonio J. Melendez Martinez **were part of the international Scientific Committee** of the Symposium. Prof. António J. Meléndez-Martínez chaired the **Roundtable discussion** on the last day of the Symposium, with the topic "Outlook and Vision on Carotenoid Research". Also, the 1st Grant Year Think Tank Representative Paula Mapelli-Brahm has received a **Student Travel Award**.

The 19th International Symposium on Carotenoids will take place in **2020 in Japan**, in the city of **Toyama**.

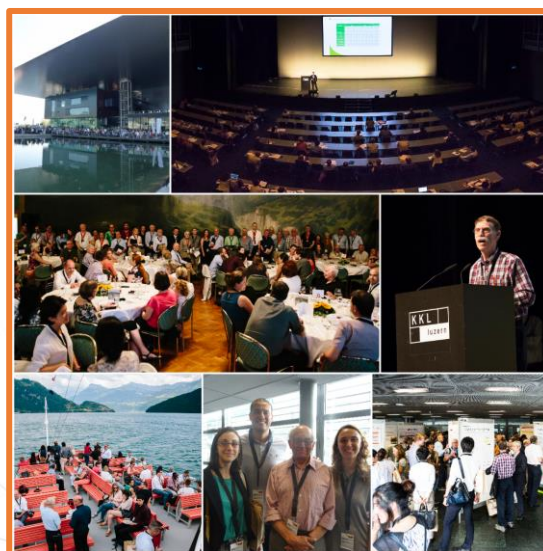
Text by Joana Corte-Real and Paula Mapelli-Brahm, the 1st grant period Think Tank Representatives

CONTRIBUTION FROM EUROCAROTEN COST ACTION MEMBERS

Presenters : G. Lietz, M. L. Bonet, A. Agócs, C. Socaciu, J. Nolan, T. Bohn, J. Hirschberg, G. Sandmann, P. Mapelli-Brahm, J. Corte-Real, A. J. Melendez-Martinez, D. Giuffrida, C. Zhu,

Posters : M. Iddir, D. Phelan, P. Mapelli-Brahm, M. da Graça Dias, D. Weber, J. Deli, V. Nagy, R. Moran, T. Bohn, D. Giuffrida, A. J. Meléndez-Martínez, A. Pintea

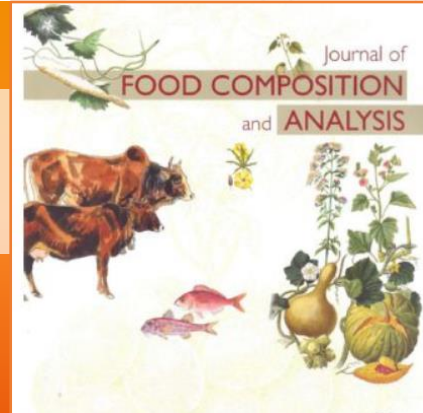
Award "Fellow of the Society": J. Deli, J. Hirschberg, G. Lietz, A. J. Meléndez-Martínez, Y. Sharoni, W. Stahl



www.michaelfund.com/Carote-Nature

NEWS FROM THE ACTION

FINISHED STSMs & CONTRIBUTION FROM THE NETWORK



FINISHED STSMs

IMPACT OF RETINOIC ACID AND CAROTENOIDS ON DNA METHYLATION STATUS AND MACHINERY IN ADIPOCYTES

Grant Holder

Alba Serrano Bengoechea,
University of the Balearic Islands, Spain

Period

15th January– 15th April 2017

Host Institution

INRA-INSERM-Aix Marseille Université, France

ELUCIDACION OF ABA ROLE IN TOMATO FRUIT RIPENING

Grant Holder

Dr. Gianfranco Diretto,
Italian National Agency for New Technologies, Energy and
Sustainable Development (ENEA), Italy

