



N°4, APRIL 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 fourth issue of the EUROCAROTEN Newsletter.**

Last February the 3<sup>rd</sup> MC and 2<sup>nd</sup> WG Meeting was held in Skopje, FYR Macedonia. In this issue of the newsletter we present a summary of the meeting as well as a short overview of the Invited Speakers Talks.

Please check our News from the Action rubric to find all about how the International Journal of Molecular Sciences is looking for contributions for a Special Issue dedicated to molecular transformations of natural products; and read the last publication from Prof. John Nolan's Group.

Also, in this issue, we would like to introduce you to María Jesús Rodrigo, research associate at Spanish National Research Council (IATA-CSIC).

Lastly, we would like to present you the next Think Tank Representatives for the 2<sup>nd</sup> Grant Period.

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

*Yours sincerely,  
Joana Corte-Real  
Paula Mapelli-Brahm  
Kristina Kljak*



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

## SUMMARY FROM PAST MEETINGS

**Summary of EUROCAROTEN's 3<sup>rd</sup> MC and 2<sup>nd</sup> WG Meeting**

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**Invited Speakers Talks**

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## FINISHED STSMs & FUTURE EVENTS

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### Future Events

**9<sup>th</sup> to 15<sup>th</sup> July**

18th International Symposium on Carotenoids

**14<sup>th</sup> & 15<sup>th</sup> September**

Meeting of the International HNE-Club at the University of Graz

## NEWS FROM THE ACTION

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**Special Issue of International Journal of Molecular Sciences**

**New publication by the Nutrition Research Centre Ireland**

## EUROCAROTEN INTERVIEW

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### Talking with: María Jesús Rodrigo

"The main objective of my lab is to investigate metabolic pathways of fruit quality components and how these metabolites are modified in the fruit by the effect of environmental and postharvest conditions."

## CAROTENOIDS IN OUR DAILY LIFE

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### Carotenoid of the Month: Astaxanthin

"Astaxanthin is the red carotenoid responsible for the red colour seen in e.g. salmon, crayfish and flamingos. The chemical structure resembles that of  $\beta$ -carotene with the difference that astaxanthin also has got one hydroxyl- and one keto-group on each side of the molecule."

### How is egg yolk colour related to carotenoids?

"Egg yolk colour is a result of deposition of carotenoids not used as a precursor of vitamin A or antioxidants by the hen."

## THINK TANK INFORMATION

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**Think Tank Representatives for 2<sup>nd</sup> Grant Period – Welcome Letter**

## WORKING GROUPS NEWS

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### Working Group 3: Nutrition and Health

"Thus, the aim of our WG is, from an interdisciplinary and integrated perspective, to scrutinize our current knowledge on carotenoid bioavailability and health related aspects, and to suggest future guidelines and strategies regarding carotenoid research."



# SUMMARY FROM PAST MEETINGS



## EUROCAROTEN 3<sup>rd</sup> MC and 2<sup>nd</sup> WG MEETINGS

13<sup>th</sup> and 14<sup>th</sup> February 2017  
Skopje, FYR Macedonia

### SUMMARY OF THE MEETING

#### Organizers:

- COST Action EUROCAROTEN
- Institute of Chemistry of the Faculty of Natural Sciences and Mathematics at the Ss. Cyril and Methodius University
- Universidad de Sevilla

The EUROCAROTEN 3<sup>rd</sup> Management Committee (MC) and 2<sup>nd</sup> Work Group (WG) meetings was inaugurated with a welcome note from the organisers and guests from FYR Macedonia.

The day's presentations have started with the 1<sup>st</sup> grant period (GP) representatives of the Think Tank Committee (TTC) and the Early Career Investigators (ECI) spokesperson presenting EUROCAROTEN's TTC and its activities, current ECI network, and expectations and opportunities of young researchers associated with this COST Action. Participants from Croatia, Cyprus, Italy and Spain presented their candidacies for the upcoming MC meetings. Voting results are as follow: 2<sup>nd</sup> GP Meeting in Trogir, Croatia; 3<sup>rd</sup> GP Meeting in Valencia, Spain; 4<sup>th</sup> GP Meeting in Lemesos, Cyprus.

