

BOOK OF ABSTRACTS

First International Conference on **ORGANIC FOOD QUALITY AND HEALTH RESEARCH**

May 18–20, 2011
Prague, Czech Republic

Jana Pulkrabová, Monika Tomaniová, Johannes Kahl and Jana Hajšlová
Editors



BOOK OF ABSTRACTS

First International Conference on **ORGANIC FOOD QUALITY AND HEALTH RESEARCH**

**May 18–20, 2011
Prague, Czech Republic**

Jana Pulkrabová, Monika Tomaniová, Johannes Kahl and Jana Hajšlová
Editors

Published by the Institute of Chemical Technology, Prague,
ICT Prague Press
Technická 5
166 28 Praha 6
Czech Republic

Edited by Jana Pulkrabová, Monika Tomaniová, Johannes Kahl and Jana Hajšlová

© 2011 by Johannes Kahl and Jana Hajšlová
Cover design © 2011 by Tomáš Čajka

ISBN 978-80-7080-779-8

First International Conference on
**ORGANIC FOOD QUALITY
AND
HEALTH RESEARCH**

18–20 May, 2011 • Prague • Czech Republic
DIPLOMAT Hotel Conference Centre

Organized by:

Food Quality and Health Association
(FQH, The Netherlands)

&

Institute of Chemical Technology, Prague
(ICT Prague, Czech Republic)

&

Technology Platform Organics
(TPOrganics)

SPONSORS & EXHIBITORS & MEDIA PARTNER

Alnatura Produktions- und Handels GmbH

Bioinstitut, o.p.s.

Biopekárna Zemanka – Jan Zeman

bio nebio s.r.o.

Czech Technology Platform for Organic Agriculture

Eosta B.V.

Ministry of Agriculture of the Czech Republic

ORGANIC-Market.info

Software AG – Stiftung

Conference is organised under auspices of the Ministry of Agriculture of the Czech Republic.



Scientific committee:

Dr. Charles Benbrooke, The Organic Research Center, USA

Prof. Dr. Susanne Bügel, University of Copenhagen, DK

Dr. Robert van Gorcom, RIKILT, NL

Dr. Manon Haccius, Alnatura, D

Dr. Niels Halberg, ICROFS, DK

Prof. Dr. Jana Hajšlová, Institute of Chemical Technology, Prague, CZ

MD Machteld Huber, Louis Bolk Institute, NL

PD Dr. Johannes Kahl, University of Kassel, D

Prof. Dr. Ulrich Köpke, ISO FAR, D

Prof. Dr. Denis Lairon, INRA, F

Prof. Dr. Carlo Leifert, University of Newcastle, UK

Prof. Dr. Urs Niggli, FiBL, CH

Prof. Dr. Ewa Rembiałkowska, Warsaw University of Life Science, PL

Prof. Dr. Franz Ulberth, JRC-IRMM, B

Organising committee

Institute of Chemical Technology, Prague

Prof. Dr. Jana Hajšlová (chair)

Monika Tomaniová, PhD

Jana Pulkrabová, PhD

Assoc. Prof. Věra Schulzová

Petra Hrádková, MSc

FQH

PD Dr. Johannes Kahl

MD Machteld Huber

PhD students of the Institute of Chemical Technology, Prague

SPONSORS & EXHIBITORS & MEDIA PARTNER:





INSTITUTE FOR ORGANIC AGRICULTURE AND SUSTAINABLE LANDSCAPE MANAGEMENT



Bioinstitut (public benefit organisation) based in Olomouc, was founded in 2004 to create an umbrella for research and educational activities in the area of Czech organic agriculture and within Central and Eastern Europe. Its co-founders and partners are the Research Institute of Organic Agriculture FiBL, The Czech Association of Organic Farmers PRO-BIO and Palacky University Olomouc, Czech Republic.

BIOINSTITUT MAIN ACTIVITIES

- Transfer of science and research findings into practice
- Education, training and publication activities
- Research

Bioinstitut is one of the founders of FiBL International - International Association of Organic Agriculture Research Institutes which was founded on February 19, 2010 at BioFach in Nürnberg, Germany. The purpose of the association is the advancement of science and research. The implemented objectives will particularly focus on the advancement of science and research in the field of organic agriculture and organic aquaculture taking into account ecological and socio-economic aspects as well as considerations to human and animal health.

Bioinstitut initiated the foundation of the CTPOA.

CZECH TECHNOLOGY PLATFORM FOR ORGANIC AGRICULTURE



CTPOA supports people and companies active in the field of organic farming and organic food production in the Czech Republic.

CTPOA AIMS

- Development of knowledge system in organic farming and food with emphasis on transfer of findings and results between practice and research
- Support for organic farming competitiveness, with a focus on production, processing and sale of organic foodstuffs
- Support for research and education

RESEARCH AND INNOVATION PRIORITIES

- Economically viable organic agriculture as a part of rural economics
- Production based on ecological principles considerate to the environment
- Organic food for improving the quality of life and health

CTPOA DOCUMENTS

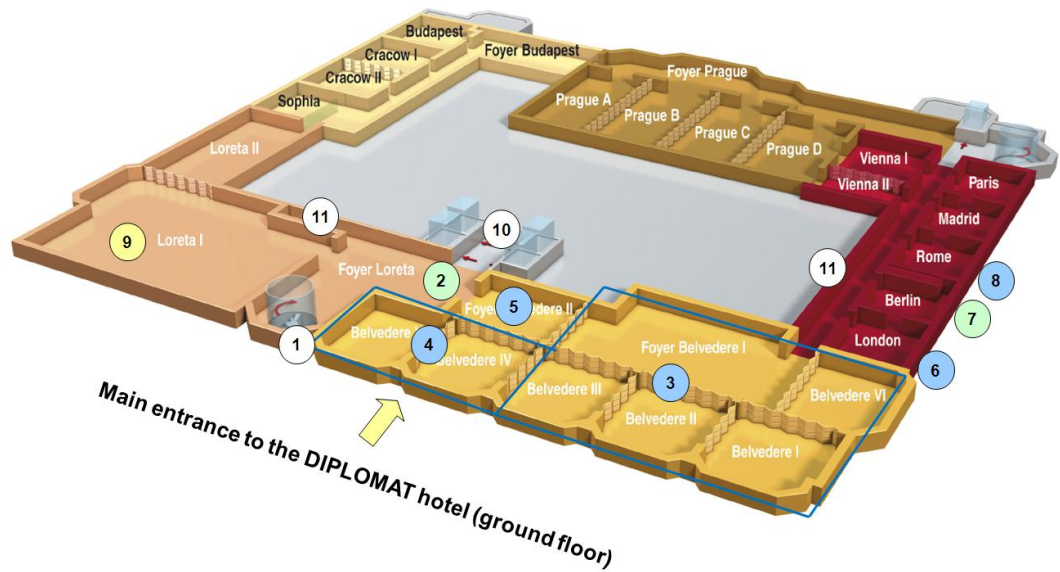
- Strategic Research Agenda (SRA)
- Implementation Action Plan (IAP)

CTPOA is the organiser of the International Scientific Conference on Organic Agriculture held in the Czech Republic. The next Conference will be held in November 2011 in Prague.

CTPOA was founded in 2009 in accordance with the aims of the European TP Organics and is acknowledged by the Ministry of Agriculture of the Czech Republic.

CTPOA activities are supported by the Ministry of Agriculture. CTPOA is coordinated by Bioinstitut.

PLAN OF THE CONFERENCE CENTRE (1ST FLOOR)



- 1: **STAIRS** from the ground floor of DIPLOMAT hotel
- 2: **FOYER LORETA** Registration for the conference
- 3: **BELVEDERE** Conference hall
- 4: **BELVEDERE** Poster area
- 5: **BELVEDERE** Exhibition area
- 6: **LONDON** Workshops
- 7: **BERLIN** Conference organizers' office
- 8: **ROME** Workshops
- 9: **LORETA restaurant** Coffee breaks & Lunch & Welcome Cocktail
- 10: **Lifts**
- 11: **Toilets**



**First International Conference on
Organic Food Quality and Health Research**

18–20 May, 2011

Diplomat Hotel Conference Centre • PRAGUE • CZECH REPUBLIC

CONFERENCE PROGRAM

WEDNESDAY, May 18, 2011

12:00–14:00
FOYER
LORETA

Registration for the FQH 2011 conference

14:00–15:00
BELVEDERE

OPENING CEREMONY AND WELCOME

Juraj Chmiel, Deputy Minister of Agriculture, Prague, Czech Republic

Johannes Kahl, chairman of FQH 2011, FQH Chair, University of Kassel, Germany

Jana Hajslova, co-chairwoman of FQH 2011, Institute of Chemical Technology, Prague, Czech Republic

Ronald van Marlen, TPOrganics/IFOAM, Brussels, Belgium

Jean-Francois Hulot, European Commission-DG Agriculture, Brussels, Belgium

15:00–17:00
BELVEDERE

OPENING SESSION

chair Johannes Kahl

15:00–15:40 L1

SUSTAINABLE DIETS: NUTRITION AS AN ECOSYSTEM SERVICE

Barbara Burlingame, Food and Agriculture Organization of the United Nations, Rome, Italy

15:40–16:20 L2

PROCESS AND PRODUCT RELATED ASPECTS OF ORGANIC FOOD QUALITY - FROM BIODIVERSITY TO HUMAN NUTRITION

Urs Niggli, Forschungsinstitut für Biologischen Landbau, Frick, Switzerland

16:20–17:00 L3

FOOD IS THE FUNDAMENTAL UNIT IN NUTRITION

David Jacob, University of Minnesota, USA

17:20–19:00
LORETA

Symposium Welcome Cocktail

THURSDAY, May 19, 2011

9:00–10:40
BELVEDERE

ORAL SESSION 1: Quality and Safety of Organic Plant and Animal Products

chair Robert van Gorcom

9:00–9:20 L4

USING HUSBANDRY TO IMPROVE DAIRY PRODUCT QUALITY

Gillian Butler, Newcastle University, UK

9:20–9:40 L5

CONTAMINATION OF LETTUCE WITH ANTIBIOTIC RESISTANT E. COLI AFTER SLURRY APPLICATION

Anette Nygaard Jensen, Technical University of Denmark, Copenhagen Denmark

9:40–10:00 L6

SOFT WHEAT AND ORGANIC AGRICULTURE FOR A NEW QUALITY CONCEPT: NUTRIENTS AND PHYTOCHEMICALS CONTENT OF OLD AND MODERN VARIETIES

Giovanni Dinelli, University of Bologna, Bologna, Italy

10:00–10:20 L7

TOMATO (LYCOPERSICON ESCULENTUM, CV. CXD271BIO) YIELD AND QUALITY DURING CONVERSION FROM CONVENTIONAL TO ORGANIC PRODUCTION

Flavio Paoletti, Istituto Nazionale di Ricerca per gli Alimenti e la Nutrizione, Rome, Italy

10:20–10:40 L8

ORGANIC POULTRY MEAT QUALITY: OXIDATIVE STATUS IN DIFFERENT GENOTYPES

Cesare Castellini, University of Perugia, Perugia, Italy

10:40–11:00

Coffee Break

11:00–11:40 BELVEDERE		ORAL SESSION 2: Impact of Processing on Organic Quality and Safety <i>chair Johannes Kahl</i>
11:00–11:20	L9	ORGANIC FOOD PROCESSING - WHERE ARE WE, WHERE COULD WE GO? <i>Ursula Kretzschmar-Rüger, Forschungsinstitut für Biologischen Landbau, Frick, Switzerland</i>
11:20–11:40	L10	QUALITY ASSESSMENT OF ORGANIC BABY FOOD MADE OF DIFFERENT PRE-PROCESSED RAW MATERIAL UNDER INDUSTRIAL PROCESSING CONDITIONS <i>Kathrin Seidel, Forschungsinstitut für Biologischen Landbau, Frick, Switzerland</i>
11:40–12:45		Lunch
12:45–13:45		WORKSHOPS 1 & 2 in parallel
12:45–13:45 LONDON		WORKSHOP 1: Organic Food Quality Concepts <i>chair Denis Lairon</i>
12:45–13:05	LW1	QUALITY CONCEPTS OF ORGANIC FOODS FROM PAST TO FUTURE <i>Angelika Ploeger, University of Kassel, Germany</i>
13:05–13:25	LW2	ORGANIC FOOD QUALITY: A FRAMEWORK FOR CONCEPT, DEFINITION AND EVALUATION FROM EUROPEAN PERSPECTIVE <i>Johannes Kahl, FQH, The Netherlands</i>
12:45–13:45 ROME		WORKSHOP 2: Consumer Related Quality Aspects <i>chair Ulla Bertelsen</i>
12:45–13:05	LW3	SENSORY PERCEPTION OF FOOD PRODUCTS: HOW DO USERS AND NON-USERS OF ORGANIC PRODUCTS DIFFER? <i>Tim Obermowe, University of Göttingen, Germany</i>
13:05–13:25	LW4	ORGANIC FOOD PRODUCTS: DIRECT MARKETING AND CONSUMERS' TRUST IN LITHUANIA <i>Virgilijus Skulskis, Lithuanian Institute of Agrarian Economics, Lithuania</i>
13:25–13:45	LW5	HEALTH EFFECTS OF AN ORGANIC DIET – CONSUMER EXPERIENCES IN THE NETHERLANDS <i>Lucy van de Vijver, Louis Bolk Institute, Driebergen, The Netherlands</i>
14:00–15:00 BELVEDERE		ORAL SESSION 3: Standardization of Novel Methods <i>chair Jana Hajslova</i>
14:00–14:20	L11	THE BIO-CRYSTALLIZATION METHOD AS A NEW INDICATOR FOR ORGANIC FOOD QUALITY <i>Nicolaas Busscher, University of Kassel, Germany</i>
14:20–14:40	L12	NATURALNESS OF PROCESSED ORGANIC FOODS <i>Ines Birlouez-Aragon, Spectralys innovations, Romainville, France</i>
14:40–15:00	L13	METABOLOMIC FINGERPRINTING / PROFILING: THE CHALLENGE IN ORGANIC CROPS AUTHENTICATION <i>Jana Hajslova, Institute of Chemical Technology, Prague, Czech Republic</i>
15:00–15:20		Coffee break

15:20–17:00 BELVEDERE	ORAL SESSION 4: Organic Food Authenticity <i>chair Franz Ulberth</i>
15:20–15:40 L14	2011 APPROACHES FOR ORGANIC FOOD AND FEED AUTHENTICATION <i>Saskia van Ruth, RIKILT, Wageningen University, The Netherlands</i>
15:40–16:00 L15	THE ORGTRACE PROJECT: CONTENT, BIOAVAILABILITY AND HEALTH EFFECTS OF TRACE ELEMENTS AND BIOACTIVE COMPONENTS OF FOOD PRODUCTS CULTIVATED IN ORGANIC AND CONVENTIONAL AGRICULTURAL SYSTEMS <i>Søren Husted, University of Copenhagen, Frederiksberg C, Denmark</i>
16:00–16:20 L16	AGRONOMICAL AND HYGIENIC-HEALTH QUALITY OF DURUM WHEAT PRODUCTIONS FROM DIFFERENT MEDITERRANEAN ENVIRONMENTS UNDER ORGANIC AND CONVENTIONAL CROPPING <i>Massimiliano Camerini, Università degli Studi del Molise, Campobasso, Italy</i>
16:20–16:40 L17	EFFECTS OF ORGANIC AND CONVENTIONAL PRODUCTION SYSTEMS, GENOTYPE AND GRAIN STORAGE ON WINTER WHEAT TECHNOLOGICAL PROPERTIES <i>Jurgita Cesevičienė, Lithuanian Research Centre for Agriculture and Forestry, Lithuania</i>
16:40–17:00 L18	THE NUTRITIVE VALUE OF SELECTED TOMATO AND BELL PEPPER CULTIVARS FROM ORGANIC AND CONVENTIONAL PRODUCTION <i>Ewa Rembiałkowska, Warsaw University of Life Sciences - SGGW, Warsaw, Poland</i>
17:30–19:00 BELVEDERE	POSTER SESSIONS
20:00–22:00	CONFERENCE DINNER (Slavia restaurant)

FRIDAY, May 20, 2011

9:00–10:15 BELVEDERE	ORAL SESSION 5: Impact of Organic Feed on Animals <i>chair Ewa Rembiałkowska</i>
9:00–9:20 L19	EFFECT OF ORGANIC DIET ON BIOMARKERS OF HEALTH AND WELL-BEING IN RAT MODELS <i>Charlotte Lauridsen, Aarhus University, Tjele, Denmark</i>
9:20–9:40 L20	IMPACT OF ORGANIC FEED ON PIGS' HEALTH <i>Albert Sundrum, University of Kassel, Germany</i>
9:40–10:00 L21	EVALUATION OF HEALTH EFFECT OF ORGANIC AND CONVENTIONAL CARROTS <i>Elena Mengheri, Istituto Nazionale di Ricerca per gli Alimenti e la Nutrizione, Rome, Italy</i>
10:15–11:40	WORKSHOPS 3 & 4 in parallel
10:15–11:40 LONDON	WORKSHOP 3: Quality Changes for Organic Food Production Chain in Africa, Asia and Latin America <i>chair Ulrich Köpke</i>
10:15–10:45 LW6	OVERCOMING UNDERNUTRITION WITH LOCAL RESOURCES IN AFRICA, ASIA AND LATIN AMERICA <i>Michael-Bernhardt Krawinkel, University of Giessen, Germany</i>

10:15–11:40 ROME	WORKSHOP 4: Dairy Products – Quality and Health Implications <i>chair Ton Baars</i>
10:15–10:35 LW7	CAN FARM MILK PROTECT FROM THE DEVELOPMENT OF CHILDHOOD ASTHMA AND ALLERGIES? <i>Charlotte Braun-Fahrländer, University of Basel, Switzerland</i>
10:35–10:55 LW8	FATTY ACIDS OF ORGANICALLY PRODUCED MILK AND ITS BENEFICIAL EFFECTS IN HUMAN NUTRITION <i>Gerhard Jahreis, University of Jena, Germany</i>
10:55–11:15 LW9	TESTING MILK ALLERGIC CHILDREN IN A DOUBLE BLIND PLACEBO CONTROLLED TRIAL <i>Thomas Roos, University of Kassel, Germany</i>
11:15–11:35 LW10	RAW MILK QUALITY VERSUS RAW MILK SAFETY – WALKING A TIGHTROPE <i>Wolfgang Kneifel, University of Natural Resources and Life Science Vienna, Austria</i>
11:40–12:00	Coffee break
12:00–13:30 BELVEDERE	ORAL SESSION 6: Impact of Organic Food on Humans <i>chair Susanne Gjested Bügel</i>
12:00–12:20 L22	IMPLICATIONS FOR HEALTH OF DIFFERENCES IN FATTY ACID COMPOSITION OF ORGANIC VERSUS CONVENTIONAL MILK <i>Chris Seal, Newcastle University, UK</i>
12:20–12:40 L23	EFFECT OF CONSUMPTION OF ORGANICALLY AND CONVENTIONALLY PRODUCED APPLES/CARROTS ON DNA DAMAGE IN HEALTHY HUMANS <i>Karlis Briviba, Max Rubner-Institute, Federal Research Centre for Nutrition and Food, Karlsruhe, Germany</i>
12:40–13:00 L24	UNTARGETED METABOLOMICS OF HUMAN BREAST MILK IN A COHORT WITH 46% CONSUMERS OF PREDOMINANTLY ORGANIC FOOD <i>Axel Mie, Karolinska Institutet, Stockholm, Sweden</i>
13:00–13:20 L25	NO EFFECTS OF ORGANIC AND CONVENTIONAL DIETS ON INTAKE AND ABSORPTION OF ZINC AND COPPER IN MEN – EVIDENCE FROM TWO CROSS-OVER TRIALS USING STABLE ENRICHED ISOTOPES <i>Susanne Gjested Bügel, University of Copenhagen, Frederiksberg, Denmark</i>
13:30–14:10 BELVEDERE	ORAL SESSION 7: Organic Related Health Concepts <i>chair Machteld Huber</i>
13:30–13:50 L26	CONCEPTS OF HEALTH, RELATING TO ORGANIC FOOD <i>Fred Wiegant, Utrecht University, The Netherlands</i>
13:50–14:10 L27	IS IT STILL REALISTIC TO EXPECT HEALTH EFFECTS FROM ORGANIC FOOD? <i>Machteld Huber, Louis Bolk Institute, Driebergen, The Netherlands</i>
14:10–14:30 BELVEDERE	CLOSING REMARKS <i>Johannes Kahl, Jana Hajslova</i> Including POSTER AWARD

CONTENT

ORAL SESSIONS	21
L-1	
SUSTAINABLE DIETS: NUTRITION AS AN ECOSYSTEM SERVICE	
B. Burlingame ¹ , S. Dernini.....	23
L-2	
PROCESS AND PRODUCT RELATED ASPECTS OF ORGANIC FOOD QUALITY - FROM BIODIVERSITY TO HUMAN NUTRITION	
U. Niggli	24
L-3	
FOOD IS THE FUNDAMENTAL UNIT IN NUTRITION	
D.R. Jacobs, Jr	25
L-4	
USING HUSBANDRY TO IMPROVE DAIRY PRODUCT QUALITY	
G. Butler.....	26
L-5	
CONTAMINATION OF LETTUCE WITH ANTIBIOTIC RESISTANT E. COLI AFTER SLURRY APPLICATION	
A.N. Jensen ^{1*} , C. Storm ¹ , D.L. Baggesen ¹ , A. Forslund ² and A. Dalsgaard ²	27
L-6	
SOFT WHEAT AND ORGANIC AGRICULTURE FOR A NEW QUALITY CONCEPT: NUTRIENTS AND PHYTOCHEMICALS CONTENT OF OLD AND MODERN VARIETIES	
G. Dinelli ^{1*} , I. Marotti ¹ , R. Di Silvestro ¹ , S. Bosi ¹ , V. Bregola ¹ , L. Ghiselli ² , A. Whittaker ² , S. Benedettelli ² and A. Segura-Carretero ³	28
L-7	
TOMATO (<i>LYCOPERSICON ESCULENTUM</i>, CV. CXD271BIO) YIELD AND QUALITY DURING CONVERSION FROM CONVENTIONAL TO ORGANIC PRODUCTION	
N. Nardo ¹ , M.S. Foddai ¹ , E. Azzini ¹ , I. Baiamonte ¹ , S. Di Ferdinando ² , S. Paoletti ² , V. Vizioli ³ and F. Paoletti ^{1*}	29
L-8	
ORGANIC POULTRY MEAT QUALITY: OXIDATIVE STATUS IN DIFFERENT GENOTYPES	
C. Castellini ¹ , E. Mourvaki ¹ , S. Ruggeri ¹ , S. Mattioli ¹ , M. Guarino Amato ² , C. Mugnai ¹ , A. Dal Bosco ^{1*}	30
L-9	
ORGANIC FOOD - WHERE ARE WE, WHERE COULD WE GO?	
U. Kretzschmar-Rüger ^{1*} , O. Schmid ¹ and A. Beck ²	31
L-10	
QUALITY ASSESSMENT OF ORGANIC BABY FOOD MADE OF DIFFERENT PRE-PROCESSED RAW MATERIAL UNDER INDUSTRIAL PROCESSING CONDITIONS	
K. Seidel ^{1*} , J. Kahl ² , F. Paoletti ³ , I. Birlouez-Aragon ⁴ , F. Sinesio ³ and U. Kretzschmar-Rüger ¹	32
L-11	
THE BIO-CRYSTALLIZATION METHOD AS A NEW INDICATOR FOR ORGANIC FOOD-QUALITY	
N. Busscher ^{1*} , J. Kahl ¹ and A. Ploeger ¹	33
L-12	
NATURALNESS OF PROCESSED ORGANIC FOODS - POTENTIAL INTEREST OF THE FLUORESCENCE SENSOR NATURALYS	
I. Birlouez-Aragon ^{1*} , A. Acharid ¹ and J. Kahl ²	34
L-13	
METABOLOMIC FINGERPRINTING / PROFILING: THE CHALLENGE IN ORGANIC CROPS AUTHENTICATION	
J. Hajšlová ^{1*} , L. Václavík ¹ , V. Schulzová ¹ , H. Novotná ¹	35
L-14	
2011 APPROACHES FOR ORGANIC FOOD AND FEED AUTHENTICATION	
S. van Ruth ^{1*} , M. Alewijn ¹ , A. Tres ¹ and G. van der Veer ¹	36
L-15	
THE ORGTRACE PROJECT: CONTENT, BIOAVAILABILITY AND HEALTH EFFECTS OF TRACE ELEMENTS AND BIOACTIVE COMPONENTS OF FOOD PRODUCTS CULTIVATED IN ORGANIC AND CONVENTIONAL AGRICULTURAL SYSTEMS	
S. Husted ^{1*} , K.H. Laursen ¹ , E.H. Larsen ² , E. Kapolna ² , P. Knuthsen ² , M. Søltoft ² , S. Bügel ³ , A.B. Mark ³ , C. Lauridsen ⁴ , M. Jacobsen ⁴ , H. Jørgensen ⁴ , U. Halekoh ⁵ and K. Kristensen ⁵	37
L-16	
AGRONOMICAL AND HYGIENIC-HEALTH QUALITY OF DURUM WHEAT PRODUCTIONS FROM DIFFERENT MEDITERRANEAN ENVIRONMENTS UNDER ORGANIC AND CONVENTIONAL CROPPING	
M. Camerini ^{1,2*} , F. Taddei ^{2,3} , G. Bentivenga ² , S. Melloni ² , G. Aureli ² and F. Quaranta ²	38
L-17	
EFFECTS OF ORGANIC AND CONVENTIONAL PRODUCTION SYSTEMS, GENOTYPE AND GRAIN STORAGE ON WINTER WHEAT TECHNOLOGICAL PROPERTIES	
J. Ceseviciene ^{1*} , A. Slepeliene ¹ , A. Leistrumaitė ² , V. Ruzgas ²	39

L-18	THE NUTRITIVE VALUE OF SELECTED TOMATO AND BELL PEPPER CULTIVARS FROM ORGANIC AND CONVENTIONAL PRODUCTION	
	E. Hallmann* and E. Rembalkowska	40
L-19	EFFECT OF ORGANIC DIET ON BIOMARKERS OF HEALTH AND WELL-BEING IN RAT MODELS	
	C. Lauridsen ^{1*} , U. Halekoh ² , M. Jacobsen ¹ , H. Jørgensen ¹	41
L-20	IMPACT OF ORGANIC FEED ON PIGS' HEALTH	
	A. Sundrum ^{1*}	42
L-21	EVALUATION OF HEALTH EFFECT OF ORGANIC AND CONVENTIONAL CARROTS	
	M. Roselli ¹ , A. Finamore ¹ , E. Brasili ¹ and E. Mengheri ^{1*}	43
L-22	IMPLICATIONS FOR HEALTH OF DIFFERENCES IN FATTY ACID COMPOSITION OF ORGANIC VERSUS CONVENTIONAL MILK	
	Ch. Seal ^{1,2} , G. Butler ^{1,3} , S. Stergiadis ^{2,3} and C. Leifert ^{2,3}	44
L-23	EFFECT OF CONSUMPTION OF ORGANICALLY AND CONVENTIONALLY PRODUCED APPLES/CARROTS ON DNA DAMAGE IN HEALTHY HUMANS	
	K. Briviba ^{1*} , B.A. Stracke ¹ , C.E. Rüfer ¹ , A. Bub ¹ and B. Watzl ¹	45
L-24	UNTARGETED METABOLOMICS OF HUMAN BREAST MILK IN A COHORT WITH 46% CONSUMERS OF PREDOMINANTLY ORGANIC FOOD	
	A. Mie ^{1*} , F. Stenius ^{1,2} , H. Rosenlund ³ , A. Nordström ⁴ , A. Bergström ³ , J. Alm ^{1,2}	46
L-25	NO EFFECTS OF ORGANIC AND CONVENTIONAL DIETS ON INTAKE AND ABSORPTION OF ZINC AND COPPER IN MEN – EVIDENCE FROM TWO CROSS-OVER TRIALS USING STABLE ENRICHED ISOTOPES	
	A.B. Mark ^{1*} , E. Kapolna ² , K.H. Laursen ³ , U. Halekoh ⁴ , S.K. Rasmussen ³ , S. Husted ³ , E.H. Larsen ² and S. Bügel ¹	47
L-26	CONCEPTS OF HEALTH, RELATING TO ORGANIC FOOD	
	F.A.C. Wiegant ¹ , M.H. Bakker ¹ , W. Dijk ¹ , H.A.B. Prins ¹ and M.A.S. Huber ¹	48
L-27	IS IT STILL REALISTIC TO EXPECT HEALTH EFFECTS FROM ORGANIC FOOD?	
	M.A.S. Huber ^{1*}	49
	WORKSHOP LECTURES.....	51
LW-1	QUALITY CONCEPTS OF ORGANIC FOODS FROM PAST TO FUTURE	
	A. Ploeger ^{1*}	53
LW-2	ORGANIC FOOD QUALITY: A FRAMEWORK FOR CONCEPT, DEFINITION AND EVALUATION FROM EUROPEAN PERSPECTIVE	
	J. Kahl ^{1*} , T. Baars ¹ , S. Bügel ¹ , N. Busscher ¹ , M.A.S. Huber ¹ , D. Kusche ¹ , E. Rembalkowska ¹ , K. Seidel ¹ , B. Taupier-Letage ¹ , A. Velimirov ¹ , A. Załęcka ¹	54
LW-3	SENSORY PERCEPTION OF FOOD PRODUCTS: HOW DO USERS AND NON-USERS OF ORGANIC PRODUCTS DIFFER?	
	T. Obermowe ^{1*} , K. Scholz ¹ , S. Hemmerling ¹ and A. Spiller ¹	55
LW-4	ORGANIC FOOD PRODUCTS: DIRECT MARKETING AND CONSUMERS' TRUST IN LITHUANIA	
	V. Skulskis ^{1*} and V. Girgzdiene ¹	56
LW-5	HEALTH EFFECTS OF AN ORGANIC DIET - CONSUMER EXPERIENCES IN THE NETHERLANDS	
	L.P.L. van de Vijver ^{1*}	57
LW-6	OVERCOMING UNDERNUTRITION WITH LOCAL RESOURCES IN AFRICA, ASIA AND LATIN AMERICA	
	M.B. Krawinkel ^{1*}	58
LW-7	CAN FARM MILK PROTECT FROM THE DEVELOPMENT OF CHILDHOOD ASTHMA AND ALLERGIES?	
	Ch. Braun-Fahrlander ^{1*}	59
LW-8	FATTY ACIDS OF ORGANICALLY PRODUCED MILK AND ITS BENEFICIAL EFFECTS IN HUMAN NUTRITION	
	G. Jahreis ^{1*} , K. Kuhnt ¹ , A. Jaudszus ¹ , C. Degen ¹ and C. Dawczynski ¹	60

LW-9

TESTING MILK ALLERGIC CHILDREN IN A DOUBLE BLIND PLACEBO CONTROLLED TRIAL
 T. Roos¹, D. Kusche², T. Baars² 61

LW-10

RAW MILK QUALITY VS. RAW MILK SAFETY – WALKING A TIGHTROPE
 W. Kneifel¹, S. Apprich¹ 62

POSTER SESSIONS 63

QUALITY AND SAFETY OF ORGANIC PLANT AND ANIMAL PRODUCTS 65

A-1

SELECTION OF LACTIC ACID BACTERIA PRODUCING ANTI-MICROBIAL STRAINS
 N. Benhamouche¹ 67

A-2

QUALITY CONTROL OF AMINOACIDS IN ORGANIC FOODS AND FOOD SUPPLEMENTS
 S. Pankova^{1*}, K. Ivanov², D. Tsvetkova¹ 68

A-3

PHYTOCHEMICALS, ANTIOXIDANT PROPERTIES AND BENEFITS OF CICHORIUM INTYBUS L.: GENETIC, ENVIRONMENTAL, AGRONOMIC INFLUENCES
 E. Azzini^{1*}, E. Venneria¹, M.S. Foddai¹, A. Durazzo¹, F. Intorre¹, F. Nobili¹, I. Garaguso¹, L. D'Evoli¹, L. Palomba¹ and G. Maiani¹ 69

A-4

COMMERCIAL FERTILIZERS AND ORGANOLEPTIC QUALITY OF ORGANICALLY GROWN APPLE FRUITS (CV. GOLDEN DELICIOUS)
 I. Baiamonte¹, E. Moneta¹, A. Raffo¹, A. D'Aloise¹, N. Nardo¹, M. Kelderer², E. Lardschneider², F. Paoletti^{1*} 70

A-5

DIETARY FIBERS OF ANCIENT AND MODERN DURUM WHEAT GENOTYPES: QUANTIFICATION AND PREBIOTIC EFFECT
 G. Dinelli^{1*}, I. Marotti¹, V. Bregola¹, I. Aloisio¹, S. Bosi¹, R. Di Silvestro¹, D. Di Gioia¹, B. Biavati¹, R. Quinn² 71

A-6

ANTIOXIDANT PROPERTIES IN THREE VARIETIES *BLASCO*, *BOLERO* AND *CRACKLIN* OF ORGANIC SOFT WHEAT FLOURS - *TRITICUM AESTIVUM* L.
 A. Durazzo^{1*}, E. Azzini¹, M.S. Foddai¹, E. Finotti¹, P. Bàrberi², M. Perenzin³, L. Plizzari³, M. Guiducci⁴ and G. Maiani¹ 72

A-7

CROPPING SYSTEMS PERFORMANCES IN ORGANIC HORTICULTURE: THE CAKE AND THE BUTTER
 S. Bellon^{1*}, H. Gauthier², C. Mazollier³, M. Navarrete¹, S. Perven¹, N. Sautereau¹, L. Urban³, M. Tchamitchian¹ 73

A-8

MYCOPOPULATION AND GRAIN QUALITY OF *TRITICUM AESTIVUM* SSP. *SPELTA* FROM ORGANIC TRIAL
 F. Bagi^{1*}, M. Bodroža-Solarov², V. Stojšin¹, D. Budakov¹, A. Bočarov-Stančić³ and J. Vučković² 74

A-9

TECHNOLOGICAL QUALITY OF *TRITICUM AESTIVUM* SPP. *SPELTA*
 M. Bodroža-Solarov^{1*}, O. Šimurina¹ and B. Filipčev¹ 75

A-10

ARE HARVEST AND SENSORY QUALITY OF LETTUCE AND ONION INFLUENCED BY GROWING CONDITIONS IN A CONVENTIONAL AND THREE ORGANIC CROPPING SYSTEMS?
 H.L. Kristensen^{1*}, U. Kidmose², D.B. Dresbøll¹ and K. Thorup-Kristensen³ 76

A-11

ANTIOXIDANT PROPERTIES OF *TRITICUM AESTIVUM* SPP. *SPELTA* FROM ORGANIC TRIAL
 N. Barylko-Pikielna⁵, A. Bendini⁷, A. Bongartz^{3*}, K. Buchecker², M.L. Cezanne³, T. Gallina Toschi⁷, E. Kostyra⁵, S. Kremer⁸, U. Kretschmar-Rüger¹, T. Obermowe⁴, P. Reichl⁶, A. Spiller⁴ 77

A-12

TOXIGENIC FUNGI AND MYCOTOXINS IN ORGANIC SPELT AND ITS PRODUCTS
 E. Solarska^{1*}, A. Kuzdraliński¹, M. Marzec¹ 78

A-13

QUALITATIVE TRAITS OF GRAINS OF SELECTED WHEAT CULTIVARS GROWN UNDER ORGANIC FARM CONDITIONS
 J. Szymona^{1*} 79

A-14

FRUIT QUALITY AND ANTIOXIDANT PROPERTIES OF KIWIFRUIT (*ACTINIDIA DELICIOSA* CV. HAYWARD) ORGANICALLY GROWN IN ITALY
 L. D'Evoli¹, S. Moscatello², A. Baldicchi³, A. Aguzzi¹, P. Gabrielli¹, S. Proietti², M. Lucarini¹, A. Battistelli², F. Famiani³ and G. Lombardi-Boccia^{1*} 80

A-15

NITRATE CONTENT IN TWO ORGANICALLY AND BIODYNAMICALLY GROWN LETTUCE VARIETIES
 M. Lucarini^{1*}, P. Gabrielli¹, S. Tufi¹, S. Paoletti², S. Di Ferdinando² and G. Lombardi-Boccia¹ 81

A-16	EFFECTS OF ORGANIC FARMING AND GENOTYPES ON ALIMENTARY-NUTRACEUTICAL PARAMETERS IN TOMATO FRUITS	
	C. Migliori ¹ , R. Lo Scalzo ¹ , L.F. Di Cesare ¹ , G. Campanelli ² , V. Ferrari ²	82
A-17	FOOD SAFETY (HONEY) IN ACCORDANCE WITH THERAPY OF BEES	
	A. Hera ^{1*} , V. Billova ¹	83
A-18	TRACE ELEMENT LEVELS OF ORGANICALLY PRODUCED MEDICINAL PLANT SAMPLES FROM TURKEY	
	İ. Narin ^{1*} , D. Çitak ² , M. Tüzen ² , E. Yılmaz ³ and M. Soylak ³	84
A-19	TRACE ELEMENT LEVELS OF ORGANIC LEGUMES AND MACARONI SAMPLES PRODUCED IN TURKEY	
	E. Yılmaz ¹ , İ. Narin ^{2*} , D. Çitak ³ , M. Tüzen ³ and M. Soylak ¹	85
A-20	ANALYSIS OF NITROSAMINES IN ORGANIC FOODS	
	L. Peykova ^{1*} , D. Oreshkova ¹ , I. Pencheva ¹	86
	IMPACT OF PROCESSING ON ORGANIC QUALITY AND SAFETY	87
B-1	DISTRIBUTION CHAIN EFFECTS ON QUALITY PARAMETERS OF ORGANICALLY GROWN TOMATOES	
	A. Raffo ^{1*} , I. Baiamonte ¹ , N. Nardo ¹ , S. Nicoli ¹ , F. Paoletti ¹	89
B-2	THE CHANGES OF BIOACTIVE COMPOUNDS OF TOMATO JUICES FROM ORGANIC AND CONVENTIONAL PRODUCTION BEFORE AND AFTER PASTEURIZATION	
	E. Hallmann ^{1*} , E. Rembiałkowska ¹ , J. Lipowski ² , K. Marszałek ²	90
	STANDARDIZATION OF NOVEL METHODS	91
C-1	PATTERN FORMATION IN EVAPORATING DROPLETS AS A TOOL FOR WHEAT QUALITY ANALYSIS	
	M.O. Kokornaczyk ¹ , G. Dinelli ¹ and L. Betti ^{1*}	93
C-2	PRELIMINARY STUDY FOR THE DEVELOPMENT OF A PSYCHOLOGICAL TEST ABOUT THE EFFECTS OF FOOD	
	U. Geier ¹ and K. Buchecker ^{2*}	94
C-3	QUALITY ASSESSMENT OF GRAPE JUICE FROM INTEGRATED, ORGANIC AND BIODYNAMIC FARMING WITH IMAGE FORMING METHODS	
	J. Fritz ^{1*} , M. Athmann ¹ and U. Köpke ¹	95
C-4	THE STEIGBILD METHOD AS A SYSTEMIC PARAMETER TO ORGANIC FOOD AUTHENTICATION	
	A. Zalecka ^{1*} , J. Kahl ²	96
	ORGANIC FOOD AUTHENTICITY	97
D-1	YEAST EXTRACT IN ORGANIC FOOD AND ITS AUTHENTICITY ACCORDING TO ORGANIC PRODUCERS	
	S. Ibing ^{1*} , A. Ross ¹ , K. Hollmann ¹ , M. Lukas ¹ , C. Dressler ² , N. Schinkowski ² and C. Strassner ¹	99
D-2	INFLUENCE OF DIFFERENT CROP MANAGEMENT PRACTICES ON NUTRITIONAL PROPERTIES OF SOFT WHEAT FLOUR - <i>TRITICUM AESTIVUM L. CV AUBUSSON</i>	
	E. Azzini ^{1*} , E. Finotti ¹ , M.S. Foddai ¹ , P. Bärberi ² , M. Perenzin ³ , L. Plizzari ³ , M. Guiducci ⁴ and G. Maiani ¹	100
D-3	FATTY ACID CONTENT IN ORGANIC AND CONVENTIONAL BULK TANK MILK IN SWEDEN	
	N. Fall ^{1*} and U. Emanuelson ¹	101
D-4	METABOLOMIC PROFILING EMPLOYING DART-TOFMS FOR QUALITY AND AUTHENTICITY ASSESSMENT OF TOMATOES AND PEPPERS FROM ORGANIC AND CONVENTIONAL FARMING	
	H. Novotná ¹ , O. Kmiecik ² , M. Galazka ² , V. Krčková ¹ , A. Hurajová ¹ , V. Schulzová ^{1*} , E. Hallmann ² , E. Rembiałkowska ² and J. Hajšlová ¹	102
D-5	SENSORY DIFFERENCE AND PREFERENCE, YIELD, AND QUALITY PARAMETERS OF BIO-DYNAMICALLY, ORGANICALLY AND CONVENTIONALLY PRODUCED WHEAT FROM THE DOK LONG-TERM FIELD TRIAL	
	C.M. Arncken ^{1*} , P. Mäder ¹ , J. Mayer ² and F.P. Weibel ¹	103
D-6	DIFFERENCES IN MICRONUTRIENT CONTENT OF ORGANICALLY AND CONVENTIONALLY GROWN CABBAGE: A METABOLOMICS APPROACH	
	A. Mie ^{1,2*} , M. Åberg ² , K.H. Laursen ³ , M. Søltoft ⁴ , E. Kapolna ⁴ , P. Knuthsen ⁴ , E. Huusfelt Larsen ⁴ , U. Nilsson ² , M. Olsson ⁵ , S. Husted ³	104

