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N°9, AUGUST 2018

NEWSLETTER

EUROCAROTEN

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

WELCOME

We are pleased to welcome you to the ninth issue of the EUROCAROTEN newsletter.

In this issue, we present a summary of past events: the BON Conference and a workshop organized by our EUROCAROTEN members in Valencia, Spain.

We are excited to invite you to our upcoming event organized by our EUROCAROTEN Consortium - Workshop on Carotenoids in Foods, Nutrition and Health in Valencia. Read more about the event on page 5.

Have a look to the News from the Action to find finished STSMs during the last period and read "STSM experience report" by Jaime Zacarías García. Also, get to know John Nolan, the BON Conference and the Early Investigator Society. In Think Tank Information rubric, check the feedback of EUROCAROTEN training school held in March 2018 in Newcastle, UK.

Upgrade your carotenoid knowledge with information how processing food affects carotenoid content and about carotenoid fucoxanthin.

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

Yours sincerely,
Marina Green
Sanja Vlaisavljević
Kristina Kljak

Subscription to the newsletter e-mailing list will be made available soon, via the EUROCAROTEN website.
For further information, please contact us via our e-mail info@eurocaroten.eu.
You can also send us your comments and proposals.

NEWS FROM THE ACTION

NEWS FROM THE ACTION
SUMMARY FROM PAST EVENT

BON 2018

Brain and Ocular Nutrition

11th – 13th of July 2018

Downing College,
Cambridge University I UK.

The BON CONFERENCE 2018 was dedicated to the role of nutrition and lifestyle for the eye and brain where nutritional scientists disseminated research findings and discussed ideas relating to the role of nutrition for human health and wellbeing.

The chair of the conference, Prof. John Nolan, pointed out that "this year's conference had work spanning from high quality [human studies] to basic carotenoid laboratory work, from reactors for making carotenoids up to testing them in Alzheimer's Disease, identifying transport molecules, and delivery mechanisms, binding proteins, how we measure the macular pigment, and how it impacts in all these research questions […]".

The conference showcased research from around the world to more than 200 delegates interested in the role of nutrition for human health and wellbeing. Several EUROCAROTEN members were part of these delegates, and participated in this scientific forum. The Chair, Dr. Antonio J. Meléndez-Martínez, presented the Action to such a multidisciplinary audience.

A new and exciting feature of this conference was the incorporation of the Early Investigator Society (EIS), where scientists at early stages of their career were supported and given the opportunity to actively participate in the conference by co-chairing conference sessions with renowned scientist in their field, as well as gaining valuable experience in disseminating their research through oral and poster presentations.

One of the outstanding presentations was given by one member of the EIS, Jirayu Tanprasertsuk, a PhD student from Tufts University in Boston, USA. He successfully presented his work: "Brain fat-soluble nutrient pattern is associated with cognitive functioning in older adults with no dementia", winning first place which included The Howard Presentation Medal and a first prize cash reward. He pointed out that "BON 2018 provided a casual platform to get connected with prominent scientists and medical professionals in the field of eye, brain, and nutrition research. I have learned so much about the impact of nutrition on eye and brain health across the lifespan".

Professor John Nolan concluded that "We now live in a time where our science can have a measurable and meaningful impact on policy, industry and human health and function. I am sure that our collective work is a stakeholder for a better future".

Read more @ www.facebook.com/eurocaroten
www.bonconference.org

NEWS FROM THE ACTION
SUMMARY FROM PAST EVENT

Workshop "Science behind fruit coloration: biochemical and molecular studies"

Institute of Agrochemistry and Food Technology (IATA-CSIC)
University of Valencia

4th– 5th July, 2018
Valencia, Spain

WORKSHOP FOR SECONDARY SCHOOL STUDENTS AT THE INSTITUTE OF AGROCHEMISTRY AND FOOD TECHNOLOGY (IATA-CSIC)-CIENCIA ARA PROGRAM

University of Valencia, Spain

4th – 5th July 2018

This 2-day Workshop for last grade secondary school students with high level of academic achievements has been organized by Dr. Maria J. Rodrigo (IATA-CSIC) and Dr. Jose V. Gil (University of Valencia).

Six students were selected for this hands-on Workshop where students isolated pigments from different fruits and analysed the absorbance spectra of the extracts.