Morning of day 1 closed with talks for our invited speakers: Prof. Dr. Alejandro Cifuentes (CIAL-UAM-CSIC, Spain), Dr. Kostlend Mara (INRA Versailles, France) and Dr. Peter Sylvander (AstaReal, Sweden) (read more at the next page).

The afternoon proceeded with WG 1, 2 and 3 individual meetings, followed by the meeting's summary by WG Leaders/Vice-Leaders where it was presented and discussed work done so far and future steps in tasks and deliverables. During WG 4 meeting, changes in EUROCAROTEN website and procedure for news notification were presented. Furthermore, the Workshop on "Sustainable production of carotenoids", that will be held during next meeting in Croatia, and the "Bioavailability – Bioefficacy" training school, taking place in March 2018, were announced.

To see more photos from the meeting please visit our Facebook page: [www.facebook.com/eurocaroten](https://www.facebook.com/eurocaroten).

### FIRST ANNOUNCEMENT

EUROCAROTEN MC & WG Meetings and  
Workshop "Sustainable Production of  
Carotenoids"  
to be held in Trogir (Croatia)  
from 16<sup>th</sup> to 18<sup>th</sup> October 2017

# SUMMARY FROM PAST MEETINGS

## EUROCAROTEN 3<sup>rd</sup> MC and 2<sup>nd</sup> WG MEETINGS INVITED SPEAKERS TALKS

### FOOD, CANCER AND FOODOMICS: RECENT RESULTS

**Prof. Dr. Alejandro Cifuentes** ([a.cifuentes@csic.es](mailto:a.cifuentes@csic.es))  
**Laboratory of Foodomics, CIAL, National Research Council of Spain (CSIC), Madrid, Spain**

Prof. Alejandro Cifuentes has introduced us to the concept of Foodomics within the context of nutrition and non-communicable diseases, like cancer. A multidisciplinary and integrated approach to nutrition, including fields from genomic to metabolomics, to study the mechanisms behind the effects of food and nutrition on long-term population health, and a potential approach to tackle personalized nutrition treatments.



### PLANT NEW BREEDING TECHNIQUES AND THEIR REGULATORY STATUS

**Dr. Kostlend Mara** ([kostlend.mara@inra.fr](mailto:kostlend.mara@inra.fr))  
**DNA Repair and Genome Engineering team, INRA (Institute Jean-Pierre Bourgin), Versailles, France**

Dr. Kostlend Mara is currently working on new plant breeding techniques, and he is specifically interested in working with Site Directed Nucleases, like CRISPR/Cas9. These techniques allow editing of very precise regions of the plant genome in order to obtain plants with improved characteristics including the generation of new traits in relevant crops. During his presentation Dr. Mara has also discussed the different Regulatory Frameworks in Europe and North America regarding GMOs, and the challenges in the EU for the regulation of new Plant Breeding Techniques.



### ASTAXANTHIN – FROM ACADEMIC LAB TO COMMERCIAL PRODUCT

**Dr. Peter Sylvander** ([peter.sylvander@astareal.se](mailto:peter.sylvander@astareal.se))  
**AstaReal AB, Sweden**

Dr. Peter Sylvander works at AstaReal AB, with the production of astaxanthin based products to support human and animal health and nutrition. "Why astaxanthin?". This carotenoid is a potent anti-oxidant with biological activity, and no pro-oxidant effects known to date. One positive effect of this carotenoid, reported in mouse studies, is the improvement of muscle endurance after astaxanthin supplementation. During his presentation Dr. Sylvander has given an overview of the company, product production and quality aspects, and spoken about how to step from academia to industry and to the consumer's market.