D-7	ASSESSMENT OF QUALITY OF ORGANICALLY AND CONVENTIONALLY GROWN POTATOES V. Krtková ¹ , V. Schulzová ^{1*} , P. Dvořák ² and J. Hajšlová ¹	105
D-8	FURANOCOUMARINS IN CELERIAC FROM DIFFERENT FARMING SYSTEMS: THREE-YEARS STUDY V. Schulzová ^{1*} , L. Babička ² and J. Hajšlová ¹	106
D-9	COMPOSITIONAL FIGURES AND PHENOLIC COMPOUNDS IN TOMATOES GROWN BY CONVENTIONAL, ORGANIC AND BIODYNAMIC AGRICULTURE L. D'Evoli ^{1*} , E. Finotti ¹ , P. Gabrielli ¹ , L. Gambelli ¹ , S. Di Ferdinando ² , S. Paoletti ² and G. Lombardi-Boccia ¹	107
D-10	DIFFERENCES IN WHEY PROTEINS CONTENT BETWEEN COW'S MILK COLLECTED IN LATE PASTURE AND EARLY INDOOR FEEDING SEASON FROM CONVENTIONAL AND ORGANIC FARMS IN POLAND B. Kuczyńska ^{1*} , E. Metera ² , K. Puppel ¹ , M. Golembiewski ¹ , T. Sakowski ² , K. Słoniewski ²	108
D-11	ORGRACE- NO DIFFERENCE IN LEVELS OF BIOACTIVE COMPOUNDS FOUND IN CROPS FROM SELECTED ORGANIC AND CONVENTIONAL CULTIVATION SYSTEMS P. Knuthsen ^{1*} , M. Søltoft ¹ , K.H. Laursen ² , A. Bysted ¹ , K.H. Madsen ¹ , J. Nielsen ² , U. Halekoh ³ and S. Husted ²	109
D-12	COMPARISON OF SELECTED PHYSICAL AND CHEMICAL PARAMETERS OF APPLES FROM ORGANIC AND CONVENTIONAL PRODUCTION M. Adamczyk ¹ , E. Hallmann ¹ and E. Rembiałkowska ^{1*}	110
D-13	CONTENT OF MINERAL COMPONENTS IN RED BEET (<i>BETA VULGARIS</i> L.SSP. <i>VULGARIS</i> ROTE KUGEL) FROM DIFFERENT PRODUCTION SYSTEMS S. Štraus ¹ , F. Bavec ¹ , M. Bavec ^{1*}	111
D-14	HIGH SENSITIVITY, LOW IMPACT PESTICIDE DETECTION METHOD: A SINGLE-DROP MICRO-EXTRACTION TECHNIQUE FOR PPT DETECTION OF TRIAZINE PESTICIDES D. Bradley, G. Williams ^{1*}	112
	IMPACT OF ORGANIC FEED ON ANIMALS	113
E-1	EFFECTS OF ORGANICALLY AND CONVENTIONALLY PRODUCED FEED ON BIOMARKERS OF HEALTH IN A CHICKEN MODEL M.A.S. Huber ¹ , L.P.L. van de Vijver ¹ and project group	115
E-2	EFFECT OF LEGUME GRAINS AS DIETARY PROTEIN SOURCE ON THE QUALITY OF ORGANIC LAMB MEAT A. Bonanno ^{1*} , G. Tornambè ¹ , A. Di Grigoli ¹ , V. Bellina, G. Di Miceli ² , D. Giambalvo ²	116
E-3	ASSIMILABILITY OF BIOLOGICALLY ACTIVE SUBSTANCES OF SEA BUCKTHORN OIL IN TISSUES OF LABORATORY ANIMALS A. Jurgoński ¹ , S. Czaplicki ² , Z. Zduńczyk ¹ , D. Oгородowska ² , J. Juśkiewicz ¹ , R. Zadernowski ²	117
E-4	100% ORGANIC FEED ON SWEDISH ORGANIC DAIRY HERDS, DOES IT SECURE TRACE METAL STATUS FOR ANIMAL HEALTH? I. Blanco-Penedo ^{1*} , N. Fall ¹ , T. Lundh ² , U. Emanuelson ¹	118
E-5	CARBOHYDRATE AND LIPID COMPOSITION OF VEGETABLES, AND BIOAVAILABILITY ASSESSED IN A RAT MODEL: IMPACT DIFFERENT CULTIVATION SYSTEMS H. Jørgensen ^{1*} , K.E. Bach Knudsen ¹ and C. Lauridsen ¹	119
E-6	ORGANIC DIETS AND PHYSICAL ACTIVITY: RESEARCH EXPERIENCE USING A RAT MODEL H. Jørgensen ^{1*} , U. Halekoh ² and C. Lauridsen ¹	120
E-7	ASSIMILABILITY OF BIOLOGICALLY ACTIVE SUBSTANCES OF AMARANTH OIL IN TISSUES OF LABORATORY ANIMALS A. Jurgoński ¹ , D. Oгородowska ^{2*} , Z. Zduńczyk ¹ , S. Czaplicki ² , R. Zadernowski ² , J. Juśkiewicz ¹	121
E-8	RELATIONSHIPS BETWEEN PHYSIOLOGICAL INDICATORS IN BLOOD, YIELD AND COMPOSITION OF MILK OBTAINED FROM ORGANIC DAIRY COWS T. Sakowski ^{1*} , B. Kuczyńska ² , E. Metera ¹ , K. Słoniewski ¹ and B. Romanowicz ¹	122
E-9	ORGANIC POULTRY MEAT QUALITY: OXIDATIVE STATUS IN DIFFERENT GENOTYPES C. Castellini ¹ , E. Mourvaki ¹ , S. Ruggeri ¹ , S. Mattioli ¹ , M. Guarino Amato ² , C. Mugnai ¹ , A. Dal Bosco ^{1*}	123

IMPACT OF ORGANIC FOOD ON HUMANS	125
F-1	
HEALTH RELATED ASPECTS OF ORGANICALLY PRODUCED WHEAT	
A. Hussain ^{1*} , H. Larsson ¹ , R. Kuktaite ¹ , M.L. Prieto-Linde ¹ , E. Johansson ¹	127
F-2	
DAIRY FAT AFFECTS THE CONCENTRATION OF PHYTANIC ACID IN PLASMA IN HEALTHY VOLUNTEERS	
L.B. Werner ^{1*} , L.I. Hellgren ² , M. Raff ¹ , S.K. Jensen ³ , R.A. Petersen ¹ , T. Drachmann ² , T. Tholstrup ^{1*}	128
F-3	
EVALUATING PESTICIDE EXPOSURE IN ORGANIC AND CONVENTIONAL CONSUMERS	
L. Oates ^{1*} and M. Cohen ¹	129
F-4	
THE PROTECTIVE EFFECT OF FARM MILK CONSUMPTION ON CHILDHOOD ASTHMA AND ATOPY: THE GABRIELA STUDY	
G. Löss ^{1,2*} , S. Apprich ³ , M. Waser ^{1,2} , W. Kneifel ³ , E. von Mutius ⁴ , J. Genuneit ⁵ , G. Büchele ⁵ , J. Weber ⁴ , B. Sozanska ⁶ , H. Danielewicz ⁵ , E. Horak ⁷ , R.J.J. van Neerven ⁸ , D. Heederik ⁹ , P.C. Lorenzen ¹⁰ , Ch. Braun-Fahrlander ^{1,2} and the GABRIELA study group	130
F-5	
EFFECT OF CONSUMPTION OF ORGANIC STRAWBERRY JAM ON GLYCAEMIC STATUS IN HYPERINSULINEMIC AND TYPE 2 DIABETIC VOLUNTEERS	
F. Intorre ¹ , L.M. Donini ² , G. Catasta ¹ , B. Neri ³ , T. Hagedorn ³ , E. Toti ¹ , M.S. Foddai, E. Venneria ¹ , L. Palomba ¹ , E. Azzini ¹ and G. Maiani ^{1*}	131
F-6	
EFFECT OF FAT MODIFIED CHEESE ON BLOOD CONCENTRATION OF FATTY ACIDS AND ANTIOXIDANT LEVELS IN NORMOLIPIDEMIC VOLUNTEERS: A PILOT STUDY	
F. Intorre ¹ , M.S. Foddai ¹ , E. Azzini ¹ , B. Martin ² , M.C. Montel ³ , G. Catasta ¹ , E. Toti ¹ , E. Finotti ¹ , L. Palomba ¹ , E. Venneria ¹ and G. Maiani ^{1*}	132
F-7	
ORGANIC AND CONVENTIONAL DIET INFLUENCED ORGANOPHOSPHOROUS PESTICIDE METABOLITES IN URINE	
M. Bavec ^{1*} , M. Robačar ² , S.G. Mlakar ¹ , V. Hrženjak ² , V. Lapajne ² , Z. Simonović ² , K. Turk ² , B. Mlakar ³ , A. Bavec ⁴ , F. Bavec ¹	133
F-8	
BIOACTIVITY PROFILES OF GRAIN LEGUMES: POTENTIAL ORGANIC SOURCES FOR WEIGHT-CONTROL SUPPLEMENTS	
G. Dinelli ^{1*} , I. Marotti ¹ , S. Bosi ¹ , R. Di Silvestro ¹ , V. Bregola ¹ , A Wittaker ² , S. Benedettelli ²	134
F-9	
THE VALORISATION OF DIFFERENT ITALIAN AGRICULTURAL ECOTYPES	
A. Durazzo ^{1*} , E. Azzini ¹ , A. Raguzzini ¹ , E. Venneria ¹ , M.S. Foddai ¹ , F. Intorre ¹ , L. Palomba ¹ and G. Maiani ¹	135
WORKSHOP 1 – ORGANIC FOOD QUALITY CONCEPTS	137
G-1	
PRODUCT QUALITY AS A FUNCTION OF LIGHT AND NITROGEN SUPPLY: CONTRIBUTING TO A QUALITY CONCEPT FOR ORGANIC AGRICULTURE?	
M. Athmann ^{1*} , J. Fritz ¹ and U. Köpke ¹	139
G-2	
HOW MANY COMPROMISES CAN ORGANIC FARMING AFFORD? – CHALLENGES FOR THE CREDIBILITY OF ORGANIC FARMING IN THE EU	
K.K. Jensen ^{1*} , B. Forkman ² and P. Sandøe ^{1,2}	140
G-3	
ORGANIC FOOD QUALITY RESEARCH IN ESTONIA	
D. Matt ^{1*} , A. Luik ¹ , E. Peetsmann ¹ and M. Roasto ²	141
G-4	
CONCEPTUALIZATION OF ORGANIC FOOD AMONG POLISH CONSUMERS AND THEIR WILLINGNESS TO ACCEPT INNOVATION IN ORGANIC PRODUCTS	
S. Żakowska-Biemans ^{1*}	142
WORKSHOP 2 – CONSUMER RELATED QUALITY ASPECTS	143
H-1	
THE IRISH ORGANIC FOOD MARKET: SHORTFALLS, OPPORTUNITIES AND THE NEED FOR RESEARCH	
R. Tobin ^{1*} , T. Larkin ^{1*} and S. Moane ¹	145
H-2	
ORGANIC AND CONVENTIONAL YOGURTS: STUDY OF SENSORY PROFILES AND CONSUMER ACCEPTABILITY	
A. Bendini ^{1*} , S. Barbieri ¹ , F. Gottardi ² , T. Gallina Toschi ¹ and M. Canavari ³	146
H-3	
CONSUMER ORIENTED SENSORY MARKETING FOR ORGANIC PRODUCTS- INSIGHTS FROM THE EU-FUNDED PROJECT ECROPOLIS	
S. Hemmerling ¹ , T. Obermow ^{1*} and A. Spiller ¹	147

H-4

MARKET NEEDS FOR SENSORY PROPERTIES ALONG THE ORGANIC FOOD SUPPLY CHAIN IN EUROPE

M. Maciejczak^{1*}, S. Żakowska-Biemans², A. Spiller³, T. Obermowe³, R. van Veggel⁴, D. Asioli⁵, M. Canavari⁵, H. Stolz⁶, L. Baumgart⁶, C. Frissur⁷ 148

H-5

ECROPOLIS - TRANSPARENCY IN SENSORY PROPERTIES AND CONSUMER EXPECTATIONS IN ORGANIC FOOD

N. Barylko-Pikielna⁵, A. Bendini⁷, A. Bongartz^{3*}, K. Buchecker², M.L. Cezanne³, T. Gallina Toschi⁷, E. Kostyra⁵, S. Kremer⁸, U. Kretzschmar-Rüger¹, T. Obermowe⁴, P. Reichl⁶, A. Spiller⁴ 149

H-6

HOW DO FRENCH CONSUMERS PERCEIVE ORGANIC LABELS IN WINE?

E. Ginon^{1*}, G. Ares², S. Issanchou³, A. Sutan¹ and R. Deliza^{3,4} 150

WORKSHOP 4 – DAIRY PRODUCTS – QUALITY AND HEALTH IMPLICATIONS..... 151

I-1

CONTENT OF FATTY ACIDS, VITAMIN E AND CAROTENOIDS IN MILK AND HERBAGE AS AFFECTED BY SWARD COMPOSITION AND PERIOD OF GRAZING

M.K. Larsen^{1*}, X.C. Fretté^{1,3}, T. Kristensen², J. Eriksen², K. Søegaard², J.H. Nielsen^{1,4} 153

I-2

COMPARATIVE MILK PROTEOMICS AND METABOLOMICS: A PILOT STUDY ON EFFECTS OF ROUGHAGE AND FARMING-STYLE ON COW MILK

S. Mosler¹, J. Wohlers¹, D. Kusche¹, T. Baars^{1*} 154

I-3

THE POTENTIAL OF ORGANIC MILK - FATTY ACID AND ANTIOXIDANT PROFILES OF BIODYNAMIC AND CONVENTIONAL MILK FROM LOW- AND HIGH-INPUT SYSTEMS IN SUMMER AND WINTER

D. Kusche¹ and T. Baars^{1*} 155

I-4

RUMINANT FATTY ACIDS IN BREAST MILK: RELATIONS WITH ORGANIC DAIRY CONSUMPTION AND PROTECTION AGAINST ALLERGY DEVELOPMENT IN THE CHILD

C. Thijs^{1*}, A. Müller², L. Rist³, A. P. Simoës-Wüst³, I. Kummeling¹, B. Snijders¹, M.A.S. Huber⁴, P. Dagnelie¹, P. von den Brandt¹ 156

I-5

INFLUENCE OF MILK YIELD AND LACTATION PHASE ON FATTY ACIDS COMPOSITION OF MILK FROM ORGANIC FARMS

T. Sakowski^{1*}, B. Kuczyńska², E. Metera¹, K. Słoniewski¹ and B. Romanowicz¹ 157

I-6

RAW MILK CHALLENGES AND EHEC

T. Baars^{1*}, D. Kusche¹ and L. Gramann¹ 158

I-7

IMPROVING THE FATTY ACID COMPOSITION IN ORGANIC DAIRY FARMING IN WINTER DIETS

J. Wohlers¹, D. Kusche² and T. Baars^{2*} 159

INDEX..... 161

ORAL SESSIONS
(L-1 – L-27)

L-1

SUSTAINABLE DIETS: NUTRITION AS AN ECOSYSTEM SERVICE**B. Burlingame*, S. Dernini**

FAO, Viale delle Terme di Caracalla 00153 Rome, Italy

* E-mail: Barbara.Burlingame@fao.org

Organic agriculture, as defined by FAO, is a system that relies on ecosystem management rather than external agricultural inputs, and food is an ecosystem service. The link between organic agriculture and human health and nutrition requires consideration of not just food, but the more complex issue of the diet as a whole. Even as fast food and soft drink consumption leads to childhood obesity at staggering levels all over the world, and as global food production squeezes ever-higher yields out of the three crops that provide more than half the planet's dietary energy supply, and as micronutrient malnutrition is increasingly addressed through pharmaceutical and therapeutic preparations, the wider nutrition community began pondering possibility that food and nutrition security could be considered an ecosystem service. At the same time, the governing body of the Convention on Biological Diversity requested that FAO, together with partners, implement a cross-cutting initiative on biodiversity for food and nutrition. Thus was the formal coming together of the sectors of agriculture, environment, and health, embarking on a common path with nutrition as the central element. By the end of 2010, a series of events, both technical and intergovernmental, had led to a platform for action, a proposal for a code of conduct and a consensus definition for sustainable diets, as follows:

Sustainable Diets are those diets with low environmental impacts which contribute to food and nutrition security and to healthy life for present and future generations. Sustainable diets are protective and respectful of biodiversity and ecosystems, culturally acceptable, accessible, economically fair and affordable; nutritionally adequate, safe and healthy; while optimizing natural and human resources.

As such, sustainable diets as a concept should be considered the logical extension to organic agriculture. Significant background events and papers will be discussed including the FAO Regional Conferences for Europe, the AFROFOODS Call for Action from the House of the Slaves, the Mediterranean Diet as a Model for Sustainable Diets, Traditional Food Systems of Indigenous Peoples, and the results of the survey on Sustainable Diets.

L-2**PROCESS AND PRODUCT RELATED ASPECTS OF ORGANIC FOOD QUALITY - FROM BIODIVERSITY TO HUMAN NUTRITION****U. Niggli**

Research Institute of Organic Agriculture 5070 Frick, Switzerland

* E-mail: urs.niggli@fibl.org

Agriculture is challenged to reduce trade-offs between the fast growing demand for food, negative impacts on the environment, overexploitation of natural or non-renewable resources, and quality aspects of food such as safety, nutritional value and ethical standards. Therefore, any concepts on how to best farm land, rear livestock and process, package, transport and market foods have to be assessed against a comprehensive set of criteria. In a multifunctional perspective, organic agriculture and food production performs conclusively well.

Among a growing number of food schemes and labels claiming sustainability, organic has a sound scientific evidence of the actual (real-life) ecological, social and livelihood impacts. A most recent FiBL meta-analysis of 315 scientific papers listed 240 for organic farming (of which 89 % are peer-reviewed), the other papers cover sustainability aspects of all the other labels such as FairTrade, Rainforest Alliance and three others.

The real strengths of organic farming are synergies between otherwise conflicting objectives: Best organic farming practice improves soil fertility and as a result of this stabilizes yields, optimizes food quality and abates global warming. It's productivity increase is grounded on the careful use of ecosystem services including inter and intra-species diversity. Resilience or robustness is an inherent quality of organic cropping and livestock systems which benefits quality, safety and authenticity of foods. The lecture will give examples and data of such synergies between process and product quality. It also highlights that organic agriculture is multifunctional in its nature as it produces not only commodities but also many non-commodity outputs such as environmental services, landscape amenities and cultural.

L-3**FOOD IS THE FUNDAMENTAL UNIT IN NUTRITION****D.R. Jacobs, Jr**

Division of Epidemiology and Community Health, School of Public Health, University of Minnesota, Minneapolis, MN, USA; Guest Professor, Department of Nutrition, School of Medicine, University of Oslo, Oslo, Norway

* E-mail: jacob004@umn.edu

In the concept of “food synergy” food was once alive and consists of a harmonious biochemical constitution (due to evolution), suitable for the life of the organism eaten. Some aspects of that harmony survive digestion and become systemic in the eater. The health effect of eating food is synergistic, in the sense that the effect of the composite is greater than or equal to the sum of the effects of the constituents, were they eaten in isolation. Under the concept of food synergy, food should be more healthful than isolated constituents (supplements). Both long term observational studies and clinical trials find no difference in clinical outcomes and death in supplement users for most supplements; some even find adverse clinical outcomes in supplement users. In contrast, one of the most consistent findings in nutritional epidemiology is the positive association of certain food patterns that are rich in diverse phytochemicals with better health and fewer new clinical events. The nutrient concept, as a guiding principle for healthy eating, seems most helpful in the case of deficiency diseases, but may be misleading when the diet is generally adequate. The best bet for health is to eat food rich in biologically active constituents, prepared for maintaining maximalbiological activity.

L-4**USING HUSBANDRY TO IMPROVE DAIRY PRODUCT QUALITY****G. Butler**

Livestock Project Manager, Nafferton Ecological Farming Group, Newcastle University, Nafferton Farm, Northumberland, NE43 7XD

* E-mail: gillian.butler@ncl.ac.uk

There is growing evidence that organic dairy products are better for us compared to those from conventional production. However, the higher levels of beneficial unsaturated fatty acids and antioxidants they contain do vary throughout the year and also between farms and countries: organic milk is not always *better*.

Findings will be presented to show the increase in these beneficial fatty acids (and hence a reduction in potentially harmful saturated fatty acids) is linked directly to cows grazing rather than a diet with silage or concentrates. Further more, if this grazed forage is grown in the absence of nitrogen (and likely to have a high proportion of clover?) the omega 3 fatty acids are boosted more than other unsaturated fatty acids. Work is also investigating feeds that potentially can be used to maintain summer quality in the winter and comparative trials have shown the response to this approach is also greater under organic rather than conventional management.

We now have good indication of management necessary to optimise the fatty acid profile in milk and organic management is a great start, although there might be scope for further improvement.

L-5

CONTAMINATION OF LETTUCE WITH ANTIBIOTIC RESISTANT *E. COLI* AFTER SLURRY APPLICATION**A.N. Jensen^{1*}, C. Storm¹, D.L. Baggesen¹, A. Forslund² and A. Dalsgaard²**

¹ Division of Microbiology and Risk Assessment, National Food Institute, Technical University of Denmark, Copenhagen Denmark

² Department of Veterinary Disease Biology, Faculty of Life Sciences, University of Copenhagen, Denmark

* E-mail: anyj@food.dtu.dk; Tel: 04535886328; Fax: 04535887001

Due to disease outbreaks associated with contaminated vegetables it has been speculated to what extent this may be linked with application of animal manure as fertilizer, which is particularly practiced in organic vegetable production where conventional fertilizers are prohibited. A field survey was therefore performed to assess the survival and transfer of antibiotic-resistant *E. coli* from animal manure to lettuces, with *E. coli* serving as an indicator of bacterial enteric pathogens.

Animal slurry was applied to 3 Danish fields prior to planting of lettuce seedlings, then 5-8 weeks later at the normal time of harvest, inner and outer leaves of 10 lettuce heads were pooled into one sample unit with a total of 50 pools per field. Additionally, in one field, 15 soil samples were collected weekly until the harvest time. *E. coli* was enumerated by plating 1 mL of 10-fold serial dilutions of 5 g of homogenized sample material, i.e. manure, soil and lettuce onto Petrifilm™ Select *E. coli* count plates (3M) containing 16 mg/L streptomycin or 16 mg/L ampicilin or no antibiotics. Plates were then incubated 24 h at 44°C. Selected isolates of *E. coli* (n=83) from slurry, soil and lettuce were analysed by PFGE DNA typing for further discrimination.

The slurry applied to the fields contained 3.0-4.5 Log₁₀ *E. coli* CFU/g and resistant *E. coli* ranged from 1.0 to 4.4 Log₁₀ *E. coli* CFU/g with particular high numbers of streptomycin resistant *E. coli* in conventional pig slurry (field 1) opposed to organic cow slurry (field 2 and 3). *E. coli* was found in 36-54% of the pooled lettuce samples at the three fields with a detection limit of 10 CFU/g and 10-18% and 0-4% of pools had streptomycin and ampicilin resistant *E. coli*, respectively. Unexpectedly, the highest percentage of lettuce pools with antibiotic resistant *E. coli* were found on fields fertilized with organic cow slurry where 0.1-5% of *E. coli* was resistant opposed to 5-50% resistant *E. coli* in conventional slurry. Numbers of *E. coli* in 14-20% of pooled lettuce samples exceeded a satisfactory microbiological hygiene criteria level of 100 CFU/g. The numbers of resistant *E. coli* for both antibiotics were approximately 10-fold lower than the sensitive *E. coli*.

At the time of harvest, the numbers of *E. coli* in 5 of 15 soil samples were reduced below the detection limit and no samples exceeded 100 CFU/g, which was in contrast to the lettuce samples, where 20% of faecally contaminated samples contained >100 *E. coli*/g. This indicates that fecal contamination of crops originated from alternative sources such as contaminated water or wildlife. This was supported by genotyping of *E. coli*, where half of the 21 PFGE types were found on single occasions in either soil or lettuce, whereas the other half was found both in slurry and lettuce indicating a possible transfer.

Keywords: lettuce, manure fertilizer, faeces contamination, resistant bacteria, food safety

Acknowledgement: *The PathOrganic project under the CoreOrganic ERA-net (project no. 1888).*

L-6

SOFT WHEAT AND ORGANIC AGRICULTURE FOR A NEW QUALITY CONCEPT: NUTRIENTS AND PHYTOCHEMICALS CONTENT OF OLD AND MODERN VARIETIES

G. Dinelli^{1*}, I. Marotti¹, R. Di Silvestro¹, S. Bosi¹, V. Bregola¹, L. Ghiselli², A. Whittaker², S. Benedettelli² and A. Segura-Carretero³

¹ Department of Agroenvironmental Science and Technology, University of Bologna, Bologna, Italy

² Department of Crop, Soil and Environmental Science, University of Florence, Florence, Italy

³ Department of Analytical Chemistry, University of Granada, Granada, Spain

* E-mail: giovanni.dinelli@unibo.it; Tel: +390512096672; Fax: +390512096241

Soft wheat and its derivative products, besides representing an important nutrient source in the human diet, may also be considered as functional foods due to the content of unique phytochemicals involved in the prevention of chronic diseases (-diabetes, cardiovascular diseases, cancer). The bran layer of the wheat kernel is particularly rich in insoluble (IDF) and soluble dietary fiber (SDF). IDF has direct effects on the colon by preventing constipation and cancer, while SDF is known to modulate blood glucose and insulin levels and has a high prebiotic activity. The bran layer of wheat grains is relatively rich in antioxidant compounds. Polyphenols are the most representative class of antioxidants in the wheat kernel and are high in antiradical activity, thus preventing heart disease and cancer. Modern wheat varieties were bred for conventional high-input agriculture to enhance yield, pest resistance and rheological properties, without considering the nutraceutical features. Ancient wheat varieties may potentially reverse the current lack in appropriate cultivars for organic farming and provide a wide source of genetic variability for organic breeding programs aimed at identifying varieties with enhanced health-promoting properties. The aim of the research was to characterize the nutrient (starch, proteins, gluten, lipids) and phytochemical (dietary fiber, polyphenols, flavonoids) content profiles of 17 old soft wheat varieties and 6 modern soft wheat varieties, cultivated under organic conditions at the same location (Bologna, Italy) over two consecutive years (2006/2007 and 2007/2008). As regards the nutrient composition, a higher protein and starch content were present in the old wheat varieties in comparison to modern cultivars, thereby confirming that the modern cultivars are not able to fully express their potential under organic conditions. The IDF and SDF content also showed a higher total dietary fiber content in old varieties (17.2 ± 0.4 g/100g) compared to the modern cultivars (16.4 ± 0.4 g/100g). Moreover, the analysis of antioxidant compounds showed that ancient varieties contain a higher bound and total flavonoids content (35.4 ± 2.2 mg/100g and 53.8 ± 2.3 mg/100g respectively) in comparison to the modern varieties (29.9 ± 2.7 mg/100g and 47.8 ± 1.3 mg/100g respectively). Mass spectrometry analyses evidenced relevant differences in the qualitative profile of polyphenols between modern and old cultivars in terms of both free and bound fractions. Results showed that old varieties represent an intriguing genetic resource for organic breeding programs. Furthermore, ancient grains may offer added nutraceutical value, suggesting their use in the development of organic health-promoting products.

Keywords: soft wheat, old varieties, dietary fiber, polyphenols

L-7

TOMATO (*LYCOPERSICON ESCULENTUM*, CV. CXD271BIO) YIELD AND QUALITY DURING CONVERSION FROM CONVENTIONAL TO ORGANIC PRODUCTION

N. Nardo¹, M.S. Foddai¹, E. Azzini¹, I. Baiamonte¹, S. Di Ferdinando², S. Paoletti², V. Vizioli³ and F. Paoletti^{1*}

¹ Istituto Nazionale di Ricerca per gli Alimenti e la Nutrizione, Rome, Italy

² Agenzia Regionale per lo Sviluppo e l'Innovazione dell'Agricoltura del Lazio, Rome, Italy

³ Fondazione Italiana per la Ricerca in Agricoltura Biologica e Biodinamica, Rome, Italy

* E-mail: paoletti@inran.it; Tel: 00390651494562; Fax: 00390651494550

The conversion of a conventional farm to the methods of the organic farming is a very critical stage of technical and economical investment. From an agronomical point of view, usually the conversion needs a very different length of time with respect to that set by the regulation, because the organic farming is based on the soil fertility and, in general, on the preservation at the equilibrium of the farm's ecosystem. These elements affect time and method of the conversions that, although based on clear principles, can require different interventions and solutions and give different results in different times depending on the starting conditions of fertility, farm organization, operating possibilities and knowledge.

A research project has been funded by the Lazio Region (central Italy) into the Interregional Programme Agriculture Quality with the general objective to monitor the soil characteristics and biodiversity, the quality of the products as well as to study the economical aspects in a farm sited in Lazio Region (Central Italy) during a 3 years conversion period from conventional to organic. Generally, in the geographical area interested by this study the organic farms have not a livestock. For this reason the conversion plan was focused on the rotation and the use of green manure. This work concerns the results of the first year of the conversion (certification body: Suolo e Salute srl). In particular, the results of the determination of the yield and some quality characteristics of processing tomato (*Lycopersicon esculentum*, cv. CXD271bio) are presented. Moreover, the results were compared to those from a neighboring farm managed with the conventional method, having the same characteristics of the soil. The tomato samples from two field replicates of both the farms were analysed for the following parameters: moisture and soluble solids content, titratable acidity, colour, texture, composition in organic acids, carotenoids and antioxidant capacity with FRAP and TEAC methods. Data were analysed by Anova and multiple comparison test (Duncan at $P < 0.05$).

Although it is clear that it will be possible to draw meaningful conclusions only at the end of the project, the results of the first year of the study indicate that the yield of the farm in conversion was higher than that of the conventional one (20,575 kg/ha, 1.235 kg/plant VS. 17,202 kg/ha 17.202, 1.032 kg/plant). A significant effect of the field replicates on all the quality parameters was observed. The samples of tomato from the farm in conversion showed higher values of the colour parameters, size, moisture content, while lower levels were found for the soluble solids content, titratable acidity, malic acid and antioxidant capacity determined by TEAC method.

Keywords: tomato, conversion period, quality, yield

Acknowledgement: Study carried out in the project "Valutazione di schemi di conversione all'agricoltura biologica e biodinamica in aziende tipo della Regione Lazio" by Agenzia Regionale per lo Sviluppo e l'Innovazione dell'Agricoltura del Lazio (ARSIAL, Regional Agency for the Development and the Innovation of the Agriculture of Lazio) – Lazio Region.

L-8

ORGANIC POULTRY MEAT QUALITY: OXIDATIVE STATUS IN DIFFERENT GENOTYPES

C. Castellini¹, E. Mourvaki¹, S. Ruggeri¹, S. Mattioli¹, M. Guarino Amato², C. Mugnai¹, A. Dal Bosco^{1*}

¹ Department of Applied Biology, University of Perugia, Perugia, Italy

² Agricultural Research Council, Monterotondo, Roma, Italy

* E-mail: dalbosco@unipg.it; Tel: 00390755857110; Fax: 00390755857122

According to (EC) Reg. 889/2008 the choice of breeds for organic system shall take into account the capacity of animals to adapt to local conditions and a wide biological diversity should be encouraged. The adaptability of animals to environment is deeply lied to the utilize of available pasture that improve their health through bioactive intake. Moreover this situation is reflected by meat oxidative status. Thus the aim of the work was to evaluate *in vivo* and meat oxidative status of eight chicken genotypes (100 birds each) different for growing rate reared under organic system and in particular: very slow (Robusta maculata, R; Livorno, L; Ancona, A); slow (Gaina, G; Cornish x Livorno, CL; Cornish x Ancona, CA); medium (Kabir, K; Naked neck, N). At slaughter weight (about 2 Kg), 20 birds per group were killed and the antioxidant status of plasma (Reactive Oxygen Substances– ROS, Antioxidant Power of plasma – AP, Thiobarbituric Acid Reactive Substances – TBARS and tocopherols content) and of breast and drumstick muscles (TBARS and tocopherols content) were determined. *In vivo* oxidative status was influenced by genotype; L and A chickens showed the highest values of ROS and the lowest of AP, because of their intense motor activity (data not shown). R, G and the crossbreeds showed the lowest values of ROS and the highest of total tocopherols thanks to their high foraging activity at pasture (data not shown). Concerning meat, it was possible to highlighting three "categories " of efficiency of grass intake and of tocopherols content and consequently of peroxidative processes: in particular L, A and R showed the lowest TBARS/tocopheros ratio of drumstick, CA, CL and G the intermediate and K and N the highest ones. Our results indicate that only meat from slow growing genotypes had a well-developed and efficient antioxidant defense to contrast peroxidative processes. In conclusion, on the basis of *in vivo* and meat oxidative status the better environmental adaptability has been reached by the two crossbreeds and R chickens.

Keywords: organic, poultry, genotype, oxidative status

Acknowledgement: Research funded by Agricultural Research Council (CRA), Ministry of Agriculture, Italy.

L-9

ORGANIC FOOD - WHERE ARE WE, WHERE COULD WE GO?

U. Kretzschmar-Rüger^{1*}, O. Schmid¹ and A. Beck²

¹ Research Institute of Organic Agriculture (FiBL), Frick, Switzerland

² Assoziation ökologischer Lebensmittelhersteller e.V. Aoel, Bad Brückenau, Germany

* E-mail: Ursula.kretzschmar@fibl.org; Tel: 0041-628650415; Fax: 0041-628657273

Many consumers as well as processors expect that organic food should be processed differently as conventional. The EU Regulation (EC) 843/2007 and the implementation rules EC Regulation 889/2009 cover a number of consumer perceptions regarding organic food processing like the use of organic raw materials, minimal use of additives, yearly certification, traceability and labelling concepts. In 2007 the EU Council Regulation (EC) 834/2007 established for the first time also principles for organic food processing.

Furthermore the exclusion of processing methods that might mislead regarding the true nature of the product or do not guarantee and maintain the integrity of the organic product are core principles in the EC Regulation 834/2007. But this raises a number of fundamental questions: To use deep frozen vegetables for a sterilized vegetable salad: is this misleading regarding the true nature of the product? Is such a product processed with care?

Regarding the choice of processing methods there is still no overall theoretical quality concept. More and more processing methods are already used which may be not in compliance with the principles of organic agriculture! Clear guidelines on product specific level for the evaluation of gentle/careful processing methods should be developed in close collaboration between the private sector, competent authorities, EU commission and the research.

With the possibility to produce additives of agricultural sources in certified organic quality new questions arose: are the established requirements for organic products sufficient for "organic additives"?

Is it still a goal to strive for the minimal use of additives or are organic additives like organic wheat starch or organic soya lecithin equal to the use of organic ingredients? Is the principle of "essential technological need" still valid when using more and more "organic" additives?

In addition organic products have to meet further environmental or sustainable criteria. Evaluating the ecological performance of an operation requires management procedures which generate relevant data on environmental parameters: an environmental management system. The organic sector should therefore discuss how to enable operators to install such procedures in the best way.

Fair trade is an equally important issue belonging to sustainability, but is still at a more experimental stage in the developed countries, contrary to already long-time introduced concepts in third world countries. Fair trade between farmers, transport organisations, processors and traders became more and more relevance. Last but not least the transparency is a major topic with regard to processing. May be new concepts for communicating with consumers must be developed, for example the environmental performance as well as careful processing methods of organic products needs to be communicated!

Keywords: organic food processing, naturalness, additives, processing methods, authentic, transparency

Acknowledgement: *We acknowledge the Commission of the European Communities as well as the Swiss Federal Office for Education and Science (BBW) for their financial support of the project QualityLowInputFood.*

L-10

QUALITY ASSESSMENT OF ORGANIC BABY FOOD MADE OF DIFFERENT PRE-PROCESSED RAW MATERIAL UNDER INDUSTRIAL PROCESSING CONDITIONS

K. Seidel^{1*}, J. Kahl², F. Paoletti³, I. Birlouez-Aragon⁴, F. Sinesio³ and U. Kretzschmar-Rüger¹

¹ Forschungsinstitut für biologischen Landbau FiBL, Food quality, safety and processing, Frick, Switzerland

² University of Kassel, Department of Organic Food Quality and Food Culture, Witzenhausen, Germany

³ Istituto Nazionale di Ricerca per gli Alimenti e la Nutrizione (INRAN), Roma, Italy

⁴ Spectralys innovations, Romainville, France

* E-mail: kathrin.seidel@fibl.org; Tel: 0041-628650406; Fax: 0041-628657273

Commercial as well as home-made baby food purée processed out of organic carrots has to warrant dietary adequacy, a high nutritive value, excellent food safety and sensory quality. The quality of baby food deeply depends on many factors within the production chain i. e. the quality of organic raw material, the pre-processing and storage treatments as well as the processing conditions.