More than ten different fruits were selected for this Workshop, such as green pepper, cherry, sweet orange, blood orange, peach or raspberry, considering their coloration and pigments composition. Students were also familiarized with molecular biology techniques such as PCR by amplifying a fragment of the first gene of the carotenoid pathway "phytoene synthase" from citrus.

During the Workshop the carotenoid content and biosynthetic pathway in different fruits were reviewed highlighting the importance of these compounds for our health and nutrition.

NEWS FROM THE ACTION

CONTRIBUTION FROM THE NETWORK & FINISHED STSMs

SPECIAL ISSUE OF JOURNAL "ANTIOXIDANTS" ON THE TOPIC "CAROTENOIDS"

The journal "Antioxidants" started a new Special Issue on the topic "Carotenoids". This issue plans to publish papers on various aspects related to carotenoids: absorption, metabolism, biological activities, industrial uses, analysis, etc. The journal "Antioxidants" has a rapid peer-review process and offers high visibility as well as unlimited and free access for readers.

EUROCAROTEN member, Dr Volker Böhm, will be a guest editor of Special Issue „Carotenoids", and he invites you to submit original research papers or review articles focusing on all issues related to carotenoids. Submission deadline for this issue is 28 February 2019.

For further information, please see:
http://www.mdpi.com/journal/antioxidants/special_issues/carotenoids_health

FINISHED STSMs

A SYSTEM BIOLOGY APPROACH TO UNDERSTAND ACCUMULATION OF LYCOPENE IN TWO LYCOPENE-ACCUMULATING MUTANTS OF SWEET ORANGES (*Citrus Sinensis* L.)

Grant Holder

Jaime Zacarías Garcia
IATA-CSIC, Spain

Period

20th February – 20th April 2018

Host Institution

Italian National Agency for New Technologies, Energy and Sustainable Development (ENEA), Italy

DETERMINATION OF CAROTENOIDS PROFILE IN NFC CARROT JUICE UNDER HIGH PRESSURE PROCESSING AND HIGH PRESSURE HOMOGENIZATION

Grant Holder

Krystian Marszałek
Institute of Agricultural and Food Biotechnology (IAFB), Poland

Period

1st – 20th April 2018

Host Institution

Faculty of Pharmacy, University of Valencia, Valencia, Spain

EUROCAROTEN DATABASE AND REVIEW

Grant Holder

Daniela Nikolovska Nedelkoska
University St. Kliment Ohridski, R. Macedonia

Period

9th – 30th April 2018

Host Institution

Karl-Franzens University, Institute of Molecular Biosciences, Human Nutrition & Metabolism Research and Training Center, Austria

NEWS FROM THE ACTION
FUTURE EVENTS

Workshop on Carotenoids in Foods, Nutrition and Health

&

EUROCAROTEN 5th Management Committee and 4th Working Groups Meeting

23rd – 25th October 2018
Valencia | Spain

ORGANIZERS:

- EUROCAROTEN Consortium
- IATA-CSIC (Instituto de Agroquímica y Tecnología de Alimentos – Consejo Superior de Investigaciones Científica), Valencia, Spain.

VENUE AND TECHNICAL SECRETARIAT:

- University-Enterprise Foundation of Valencia (Fundación Universidad-Empresa de la Universitat de València) – ADEIT. Plaza Virgen de la Paz, 3 46001 Valencia (Spain).

WORKSHOP ON CAROTENOIDS IN FOODS, NUTRITION AND HEALTH

23rd and 24th October 2018

Organized within the WG2 (Quality & Food chain) and WG3 (Nutrition & Health) of EUROCAROTEN, this workshop is aiming to critically and scientifically discuss controversies and advances in the area of carotenoids in food science and nutrition, focusing on aspects related to their occurrence in food items and health related aspects.

In accordance with the workshop aim, keynote speakers will be Dr. Johannes Von Lintig (Case Western Reserve University, USA), Dr. Maria Tsimidou (Aristotle University of Thessaloniki, Greece), Dr. Manfred Eggersdorfer (University of Groningen, Netherlands), Dr. Maria Helena Damasio (ROHA Europe, S.L.U) and Dr. Silvia Peris (Novus International).