Period

5th June – 5th July 2017

Host Institution

INRA/INP ENSA Toulouse, France

EXPLORING NATURAL COLOR DIVERSITY IN THE TRADITIONAL EUROPEAN TOMATO: PHENOTYPING AND SAMPLING

Grant Holder

Dr. Clara Pons
Institute for Plant Molecular and Cell Biology, Spain

Period

16th June– 5th July 2017

Host Institution

Faculty of Agriculture, The Hebrew University of Jerusalem,
Israel

GENETIC AND POSTHARVEST ENVIRONMENTAL FACTORS AFFECTING CAROTENOID COMPOSITION IN TOMATO

Grant Holder

Dr. Joan Casals Missio
Italian National Agency for New Technologies, Energy and
Sustainable Development (ENEA), Italy

Period

16th June – 5th July 2017

Host Institution

State of Israel/Ministry of Agriculture, Agricultural Research
Organization, Israel

CONTRIBUTION FROM THE NETWORK

SPECIAL ISSUE: 8TH INTERNATIONAL CONGRESS ON PIGMENTS IN FOOD

"COLOURED FOOD FOR HEALTH BENEFITS"

COST EUROCAROTEN members Antonio J. Meléndez-Martínez and Adela Pintea are guest editors of a special volume of Journal of Food Composition and Analysis (impact factor 2.752).

The volume will publish works presented in the 8th International Congress on Pigments in Food - Coloured Food for Health Benefits held in Cluj-Napoca (Romania) and organized by the EUROCAROTEN Vice Chair Carmen Socaciu.

For more details please see:

<https://www.journals.elsevier.com/journal-of-food-composition-and-analysis/call-for-papers/special-issue-8th-international-congress-on-pigments-in-food>

FUTURE EVENTS

SAVE THE DATE

EUROCAROTEN 4th MC & 3rd WG Meetings and Workshop “Sustainable Production of Carotenoids”

16th – 18th October 2017

Hotel Sveti Križ, TROGIR | CROATIA



EUROCAROTEN 4th MC & 3rd WG Meetings and Workshop “Sustainable Production of Carotenoids”

Workshop “Sustainable Production of Carotenoids” will be held on 16th – 17th October, and it will address recent developments in the fields of **carotenoid biosynthesis**, **carotenoid biotechnology**, **carotenoid extraction** and **bioprocessing**.

The workshop has attracted an excellent complementary set of speakers of global importance: **Gerhard Sandmann**, J.W. Goethe Universität; **Enrique Cerdá Olmedo**, Universidad de Sevilla; **Masha Sapojnik**, LycoRed Ltd.; **Ralf Welsch**, Albert-Ludwigs Universität Freiburg; **Salim Al-Babili**, King Abdullah University of Science and Technology; **Giovanni Giuliano**, Italian National Agency for New Technologies, Energy and Sustainable Economic Development (ENEA); **Meike S. Andersson**, HarvestPlus. Additionally, Workshop topics and selected complementary presentations from Early Career Investigators are presented in Think Thank Information rubric on page 8.

Scientists, companies and other stakeholders **outside EUROCAROTEN** as well as EUROCAROTEN members not entitled to reimbursements **are welcome to attend** the workshop. The registration fee of 150 € will cover attendance to the workshop with all material, four meals, coffee breaks and guided city tour of Split. Please, contact Mladen Brnčić (mbrncic@pbf.hr) or Filip Dujmić (fdujmic@pbf.hr) for registration. Deadline for registration is **September 15th 2017**.

The **Working Groups** (WGs) meetings will be held during

afternoon on October 17th while the **annual Management Committee** (MC) and will be held during morning hours on October 18th.

For complete program and more information please visit <https://www.eurocaroten.eu/?q=node/115>.

3rd Scientific Workshop of the POSITIVE COST Action “Omics breakthroughs in the health effects of plant food bioactives”

20th – 21st September 2017
Thessaloniki | Greece



Focus of this year workshop is on how all «Omics» (including Nutrigenetic, Nutri (Epi)genomics, Metabolomics and Microbiomics) have helped to **provide new findings on the health effects of plant food bioactives**. Several excellent researchers will show their scientific findings resulting from the use of these approaches.

Detailed program is available on the website of POSITIVE Workshop at: <http://omics-thessaloniki2017.gr/>.