The regulation framework for baby food (ECC Regulation 2006/141; ECC Directive 2006/125 and the correction document) is general oriented toward food safety. The concept is less oriented toward nutrient density, freshness or other "positive" quality approaches like sensory, nutritional value etc. In contrast organic food processing is focused on natural and careful processing methods (EC – Reg 834/2007) which should receive a high quality and nutritional value as the consumers expect.

"Gentle processing" of organic foods should save the good organic quality of raw material to the end product by evaluation critical quality influencing processing steps (QP) and improving the critical quality points (QP). As QP was the used raw material identified. The influence of the used raw material to the final product quality (fresh, stored-fresh, frozen,) was evaluated in this project. Therefore three industrial tests were performed with fresh, with frozen and with stored Swiss Demeter carrots (Bolero). Carrot raw material passed through various pre-processing stages, including washing, dicing, peeling and cutting for fresh and stored-fresh raw material, and additional through blanching and freezing for frozen carrot cubes. This pre-processed raw material was processed and sterilized to baby puree in glasses. Statistically significant differences were found for 11 sensory attributes among the three puree samples. Especially deep frozen processed samples differentiated for lighter global odour and flavour, canned odour and flavour, sweetness, saltiness and texture parameters. Samples processed from frozen carrots show increased moisture content as well as dramatic decrease of fumaric and malic acid. Compared to the fresh carrots, the heat processing caused a decrease of 24% in the total carotenoid concentration. Lutein concentration decrease was higher than that of alpha and beta-carotene. While the use of stored carrots and, more clearly, of frozen carrots resulted in a higher decrease of the carotene content. In the frozen puree sample also a higher level of volatile compounds was found. Biocrystallization can differentiate baby food samples from fresh and frozen raw material with high significance ($p < 0.001$). Also safety parameters as Furan, Furosine and CML were analysed and showed increased contents in puree of fresh carrots. It could be summarized that although sterilisation following the pre-treatment of the raw material, a significant influence on the quality the baby foods produced by fresh carrots were clearly discriminated. Our research showed that based on the method Quality Analysis of Critical Control Points (QACCP) quality factors for the improvement were determined and the product could be optimized.

Keywords: processing, carrot baby food, quality optimization, organic raw material

Acknowledgement: *The editors gratefully acknowledge financial support from the Core Organic Funding Bodies of Switzerland, Finland, France, Germany and Italy as well as the practical support from the two industrial partners.*

L-11

THE BIO-CRYSTALLIZATION METHOD AS A NEW INDICATOR FOR ORGANIC FOOD-QUALITY**N. Busscher^{1*}, J. Kahl¹ and A. Ploeger¹**

¹ Department of Organic Food Quality and Food Culture, Institute of Organic Agriculture/ University of Kassel, Kassel, Germany

* E-mail: busscher@uni-kassel.de; Tel: 0049(0)5542 98 1721; Fax: 0049(0)5542 98 1713

Crystallization patterns emerge when an aqueous di-hydrate copper chloride ($\text{CuCl}_2 \cdot 2 \text{H}_2\text{O}$) solution with the sample in question (e.g., a watery extract of food products) is crystallized on a glass plate. The laboratory procedures are described in standardized protocols. The patterns can be evaluated according to standardized evaluation methods. The standardization of the bio-crystallization method for organic food quality has been reported for carrots and milk (Kahl et al. 2009, Busscher et al. 2010a). Furthermore samples from different treatments (e.g. farming practices) could be significantly discriminated based on the texture analysis of the emerged crystal pictures (Szulc et al. 2010). In order to apply the bio-crystallization on food samples in addition to authentication issues, the relation of the emerging picture and its textural and structural features with food quality criteria and/or indicators has to be elaborated. Therefore the building process of the emerging picture needs to be understood more deeply according to its physical and chemical properties. The factors of influence of the evaporation- and crystallization process of the bio-crystallization in the presence of an additive (like a food sample) have been studied (Busscher et al. 2010b, Busscher et al. 2011). As a result of this investigation a negative process-entropy and the hypothesis of self organization characteristics were formulated. A negative process entropy and self-organization abilities may help to explain that pictures with a structure emerge. Based on this the hypothesis for the building process of the bio-crystallization picture can be formulated that the emerging picture is influenced by those properties of the additive, which are influencing the process-entropy and the self-organization. This would be a hypothetical basis for the connection of food quality with the concept of structure.

Keywords: bio-crystallization, pattern, self organization

L-12

NATURALNESS OF PROCESSED ORGANIC FOODS - POTENTIAL INTEREST OF THE FLUORESCENCE SENSOR NATURALYS**I. Birlouez-Aragon^{1*}, A. Acharid¹ and J. Kahl²**¹ Spectralys Innovation, BIOCITECH, Romaiville, France² Dep. Organic Food Quality and Food Culture, Witzenhausen, Germany

* E-mail: ines.birlouez@spectralys.fr; Tel: (33) 1 41 50 67 70; Fax: (33) 1 41 50 15 60

Although organic products should only respect the strict regulatory specifications regarding organic farming procedures, much higher expectations are expressed by the consumer. In addition to the protection of environment, a higher quality level of the organic food product itself is required, including higher sensorial and nutritional values and higher safety level.

Commercial organic processed products do not meet those requirements because similar processing technologies to those applied to conventional food products are used. And processing as well as storage induces vitamin loss, PUFA oxidation, loss of protein nutritional value and potentially formation of some neoformed contaminants, such as acrylamide and furan.

The lack of simple and cost effective analytical tools to monitor the quality loss during food processing and storage partly explains the little attention paid to the importance of the impact of production conditions on the final quality of the product. However, new spectral techniques such as fluorescence can provide useful and reliable information with that respect.

We present in this paper the fluorescence based sensor, Naturalys, that measures the fluorescence fingerprint of the food product, directly and non destructively in 25 seconds. Specifically adapted software allows analysis of the spectral information correlated to the impact of processing and storage. Shortly, after mathematical decomposition of the fluorescence image to reduce the number of informative variable regarding the physicochemical state of the product, the processed or stored product is compared to a reference that is the fresh product or the just processed product respectively. The result is given in percentage of global quality loss during the process.

Three examples are given that illustrate the pertinence of this global quality index, also named naturalness level. With the first example of organic carrot baby puree, it is shown that different processing techniques can be compared according to this global quality parameter that is correlated to both degradation of important nutrients and formation of the neoformed contaminant furan. The second example measures the loss of protein nutritional value according to the pasteurization or sterilization process applied, with particular insight on infant formulas of particular nutritional importance. Finally the example of fruit juices is given where loss of global sensorial and nutritional quality is evidenced during shelf life depending on packaging and storage temperature.

Keywords: Organic food, fluorescence, quality, naturalness, nutrition

L-13

METABOLOMIC FINGERPRINTING / PROFILING: THE CHALLENGE IN ORGANIC CROPS AUTHENTICATION**J. Hajšlová^{1*}, L. Václavík¹, V. Schulzová¹, H. Novotná¹**¹ Department of Food Chemistry and Analysis, Institute of Chemical Technology, Prague, Czech Republic

* E-mail: jana.hajslova@vscht.cz; Tel: +420220443185

Considering consumers' growing interest in food of local origin or food cultivated by organic farming practices, the introduction of reliable authentication strategies enabling to prevent fraud and helping to sustain confidence in organic products is urgently needed. Until now, various analytical approaches, mainly chromatography and spectroscopy - based methods, have been employed to distinguish organic crops from those grown under conventional conditions. Typically, various matrix components such as macronutrients (specific proteins, sugars, lipids,..) or minerals (such as nitrates) as well as minor constituents represented by vitamins, antioxidants, and other biologically active substances have been the most common target analytes.

Recently, 'omics' technologies that enable large-scale assessment of levels of mRNA (transcriptomics), proteins (proteomics) and metabolites (metabolomics) have emerged as a powerful tool in food commodities characterization. At the time of its emergence, the latter one, metabolomics was mainly viewed as an advanced, specialized tool of analytical biochemistry enabling innovative research on plants and other organisms. This 'omics' strategy centered around detection of the broadest possible range of small molecules (<1500 Da) in complex biological matrices has started to find applications also in organic food authentication. Metabolomics may be used either for 'fingerprinting' of samples to perform comparative analyses aimed at detection of differences or for 'profiling' in which individual, differential sample components (both primary and secondary metabolites) are identified for further chemometric assessment. With regard to a growing concern in organic foodstuffs, the control of their quality and authenticity becomes an urgent issue. Until now, a wide range of analytical approaches has been tested to distinguish organic crops from those grown under conventional conditions. Typical composition and levels of various components such as macronutrients (proteins, sugars, lipids) or minerals as well as minor components such as vitamins, antioxidants, and other biologically active substances, were analyzed for the purpose of comparison.

In this presentation, the results of several case studies concerned with authentication of organic food of both animal (milk) and plant origin (potato tubers, tomatoes, wheat, apples, peppers, medicinal plants etc.) will be presented. Advanced analytical techniques such as ambient mass spectrometry realized by DART (Direct Analysis in Real Time) ion source coupled with Orbitrap mass spectrometric (MS) detector or ultra performance liquid chromatography (UPLC) MS were employed for samples fingerprinting / profiling. Partial least squares linear discrimination analysis (PLS-LDA) was used for handling of the generated data aimed at construction of classification models.

Keywords: Metabolomics, Authentication, Fingerprinting, Organic crops**Acknowledgement:** *This study was carried out with support from the Ministry of Education, Youth and Sports, Czech Republic, the project MSM 6046137305 and specific university research (MSMT no. 21/2010).*

L-14

2011 APPROACHES FOR ORGANIC FOOD AND FEED AUTHENTICATION**S. van Ruth^{1*}, M. Alewijn¹, A. Tres¹ and G. van der Veer¹**¹ RIKILT, Wageningen UR, P.O. Box 230, 6700 AE Wageningen, The Netherlands

* E-mail: saskia.vanruth@wur.nl; Tel: +31-317-480256; Fax: +31-317-417717

People's growing awareness of health, environment and animal welfare has led to an increased public interest in the quality of foods and food production systems. This in turn boosted organic production. Due to higher production costs, organic produce tends to retail at a higher price than their conventional counterparts. As a consequence of the premium price, organic produce is susceptible to fraud. Fair competition between producers and sustained consumer confidence favour organic production, and it requires regular confirmatory assessments of the identity of organic produce in addition to administrative controls.

Traditional analytical strategies for guaranteeing quality and uncovering adulteration have relied on the determination of the amount of a marker compound or compounds in a material and a subsequent comparison of the value(s) obtained with those established for equivalent material. Authentication of organic produce is complex, and depends very much on the product examined. Therefore, it is unlikely to find a single marker that allows discrimination between organic and conventional produce in general. Even for a particular product, this approach is challenging. Selective fingerprinting, which involves analysis of a range of compounds which are considered potential discriminators, is the more promising approach. As these techniques result in a high number of variables the application of multivariate statistical methods greatly facilitate the evaluation of the data. In the presentation an overview on targeted single/multiple marker approaches will be provided, e.g. based on isotope ratio analysis, in addition to information on the fingerprint type of methodology. The various techniques will be illustrated with real life examples for both food and feed.

Keywords: Authentication, feed, food, fraud, organic

L-15

THE ORGTRACE PROJECT: CONTENT, BIOAVAILABILITY AND HEALTH EFFECTS OF TRACE ELEMENTS AND BIOACTIVE COMPONENTS OF FOOD PRODUCTS CULTIVATED IN ORGANIC AND CONVENTIONAL AGRICULTURAL SYSTEMS

S. Husted^{1*}, K.H. Laursen¹, E.H. Larsen², E. Kapolna², P. Knuthsen², M. Søltøft², S. Bügel³, A.B. Mark³, C. Lauridsen⁴, M. Jacobsen⁴, H. Jørgensen⁴, U. Halekoh⁵ and K. Kristensen⁵

¹ University of Copenhagen, Faculty of Life Sciences, Department of Agriculture and Ecology, Plant and Soil Science Laboratory, Thorvaldsensvej 40, DK-1871 Frederiksberg C, Denmark

* E-mail: shu@life.ku.dk; Tel: +4535333498; Fax: +4535283460

² Technical University of Denmark, The National Food Institute, Mørkhøj Bygade 19, DK-2860 Søborg, Denmark

³ University of Copenhagen, Faculty of Life Sciences, Department of Human Nutrition, Rolighedsvej 30, 1958 Frederiksberg C, Denmark

⁴ Aarhus University, Faculty of Agricultural Sciences, Department of Animal Health, Welfare and Nutrition, Research Centre Foulum, P.O. Box 50, 8830 Tjele, Denmark

⁵ Kristian Kristensen, Senior Scientist, Department of Genetics and Biotechnology, Statistics and Decision Analysis, Danish Institute of Agricultural Sciences, P.O.Box 50, 8830 Tjele, Denmark

Trace elements, bioactive secondary metabolites and vitamins are among the most important quality parameters in plants. Yet, very little information is available on their content, bioavailability and health effects in organically grown plant food products. The main objective of OrgTrace is to study the impact of different agricultural management practices relevant for organic farming on the ability of cereal and vegetable crops to absorb trace elements from the soil and to synthesize bioactive compounds (secondary metabolites, antioxidant vitamins and phytates) with health promoting effects.

Based on different plant products produced in OrgTrace, diets were composed and the bioavailabilities of health promoting substances were analyzed in a human intervention study. Moreover, various health effects such as immune system responses were studied using rats as model organisms.

OrgTrace is the first study, which follows selected elements and bioactive compounds all the way from the plant and soil system to absorption in the human body. All experimental studies have now been finalized and we are able to draw final conclusions.

In this oral and poster presentation the overall scientific idea of OrgTrace and the main results obtained will be presented.

Keywords: minerals, secondary metabolites, vitamins, diets, absorption

Acknowledgement: *The funding provided by ICROFS, International Center for Research in Organic Food Systems, Denmark contract 3304-FOJO-05-45 is greatly appreciated.*

L-16

AGRONOMICAL AND HYGIENIC-HEALTH QUALITY OF DURUM WHEAT PRODUCTIONS FROM DIFFERENT MEDITERRANEAN ENVIRONMENTS UNDER ORGANIC AND CONVENTIONAL CROPPING**M. Camerini^{1,2*}, F. Taddei^{2,3}, G. Bentivenga², S. Melloni², G. Aureli² and F. Quaranta²**¹ Università degli Studi del Molise, Dipartimento SAVA– Via F. De Sanctis 86100 Campobasso² CRA-QCE, Via Cassia 176 - 00189 Roma³ Università Campus Bio-Medico, Via A. Del Portillo 21, 00128 Roma

* E-mail: massimiliano.camerini@unimol.it; Tel: +39 – 339 - 7831935; Fax: +39 – 06 - 3319215

The data of the Italian Service Institute for the agricultural and food market (Ismea) show that in 2008, almost 120,000 hectares of durum wheat (*Triticum durum* Desf.) were managed organically, accounting for some 10% of total Italian durum wheat surface and representing more than 20% of national organically cultivated areas. In general, durum wheat productions from organic cropping are characterised by lower yields and protein content compared to grain from conventional agriculture, even due to limited readily-available nitrogen inputs. Furthermore, as weed control strategies cannot rely on the use of chemically synthesized compounds, crops are more exposed to the competitive action of weeds. Regarding health quality of organic productions, as the use of synthetic compounds is not permitted to control pathogens, some claims were made about a greater incidence of plant diseases on organically managed crops compared to conventional ones, with consequent increase of the risks for mycotoxins contamination.

In 2010, we compared the performance of 8 cultivars, differing in agronomical traits and duration of biological cycle, in 2 locations of south central Italy, namely Colletorto (South Apennine range) and Tarquinia (Central thyrrenic coast), under organic and conventional management. Several agronomical (heading date, plant height, N. of spikes/m², yield, test weight, thousand kernel weight) and quality (ashes, protein content, SDS, yellow index, Total Antioxidant Capacity, grain Deoxynivalenol content) parameters were evaluated and analysed using the technique of Principal Component Analysis (PCA).

Data analysis revealed how Tarquinia site was less favourable to organic production, as demonstrated by the clear separation of the two groups of productions in the PCA biplot; on the contrary, results from the Colletorto site were characterised by a less clear separation between organic and conventional production. DON concentrations were below the detection limit in almost all the assayed samples, and no differences emerged between organic and conventional grains. On the basis of the analyzed data, it seems that environments less suitable for high-yield conventional durum wheat cropping are more adapted to organic durum wheat farming, as limiting agroclimatic conditions don't allow cultivars to reach high yield levels. Moreover, limited to Deoxynivalenol contamination, our results showed how organic management is able to deliver productions whose hygienic-health quality isn't lower than conventionally derived ones.

Keywords: Durum wheat, Organic cropping, Quality, Deoxynivalenol

Acknowledgement: *We thank Dr. Mauro Fornara and Mr. Valerio Mazzon for their helpful, excellent technical assistance.*

L-17

EFFECTS OF ORGANIC AND CONVENTIONAL PRODUCTION SYSTEMS, GENOTYPE AND GRAIN STORAGE ON WINTER WHEAT TECHNOLOGICAL PROPERTIES**J. Ceseviciene^{1*}, A. Slepeliene¹, A. Leistrumaitė², V. Ruzgas²**

¹ Chemical Research Laboratory, Institute of Agriculture, Lithuanian Research Centre for Agriculture and Forestry, Akademija, Kedainiai distr., Lithuania

² Department of Cereal Breeding, Institute of Agriculture, Lithuanian Research Centre for Agriculture and Forestry, Akademija, Kedainiai distr., Lithuania

* E-mail: jurgita@lzi.lt; Tel: +37034737664; Fax: +37034737096

Research material was winter wheat (*Triticum aestive* L.) grain samples coming from the field experiments carried out over the 2008-2009 period at the Institute of Agriculture in Dotnuva, Lithuania. The study was aimed to estimate organic and conventional production systems, genotype and storage effects on grain - flour - dough - bread technological properties; increase the current knowledge about the interactions of winter wheat technological traits. Cluster analysis was applied to assess the differences in quality traits among the genotypes. The aim of selection was high quality, low input cultivars. Winter wheat technological properties of sixteen genotypes grown under organic and conventional production systems were evaluated twice a year (1 and 10 months after harvest). Grain protein content (DM) varied between 7.7 and 15.7%, falling number between 205 and 434 sec, depending on cultivar, production system, and storage. The results indicated significant effects of genotype, production system and storage on all quality traits. The extent of these effects differed; for all technological properties, the component of variation due to organic - conventional production systems was greater than due to genotype and storage, indicating the greater influence of production systems on these traits. However, for protein, starch contents, gluten quantity and quality, sedimentation and dough stability the genotype effect was higher than the effect due to storage. Falling number, flour water absorption and bread low volume traits are controlled more by storage effects than genetics. Significantly negative linear correlation was found between bread low volume and starch content (-0.39** ÷ -0.70**), while significantly positive linear correlation was found between bread low volume and protein content (0.44** ÷ 0.49**) in organic and conventional production systems at both evaluation times.

Keywords: winter wheat, organic, conventional, storage, technological properties

L-18**THE NUTRITIVE VALUE OF SELECTED TOMATO AND BELL PEPPER CULTIVARS FROM ORGANIC AND CONVENTIONAL PRODUCTION****E. Hallmann* and E. Rembiałkowska**

¹ Division of Organic Food, Department of Functional Food and Commodity, Warsaw University of Life Sciences - SGGW, Warsaw, Poland

* E-mail: ewelina_hallmann@sggw.pl; Tel: 048225937037; Fax: 048225937036

Tomato fruits contain high level of the antioxidants as vitamin C, polyphenols, including flavonoids and carotenoids as lycopene and beta-carotene. Sweet red bell pepper is one of the best source of the ascorbic acid and carotenoids, also of the phenolic compounds important in human diet. There were some studies showing the higher level of bioactive compounds in the organically produced tomato and bell pepper fruits than in the conventional ones, but not all studies were consistent in this respect. The levels of carotenoids and phenolics are very variable and may be affected by maturity, genotype and cultivation.

The aim of this study was to analyse the composition of tomato and bell pepper fruits cultivated in organic and conventional system. Two cultivars of standard tomato (Merkury and Rumba) and two cherry type tomatoes (Conchita and Picolino) have been analysed. The tomato fruits were cultivated in certified organic and conventional private farms located in Mazovia region in 2008 and 2009 years. The fruits were collected in the same stage of maturity in the organic and conventional farms. Tomatoes were freeze-dried and chemically analysed. The obtained results showed that in 2008 organic tomatoes contained significantly more dry matter, total sugars and vitamin C, p-coumaric acid, rutin and myricetin in comparison to the conventional fruits. In 2009 organic tomatoes contained significantly more dry matter, total and reducing sugars, organic acids, vitamin C, lycopene, gallic and chlorogenic acid, myricetin and kaempferol in comparison to the conventional fruits.

Three bell pepper cultivars Roberta, Spartacus and Berceo have been selected to study in 2008 and 2009 years. Vegetables were cultivated in the neighbouring organic and conventional farms. Fully ripe bell pepper fruits have been collected in the same week of fructification period and were chemically analysed. The carotenoids and phenolics including the profile have been determined in fruits. Organically produced bell peppers contained different profile of carotenoids and polyphenols in comparison to conventional one in two years of conducted experiment. In 2008 sweet bell pepper from organic cultivation contained significantly more gallic and chlorogenic acids, rutin, D-urocetin glucoside, kaempferol and quercetin, also carotenoids as: cryptoxanthin, antheroxanthin, luteolinoloxanthin. In 2009 organic bell pepper contained significantly more cis-beta-carotene, alpha-carotene, crypto-flavin, alpha-cryptoflavin and lutein. From phenolic compounds organic sweet bell pepper contained significantly more gallic and chlorogenic acids, D-kaempferol glucoside and kaempferol in comparison to the conventional one.

Keywords: tomato, bell pepper, organic, conventional, polyphenols, carotenoids

Acknowledgement: *We want to thank Polish Ministry of Agriculture and Rural Development for the financial support to conduct this study.*

L-19

EFFECT OF ORGANIC DIET ON BIOMARKERS OF HEALTH AND WELL-BEING IN RAT MODELS**C. Lauridsen^{1*}, U. Halekoh², M. Jacobsen¹, H. Jørgensen¹**

¹ Department of Animal Health and Bioscience, Aarhus University, Blichers Alle 20, Postbox 50, 8830 Tjele, Denmark

² Department of Genetics and Biotechnology, Aarhus University, Blichers Alle 20, Postbox 50, 8830 Tjele, Denmark

* E-mail: charlotte.lauridsen@agrsci.dk; Tel: +45-89991238; Fax: +45-89991166

Most studies reported in the literature on organic versus conventional production systems and health impact suffer from the fact that only one replication per food produce was used, whereby the variation due to other sources could not be estimated. The overall objective of the present studies was to study the effects of foods-based on well-defined and well-controlled food produce systems - on health and well-being after long-term consumption using the rat as a model.

The crops used in Exp. 1 were obtained from a 2-year field trial study at three different locations (Foulum, Jyndevad and Flakkebjerg) in Denmark using two replications (plots). The crops (barley, faba beans, potatoes, wheat and rape seed) were grown in the long-term CropSys crop rotation experiment (<http://www.cropsys.elr.dk/uk/>) using three different agricultural systems: one conventional (C) and two organic growth systems (OA, organic using animal manure, and OB, organic using cover crops). Diets of each cultivation system were prepared at Research Centre Foulum, freeze-dried and kept frozen until use.

Carrots for experiment 2 were grown in the VegQure crop rotation experiment (<http://www.vegquire.elr.dk/uk/>) located at Aarslev. The cultivation systems and harvest years were similar as described above, and three replications (plots) were used. Carrots of each cultivation system were freeze-dried, and carrot-diets were prepared containing 40% carrot and 60% altromin (laboratory rat chow).

Experimental rats were obtained from Taconic a/s (Lille Skensved, Denmark) at weaning, and were fed the diets throughout the experiments. A control group of rats was included in both experiments, which was fed 100% of the altromin. Several biomarkers of health were assessed *in vivo* (growth, physical activity, bioavailability, clinical data), and *post mortem* (clinical evaluation, blood and tissue sampling for several indicators of nutritional status, immunity, and antioxidant activity).

Subsets of variables relating to fat, plasma or liver measurements of Exp. 1 were analyzed in a multivariate statistical model, and by visually graphical inspection (discriminant component analysis plot), it was possible to differentiate the three cultivation systems. However, only harvest year had a significant impact. Preliminary results showed that the concentration of immunoglobulin G in plasma of rats was influenced cultivation system. Regarding Exp. 2, harvest year rather than cultivation system influenced the used biomarkers in rats fed carrots, and where dietary difference was obtained, this was ascribed to difference between carrot diets and Altromin rather than cultivation system. In conclusion, several growing factors than just cultivation affect healthiness of vegetable products.

Keywords: organic food, conventional food, immunity, carrots

Acknowledgement: *The work of experiment 1 was financially supported by the Ministry of Food, Agriculture, and Fisheries, Denmark, and coordinated by the International Centre for Research in Organic Food Systems (ICROFS) via the OrgTrace project <http://www.orgtrace.elr.dk/uk/>). The work of experiment 2 was financially supported via the EU FP6 ERA-net CORE Organic program through the QACCP-project (<http://www.coreorganic.org/research/#Anchor-QACC-25881>).*

L-20**IMPACT OF ORGANIC FEED ON PIGS' HEALTH****A. Sundrum^{1*}**

¹ Department of Animal Nutrition and Animal Health, University of Kassel, Germany

* E-mail: Sundrum@uni-kassel.de

Organically produced plants are the source of food for humans and feed for farm animals. Whether and to what degree organic feed has a resounding impact on pigs' health, cannot be answered by a simple "yes" or "no" but depends on complex interactions between various factors. The focus here lies on the quality of feed and the feeding regime.

State of the art regarding the quality of organic feed for pigs is outlined, based on a literature review. Major points were: macro and micro nutrients varied to a high degree between harvesting. Organic feed in general contained more minerals and anti-oxidant micronutrients than conventional products. Pesticide residues have seldom been detected while fungal toxins have been found repeatedly in different survey studies.

The results of a current epidemiological study conducted in a total of 101 organic pig farms in six European countries are highlighted with respect to the implemented feeding regimes. When asked for the origin of their feed, six farms produced 100 % of their feed themselves, whereas 52 farms indicated that more than 50 % of the feed ration consisted of home-grown feed while on 43 farms less than 50 % originated from the farm. Concerning controlling of the nutrient supply, 46 of the farms did not make use of any feed analyses. 64 farmers did not prompt analyses of feed or straw for the presence of fungal toxins. In total, 16 farms did not conduct any calculations of the feed ration, while 40 farmers formulated the diets based on values from the literature and 45 farmers on values from recent feed analyses. Only few farmers made use of the options for multiple phase feeding.

Due to the large heterogeneity between farms with respect to feed quality and feeding regimes, no general conclusions can be drawn regarding the impact of organic feed on pigs' health. On the other hand, various options are to the farmer's disposal to optimise feed quality and feeding regime. Whether organic farmers are successful in making use of these tools can be judged only by an ongoing assessment of the farm's status of pigs' health.

It is concluded that a result oriented approach is required to provide valid information and induce adequate feedback mechanisms on the farm level, while meeting the expectations of consumers with respect to pigs' health and justifying premium prices for organic pork.

Keywords: pig, animal health, output approach

L-21

EVALUATION OF HEALTH EFFECT OF ORGANIC AND CONVENTIONAL CARROTS**M. Roselli¹, A. Finamore¹, E. Brasili¹ and E. Mengheri^{1*}**¹ Istituto Nazionale di Ricerca per gli Alimenti e la Nutrizione (INRAN), Rome, Italy

* E-mail: mengheri@inran.it; Tel: +39-6-51494523; Fax: +39-6-51494550

Studies on the health effect of organic products are still limited and often contradictory, possibly due to variability in the farming system, year of the harvest, climate, soil conditions and degree of ripeness. Carrots are one of the most common vegetables, but there is still a need to verify the health effects of organic carrots, and their relationship with growing conditions and year production. For this reason, in the present study we investigated whether different cultivars of organic (ORG) and conventional (CV) carrots of two years production could differently modulate mice intestinal and peripheral immune function. We have considered the gut immune function since it represents the first line of defence against pathogens and dangerous environmental agents, and ensures a relevant immune defence .

Carrots: Danish (Bolero variety) and Italian (Maestro and Excelso varieties) carrots from 2007 and 2008 harvests were used. The Danish carrots were grown in three ORG (ORG1, ORG2 and ORG3) and one CV cropping systems. The three ORG crop rotations had increasing content of cover crops for nutrient management and intercrops to increase biodiversity and natural mechanisms for pest regulation. The Italian carrots were grown in one ORG and one CV field for each variety, situated close to each other.

Animals: Balb/c mice, 21 days old, were fed for 1 month with diets containing the different ORG or CV freeze-dried carrots (70 g/kg diet). Immune phenotypes of blood, spleen and gut *lamina propria* and intraepithelial lymphocytes (LPLs and IELs, respectively) were analyzed by flow cytometry. Cytokines were analyzed from sera by a cytometric assay.

No significant differences were found in body weight and food intake among the different groups of animals fed either ORG or CV Danish and Italian carrots, independently of the year production. The consumption of ORG2 and ORG3 both on the first and second year of carrot production had similar effects on the distribution of lymphocyte populations in IELs, LPLs, spleen and blood, and differed from the effect of ORG1 consumption. Concerning the Italian carrots, more differences between ORG and CV carrots were observed in the first year, as compared to the second year. The analysis of pro - and anti-inflammatory cytokines did not reveal any significant differences among ORG and CV Danish and Italian carrots.

Although a great variability was observed between the first and second year carrot harvests, no adverse effects were found after the ORG carrots consumption, both from Danish and Italian trials.

Keywords: organic carrots, immune response, mice

Acknowledgements: Work supported by Italian Ministry MIPAAF, Grant no. 2006 "QACCP".

L-22**IMPLICATIONS FOR HEALTH OF DIFFERENCES IN FATTY ACID COMPOSITION OF ORGANIC VERSUS CONVENTIONAL MILK****Ch. Seal^{1,2}, G. Butler^{1,3}, S. Stergiadis^{2,3} and C. Leifert^{2,3}**¹ Human Nutrition Research Centre, Newcastle University, Newcastle upon Tyne NE1 7RU, UK² School of Agriculture, Food & Rural Development, Newcastle University, Newcastle upon Tyne NE1 7RU, UK³ Nafferton Ecological Farming Group, Newcastle University, Stocksfield, Northumberland, NE43 7XD

Differences in animal management systems have a major impact on all aspects of animal production including product yield, product sensory characteristics and nutrient composition; the consequence of changing management systems, therefore, has impacts throughout the food chain from the primary producer to the consumer. We have completed a number of studies investigating the impact of organic managements systems on milk fatty acid composition, including the relative proportions of saturated, monounsaturated and polyunsaturated fatty acids in milk. In addition we have focussed on the analysis of the conjugated linoleic acids of the C18 series (conjugated linoleic acids or CLA) which are of particular interest because of their reported effects on a number of lifestyle diseases such as obesity, cancer and hypertension. We showed significant seasonal effects on milk fatty acid content with higher concentrations of polyunsaturated fatty acids and CLA isomers in organic compared with conventional milks and higher concentrations in summer compared with winter sampling periods. These differences were not only seen in milk at the farm level but also in supermarket milk, clearly demonstrating that changing management systems will affect the composition of products entering the human diet. The relevance of these differences in the context of human health, however, has not been investigated in intervention trials and such experiments are clearly required. In the meantime, predictions of the benefits of consuming organic dairy foods can be made using knowledge of concentrations of fatty acids in [dairy] foods and their habitual intake in the human diet. Dairy foods are the principal source of CLA in the diet, and so it is possible to calculate differences in CLA intake based on changing dairy foods from conventional management systems with those produced under organic conditions. These empirical calculations can then be used to predict possible health benefits in comparison with studies where fatty acid intake has been artificially manipulated. The results of such calculations and the potential magnitude of beneficial effects will be discussed in this presentation.

L-23

EFFECT OF CONSUMPTION OF ORGANICALLY AND CONVENTIONALLY PRODUCED APPLES/CARROTS ON DNA DAMAGE IN HEALTHY HUMANS**K. Briviba^{1*}, B.A. Stracke¹, C.E. Rüfer¹, A. Bub¹ and B. Watzl¹**

¹ Institute of Physiology and Biochemistry of Nutrition, Max Rubner-Institut, Federal Research Centre for Nutrition and Food, Karlsruhe, Germany

* E-mail: karlis.briviba@mri.bund.de

Epidemiological and experimental data suggest that an increased intake of plant food rich in polyphenols and carotenoids can reduce the risk of cancers. DNA damage is an important step in the initiation of carcinogenesis.

Here we report our data on the effects of consumption of organic and conventionally produced apples and carrots grown under controlled conditions on DNA damage in human peripheral blood lymphocytes (PBL).

Six healthy volunteers consumed either organically or conventionally grown apples (Golden Delicious, 1000 g) in a double-blinded, randomized, crossover study. Neither statistically significant difference in the sum of phenolic compounds, nor in either of the polyphenol classes were found between the agricultural methods. Consumption of neither organically nor conventionally grown apples caused any changes in endogenous DNA strand breaks, Fpg protein-sensitive sites or capacity to protect DNA against damage caused by hydrogen peroxide. But, a statistically significant decrease in the levels of endonuclease III sensitive sites and an increased capacity to protect DNA against damage induced by iron chloride were determined 24 h after consumption of either organic or conventional grown apples indicating an antigenotoxic potential of both organically or conventionally grown apples.

Further, we have investigated the effect of either organically or conventionally produced carrots on DNA damage in an intervention study. Consumption of organically or conventionally produced carrots (200 g/d, for 2 weeks) significantly increased plasma α - and β -carotene concentration in both intervention groups. But, there was no effect on exogenous DNA damage in human PBLs.

Thus, these results indicate that the agricultural system does not necessarily lead either to differences in phytochemical content (polyphenols, carotenoids) in apples and carrots or antigenotoxic effects. Furthermore, this study identified apples as a fruit with antigenotoxic properties and partly characterized their antigenotoxic mechanism in humans.

Keywords: Apple, carrot, organic, conventional agricultural methods, DNA damage

Acknowledgement: *The present study was supported by the Federal Agency for Agriculture and Food; Bundesprogramm ökologischer Landbau (04OE027). The authors thank P. Weibel, Research Institute of Organic Agriculture, Frick, Switzerland, and G. Rahmann, Heinrich von Thünen-Institute, Westerau, Germany, for providing the apples and carrots, respectively.*

L-24

UNTARGETED METABOLOMICS OF HUMAN BREAST MILK IN A COHORT WITH 46% CONSUMERS OF PREDOMINANTLY ORGANIC FOOD**A. Mie^{1*}, F. Stenius^{1,2}, H. Rosenlund³, A. Nordström⁴, A. Bergström³, J. Alm^{1,2}**¹ Department of Clinical Research and Education, Södersjukhuset, Karolinska-Institutet, Stockholm, Sweden² Sachs' Children's Hospital, Södersjukhuset, Stockholm, Sweden³ Institute of Environmental Medicine, Karolinska - Institutet, Stockholm, Sweden⁴ Department of Oncology - Pathology, Karolinska Institutet, Stockholm, Sweden

* E-mail: axel.mie@ki.se; Tel: +46-8-616 39 51; Fax: +46-8-616 29 33

Several cross-sectional studies have shown that children in anthroposophic families have a substantially lower risk of developing allergic diseases compared to children in non-anthroposophic families. The ALADDIN study (Assessment of Lifestyle and Allergic Disease During Infancy) is a birth cohort study including 550 children from anthroposophic, partly anthroposophic and non-anthroposophic families in the area of Järna, Sweden. ALADDIN is aimed at elucidating which lifestyle factors during pregnancy, infancy and early childhood account for the observed protective effect on development of allergy.

A number of hypotheses for explaining this effect have been developed within ALADDIN. One hypothesis claims that differences in lifestyle are reflected in the breast milk composition, with consequences for the infant's nutrient supply, intestinal flora and immune system. In the cohort 46 % of the mothers reported a predominantly organic diet. The present sub-study investigates differences in breast milk composition of mothers to two months old infants using non-targeted metabolomics.

Breast milk samples of 250 mothers are analyzed by non-targeted metabolomics. Separation is achieved by reversed-phase (RP-LC) and hydrophilic interaction (HILIC) ultrahigh pressure liquid chromatography. Detection is achieved using q-ToF mass spectrometry (MS) with positive and negative electrospray ionisation. This broad analysis aims at detecting as many small molecules (50-1200 atomic mass units) as possible. After peak alignment, data are analyzed for a differential effect of lifestyle factors on the concentration of individual compounds in the breast milk, and compounds of interest are chemically identified.

The study design, the number of samples and the collected questionnaire and interview lifestyle information allow for the differentiation of the impact of various lifestyle factors on the breast milk metabolome, including the effect of the consumption of predominantly organic or conventional food by the mother. Initial results are presented.

Keywords: anthroposophic lifestyle, organic and conventional food, allergy in children, breast milk, metabolomics

L-25

NO EFFECTS OF ORGANIC AND CONVENTIONAL DIETS ON INTAKE AND ABSORPTION OF ZINC AND COPPER IN MEN – EVIDENCE FROM TWO CROSS-OVER TRIALS USING STABLE ENRICHED ISOTOPES

A.B. Mark^{1*}, E. Kapolna², K.H. Laursen³, U. Halekoh⁴, S.K. Rasmussen³, S. Husted³, E.H. Larsen² and S. Bügel¹

¹ Department of Human Nutrition, Faculty of Life Sciences, University of Copenhagen, Frederiksberg, Denmark

² Department of Food Chemistry, National Food Institute, Technical University of Denmark, Denmark

³ Plant and Soil Science Section, Department of Agriculture and Ecology, Faculty of Life Sciences, University of Copenhagen, Frederiksberg, Denmark

⁴ Department of Genetics and Biotechnology, Research Centre Foulum, Aarhus University, Denmark

* E-mail: alzb@life.ku.dk; Tel: +4535332623; Fax: +4535332483

Background: Organic foods have been repeatedly claimed to have a higher content of nutrients, but little is known about the effect of production method on absorption of nutrients *in vivo*.

Objectives: Our aim was to investigate the effects of organic and conventional diets on intake and absorption of zinc and copper in humans.

Design: A double-blind, cross-over, intervention trial (3 dietary periods of 12 d, separated with 2-wk-long wash-out periods) was performed in 2008 (n=17) and 2009 (n=16) in young men. The diets were based on 9 crops grown in 2 organic and 1 conventional systems in 2 replications over 2 y. Primary outcomes were intake and apparent absorption of zinc and copper (the latter determined by fecal excretion of stable enriched isotopes extrinsically added to the entire menu).

Results: Within each y, intake and absorption of zinc (overall mean \pm SD 12.35 \pm 0.47 mg/10MJ and 44.6% \pm 12.1, respectively) and copper (overall mean \pm SD 2.12 \pm 0.28 mg/10MJ and 41.2% \pm 13.2, respectively) were not significantly different between the organic and conventional diets. Growing season had no effect on zinc intake and absorption. However, in 2008 copper intake was higher (P=0.01) and absorption lower (P<0.005) compared with 2009 (mean absorption \pm SD; 35.3% \pm 13.5 in 2008 and 54.0% \pm 10.7 in 2009).

