



N°11, FEBRUARY 2019

NEWSLETTER



EUROCAROTEN

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

WELCOME

We are pleased to welcome you to the 11th issue of the EUROCAROTEN newsletter.

In this issue, dedicated to Peter Fleischmann, we present a EUROCAROTEN's Training school EUROCAROTEN training school "Analysis of Carotenoids" which will be held in April 2019 in Egham, UK. In Interview rubric, get to know Joseph (Yossi) Hirschberg, one of trainers.

Have a look on the 'News from the Action' rubric to find finished STSMs during the last period and read "STSM experience report" by Xin Jin, Anjo Elgersma and Fabienne Remize.

Read about our carotenoid of the month – lutein and how to obtain value-added ingredients by converting waste-derived carotenoids.

In Think Tank Information rubric find information about open call for Think Tank Representatives for 4th grant period and how to apply.

Keep in mind EUROCAROTEN's International Conference on Carotenoid Research and Applications in Agro-food and Health, which will be held in November 2019 in Lemesos, Cyprus. Check updates at <https://www.eurocaroten.eu/?q=lemesos2019>.

Also, 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,
Sanja Krstić
Marina Green
Kristina Kljak*



Subscription to the e-mailing list is available via the EUROCAROTEN website.

Send your comments and proposals to info@eurocaroten.eu.

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IN MEMORIAM

PETER FLEISCHMAN



A farewell to our friend
PETER FLEISCHMAN,
the ever smiling man

We would like to **dedicate a few lines to remember our colleague Peter Fleischmann**, who sadly passed away last February. For over 20 years, Peter worked **on carotenoid-derived compounds** (mainly aromas). This is a field that is attracting increasing interest in recent years and that will benefit from the excellent work he conducted in different labs in Japan and Germany during the last two decades.

Having worked on other subjects, **Peter was really fond of carotenoids and totally committed to the field**. Indeed, he was carrying out an excellent job

in the organization of the next Pigments in Food Congress.

Apart from this, **Peter was well-known for his friendliness and his characteristic smile**, which never abandoned him. He will be much missed by the many “carotenoid people” that **were lucky of having had the pleasure of known him**.

It is most fitting and a great honour for EUROCAROTEN to dedicate this newsletter to him and his memory.



NEWS FROM THE ACTION

CONTRIBUTION FROM THE NETWORK

Plant Science Workshop

15th – 25th April 2019

King Abdullah University of
Science and Technology (KAUST)

Thuwal | Saudi Arabia



PLANT SCIENCE WORKSHOP AT KAUST

The King Abdullah University of Science and Technology (KAUST) is organizing a **Plant Science Workshop for BS/MS students from 15th to 25th April 2019.**

King Abdullah University of Science and Technology (KAUST) is a **graduate-level research University located on the shores of the Red Sea in Saudi Arabia.** KAUST is dedicated to advancing science and technology through interdisciplinary research, education and innovation.

At the workshop, several aspects of Plant Biology will be presented, including:

- Genetics and genomics
- Gene editing
- Developmental biology
- Plant microbe interaction
- Stress physiology
- Metabolism.

The course includes lectures and lab work.

Successful applicants will receive full funding for travel and accommodation, and a stipend for a two-week period of study at KAUST.

For more information visit
<https://psws.kaust.edu.sa/>.



جامعة الملك عبدالله
للعلوم والتقنية
King Abdullah University of
Science and Technology



NEWS FROM THE ACTION FINISHED STSMs

QUANTIFICATION OF GGPP-DERIVED ISOPRENOIDS BY LC-MS IN SEVERAL TISSUES OF TOMATO TRANSGENIC PLANTS OVEREXPRESSING DIFFERENT PLASTIDIAL GGPP SYNTHASES