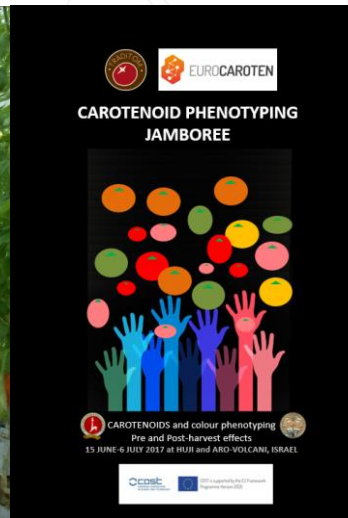
For abstract submission and registration please also visit official website of the Workshop. Abstract submission deadline is **August 25th 2017**.

FINISHED STSMs EXPERIENCE REPORT

CLARA PONS

EXPLORING NATURAL COLOR DIVERSITY IN THE TRADITIONAL EUROPEAN TOMATO: PHENOTYPING AND SAMPLING

Affiliation	Institute for Plant Molecular and Cell Biology, Spain
Position	PhD
Host Institution	Prof. Dani Zamir, The Robert H. Smith Institute Of Plant Sciences and Genetics in Agriculture; The Hebrew University of Jerusalem, Rehovot/Israel
E-mail	cpons@upvnet.upv.es



For my STSM, I worked for 3 weeks in the lab of Prof. Dani Zamir at Robert H. Smith Institute of Plant Sciences, and Genetics in Agriculture (The Hebrew University of Jerusalem). The aim of my project was to explore the natural variation in colour mutants within a large collection of traditional European tomatoes and to identify new mutations related to carotenoid metabolism. These new genetic variants can be useful for both scientists and breeder's as colour and carotenoid-associated nutritional value is important breeding goals.

These activities are in the frame of the TRADITOM project, where more than 1500 different traditional European varieties have been genotyped and deeply phenotyped in different locations during the last two past years. Several core collections were generated targeting different scientific goals, and among them, we developed a colour core collection. These materials are a useful for the screening of natural variation in relation to carotenoids and fruit quality.

The phenotyping of this population in combination with genotyping, transcriptomic and metabolomic data is helping us to identify new mutants related to carotenoid metabolism and to contribute to understanding carotenogenesis and its regulation during tomato ripening. For that reason, I got into contact with Prof. Zamir group, which has excellent experience in managing, screening and phenotyping large collections of tomato plants including all required infrastructure, which is missing at my institute.

I was surprised how easy and quick was to submit the STSM proposal and get it approved by the STSMs committee, so a few weeks after submission I received the response from the STSM coordinator Lourdes Gomez that my application was approved. From the first day, the cooperation with the group members, especially Josef Fisher, was very pleasant and productive. I always felt like at home and well supported. The following weeks I was working together with Josef Fisher and with two Postdocs from Spain and Italy, Joan Casals and Adriana Sacco both with a large experience of working in tomato. From the beginning, all the colour/carotenoid phenotyping crew was working as a team, what made our work much easy and efficient. During the weekends, me and phenotyping team we took the opportunity to explore the country and enjoy the time.

I would like to thank EUROCAROTEN organization for the support they gave me to accomplish this great scientific and personal experience in Prof. Zamir's lab, a collaboration that I hope will continue during the time. I highly recommend people to take the opportunity EUROCAROTEN offers to work in other labs. It is a wonderful and fulfilling experience.

Read more @ www.facebook.com/eurocaroten

EUROCAROTEN INTERVIEW

TALKING WITH:

John Landrum

Affiliation Department of Chemistry and Biochemistry, Florida International University

Position Professor and Director of Pre-Health Professions Advising

Country USA

Area of Interest macular carotenoids, metabolism and transport of lutein and zeaxanthin, xanthophyll-binding proteins



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

We have been engaged understanding the identity, distribution, and function of the macular pigments for the past thirty-plus years.

Which area of carotenoids research do you find most interesting?

We are fascinated by the ability of proteins to specifically recognize and bind such closely related structures as zeaxanthin and lutein. Their unique distribution in the retina is a result of a high fidelity binding and transport mechanism. This suggests that the two carotenoids function in distinctly different roles.

Please, tell us little bit about the International Carotenoid Society (ICS) and its projects? How to join ICS?