# FINISHED STSMs AND FUTURE EVENTS

## SAVE THE DATE

9<sup>th</sup> – 14<sup>th</sup> July 2017

LUCERNE | SWITZERLAND



## FINISHED STSMs

### INVESTIGATION OF COLD TOLERANCE IN GRAPEFRUITS ENHANCED BY CAROTENOID ACCUMULATION BY A SYSTEMS BIOLOGY APPROACH

#### Grant Holder

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

#### Period

5<sup>th</sup> – 19<sup>th</sup> March 2017

#### Host Institution

Institute of Agrochemistry and Food Technology (IATA-  
CSIC), Spain

### A SYSTEM BIOLOGY APPROACH TO UNDERSTAND THE INVOLVEMENT OF LYCOPENE IN COLD TOLERANCE OF CITRUS FRUITS

#### Grant Holder

Dr. Lorenzo Zacarias,  
IATA-CSIC, Spain

#### Period

29<sup>th</sup> March – 5<sup>th</sup> April 2017

#### Host Institution

ENEA, Italy

### RAPID SCREENING OF FLOWER CAROTENOIDS BY HIGH- PERFORMANCE THIN-LAYER CHROMATOGRAPHY (HPTLC)

#### Grant Holder

Dr. Antonio J. Meléndez Martínez,  
University of Seville, Spain

#### Period

5<sup>th</sup> – 12<sup>th</sup> April 2017

#### Host Institution

National Institute of Chemistry, Department of Food  
Chemistry, Ljubljana, Slovenia

## FUTURE EVENTS

### THE 18<sup>TH</sup> INTERNATIONAL SYMPOSIUM ON CAROTENOIDS

9<sup>th</sup> – 14<sup>th</sup> July 2017 | Lucerne, Switzerland

EUROCAROTEN's Chair Dr. Antonio J. Meléndez Martínez  
(Universidad de Sevilla, Spain) will speak about the *status quo*  
and future of carotenoid research, and chair a roundtable  
discussion. Other EUROCAROTEN members, G. Lietz, M. L.  
Bonet, T. Bohn, J. Hirschberg and R. Rühl will also participate as  
speakers.

For more information please visit the event's website at:  
[www.icslucerne2017.org](http://www.icslucerne2017.org).

### MEETING OF THE INTERNATIONAL HNE-CLUB AT THE UNIVERSITY OF GRAZ

14<sup>th</sup> & 15<sup>th</sup> September 2017 | Graz, Austria

The next meeting with the topic in "Reactive Oxygen Species and  
Lipid Peroxidation in Human Health and Disease Memory" will be  
held in honour of the late Professor Herman Esterbauer.

For more information please visit the event's website at:  
[http://users2.unimi.it/HNECLUB/?page\\_id=1798](http://users2.unimi.it/HNECLUB/?page_id=1798).



# NEWS FROM THE ACTION

## PUBLICATIONS AND CONTRIBUTIONS FROM THE NETWORK



SPECIAL ISSUE OF INTERNATIONAL JOURNAL OF  
MOLECULAR SCIENCES  
"MOLECULAR TRANSFORMATIONS OF NATURAL  
PRODUCTS"



International Journal of  
*Molecular Sciences*

EUROCAROTEN members Prof. Vladimir Kren and Dr. Lourdes Gómez will be guest editors in a special issue about molecular (bio)-transformations of natural products, of the open access *International Journal of Molecular Sciences* (IF 3.257).

Topics for this Special Issue will include the discovery of new methods, catalysts and biocatalysts, and the optimization of their functions.

Deadline for manuscript submissions: 31<sup>st</sup> October 2017

For more details please visit:  
[http://www.mdpi.com/journal/ijms/special\\_issues/transformations](http://www.mdpi.com/journal/ijms/special_issues/transformations)

NEW PUBLICATION BY THE NUTRITION RESEARCH  
CENTRE IRELAND

J Nutr Health Aging  
Volume 21, Number 3, 2017

### NON-DIETARY CORRELATES AND DETERMINANTS OF PLASMA LUTEIN AND ZEAXANTHIN CONCENTRATIONS IN THE IRISH POPULATION

R. MORAN<sup>1</sup>, J.M. NOLAN<sup>1</sup>, J. STACK<sup>1</sup>, A.M. O'HALLORAN<sup>2</sup>, J. FEENEY<sup>2,3</sup>, K.O. AKUFFO<sup>4</sup>,  
R.A. KENNY<sup>2</sup>, S. BEATTY<sup>3</sup>

Publication by EUROCAROTEN participants, Professor John Nolan and postgraduate researcher Dr. Rachel Moran, has been published in the *Journal of Nutrition Health and Aging*. The aim of this research was to investigate non-dietary correlates and determinants of plasma lutein and zeaxanthin concentrations in 3,681 Irish adults, as part of The Irish Longitudinal Study on Ageing (TILDA).