Grant Holder

Victoria Barja

Centre for Research in Agricultural Genomics (CRAG), Spain

Period

15th October – 15th November 2018

Host Institution

Wageningen University and Research, Netherlands

EXPLORING THE ROLE OF MITOCHONDRIAL METABOLISM IN CAROTENOID BIOSYNTHESIS DURING TOMATO FRUIT RIPENING

Grant Holder

Igor D. Florez-Sarasa

Centre for Research in Agricultural Genomics (CRAG), Spain

Period

10th – 24th November 2018

Host Institution

Max Planck Institute of Molecular Plant Physiology, Germany

IMPACT OF LACTIC FERMENTATION ON CAROTENOIDS FROM FRUIT JUICES

Grant Holder

Fabienne Remize

La Réunion University, France

Period

10th November 2018 – 25th January 2019

Host Institution

University of Valencia, Spain

CAROTENOIDS AND NON-TARGETED METABOLOMIC ANALYSIS OF DE-ETIOLATED RICE LEAVES UPON EXPOSURE TO LIGHT

Grant Holder

Xin Jin

University of Lleida, Spain

Period

18th – 24th November 2018

Host Institution

Royal Holloway University London, UK

DEVELOPMENT OF A JOINT LAB COURSE FOR THE EUROCAROTEN TRAINING SCHOOL ON CAROTENOID ANALYSIS AND MOLECULAR BIOLOGY AT ROYAL HOLLOWAY, UNIVERSITY OF LONDON

Grant Holder

Prof. Dr. Gerhard Sandmann,

Goethe University Frankfurt, Germany

Period

11th - 16th January 2019

Host Institution

Royal Holloway University London, UK

EXCHANGE KNOWLEDGE AND EXPLORE OPTIONS FOR COLLABORATIVE WORK ON β -CAROTENE IN FORAGES

Grant Holder

Anjo Elgersma

“Anjo Elgersma” (SME), Netherlands

Period

14th - 16th January 2019

Host Institution

Department of Agricultural Research for Northern Sweden, Sweden



NEWS FROM THE ACTION

FUTURE EVENTS



TRAINING SCHOOL

Analysis of Carotenoids

8th – 10th April 2019

Royal Holloway University of
London

Egham | UK

ORGANIZER:

- Professor Paul D. Fraser, Royal Holloway University of London, UK

VENUE: Royal Holloway University of London
School of Biological Sciences
Egham Hill, Egham, TW20 0EX.UK

The course is directed towards postgraduate (MSc or PhD) level or Early Career Investigators where their research projects would benefit from hands on use of techniques for carotenoid analysis.

During three-day training school, applicants will participate in both **theoretical and practical aspects** of the workshop. The course will provide an overview of the approaches used to analyse carotenoids including:

- Chromatographic separations
- Detection methods
- Data analysis
- Practical overview of functional complementation of carotenoid gene products will be provided.

A great attention is given to the **practical aspect**, which will cover:

- Extraction procedures
- Chromatographic separation
- Identification of carotenoids in lab work.

The third day of training school is reserved **for talks from experts**:

- Prof Joseph Hirschberg
- Prof Gerhard Sandmann
- Prof Maria Jesus Rodrigo
- Prof Giovanni Giuliano
- Prof Antonio Melendez Martinez
- Dr Marilise Nogueira
- Dr Harriet Berry.



FINISHED STSM'S EXPERIENCE REPORT

Xin Jin

CAROTENOIDS AND NON-TARGETED METABOLOMIC ANALYSIS OF DE-ETIOLATED RICE LEAVES UPON EXPOSURE TO LIGHT

Affiliation	University of Lleida, Lleida, Spain
Position	PhD Student
Host Institution	Royal Holloway University of London, London, UK
E-mail	xinjin@pvcf.udl.cat



My short-term scientific mission was carried out at the [Royal Holloway University of London, UK](#), for a period of one week, under the supervision of [Prof. Paul Fraser](#).

The major objective of my STSM was to use de-etiolated rice leaves as materials to perform metabolomics analysis to [generate a global metabolomic profile of rice leaves during the de-etiolation process, with a particular focus on carotenoids, phytosterols and vitamin E](#).

First of all, I would like [to thank Prof. Fraser](#) and his team for making this visit possible, and all their help in the lab. Special thanks to [Dr. Margit Drapal](#) for her kind guidance with great patience. And also, I want to express [my gratitude to the EUROCAROTEN network](#) for offering me this opportunity.