The ICS was founded in 2001 but grew out of a series of symposia that began in 1966 when 53 carotenoid researchers met in Trondheim, Norway, to compare their methods and share the work. [...] We recently concluded the 18th triennial International Carotenoid Symposium in Luzern, Switzerland, and have chosen Toyama, Japan, as the site of the 2020 meeting. [...] The principal activity of the Society is to organize and host the Symposia but we also take seriously the goal of promoting the careers of young scientists in the field. We provided almost \$12k in travel support to enable young researchers from across the globe to attend the Luzern Symposium. It was the first Symposium to include a half-

day pre-Symposium Young Investigators Forum devoted to mentoring young investigators and providing them insight and mentorship needed to further their careers. Students may join the Society by creating a profile and paying the student membership of \$10. Full members pay an annual dues of \$65 and emeritus members pay \$50. We also have corporate memberships. All of our resources generated from dues are used to support the cost of our website and to support student travel and awards. We are working to build a more dynamic content on our website and welcome submission of articles on a wide range of topics dealing with carotenoids, their properties and functions for inclusion on the site.

You are the president of ICS – Please describe your experience at this position.

As president my largest concern has been to develop our membership management and bring our Society onto solid fiscal footing. We instituted a membership dues about 2 years ago to enable us to continue our support of student/young investigator travel awards and to cover operating costs of the website. I have devoted a sizeable amount of time this past year working with our Organizing Committee to ensure that the Symposium would have a strong scientific program. Our Council has created the honorific title of Fellow of the International Carotenoid Society as a result of my recommendation and we have just inducted 55 members of the Society as Fellows. [...]

Read more @ www.facebook.com/eurocaroten

CAROTENOIDS IN OUR DAILY LIFE

CAROTENOIDS OF THE MONTH

Name: Phytoene Phytofluene

Chemical Formula: $C_{40}H_{64}$ $C_{40}H_{62}$

Molecular Weight: 544 g/mol 542 g/mol

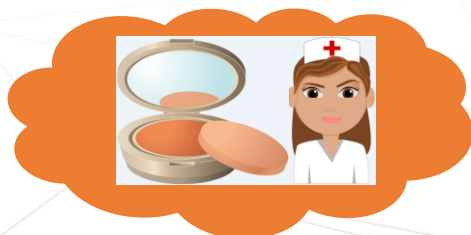


THE COLOURLESS CAROTENOIDS PHYTOENE AND PHYTOFLUENE

Phytoene and phytofluene can be considered as rarities among carotenoids as they are colourless. Having fewer conjugated double bonds (3 and 5, respectively) than a typical carotenoid they absorb ultraviolet rather than visible light. Because of their different properties and wavelength of maximal absorption (286 and 348 nm in petroleum ether, respectively) they have not been determined in a large number of studies dealing with carotenoids. Indeed, such wavelengths are far from 450 nm, the typical one used to detect carotenoids, this being one of the main reasons of the scarcity of data about them in foods, tissues and fluids as compared to other major bioavailable dietary carotenoids, namely lutein, zeaxanthin, β -cryptoxanthin, β -carotene and lycopene. However, they are very important carotenoids since formation of phytoene is the first committed step in the biosynthesis of carotenoids. More importantly, they are present in widely consumed foods (tomatoes, carrots, citrus fruits, watermelons, etc.) and can be detected in human plasma, milk and tissues. Recent reviews highlight the importance of these largely ignored carotenoids, so research on them is expected to expand considerably in the near future.

IMPORTANCE OF COLOURLESS CAROTENOIDS FOR HEALTH PROMOTION AND COSMETIC PURPOSES

There are studies of different nature (*in vitro*, *ex vivo*, *in vivo*) pointing to the fact that phytoene and phytofluene may be involved in health-promoting biological actions. Hence, they are, like other carotenoids, interesting in the context of functional foods, indicating that the colourless carotenoids may be involved either on their own or together with other compounds in health-promoting biological actions. The growing importance of these compounds in the context of functional foods is therefore undeniable. Thus, they have exhibited antioxidant capacity, anticarcinogenic and anti-inflammatory properties in a variety of studies. Interestingly, they seem to accumulate much more efficiently than other carotenoids on the skin, where they are thought to provide not only health (protection against light-induced erythema, skin cancer) but also cosmetic benefits. Thus, supplementation with phytoene and phytofluene-rich products have been shown to have a skin whitening effect and to improve other skin characteristics like dryness, suppleness, roughness, or texture. It is not surprising then that their importance in the context of nutricosmetics is also growing incessantly.