Conclusions: Zinc and copper were well absorbed from the investigated diets. The consumption of organic diets did not improve apparent absorption of these trace elements compared with the conventional diets.

Keywords: Organic foods, trace elements, apparent absorption, men

Acknowledgement: *We thank all the subjects; the excellent laboratory and kitchen staff and the students from the Department of Human Nutrition, LIFE, KU, DK; the technical staff from the Department of Food Chemistry, DTU, DK, the coordinators of the field trials from the Department of Agroecology and Environment, Faculty of Agricultural Sciences, AU, DK and the technical staff from the Plant and Soil Science Section, Department of Agriculture and Ecology, LIFE, KU.*

L-26**CONCEPTS OF HEALTH, RELATING TO ORGANIC FOOD****F.A.C. Wiegant¹, M.H. Bakker¹, W. Dijk¹, H.A.B. Prins¹ and M.A.S Huber¹**¹ Dptm. Biology, Utrecht University, The Netherlands

* E-mail: f.a.c.wiegant@uu.nl

The health benefits of consuming organically produced foods compared to conventional foods are unclear. Important obstacles to draw clear conclusions in this field of research are: 1) the lack of a clear operational definition of 'health', 2) the inability to distinguish between different stages of healthiness using valid biomarkers and 3) difficulties in identifying an overall integrative physiological explanation of effects induced by the consumption of organically produced food in comparison with those induced by consumption of conventional food.

In this paper, some shortcomings of the current definition of health are outlined. In particular, it is explained how implementing a dynamic component into the definition of health, which is reflected by the ability to adapt, is of particular importance.

The state of health could then be determined by challenging an individual with some form of stress and subsequently by evaluating and qualifying the coherence in recovery of various physiological processes and parameters. A set of relevant parameters include the activity of the immune system and the activity of the autonomous nervous system (ECG, EEG, GSR). A well-coordinated pattern of recovery towards homeostasis is suggested to reflect a qualitatively good state of 'health'. Adding a dynamic component to the current concept of health would allow for classification of various levels of 'health' within individuals, who are all considered to be healthy. Furthermore, it would enable objective evaluation of preventive strategies, including the consumption of organically related foods that aim to strengthen health.

To further analyze the mechanisms that facilitate and maintain a general state of health, the concepts of 'homeostasis' and 'allostasis' are addressed. Also, a number of concepts that are related to these underlying mechanisms are outlined. These include 'the ability to adapt', 'resilience', and 'robustness'. Finally, the concept of 'hormesis' is addressed as a possible explanation in which a variety of physiological mechanism are triggered leading to beneficial health-related effects of organic foods as compared to conventional foods.

L-27

IS IT STILL REALISTIC TO EXPECT HEALTH EFFECTS FROM ORGANIC FOOD?**M.A.S. Huber¹**¹ Department of Health Care and Nutrition, Louis Bolk Institute, Driebergen, The Netherlands

* E-mail: m.huber@Louisbolk.nl; Tel: 00 31 343 523876 Fax: 00 31 343 515611

The topic of health effects of organic food has a high societal interest, although scientifically there is still much uncertainty. Within the categories of science, as discriminated by sociologists Funtowicz and Ravetz (1991), this topic of research is placed in the category of "post-normal science", which means that scientists may display strong reactions towards the topic, either positive or negative. This implies that science performed on the topic needs to be solid. Proof will not be found quick, but the body of evidence is growing.

The topic is complex: either the products can be studied, or their effects in consumers, being animals or humans. The quality of the products varies strong, relating to the years since transition to organic soil management, the skills of the farmer, the varieties chosen and the year and its climatic conditions.

And if effects are being studied, is this the uptake, excretion, or physiological effects? Which effects are being studied and in what kind of design? And how should these be interpreted?

In a recent systematic review Dangour et al.(2010) concluded that no health effects from organic food could be found. One reason was that too few as well as not comparable studies were performed. As health outcomes the influence of organic food on a range of defined illnesses was chosen, among which allergies an immune related disease, diabetes, cardiovascular disease and cancer. Only in allergies some effects are being found. It can be questioned if it is realistic to expect scientifically verifiable effects from organic food on such medical situations, which usually require serious medication. It will be argued that a different view on health and health effects, in the sense of resilience and the ability to adapt and to cope, might be more appropriate when studying effects from organic food. Some examples will be discussed, as well as a perspective for research.

Keywords: organic food, definition of health, health effects

**WORKSHOP
LECTURES
(LW-1 – LW-10)**

LW-1**QUALITY CONCEPTS OF ORGANIC FOODS FROM PAST TO FUTURE****A. Ploeger^{1*}**

¹ Department of Organic Food Quality and Food Culture, University of Kassel, Nordbahnhofstrasse 1a 37213 Witzenhausen, Germany

* E-mail: a.ploeger@uni-kassel.de

In the past quality concepts for food included nutrition as an important part of a lifestyle linked to personal values and a concept of health. Examples for this are food quality concepts in ancient Chinese or Indian medicine such as TCM (Traditional Chinese Medicine) or Ayurveda (Sanskrit scripts). In Greek language “diaita” included all measures (sports, food, nutrition, lifestyle) supporting human health (body and soul). Today the meaning of “diet” has changed and is mainly focusing on nutrients to support the human metabolism. Today nutrigenomics/ metabolomics are research areas where a lot of money is spent to understand an individual health supporting nutrition. Therefore fortification of food is a logical development in food industry.

In Europe especially in the 1920 to 1950 (period of industrialization) a new so called “Reform movement” tried to link nature and food to human health and life style (e.g. in Switzerland Dr. Bircher - Benner, in Germany Rudolf Steiner, Werner Kollath, in Great Britain Sir Albert Howard and Lady Eve Balfour). They all shared the antagonism to intervention that caused “denaturing” of food such as artificial, synthetic fertilizers for farming or “industrial” food processing changing the value of food for human health. Lady Eve Balfour claimed a memorable concept of health: “health, whether of soil, plant, animal and man is one and indivisible” (Balfour, 1943 p. 28). She called that the “natural cycle”. According to her opinion the quality of soil should be transmitted to plants and then to animals or man directly. Has this assumption been proven? Is it still valid? Thinking of organic food today the question is if there is still the “concept” of linking nature, food and human health?

This paper focuses on today’s understanding of human health and “nutrition”, how quality is defined in Europe in general and if there is still a different understanding of food quality for organic foods? Do we see “a quality concept” when we are looking deeper into the regulations for organic agriculture and organic food processing? Do people expect a “plus” for their health purchasing organic food and how can we interpret Lady Eve Balfour’s concept today?

LW-2**ORGANIC FOOD QUALITY: A FRAMEWORK FOR CONCEPT, DEFINITION AND EVALUATION FROM EUROPEAN PERSPECTIVE**

J. Kahl^{1*}, T. Baars¹, S. Bügel¹, N. Busscher¹, M.A.S. Huber¹, D. Kusche¹, E. Rembiałkowska¹, K. Seidel¹, B. Taupier-Letage¹, A. Velimirov¹, A. Załęcka¹

¹ FQH c/o Louis Bolk Institute, Driebergen, The Netherlands

* E-mail: kahl@uni-kassel.de

FQH (www.fqh.org) experts elaborated a framework for concept, definition and evaluation for organic food quality. The work was carried out within FQH in four expert workshops to give arguments for a substantial debate on this topic. The EC Regulation 834/2007 is defining organic agriculture and food production as based on natural substances and processes. Naturalness, used for the constructed concept of nature, may be therefore the guiding factor for organic stakeholders. IFOAM (International Federation Organic Agricultural Movement) defines the goal of organic food production as related to health and sustainability. Whereas sustainability is used to describe the motivation in production, health is mentioned for process and product related issues. A conceptual framework for organic food has to consider a whole chain approach from field to fork and a system approach with an understanding of a living organism as the start. The quality of organic food can be described according to a process and product related aspect. The product related aspect, which was focused on, can be further described by product attributes (criteria). In addition to already described criteria as nutrition, criteria of organic food derived from 834/2007 "vital qualities", "organic integrity" and "true nature" were defined in a consensus discussion among the experts. For evaluation each criteria has to be described by indicators. The determination of indicators should be through parameters, where parameters are part of detection methods. The definition of indicators and parameters is a broad and complex issue which has to be supported by experts from the different disciplines and stimulated as well as reflected upon by the stakeholders. The target for organic food quality assessed within the four scales should contribute to the improvement and development of existing and new production methods, development of Code of Practices (best management praxis) and authentication of organic food (test if or to what degree organic production methods were applied).

Keywords: organic food, naturalness, vital qualities, organic integrity, true nature

LW-3

SENSORY PERCEPTION OF FOOD PRODUCTS: HOW DO USERS AND NON-USERS OF ORGANIC PRODUCTS DIFFER?**T. Obermowe^{1*}, K. Scholz¹, S. Hemmerling¹ and A. Spiller¹**¹ University of Göttingen- Department of Agricultural Economics and Rural Development, Göttingen, Germany

* Email: tobermo@uni-goettingen.de; Tel: +0049-551394827; Fax: +0049-5513912122

The growth of the German organic food market is linked with changing market structures and challenging consumer needs. As the respective literature shows egocentric purchasing motives such as health, freshness and taste have become increasingly important, whereas altruistic motives such as animal welfare and environmental aspects tend to influence a buying decision for organic food products less and less.

Concluding from numerous studies and surveys, conducted not only in Germany but in many European countries, especially sensory aspects seem to be of greater relevance for the buying decision in favor of organic food. According to those findings, particularly food properties such as odor, appearance and taste are used to evaluate the quality of organic food products and therefore constitute influencing factors of sensory preferences. The literature review reveals that there is a strong need for analyzing differing sensory perceptions and preferences of the consumers in order to develop target group specific marketing strategies for organic products.

To this end an online survey conducted in June 2009 in Germany investigates the nutrition behavior, consumption habits and sensory preferences of 294 respondents. Even though taste didn't result as a determining buying motive in this investigation in opposition to the findings of other surveys, the hypothesis that consumers and non-consumers of organic products differ in their sensory preferences has been proved right for one dimension of the sensory preferences, i.e. natural flavor. As expected, the consumers of organic food products show a significant higher mean preference for natural flavor than the subjects who claim not to consume organic food. Moreover, differentiating between intensive-, medium-, seldom- and non-users, using an index built on the frequency of consumption of different product categories, it emerged that a high intensity of consuming organic products suggests a high preference for natural tasting food. Thus, the subjects with an intensive frequency of organic food consumption show the highest average preference, followed by the medium-users, whereas seldom- and non-users have significant low, yet negative mean preferences for the naturalness of taste.

All in all, the outcomes of both the survey as well as the corresponding literature review indicate the necessity for a more differentiated examination of organic food consumers regarding their sensory preferences. In this context, the EU-funded research project ECROPOLIS provides a promising approach by discerning different target groups for the organic food market considering consumers' dietary habits as well as their sensory perception and preferences. Combining marketing and sensory research tools the project aims at identifying consumer typologies as well as corresponding market strategies in six different European countries.

Keywords: German organic food consumers, sensory preferences, online survey, natural taste

LW-4**ORGANIC FOOD PRODUCTS: DIRECT MARKETING AND CONSUMERS' TRUST IN LITHUANIA****V. Skulskis^{1*} and V. Girgzdiene¹**

¹ Lithuanian Institute of Agrarian Economics, V. Kudirkos Str. 18, 03105 Vilnius, Lithuania

* E-mail: virgis@laei.lt; Tel: 00370 5 261 81 47; Fax: 00370 5 261 45 24

The production and consumption of organic food products is growing steadily. According to M. Truninger (2006) and F. Schneider et. al. (2009), consumers' trust in these products has a double meaning: institutional trust (trust in the system of organic production) and personal trust (trust in organic movement and its participants).

The aim of the research is to identify the key factors of direct marketing that influence consumers' choice to buy organic food products.

The research was based on the results of survey carried out in Vilnius, and the data of questionnaires were analysed using methods of systemic analysis. In total 502 respondents (of which 49% men and 51% women) answered presented questions. Percentage distribution of respondents in age groups (18-29; 30-39; 40-49; 50-59 and 60+) was rather equal (17-21%).

Results: The most important reason why 77% of respondents buy organic food products is that, in their opinion, these products are healthier than conventional food. 60% of respondents think that the main reason which lowers the popularity of organic food is too high prices in comparison with the prices of conventional products. Even 66% of respondents trust (and 30% distrust) in the quality of organic products bought in farmers' markets and only 51% trust (and even 47% distrust) supermarkets. Families with high income and younger purchasers more often trust in the quality of such products sold in farmers' markets, but the trust of older consumers gradually goes down. Even 82% of respondents accept (40% absolutely accept and 42% more accept than not) the idea to sell organic products in special markets.

The most often named factor that might increase consumers trust in organic food is an additional quality control of these products (in total 63% of respondents named it and 31% indicated it as the most important). According to the named frequency (56%), the purchase from the known or familiar organic farmers ranks second.

More and more organic products are sold in farmers' markets and fairs: according to the acceptance, this channel of sales ranks second among the most popular trade places of organic products (54% of respondents named it). But for the meantime supermarkets still rank first as the main place of organic food purchase (named by 62% of respondents, -mostly young).

Conclusions: The results of the research prove the growing up consumers' interest in direct sales of organic food products. 82% of Vilnius residents (consumers of these products) accept the idea to sell organic products in separate farmers' markets since consumers trust in the quality of products bought in such markets is greater, but they want a stronger control.

Keywords: organic food products, direct marketing of organic food, consumers' trust

LW-5**HEALTH EFFECTS OF AN ORGANIC DIET - CONSUMER EXPERIENCES IN THE NETHERLANDS****L.P.L. van de Vijver^{1*}**¹ Department of Health Care and Nutrition, Louis Bolk Institute, Driebergen, The Netherlands

* E-mail: l.vandevijver@Louisbolk.nl; Tel: 00 31 343 523872; Fax: 00 31 343 515611

In a qualitative research, with the consumer of organic products as the expert pre-eminently, respondents were asked to fill out an online questionnaire, with questions about their personal experience with organic food. Especially those people who changed from conventional into organic food consumption are able to describe effects on their personal health and were asked to participate. The questionnaire consisted of 43 questions, both multiple choice and open. The questions on the experienced effects were open, to ensure that the participant was fully free to describe all the effects he/she had noticed. Further, the participants were asked in how far they agree/disagree with a series of statements on health effects of organic foods.

In total 565 respondents participated.

Of these, a fourth part experienced no health effects, whereas the other three fourth described one or more health effects. Health effects mentioned were¹:

- better general health/resistance (50%); less often ill, and when ill the number of days is lower
- more fit and more energetic (27%)
- positive effect on psychic wellbeing (22%)
- improved stomach and bowel function (17%)
- improved condition of skin, hair and/or nails (13%)
- less allergic complaints (10%)
- better satiation (10%)

This research is a qualitative research, and therefore by definition subjective. On the other hand, an explanation for these experienced health effects may be found in objectively measured differences in nutritional content between organic and conventional food. Organic food contains on average more antioxidants, more fibre and more dry matter. Further, next to the change of the origin of the food (organic instead of conventional) the choice of products often changes, less ready-to-eat meals and more fresh products are chosen. Next to this, the choice for organic seems to be part of a whole process of realization, which also may lead to changes in other lifestyle factors.

Research, in which the consumer has the opportunity to speak out, shows to be a very informative way to get insight into the experiences of the consumers with organic food. From this study it shows that $\frac{3}{4}$ had experienced some kind of health effect. This information helps to form a basis for several hypotheses and will be used as point of support for new research.

Keywords: Consumer, experience, health effect, online questionnaire

¹ %= percentage of subjects mentioning this effect

LW-6**OVERCOMING UNDERNUTRITION WITH LOCAL RESOURCES IN AFRICA, ASIA AND LATIN AMERICA****M.B. Krawinkel^{1*}**

¹ Institute of Nutritional Sciences and Dept. of Pediatrics and Adolescent Health, Justus-Liebig-Universitaet Giessen, Germany

* E-mail: Michael.Krawinkel@ernaehrung.uni-giessen.de

Local resources for food security are widely underestimated in areas where development has cut the chains of traditional knowledge and skills of the population. Therefore, often research is needed in order to identify and examine the neglected food plants and animals. This is especially true for fruits and vegetables but also relevant for e.g. the consumption of millet, quinoa and other forgotten or neglected staple foods.

Making use of natural resources also provides an excellent opportunity to increase the diversity of diets thereby achieving the supply of nutrients within their biological structures. Besides increasing the availability of nutrients and food energy fruits and vegetables are also sources of valuable bioactive substances, e.g. phytosterols, resveratrol, momordicine, exerting preventive and curative health effects.

This approach to overcoming hunger does not just mean to increase actual food availability - often measured in terms of food energy only - but to include foods into the diets which contribute to health immediately and on longer terms. Also, identifying food sources which are not considered yet can help to secure nutrition and food. Research in this field requires a well planned interaction between researchers and local populations. Food security can be achieved with sustainable use of natural resources in most circumstances.

LW-7**CAN FARM MILK PROTECT FROM THE DEVELOPMENT OF CHILDHOOD ASTHMA AND ALLERGIES?****Ch. Braun-Fahrländer^{1*}**¹ Swiss Tropical and Public Health Institute, 4002 Basel, Switzerland

* E-mail: C.Braun@unibas.ch

Cow's milk is an important part of human diet and a source of food allergy for some individuals. Medical guidance strongly discourages consumption of raw milk because of the known health risk associated with pathogenic bacteria present in unpasteurized milk. Despite these risks there is a growing body of epidemiological evidence suggesting that consumption of unprocessed cow's milk does not increase but rather decreases the risk of asthma, hay fever and atopic sensitisation.

The presentation reviews the epidemiological literature and discusses components of unprocessed milk potentially responsible for this protection. Although the epidemiological evidence consistently suggest a protective role of unprocessed cow's milk consumption on the development of asthma, hay fever and atopic sensitization the underlying mechanisms are not yet understood and the consumption of raw milk cannot be recommended as a preventive measure for allergic diseases.

LW-8

FATTY ACIDS OF ORGANICALLY PRODUCED MILK AND ITS BENEFICIAL EFFECTS IN HUMAN NUTRITION**G. Jahreis^{1*}, K. Kuhnt¹, A. Jaudszus¹, C. Degen¹ and C. Dawczynski¹**¹ University of Jena, Institute of Nutrition, Dept. Nutritional Physiology, Jena, Germany

* E-mail: b6jage@uni-jena.de; Tel: (49) 3641 949610; Fax: (49) 3641 949612

Milk has a wide variety of fatty acids (FA): branched, conjugated, n-3, short-chain, and *trans* (*t*) FA as well as FA with uneven-numbered C-atoms; mainly due to the ruminants microbial activity and the ingested feed. The main focus is on *t*FA, conjugated linoleic acids (CLA) and especially on n-3 FA of dairy fat. Milk samples from different feeding and management systems have different n-3, *t*FA, CLA, and short-chain FA contents and even different isomer pattern.

An organic feeding regime rich in pasture and herbage increases PUFA. This is associated with an increase of *t*FA and CLA and a change of the CLA pattern of dairy fat. For example, in Alpine milk, the portion of the "pasture specific" CLA isomer *t*11, *c*13 significantly increased, while *t*7, *c*9 isomer decreased.

In cell culture studies, total CLA and *t*11, *c*13 CLA of cell membranes increased after incubation with pure Alpine milk fat compared with conventional milk fat. Our recent study showed that Kenyan Maasai consume a diet rich in milk fat. Marker FA of milk fat intake *t*11 C 18:1 (vaccenic acid) and total CLA were reflected by Maasai's red blood cells (RBC). In addition, the low *t*9 (elaidic acid)/*t*11 index of Maasai's diet (0.1) resulted in a low *t*9/*t*11 index in RBC (0.4). In RBC of Bulgarian shepherds (high intake of self-made sheep milk products), *t*11 and CLA were similarly elevated like in Maasai's RBC. Dietary *t*11 is converted into *c*9, *t*11 C LA (ca. 25%) by endogenous Δ 9-desaturation.

We tested, whether purified *c*9, *t*11-CLA (1% of the diet) can inhibit airway inflammation in a mouse model of allergic airway disease. *c*9, *t*11-CLA fed mice developed significantly less airway reactivity in response to methacholine provocation *in vivo*. Our data indicate that *c*9, *t*11-CLA is, in part, responsible for the protective effect of milk consumption on the development of allergic airway disease. For the future, oral intervention with *c*9, *t*11-CLA-rich organic milk might represent an attractive novel strategy in the prevention and treatment of asthma and allergic airway disease.

To sum up, n-3 FA and CLA, normally enriched in milk from grazing cows exert important beneficial effects in patients with inflammatory and cardiovascular diseases. A quality management system for increasing these both groups of fatty acids in organically produced milk is necessary.

Key words: milk fat, n-3 fatty acids, conjugated linoleic fatty acids, health effects, anti-inflammatory effects

LW-9

TESTING MILK ALLERGIC CHILDREN IN A DOUBLE BLIND PLACEBO CONTROLLED TRIAL**T. Roos^{1*}, D. Kusche², T. Baars²**¹ Dr.med. Praxis for dermatology and allergies, D-26409 Wittmund² University of Kassel, Department for Biodynamic Agriculture, D-37213 Witzenhausen

* E-mail: docroos@web.de; Tel: 00.49.4462 205785

Children (n=12) who were diagnosed for milk allergy were tested in their reaction to milk of two different origins. Blood samples were taken for IgE, and a prick and a patch test was carried through, followed by a double-blind placebo-controlled oral food challenge (DBPCFC). In the testing, the standard-milk was a retail milk from conventional origin, which was homogenized, pasteurized and standardized at 3.7% fat. This milk was compared with a ‚Vorzugsmilch‘ (Grade-A raw milk) from certified biodynamic production. The reason to examine such a difference in milk quality was motivated by two facts; first, in the past the ‚normal‘ standard for testing was a homogenised conventional milk. Second, in this pilot study only 20 children could be tested and therefore a large difference was examined for comparison. If no differences in reactions were present between the two extremes it did not make sense to look for individual factors to explain differences between the two milks.

There were no differences in the patients' reactions between the two milk origins within the prick and patch test. Seven out of the eleven children with a positive skin reaction in prick and atopy-patch-testing showed an allergic reaction to the conventional homogenised and pasteurised milk after oral provocation with several ml of milk, whereas all children tolerated oral provocation with biodynamic raw milk.

These results were backed up by recent epidemiological insights, which showed that raw milk is a factor in the prevention of asthma and allergies in both farm and non-farm children. Our results showed that children who are allergic to conventional milk tolerate raw milk. The observation that some children, who showed positive skin-testing to milk, tolerated conventional milk in the DBPCFC may be due to a tolerance-induction during the DBPCFC.

Since raw milk is very suspect for zoonotic diseases, monthly farm data were evaluated about the hygienic and bacteriological status (2007-2010). There were several periods mainly during the grazing season where the coliform-levels were above the legally accepted level of 20 germs/ml. Additionally all milking cows were sampled separately (milk twice and dung once) to evaluate the levels of EHEC, Campylobacter, Salmonella and other pathogens. All milk samples tested negatively for these zoonotic diseases; however, about 2-3% of the cows were EHEC bearers based on dung samples. Monthly milk fatty acid analysis (2008-2010) showed the typical profile of an extensive grass-based system during summer and hay feeding during winter. N3-levels were constant and the CLA9ct11 as an indicator of fresh grass intake showed very high levels during the course of the grazing season.

Future research will investigate raw milk origin as well as the steps in processing, such as the heating level of the milk, homogenization, and also the change in milk quality through feeding of silages of grass and maize plus increased levels of concentrates in order to evaluate the influence of these parameters to the tolerability of raw milk in milk-allergic patients.

Key words: allergy control, blind placebo-controlled trial, raw milk

LW-10**RAW MILK QUALITY vs. RAW MILK SAFETY – WALKING A TIGHTROPE****W. Kneifel^{1*}, S. Apprich¹**

¹ Department of Food Science and Technology, Institute of Food Science, University of Natural Resources and Life Science Vienna (BOKU)

* E-mail: wolfgang.kneifel@boku.ac.at; Tel.0043-1-47654-6291

It is well-known that raw milk can act as a substrate as well as a vector for a variety of micro-organisms. If pathogens are found in raw milk, they may originate from the cow itself (zoonoses, cow's disease), from the environment, and/or from humans manipulating with the milk and equipment. Thus contaminated raw milk may cause a wide range of diseases to humans (listeriosis, salmonellosis, brucellosis, tuberculosis etc.). Moreover, the consumption of raw milk can be especially hazardous to so-called "high risk consumers" like pregnant women, infants, children, elderly persons and people with weakened immune system. Traditionally, milk pasteurization is applied to prevent consumers of any safety risk and forms the sound basis for providing pathogen-free milk of high hygiene quality and convenient shelf-life to the consumer.

Although raw milk may be a potential carrier of pathogens, recent studies have imposingly demonstrated that raw milk consumption may exert beneficial effects to humans in terms of allergy and asthma prevention. Interestingly, these effects have not been seen with processed and pasteurized milk. Therefore research activities have been concentrated on tracing and identifying relevant native milk compounds. In this context, sufficiently mild processing technologies need to be developed in order to maintain the native status of the milk, but also to exclude any harmful microbe. In addition, a proper safety monitoring network must accompany the entire primary production, collection and manufacturing process of such products.

The presentation will not only give a brief survey on safety issues of raw milk, but also critically deal with questions like "how can we assess milk to be free of pathogens in a way that guarantees that no harmful microbe may cause any disease?" and "how can we fully eliminate pathogens from milk to assure a totally safe product?"

Keywords: raw milk, quality, safety, risk factors

POSTER SESSIONS

**QUALITY AND SAFETY
OF ORGANIC PLANT
AND ANIMAL
PRODUCTS
(A-1 – A-20)**

A-1

SELECTION OF LACTIC ACID BACTERIA PRODUCING ANTI-MICROBIAL STRAINS**N. Benhamouche^{1*}**¹ Laboratoire de génétique moléculaire et appliqué université mohamed bodiaf Usto Oran Algerie

* E-mail: norabadraoui@yahoo.fr

The research of high hygienic quality food is considered an universal orientations research the increase in the food poisonings caused by the microbial proliferation by the decrease of hygienic conditions of manufacture and conservation encouraged the researchers to reflect for another means to reduce these food poisonings. Our work consists in exploiting the potentiality of lactic bacteria that produce an anti-microbial substances for limited the growth and inhibited the undesirable micro-organisms.

The microbiological methods were applied for the selection of the producing anti-microbial strains which come from the collection of the laboratory of applied microbiology of oran university.

The result obtained showed that 16 strains of 48 strains revealed a very significant antimicrobial activity.

The effect of the lactic acid was eliminated by the addition phosphate buffer in culture medium and the rate of inhibition obtained reach 25% compared with those obtained in unbuffered medium.

The producing antimicrobial substances strains belong to the following species, *lactococcus lactis* subsp *lactis*, *lactococcus lactis* subsp *lactis* biovar *diacetylactis*, *leuconostoc mesenteroides* subsp *mesenteroides*.

Escherichia coli and *bacillus cereus* resisted to the anti-microbial substances of lactic bacteria species, whereas, 7 strains inhibit *staphylococcus aureus*, one strain inhibit *listeria innocua* in MRS and M17.

The growth kinetics in mixed culture of *lactococcus lactis* strains with *staphylococcus aureus* in milk medium showed that the cellular number of the latter is strongly reduced after 96h compared to the pure culture.

The optimum conditions of antimicrobial substances production will have been specified in another future research.

Keywords: lactic acid bacteria, *lactococcus lactis*, anti-microbial

A-2

QUALITY CONTROL OF AMINOACIDS IN ORGANIC FOODS AND FOOD SUPPLEMENTS

S. Pankova^{1*}, K. Ivanov², D. Tsvetkova¹

¹ Department of Pharmaceutical Chemistry, Faculty of Pharmacy, Medical University Sofia

² Department of Pharmaceutical Chemistry, Faculty of Pharmacy, Medical University Plovdiv

* Email: phddanka@yahoo.com; Tel: + 359 92 36 530; Fax: + 359 987 987 4

L-Arginine is mediator in nonadrenergic, noncholinergic neurotransmission and is important for neuroprotection, learning and memory, synaptic plasticity and dilatation of small blood vessels in brain, immune function, release of hormones, cell division.

L-Arginine is involved in metabolic pathways and promotes lymphocyte production, reduces healing time of injuries, decreases blood pressure by stimulation of synthesis of nitric oxide, helps for liver detoxification by neutralizing ammonia.

L-glutamic acid acts as fuel for the brain, improves mental capacities and shows promise in the treatment of neurological diseases, epilepsy, Parkinson's, mental retardation, personality disorders, muscular dystrophy, ulcers, hypoglycemic coma, benign prostatic hyperplasia.

The variety of manufactured and proposed on the market food supplements, containing L-Glutamic acid and L-Arginine, set the pattern for the necessity of development of method, which can provide the possibility for their simultaneous determination with great selectivity, accuracy and precision. In accordance with these requirements, the aim of current study is to validate an isocratic HPLC method, with UV – detection, which can be appropriate for quality control of this aminoacids in different dosage food supplements.

Methods. HPLC system: column Spherisorb ODS RP – C18 (250 mm/4.6 mm i.d. = 5 μ m; mobile phase: methanol: water = 1:1 v/v; flow rate – 1.0 ml/min; t = 25°C; UV – detection: λ = 210 nm.

Results. HPLC method is validated in respect of analytical parameters: selectivity, precision, accuracy, linearity, limit of detection, limit of quantitation.

Accuracy and precision suit relevant confidence interval. Linearity is presented by regression equations, which show proportional accordance $AUC = f(C)$.

Conclusion. The applied HPLC method is appropriate for quality control with great accuracy and precision in food supplements of L-Glutamic acid 100 mg – tablets: Aci – dalex Aids Digestion, Calcium – Complex, Cobal – M, Country Life – Calcium Magnesium Zinc with L – Gluta – mic acid, Daily Nutrition Vitamins and Minerals, Di – Acid Stim, Gastro Digest II, Nutifacts 21 Complete, Othoplex L. M. 1, Recall Biocare, Super Vitamin Beverly nutrition, Trophic Glutamic acid, Ultimate Nutrition Super Complete Formula; capsules: Basic Pygeum Herbal, Bromelain Papain; L-Arginine 1000 mg – tablets: Good N Natural 1000, Jarrow Formula 1000, Kal 1000, Natrol 1000, Nature's Bounty 1000, Now Foods 1000, Thompson Nutritional 1000, 21 century 1000, Source naturals 1000; capsules: GNC 1000, Max Strength AKG, solutions: Liquid L-Carnitine, Co Enzyme Q –10 and L-Arginine.

Keywords: Aminoacids, L-Glutamic acid, L-Arginine, HPLC, food additives

A-3

PHYTOCHEMICALS, ANTIOXIDANT PROPERTIES AND BENEFITS OF CICHORIUM INTYBUS L.: GENETIC, ENVIRONMENTAL, AGRONOMIC INFLUENCES

E. Azzini¹, E. Venneria¹, M.S. Foddai¹, A. Durazzo¹, F. Intorre¹, F. Nobili¹, I. Garaguso¹, L. D'Evoli¹, L. Palomba¹ and G. Maiani¹

¹ Area Scienze della Nutrizione, Istituto Nazionale di Ricerca per gli Alimenti e la Nutrizione, Roma, Italy
E-mail: azzini@inran.it; Tel: +390651494461; Fax: +390651494550

Chicory a plant genus typical of Mediterranean Area, is native to Europe, Western Asia, and North America and its colour varies from white to red. Several Italian regions, particularly in northern Italy, are involved in this cultivation that links good taste with the healthy and nutritional properties. As well known the consumption of phytochemicals from fruits and vegetables can improve the prevention of several chronic degenerative pathologies. Phytochemicals content may be affected by several factors: genetic, environment, agronomic practices and post-harvest conditions. So the production of certified products and high-quality products is very important for food industry and for consumers' health, giving to consumer quality, security, authenticity, especially regional origin.

The aim of this work was to investigate the antioxidant properties and bioactive molecules contents of four common diet vegetables of the *Cichorium intybus L* belonging to different-varieties, cultivars and agronomic practices : Chicory Pan di Zucchero, Red Chicory of Treviso , Variegated Chicory of Castelfranco and common chicory. In addition cell cytotoxicity and antiproliferative effects of polyphenolic extracts of selected foodstuffs in Caco-2 cell models were studied.

Comparing different varieties, the ascorbic acid ranged from 44.3 to 92.1 mg/kg, lutein from 0.99 to 15.52 mg/kg and β -carotene from 0.22 to 42.13 mg/Kg. The Total Antioxidant Capacity evaluated using FRAP ranged from 1.15 to 12.72 mmol/kg. For Pan di Zucchero, organic sample shows significantly higher chlorogenic acid levels than conventional one.

Regarding potential bioactivities, the chicory extracts seem to cause a high cytotoxicity in human epithelial colorectal adenocarcinoma cells (caco-2) reducing cell viability to values lower than 10%. In addition, the polyphenols fractions from radish extracts have indicated a moderate antioxidant behavior until 17 μ M concentration, while at 70 μ M and 34 μ M concentrations a pro-oxidant effect was revealed for radish of Treviso and Castelfranco respectively.

Our findings demonstrate a large variation in phytochemicals content by species, environmental and agricultural factors.

Keywords: Cichorium intybus L, agronomic practice, phytochemicals, bioactivity

Acknowledgement: *This research was supported by MiPAAF -"BIOVITA PROJECT".*

A-4

COMMERCIAL FERTILIZERS AND ORGANOLEPTIC QUALITY OF ORGANICALLY GROWN APPLE FRUITS (CV. GOLDEN DELICIOUS)

I. Baiamonte¹, E. Moneta¹, A. Raffo¹, A. D'Aloise¹, N. Nardo¹, M. Kelderer², E. Lardschneider², F. Paoletti^{1*}

¹ Istituto Nazionale di Ricerca per gli Alimenti e la Nutrizione (INRAN), Roma, Italia

² Centro di Sperimentazione Agraria e Forestale Laimburg, Ora (Bz), Italia

* E-mail: paoletti@inran.it; Tel: 00390651494562; Fax: 00390651494550

In the organic production only organic fertilizers can be used to supply the soil with nitrogen. The mineralization of these products is slow causing a problem with the nitrogen supply when the demands of the plants is high.

Italy is the main producer of organic apples in Europe (about 42,000 MT on 115,000 MT in 2006). More than 60% of the organic apples produced in Italy are grown in Alto Adige region (North-East of Italy). In this region problems with nitrogen supply to apple plants in spring are common. In spring the demand of nitrogen of the apple trees in Alto Adige is high, but the weather conditions are often bad and the temperature of the soil is slow. In these conditions the mineralization of the organic fertilizers starts slowly, the trees own reserves may become exhausted, the nitrogen supply from the mineralization of the soil organic matter is not yet sufficient. Therefore, it is important to supply the plants timely in spring with fertilizer nitrogen.

The objective of this work was to determine the effect of various commercial fertilizers used for organic apple growing and the conditions of their use on the organic acid and sugar composition and on the formation of volatile compounds in fruits of Golden delicious cultivar. The fruits were grown in the experimental fields of the Centro di Sperimentazione Agraria e Forestale Laimburg, in Alto Adige region. In addition, fruits from a plot without the use of fertilizer ("control") and a plot where a mineral fertilizer ("ammonium sulphate") were grown in Laimburg, harvested and analyzed for comparison. Malic, oxalic and citric acid were the organic acids detected; fructose, glucose and sucrose the sugars identified and quantified. Higher levels of organic acids and sugars were found in the "control" and "ammonium sulphate" samples. The different conditions of fertilization seemed to significantly affect the formation of some aroma volatile compounds. Considering the three main key odorants, butyl acetate level was higher in the "compost + biogas slurry" sample and in the "control"; a higher level of hexyl acetate was found in the "control" only. For both compounds lower levels were found in the "ammonium sulphate" sample and in one of the organic fertilizer "Azocor 105" treatment. No differences were found in the level of 2-methylbutyl acetate.

Keywords: apple, fertilization, quality

Aknowledgement: *Work carried out in the project "Qualità nutrizionale ed organolettica e impatto ambientale di produzioni biologiche. Un caso studio: il melo", funded by Ministero delle Politiche Agricole Alimentari e Forestali.*

A-5

DIETARY FIBERS OF ANCIENT AND MODERN DURUM WHEAT GENOTYPES: QUANTIFICATION AND PREBIOTIC EFFECT

G. Dinelli^{1*}, I. Marotti¹, V. Bregola¹, I. Aloisio¹, S. Bosi¹, R. Di Silvestro¹, D. Di Gioia¹, B. Biavati¹, R. Quinn²

¹ Department of Agroenvironmental Science and Technology, University of Bologna, Bologna, Italy

² Kamut International Ltd, Big Sandy, Montana, USA

* Email: giovanni.dinelli@unibo.it; Tel: +390512096672; Fax: +390512096241

Durum wheat is an important component of the Mediterranean diet and several researches highlight the health-promoting effects of whole-grain consumption. In particular soluble dietary fiber (SDF) has important therapeutic implications for different pathologies (diabetes, hyperlipidemia) and may have preventive implications for hypertension and heart diseases. SDF is not absorbed in the intestine, but acts as fermentative substrate for colon bacteria with a marked effect on the nutritional and health status of the host (intestinal bacteria composition, stimulation of the immune response, anticancer activity).

The aim of present study was to quantify TDF (total dietary fiber), SDF and its major components (resistant starch, arabinoxylan, beta-glucan) found in seven modern (AncoMarzio, Claudio, Iride, Lenvante, Orobel, Solex, Svevo), two old (Senatore Cappelli, Urria) Italian durum wheat cultivars, and a closely related ancient wheat *Triticum turanicum turgidum* accession (Kamut@Khorasan). The different accessions were grown according to organic conditions at the Experimental farm of the University of Bologna, Italy (growing season 2008/2009). Wheat grain TDF, SDF and related main fractions were quantified according to official AOAC methods. Prebiotic effects of extracted SDF were determined by evaluating the capability of SDF of sustaining growth of a *Lactobacillus* (*L. plantarum* strain) and *Bifidobacterium* (*B. pseudocatenulatum* strain) when added as the sole source of carbon. No significant differences in TDF and SDF content between old and modern wheat genotypes were found; a similar trend was observed also for arabinoxylans and beta-glucans. In contrast, the resistant starch assay highlighted significant differences: the old varieties Senatore Cappelli and Urria showed higher values (5.01 ± 0.13 and 4.47 ± 0.43 g/100g respectively) than the modern cultivars AncoMarzio, Claudio, Iride and Solex (mean value 1.82 ± 0.28 g/100g).

As regards prebiotic effects, Kamut khorasan, Levante, Orobel, Svevo showed good activities for *L. plantarum*, while all the three ancient cultivars Kamut khorasan, Senatore Cappelli, Urria exhibited significant prebiotic effects on *B. pseudocatenulatum*. Although among wheat cultivars no significant differences in TDF and SDF content were observed, SDF of some accessions, especially Kamut khorasan, showed a higher stimulation of *L. plantarum* and *B. pseudocatenulatum* growth. Obtained data indicated that qualitative composition of dietary fibers play a relevant role in determining effects on gut microorganism. The present study highlighted the potential use of some old wheat genotypes as valuable source for the development of organic health promoting products.