Short talks will include presentations from 16 researchers from EU, USA and Tunisia. With intention to promote their current research and studies conducted as STSM within EUROCAROTEN, majority of short talk speakers will be Early Career Investigators (ECIs).

Researchers addressing topics related to the scope of the Workshop are encouraged to register and submit their work which will be presented as poster. Abstracts can be submitted using the following link until 20th September:
https://congresos.adeituv.es/eurocaroten/presentacion/index.en.html

MANAGEMENT COMMITTEE AND WORKING GROUPS MEETING

24th and 25th October 2018

WGs meetings will be held on 24th with final discussion of all WGs the 25th October. The event will finish with MC meeting on 25th October.

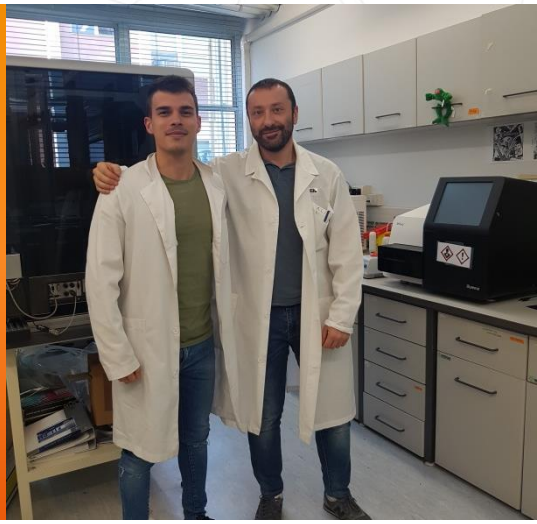
For more information, including registration and schedule of the meeting, please visit official webpage:
https://congresos.adeituv.es/eurocaroten/ficha.en.html

FINISHED STSM'S
EXPERIENCE REPORT

Jaime ZACARÍAS GARCÍA

A SYSTEM BIOLOGY APPROACH TO UNDERSTAND ACCUMULATION OF LYCOPENE IN TWO LYCOPENE-ACCUMULATING MUTANTS OF SWEET ORANGES (*Citrus sinensis* L.)

Affiliation	Instituto de Agroquímica y Tecnología de Alimentos (IATA-CSIC), Valencia, Spain
Position	PhD Student
Host Institution	Agenzia Nazionale per le nuove tecnologie, l'energia e lo sviluppo económico sostenibile (ENEA), Rome, Italy
E-mail	jaizagar@alumni.uv.es



My short-term scientific mission was carried out at the Agenzia nazionale per le nuove tecnologie, l'energia e lo sviluppo economico sostenibile (ENEA), in Rome (Italy) for 8 weeks, under the supervision of Dr. Gianfranco Diretto. In my PhD work I'm investigating the physiological and molecular basis related to lycopene accumulation in the flesh of new sweet orange mutants (Kirkwood Navel and Ruby Valencia). To gain further insights into that objective and get background and experience in new techniques and strategies, we decided to perform a short stay in the Dr. Diretto's lab with two main objectives: 1) to initiate a metabolomic approach to identified metabolic changes in peel and pulp of the two orange mutants in different stages of ripening, respect to that of the parental fruits, that may be responsible/consequence of lycopene accumulation, and 2) to analyse the concentration of the hormone abscisic acid (ABA) and its catabolites in the peel and pulp of the mutants and the ordinary oranges, in order to know if there is a partial blockage in the carotenoid biosynthetic pathway disrupting the normal flow of metabolites in the pulp of the mutants.

At a scientific level, the STSM stay has been a very enriching experience. I learnt new techniques and used new equipment not available in Valencia. This stay allowed me to know a new research Institute and get familiar with other research projects in an excellent and internationally recognised lab. Dr. Diretto and the team have large experience and background in metabolomics and biotechnology of carotenoids in different crops (tomato, potato, etc.) and not doubt that the experience, background and results I got there will be very fruitful, not only for my PhD work but also to my future scientific career. From the first day, the lab's team make me feel integrated, give me support and creating a nice atmosphere around. Personally, I am deeply grateful for this opportunity and to be part of such amazing scientific and human team.