TILDA represents a unique large-scale, nationally representative, longitudinal study on ageing in the Republic of Ireland and has collected data on all aspects of health, economic and social circumstances from adults aged 50 years and older.

Publication is available at:  
<https://profjohnnolan.files.wordpress.com/2015/11/07-moran2.pdf>

Read more @ [www.facebook.com/eurocaroten](http://www.facebook.com/eurocaroten)



# EUROCAROTEN INTERVIEW

## TALKING WITH:

**María Jesús Rodrigo**

**Affiliation** Group of Postharvest Physiology, Pathology and Biotechnology, Institute of Agrochemistry and Food Technology – Spanish National Research Council (IATA-CSIC)

**Position** Research Associate

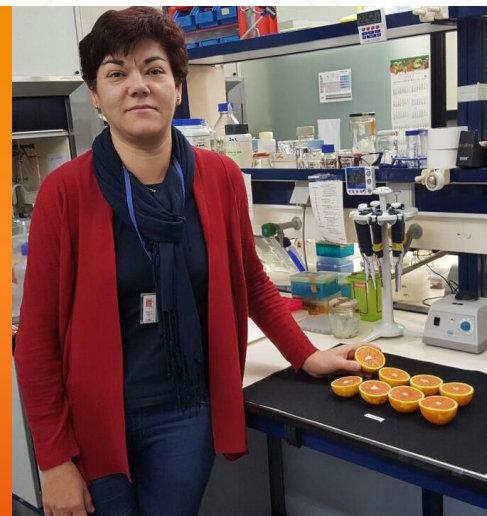
**Country** Spain

**Area of Interest** Fruit quality and postharvest technology, citrus, carotenoid biosynthesis and biotechnology, bioactive metabolites

**Link to other interviews and networks:**

CaRed - Spanish Carotenoid network

([https://www.facebook.com/pg/carotenoid/about/?ref=page\\_internal](https://www.facebook.com/pg/carotenoid/about/?ref=page_internal))



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

The main objective of my lab is to investigate metabolic pathways of fruit quality components and how these metabolites are modified in the fruit by the effect of environmental and postharvest conditions. Our work is mainly focused, but not exclusively, on citrus fruits. The investigation of carotenoids biosynthesis, accumulation and deposition in citrus is one of our main research lines. We are focused not only in the carotenoid composition changes occurring during fruit ripening and postharvest life, but also we aim to understand the genetic and molecular basis of carotenoid and colour diversity in the genus Citrus. Moreover, we are also interested in the function of carotenoids in the fruit and how these compounds can influence the fruit postharvest performance.

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

I am very interested in understanding the mechanisms that regulate carotenoid metabolism and accumulation, especially in tree fruit crops. For example, I find very interesting to investigate how the enzymes of the pathway are physically interacting *in vivo* to modulate the flux or to fully understand the mechanisms that allow massive accumulation of specific carotenoids in sink organs. On the other hand, I find also very attractive the study of other aspects more related to nutrition or bioactivity carotenoids such as the relationship between carotenoid deposition structures and their bioaccessibility and bioavailability.

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

We offer our expertise in biochemistry, molecular biology and analytical determination of carotenoids in different fruit and vegetable matrices, as well as our experience in fruit physiology and postharvest management. We are characterizing at different levels citrus cultivars and mutants with distinctive carotenoid composition and we would like to collaborate with other groups to fully understand the genetic and molecular basis of these particular cultivars and to expand our characterization with nutritional and functional studies.