I am very grateful to have this opportunity to work in a very beautiful campus, a very well-equipped and

organized laboratory, together with Prof. Fraser and his team. The colleagues were very nice and professional. It was a totally different atmosphere, a rich learning environment for me.

I had a really good experience there, not only I [learnt new techniques and improved my experimental skills](#), also I was able to finish all my experiments and [obtain the data that is crucial to completing my PhD thesis](#). I certainly acquired more knowledge related to [Gas chromatography–mass spectrometry \(GC-MS\), high-performance liquid chromatography–mass spectrometry \(HPLC-MS\) and Ultra Performance Liquid Chromatography \(UPLC\)](#).

This STSM experience was definitely one of the best experiences of my PhD. [Thanks COST Action CA15136!](#)



FINISHED STSM'S EXPERIENCE REPORT

Anjo Elgersma

EXCHANGE KNOWLEDGE AND EXPLORE OPTIONS FOR COLLABORATIVE WORK ON β - CAROTENE IN FORAGES

Affiliation	"Anjo Elgersma" (SME), Netherlands
Position	Independent researcher
Host Institution	Department of Agricultural Research for Northern Sweden, Swedish University of Agricultural Sciences (SLU), Umeå, Sweden
E-mail	anjo.elgersma@hotmail.com



My short-term scientific mission comprised a working visit of **one week to Umea, SLU, Sweden**, and **aimed to foster collaboration with intention to perform joint research**. At SLU, research projects are being carried out on **vitamin contents of grasses and legumes**. There are various cuts during the year and the harvest moment is important for forage quality.

I am working on forages and we **discussed my data from an experiment to study the effects of harvest date, swath management and wilting duration on changes in concentrations of beta-carotene in red clover - perennial ryegrass herbage**. In my home situation, I lack expertise to elaborate the data. In-depth discussion with my **host Dr Anne-Maj Gustavsson took place about variation among replicates and analytical errors when measuring β -carotene**. Suggestions were made for presenting the research outcomes.

We further discussed the effect of delayed harvests, as can happen in practice due to adverse weather conditions. **During the season, leaf/stem proportions change and this affects contents of compounds such as beta-carotene, lutein and alpha-tocopherol**. These SLU data were discussed with Dr Gustavsson and her colleagues. We exchanged data and ideas.

The STSM allowed me to gain access to specific data, literature sources and methods not available in my own institution. **The renewed and new contacts and discussions with researchers from SLU was of great value for me, scientifically and personally**. To undergo the Swedish winter with snow, temperatures as low as -19 °C and short days was also an interesting experience.

In addition, **this visit resulted in agreement for future collaboration with Dr Gustavsson**. First of all, we will elaborate the raw data from various trials for publication in the future. Also, **we will start a joint project to increase scientific progress on quality of grass-legume mixtures**. I will work on that project in close collaboration with SLU during 2019.

I thank **Dr Gustavsson and the SLU staff** for their hospitality and for the nice atmosphere, **prof. Lourdes Gomez** for feedback on the application and **the EUROCAROTEN committee** for financial support.

FINISHED STSM'S EXPERIENCE REPORT

Fabienne Remize

IMPACT OF LACTIC FERMENTATION OF FRUITS ON CAROTENOIDS

Affiliation UMR QualiSud, University of La Réunion, France
Position Independent researcher
Host Institution Department of Food Science and Nutrition, Faculty of Pharmacy, University of Valencia, Spain
E-mail fabienne.remize@univ-reunion.fr



I was hosted for three months in **Francisco Barba's lab** (Department of Food Science and Nutrition, Faculty of Pharmacy, University of Valencia, Spain). My research activities in University of La Reunion, QualiSud (France) are dedicated to the **use of lactic acid bacteria in food**. In particular, lactic fermentation of fruits and vegetables has been investigated for several years, with the **objective of increasing antioxidant activity thanks to lactic acid bacteria metabolic activity**. In F. Barba's lab, research is performed on non-thermal technologies and bioactive compounds from food and by-products. In accordance to our topics, **we have developed during my stay in Valencia a collaborative project based on the impact of lactic fermentation on carotenoids from fruits**.