Despite Rome is a large and quite chaotic city, it is also fascinating, wonderful and charming city, and the STSM stay also allowed to be immersed in this lovely city for few weeks. Finally, I would like to express my sincere gratitude to Dr. Gianfranco Diretto and the team for their kindness and support. I also thank the COST Action CA15136 EUROCAROTEN, the scientific and administrative staff for the effort and to make possible opportunities like this to young scientists. I strongly recommend this experience to other young researches both personally and professionally.

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EUROCAROTEN INTERVIEW

TALKING WITH:

John Nolan

Affiliation	Nutrition Research Centre Ireland School of Health Science, WIT
Position	Principal Investigator and BON Conference Committee Chair
Country	Ireland
Area of Interest	Nutrition, Macular Carotenoids, Wellness, Micronutrients, Vision and Cognition

Link to other interviews and networks:
http://carotenoides.us.es
https://www.facebook.com/IBERCAROT/
http://comunicacion.us.es/canal-ciencia/la-us-lidera-una
http://www.color.us.es/

Please, tell us a bit about your research.

My current research is focused in profiling macular pigment (MP) in different populations with an interest in the healthy population, how this pigment is connected to their general wellness and what parameters are linked to that. The current studies we are conducting look at everything from optimizing delivery mechanisms of these pigments to the tissues of interest, all the way through testing MP in the normal population and in people with mild cognitive impairment and Alzheimer's disease. Across all of those projects the core element is nutrition and visual function. The NRCI has the capacity to measure nutrition with specific interest in carotenoids, and now omegas, and also, we are able to measure functional measures that are connected to wellness.

From your point of vieww, what are the greatest uimpacts that the stufy in carotenoids has on society?

The impact of the study of carotenoids can be measured in many different ways […] one of the most important being […] on the scientists that are doing the studies, for them is an area of research where they can challenge themselves and that respective field in real-time. And to be successful with anything, there has to be incentives and motivations; the 'quest for knowledge', as Albert Einstein said, is more truthful and more important, than the knowledge itself. […] it is the journey that the individual goes on, it is what is really valuable for me. Of course, if we are doing work with a disease such as AMD or AD, any potential impact, albeit maybe even subtle, is just wonderful.

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

We need to find a way to work with industry safely and ethically. All these research programmes have stakeholders that need to be acknowledge and managed […] and disclosure of that is important. How it is managed is key to the independent nature of the group but at the same time, the success of the group. The network that the EUROCAROTEN provides is quite unique because it opens the door to that industry relationship and partnership, again, one that is governed and controlled by the scientist […] The future science depends on appropriate investment from the industry. How we, […] as multiple centres of excellence across the world […], have challenged the nutraceutical companies to make sure that the nutrition compounds that have been provided for use in food supplements are pure, safe, efficacious and impactful.

You organized and chaired BON Conference 2018; please tell us your experience.

The idea of BON Conference started back in 2011, with the objective of being a focused congress dedicated to the role of nutrition with emphasis on carotenoids and co-nutrients for the eye and for the brain, primarily. BON Conference 2018 has now created a benchmark and platform for a select group of over 200 members. You learn and get inspired more in those couple of days […].

Read more @ www.facebook.com/eurocaroten
https://profjohnnolan.com/

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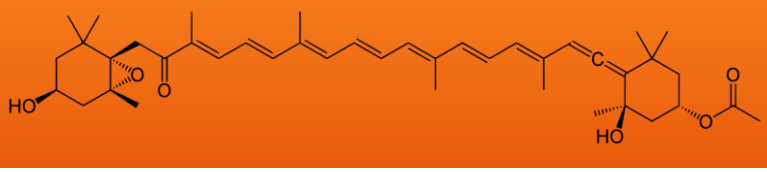
CAROTENOIDS IN OUR DAILY LIFE

CAROTENOID OF THE MONTH

Name: Fucoxanthin

Chemical Formula: $C_{02}H_{58}O_6$

Molecular Weight: 658.91 g/mol



EFFECTS OF THERMAL TREATMENTS ON CAROTENOIDS BIOACCESSIBILITY/BIOAVAILABILITY

The term bioaccessibility refers to the fraction of ingested carotenoids that is incorporated into mixed micelles. The greater the bioaccessibility of a carotenoid, the greater its bioavailability – the fraction of ingested carotenoids that crosses the intestinal wall to enter the bloodstream or to accumulate in the different tissues/organs.