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

Before the Action, there was a lack of coordination in carotenoid research within the EU although many groups are working in this field at high top standard and covering all areas. Therefore, the Action has offered a unique opportunity for coordination (e.g. harmonization of procedures, avoid overlapping objectives etc.) and, of course, networking. We should take advantage of EUROCAROTEN to broaden the objectives of our projects by means of collaborations, discuss novel ideas and strategies, and identify gaps in the carotenoid research. I would like to remark the importance of the Action for young researchers, ECI and predoctoral students, since this Action provides an excellent platform for training in different backgrounds and to interact with scientists leading the carotenoid field in EU.

Read more @ [www.facebook.com/eurocaroten](https://www.facebook.com/eurocaroten)

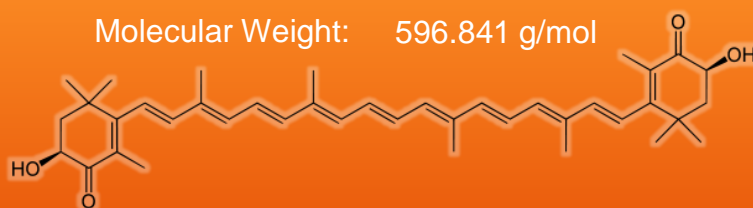
# CAROTENOIDS IN OUR DAILY LIFE

## CAROTENOID OF THE MONTH

Name: Astaxanthin

Chemical Formula:  $C_{40}H_{52}O_4$

Molecular Weight: 596.841 g/mol



## HOW IS EGG YOLK COLOUR RELATED TO CAROTENOIDS?

Egg yolk colour is a result of deposition of carotenoids not used as a precursor of vitamin A or antioxidants by the hen. Therefore, xanthophylls are usually found in egg yolk, and typical maize-soybean meal diet will result in deposition of lutein, zeaxanthin and  $\beta$ -cryptoxanthin. Egg yolk colour has been regarded as an important egg quality characteristic since consumers tend to associate yellow to orange yolk with hens good health. In the 1960s, a simple Yolk Colour Fan (YCF) was developed to distinguish pale yellow (1) to dark orange yolk colour (15), and this scale is still in use. Preferred egg yolk colour depends on the targeted market, and for example, preferred range in USA is YCF 7 – 10, while in some countries of Europe and Asia is YCF 10 – 14. When hen's diet is not based on maize grain, pigment supplementation is required to achieve desired egg yolk colour. Experiments have shown that specific egg yolk colour is a result of a combination of different levels of yellow and red xanthophylls. Yellow carotenoids are needed to produce a base for coloration, and desirable YCF will be achieved with the inclusion of small amounts of red xanthophylls. Due to the increased concern about the use of the synthetic additives in foods and feeds, plants as marigold flower, alfalfa or red pepper are used as natural sources of carotenoids.

**Text by Kristina Kljak,**  
Assistant professor at University of Zagreb, Croatia

E-mail: [kkljak@agr.hr](mailto:kkljak@agr.hr)

## ASTAXANTHIN

Astaxanthin is the red carotenoid responsible for the red color seen in e.g. salmon, crayfish and flamingos. The chemical structure resembles that of  $\beta$ -carotene with the difference that astaxanthin also has got one hydroxyl- and one keto-group on each side of the molecule. It does not have a pro-vitamin A activity but is a potent antioxidant. Studies have associated consumption of astaxanthin with positive effects on a range of health and performance related endpoints such as cardiovascular health, muscle fatigue, chronic inflammation, etc. The mechanism behind these effects is not yet fully understood but is likely coupled to astaxanthin's ability to quench oxygen radicals and protect cell membranes against peroxidation. In contrast to many other carotenoids, astaxanthin is not commonly found in terrestrial plants and animals but is predominantly found in aquatic environments. The main producers in nature are aquatic crustaceans who synthesize it using other carotenoid precursors, such as  $\beta$ -carotene, from ingested algae. There are, however, also a few species of algae, yeast and bacteria that are able to synthesize astaxanthin *de novo* and these species are used for commercial, large scale production of natural astaxanthin that is used for e.g. human nutritional supplements, animal feed and beauty products.