Keywords: ancient grain, durum wheat, Kamut khorasan, dietary fibers, prebiotic

A-6

ANTIOXIDANT PROPERTIES IN THREE VARIETIES *BLASCO*, *BOLERO* AND *CRAKLIN* OF ORGANIC SOFT WHEAT FLOURS - *TRITICUM AESTIVUM* L.

A. Durazzo^{1*}, E. Azzini¹, M.S. Foddai¹, E. Finotti¹, P. Bàrberi², M. Perenzin³, L. Plizzari³, M. Guiducci⁴ and G. Maiani¹

¹ Area Scienze della Nutrizione, Istituto Nazionale di Ricerca per gli Alimenti e la Nutrizione, Roma, Italy

² Scuola Superiore Sant'Anna di Studi Universitari e di Perfezionamento (SSSUP-, Pisa, Italy)

³ Unita' di Ricerca per la Selezione dei Cereali e la Valorizzazione delle Varieta' Vegetali (CRA-SCV), Sant'Angelo Lodigiano, Lodi, Italy

⁴ Dipartimento di Scienze Agrarie e Ambientali, Università di Perugia (DISAA-PG), Italy

*Email: durazzo@inran.it; Tel: +390651494461; Fax: +390651494550

In this work we have evaluated antioxidant capacity of three varieties *Blasco*, *Bolero* and *Craklin* of organic soft wheat flours - *TRITICUM AESTIVUM* L.- cultivated in three Italian areas (Pisa, Perugia and S. Angelo Lodigiano) during 2 years of cultivation. In addition we have quantified in selected flours lutein plus zeaxanthin (wheat carotenoids) content.

Total antioxidant capacity of flours was evaluated using two different assays, TEAC (Trolox Equivalent Antioxidant Capacity) and FRAP (Ferric Reducing-Antioxidant Power). As regards carotenoids, flour samples of organic soft wheat were analyzed by HPLC.

During the second year of cultivation, an increase ($P < 0.01$) in FRAP values (mmol/Kg) was observed in soft wheat cv *Blasco* cultivated in S. Angelo Lodigiano, while an inverse trend ($P < 0.01$) was observed in soft wheat cv *Bolero* cultivated in Pisa. In addition, our results show how the cultivation area affects significantly the total antioxidant capacity in all varieties.

Regarding carotenoids content, monitoring lutein plus zeaxanthin content by experimental areas, a significant increase was observed in second year of cultivation for all varieties. In particular soft wheat cv *Craklin* cultivated in S. Angelo Lodigiano reached the highest value of lutein plus zeaxanthin (399.19 $\mu\text{g}/100\text{g}$) during the second year of cultivation.

Our findings have showed that environmental interactions such as year of cultivation, environmental and pedoclimatic factors could influence the antioxidant properties in organic soft wheat.

Keywords: soft wheat, organic practice, cultivar, antioxidant power, carotenoids

A-7

**CROPPING SYSTEMS PERFORMANCES IN ORGANIC HORTICULTURE:
THE CAKE AND THE BUTTER**

**S. Bellon^{1*}, H. Gauthier², C. Mazollier³, M. Navarrete¹, S. Penvern¹, N. Sautereau¹,
L. Urban³, M. Tchamitchian¹**

¹ INRA UR767 Ecodéveloppement Site Agroparc 84914 Avignon Cedex 11 - France

* Email: bellon@avignon.inra.fr

Both environmental quality and nutritional quality are key challenges organic food and farming, as acknowledged in the new EU regulation (CE 834/2007). In horticulture, such qualities strongly depend on cropping systems. This paper deals with the design of horticultural systems likely to achieve multiple objectives (productivity, product quality, pests and disease control, environment preservation). First, we briefly review recent literature on quality features of organic horticultural production and products. Studies on consumers' attitudes and nutritional quality of organic products developed during the past decade. They are generally poorly linked with cropping systems and practices. The nutritional value of organic fruits and vegetables is usually higher than conventional ones, especially in terms of polyphenol content and antioxidant properties. However, such attributes are also subject to interannual variation and to internal differences in organic practices. Secondly, we report on field and experimental studies on peach quality conducted during 3 years in the south of France. The experimental design included four modalities compared on a plot of yellow peach with 4 replicates. Organic farming (OF) and integrated fruit production (IFP) were compared, each cropping system having two levels of nitrogen fertilisation (120 kg N/ha/yr and 150 N/ha/yr). Measurements were related to total polyphenol content of peach fruits and leaves as well as fruits vitamin C content and leaves N content. In 2008, organic fruits exhibited a higher total polyphenol content as compared with IFP modalities (347.1 vs 271.2 mg/100g MS, $P=0.012$). Fruit polyphenol content was higher with lower fertilisation levels ($p=0.012$). As a whole, total polyphenol content decreased from OF with lower N fertilisation to IFP with higher N fertilisation, whereas the two other modalities exhibit similar values. Leaf total polyphenol content was significantly lower with IFP-150 kg N.ha⁻¹ than in both organic modalities. Leaf N content was significantly higher in IFP, as compared with OF. Organic management combined with a restricted N fertilisation display higher polyphenol contents in fruits and leaves. We conclude that binding both factors can contribute to a peach production with higher nutritional value. Thirdly, results are discussed along three directions: (i) relevance of integrative approaches to address the multiple performances of organic horticulture, (ii) technical assets and possible trade-offs to achieve both product and environmental qualities, (iii) leeways for the intensification of organic horticulture. Our results plead for a development of OF towards low-input systems integrating a set of alternative methods, consistent with OF «eco-functional» intensification challenges.

Keywords: horticulture, cropping system, design, polyphenol content, intensification

A-8

MYCOPOPULATION AND GRAIN QUALITY OF *TRITICUM AESTIVUM* SSP. *SPELTA* FROM ORGANIC TRIAL

F. Bagić^{1*}, M. Bodroža-Solarov², V. Stojšin¹, D. Budakov¹, A. Bočarov-Stančić³ and J. Vučković²

¹ Faculty of Agriculture, Department of Environmental and Plant Protection, Novi Sad, Serbia

² Institute for Food Technology in Novi Sad, University of Novi Sad, Novi Sad, Republic of Serbia

³ Bio-ecological center, Zrenjanin, Serbia

* E-mail: bagifer@polj.uns.ac.rs; Tel: + 381 21 4853 405, Fax: 021 450 616

The investigations were conducted during two vegetation seasons, 2008/2009 and 2009/2010, which were different in respect of meteorological conditions during flowering and ripening. The trial was located in north Serbia, under standard agro technical conditions. Three different spelta wheat cultivars were analyzed: Nirvana, Eko 10 and Ostro.

Grain samples were collected during period of harvest. The percentage of infected wheat grain was determined using moist chamber method and by isolations on nutrient media. The grain infection level was investigated separately for hulled and dehulled grain.

Drought spring in 2008/2009, followed by lower temperature and expressive rainfall after period of flowering were conducive for rapid development of *Alternaria*, *Fusarium*, *Cladosporium*, *Penicillium* and *Aspergillus* genera on wheat.

In this vegetation season, grain infection level with fungus *Alternaria* was extremely high in the case of hulled grain (98-100%). On the contrary, dehulled grain had *Alternaria* infection level between 13-16%.

Significant decline in wheat technological quality was also registered. The wheat gluten was degraded which caused drastic decline in the parameters of technological quality. Phytopathological analyses has shown that there is a significant correlation between the technological quality and level of fungal infestation.

On the contrary of previously described, during vegetation 2009/2010 period of wheat flowering and ripening was characterized by heavy rainfalls, which served optimal conditions for infections by species from genus *Fusarium*. The mean value of *Fusarium* infected grain percentage achieved 12%, which regularly resulted in high mycotoxin content. Comparing two investigated years in respect of *Alternaria* infection can be concluded, that the colonization in 2010 was not so high and in hulled variants achieved maximally 57%. Dehulled variants regularly had much less *Alternaria* infection than hulled ones (maximally 9% in 2010). Grain and flour from vegetation season 2009/2010 were characterized by decrease of technological quality and high DON mycotoxin content.

Keywords: spelta, mycopopulation, technological quality, DON

Acknowledgement: Authors are thankful to Ministry of science and technological development, Republic of Serbia, project no III 46005.

A-9

TECHNOLOGICAL QUALITY OF *TRITICUM AESTIVUM* SPP. *SPELTA*

M. Bodroža-Solarov^{1*}, O. Šimurina¹ and B. Filipčev¹

¹ Institute for Food Technology in Novi Sad, University of Novi Sad, Novi Sad, Republic of Serbia

* Email: marija.bodroza@fins.uns.ac.rs; Tel: +381 21 485 3771; Fax: +381 21 450 725

Several cultivars of *Triticum aestivum* ssp. *spelta* (spelt) were collected from Hungary, Austria and Serbia in order to establish organic field trials in which their bread making performance under the environmental conditions of north Serbia was studied during 2009. The obtained spelt flours were used to evaluate the technological quality traits in comparison to the bread wheat cultivar Edevan, selected in Austria as suitable for the organic production.

Physical dough properties are mainly defined by quantity and quality of gluten. The investigation of protein showed higher protein content in the spelt varieties than in the bread wheat cultivar (13.2% d.b.). The Hungarian spelt population Ekö10 had the highest protein (16.9% d.b.) and gluten content (35.8), but demonstrated poorer overall technological quality than the control bread wheat.

Rheological parameters were determined using Farinograph, Extensograph, Amylograph, and a new rheological tool for wheat characterization, Mixolab[®], a dough mixer which was used to evaluate the single effect of protein and starch qualities on thermomechanical properties of spelt and bread wheat dough. Mixolab[®] method could be used for characterization of poor wheat flour quality with important advantages over traditional rheological method.

The obtained results demonstrated higher water absorption, better dough elasticity and the highest susceptibility to starch retrogradation in the bread wheat. Cultivar Nirvana had better mixing characteristics than the other tested spelt cultivars but showed the lowest capacity to absorb water. The extensograph parameters were on a low side for the spelt cultivars which disabled their quantification, however, differences in the protein quality were assessed by the Mixolab[®] measurements. The highest value of minimal torque (C2) of the Mixolab curve i.e. better protein stability during heating was observed for the bread wheat (0.50 Nm). Within the spelt cultivars this parameter ranged from 0.20 Nm for Ekö10 and Ostro to 0.36 Nm for Nirvana.

Elastic modulus (G') is a measure of gluten matrix strength performed by dynamic oscillatory measurements using a Haake Mars rheometer. For the dough made from spelt wheat flour, elastic modulus was lower than that of dough made from bread wheat flour.

Keywords: spelt, processing, rheology, quality

Acknowledgement: *The authors gratefully acknowledge the financial support from the Ministry of Science and Technological Development of the Republic of Serbia (Project III 46005).*

A-10

ARE HARVEST AND SENSORY QUALITY OF LETTUCE AND ONION INFLUENCED BY GROWING CONDITIONS IN A CONVENTIONAL AND THREE ORGANIC CROPPING SYSTEMS?**H.L. Kristensen^{1*}, U. Kidmose², D.B. Dresbøll¹ and K. Thorup-Kristensen³**¹ Department of Horticulture, Aarhus University, Aarslev, Denmark² Department of Food Science, Aarhus University, Aarslev, Denmark³ Department of Agriculture and Ecology, University of Copenhagen, Høje Tåstrup, Denmark

* Email: Hanne.Kristensen@agrsci.dk; Tel: +4589993233

Differences in nutrient availability and methods of pest management may affect crop growth and product quality. The question is whether conventional and organic cropping systems, which differ clearly in strategies for nutrient and pest management, influence the harvest and sensory quality of the products? With the aim to elucidate this question, lettuce and onion were grown in a conventional and three organic cropping systems with increasing levels of nutrient recycling and use of intercrops for natural pest management in the period of 2007-2009. The conventional and first organic system relied fully on external inputs in the form of NPK or liquid manure for nutrient management, respectively. In the second organic system, low external inputs of liquid manure were combined with the use of catch crops and legumes for recycling of nutrients within the agroecosystem and input of N from fixation. In the third organic system, intercrops were used for natural pest management in addition to catch crops and legumes for nutrient management. The harvest yield and quality were registered for both crops, and sensory analysis was performed as quantitative descriptive analysis by a trained sensory panel of 10 panelists for lettuce. The sensory panel developed a vocabulary which includes bitterness, sweetness, lettuce- and pea flavour. Total yields per meter crop row were comparable in the three organic systems and amounted 72% and 76% of those in the conventional system for onion and lettuce, respectively. A total of 10-19% of onion and 8-10% of lettuce yields were discarded due to defects and did not differ between cropping systems in average over the three years of experiment. In addition, there was no influence of cropping system on the reasons why products were discarded. In individual years, harvest quality defects differed between cropping systems for onion, however, not allowing overall conclusions on best performing system. Likewise the sensory analysis showed only minor differences between lettuce grown in the conventional or the organic cropping systems for selected sensory attributes like bitterness. There was also an interaction between the effect of the growing system and growing years. We conclude that harvest and sensory quality were not affected by the clear differences in nutrient and pest management between the four cropping systems.

Keywords: harvest quality, sensory analysis, onion, lettuce**Acknowledgement:** *The study was funded by The International Centre for Research in Organic Food Systems.*

A-11

“ECROPOLIS” ORGANIC TASTE OF YOGHURT - SENSORY INSIGHTS OUT OF THE EC-PROJECT “ECROPOLIS”

N. Barylko-Pikielna⁵, A. Bendini⁷, A. Bongartz^{3*}, K. Buchecker², M.L. Cezanne³, T. Gallina Toschi⁷, E. Kostyra⁵, S. Kremer⁸, U. Kretzschmar-Rüger¹, T. Obermowe⁴, P. Reichl⁶, A. Spiller⁴

¹ Research Institute of Organic Agriculture / FiBL, Frick, Switzerland (project coordinator)

² Verein zur Förderung des Technologietransfers an der Hochschule Bremerhaven e.V. -TTZ, Bremerhaven, Germany

³ Zurich University of Applied Sciences / ZHAW, Wädenswil, Switzerland

⁴ University of Göttingen -Department für Agrarökonomie und Rurale Entwicklung, Göttingen, Germany

⁵ Warsaw University of Life Sciences / WULS, Warsaw, Poland

⁶ AgroParisTech / APT, Massy, France

⁷ University of Bologna, Bologna, Italy

⁸ Wageningen University and Research Centre / A+F, Wageningen, The Netherlands

* Email: annette.bongartz@zhaw.ch; Tel: +41 58 934 57 22; Fax: +41 58 934 58 13

Distributors and promoters of organic food claim superior tastes for their products compared to the conventional alternative. This argument however is still subject to a hard debate and thus deserves more scientific evidence. Since repurchases are dependent on the overall liking of a product and sensory experiences may have an important impact, knowledge about these dimensions is crucial for producers and marketers of organic food to offer products which meet consumer expectations.

Besides other important aspects, sensory properties as well as consumer acceptance of six different product groups (dairy-, meat-, bakery- and tomato-products, vegetable oil and apples) were analysed in detail within the EU funded project ECROPOLIS (www.ecropolis.eu) in six European countries (France, Germany, Italy, Poland, Switzerland, The Netherlands). In order to explain how the scientific approach of the project helps to explore product insights, dairy products represented by “natural (plain) full cream yoghurts” were chosen as an example.

On the one side results of the detailed analysis are capable to show relevant information concerning sensory product properties (sensory profiles) of plain yoghurts as well as the influence of these aspects on the product popularity by the consumer (acceptance and preference mapping). Additionally results show how the regulatory framework respectively the requirements for plain yoghurts produced under organic regulation influences the sensory appearance of the products. And results show as well the product improvement potential of organically produced plain yogurts. Some consolidated key-insights from the results out of six European countries: Sensory differences between organic and conventional products depend more on production technology (stirred or semi-solid) and regulatory framework (application of milk powder, homogenisation of milk) than on the organic or conventional origin of raw material. For example semi-solid yoghurts in some countries are less accepted and yoghurts that additionally are produced without application of milk powder all show a certain sedimentation of whey and are even less accepted. Disregarding the aspect of “organic” and “conventional”, the acceptance towards plain yoghurt seems to be more or less dependent on certain sensory attributes as there are especially creaminess, smoothness (both texture) and a moderate and balanced sourness (taste). And the presence of liquid on the surface is often not liked. Consumers respond differently in the six European countries concerning the labelling (halo) effect of organic and conventional, meaning that consumer from some countries (e.g. Germany, ...) are more influenced by the declaration of “organic” and “conventional” when tasting the products than others (e.g. Switzerland). German consumers assumes better sensory quality in “healthy, fair-trade etc. products.

Keywords: sensory profiling, consumer test, preference mapping, natural yoghurt, product improvement potential

A-12

TOXIGENIC FUNGI AND MYCOTOXINS IN ORGANIC SPELT AND ITS PRODUCTS**E. Solarska^{1*}, A. Kuzdraliński¹, M. Marzec¹**¹ Group of Organic Food, University of Life Sciences in Lublin, Poland

* Email: ewa.solarska@up.lublin.pl; Tel: 048814623358; Fax: 048814623400

Spelt was grown in ancient times and now it is renewed in organic farming in Europe and North America mainly due to the nutritional value. Quality estimation of spelt yield in aspect of toxigenic fungi and mycotoxins occurrence is very important regarding consumer health. Mycotoxins produced by fungi are the one of the most dangerous compounds which contaminate cereal products.

The aim of this study was to determine the presence of toxigenic fungi and produced by them mycotoxins in organic spelt growing in Poland and to determine of mycotoxins in products from the spelt. Conventional mycological analysis and polymerase chain reaction (PCR) were used for the detection of *Fusarium* species in spelt grain. The occurrence of four mycotoxins was investigated in samples of organic spelt and presence of five mycotoxins was tested in spelt products. The kernels of spelt were sampled in the summer of 2007-2008 in organic farms in north-eastern Poland. The Enzyme-Linked ImmunoSorbent Assay (ELISA) method was used to identify aflatoxins, ochratoxin A, T-2 toxin, deoxynivalenol and zearalenone.

The main of *Fusarium* head blight cause of spelt was *Fusarium poae*. Among 24 of the examined samples of spring and winter spelt deoxynivalenol was identified especially in 2008, T-2 toxin sporadically only in 2007, aflatoxins and ochratoxin A were not found. Among 20 of the examined cultivars of winter spelt, deoxynivalenol was identified in 6 samples (up to 0.3 mg/kg), T-2 toxin was identified in one sample in very low amount (below 75 µg/kg) while aflatoxins and ochratoxin A were not found. Among 3 of the examined cultivars of spring spelt deoxynivalenol, T-2 toxin, aflatoxins and ochratoxin A were not found. Deoxynivalenol was found in following winter spelt cultivars: T. spelta L. album, T. spelta BG, T. spelta BG 1166, T. spelta, Schwabenspelz and Francencorn. T-2 toxin was identified in T. spelta L. album BG 31. Among 13 products from spelt, DON was detected in 1 sample, OTA in 1 sample and ZEA in 1 sample, T-2 toxins and aflatoxins were not found.

Keywords: spelt, organic farming, *Fusarium* toxigenic fungi, mycotoxins

A-13

QUALITATIVE TRAITS OF GRAINS OF SELECTED WHEAT CULTIVARS GROWN UNDER ORGANIC FARM CONDITIONS**J. Szymona**¹¹ Department of Agricultural Ecology, University of Life Sciences in Lublin, Poland

* Email: jerzy.szymona@up.lublin.pl; Tel: 048 81 5016830, Fax: 048 81 7428314

Cereal crops dominate in the whole of organic cultivations on arable lands at organic farms.

The economic value of cereals is determined by their yield size and quality. The qualitative traits of grain are the general selection element of a cultivar to be grown. Some traits are taken into account when cultivars are selected for fodders, while others when grain has to have consumption purposes: for bread or biscuits baking. Feeds require highly yielding cultivars, which not necessarily should be combined with large grain size. Instead, the grain size, milling parameters, as well as composition and quality of grain determining the flour baking value, are important for consumption: some for biscuit and other for bread baking. Beneficial agricultural features are also significant – resistance to diseases, competitiveness with weeds, etc.

The study aimed at analyzing the grains of 37 European winter wheat cultivars grown in the field experiment in organic farm. Following items were determined in wheat grains: total protein (%), gluten (%), and starch contents (%), Zeleny's sedimentation index (ml), and moisture content (%). All these determinations were carried out using IR analyzer (Bruins Instruments).

The three-year results (2007–2010) indicated quite prominent influence of weather conditions on values of all examined grain quality elements. Ecological conditions contribute to the decrease of the protein content in wheat grain and to the decrease of the sedimentation value. Despite of the appropriate fertilization with compost, the decrease of gluten concentration in wheat grains was recorded. A great variability in grain quality of studied wheat cultivars grown in the organic farms has been confirmed.

Keywords: organic, wheat, gluten, grain quality

A-14

FRUIT QUALITY AND ANTIOXIDANT PROPERTIES OF KIWIFRUIT (*ACTINIDIA DELICIOSA* CV. HAYWARD) ORGANICALLY GROWN IN ITALY

L. D'Evoli¹, S. Moscatello², A. Baldicchi³, A. Aguzzi¹, P. Gabrielli¹, S. Proietti², M. Lucarini¹, A. Battistelli², F. Famiani³ and G. Lombardi-Boccia^{1*}

¹ Istituto Nazionale di Ricerca per gli Alimenti e la Nutrizione, Roma, Italy

² Istituto di Biologia Agroambientale e Forestale, CNR, Porano, Italy

³ Dipartimento di Scienze Agrarie e Ambientali, Università degli Studi di Perugia, Italy

* Email: lombardiboccia@inran.it; Tel: 0039 0651494446; Fax: 0039 0651494550

The cultivation of kiwifruit (*Actinidia deliciosa*, cv Hayward) has had a steady increase in Italy and at the production obtained in the Lazio region (central Italy - main area for kiwifruit production in Italy – about 10% of the world production of kiwifruits) was recognised the Protected Geographical Indication (PGI) "Kiwi Latina", according to the EU rules. In the PGI area, organic orchards are also cultivated. This study aimed to evaluate the qualitative and antioxidant properties, including total phenolics, ascorbic acid, carotenoids and tocopherols, of organically grown kiwifruits obtained in three different orchards which are representative of the organic production of the PGI area.

For two consecutive years (2007 and 2008), fruits were harvested when the soluble solids were around 7.0 °Brix and then were stored in a refrigerated room in normal atmosphere. Yield/ha was recorded. After 5 months of storage, at eating-ripening stage, samples of fruits were analysed. The yield/ha varied, especially for a year effect, from 16 to 30 t/ha. Fruit weight, dry matter content and soluble solids concentration were 90-115 g, around 15% (determined at 105 °C) and between 13 and 14.5 °Brix, respectively. The total non structural carbohydrates and citrate and malate were 90-113 mg/g f.w., 10-15 m/g f.w. and around 3 mg/g f.w., respectively. The oxalic acid content was low. Total ascorbic acid and total polyphenols were around 66 mg/100g and 0.10 g GA/100g, respectively, without significant differences among the three orchards considered. Lutein was the most abundant carotenoid with values around 0.20 mg/100 g, followed by β-carotene (about 0.05 mg/100 g). Among tocopherols, α-tocopherol was the most abundant followed by γ-tocotrienol and γ-tocopherol. Variability in carotenoid contents was low, whereas the content in tocopherols varied greatly among the different orchards. Samples were also analysed for the *in vitro* antioxidant activity carried out on hydrosoluble extracts by ABTS method. The results indicate that, in the PGI area "Kiwi Latina", with the organic cultivation method, acceptable-good yields, especially in favourable years, can be obtained in association with good qualitative and nutritional characteristics of the fruits. Relationships between *in vitro* antioxidant activity and antioxidant contents of the fruits and differences found in the yield/ha and some characteristics of the fruits obtained in the different considered years and orchards are discussed.

Keywords: kiwi, ascorbic acid, liposoluble vitamins, total polyphenols, antioxidant activity

Acknowledgement: The study was carried out in the frame of the Project "QUALKIWI" supported by Mipaaf.

A-15

NITRATE CONTENT IN TWO ORGANICALLY AND BIODYNAMICALLY GROWN LETTUCE VARIETIES

M. Lucarini^{1*}, P. Gabrielli¹, S. Tufi¹, S. Paoletti², S. Di Ferdinando² and G. Lombardi-Boccia¹

¹ National Research Institute on Food and Nutrition - Rome (Italy)

² Agenzia Regionale per lo Sviluppo e l'Innovazione dell'Agricoltura del Lazio (ARSIAL), Rome, Italy

* Email: lucarini@inran.it; Tel: 0039 0651494446; Fax: 0039 0651494550

Green leafy vegetables greatly contribute to the total intakes of nitrates from the daily diet. Such compounds are potentially toxic for human health in that they can be reduced to carcinogenic nitrosamine. The concentration of nitrates in green leafy vegetables is determined by multiple factors: plant metabolism, environment, the season when the crop is picked, the amount of nitrate fertilizer used to grow up the crop.

This study was addressed to explore the possibility to lower nitrate content in two lettuce varieties by acting on crop factors like the type and quality of manures applied. A research project* has been funded by the Lazio Region into the *Interregional Programme Agriculture Quality* with the general objective to monitor the soil characteristics and biodiversity, the quality of the products as well as to study the economical aspects in a farm sited in Lazio Region (Central Italy) during a 3 years conversion period from conventional to organic and organic to biodynamic cultivation. Two lettuce varieties, *Lattuga romana* and *Foglia di quercia*, were grown by organic and biodynamic cultivation systems. The biodynamic cultivation was performed following two types of manuring: 1) Biodynamic with treatments (compost, 500p, 501 and green manure); 2) Biodynamic without treatments (compost and green manure). The experimental control was grown organically (compost only). For the control of adversity were adopted the same treatments.

Both the varieties were picked randomly from the experimental fields in July; *Lattuga romana* was also sampled in December. When delivered at laboratory samples were washed with deionised water, pooled and freeze-dried. Nitrate content was determined by ion-pair HPLC with diode array detector using a method of Ferreira et al. (2007). Nitrate concentration in both the salad varieties varied greatly (*Lattuga romana* from 826 to 1390 mg/100g dry weight (DW); *Foglia di quercia* from 1925 to 3818 mg/100g DW). *Foglia di quercia* variety accumulated higher amount of nitrate compared to the *Lattuga romana* variety. No significative differences were highlighted among the three cultivation methods. An influence of growing season on nitrate concentration in *Lattuga romana* variety was found.

Keywords: salad, nitrate, organic and biodynamic cultivations

Acknowledgement: Study carried out in the project "Valutazione di schemi di conversione all'agricoltura biologica e biodinamica in aziende tipo della Regione Lazio" by ARSIAL.

A-16

EFFECTS OF ORGANIC FARMING AND GENOTYPES ON ALIMENTARY-NUTRACEUTICAL PARAMETERS IN TOMATO FRUITS**C. Migliori¹, R. Lo Scalzo¹, L.F. Di Cesare¹, G. Campanelli², V. Ferrari²**¹ CRA-IAA, via G. Venezian n.23- 20133, Milan (Italy)² CRA-ORA, via Salaria n.1-63030, Monsampolo del Tronto, Ascoli Piceno (Italy)

Two genotypes of tomato (*Solanum lycopersicum* L.) “Giulianova” and “Perbruzzo”, grown both with organic (Or.) and conventional (Conv.) systems for three years (2008-2010) in the fields of the Research Unit CRA-ORA, were harvested at commercial ripening each year in July. The trials were carried out according to the randomized blocks scheme with three repetitions.

The Conv. system was performed according to the best available agricultural techniques and the Or. one according to the current regulation (EU Council Regulation 2007/834; EU Commission Regulation 2008/889).

Samples were evaluated for alimentary [characteristic volatile substances, soluble sugars (glucose and fructose), organic acids (oxalic, citric and malic) and pH] and nutraceutical (lycopene) parameters.

During the three years of experimentation, the characteristic volatile substances in “Giulianova” tomato increased in the Or. samples, while this response was less evident in “Perbruzzo” genotype.

The other alimentary parameters did not show any influence by organic agriculture in both genotypes during all the experimentation period.

Nutraceutical quality in tomato was expressed by the lycopene content, a molecule with an high antioxidant power, that cause a positive correlation between diet rich in tomato and its derivatives and low incidence of epithelial and prostate tumours. The lycopene content in both genotypes cultivated with Conv. system was constant during the whole period of experimentation. In the same genotypes cultivated with Or. system the lycopene content was lower than Conv. samples during the first and second years. While lycopene was similar to the Conv. sample in “Giulianova” genotype and higher in “Perbruzzo” in comparison with the Conv. sample during the third year.

In conclusion, the changes of parameters in tomato fruits could be effected by the cultivation system and genome for alimentary quality, especially for volatile substances; while nutraceutical one seemed only to be influenced by the cultivation system.

Acknowledgement: *This research was performed in the project “VALORBIO”, funded by the Italian Ministry of Agriculture and Forestry, DM 314/2007.*

A-17

FOOD SAFETY (HONEY) IN ACCORDANCE WITH THERAPY OF BEES

A. Hera^{1*}, V. Billova¹

Institute for State Control of Veterinary Medicines, Brno, Czech Republic

* Email: hera@uskvbl.cz; Tel: +420602487743

In European pharmaceutical legislation there are established certain rules to alleviate the lack of veterinary medicines for minor uses and minor species (MUMS), which are aimed at elimination of illegal use of medicines in animals as well as reduction of using medicines off-label. The working parties of European Medicines Agency together with further international organizations concerned with foodstuffs safety as Codex Alimentarius, IFAH, EFSA are currently dealing with the issue to increase the availability of medicines for MUMS.

The subject of interest of our study is availability of veterinary medicinal products (VMP) in beekeeping and safety of bee products for consumer health. Honey bee (*Apis mellifera*) producing honey for human consumption belongs to minor species according to current view of European legislation.

Marketing authorization of VMP for bees is subject to Regulation (EC) No 470/2009 for the establishment of maximum residue limits (MRL) of pharmacologically active substances in foodstuffs of animal origin and Commission Regulation (EU) No 37/2010 where all pharmacologically active substances for which MRL was established or no MRL is necessary for honey are listed.

Amitraz (MRL established), coumafos (MRL established), flumethrin and oxalic acid (no MRLs necessary), other substances such as formic acid, camphor, menthol, thymol, essential oils (e.g. eucalyptus -oil) are included in Annex II of the Regulation for all food producing species which therefore applies to bees and honey. Czech VMPs for bees have granted marketing authorization in compliance with the regulation (poster).

A precondition for using VMP for bees is zero withdrawal period and measures formulated in SPC (Summary of Product Characteristics) stipulating its use out of honey gathering period, from half of April till end September (from 16.04. to 30.09.)

For purposes of honey safety control in this country National Reference Laboratory of Institute for State Control of Veterinary Medicaments and Control Laboratories of the State Veterinary Administration have been carrying out the monitoring of veterinary medicines residues and substances prohibited to use in food-producing animals in accordance with Council Directive 96/23 EC.

Analytical technics used for determination of residues in honey at NRL and results of monitoring as national production of honey as import from third countries in years 2006 -2009 are presented in tables at poster.

In the work conclusion has been accented that as long as the veterinary medicinal products are used according to the rules of medicines law and its regulations i.e. in compliance with recommendations of SPC and package insert, the health of humans as consumers of honey and other bee products is not threatened.

Key words: food safety, veterinary medicinal products for bees, honey, residues

A-18

TRACE ELEMENT LEVELS OF ORGANICALLY PRODUCED MEDICINAL PLANT SAMPLES FROM TURKEY

İ. Narin^{1*}, D. Çitak², M. Tüzen², E. Yılmaz³ and M. Soylak³

¹ Department of Analytical Chemistry, Faculty of Pharmacy, Erciyes University, Kayseri, Turkey

² Department of Chemistry, Faculty of Art and Science, Gaziosmanpaşa University, Tokat, Turkey

³ Department of Chemistry, Faculty of Science, Erciyes University, Kayseri, Turkey

* Email: narin@erciyes.edu.tr; Tel: +903524380486; Fax: +903524379169

From the earliest times human have had to distinguish between those plants which are poisonous and those which are not, and there has gradually developed knowledge of naturally occurring drugs. Medicinal plants are the oldest known health care products. Their importance is still growing although it varies depending on the ethnological, medicinal and historical background of each country. Medicinal plants are also important for pharmacological research and drug development. In addition, plant constituents are used generally directly as therapeutic agents by folk.

The aim of this study was to determine the content of some trace elements of organically produced medicinal plants in Turkey. For this purpose, trace element contents of organically produced twenty one different medicinal plants (*hypericum perforatum*, *artichoke leaves*, *rosa canina*, *pomegranate flowers*, *fenne*, *lamium album*, *olive leaf*, *folium malvae*, *urtica dioica*, *flos rubus*, *alchemilla vulgaris*, *origanum majorano*, *crataegus monogyna*, *mashmallow flower*, *ginko biloba*, *bay laurel leaves*, *yarrow herb*, *chicory herb*, *rose flowers*, and *eucalyptus globulus*) were determined by atomic absorption spectrometric method. Medicinal plant samples are purchased from a company with performing organic produced from Turkey.

Contents of some trace element of plant samples were determined by flame and electro thermal atomic absorption spectrometer after microwave digestion. For this purposes, one gram of each sample was digested with 6 mL of HNO₃ (65 %) and 2 mL of H₂O₂ (30 %) in microwave digestion system and diluted to 10 mL with deionized water. A blank digest was carried out in the same way. Trace element levels of solutions were measurement by Perkin Elmer Analyst Model 700 atomic absorption spectrometer. Cu, Zn, Mn Fe and Ni levels of medicinal plant samples were determined by flame atomic absorption spectrometry, while Pb and Cd levels were determined by electro thermal atomic absorption spectrometry.

Keywords: Medicinal plants, flame and electro thermal atomic absorption spectrometry, trace element levels, microwave digestion

A-19

TRACE ELEMENT LEVELS OF ORGANIC LEGUMES AND MACARONI SAMPLES PRODUCED IN TURKEY**E. Yılmaz¹, İ. Narin^{2*}, D. Çitak³, M. Tüzen³ and M. Soylak¹**¹ Department of Chemistry, Faculty of Science, Erciyes University, Kayseri, Turkey² Department of Analytical Chemistry, Faculty of Pharmacy, Erciyes University, Kayseri, Turkey³ Department of Chemistry, Faculty of Art and Science, Gaziosmanpaşa University Tokat, Turkey

* Email: narin@erciyes.edu.tr; Tel: +903524380486; Fax: +903524379169

Trace elements are essential for biological processes and play a vital role in grown and developed. In spite of some elements are essential, some elements such as arsenic, lead, and cadmium, etc. are toxic elements. Trace elements levels in foods are affected from soils, fertilizers, air industrial process, transportation and package.

Organic foods are made with organic standards set by national governments and international organization. These standards are involved using less fertilizer and pesticide. In addition organics food is known to contain more nutrients, useful element and vitamins than has been intensively farmed.

Atomic absorption spectrometry is widely using technique for determination of elements in trace levels. Generally, physical condition of sample for determination by atomic absorption spectrometry is liquid phase. For this purpose, some procedures such as wet and dry digestion, and microwave digestion have been used for digestion of solid samples.

A microwave digestion offers some advantage over conventional digestion procedures for trace element analysis of food samples. These advantages can be reduced acid consumption, less contamination and preparation time.

The purpose of the present work was to be determined the levels of some trace elements in eight different type legumes (chickpea, two type boiled wheat, green, yellow and red lentil, kidney beans, and rice) and three type macaroni samples (spaghetti, penne rigat macaroni and fusilli macaroni) produced with organic procedures. The food samples were digested by microwave furnace systems. Cu, Zn, Mn Fe and Ni contents were determined by flame atomic absorption spectrometry, while Pb and Cd levels were determined by electro thermal atomic absorption spectrometry. Correlations of the obtained results are investigated statistical by SPSS 13.0.

Keywords: Analysis of trace elements in organic foods, atomic absorption spectrometry, microwave digestion

A-20**ANALYSIS OF NITROSAMINES IN ORGANIC FOODS****L. Peykova^{1*}, D. Oreshkova¹, I. Pencheva¹**¹ Medical University - Sofia, Faculty of Pharmacy, 2 Dunav str., 1000, Sofia, Bulgaria

* Email: phddanka@yahoo.com; Tel: 00359898486767

Nitrosamines are classified by IARC as Group 2B carcinogens. Nitrosamines might be present in organic foods as products of reaction between secondary amines and nitrosation system. The aim of the study was to test the concentration of nitrosamines in Bulgarian products. High performance liquid chromatography with UV detector was used. A standard solution of N-nitrosodiethanolamine (detection peak with retention time 2.33min) was used for comparison of samples. The limit of detection of the method was determined to 14×10^{-9} g/ml. The results of the testing showed that analysed Bulgarian organic foods did not contain nitrosamines above the limit of detection of the method.

Keywords: analysis, organic foods, nitrosamines

**IMPACT OF
PROCESSING ON
ORGANIC QUALITY
AND SAFETY
(B-1 – B-2)**

B-1

DISTRIBUTION CHAIN EFFECTS ON QUALITY PARAMETERS OF ORGANICALLY GROWN TOMATOES**A. Raffo^{1*}, I. Baiamonte¹, N. Nardo¹, S. Nicoli¹, F. Paoletti¹**¹ National Research Institute on Food and Nutrition (INRAN); Via Ardeatina, 546 - 00178 – Rome, Italy

* Email: raffo@inran.it; Tel: 0039 0651494573; Fax: 0039 0651494550

In order to evaluate the effects of short, compared to medium or long distribution chains, on some quality parameters of organically grown fresh tomatoes, a post-harvest experiment was carried out by reproducing in the lab the most common temperature, relative humidity conditions and storage-transport times occurring in the real distribution chain of organic horticultural fresh products.

Organically grown tomatoes of the cv. Nerina harvested at three different ripening stages (mature green, turning, red) were subjected to conditions corresponding to a short (1 day at room temperature), a medium (cold storage for 2 days, followed by ripening at room temperature) and a long distribution chain (cold storage for 6 or 9 days, followed by ripening at room temperature). In addition fruits harvested at the three different ripening stage were also subjected to optimal storage condition (8°C, turning and red tomatoes; 13°C green tomatoes, all at 95% R.H.) for 16 days.

At the end of the post-harvest experiment fruits were analyzed for volatile aroma compounds, organic acids, ascorbic acid, soluble sugars, texture, phenolic compounds.

Conditions of medium and long distribution chain (harvest at the green stage and cold storage-transport) did not have a significant detrimental effect when compared to short chain on the formation of some key tomato odorants, such as the lipid-derived aroma compounds (among which (3Z)-3-hexenal, hexanal) and the carotenoid-derived volatiles (among which damascenone, b-ionone).

On the other hand, conditions of medium and long chain greatly inhibited the formation of other aroma compounds (such as 1-nitro-2-phenylethane and 2-isobutylthiazole, related to the amino acid metabolism), which showed markedly higher levels in vine ripened fruits (or at the end of the short chain experiment).

Another significant effect was observed on firmness: fruits subjected to medium or long chain tended to show a reduced firmness when compared to vine ripened tomatoes, at harvest or at the end of the short chain.

On the contrary biosynthesis of ascorbic acid was scarcely affected by the distribution chain conditions: green harvested tomatoes, subjected to cold storage and ripened at room temperature afterwards, were able to accumulate an amount of ascorbic acid similar to that observed in vine ripened fruits.