Many consumers believe that any type of food processing degrades the phytonutrients and therefore processed foods are "less healthy" than fresh foods. Although it is true that there are many industrial processes that effectively degrade carotenoids, it is also true that not all processing is negative.

In fact, this is shown in a recent research carried out by EUROCAROTEN members on certain thermal treatments (Mapelli-Brahm et al., 2018). Analysed thermal treatments (freezing/thawing and pasteurization) decreased particle sizes and ruptured cellular structures, which, in turn, had two opposite effects: 1. Favoured carotenoid degradation due to a greater exposition to the acid environment, oxygen and enzymes (negative effect); and, 2. Increased carotenoid bioaccessibility by enhancing their release from the food matrix (positive effect). Since the positive effect was greater than the negative effect, ultra-frozen juices that were thawed at room temperature or in the microwave were potentially better for increasing carotenoid levels in the body than fresh juice.

Text by Paula Mapelli Brahm, PhD Candidate at Universidad de Seville, Spain.
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CAROTENOID OF THE MONTH: FUCOXANTHIN

Fucoxanthin is one of the most abundant carotenoid that contributes more than ten percent of the estimated total production of carotenoids in nature. It is an orange pigment presented mostly in brown seaweeds, but also in microalgae and diatoms, which absorbs high amounts of light in deep sea.

Due its unique molecular structure (5, 6-monoepoxide and an extraordinary allenic bond) this carotenoid has remarkable biological properties such as antioxidant, anti-inflammatory, anticancer, antidiabetic, antiangiogenic and antimalarial; it also, portrays highly protective effects on the liver, brain, bones and skin. Dietary fucoxanthin is deacetylated into fucoxanthinol in the intestinal tract by enzymes and forwarded into the circulatory system in mammals.

Fucoxanthin shows significant antioxidant potential in synergism with polyphenols decreasing intracellular reactive oxygen species. It has been reported that it reduces the viability of some human cancer cell lines (Caco-2, HT-29) and induces apoptosis. This carotenoid can also decrease blood glucose, insulin and lipid levels in human plasma.

Because of its great biological activity, fucoxanthin deserves implication in food and pharmaceutical industry.

Text by Sanja Vlaisavljević Krstić, Research Associate at University of Novi Sad, Serbia
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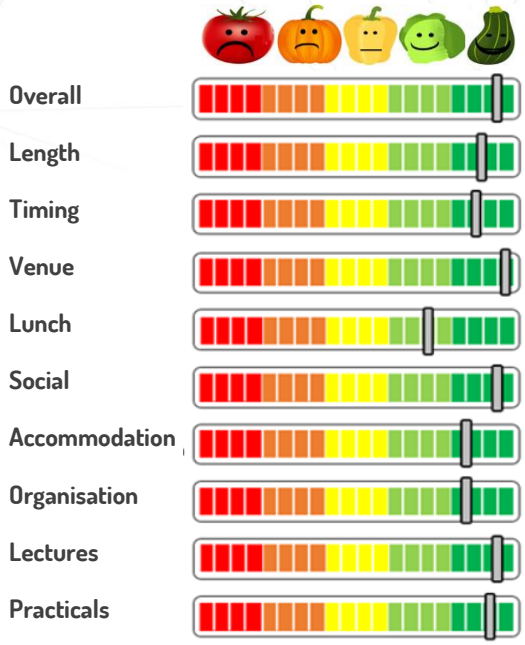
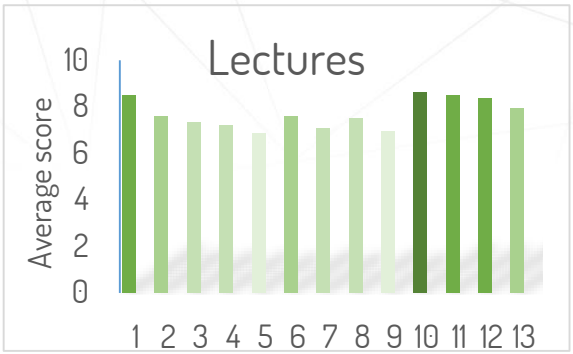
THINK TANK INFORMATION