Text by Antonio J. Meléndez-Martínez
Associate Professor at University of Seville, Spain
E-mail: ajmelendez@us.es



THINK TANK INFORMATION

EUROCAROTEN Workshop on Sustainable Production of Carotenoids – From Biosynthesis to Biotechnology

16th – 17th October 2017

Trogir | Croatia

The Workshop will comprise of key lectures by invited speakers from academia and industry and of contributed lectures by early career investigators (ECIs). A call for abstracts to ECIs was held during June, and the Workshop Organizing Committee, with distinguished scientists and young researchers within EUROCAROTEN as members, selected complementary presentations for the Workshop. Main topics of the Workshop with representative example presentations are as follows:

■ CAROTENOID BIOSYNTHESIS AND ACCUMULATION

“Regulation of β -Carotene biosynthesis and accumulation in maize endosperm” by Jin X., Bai C., Berman J., Farre G., Capell T., Christou P., Sandmann G. and Zhu C.

■ NOVEL SOURCES OF NATURAL CAROTENOIDS

“The development and evaluation of a new plant-based renewable source of carotenoids” by Nogueira M., Enfissi E. M. A., Sandmann G. and Fraser P. D.

■ METABOLIC ENGINEERING AND SYNTHETIC BIOLOGY APPROACHES TO CAROTENOID PRODUCTION

“Metabolic engineering of xanthophylls in tomato fruit” by Karniel U., Mann V. and Hirschberg J.

■ CAROTENOID BIOPROCESSING

“Enhanced bioaccessibility of β -carotene through microencapsulation by emulsion-electrospraying” by Gómez-Mascaraque L. G., Perez-Masiá R., González-Barrio R., Periaño M. J., López-Rubio A.

■ INDUSTRIAL PRODUCTION AND INNOVATIVE PROCESSING TECHNOLOGIES

“Encapsulation of microalgal origin carotenoids in ulvan nanomatrices using electrohydrodynamic process” by Papadaki S. and Tzovenis I.

Read more at <https://www.eurocaroten.eu/?q=node/115>.



OF EARLY CAREER INVESTIGATORS AND
OTHER YOUNG RESEARCHERS

Representatives for 2nd grant period:

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Kristina Kljak
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WORKING GROUP NEWS

WG 4. TRANSFER, DISSEMINATION AND EXPLOITATION

Our EUROCAROTEN Cost Action has brought together many carotenoid experts including scientists, science communicators and industrial partners from different disciplines all participating in the scientific WGs 1-3. WG4 ensures the cross-talk between WGs and Action participants to integrate and transfer the Action outcomes, disseminate our results and to make sure efficient implementation and exploitation of the Action findings. WG4 functions as a service tool for the whole Action and can do very little without inputs from the other WGs. We are here together with all of you. The objective of the WG4 is to improve communication between scientists, nutrition/health professionals,

policy makers, regulatory agencies and citizens. We aim to increase knowledge of all Europeans of the importance of carotenoids for health and agro-food sector to promote well-being of the European citizens. We hope to catalyse carotenoid-based innovations leading to new technologies and products to increase competitiveness of Europe. **WG4 for all - all for carotenoids!**

WG leader: Anneli Ritala-Nurmi (anneli.ritala@vtt.fi)

WG vice-leader: George Manganaris (george.manganaris@cut.ac.cy)

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.

Joana Corte-Real and Paula Mapelli-Brahm for their Summary of the 18th International Symposium on Carotenoids.

John Landrum for his contribution to our EUROCAROTEN Interview.

Antonio J. Meléndez Martínez for his contribution to the Carotenoid of the Month rubric.

Anneli Ritala-Nurmi and George Manganaris in WG4 description.

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

COST (European Cooperation in Science and Technology) is a pan-European intergovernmental framework. Its mission is to enable break-through scientific and technological developments leading to new concepts and products and thereby contribute to strengthening Europe's research and innovation capacities. www.cost.eu

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