Keywords: distribution chain, tomatoes, aroma compounds, sugars, organic acids

Acknowledgement: *The present study was performed within the project BIOVITA (W.P.3.1 - Supply chain of horticultural products) funded by the Italian Ministry of Agriculture, Food and Forestry Policy.*

B-2

THE CHANGES OF BIOACTIVE COMPOUNDS OF TOMATO JUICES FROM ORGANIC AND CONVENTIONAL PRODUCTION BEFORE AND AFTER PASTEURIZATION**E. Hallmann^{1*}, E. Rembiałkowska¹, J. Lipowski², K. Marszałek²**¹ Division of Organic Food, Warsaw University of Life Sciences - SGGW, Warsaw, Poland² Department of Fruit and Vegetable Product Technology, Institute of Agricultural and Food Biotechnology

* Email: ewelina_hallmann@sggw.pl; Tel: 048225937037; Fax: 048225937036

The most important rule of the organic agriculture is crop production without artificial pesticides and mineral fertilizers. Only natural fertilizers as compost, manure, also green manure are used. Plants are protected by natural insect predators and different plant extracts. Tomato juice is a very good of bioactive compounds as vitamin C, polyphenols and carotenoids as lycopene and beta-carotene. Thermal processing of tomato has a negative impact on bioactive compounds' content in juice, but it is one of the best methods to protect the nutritive value of tomato. Some hitherto experiments indicated that tomato juice from organic production contained more antioxidant compounds, but some other studies were contradictory.

The aim of this study was to study the chemical composition of tomato juice (fresh and pasteurized) prepared from organic and conventional fruits. Two cultivars tomato (Rumba and Picolino) from organic and conventional cultivation have been used for the experiment. The tomato fruits were cultivated in certified organic and conventional private farms located in Mazovia region in 2008 and 2009. The tomato fruits were collected in the same stage of maturity in the organic and conventional farms. Fruits were washed, cut into small pieces and converted into pulp. Half of samples were kept fresh and the rest was pasteurized 20 min. in 90°C. Tomato juice samples were freeze-dried and chemically analyzed. The content of dry matter, vitamin C, polyphenols and carotenoids has been determined. The obtained results showed that in 2008 fresh tomato juice from organic production contained significantly more lycopene and chlorogenic acids in comparison to conventional one. After pasteurization organic tomato juice contained significantly more chlorogenic acid, D-quercetin glucoside, naringin and myricetin in comparison to conventional samples. In 2009 fresh organic tomato juice contained significantly more vitamin C, lycopene and beta-carotene, gallic and chlorogenic acids, rutin and kaempferol in comparison to conventional ones. After pasteurization organic tomato juice contained significantly more dry matter, lycopene, beta-carotene, gallic and chlorogenic acids in comparison to conventional one.

Keywords: tomato juice, organic, conventional, polyphenols, carotenoids**Acknowledgement:** *We want to thank Polish Ministry of Agriculture and Rural Development for the financial support to conduct this study.*

**STANDARDIZATION
OF NOVEL METHODS
(C-1 – C-4)**

C-1

PATTERN FORMATION IN EVAPORATING DROPLETS AS A TOOL FOR WHEAT QUALITY ANALYSIS**M.O. Kokornaczyk¹, G. Dinelli¹ and L. Betti^{1*}**¹ Department of Agroenvironmental Sciences and Technologies, University of Bologna, Bologna, Italy

* Email: lucietta.betti@unibo.it; Tel: +39 051 2096734; Fax: +39 051 2096770

We studied the pattern formation in evaporating droplets of common wheat kernel leakages prepared out of modern and ancient wheat varieties as a possible tool for wheat quality analysis. The experiments showed that the substances which pass into the water during the soaking of the kernels created ordered crystalline structures with varying degree of complexity: the forms ranged from spots and simple structures, through ramified tree-like dendrites, up to very complex fractal-like and hexagonal shapes.

The resulting patterns were observed and photographed under an optical microscope with dark field in small magnifications. The photos of the crystalline structures were evaluated visually and by means of the image analysis software *Image J* with plug-in for skeleton analysis and fractal analysis. The visual evaluation was performed by a team of evaluators and consisted in scoring the pictures by placing them in a 10 point scale with reference pictures visualizing different degrees of complexity. In the computer supported evaluation the patterns were analyzed for their local connected fractal dimensions; moreover, the perimeter and area of the crystalline structures, as well as the total length of ramifications, were calculated. Out of the results it can be claimed that the wheat varieties differ in their pattern forming capacities. Two of the analyzed wheat varieties showed poor pattern formation, whereas other two varieties created well formed and complex patterns.

Additionally, the wheat varieties were analyzed for their vigor by means of the germination test and the measurement of the electrical conductivity of the leakages. Our results show that the vigorous varieties produced more complex forms during the droplet evaporation, whereas the varieties with poor vigor produced simple forms, suggesting a correlation between the wheat quality and the complexity of crystalline structures.

Keywords: droplet evaporation, wheat quality, self-organization, fractals, vigor

Acknowledgement: *We would like to thank Demeter Italia for financing this research.*

C-2

**PRELIMINARY STUDY FOR THE DEVELOPMENT OF A
PSYCHOLOGICAL TEST ABOUT THE EFFECTS OF FOOD****U. Geier¹ and K. Buchecker^{2*}**¹ Research Association for Biodynamic Agriculture, Darmstadt, Germany² ttz Bremerhaven, Bremerhaven, Germany

* Email: geier@forschungsring.de; Tel: 0049 6151 842128; Fax: 0049 6151 842125

Dürschmidt (2008) points out that only a fraction of the sensory input finds its way into our consciousness and therefore, only this fraction will be available in e.g. a classical sensory examination of food. For some years the number of studies concerning food-induced emotions has increased (cf. Greimel et al. 2006, King & Meiselman 2010, Thomsen et al. 2010, Walla et al. 2010). Research on the effects of food on the psyche to-date does not offer sufficient information about specific food items consumed every day. There are several reasons for this. The questions posed are unspecific (e.g. about the relationships between food and emotions in general), the questions are posed in very specific situations, which do not allow generalization or, inquiry is made about particular food items, which have been selected because of their popularity (ice cream, chocolate, pasta, pizza). According to the psychological specialist publisher Hohgreffe, to date no specific psychological test about the effects of food is available.

A preliminary study was to find out if it is possible to measure the effects of single food items using a sensory consumer test (according to DIN 10974). The study aimed to develop a standardized test for the supplementary assessment of food by measuring the physical and mental human condition. In 2010 the research provider ttz Bremerhaven conducted six tests with 60 consumers per test. In each test three samples were compared, sometimes additionally with a reference sample. After a short introduction, the test persons tasted the coded food and then answered six questions in a questionnaire about how they felt after eating the food. The test took 20 to 30 minutes. Test criteria have partly been taken from the multidimensional sensitivity questionnaire by Steyer et al. (1997). The test persons were asked about their sensations of cold/warm, light/heavy, ease/unease, invigorated/weakened, alert/tired and good/bad mood in a five-stage spectrum. There were two tests about dairy products and non-dairy milk substitutes, two vegetable tests and two tests of bakery products. For very different products, significant results could be determined, e.g., cow's milk caused a feeling of greater calm and more warmth than soy milk. With very similar food, e.g. different varieties of carrots, no significant differences were determined. Experienced sensory experts who are used to focus on the quality of foods noticed more significant differences than inexperienced test persons.

A follow-up study aims at finding out whether by modifying the test, the outcome will become more precise, e.g. through an enhanced test introduction, more time between eating the product and assessing it and improved questions. It will also examine the relation of sensory and psychological assessment.

Keywords: psychological test, sensory analysis, food assessment

C-3

QUALITY ASSESSMENT OF GRAPE JUICE FROM INTEGRATED, ORGANIC AND BIODYNAMIC FARMING WITH IMAGE FORMING METHODS**J. Fritz^{1*}, M. Athmann¹ and U. Köpke¹**¹ Institute for Organic Agriculture, University of Bonn, Katzenburgweg 3, 53115 Bonn, Germany

* Email: j.fritz@uni-bonn.de; Tel: ++49 (0)2242-9134290

An impact on product quality when changing from Integrated to Organic and Biodynamic Farming has frequently been reported by wine growers. To test these reports for scientific validity, a long-term field trial comparing Integrated, Organic and Biodynamic Farming was established in 2006 at the Geisenheim Research Center in Germany. Complementary to chemical analysis, encoded grape samples were examined with the image forming methods biocrystallization, capillary dynamolysis and circular chromatography from 2006 to 2010. Fresh grape juice and juice that had been aged up to 9 days were investigated. Each year, 660 to 990 images were produced and evaluated.

The images were evaluated visually. The samples were characterised based on reference series that indicate the effects of juice concentration and juice aging on image structures. The assignment of production methods to samples was based on empirical evidence: i. For a similar expression of structures, samples from juice produced with Integrated Farming needed more juice per sample than samples from Organic and Biodynamic origin, and ii. samples from Integrated Farming showed more structures that indicate enhanced aging compared with the images gained from samples from Organic and especially samples from Biodynamic Farming treatments.

Based on these observations, a correct assignment of all encoded samples to production methods was possible for 2006 and 2007 samples (for each year 2 samples per production method, respectively) as well as 2008 and 2010 samples (for each year 3 samples per production method). In 2009, 7 out of 9 samples were assigned correctly. In all years, all integrated samples were precisely identified.

Generally, these results indicate a higher product quality of Biodynamic and Organic grape juices compared with juices from grapes produced according to the rules of Integrated Farming. If further investigations will confirm these differences assessed for the grape juice also for the wines based on grapes of these different origins, image forming methods might become a valuable complement to chemical analysis in wine quality assessment in the long run.

Keywords: capillary dynamolysis, biocrystallization, circular chromatography

Acknowledgement: *We gratefully acknowledge the financial support by Software AG Stiftung, Darmstadt and Damus Stiftung, Karlsruhe, Germany.*

C-4

THE STEIGBILD METHOD AS A SYSTEMIC PARAMETER TO ORGANIC FOOD AUTHENTICATION**A. Zalecka^{1*}, J. Kahl²**

¹ Division of Organic Foodstuffs, Faculty of Human Nutrition and Consumer Sciences, Warsaw University of Life Sciences, Warsaw, Poland

² Department of Organic Food Quality and Food Culture, University of Kassel, Witzenhausen, Germany

* Email: aneta_zalecka@sggw.pl; Tel: 0048225937036; Fax: 0048225937036

The growing market of organic food products demands for product oriented quality control. One major concern is the differentiation of organically grown from conventionally grown food. With the capillary dynamolysis technique patterns are produced on filter paper and evaluated as a fingerprint of the sample as a whole. Although the capillary dynamolysis method was able to show these differences on coded samples for a wide range of different products it has never been validated in such a way that the results of the tests can be used as a commercial quality parameter. Recently initial efforts have been made to standardize the method, including documentation of the procedures according to international standard norms and development of an evaluation tool which allows statistical analysis of the results.

For the development and characterization of the method the WALA approach is basically adopted. For wheat samples a watery extract is made. Wheat extracts and carrot juices are filtered and set to rise in a filter paper. The paper sheet has been rolled into a cylinder and stands in a specially designed glass dish (phase 1). After drying a AgNO₃ solution is set to rise through the same paper. This will partly dissolve the dried extract, carry it further up and finally dry (phase 2). In the third phase FeSO₄ solution rises until a fixed height of the paper sheet. For all phases relative humidity in the laboratory room is controlled and kept constant; the rising phases are performed under complete exclusion of light. The dry test papers are finally exposed to light by which the patterns are developed and structures become visible. Evaluation of the tests consider largely the form elements in this flow patterns. For every run control (water) and standard (sugar) pictures are made.

In order to test the method ability to discriminate different product qualities, carrot juices, produced under different conditions and two wheat varieties were used. This resulted in documented procedures which were used in three laboratories and defined criteria for the visual evaluation of the patterns. Moreover a systematic investigation of the different factors influencing the result was carried out and certain method parameters such as repeatability, intermediate precision and reproducibility were determined. Intercomparisons between three partner laboratories resulted in comparable patterns for wheat and carrot samples. The pictures were evaluated by simple descriptive tests, which were developed and applied in sensory testing already. Moreover the patterns were evaluated in a triangular test which was also adopted from sensory analysis. Apple, carrot and wheat samples from different origin can be differentiated, when the simple descriptive test is applied. When the triangular test is used for the differentiation of the samples, highly significant results can be achieved.

Keywords: food quality, quality control, Steigbild

**ORGANIC FOOD
AUTHENTICITY
(D-1 – D-14)**

D-1

YEAST EXTRACT IN ORGANIC FOOD AND ITS AUTHENTICITY ACCORDING TO ORGANIC PRODUCERS

S. Ibing^{1*}, A. Ross¹, K. Hollmann¹, M. Lukas¹, C. Dressler², N. Schinkowski² and C. Strassner¹

¹ Münster University of Applied Sciences, Department of Home Economics and Nutrition Sciences, Münster, Germany

² Organic Processors and Traders Association, Berlin, Germany

* Email: Sandra.Ibing@fh-muenster.de; Tel: +49-(0)251-8365490; Fax: +49-(0)251-8365402

Yeast extract is used as an ingredient in organic food primarily to improve flavour. This application is being increasingly critically viewed in the media and by consumers as it is assumed to have similar effects to those discussed for synthetic flavour enhancers. Furthermore, some people involved in the organic food industry see yeast extract as an ingredient that does not align with the principle of authenticity. Even the revised EU organic regulation highlights yeast extract as it demands using certified organic yeast extract for organic products.

In this research project scientifically based evidence both for and against the use of yeast extract in organic food was sought in literature. A survey of organic food producers identified the operational practice and relevance of using yeast extract (questionnaire in written form, n=35, response rate = 63%, 3 deep interviews with experts). Sensible alternatives for organic food processing were to be identified by both the literature and producer survey. The results from scientific studies do not allow a decisive scientific statement, however the studies about monosodium glutamate point to controversial issues. Analyses of consumer information websites show the high interest of consumers in the use of yeast extract as ingredient in both organic and conventional products and its purported nutritional-physiological effects. Misunderstandings concerning the terms 'glutamate' and 'yeast extract' and the critical discussion of using yeast extract as flavour enhancer point to the consumers' uncertainty. They ask for more information and expect transparent labelling. A dichotomy is evident in that consumers want organic food to taste "natural", but also enjoy the umami-taste.

Amongst organic processors the controversial discussion is reflected by the diverse answers. 59% of the companies surveyed use conventional yeast extract, though 82% exclusively produce organic products. More than half of the companies receive critical consumer requests concerning yeast extract. The sensory profile of a product is the most important reason given for its use. For 59% of the companies surveyed the use of alternatives is not considered necessary, some do not know any alternatives, others name celery or the combination of certain spices. Some producers already use organic yeast extract or change the recipe to avoid it completely, but this necessitates high development costs. On current data it is not possible to give a decisive statement either for or against the use of yeast extract in organic food. However, a transparent communication towards the consumer is fundamental, especially the clear differentiation of the terms used. Most producers of organic products are aware of these consumer interests and the revised regulatory framework, but their reactions differ widely. The research project identified numerous approaches for further research.

Keywords: yeast extract, organic products, flavour enhancer, glutamate

Acknowledgement: *The project was initiated by the German Organic Processors and Traders Association (BNN-Bundesverband Naturkost Naturwaren Herstellung und Handel e.V.) and was carried out in cooperation with the University of Applied Sciences Münster from February to December 2009. The project was funded by the German Federal Ministry of Food, Agriculture and Consumer Protection (BMELV) within the federal organic farming programme.*

D-2

INFLUENCE OF DIFFERENT CROP MANAGEMENT PRACTICES ON NUTRITIONAL PROPERTIES OF SOFT WHEAT FLOUR - *TRITICUM AESTIVUM L. CV AUBUSSON*

E. Azzini^{1*}, E. Finotti¹, M.S. Foddai¹, P. Bàrberi², M. Perenzin³, L. Plizzari³, M. Guiducci⁴ and G. Maiani¹

¹ Area Scienze della Nutrizione, Istituto Nazionale di Ricerca per gli Alimenti e la Nutrizione, Roma, Italy

² Scuola Superiore Sant'Anna di Studi Universitari e di Perfezionamento (SSSUP-PI), Pisa, Italy

³ Unita` di Ricerca per la Selezione dei Cereali e la Valorizzazione delle Varieta` Vegetali (CRA-SCV), Sant'Angelo Lodigiano, Lodi, Italy

⁴ Dipartimento di Scienze Agrarie e Ambientali, Università di Perugia (DISAA-PG), Italy

* Email: azzini@inran.it; Tel: +390651494461; Fax: +390651494550

The beneficial properties of grains are attributed in part to their unique phytochemical composition: vitamins and minerals, unsaturated fatty acids, tocotrienols, tocopherols, insoluble and soluble fiber, phytosterols, stanols, sphingolipids, phytates, lignans, and antioxidants like phenolic acids. In the frame of a long-term experiment carried out in three Italian areas, conventional and organic wheat cropping systems were compared in 2006-2008 to evaluate the effect of system management on soft wheat flour quality. Tested flour samples were obtained with the same milling techniques. The research was focused on the identification and quantification of bioactive molecules (vitamins and carotenoids) in soft wheat flour samples (cv. *Aubusson*) from organic and conventional agronomic practices. In addition the synergistic action of bioactive molecules was evaluated by two assays the TEAC (Trolox Equivalent Antioxidant Capacity) and FRAP (Ferric Reducing Antioxidant Power).

From our results, Lutein plus zeaxanthin content ranged from 70 to 263 $\mu\text{g}/100\text{gr}$ and from 94 to 261 $\mu\text{g}/100\text{gr}$ for organic and conventional flour respectively. Mean TEAC and FRAP values were respectively 0.48 ± 0.11 mmol/kg and 1.89 ± 0.48 mmol/kg in organic wheat flour, 0.44 ± 0.10 mmol/kg and 2.16 ± 0.12 mmol/kg in conventional wheat flour. The comparison between organic and conventional flour samples from different production areas showed differences in nutritional quality indicating the close linkage between quality and environment, pedoclimatic conditions as well as agronomic practices.

Keywords: soft wheat, agronomic practice, antioxidant power, bioactive compounds

D-3**FATTY ACID CONTENT IN ORGANIC AND CONVENTIONAL BULK TANK MILK IN SWEDEN****N. Fall^{1*} and U. Emanuelson¹**

¹ Department of Clinical Sciences, Swedish University of Agricultural Sciences, PO Box 7054, SE- 750 07 Uppsala, Sweden

* Email: Nils.Fall@slu.se

Fatty acids in milk are important for the human consumer, the calf and the cow. Studies indicate that milk from organic and conventional dairy farms may differ in this aspect. The aim of this study was therefore to investigate whether there are differences in the fatty acid composition in milk from organic and conventional farms in Sweden. The bulk tank milk samples were collected from 18 organic and 19 conventional dairy farms in January 2006. Herd characteristics were collected by questionnaires and from the official milk recording scheme. Multivariable linear mixed models were used to evaluate the associations between milk composition and type of farm. In addition to management type, the variables included in the models were housing type, milk fat content, herd size, average milk yield and time on pasture during summer.

The median proportion of conjugated linoleic fatty acids (CLA) was 0.63 % in organic compared to 0.48 % in conventional herds. The proportion of total n-3 fatty acids was 1.44 and 1.04 % in organic and conventional milk, respectively, and the proportion of total n-6 fatty acids was 2.72 and 2.20 %, respectively. The multivariable regression models indicated significantly higher proportion of CLA, total n-3 and n-6 fatty acids in organic milk and a more desirable ratio of n-6 to n-3 fatty acids, for the human consumer, in organic milk.

Hence, the results from this study indicate that the FA content in milk is affected by farming system, where organically produced milk have a higher content of FA and a more desired ratio of Omega-6 FA to Omega-3 FA with potential benefits to human health.

Keywords: organic, milk, fatty acid, composition

D-4

METABOLOMIC PROFILING EMPLOYING DART-TOFMS FOR QUALITY AND AUTHENTICITY ASSESSMENT OF TOMATOES AND PEPPERS FROM ORGANIC AND CONVENTIONAL FARMING

H. Novotná¹, O. Kmiecik², M. Galazka², V. Krtková¹, A. Hurajová¹, V. Schulzová^{1*}, E. Hallmann², E. Rembiałkowska² and J. Hajšlová¹

¹ Department of Food Chemistry and Analysis, Institute of Chemical Technology, Prague, Czech Republic

² Division of Organic Foodstuffs, Warsaw University of Life Sciences, Warsaw, Poland

* Email: vera.schulzova@vscht.cz; Tel: +420220444389; Fax: +420220443185

Organic agriculture was developing rapidly in the last decade, driven by increasing consumer demand, price premiums, and improving market opportunities. This development was accompanied by an increasing demand for analytical methods, which could verify the authenticity of organic foods. This contribution concentrates on one of the novel methods of food analysis, which is the metabolomic profiling by the Direct analysis in real time (DART) ion source coupled to a time-of-flight mass spectrometry (TOFMS). The data obtained by the DART-TOFMS are treated by the Linear discriminant analysis (LDA). This methodology has been tested on a wide set of tomato and pepper samples.

Pepper samples were represented by 3 varieties and tomato samples by 5 varieties. Samples of pepper and tomato were grown both conventionally and organically in the neighbouring farms in Poland and each sample was represented by 2 subsequent years (2007 and 2008).

Freeze-dried samples were extracted by a MeOH-water mixture. Each sample was measured in both positive and negative ion mode. The results obtained from the positive ion mode enabled better differentiation between organically and conventionally grown samples than the results from the negative ionization mode. In both tomato and pepper samples the recognition ability obtained by LDA was 100 % and the prediction ability was above 80 %.

Keywords: Tomato, Pepper, Organic and conventional, DART-MS, Metabolomic profiling

Acknowledgement: *This study was carried out with support from the Ministry of Education, Youth and Sports, Czech Republic, the project MSM 6046137305 and specific university research (MSMT no. 21/2010); Polish team wants also to thank Polish Ministry of Agriculture and Rural Development for the financial support to conduct this study.*

D-5

SENSORY DIFFERENCE AND PREFERENCE, YIELD, AND QUALITY PARAMETERS OF BIO-DYNAMICALLY, ORGANICALLY AND CONVENTIONALLY PRODUCED WHEAT FROM THE DOK LONG-TERM FIELD TRIAL**C.M. Arncken^{1*}, P. Mäder¹, J. Mayer² and F.P. Weibel¹**¹ Research Institute of Organic Farming (FiBL), Frick, Switzerland² Agroscope Reckenholz-Tänikon Research Station (ART), Zürich, Switzerland

* Email: Christine.arncken@fibl.org; Tel: +41/628657237; Fax: +41/628657273

Wheat is the most important crop in temperate countries, with an increasing organic share. Along with ecological advantages, the organic community claims superior intrinsic quality of organic compared to conventional food, including sensory properties.

In our study, we performed sensory triangle tests with blinded samples of dry whole wheat flour. We also assessed grain yield and common standard wheat quality parameters. The wheat samples originated from the "DOK" long-term system comparison trial near Basel, Switzerland. The compared farming systems were: biodynamic (BIODYN), bioorganic (BIOORG) and conventional (CONFYM).

Average yields of the organic systems BIODYN and BIOORG from 2006 to 2009 were 40% lower than conventional yields due to 89% (BIODYN) and 83% (BIOORG) lower input of available N via fertilizers. Grain crude protein content was 161 g kg⁻¹ in the conventional and 119 g kg⁻¹ in both organic systems.

For the triangle tests, two 30-person panels (one with a majority of conventional consumers, the other with a majority of organic consumers) tested all three possible farming system pairings from two years (one from 2006 and 2007, one from 2007 and 2009) and from two field replicates, resulting in 24 single comparisons.

In two single comparisons (BIODYN vs. CONFYM), sensory difference was significant ($\alpha = 0.05$), but not in the other 22 single comparisons. Calculating all comparisons across all years, the factor "pair of farming systems" had a significant ($p = 0.045$) influence on the proportion of correct triangle test answers. This was highest when systems CONFYM and BIODYN were compared (41.7%).

The triangle tests were followed by a preference question. Preference data were only analyzed when triangle test answers were correct. In one comparison case, a significant preference was given (BIOORG preferred to CONFYM). In the other 23 comparisons, preference was not significant. Calculating the CONFYM vs. BIOORG comparison across all years, a highly significant interaction ($p = 0.002$) showed that the panel of conventional consumers preferred CONFYM wheat and the panel of organic consumers preferred BIOORG wheat. The same could be seen for the CONFYM vs. BIODYN comparison as a tendency ($p=0.08$).

The study shows that despite lower protein content in the organic compared to the conventional wheat, the sensory quality is not negatively, however, partly even positively influenced. Although the triangle tests were too challenging and strict to show sensory differences between conventional and organic flour, they helped to select the relevant preference answers. Interestingly, preference for either organic or conventional wheat was significantly dependent on the panelists' custom to organic or conventional food.

Keywords: wheat quality, sensory quality, triangle test, organic, conventional

Acknowledgement: *We gratefully acknowledge support of this study by the following foundations: Mahle-Stiftung, Software AG Stiftung, Rogau-Stiftung, Zukunftsstiftung Landwirtschaft, Evidenz-Stiftung.*

D-6

DIFFERENCES IN MICRONUTRIENT CONTENT OF ORGANICALLY AND CONVENTIONALLY GROWN CABBAGE: A METABOLOMICS APPROACH

A. Mie^{1,2*}, M. Åberg², K.H. Laursen³, M. Søltoft⁴, E. Kapolna⁴, P. Knuthsen⁴, E. Huusfelt Larsen⁴, U. Nilsson², M. Olsson⁵, S. Husted³

¹ Department of Clinical Science and Education, Karolinska -Institutet, Stockholm, Sweden

² Department of Analytical Chemistry, Stockholm University, Stockholm, Sweden

³ Plant and Soil Science Laboratory, Department of Agriculture and Ecology, Faculty of Life Sciences, Copenhagen University, Frederiksberg, Denmark

⁴ Food Chemistry, DTU Food, National Food Institute, Technical University of Denmark, Søborg, Denmark

⁵ Department of Horticulture, Swedish Agricultural University, Alnarp, Sweden

* Email: axel.mie@ki.se; Tel: +46-8-616 39 51; Fax: +46-8-616 29 33

There is an increasing body of research comparing organically and conventionally grown produce with respect to the content of certain micronutrients, such as vitamins, antioxidants and other phytochemicals. However, most studies evaluate only a small number of predetermined micronutrients, and no study so far has an untargeted approach to finding differences in micronutrient composition.

In this study, white cabbage from a 2-year controlled cultivation is compared using LC-MS based metabolomics, in an effort to find differences between the organically and conventionally grown crops. Three production systems, one conventional and two organic, are used, distinguished by the form (mineral fertiliser vs. green and farmyard manure) and amount of nitrogen fertilisation, with impact on the crops metabolism and micronutrient composition. Each of the three production systems has three replicate plots on the same field site.

Freeze-dried white cabbage samples are sequentially extracted with solvents of different polarity. Extracts are analysed by liquid chromatography – q-ToF mass spectrometry (LC-MS) using reversed-phase LC columns and both positive and negative electrospray ionisation. Raw data are aligned and analyzed for a differential effect of agricultural production system on the concentration of individual compounds in the white cabbage, and compounds of interest are chemically identified.

Initial data analysis on one dataset with approximately 3000 detected compounds (mass spectral features) shows that 490 compounds were differentially expressed ($p < 0.05$) in the conventional cabbage compared to cabbage fertilised by green and animal manure. Although the impact of detailed chemical composition of one crop on human health is not straight-forward and far from understood, these results may serve as a rationale for developing hypotheses of differential health effects of organic and conventional crops.

Keywords: metabolomics, untargeted analysis, white cabbage, nutrients, comparison of conventional and organic agriculture

D-7

ASSESSMENT OF QUALITY OF ORGANICALLY AND CONVENTIONALLY GROWN POTATOES**V. Krtková¹, V. Schulzová^{1*}, P. Dvořák² and J. Hajšlová¹**¹ Department of Food Chemistry and Analysis, Institute of Chemical Technology, Prague, Czech Republic² Czech University of Life Sciences Prague, Department of Quality of Agricultural Products, Czech Republic

* Email: vera.schulzova@vscht.cz; Tel: +420220444389; Fax: +420220443185

Growing consumers' interest in organically produced foods obviously reflects escalating public concern about environmental and personal health issues. In order to be able to make a free and informed choice between organic and conventional foods, an objective assessment of a product quality based on a sound scientific knowledge is needed.

The research project "Soil protecting growing systems in potatoes with focus on quality organic production and arable land", was realised in cooperation with Czech University of Life Sciences Prague, Department of Quality of Agricultural Products. The aim of this project was to investigate the influence of growing conditions on the quality of potatoes (*Solanum tuberosum*). Two traditional varieties (Katka and Finka) and new perspective varieties (Jelly, Red Anna and Monika) were grown at two different localities in Czech Republic. To determine possible inter-annual variations experiments were performed on three consecutive crops (2008 – 2010).

The parameters studied included positive biologically active compounds (chlorogenic acid, starch, amino acids, vitamin C etc.), occurrence of toxic secondary metabolites was also investigated (total glycoalkaloids content, calystegines content).

The levels of biologically active compound depend mainly on the variety and climatic conditions (year of farming), but a type of a cultivation system does not play a significant role. The levels of currently investigated natural toxic alkaloids calystegines seem to be frequently higher than levels of monitored and legislatively controlled natural toxicants glycoalkaloides.

Keywords: Potatoes, Growing system, Secondary metabolites, Natural toxicants

Acknowledgement: *This study was carried out within the project NAZV QH82149 supported by Ministry of Agriculture of the Czech Republic; project MSM No. 6046137305 and specific university research (MSMT no. 21/2010) supported by the Ministry of Education, Youth and Sports of the Czech Republic.*

D-8

FURANOCOUMARINS IN CELERIAC FROM DIFFERENT FARMING SYSTEMS: THREE-YEARS STUDY**V. Schulzová^{1*}, L. Babička² and J. Hajšlová¹**¹ Department of Food Chemistry and Analysis, Institute of Chemical Technology, Prague, Czech Republic² Czech University of Life Sciences Prague, Department of Quality of Agricultural Products, Czech Republic

* Email: vera.schulzova@vscht.cz; Tel: +420220444389; Fax: +420220443185

The aim of this study was to investigate the effect of the way of celeriac cultivation on the content of naturally occurring toxicants - furanocoumarins. Organic farming using anaerobically fermented pig slurry was compared with mineral, combined, and non-fertilized farming. The average levels of furanocoumarins in variety Albin was 2.6 mg kg⁻¹ and in variety Kompakt 10.2 mg kg⁻¹, ranging from 1.0 to 23.5 mg kg⁻¹. Content of targeted toxicants was relatively low and obviously does not present health risk for consumers. Statistically significant differences between varieties Albin and Kompakt were found, total furanocoumarins content was significantly lower in variety Albin (t-test, $\alpha=0.05$).

LDA was employed as a chemometric tool for assessment of influences of varieties, crop year, and farming system to furanocoumarins levels. It was not possible to separate celeriac samples according to the way of farming when more crop years were analysed. According to variety it was possible to separate whole data set from 85.7%, in individual crop year the recognition ability was on average higher than 90%. According to crop year it was possible to separate whole set of samples from 70.8%, when individual variety was compared it was 100% for both tested varieties.

Anaerobically fermented pig slurry (organic fertilizer with high fertilization efficiency) is a good alternative to mineral fertilization in terms of certain agricultural parameters such as crop yield. However the distinct impact on furanocoumarin levels was not found i.e. no significant relationships between the levels of monitored toxic compounds and the way of fertilization were observed. Fertilization method does not influence significantly the levels of these plant secondary metabolites. The climatic conditions in particular crop years play an important role in the furanocoumarins occurrence.

Keywords: Celeriac, Fertilisation system, Furanocoumarins, LDA analysis

Acknowledgement: *This study was carried out within the project MSM No. 6046137305 supported by the Ministry of Education, Youth and Sports of the Czech Republic.*

D-9

COMPOSITIONAL FIGURES AND PHENOLIC COMPOUNDS IN TOMATOES GROWN BY CONVENTIONAL, ORGANIC AND BIODYNAMIC AGRICULTURE

L. D'Evoli^{1*}, E. Finotti¹, P. Gabrielli¹, L. Gambelli¹, S. Di Ferdinando², S. Paoletti² and G. Lombardi-Boccia¹

¹ National Research Institute on Food and Nutrition-Rome (Italy)

² ARSIAL, Regional Agency for the Development and the Innovation of the Agriculture of Lazio - Rome- (Italy)

* Email: devoli@inran.it; Tel:+39 0651494446; Fax:+39 0651494550

The study was addressed to evaluate the influence of different methods of cultivation on compositional figures, total polyphenols and phenolic acid content in tomatoes (*Lycopersicon esculentum*, cv. CXD271BIO). A research project* has been funded by the Lazio Region into the *Interregional Programme Agriculture Quality* with the aim to monitor the soil characteristics and biodiversity, the quality of the products as well as to study the economical aspects in a farm sited in Lazio Region (Central Italy) during a 3 year conversion period from conventional to organic and organic to biodynamic. Two farms were involved in the planned field trials: Farm A) conversion from conventional to organic cultivation. Farm B) conversion from organic to biodynamic cultivation. The biodynamic cultivation system is characterized by field preparations (500, 500p and 501) and compost preparations (502, 503, 504, 505, 506, 507, 508), the use of green manure multifloreal to improve the fertility and biodiversity of the soil microfauna and microflora. The biodynamic cultivation was performed following two types of manuring: 1) Biodynamic with treatments (compost, 500p, 501 and green manure); 2) Biodynamic without treatments (compost and green manure). The experimental control was grown organically. For the control of adversity were adopted the same treatments.

Tomatoes were picked randomly from each experimental field, pooled on the basis of the respective cultivation method and analysed for their chemical composition; total polyphenol content was determined by Singleton et al. method (1999); phenolic acids (caffeic, p-coumaric, ferulic, chlorogenic acids) were determined by RP-HPLC (Hanna et al, 1991; Awad et al., 2000).

Conventionally grown tomatoes showed a markedly higher concentration of total polyphenols compared with the organic ones, the same was observed for most of the phenolic acids (caffeic, p-coumaric and ferulic acids) but chlorogenic acid, which was significantly higher ($p < 0.0001$) in the organic cultivation. Concerning the three types of organic cultivations, marked differences were found only in total polyphenol content (biodynamic > organic).

Keywords: tomato, polyphenols, phenolic acids, minerals

Acknowledgement: Study carried out in the project "Valutazione di schemi di conversione all'agricoltura biologica e biodinamica in aziende tipo della Regione Lazio" by ARSIAL.

D-10

DIFFERENCES IN WHEY PROTEINS CONTENT BETWEEN COW'S MILK COLLECTED IN LATE PASTURE AND EARLY INDOOR FEEDING SEASON FROM CONVENTIONAL AND ORGANIC FARMS IN POLAND

B. Kuczyńska^{1*}, E. Metera², K. Puppel¹, M. Gołembiewski¹, T. Sakowski², K. Stoniewski²

¹ Cattle Breeding Department, Faculty of Animal Science, Warsaw University of Life Sciences, 02-786 Warsaw, Poland

² Animal Science Department, Institute of Genetics and Animal Breeding, Polish Academy of Science, Jastrzębiec, 05-552 Wólka Kosowska, Poland

* Email: Beata_kuczyńska@sggw.pl; Tel: 048225936540; Fax: 048225936538

Quantity, quality and types of proteins in milk influence the yield and technological and health-beneficial properties of milk. The value of milk proteins is more than twice as valuable as milk fat. The amount of whey proteins produced by cows strongly depends upon many factors including: cows' diet, health, stage of lactation, breed and part of the year. Since organic production systems result in improved food quality, little scientific data on bioactive compounds in cows has been published. The main aim of the study was to investigate bioactive whey proteins concentrations in cow's milk collected in late pasture (LP) and early indoor feeding (EIF) season from conventional and organic farms in Poland.

Individual milk samples were collected from cows of two breed: Polish Holstein-Friesian and Polish Black and White kept at 5 farms on the North and Central-East of Poland. During LP basic diet of organic cows was pasture. Daily ratio for the organic cows during EIF consisted of silages, roughages, concentrates. Compared to organic daily ratio of cows kept in conventional system were supplemented with concentrates (during LP). During EIF period conventional cows were fed by TMR (Total Mixed Ratio). Milk samples (about 30 ml of milk) were collected during evening milking. Basic parameters of the milk, i.e. fat, protein, casein and lactose content were examined on Milkoscan FT – 120. Evaluation of hygienic status of the milk was based on somatic cell count on Somacount – 150. Whey proteins were examined on HPLC – Agilent 1100 series. Data was analyzed according to univariate linear mixed model, separately for LP and EIF season, using PROC MIXED in SAS.

Results showed that in the LP somatic cell score (SCS) were higher under organic farming conditions. However, percentages of protein and fat were higher under conventional farming conditions. In EIF, milk from conventional dairy farm had a higher percentage of fat, lactose and a lower concentration of protein and SCC in comparison to milk from organic farm.

Organic milk in LP had a higher concentrations of beneficial whey proteins than conventional milk, including β -lactoglobuline (B-LG; 4.12 vs. 2.68 g/l), lactoferrin (Lf; 334.99 vs. 188.02 mg/l), and lysozyme (Lz; 15.68 vs. 12.56 μ g/l). However, conventional milk in EIF had higher concentrations of bovine serum albumin (BSA; 146.47 vs. 118.65 mg/l), lactoferrin (Lf; 215.49 vs. 185.27 mg/l), and lysozyme (Lz; 16.63 vs. 13.22 μ g/l).

The results show small differences in the investigated parameters between organic milk and the milk from conventional system during EIF. However, in LP there were a significant differences: milk from organic farm had a higher concentration of bioactive whey protein's (B-LG, Lf, Lz).

Keywords: milk quality, organic milk, conventional milk, whey protein

D-11

ORGTRACE- NO DIFFERENCE IN LEVELS OF BIOACTIVE COMPOUNDS FOUND IN CROPS FROM SELECTED ORGANIC AND CONVENTIONAL CULTIVATION SYSTEMS

P. Knuthsen^{1*}, M. Søltøft¹, K.H. Laursen², A. Bysted¹, K.H. Madsen¹, J. Nielsen², U. Halekoh³ and S. Husted²

¹ Food Chemistry, DTU Food, National Food Institute, Technical University of Denmark, DK-2860 Søborg, Denmark

² Faculty of Life Sciences, University of Copenhagen, DK-1871 Frederiksberg C, Denmark

³ Faculty of Agricultural Sciences, Aarhus University, DK-8830 Tjele, Denmark

* Email: pkn@food.dtu.dk; Tel: +45 3588 7432; Fax: +45 3588 7488

Various bioactive compounds belonging to the secondary plant metabolites are currently believed to be associated with beneficial health properties. Contents of bioactive compounds in plants are affected by cultivation system, and some studies indicate that contents are higher in organically than in conventionally grown plants.

The objective of the present study was to compare the content of selected bioactive compounds in organically and conventionally grown crops, and to evaluate if the ability of the crops to synthesize selected secondary metabolites was systematically affected by growth systems across different growth years as well as soil types. In the conventional system, pesticides and inorganic fertilizer were used like generally applied conventionally. In the organic cultivation, one system relied on the import of animal manure, and the other system on the use of cover crops. The study is part of a larger project, OrgTrace, looking at the impact of cultivation system on minerals and bioactive compounds, all cultivations carried out under well controlled conditions.