We first seek into literature if fermentation process could lead to changes into carotenoid compounds. Whereas alcoholic fermentation does not have a clear impact on carotenoids, **lactic fermentation has been shown to modulate the content of carotenoids**, for instance lycopene, and **possibly to change its bioavailability by changing its cis/trans ratio**. Additionally, indirect effects on lipoprotein complex could be involved. **Several fruit juices** or purées have been prepared (**mango, papaya, pineapple and orange**) for lactic fermentation.

Depending on the strain and the substrates, **changes in total carotenoid level were observed over lactic fermentation**. Additional experiments to determine which compounds are modified is currently performed.

Noteworthy **this stay was a unique opportunity to plan future research join activities**. I really appreciated the warm welcome from Francisco and the team, and the city of Valencia is a pleasant place to live, with many cultural and leisure activities.



EUROCAROTEN INTERVIEW

TALKING WITH:

Joseph (Yossi) Hirschberg

Affiliation	The Hebrew University of Jerusalem
Position	Professor in Nutrition
Country	Israel
Area of Interest	Plant genetics and molecular biology, Carotenoid biosynthesis, Regulation of gene expression by apocarotenoids, Absciscic acid (ABA) effects in fruit development, Biotechnology



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

I am a geneticist and my laboratory is the only one of 12 groups in the **Department of Genetics** that is working on plants. **My lab has been working on carotenoid biosynthesis since more than 25 years.** We utilize genetic tools to unravel genes and enzymes that are involved with carotenoids. Our model organisms are **tomato and Arabidopsis**. For example, we isolated dozens of mutations in tomato that alter fruit colour from the “wild type” red, which is determined by lycopene. Identifying and cloning the mutated gene have revealed new enzymes that regulate carotenoids.

In general terms, which area of the carotenoids do you find most interesting?

My main interest is **carotenoid biosynthesis and its regulation in plants**. Under this general title, I include biotechnology and sustainable production of natural high-value carotenoids.

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

My group is proficient with **molecular biology in general**, i.e. cloning and sequencing of DNA, gene expression

analysis, transgenic expression of genes in plants, and of course carotenoid analysis.

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

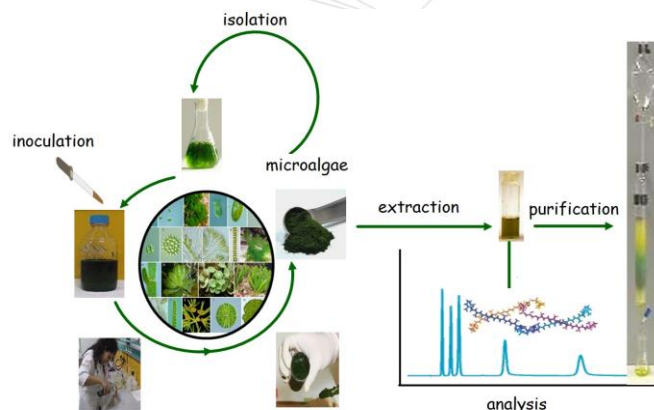
The main contribution of EUROCAROTEN COST Action is clearly **the enhancement of collaborations among European scientists, especially young ones**. Not less important is getting to know other disciplines, different scientific cultures and, simply said, experiencing different cultures.



Carotenoid mutants in tomato

Read more @ www.facebook.com/eurocaroten

CAROTENOIDS IN OUR DAILY LIFE



CAROTENOID OF THE MONTH

Name: Loroaxanthin

Chemical Formula: $C_{40}H_{56}O_3$

Molecular Weight: 584.885 g/mol

CAROTENOID OF THE MONTH: Loroaxanthin

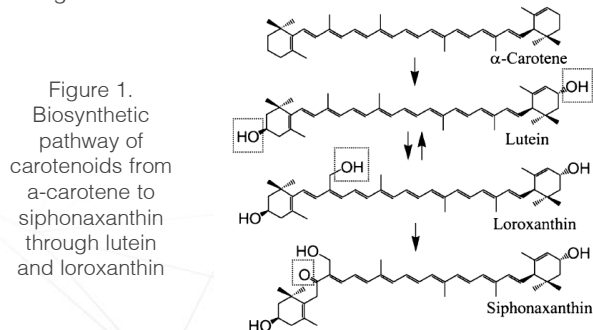
Loroaxanthin, also known as **19-hydroxylutein**, has been isolated as a major carotenoid from the green algae *Scenedesmus obliquus*, *Chlorella vulgaris* and *Tetraselmis suecica*.