**Text by Dr. Peter Sylvander**  
AstaReal AB, Sweden

E-mail: [peter.sylvander@astareal.se](mailto:peter.sylvander@astareal.se)

Read more @ [www.facebook.com/eurocaroten](https://www.facebook.com/eurocaroten)



# THINK TANK INFORMATION

## THINK TANK REPRESENTATIVES FOR THE NEXT 2<sup>ND</sup> GRANT PERIOD – WELCOME LETTER

As this first Grant Period of EUROCAROTEN COST Action comes to an end, it is time to pass on the responsibilities of being a Think Tank Representative to two new candidates.

The selection process for the new Representatives of the Think Tank Group (TTR), taking place during the month of March it is now closed and we have found our **new representatives for the next Grant Period**:

- **Ludmila Bogacz-Radomska**, Assistant Professor at Wrocław University of Economics (Poland)  
E-mail: [Ludmila.bogacz-radomska@ue.wroc.pl](mailto:Ludmila.bogacz-radomska@ue.wroc.pl)
- **Mohammed Iddir**, PhD Student at the Luxembourg Institute of Health (Luxembourg)  
E-mail: [Mohammed.Iddir@lih.lu](mailto:Mohammed.Iddir@lih.lu)



In the name of our network, we would like to extend a most cordial welcome to them.

According to their professional profiles and their enthusiasm we know that the chosen candidates are capable to carry out the tasks of this group, and we know that their contribution will be of value within EUROCAROTEN.

Paula Mapelli-Brahm and Joana Corte-Real also use this opportunity to sincerely thank the invitation to be the 1<sup>st</sup> Grant Period Representatives of the Think Tank Group, and bid farewell. This work has led us to a personal and professional development and also given us a sense of contributing to a common goal.

Lastly, we would like to thank everyone who has shown interest and applied to our call, and we wish all the luck to the new representatives and offer our support for any guidance or counselling.



OF EARLY CAREER INVESTIGATORS AND  
OTHER YOUNG RESEARCHERS

Representatives for 1<sup>st</sup> grant period:

Joana Corte-Real ([joana.corte-real@lih.lu](mailto:joana.corte-real@lih.lu))

Paula Mapelli-Brahm ([pmapelli@us.es](mailto:pmapelli@us.es))

ECI spokesperson:

Kristina Kljak ([kkljak@agr.hr](mailto:kkljak@agr.hr))



Joana Corte-Real

Kristina Kljak

Paula Mapelli-Brahm





# WORKING GROUP NEWS

## WG 3. NUTRITION AND HEALTH

WG3 is concerned with the relation of carotenoids and health, as several studies have shown that their dietary intake and their tissue levels are correlated with reduced risk of developing several chronic diseases. However, also negative effects on health outcomes have been reported, namely following the intake of high dosed supplements with isolated carotenoids over prolonged time. Thus, the aim of our WG is, from an interdisciplinary and integrated perspective, to scrutinize our current knowledge on carotenoid bioavailability and health related aspects, and to suggest future guidelines and strategies regarding

carotenoid research. In addition, our aim is to also attract industry participation and funding via a EUROCAROTEN call for industry, which allows co-funding of PhD students. A further activity is the assembling of data regarding carotenoid tissue levels in healthy and diseased subjects in a global database.

WG leader: Torsten Bohn ([torsten.bohn@lih.lu](mailto:torsten.bohn@lih.lu))

WG vice-leader: Joanna Dulinska-Litewka ([joanna.dulinska@uj.edu.pl](mailto:joanna.dulinska@uj.edu.pl))

## ACKNOWLEDGEMENTS

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

**Peter Sylvander** and **Kristina Kljak** for their contribution to the Carotenoid of the Month rubric.

**Torsten Bohn** and **Joanna Dulinska-Litewka** in WG3 description.

**María Jesús Rodrigo** for her contribution to our EUROCAROTEN Interview.

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

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](http://www.cost.eu)

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