In our study, the selected compounds were polyacetylenes, polyphenols (flavonoids and phenolic acids), and carotenoids. The crops studied were carrots, onions, and potatoes.

After careful sampling, sample preparation and extraction of the relevant compounds from the crops, contents of the bioactive compounds were analyzed by high-performance liquid chromatography with ultraviolet quantification and verification by mass spectrometry.

The results showed that contents of neither polyacetylenes and carotenoids in carrots, flavonoids in onions, nor phenolic acids in carrots and potatoes were significantly influenced by growth system. Thus it could not be concluded that the organically grown crops had higher contents of bioactive compounds than the conventionally grown. This indicates that giving preference to organic products because they contain more bioactive components is doubtful. However, still there are many good reasons for the consumer to choose organic food products, including: no pesticide residues in foods, animal welfare, and environmental protection.

Keywords: Cultivation system, crops, polyphenols, polyacetylenes, carotenoids

Acknowledgement: *We acknowledge the research groups in the CropSys and Vegqure rotation experiments, coordinated by Jørgen E. Olesen and Kristian Thorup-Kristensen respectively, for carrying out the field trials. This work was financially supported by the Ministry of Food, Agriculture and Fisheries, Denmark and coordinated by the International Centre for Research in Organic Food systems via the OrgTrace project.*

D-12

COMPARISON OF SELECTED PHYSICAL AND CHEMICAL PARAMETERS OF APPLES FROM ORGANIC AND CONVENTIONAL PRODUCTION**M. Adamczyk¹, E. Hallmann¹ and E. Rembiałkowska^{1*}**

¹ Division of Organic Food, Department of Functional Food and Commodity, Warsaw University of Life Sciences - SGGW, Warsaw, Poland

* Email: Ewa_rembialkowska@sggw.pl; Tel: 048225937038; Fax: 048225937036

The aim of work was to compare the selected physical and chemical traits and keeping quality of the apples (*Malus domestica Borkh.*) from the organic and conventional cultivation. The studies have been conducted for 3 years on 3 apple cultivars (Idared, Cortland and Jonagold) from 3 neighbouring pairs of orchards.

After the harvest in the fruits the content of dry matter, extract, total saccharides, reducing saccharides, organic acids, vitamin C, flavonols and anthocyanines has been determined. Moreover the weight of fruits, their diameter, blush surface and firmness have been evaluated. After the storage period the same traits have been analysed in the apples.

Organic apples had lower fruit weight and diameter, at the same time higher part of the blush at skin and higher content of dry matter, extract, total saccharides, vitamin C, flavonols and anthocyanines compared to the conventional apples. In case of the reducing saccharides and organic acids significantly higher content has been found for the organic apples cultivar Cortland and Jonagold. Apples from the organic and conventional orchards haven't differed significantly in terms of their firmness and ratio: total saccharides / organic acids.

After recounting into dry matter the higher content of the vitamin C, flavonols and anthocyanines has been found in the organic apples than in the conventional ones; the other parameters were not different. The keeping period changes resulted in the lower weight and firmness of fruits and higher content of dry matter and extract. The statistical analysis has proved the significant impact of cultivation method on the fruit weight and extract but the fruit firmness after keeping period hasn't differed depending on the cultivation method.

Keywords: apple, physical traits, chemical traits, organic cultivation, conventional cultivation

D-13

CONTENT OF MINERAL COMPONENTS IN RED BEET (*BETA VULGARIS* L.SSP. *VULGARIS* ROTE KUGEL) FROM DIFFERENT PRODUCTION SYSTEMS**S. Štraus¹, F. Bavec¹, M. Bavec^{1*}**

¹ University of Maribor, Faculty of Agriculture and Life Sciences, Institute for Organic Farming, Hoče, Slovenia
* Email: martina.bavec@uni-mb.si; Tel: 0+386 2 3209049; Fax: +386 2 6161158

Consumers expect that organically-grown food is better quality, healthier and more nutritious than conventionally-grown foods. Some studies indicating differences, but results are often contradictory. Red beet (*Beta vulgaris* L.) 'Rote Kugel' was produced in field experiment under three farming systems (conventional (CON), integrated (INT), organic (ORG)) using established methods. There was assessed an impact of production system on the content of macro- (potassium, calcium, magnesium, sodium, phosphorus) and microelements (iron, zinc, manganese, copper) and vitamin C in the flesh of red beet roots. Also dry weight (DW) was measured, and was statistically significant different, ranged from 947.55 g/kg for CON and 952.18 g/kg for ORG. The highest content of all macroelements were for red beet roots from conventional and the lowest from integrated production systems. Significant differences were measured for magnesium (3.19; 2.69 and 2.39 g/kg for CON, ORG, INT), potassium (46.62; 37.42; 36.54 g/kg for CON, ORG, INT), sodium (3.27; 2.57; 2.49 g/kg for CON, INT, ORG) and phosphorous (2.78; 2.60; 1.88 g/kg for CON, INT, ORG). Significant differences were measured also for nitrogen, values for conventional were 60 % higher than for organic production system (22.30 and 13.52 g/kg), due to the fact that in conventional production system mineral fertilizers are used. Except zinc all others microelements are statistically significant different between production system. The iron content was the highest in the organic production system (258.62 mg/kg, 30 % higher than CON). The results are similar also for copper (11.79 and 9.51 mg/kg; 20 % higher than CON). Also the manganese is statistically significant different, but conventional production system is the highest (162.62 and 118.59 mg/kg). The values for vitamin C is the highest in organic production system (4.30 and 3.25 mg/100 g, 25 % higher).

Our findings are in line with findings from other research, especially for dry weight, iron and vitamin C. So we could conclude that organic food is better quality.

Keywords: red beet, mineral content, production system

Acknowledgement: Operation part financed by the European Union, European Social Fund. The results presented in this article are an output of the research project J4-9532: "The Quality of Food Dependent on the Agricultural Production Method", funded by the Ministry of Higher Education, Science and Technology of Slovenia.

D-14**HIGH SENSITIVITY, LOW IMPACT PESTICIDE DETECTION METHOD:
A SINGLE-DROP MICRO-EXTRACTION TECHNIQUE FOR PPT
DETECTION OF TRIAZINE PESTICIDES****D. Bradley, G. Williams^{1*}**¹ Department of Chemistry, University of Johannesburg, PO Box 524, Auckland Park, 2006, South Africa

* Email: bwilliams@uj.ac.za

It is important to accurately and reliably measure trace pesticide residues in water, soil and agricultural products in as efficient a manner as possible. This is desirable to determine the fitness-for-purpose of agricultural products (safe consumption), pesticide residue certification, water quality determination, etc.

The single-drop micro-extraction technique holds promise to surpass expensive solid-phase systems but has met some limitations relating to the levels of analyte that may reliably be extracted and measured with GC-FID, GC-PND or GC-MS. This method is cheap and especially accessible via the simple use of a selected pesticide-grade organic solvent and consequently may surpass the utility of solid-phase methods, especially in countries where importation of SPME or SPE consumables may be tedious or costly. While specific protocols are required to be followed, the method is technically easy to execute and therefore training of technologists is a simple matter.

Triazines are used in many countries of the world to control weed plants, typically of the broad-leaf variety, in agricultural plantations. The presentation deals with our research leading to significant advances to the single-drop micro-extraction method that have allowed us to analyse for complex mixtures of triazine pesticides in various matrices (various water sources, various soil samples and fruit juice) down to sub-ppb levels with low (<10% RSD values). We have evaluated several organic solvents for this purpose and have also investigated the influence of a range of metal salts on the success of the extraction. Parameters such as stirring or static extractions, and the limitations of these, have also been investigated. Instrument set-up, using GC-MS, has been optimised. The method has furthermore been validated at the sub-ppb level making use of certified reference materials.

**IMPACT OF ORGANIC
FEED ON ANIMALS
(E-1 – E-9)**

E-1

EFFECTS OF ORGANICALLY AND CONVENTIONALLY PRODUCED FEED ON BIOMARKERS OF HEALTH IN A CHICKEN MODEL**M.A.S. Huber¹, L.P.L. van de Vijver¹ and project group**¹ Department of Health Care and Nutrition, Louis Bolk Institute, Driebergen, The Netherlands

* Email: m.huber@Louisbolk.nl; Tel: 00 31 343 523876 Fax: 00 31 343 515611

Consumers expect organic products to be healthier. However, limited research has been performed to study the effect of organic food on health. The present study aimed to identify biomarkers of health to enable future studies on this topic in humans. A feeding experiment was performed in two generations of three groups of chickens with different immune responsiveness, either high or low and a random control group, which were fed identically composed feeds from either organic or conventional produce. The animals of the second generation were exposed to an immune challenge. At 13 weeks of age the animals were sacrificed. Feed and ingredients were analysed on macro- micronutrients, i.e. vitamins, minerals, trace elements, heavy metals and microbes. The health of the chickens was studied by general health and immune parameters, metabolomics, genomics and post-mortem evaluation. Only slight differences in nutrient content in the feeds were observed. On average the conventionally produced feeds had a 10% higher protein content, but the metabolizable energy of the feeds was comparable. Although animals on both feeds were healthy, differences between the groups were found. The random control group of chickens fed conventional feed showed overall a higher weight gain during life span than the group on organic feed, although feed intake was mostly similar. The animals on organic feed showed an enhanced immune reactivity, a stronger reaction to the immune challenge, as well as a slightly stronger 'catch-up-growth' after the challenge. Biomarkers for future research were identified in the parameters feed intake, body weight and growth, and in immunological, physiological and metabolic parameters, which were especially informative after the challenge.

Key words: Intervention, chicken model, biomarkers, immunology, metabolomics, nutrigenomics

E-2

EFFECT OF LEGUME GRAINS AS DIETARY PROTEIN SOURCE ON THE QUALITY OF ORGANIC LAMB MEAT**A. Bonanno^{1*}, G. Tornambè¹, A. Di Grigoli¹, V. Bellina, G. Di Miceli², D. Giambalvo²**¹ Dipartimento DEMETRA, sezione di Produzioni Animali, Università degli Studi di Palermo, Italy² Dipartimento dei Sistemi Agro-Ambientali (SAGA), Università degli Studi di Palermo, Italy

* Email: abonanno@unipa.it; Tel: +39 091 238 95065; Fax: +39 091 6515531

This study aimed to evaluate the effects of replacing soybean meal in the diet with alternative legume grains without GMO presence and at low aflatoxin risk, on the carcass and meat quality traits of lambs.

After weaning at 66±6 d of age, 28 male Comisana lambs were divided into 4 groups and gradually adapted to diets over a 15-d period. Until slaughter at 129±6 d of age, each group received *ad libitum* pelleted alfalfa hay and concentrates differing for the protein source: chickpea (CP), faba bean (FB), pea (PE) and soybean meal (SM), respectively.

Measurements of lambs body weight and feed intake were made weekly. Carcass parameters were recorded after slaughter, and tissue components of the hind leg were determined by dissection. *Longissimus dorsi* (LD) meat was evaluated for pH, meat and fat colour, thawing and cooking losses, Warner-Bratzler shear force, chemical composition, fatty acid profile, and sensory properties based on the triangle test.

CP lambs showed higher dry matter (588 vs. 495 g/d; P≤0.05) and protein intake (121 vs. 103 g/d; P≤0.05) from concentrate in comparison with SM lambs. Lambs growth, cold carcass weight (11.1, 11.3, 11.6 and 11.2 kg for CP, FB, PE and SM lambs, respectively) and net dressing percentage were not modified by the protein source, whereas CP lambs had higher incidence of perirenal and pelvic fat than SM group (2.6 vs. 1.6 % of half carcass; P≤0.05).

LD meat from different diets did not differ for chemical composition, colour, thawing and cooking losses, tenderness, and sensory properties assessed by triangle tests.

The oleic acid (C18:1 c9) was the prevalent fatty acid in the intramuscular fat of lambs from all the groups. Compared to SM, other concentrates reduced the incidence of palmitoleic acid (C16:1 c9) (2.4, 2.6, 2.8 and 3.2 % FAME for CP, FB, PE and SM meat, respectively; P≤0.05). The CP, compared with other groups, increased the linoleic acid (C18:2 c9 c12) (10.6, 7.2, 7.3 and 8.1 % FAME for CP, FB, PE and SM meat, respectively; P≤0.01), *trans* vaccenic acid (C18:1 t11) (2.2, 0.8, 0.9 and 1.6 % FAME for CP, FB, PE and SM meat, respectively; P≤0.01) and, to a lesser and not significant extent, the total isomers of conjugated linoleic acid (CLA) (1.8, 1.6, 1.3 and 1.3 % FAME for CP, FB, PE and SM meat, respectively).

These results showed that soybean can be totally replaced in the concentrate by safer and more locally available legume grains, achieving comparable quality characteristics of lambs carcass and meat.

Comparing the legume grains, the chickpeas resulted to induce an increase in feed intake and carcass adiposity, as well as changes in fatty acid composition of intramuscular fat, effects presumably linked to their higher fat content and ruminal degradability.

Key words: chickpea, faba bean, pea, soybean meal, meat fatty acid composition

E-3

ASSIMILABILITY OF BIOLOGICALLY ACTIVE SUBSTANCES OF SEA BUCKTHORN OIL IN TISSUES OF LABORATORY ANIMALS

A. Jurgoński¹, S. Czapliski^{2*}, Z. Zduńczyk¹, D. Ogrodowska², J. Juśkiewicz¹, R. Zadernowski²

¹ Department of Biological Function of Food, Institute of Animal Reproduction and Food Research of the Polish Academy of Sciences, Olsztyn, Poland

² Department of Food Plant Chemistry and Processing, Faculty of Food Sciences, University of Warmia and Mazury in Olsztyn, Olsztyn, Poland

* Email: selek@go2.pl; Tel: 048502662951; Fax: 048895233466

Sea buckthorn (*Hippophae rhamnoides* L.) fruit is the subject of interest for many research centres all over the world, mainly for its health-promoting values. This species is worthy of dissemination in ecological cultivation because plants and their fruits are resistant to diseases and pests. Sea buckthorn live in symbiosis with nitrogen-fixing bacteria and can be cultivated on agriculturally degraded lands and fallow lands. In this research fruits were collected from a plantation situated on region Podlasie which is called "The Green Lungs of Poland". The oil obtained from this fruit is characterized by a high content of biologically active substances: carotenoids, tocopherols and sterols. Therefore, the aim of the study was to analyse the effect of following a diet with the addition of sea buckthorn oil on the assimilability of the above-mentioned components in the tissues of laboratory animals.

The experiment was conducted on 24 males of the Wistar strain, divided into three groups of eight animals. Rats were fed for 28 days diets that were modifications of a standard casein-based diet for laboratory rodents (AIN-93). The source of fat, depending on the group, was sea buckthorn oil (BO group), pork lard (PL group) and soya oil (SO group). After four weeks of feeding, rats were sacrificed and their blood and internal organs were taken for analysis. The tissues obtained were analysed for the content of retinol, tocopherols and squalene, and the profile of fatty acids was determined.

In the liver tissue of laboratory animals fed the diet with the addition of sea buckthorn oil (BO), retinol and its esters were found in the highest amounts. Their content amounted to 553.43 nmol/g and 190.78 nmol/g. This component occurred in the lowest amount in liver tissues of animals fed the diet with the addition of soya oil (SO) (397.25 nmol/g) and the diet with the addition of animal fat (PL) (293.85 nmol/g). Two tocopherol homologues (α -tocopherol and γ -tocopherol) were found in liver tissue. α -tocopherol in liver tissues of animals fed the diet with the addition of sea buckthorn oil (BO) occurred in the highest amounts (44.99 mg/g) as compared to control samples (SO – 28.01 mg/g, PL – 28.01). Different results were obtained in the case of γ -tocopherol, which was found in the lowest amounts (0.13 mg/g) in liver tissues of the BO group.

The following saturated fatty acids were identified in the tissues under examination: palmitic acid ($C_{16:0}$) and stearic acid ($C_{18:0}$). Mono-unsaturated acids were represented by: palmitoleic acid ($C_{16:1}$), oleic acid omega 9 acid ($C_{18:1\omega9}$) and oleic acid omega 7 acid ($C_{18:1\omega7}$). Palmitoleic acid and oleic acid omega 7 in the fatty tissue of animals fed the diet with the addition of sea buckthorn oil had a much higher percentage share (15.53 % and 6.69 %, respectively) in comparison to control samples. Among poly-unsaturated acids, linoleic acid ($C_{18:2}$) (LA) was found in all tissues, while linolenic acid ($C_{18:3}$) (ALA) was identified only in the liver tissue.

Key words: Sea buckthorn oil, nutrition, retinol, tocopherols, fatty acids

E-4

100% ORGANIC FEED ON SWEDISH ORGANIC DAIRY HERDS, DOES IT SECURE TRACE METAL STATUS FOR ANIMAL HEALTH?**I. Blanco-Penedo^{1*}, N. Fall¹, T. Lundh², U. Emanuelson¹**¹ Department of Clinical Sciences, Swedish University of Agricultural Sciences, Uppsala, Sweden² Department of Occupational and Environmental Medicine, Lund University Hospital, Lund, Sweden

* Email: isabel.blanco.penedo@slu.se; Tel: 0046018671447; Fax: 0046018673545

Supplying adequate levels of trace metals in cattle diet is essential to maintain animals in good health. This issue is even more important for the organic farms. According to animal health and welfare standards, farms should meet the trace metal requirement of animals at any moment of their production cycle such as early-lactation cows with high metabolic demands and stress under calving or dry cows mainly fed roughage.

From January 2008 the diet of organic dairy farms moved further away and more explicitly from the conventional when organic ration became 100% organic (EU Regulation No 889/2008). In organic farms with a high proportion of in-farm produced forage this fact may have (adversely) affected the animal-trace metal status when the potential role of the concentrate to guarantee the physiological trace metal requirements is constrained under the current legislation.

Organic cows are prone to some mineral deficiencies and there is evidence of the association with imbalances in the diet reported in the Scandinavian context. Sub-clinical or marginal mineral deficiencies can be difficult to diagnosis but can cause physiological stress and decreased production.

The aim of the present study was to evaluate trace metal status of dairy cows at different stages of the lactation in organic and conventional herds during five years of study that covered the period before and after the change of legislation.

Trace metal concentrations (Cu, Co, Se, Zn, Mn, Mo, I and Fe) were determined by inductively coupled plasma mass (ICP-MS) in 208 plasma samples from early-lactation and dry cows collected from 2005 to 2010 in 13 organic and 13 conventional Swedish herds.

Data editing, descriptive statistics and statistical multivariate model building were performed in Stata® version 11 (Stata Corporation, College Station, TX, USA). Preliminary results will be presented in relation to the possible effects of the change of legislation on trace metal status, comparing both periods within organic and between conventional herds that account different feeding regimes and husbandry practices. The study emphasizes the importance of each practice to the success of a balanced diet in order to optimize animal health on organic farms.

Key words: organic feed, trace metal, organic cows

E-5

CARBOHYDRATE AND LIPID COMPOSITION OF VEGETABLES, AND BIOAVAILABILITY ASSESSED IN A RAT MODEL: IMPACT DIFFERENT CULTIVATION SYSTEMS**H. Jørgensen^{1*}, K.E. Bach Knudsen¹ and C. Lauridsen¹**

¹ Aarhus University, Faculty of Agricultural Sciences, Department of Animal Health and Bioscience, Research Centre Foulum, Denmark

* Email: Henry.Jorgensen@agrsci.dk; Tel: +45 8999 1130; Fax: +45 8999 1166

Environmental as well as cultivation factors may greatly influence the chemical composition of plants. Main factors affecting chemical composition of foodstuff are level and type of fertilizer (conventional and organic cultivation systems), location or soil type, and year of harvest. Organic foods are defined as products, which are produced under controlled cultivation conditions characterized by the absence of synthetic fertilizers and very restricted use of pesticides.

Dietary carbohydrates constitute a major fraction of most foodstuffs and can be divided according to glycosidic linkage into sugars (mono- and disaccharides), oligosaccharides, starch and non-starch polysaccharides (NSP). The bulk of disaccharides and starch will be broken down by the action of pancreatic and mucosal enzymes in the small intestine, while there are no enzymes capable of cleaving some types of oligosaccharides and NSP. A fraction of starch (resistant starch) may also pass the small intestine undegraded either because the starch is physically inaccessible, the starch has a structure that resist amylolysis or the starch is retrograded after heat treatment. Lignin is not a carbohydrate but is tightly associated to cell wall polysaccharides. The term dietary fibre (DF) is used for cell wall and storage NSP and lignin. Adequate intake of dietary fibre are generally accepted as linked to health benefit into a protective role in large bowel cancer, diabetes, coronary heart disease and the issue of faecal bulking.

Linoleic (C18:2 n-6) and α -linolenic (C18:3 n-3) are essential fatty acids, which cannot be synthesized in the mammalian organism, and therefore must be supplied in the diet of animals and man. These fatty acids are precursors for the important longer chain higher polyunsaturated fatty acids of the n-6 and n-3 families. Although fats are an essential part of the diet, consumption in excess, may exert negative effects on human weight change.

In the present study, potatoes, carrots, peas, green kale, apple, and rapeseed were grown by three different cultivation strategies, i.e. organic (ORG), conventional (CON), or semi-organic (ORG+) farming system. The ingredients were mixed with a standard synthetic mixture and were formulated to meet the NRC requirements for rats and used in a balance experiments for measuring the bioavailability of the ingredients.

Carbohydrate and lignin were predominant dietary constituents with value from 584 g/kg DM in kale to 910 g/kg DM in potatoes. Triacylglycerol was the major lipid class in pea with 82 % of total fatty acids in contrast to apple with only 35 % of fatty acids of the ether extract. Cultivation system had minor impact on the bioavailability of the plant ingredients, when assessed in the rat model.

Key words: Dietary fiber, faecal bulking, starch, low molecular sugars

E-6

ORGANIC DIETS AND PHYSICAL ACTIVITY: RESEARCH EXPERIENCE USING A RAT MODEL**H. Jørgensen^{1*}, U. Halekoh² and C. Lauridsen¹**¹ Department of Animal Health and Bioscience, Aarhus University, Blichers Alle 20, 8830 Tjele, Denmark² Department of Genetics and Biotechnology, Faculty of Agricultural Sciences, Aarhus University, Denmark

* Email: Henry.Jorgensen@agrsci.dk; Tel: +45 8999 1130; Fax: +45 8999 1166

Total energy expenditure or heat production is comprised of basal metabolic rate, thermic effect of food, and physical activity. Physical activity is the most variable and easily altered component of total heat production. Physical activity is influenced by a number of biological parameters i.e. diet, genetics, age, and gender. The diet components of the macro - as well as micronutrients and other components (secondary metabolites) associated with a diet could contribute to the well-being of the animal and cause variation in physical activity. We have previously observed that rats fed a diet composed of ingredients based on an organic cultivation system showed less movement during the day than other dietary treatments (Lauridsen et al. 2008, JSFA, 88, pg 720-732).

In order to further investigate this result, i.e. to take the variability of cultivation systems used for conventional and organic growing into consideration, an experiment with diets based on conventional or organic cultivation systems of the OrgTrace project (<http://www.orgtrace.elr.dk/uk/>) was carried out. In brief, the ingredients used in the experimental diets were grown according to three different cultivation strategies: one conventional (C) and two organic systems (OA, organic using animal manure; and OB, organic using cover crops). The field-experiment included 2 harvest years, 3 locations and 2 replications, giving in total 36 experimental diets. In addition, a diet consisting of altromin (rat chowder) was included.

The diets were given to weaned female, in groups of five rats per diet and given their assigned diet, for approx. 2.5 months. Throughout the experimental period the rats were monitored and weighed each week. The rat's heat production and physical activity was measured with two open-air circuit respiration chambers, and measurement was done on a group of 5 rats. In the chamber the rats were placed in individual cages. The activity was measured using both passive infrared detectors and with video recording.

Both methods showed that the physical activity level of rats during the day. Being night-active animals, rats are usually resting during the day-time. Differences between dietary treatments indicated a generally lower activity level of rats fed altromin than the plant-based diets of the conventional and organic systems, though these differences proved not to be significant.

Key words: Activity, day-night, fruits, vegetables, organic, cultivation

Acknowledgement: *The work of experiment 1 was financially supported by the Ministry of Food, Agriculture, and Fisheries, Denmark, and coordinated by the International Centre for Research in Organic Food Systems (ICROFS) via the OrgTrace project <http://www.orgtrace.elr.dk/uk/>.*

E-7

ASSIMILABILITY OF BIOLOGICALLY ACTIVE SUBSTANCES OF AMARANTH OIL IN TISSUES OF LABORATORY ANIMALS

A. Jurgoński¹, D. Ogrodowska^{2*}, Z. Zduńczyk¹, S. Czaplicki², R. Zadernowski², J. Juśkiewicz¹

¹ Department of Biological Function of Food, Institute of Animal Reproduction and Food Research of the Polish Academy of Sciences, Olsztyn, Poland

² Department of Food Plant Chemistry and Processing, Faculty of Food Sciences, University of Warmia and Mazury in Olsztyn, Olsztyn, Poland

* E-mail: dorotamanta@gmail.com; Tel: 048502790231; Fax: 048895233466

The aim of current epidemiological research in nutrition is to analyse the relationships between dietary factors and the health conditions of individuals and the population and to create a scientific framework for eliminating diseases of civilization. It is known *Amaranthus cruentus* is a plant which is resistant for drought, can grow on poor soil and not require fertilization. *Amaranthus cruentus* cultivar Rawa is cultivated to be matched to the Polish climatic and soil conditions. Crops used in our research were cultivated in ecological way on selected plantation situated near Łomża in north-eastern Poland where it is important that amaranthus is a C4 plant with better carbon dioxide assimilation.

This study focuses on the main biologically active components of amaranth oil: squalene, tocopherols and fatty acids.

The experiment was conducted on 24 males of the Wistar strain, divided into three groups of eight animals. Rats were fed for 28 days diets that were modifications of a standard casein-based diet for laboratory rodents (AIN-93). The source of fat, depending on the group, was amaranth oil (AO), pork lard (PL) and soya oil (SO). After four weeks of feeding, rats were sacrificed and their blood and internal organs were taken for analysis.

In the blood of animals under examination, the highest squalene content was found in the sample obtained from the population fed the AO diet (84.86 µg/ml of blood plasma). It significantly differed from other variants, for which the content of this compound amounted to 3.06 µg/ml of blood plasma (PL) and 4.48 µg/ml (SO). The highest content of squalene was also found in the liver tissue from the population fed the diet with the addition of amaranth oil (5439.30 µg/g). This value differed statistically from other results, which were about 50 times lower (103.09 µg/g) and about 100 times lower (52.60 µg/g) for the population fed the SO diet and the population fed the PL diet, respectively. Enrichment of a diet with amaranth oil resulted in an increase in squalene concentration in fatty tissue (639.59 µg/g), and the level of this compound statistically differed in comparison to control samples.

In the brain tissue of rats fed the SO diet, the squalene content was about 36% lower (6.79 µg/g) compared to animals receiving the AO diet (18.73 µg/g). Animals fed the PL diet (10.48 µg/g) also recorded 64.79% lower results in comparison to the population fed the diet with amaranth oil.

The effect of diet on the content of tocopherol homologues in tissues was also analysed. The analysis involved blood, fatty tissue, brain tissue and liver and identified the presence of α-tocopherol and γ-tocopherol in liver. In other samples, tocopherols occurred only in trace amounts.

While determining the profile of fatty acids in the tissues, the following saturated fatty acids were identified: palmitic acid (C_{16:0}) and stearic acid (C_{18:0}). Mono-unsaturated acids were represented by: palmitoleic acid (C_{16:1}), oleic acid omega 9 acid (C_{18:1ω9}) and oleic acid omega 7 acid (C_{18:1ω7}). Linoleic acid (C_{18:2}) (LA), a representative of poly-unsaturated acids, was found in all tissues, while linolenic acid (C_{18:3}) (ALA) was not identified in the brain tissue or the fatty tissue.

Key words: amaranth oil, nutrition, squalene, tocopherols

E-8

RELATIONSHIPS BETWEEN PHYSIOLOGICAL INDICATORS IN BLOOD, YIELD AND COMPOSITION OF MILK OBTAINED FROM ORGANIC DAIRY COWS**T. Sakowski^{1*}, B. Kuczyńska², E. Metera¹, K. Słoniewski¹ and B. Romanowicz¹**

¹ Department of Animal Science, Institute of Genetics and Animal Breeding, Polish Academy of Science, Jastrzebiec, Poland

² Department of Cattle Breeding, Faculty of Animal Science, Warsaw University of Life Sciences, Warsaw, Poland

* Email: t.sakowski@ighz.pl; Tel: +48227561711; Fax: +48227561417

Relationships between physiological indicators in blood, milk yield and composition were studied in 50 first parity cows from four organic farms in Poland to find the influence of organic feeding management on milk composition. Farms differed with milk production level. Cows were loose housed and fed *ad libitum* with grass-clover silage and hay, concentrates (cereals and legumes) during indoor season and also grazed during outdoor season. Blood and milk samples were taken during four lactation stages: “beginning”, “peak”, “full” and “end”. Yield of energy corrected milk (ECM) and body condition (BCS) were also recorded.

BHB, transaminases, glucose and albumin content were determined in blood with spectroscopy. Basic milk composition was determined with infrared spectroscopy. The fatty acid (FA) methyl esters profile was determined using gas chromatography. Fat soluble vitamins: A, E, D and β -carotene were determined using HPLC. Data was statistically analyzed with SAS programme.

Significant positive correlation ($r=0.34$) was found between BHB and ECM for cows at the beginning of lactation. This indicates that sharp increase in milk yield after calving leads to growing energy deficit. Moreover, BHB was negatively correlated with mono- and poly-unsaturated FA (MUFA and PUFA) in milk ($r=-0.30$ and $r=-0.26$ respectively). This indicates that high milk yield just after calving had negative impact on unsaturated FA content, probably due to high fat mobilization from body tissues.

In the second phase, ECM was still significantly negatively correlated with PUFA ($r=-0.34$). ECM was also significantly negatively correlated with albumin content in blood ($r=-0.36$). Both correlations indicate that energy was still being mobilized from the body at this stage. Moreover, albumin was negatively correlated with MUFA and PUFA ($r=-0.41$ and $r=-0.51$ respectively).

The content of other bioactive substances in milk varied substantially between farms and lactation phases. CLA (c 9 t 11) ranged from 0.49 to 1.49 g/100g of fat. Vitamin A from 238 to 2219 $\mu\text{g/l}$, vitamin E from 1127 to 7389 $\mu\text{g/l}$ and vitamin D from 0.33 to 18.75 $\mu\text{g/l}$, β -carotene ranged from 287 to 899 $\mu\text{g/l}$.

The highest quality milk - in respect to CLA and vitamin content was produced by cows grazed on good quality sward with a high content of legumes (35%) and herbs (10%).

Key words: BHB, ECM, PUFA, CLA, vitamins

E-9

ORGANIC POULTRY MEAT QUALITY: OXIDATIVE STATUS IN DIFFERENT GENOTYPES

C. Castellini¹, E. Mourvaki¹, S. Ruggeri¹, S. Mattioli¹, M. Guarino Amato², C. Mugnai¹, A. Dal Bosco^{1*}

¹ Department of Applied Biology. University of Perugia, Perugia, Italy

² Agricultural Research Council, Monterotondo, Roma, Italy

* E-mail: dalbosco@unipg.it; Tel: 00390755857110; Fax: 00390755857122

According to (EC) Reg. 889/2008 the choice of breeds for organic system shall take into account the capacity of animals to adapt to local conditions and a wide biological diversity should be encouraged. The adaptability of animals to environment is deeply tied to the utilize of available pasture that improve their health through bioactive intake. Moreover this situation is reflected by meat oxidative status. Thus the aim of the work was to evaluate *in vivo* and meat oxidative status of eight chicken genotypes (100 birds each) different for growing rate reared under organic system and in particular: very slow (Robusta maculata, R; Livorno, L; Ancona, A); slow (Gaina, G; Cornish x Livorno, CL; Cornish x Ancona, CA); medium (Kabir, K; Naked neck, N). At slaughter weight (about 2 Kg), 20 birds per group were killed and the antioxidant status of plasma (Reactive Oxygen Substances - ROS, Antioxidant Power of plasma – AP, Thiobarbituric Acid Reactive Substances – TBARS and tocopherols content) and of breast and drumstick muscles (TBARS and tocopherols content) were determined. *In vivo* oxidative status was influenced by genotype; L and A chickens showed the highest values of ROS and the lowest of AP, because of their intense motor activity (data not shown). R, G and the crossbreeds showed the lowest values of ROS and the highest of total tocopherols thanks to their high foraging activity at pasture (data not shown). Concerning meat, it was possible to highlighting three "categories " of efficiency of grass intake and of tocopherols content and consequently of peroxidative processes: in particular L, A and R showed the lowest TBARS/tocopheros ratio of drumstick, CA, CL and G the intermediate and K and N the highest ones. Our results indicate that only meat from slow growing genotypes had a well-developed and efficient antioxidant defense to contrast peroxidative processes. In conclusion, on the basis of *in vivo* and meat oxidative status the better environmental adaptability has been reached by the two crossbreeds and R chickens.

Key words: organic, poultry, genotype, oxidative status

Acknowledgement: Research funded by Agricultural Research Council (CRA), Ministry of Agriculture, Italy.

**IMPACT OF ORGANIC
FOOD ON HUMANS
(F-1 – F-9)**

F-1

HEALTH RELATED ASPECTS OF ORGANICALLY PRODUCED WHEAT**A. Hussain^{1*}, H. Larsson¹, R. Kuktaite¹, M.L. Prieto-Linde¹, E. Johansson¹**

¹ The Swedish University of Agricultural Sciences (SLU), Department of Agriculture - Farming Systems, Technology and Product Quality, Faculty of Landscape Planning, Horticulture and Agricultural Sciences, Box 104, SE-23053, Alnarp, Sweden

* Email: Abar.Hussain@slu.se

Consumer demand in Sweden as well as in many countries around the world is increasing as related to quality food, including organically produced food. For quality food, both the issues of how the crop has been grown, i.e. in a resource effective way and without for the environment harmful use of chemicals, and what nutritionally and health related values the food holds, has increased in importance lately. Further, transportation of food as related to a desire to consume locally produced food is an issue as well for the consumers. Thus, the aware consumer often prefers locally and organically produced food also with added value in terms of highly nutritious food that adds to health. Organically produced food is of interest for those consumers of several reasons; it is thought to result in a more balanced cultivation of crops with improved plant nutrition values and lower energy consumption and decreased negative climatic influences.

The present study aimed at evaluating organically grown wheat for its nutritional value and relates the nutritional value of the crop to health aspects of human. Wheat is one of the major staple food crops of the world, occupying the largest amount of the crop acreage worldwide and wheat is also the principal cereal grain crop used for food consumption in most developed and developing countries of the world. In the current study we aim at analysing minerals, proteins and antioxidants in organically grown winter and spring wheat genotypes grown in different locations in Sweden. The results showed that especially primitive wheat genotypes were of substantial importance as to be used for organic production as a high value nutritional crop. Generally, the primitive wheat showed higher amounts of essential minerals and significantly lower amount of heavy metals such as e.g. cadmium accumulation as compared to more modern cultivars. The primitive wheat genotypes were also found rather stable over environments as to the high accumulation of essential minerals as compared to other wheat genotypes investigated. Also the primitive wheat showed a low bio-concentration factor for heavy metals, indicating low ability to accumulate heavy metals from the soil to the grain. Further, our results showed that the levels of essential minerals in all wheat genotypes analyzed in the present study within organic production systems generally were higher as compared to what has been found in other studies investigating wheat produced within inorganic conditions. By using the most promising genotypes produced in our organic cultivation system the amount of essential minerals in the wheat reached close to daily requirements within a normal level of consumption of wheat.

Further, none of the analyzed wheat genotype groups in our study reached the Hazard Quotient, that was calculated within the study, meaning that no health risk to human, as to content of heavy metals could be expected. At present, analyses of antioxidants and proteins contents is ongoing that will further evaluate the wheat material from our organic production systems as to benefits for the human health.

F-2

DAIRY FAT AFFECTS THE CONCENTRATION OF PHYTANIC ACID IN PLASMA IN HEALTHY VOLUNTEERS

L.B. Werner^{1*}, L.I. Hellgren², M. Raff¹, S.K. Jensen³, R.A. Petersen¹, T. Drachmann², T. Tholstrup^{1*}

¹ Department of Human Nutrition, Faculty of Life, University of Copenhagen, Frederiksberg 1958, Denmark

² Center for Biological Sequence Analysis, DTU Systems Biology, Technical University of Denmark, 2800 Lyngby, Denmark

³ Department of Animal Health and Bioscience, Faculty of Agricultural Sciences, Aarhus University, 8830 Tjele, Denmark

* E-mail: Louise Bruun Werner, lbw@life.ku.dk; Tel: 35332367; Tine Tholstrup, tth@lifer.ku.dk; Tel: 35332486

Background: Phytanic acid produced in ruminants from chlorophyll may have preventive effects on the metabolic syndrome, partly due to the reported RXR and PPAR- α agonist activity. Milk from cows fed increased levels of "green" silage, increases phytanic acid concentration, but it is unknown if this leads to higher circulating levels of phytanic acid in plasma.

Objective: To investigate if cow feeding regimes affects concentration of plasma phytanic acid and risk markers of the metabolic syndrome in human.

Design: In a double-blind, randomized, 4 wk, parallel intervention study 14 healthy young subjects were given 45 g milk fat/d from test butter and cheese with 0.24 wt% phytanic acid or a control diet with 0.13 wt% phytanic acid. Difference in phytanic acid was obtained by feeding roughage with low or high content of chlorophyll.

Results: There tended to be a difference in plasma phytanic acid ($P=0.0730$) concentration after the dietary intervention. Plasma phytanic acid increased within both groups with the highest increase in control group (24 %) compared to phytanic acid group (15 %). There were no significant effects of phytanic acid on risk markers for the metabolic syndrome.

Conclusions: The results indicate that it is possible to modify the plasma phytanic acid concentration in healthy humans by an increase intake of milk fat containing even low phytanic acid concentration. A lack of difference between treatments may be due to a small sample size and modest difference of phytanic acid in the test diet and no other effects of feeding regime were observed

Acknowledgement: *Sponsored by the Danish Dairy Research Foundation and the Danish council for Strategic Research.*

F-3

EVALUATING PESTICIDE EXPOSURE IN ORGANIC AND CONVENTIONAL CONSUMERS**L. Oates^{1*} and M. Cohen¹**¹ School of Health Sciences (Wellness), RMIT University, Melbourne, Australia

* Email: liza.oates@rmit.edu.au; Tel: +61 3 9925 7440; Fax: +61 3 9925 7178

There is evidence to suggest that the use of pesticides in conventional farming poses potential health risks and recent studies have indicated that elevated levels of organophosphate pesticide metabolites in urine are associated with increased ADHD prevalence in children and exposure to paraquat (herbicide) and maneb (fungicide) may increase the risk of Parkinson's Disease in genetically susceptible individuals. Direct evidence that dietary exposure to pesticides can influence health is extremely limited and at present biological reasoning is employed to assert that the consumption of organic produce will reduce the risk of developing pesticide related diseases. However this assumes that conventional (nonorganic) food contains higher levels of pesticides than organic food resulting in people who consume conventional food having higher tissue levels of pesticide residues in their bodies that subsequently lead to detrimental health outcomes.