Loroaxanthin and loroaxanthin esters are phylogenetically important pigments that have been detected in this genus. Some strains do possess loroaxanthin whereas the others do not. Hence, the study of loroaxanthin distribution in algae provides a **valuable tool to investigate phylogenetic questions in green algae** which is lacking in terrestrial plants. Therefore, it has been regarded as **taxonomical marker**.

Loroaxanthin has been detected not only in Prasinophyceae but also in other classes of Chlorophyta: Charophyceae, Chlorophyceae, Pleurostrophyceae, and Ulvophyceae. It is synthesized from lutein (Figure 1).

Most species produce loroaxanthin and no siphonaxanthin, while some produce siphonaxanthin and some produce only lutein without loroaxanthin and siphonaxanthin. **Relationship between carotenoid types and molecular phylogeny is still discussed.**

It has **one more hydroxyl group compared to lutein** which will most probably alter not only its antioxidant character but also **biological activities**. For this reason, its activities are still under investigation.



CONVERTING WASTE-DERIVED CAROTENOIDS INTO VALUE-ADDED INGREDIENTS

Agro-industrial wastes and by-products derived from plant and animal sources are **rich in bioactive compounds that could potentially be extracted, purified and exploited as functional ingredients in value-added products**. Carotenoids, the natural pigments with commercially desirable properties, such as their **natural origin, provitamin A activity, as well as coloring and antioxidant properties**, constitute an important part of these waste materials. **Tomato skin and seeds, avocado peel, orange and tangerine peels** are examples of a cheap and highly rich source of carotenoids (e.g. the tomato peel contains nearly to five times more lycopene than the tomato pulp).

Trying to comply with consumers' demand for healthier and safer products, the producers can achieve many **health improving benefits through incorporation of waste-derived carotenoids into products, both under carotenoid presence as natural additives** (antioxidants, colorants, preservatives), **or even incorporated to add value to the products** (due to their health promoting function). Some of the carotenoids recovered from wastes are **already valorized in food products that can be found on the market** (e.g. lycopene from tomato waste used as food antioxidant and supplement). In overall, converting agro-industrial wastes and by-products into value-added products is **economic and environmentally friendly approach** that open new research directions not only in production of functional food, but also in **pharmacy, medicine, or agriculture and farming research fields**.

Text by Daniela Nikolovska Nedelkoska, Assistant Professor at University St. Kliment Ohridski, Former Yugoslavian Republic of Macedonia

Email: daniela.nedelkoska@uklo.edu.mk

Text by Aysegül Erdoğan (research scientist), Zeliha Demirel (research scientist) and Meltem Conk-Dalay (Prof. Dr.) from Ege University, Turkey
E-mail: aysegul_erdogan@live.com

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THINK TANK INFORMATION

APPLICATION AND SELECTION OF THE 4th GRANT PERIOD TT REPRESENTATIVES

The opportunity for early career investigators (ECIs) and PhD students, to develop their **leadership skills** and **start creating their own contacts network** **has come!**

Each year, two new Think Tank Representatives are chosen to assure a fair opportunity for ECIs to take on leadership roles within the EUROCAROTEN network.

WHO CAN APPLY?

All ECIs and PhD students, working with participating members of the EUROCAROTEN COST Action, are welcome to apply to take part in the Think Tank Group. We will be delighted to receive your **CV and motivation letter** in our email: think.tank@eurocaroten.eu.

The call is open until from **March 1st to April 1st 2019**. Evaluation process will last to April 20th 2019.

SELECTION PROCESS

This year we will be selecting **one ECI** and **one PhD student**, from our list of candidates. The selection process will take into account **geographical and gender balance** issues.

The applications will be evaluated by the current Think Tank Committee Members and by the Chair and Vice-Chair of the Action Dr. Antonio J. Meléndez-Martínez and Prof. Carmen Socaciu.