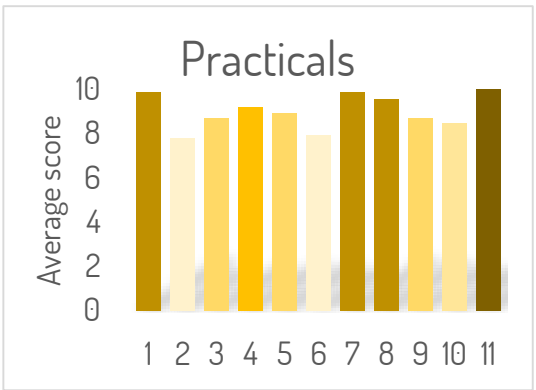
FEEDBACK REPORT - Training school Bioavailability of Carotenoids

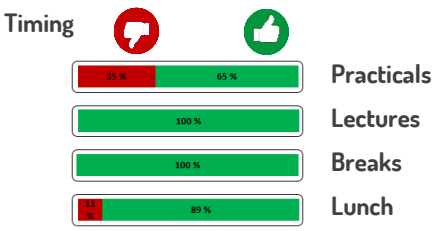


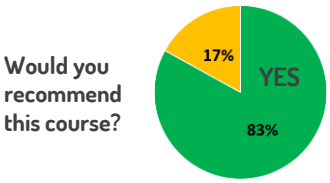


1 - Carotenoids in Agro-food and health
2- Measuring the masses – how and why to apply metabolomics in biomedical research
3- Basics of proteomics
4- Control of gene expression by DNA methylation
5- Carotenoids - A case for metabolomics in redefining human health
6- Dietary and host factors influencing carotenoid bioaccessibility
7- Carotenoid bioavailability in cell models: a critical view
8- The effect of genetic variations on the bioavailability of carotenoids in humans
9- Personalised Nutrition: lessons from the Food4Me Study
10- Design and analysis of bioavailability studies
11- Basics of compartmental modelling
12- Carotenoid bioefficacy in compartmental modelling
13- Using compartmental modelling in superkid models

1- Processing and analysis of metabolomics data – what to do and what not to do
2- Methods for DNA methylation analysis
3- Carotenoid bioaccessibility – from oral phase to intestinal micellization
4- Carotenoid bioavailability in cell models – a step by step practical guide
5- Genetic variation analysis – a step by step practical guide
6- How best to analyse the carotenoid metabolome
7- Carotenoid bioavailability in Caco-2 cell models
8- Chylomicron separation from blood samples and stable isotope preparation
9- RNA/DNA extraction
10- Primer design and qPCR analysis
11- WinSAAM – a step by step practical guide



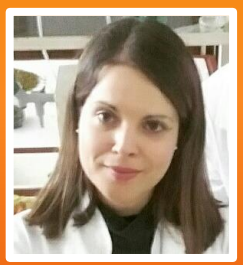




THINK TANK

OF EARLY CAREER INVESTIGATORS AND OTHER YOUNG RESEARCHERS

Representatives for 3rd grant period:



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THINK TANK INFORMATION FEEDBACK REPORT - Training school Bioavailability of Carotenoids

Did you enjoy workshop?

- Fantastic!
- Absolutely love it!
- Great topics!
- I learned so much more than I expected.

Was length appropriate?

- Could be better improved.
- I wanted it to last longer.
- More time can be allocated to practicals.

Did you enjoy social event?

- Lovely event!
- Original idea!
- Great meal, drinks and place!
- It was cosy!

Was accommo-dation satisfactory?

- Not too bad.
- Nice friendly staff.
- Perfect.
- Not from the proposed list.

Was lunch satisfactory?

- Great!
- Higher variability could be an advance.
- Better warm lunch.
- At least different choice.

Was the workshop well organised?

- Need better time managing.
- Sessions well defined.
- No comments on this, THANKS!

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 making of the EUROCAROTEN Newsletter.

Jaime Zacarías García who has kindly given his testimony.

Prof. John Nolan for his contribution to our EUROCAROTEN Interview.

Sanja Vlaisavljević Krstić and Paula Mapelli Brahm for contribution to our "Carotenoids In Our Daily Life" rubric.

Mohammed Iddir for feedback report of Training school Bioavailability of Carotenoids

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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.

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