You can find **more information** about EUROCAROTEN COST Action on **COST website/Facebook**.

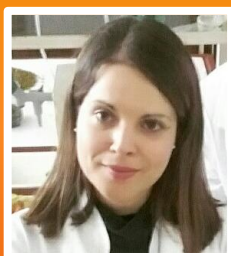
For any questions regarding the Think Tank activities, or application process, don't hesitate to contact us.

We look forward to hearing from you.



OF EARLY CAREER INVESTIGATORS AND
OTHER YOUNG RESEARCHERS

Representatives for 3rd grant period:

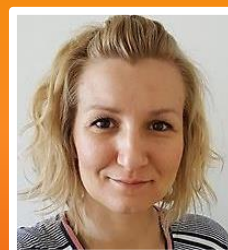


Sanja Krstić
sanja.vlajsavijevic@dh.uns.ac.rs



Marina Green
mgreen@wit.ie

ECI spokesperson:



Kristina Kljak
kkljak@agr.hr

WORKING GROUP NEWS

Leaders of WG3, Dr. Torsten Bohn, and WG4, Dr. Anneli Ritala, gave us insight in progress done so far, as discussed during WGs meetings in Valencia.

REPORT FOR WG3: During the meeting in Valencia several aspects were discussed within WG3. The progress of the **two major reviews** was recapitulated. Joan Ribot (University of the Balearic Islands, Spain) **presented WG3 questionnaire**, which was tested on graduate and undergraduate students at the University. Following some slight further modification, **the ten questions will be translated into other languages and also tested in Germany, Italy, and Poland**. Daniela N. Nedelkoska (University St. Kliment Ohridski, FYROM) gave an **update regarding the carotenoid database** headed by Brigitte Winkhofer-Roob, which compiles data **on carotenoid tissue and blood levels of healthy and diseased subjects**. The progress on SOPs within WG3 scope was briefly mentioned but not discussed. Finally, **the success of the bioavailability training at the University of Newcastle** (March 2018, organized by George Lietz) was emphasized.

WG leader: Torsten Bohn (torsten.bohn@lii.hu)

WG vice-leader: Joanna Dulinska-Litewka (joanna.dulinskalitewka@uj.edu.pl)

REPORT FOR WG4: During the current reporting period, **WG4 has focused on dissemination activities towards children and youngsters**: Dr Maria Jesús Rodrigo (IATA-CSIC, Spain) and Dr Irina Milisav (University of Ljubljana, Slovenia) reported their successful workshops with school children and high-school students. Furthermore, since last meeting, **WG4 has released five Newsletters, two Scientific Newsletters and initiated a process to produce youtube videos**. The activity on our web page www.eurocaroten.eu was evaluated and we have reached a level of ca. 30 000 visitors and 60 000 visits per year. In addition, one of the measures indicated that our **visitors are truly interacting with the web and downloading contents and information**. The social media visibility of the EUROCAROTEN needs to be improved and MC members are encouraged to distribute invitations to get more followers in Facebook, LinkedIn and Twitter.

WG leader: Anneli Ritala (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 making of the EUROCAROTEN Newsletter.

Xin Jin, Anjo Elgersma and Fabienne Remize who have kindly given their testimony.

Prof. Joseph Hirschberg for his contribution to our EUROCAROTEN Interview.

Daniela Nikolovska Nedelkoska and Ayşegül Erdoğan, Zeliha Demirel and Meltem Conk-Dalay for their contribution to our "Carotenoids In Our Daily Life" rubric.

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.*

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NEWSLETTER CONTRIBUTORS

Editors:

Antonio J. Meléndez-Martínez (ajmelendez@us.es)

Kristina Kljak (kklijak@agr.hr)

Marina Green (mgreen@wit.ie)

Sanja Krstić (sanja.vlaisavljevic@dh.uns.ac.rs)

Dissemination:

Anneli Ritala (anneli.ritala@vtt.fi)

George Manganaris (george.manganaris@cut.ac.cy)

Cristina Luisa Silva (clsilva@porto.ucp.pt)

Mladen Brncic (mbrncic@pbf.hr)

Design and Layout:

Miguel Braga (miguel.braga@brag.pt)