While it is true that organic farming practices do not use synthetic pesticides and data from food residue surveys confirm reduced pesticide levels in organic produce, it is unclear whether this leads to reductions in pesticide residues sufficient to translate to health benefits in organic consumers. The KOALA birth cohort study reported lower incidence of eczema in children who consumed organic dairy products as part of an overall organic diet but attributed this to differences in nutritional content. Currently only a few small studies in children have used biomonitoring of pesticide residues to assess the influence of organic food consumption on pesticide exposure. Until this has been more thoroughly examined, any health claims for organic food based on reduced pesticide exposure will remain unsubstantiated.

As outlined in the organic Food Quality and Health (FQH) Research Agenda (2008) various study designs are required to "build a strong 'body of evidence' about the effect of good quality food on good human (and animal) health". This presentation will outline the current evidence base for organic food health claims, discuss the need for comparative biomonitoring trials and provide a rationale to determine priorities for pesticide exposure assessment. It will also present key findings from the 'Organic Consumption Survey' (OCS) and 'Organic Food Intake Survey' (OFIS) conducted in Australia.

Keywords: biomonitoring, organic diets, organic consumers, dietary pesticide exposure

Acknowledgements: *Dr Lesley Braun and Prof Neil Mann*

F-4

THE PROTECTIVE EFFECT OF FARM MILK CONSUMPTION ON CHILDHOOD ASTHMA AND ATOPY: THE GABRIELA STUDY

G. Loss^{1,2*}, S. Apprich³, M. Waser^{1,2}, W. Kneifel³, E. von Mutius⁴, J. Genuneit⁵, G. Büchele⁵, J. Weber⁴, B. Sozanska⁶, H. Danielewicz⁶, E. Horak⁷, R.J.J. van Neerven⁸, D. Heederik⁹, P.C. Lorenzen¹⁰, Ch. Braun-Fahrlander^{1,2} and the GABRIELA study group

¹ Swiss Tropical and Public Health Institute, Socinstr. 57, P.O. Box, 4002 Basel, Switzerland

² University of Basel, Petersplatz 1, 4003 Basel, Switzerland

³ BOKU Vienna, University of Natural Resources and Life Sciences, Department of Food Science and Technology, Muthgasse 18, A-1190 Vienna, Austria

⁴ LMU Munich, University Children's Hospital, Lindwurmstrasse 4, D 80337, Munich, Germany

⁵ Ulm University, Institute of Epidemiology and Medical Biometry, Helmholtzstraße 22, D 89081 Ulm, Germany

⁶ Wrocław Medical University, 1st Department of Paediatrics, Allergology and Cardiology, ul. J.M. Hoene-Wrońskiego 13C, 53-376 Wrocław, Poland

⁷ Department of Pediatrics and Adolescents, Division of Cardiology and Pulmonology, Innsbruck Medical University, Anichstr. 35, A-6020, Innsbruck, Austria

⁸ Friesland Campina Research, P.O. BOX 87, 7400 AB Deventer, The Netherlands

⁹ Utrecht University, Institute for Risk Assessment Sciences (IRAS), Division of Environmental Epidemiology, PO Box 80178, 3508TD, Utrecht, The Netherlands

¹⁰ Max Rubner-Institute, Federal Research Institute of Nutrition and Food, Department of Safety and Quality of Milk and Fish Products, Hermann-Weigmann-Strasse 1, D-24103 Kiel, Germany

* Email: georg.loss@unibas.ch; Tel: +41-61-28486-09, Fax: +41-61-28481-01

Background: Several epidemiological studies found consumption of farm milk to be inversely associated with the occurrence of hay fever, pollen sensitization, and asthma. The information on the specific components of milk conferring protection is limited to studies without analytical measurements of milk. GABRIELA, a large cross-sectional multi-centre study, offered the opportunity to relate analytically measured milk components to asthma and atopy outcomes in children and possibly explain the previously reported protective farm milk effect.

Methods: In four rural regions of Germany, Austria, and Switzerland, farm and milk exposure of 7606 5-13 year old children was assessed by a detailed questionnaire and they also provided blood samples to determine specific IgE levels. Viable bacterial counts, whey protein levels, and total fat content were analysed in 800 milk samples that were collected at the participant's homes. Associations of milk consumption and asthma, atopy, hay fever, and atopic dermatitis were computed by stratified weighted logistic regression analyses adjusted for potential confounders.

Results: Farm children as compared to non-farm children had a lower prevalence of asthma (14.0% vs. 21.1%), atopy (24.7% vs. 40.8%), hay fever (6.2% vs. 16.3%), and atopic dermatitis (12.9% vs. 17.8%). Raw milk consumption, that was reported in questionnaires, was inversely associated with asthma (aOR: 0.59, 95%-CI: 0.46–0.74), atopy (0.74, 0.61–0.90), and hay fever (0.51, 0.37–0.69) independent of other farm exposures. Consumption of exclusively boiled farm did not show a protective effect. The heating status of consumed milk as reported by parents was in very good agreement with objective measurements. Total viable bacterial counts or total fat content of milk were not significantly related to asthma or atopy. Yet, increased levels of the whey proteins were inversely associated with asthma but not with atopy. Significant inverse dose-response relations were observed for lactoferrin (p -value for linear trend = 0.02), TGF- β 2 (0.02), alpha-lactalbumin (0.02), and beta-lactoglobulin (0.04).

Conclusions: The protective effect of raw milk consumption on asthma seems to be associated with the whey protein fraction of unprocessed farm milk. Relevant immunomodulatory compounds of farm milk and underlying mechanisms need to be explored in more detail.

Keywords: Asthma, Atopy, Childhood, Milk, Farming

F-5

EFFECT OF CONSUMPTION OF ORGANIC STRAWBERRY JAM ON GLYCAEMIC STATUS IN HYPERINSULINEMIC AND TYPE 2 DIABETIC VOLUNTEERS

F. Intorre¹, L.M. Donini², G. Catasta¹, B. Neri³, T. Hagedorn³, E. Toti¹, M.S. Foddai, E. Venneria¹, L. Palomba¹, E. Azzini¹ and G. Maiani^{1*}

¹ National Institute for Research on Food and Nutrition, Italy

² "Sapienza" University of Rome, Department of Experimental Medicine, Medical Physiopathology and Endocrinology Section, Food Science and Nutrition Unit, Italy

³ Rehabilitation Clinical Institute "Villa delle Querce", Italy

* Email: intorre@inran.it; Tel: +39 06 51494557; Fax: +39 06 51494550

As the prevalence of both obesity and type 2 diabetes continues to increase worldwide, it is necessary to consider strategies aimed at weight control, which is an important factor in the management of both these pathologies. The possibility of improving the quality of life of diabetics, or of people at risk, providing them with products which are metabolically suitable and at the same time having a satisfying taste, could be valuable as far as concerning the general management of disease.

The aim of this intervention trial was to evaluate the impact of consumption of an organic strawberry jam on glycaemic status in 11 non-complicated, 5 hyperinsulinaemic and 7 type 2 diabetic volunteers, having a Body Mass Index between 30-50 Kg/m² (obesity status) and selected according to specific criteria. The composition of the jam was the following: strawberries ("Senga Sengana", "Gorella", "Marmolada" and "Polka" varieties) 60%, organic apple juice as sweetener, pectin extracted from citrus fruits as jellifying, citric acid as acidificant. A strawberry jam, containing strawberries 65%, white beet sugar as sweetener, pectin as jellifying, lemon juice as acidificant, was used as control.

Volunteers consumed a test meal consisting of 30 g of white bread with 50 g of the organic jam and 150 ml of whole cow milk; the control jam was provided within the same test meal with a week gap. For the determination of glucose and insulin levels, venous blood samples were collected after overnight fasting and every 30 minutes for 3 hours after the ingestion of the test meal.

Volunteers had a significantly lower ($P < 0.05$) increase of glucose and insulin levels at 30 minutes after the consumption of the organic jam respect to the control one, highlighting the importance of the type of carbohydrates. Indeed, the organic jam sweetened with wild apple juice, thus containing mainly fructose, was successful not only for controlling glycaemic status in diabetics but also in subjects at risk of developing this pathology, with pre-diabetes and obesity status.

The consumption of this kind of product could be a strategy to enhance the quality of life in type 2 diabetic people, helping them to follow a dietary regimen including highly accepted food; moreover, it could represent a possibility to delay the onset of type 2 diabetes.

Keywords: organic jam, type 2 diabetes, glycaemic status

Acknowledgement: TRUEFOOD "Traditional United Europe Food" is an Integrated Project financed by the European Commission under the 6th Framework Programme for RTD (Contract n. FOOD-CT-2006-016264).

F-6

EFFECT OF FAT MODIFIED CHEESE ON BLOOD CONCENTRATION OF FATTY ACIDS AND ANTIOXIDANT LEVELS IN NORMOLIPIDEMIC VOLUNTEERS: A PILOT STUDY

F. Intorre¹, M.S. Foddai¹, E. Azzini¹, B. Martin², M.C. Montel³, G. Catasta¹, E. Toti¹, E. Finotti¹, L. Palomba¹, E. Venneria¹ and G. Maiani^{1*}

¹ National Institute for Research on Food and Nutrition, Rome, Italy

² INRA, UR 1213 Herbivores, Saint-Genès-Champanelle, France

³ INRA, UR 545 Fromagères, Aurillac, France

* E-mail: intorre@inran.it; Tel: +39 06 51494557; Fax: +39 06 51494550

Dairy products, for their saturated fatty acids (SFAs) content, can be considered as a target food for modifications in fat profile with the aim to decrease the proportion of these compounds whose consumption is considered as one of the possible causes of some chronic diseases onset.

The present study investigated the effect of the consumption of two types of cheese, obtained from different cows feeding regimen and varying for fat quality, on blood lipid profile and red-ox status biomarkers of selected healthy volunteers.

A sample of 30 volunteers was randomly assigned to consume either the experimental cheese (produced with the milk from cows fed a grass and maize silage based diet with 5% of linseed oil added) or the control cheese (obtained without adding linseed oil) for 4 weeks, followed by a wash-out period and by the inversion of treatments for further 4 weeks, according to a cross-over design. Blood samples and food intake data were collected at baseline and at the end of each intervention period.

The change in the herd feeding procedures (addition of 5% of linseed oil) led to an experimental cheese characterized by a significantly ($P<0.05$) lower total fat and SFAs and higher polyunsaturated fatty acids (PUFAs) (particularly linolenic acid), alpha-tocopherol and trans-retinol content than the control cheese.

Plasma vitamin E, vitamin C and stearic acid (C18:0) significantly ($P<0.05$) increased in volunteers consuming the experimental cheese as well as oxidized low-density lipoprotein (ox-LDL) concentrations were significantly lower. On the contrary, myristic acid significantly ($P<0.05$) increased in control cheese consumers from $0.85\pm 0.36\%$ to $1.00\pm 0.39\%$ but did not change in experimental cheese consumers.

In conclusion, the consumption of the experimental cheese, obtained by changing of cows' feeding regimen and characterized by lower short chain SFAs and higher stearic and oleic acids together with a moderate higher PUFAs, was successful in limiting the enhanced blood concentration of atherogenic fatty acids, in increasing some antioxidant compounds and in lowering the oxidation of LDL, factors having a protective role towards chronic diseases etiology.

Keywords: dairy products, saturated fatty acids, blood lipid profile, red-ox status

Acknowledgement: TRUEFOOD "Traditional United Europe Food" is an Integrated Project financed by the European Commission under the 6th Framework Programme for RTD (Contract n. FOOD-CT-2006-016264).

F-7

ORGANIC AND CONVENTIONAL DIET INFLUENCED ORGANOPHOSPHOROUS PESTICIDE METABOLITES IN URINE**M. Bavec^{1*}, M. Robačar², S.G. Mlakar¹, V. Hrženjak², V. Lapajne², Z. Simonović², K. Turk², B. Mlakar³, A. Bavec⁴, F. Bavec¹**¹ University of Maribor, Faculty of Agriculture and Life Sciences, Hoče, Slovenia² Public Health Institute Maribor, Slovenia³ University of Ljubljana, Faculty of Medicine, Ljubljana, Slovenia⁴ University of Maribor, Faculty of Medicine, Maribor, Slovenia

* E-mail: martina.bavec@uni-mb.si; Tel: +386 2 3209049; Fax: +386 2 6161158

Dietary intake represents the major source of pesticide exposure. Among foods, fruits and vegetables are those with very frequent pesticide residues, as in almost every second sample in European official monitoring pesticide residues are present. Human diseases and disorders are the result of many interacting influences including radiation, chemicals, genetic background, lifestyle choices and diet. Although it is difficult to establish casual link between exposure to one or several pesticides and health problems, people became aware of their effect, especially on infants and children. Some previous studies concluded that consumption of organic products appear to provide a relatively simple way for parents to reduce their children's exposure to organophosphorus (OP) pesticides. Aim of this study was to test ability of organic diets to reduce exposure to OP pesticides and the health risks that may be connected with these exposures in the student population.

Epidemiological study was conducted in the group of 63 students - 31 consumed organic and 32 conventional diet for three days in the spring 2010. All the food and drinks were handed to them, so they did not take it on their own. In the morning before start first morning urine was collected and brought cooled to the laboratory. The same procedure was carried out on the fourth morning after consuming different diets for three days. Five OP metabolites were analyzed: diethyldithiophosphate (DEDTP), diethylphosphate (DEP), diethylthiophosphate (DETP), dimethyldithiophosphate (DMDTP) and dimethylphosphate (DMP). Urine samples were acidified and then mixed with organic solvent extraction. A sample extracts were concentrated to dryness and derivatization was carried out with pentafluorobenzyl bromide. The corresponding derivatives of dialkylphosphates were determined by gas chromatography coupled with mass spectrometry method of internal standard.

DEDTP and DMDTP were not found or were under 5 µg/L. The most frequently found OP metabolite was DMP found in the urine of 31 out of 63 students before test and 28 after test whereas 23 of them had conventional and 5 organic diet. There were no pesticides in the urine of 84% of students having organic diet and no pesticides in urine of only 25% having conventional diet.

Our study also confirmed differences in OP pesticides in urine affected by diet.

Keywords: organic, conventional, diet, organophosphorous pesticides, urine

Acknowledgement: Results are an output of the research project J4-9532: "The Quality of Food Dependent on the Agricultural Production Method", funded by the Slovenian Research Agency.

F-8

BIOACTIVITY PROFILES OF GRAIN LEGUMES: POTENTIAL ORGANIC SOURCES FOR WEIGHT-CONTROL SUPPLEMENTS

G. Dinelli^{1*}, I. Marotti¹, S. Bosi¹, R. Di Silvestro¹, V. Bregola¹, A Wittaker², S. Benedettelli².

¹ Department of Agroenvironmental Science and Technology, University of Bologna, V.le Fanin 44, 40127 Bologna, Italy

² Department of Plant, Soil and Environmental Science, University of Firenze, Piazzale Cascine 18, 50144, Firenze, Italy

* Email: giovanni.dinelli@unibo.it; Tel: +39.051.2096672; Fax: +39.051.2096642

The importance of including a legume crop in organic system rotations is well recognised from numerous studies; benefits include improved soil fertility and structure, weed reduction and pest prevention. In recent years, extracts from grain legumes have commonly been used in dietary supplements intended to control weight by providing an α -amylase and/or α -glucosidase inhibitor that reduces starch digestibility. The hypoglycemic effect of bean extracts may also be utilized as a dietary therapy management for type 2 diabetes. However, these extracts may contain significant levels of certain anti-nutritional components (e.g. lectins and trypsin inhibitors) and as a result may cause adverse effects on human health. When beans are consumed raw or only lightly cooked, the phytohemagglutinin (PHA) fraction, a member of the lectin family, agglutinates red blood cells and induces serious consequences for metabolism and health. A recent study has demonstrated that technological processing treatments used in the production of some commercial supplements decrease but do not effectively remove the anti-nutritional components (Boniglia *et al.*, 2008).

22 Accessions of grain legumes (18 *Ph. vulgaris*; 2 *Ph. coccineous*, 1 *Vigna unguiculata*, 1 *Glycine max*), grown under organic farming conditions, were screened for bioactive profiles. As regards the inhibition of α -amylase and α -glucosidase activity, the results indicated a wide variability among the investigated accessions. The inhibitory activities were not correlated with total protein, phaseolin and PHA content. For the entire set of accessions, the mean index of erythroagglutinating was 23.4 ± 20.4 . However, besides the *Vigna* spp and *Glycine* spp accessions, one *Ph. vulgaris* genotype (DG) did not show any agglutination activity. Four accessions (Verdone, K.Cina, Roviotto, DG) exhibited the highest inhibition of α -amylase activity and were characterized by unique PHA electrophoretic profiles. The inhibition of α -glucosidase was significantly correlated with the seed color, polyphenol and flavonoid content. The lowest inhibition was observed for the white-type legumes, characterized by a mean total polyphenol content (0.82 ± 0.24 mg/g seed DW) that was approximately 4 times lower than that of the coloured-type legumes (3.34 ± 0.96 mg/g seed DW). Thermal processing resulted in a slight increase in α -amylase inhibition, but a strongly reduced α -glucosidase inhibition and total phenolic content. Several of the genotypes investigated in this study exhibited intriguing properties for nutraceutical applications, in particular the common bean accession DG which has potential for the development of safety control-weight supplements (without erythroagglutination).

Keywords: Grain legumes seed, α -amylase inhibition, α -glucosidase inhibition, starch blockers, phytohemagglutinin (PHA)

F-9

THE VALORISATION OF DIFFERENT ITALIAN AGRICULTURAL ECOTYPES**A. Durazzo^{1*}, E. Azzini¹, A. Raguzzini¹, E. Venneria¹, M.S. Foddai¹, F. Intorre¹, L. Palomba¹ and G. Maiani¹**¹ Area Scienze della Nutrizione, Istituto Nazionale di Ricerca per gli Alimenti e la Nutrizione, Roma, Italy

* Email: durazzo@inran.it; Tel: +390651494461; Fax: +390651494550

The great progress in technological processes, agricultural practices and so the changes in life style led up to take attention towards local foods as principal elements for food product quality improving. In particular, it is important the investigation of traditional, local and seasonal foods: alimentary products, cultivated by techniques based on historic and cultural tradition of a specific territory and to occur only in a local place. Appropriate use of farmland, protection of animal health and welfare, environmental conservation linked to climate knowledge, soil quality and landscaping, lead to the improvements in product quality.

The aim of the current investigation was to quantify the bioactive molecules (vitamins, polyphenols, carotenoids) and to evaluate the Total Antioxidant Capacity of selected foodstuffs representing different Italian agricultural ecotypes: strawberry, cherry "Aprica" from Lombardia; potato "Rotzo", raspberry "Cansiglio" from Veneto; potato "Val Belbo", pear "madernassa" from Piemonte; apple "limoncelle", purple carrots "Fucino" from Abruzzo; chicory, strawberry "Mara des Bois" from Calabria. In addition, we have analyzed potatoes "Val Belbo" cultivated following organic and conventional regimes. For potato, chicory and carrot, analyses were also performed on cooked samples ready for consumption. The total antioxidant capacity of Italian agricultural ecotypes has been evaluated by means of two different assays, TRAP (Total Radical Trapping Antioxidant Parameter) and FRAP (Ferric Reducing-Antioxidant Power) and the molecules of interest were suitably extracted and separated by HPLC.

Our results show that in most cases typical products have considerably higher antioxidants content than commercial products. Aprica's cherries show FRAP value (mmol/Kg), TRAP value and vitamin C content significantly higher ($P < 0.001$) than values obtained for commercial products; the same trend has been reported for raspberries "Cansiglio". For wild chicory (analyzed as cooked product), FRAP and TRAP values were reported to be 20.36 ± 0.08 mmol/kg and 26.71 ± 1.04 mmol/Kg, respectively. For raw potatoes, no significant differences in antioxidant properties were found between organic and conventional products, while for cooked potatoes TRAP value was found to be higher ($P < 0.01$) in conventional product. Through the quantification and measurement of individual phytochemicals, typical products and agricultural ecotypes could be considered a valid tool for their commercialization in both developed and developing countries and for improving the quality of foods and biodiversity.

Keywords: agricultural ecotypes, agronomic practices, antioxidants, bioactive molecules

Acknowledgement: *This work was done within the research project BIOVITA financed by MIPAAF.*

**WORKSHOP 1 –
ORGANIC FOOD
QUALITY CONCEPTS
(G-1 – G-4)**

G-1

PRODUCT QUALITY AS A FUNCTION OF LIGHT AND NITROGEN SUPPLY: CONTRIBUTING TO A QUALITY CONCEPT FOR ORGANIC AGRICULTURE?**M. Athmann^{1*}, J. Fritz¹ and U. Köpke¹**¹ Institute for Organic Agriculture, University of Bonn, Katzenburgweg 3, 53115 Bonn, Germany

* Email: mathmann@uni-bonn.de; Tel: ++49 (0)228 732038

Traditionally, in Organic Agriculture product quality has been described as a function of environmental factors. Crop production methods have been oriented towards a balanced equilibrium of growth promoting factors (water, humus, nitrogen) and light and warmth as factors that enhance the formation of complex morphological and chemical structures (differentiation).

In 2008 and 2009, factorial field trials with rocket (*Eruca sativa* L.) and spring wheat (*Triticum aestivum* L.) were carried out at the experimental organic farm Wiesengut at Hennef/Sieg, Germany. The objective was to investigate the influence of light intensity, N supply and fertilizer type on product quality. The quality assessment was based on morphological parameters and chemical compounds related to growth and differentiation. Additionally, rocket was investigated with image forming methods.

For both species, as expected, full sunlight vs. shading, low vs. high N supply and manure vs. mineral fertilization resulted in lower values for growth related parameters and N-based compounds. Likewise, higher values for parameters related to differentiation and C-based compounds were measured. The content of primary and intermediary metabolites was lowered (rocket: nitrate, wheat: free amino acids), partitioning of assimilates to sinks and secondary metabolites were increased (rocket: proportion of reduced nitrogen, ascorbic acid and glucosinolate content, wheat: *i.a.* true protein content).

Image forming methods enabled discrimination of the factor levels of light intensity, N supply and fertilizer type in both years. Full sunlight vs. shading, low vs. high N supply and manure vs. mineral fertilization resulted in more pronounced structures and fewer indicators of aging in the images.

Product quality assessment based on plant physiological processes is considered as an appropriate approach for developing a quality concept for Organic Agriculture. The accurate differentiation of factor levels with image forming methods and the consistency of the results with parameters of plant morphology and composition underline the value of these methods for quality assessment.

Keywords: light intensity, nitrogen sources, manure, fertilizer type, image forming methods

Acknowledgement: We gratefully acknowledge the financial support by Software AG Stiftung, Darmstadt and Mahle Stiftung, Nürnberg and Cusanuswerk, Bonn, Germany.

G-2

HOW MANY COMPROMISES CAN ORGANIC FARMING AFFORD? – CHALLENGES FOR THE CREDIBILITY OF ORGANIC FARMING IN THE EU

K.K. Jensen^{1*}, B. Forkman² and P. Sandøe^{1,2}

¹ Institute of Food and Resource Economics, University of Copenhagen, Denmark

² Department of Large Animal Sciences, University of Copenhagen, Denmark

* Email: kkj@foi.dk; Tel: +45 2873 8581

Whereas conventional farming only promises to produce what the market demands, organic farming takes on the responsibility to produce according to standards derived from its own set of values and priorities. This makes organic farming vulnerable to critique in cases in which it does not perform well by its own standards.

By analysing the values of organic farming, we identify the core priority, which is that the environment, animal welfare and human health should be served through a healthy ecosystem, rather than by the treatment of symptoms. Conversely, if relatively great numbers of individual animals (or humans) persistently fare badly in terms of welfare, organic farming should look for a solution based on an understanding of the working of the ecosystem.

	2001	2002	2003	2004	2005	2006	2007	2008	2009
Organic	17.1	18.4	9.8	9.0	11.9	9.4	7.9	9.3	10.2
Cage	5.4	5.7	5.5	4.8	4.5	5.2	5.9	5.0	4.9
Barn	12.1	9.7	9.2	11.9	11.0	10.0	8.7	11.2	9.1
Freerange	8.6	8.9	6.6	10.0	8.2	6.9	7.5	10.3	10.6

The table show mortality in pct. among Danish layers in different egg production systems for the approximately 25% of the Danish producers involved in a self-imposed efficiency control. Thus, there is reason to believe that these figures represent the best end of the range. It appears that organic layers have had quite high mortality. Things have then improved, but the level appears to have stabilized around 10%, roughly twice as much as in cage systems and about at the same level as in other alternative systems.

Hence, in this case problems persist in the ecosystem. The mortality seems to be linked to feather pecking and cannibalism, which is partly due to large flock sizes. Flock sizes that deny the hens the possibility of performing their natural social behaviour because of a compromise with economic viability.

If organic farming is to keep its distinctive approach to responsible production, there is a great challenge in cases like the one here presented to formulate more precisely the extent to which compromises are acceptable, and the form they can take.

Keywords: Animal welfare, economic constraints, laying hens, organic principles

G-3

ORGANIC FOOD QUALITY RESEARCH IN ESTONIA

D. Matt^{1*}, A. Luik¹, E. Peetsmann¹ and M. Roasto²

¹ Institute of Agricultural and Environmental Sciences, Estonian University of Life Sciences

² Department of Food Hygiene, Institute of Veterinary Medicine and Animal Sciences, Estonian University of Life Sciences

* Email: darja.matt@emu.ee; Tel: +3727425010

In Estonia, organic farming has been developing actively for more than twenty years but research in organic food quality started only in 2003. Comparison of conventionally and organically produced products has shown certain quality differences. Organically cultivated blackcurrant contained more ascorbic acid than conventional berries. Organically grown strawberries had a higher content of soluble solids but a lower level of ascorbic acid compared to conventionally grown strawberries. Conventional carrots contained pesticide residues and had a significantly higher nitrate concentration than organic carrots; the latter were significantly preferred by rats in a feeding experiment. Comparison of organically and conventionally grown tomatoes of five different cultivars showed that their chemical composition was more dependent on the cultivar than on the growing system. There was no significant difference in total polyphenol content but there was a tendency for the content of single major polyphenols, such as quercetin, glycosides, chlorogenic etc. to be higher in organic than in conventional tomatoes.

The results of research into 39 varieties of wheat, oat and barley quality showed that the protein content of all spring cereals was lower in organic conditions compared to the conventional, but the quality of protein was better in organic cereals. Correlations between quality characteristics showed that wheat which had used nitrogen of organic origin behaved differently in the baking process. The differences between the varieties in dough development time and dough stability were more stable in organic wheat.

The mean content of cholesterol in eggs was 30%, and of potassium 7% greater in organic eggs compared to conventional eggs. No significant difference was found in the content of fatty acids, protein, sodium or dry matter. The organic eggs had a lower content of calcium than eggs from conventional farming. Negligible differences were found in the occurrence of vitamins (vitamin A, vitamin E, vitamin D3). No pesticide residues and PCB isomers compounds were found in eggs of both farming systems.

Comparison of fatty acids of organic and conventional milk showed that organic milk contained proportionally more omega-3 acids and CLA and less omega-6 fatty acids than conventional milk. Irrespective of the month, feeding period and the year the ratio of omega-6 and omega-3 fatty acids was lower in organic than in conventional milk.

Keywords: carrot, berry, cereal, egg, milk, conventional, pesticide residues, chemical analyses

G-4

CONCEPTUALIZATION OF ORGANIC FOOD AMONG POLISH CONSUMERS AND THEIR WILLINGNESS TO ACCEPT INNOVATION IN ORGANIC PRODUCTS**S. Żakowska-Biemans^{1*}**

¹ Department of Organization and Consumption Economics, Faculty of Human Nutrition and Consumer Sciences, Warsaw University of Life Sciences (SGGW), Warsaw, Poland

* Email: sylwia_zakowska_biemans@sggw.pl; Tel: +48225937133; Fax: +48225937147

Organic food consumption is a growing trend among consumers in Eastern European countries but a deep understanding of how consumers in these emerging markets interpret the concept of organic food that is essential for the implementation of successful communication strategies is still missing.

The aims of the proposed contribution are twofold: to identify how perception of organic food attributes evolve with increasing organic food market shares and changing consumers' lifestyles and values regarding food and what is their willingness to accept innovation in organic products.

The findings to be presented are based on the research carried out using quantitative approach, with face to face interviews, conducted in the years 2005, 2007 and 2008 with representative samples of Polish consumers.

The results revealed that Polish consumers give high importance to hedonistic and health values related to organic products. Their perception of organic food is highly influenced by factors such as healthiness, safety and taste but when conceptualizing organic food they also refer to marketing issues such as availability, variety, convenience and price level of organic products. These findings suggest that the majority of Polish consumers acknowledge and value organic food for its use values but non-use values (i.e., environmental or animal welfare attributes) are getting growing importance that exemplifies the changing lifestyle of Polish consumers. Convenience seem to be a concept contradictory in the opinion of Poles to organic that also reflect the immature character of domestic organic market. It was also mirrored in consumers' willingness to accept innovation with respect to organic products. Innovations impacting on the intrinsic product quality (e.g. improving healthiness and safety) were found to provide real marketplace opportunities, whereas innovations pertaining to convenience were less likely to be accepted in organic food.

The results provide a valuable insight into the way how perception of organic food attributes changes when organic markets share increases and what kind of innovation are consumers most likely to accept and reject in organic food.

Keywords: organic food, consumers, perception, innovation

Acknowledgement: *This work was performed within the grants of Polish Ministry of Science and Higher Education.*

**WORKSHOP 2 –
CONSUMER RELATED
QUALITY ASPECTS
(H-1 – H-6)**

H-1

THE IRISH ORGANIC FOOD MARKET: SHORTFALLS, OPPORTUNITIES AND THE NEED FOR RESEARCH**R. Tobin^{1*}, T. Larkin^{1*} and S. Moane¹**¹ Limerick Institute of Technology, Moylish Park, Limerick, Ireland

* Email: Rachel.Tobin@lit.ie; Tracey.Larkin@lit.ie

In 2009 the Irish organic food market was forecast to grow from €120m to €239m by 2013; however recent figures set its value at €90m possibly due to the economic downturn and the higher price of organic food. Surveys of Irish consumers reveal that 66% of consumers prefer to buy local produce and that most organic consumers are buying organic at large supermarkets, however, an estimated 70% of this market is imported from foreign producers. This evidence reveals that Irish organic producers must trade at supermarkets, and promote 'local produce' to ensure they reach the majority of buyers. 78% of organic rejecter's state price and 21% state unawareness of benefits as reasons for not buying organic. This is a clear call for organic foods to either become more cost competitive with conventional foods or to generate data that will justify the higher price of organic food.

A review of recent scientific literature reveals that there is an inconsistent conclusion between studies that have assessed the value of organic vs. conventional foods. Some studies showed a significant increase in the amount of bioactive constituents pertaining to health due to organic cultivation. However other studies have reported no significant difference. The majority of the studies reviewed were assessments of only one or few food types for one type of bioactive. There is certainly a requirement for a study that includes a wide range of foods and that assesses multiple bioactives such as polyphenols, flavanoids, anthocyanins and carotenoids.

The Irish Department of Agriculture, Fisheries and Food (DAFF) routinely test for pesticide residues in food; in this they randomly include organic products. In 2008, 59 samples were tested, of which only 4 were of Irish origin. 5 out of 59 samples had detectable residues. Positive samples originated from Italy, the United Kingdom and the United States. This report shows there is a need for a more comprehensive study of Irish organic foods to show the absence of pesticides compared to conventional foods as well as imported organic foods.

A search for studies that compare organic and conventional foods in terms of sensory attributes has revealed that studies are scarce and limited in scope. It is thought that a sensory evaluation that will assess a wide range of popular Irish organic versus conventional foods will provide data that will contribute greatly to the organic vs. conventional sensory question. Does organic food look, feel and taste better?

It is concluded that there is a need for a comprehensive study of a range of Irish organic food for health constituents, pesticide residues and sensory quality. Such a study may provide marketable data that could increase consumer confidence and boost market growth for organic food.

Keywords: Organic Food, Ireland, Bioactives, Pesticides, Sensory

Acknowledgement: *This work is supported by the Irish Research Council for Science, Engineering and Technology (IRCSET).*

H-2

ORGANIC AND CONVENTIONAL YOGURTS: STUDY OF SENSORY PROFILES AND CONSUMER ACCEPTABILITY**A. Bendini^{1*}, S. Barbieri¹, F. Gottardi², T. Gallina Toschi¹ and M. Canavari³**¹ Dipartimento di Scienze degli Alimenti, Facoltà di Agraria, Università di Bologna, Italy² COOP Italia, Direzione Qualità, Responsabile Area Sensoriale - Laboratorio Coop Italia Casalecchio di Reno (BO), Italy³ Dipartimento di Economia e Ingegneria Agrarie, Facoltà di Agraria, Università di Bologna, Italy* Email: alessandra.bendini@unibo.it; Tel: +390547338121; Fax: +390547382348

The sensory quality of 6 organic and conventional Italian yogurts, produced using only whole milk and selected lactic ferments (without flavors or fruit ingredients), was evaluated by quantitative-descriptive analysis (QDA). A set of 18 sensory descriptors (for appearance, odour, taste and mouth-feeling) were used to describe the sensory profiles of samples by a panel group composed by 8 trained assessors. The intensity of each attribute was indicated on an unstructured scale of 100 mm. The same type of specimens was subjected to an acceptability test realized in an Italian supermarket by a group of 60 consumers. The consumers were divided in two sub-groups based on the high (*heavy consumers*) or low frequency (*light consumers*) of organic food consumption. Consumers expressed their judgment on the overall liking, the acceptability for appearance, odour, taste, mouth-feeling and on some selected attributes, using both an hedonic scale ranged from 1 to 9 and a JAR scale from 1 to 5 (the overall quality only by the 9-points scale). The consumer test was realized in two different sessions: in the first no information was given on samples (*blind test*), in the second the samples were identified as organic or non organic (*labeled test*), without showing the brand.

The analysis of variance (ANOVA) of profile and consumer data was performed and a Fisher LSD post-hoc test was applied. Some results on the data segmentation (*heavy and light consumers*) and on the effect of information on liking (*blind and labeled test*) were also elaborated. Moreover, to study the sensory characteristics of “natural yogurts”, that drive the consumer, preferences multivariate analysis (PCA and preference mapping) was carried out.

Keywords: Yogurt, sensory quality, organic food, sensory profile, consumer acceptability

Acknowledgement: The study was realized thanks to the funds of the European project ECROPOLIS “Organic Sensory Information System (OSIS): Documentation of sensory properties through testing and consumer research for the organic industry (Grant agreement no.: 218477-2, SEVENTH FRAMEWORK PROGRAMME).

H-3

CONSUMER ORIENTED SENSORY MARKETING FOR ORGANIC PRODUCTS- INSIGHTS FROM THE EU-FUNDED PROJECT ECROPOLIS**S. Hemmerling¹, T. Obermowe^{1*} and A. Spiller¹**¹ University of Göttingen -Department of Agricultural Economics and Rural Development, Göttingen, Germany

* Email: tobermo@uni-goettingen.de; Tel: +0049-551394827; Fax: +0049-5513912122

Recent development of the European organic food market partially based on changing consumer needs constitutes not only a high potential but also a necessity for new target group specific marketing strategies. Deducing from the respective literature, the importance of sensory properties of organic products such as odour, appearance and particularly taste when taking purchase decisions has been increasing continuously for the last couple of years. Therefore a market segmentation, that beyond the common segmenting variables such as lifestyle, nutritional behaviour and sociodemographics uses sensory preferences to determine different target groups for organic food products, seems to be a new opportune approach. In order to fill this existing gap a segmentation model based on the Food Related Lifestyle concept, that takes into account not only consumers' lifestyles in connection with their dietary habits, but also the sensory properties of organic food, has been developed.

Within the framework of the EU-project ECROPOLIS, whose scope it is to collect data about sensory profiles from organic products in six European countries in an interactive online data base, one part of this cross-cultural survey has been conducted in Germany in 2010. Aiming at the development of a typology of organic food consumers most notably based on their sensory preferences, about 300 consumers of organic food have been interviewed to their eating and drinking habits, their shopping and cooking behaviour and the frequency and places of purchasing organic food. Moreover, questions about sensory preferences regarding taste, appearance and other properties of organic aliments have been complemented by degustation of exemplary indicator products.

The results clearly show that clustering by both food-related lifestyle variables and sensory aspects leads to significant differences between the various clusters. Thus, the suggested method proved to be feasible as well as reasonable and builds the basis for a marketing that analyses the varying consumers' needs and targets specific marketing tactics at its different audiences. First hints to the improvement of existing marketing tools as well as the development of new ones is given by a further part of the digital questionnaire, which was devoted to the acceptance of sensory labelling as well as the image and impact of the national organic label, conducting first blind and subsequently open labelled tests of indicator product samples. As expected, a significant positive image effect of the national organic label has been found that underlines the effectiveness and the importance of consumer oriented communication.

Keywords: Organic food consumers, sensory preferences, EU-funded research project, market segmentation, marketing strategies

H-4

MARKET NEEDS FOR SENSORY PROPERTIES ALONG THE ORGANIC FOOD SUPPLY CHAIN IN EUROPE

M. Maciejczak^{1*}, S. Żakowska-Biemans², A. Spiller³, T. Obermowe³, R. van Veggel⁴, D. Asioli⁵, M. Canavari⁵, H. Stolz⁶, L. Baumgart⁶, C. Frissur⁷

¹ Warsaw University of Life Sciences-SGGW, Faculty of Economic Sciences (WULS), Warsaw, Poland

² Warsaw University of Life Sciences- SGGW, Faculty of Human Nutrition and Consumer Sciences, (WULS), Warsaw, Poland

³ University of Göttingen, Institute of Agricultural Economics, (UGOE), Göttingen, Germany

⁴ Wageningen University&Research, Centre for Innovative Consumer Studies, (WUR), Wageningen, The Netherlands

⁵ University of Bologna, Department of Agricultural Economics and Engineering (UNIBO), Bologna, Italy

⁶ Research Institute of Organic Agriculture, (FiBL), Frick, Switzerland

⁷ Synabio, Paris, France

* Email: mariusz@maciejczak.pl; Tel. +48 22 5934235

The main aim of this paper is to investigate the needs of supply chain actors for consumer-relevant information with regard to the sensory quality of organic food products. It is also aimed at investigating the experiences of relevant organic supply chain actors concerning the consumer preferences with regard to sensory properties of organic products. The research method is based on the exploratory approach: using a semi-structured interview schedule 71 telephone interviews were administered to stakeholders in 6 European countries. The respondents have been selected in different tiers of the organic supply chain. Then, the interviews were transcribed and analyzed using the semantic methodology of Keywords.

For the researched stakeholders, together with other intrinsic and extrinsic factors affecting the perception of food quality, sensory characteristics of organic products are very important and play either a primary or a secondary role in the selection process. The results show that organic supply chain actors mostly describe the sensory quality of organic foods as superior comparing to conventional food products. However, in some cases the sensory attributes of organic products are indicated as inferior. According to interviewees sensory-related issues of organic food is expected to increase in importance in the future. They also agreed that there is a lack of direct communication of sensory characteristics of organic food to consumers. In addition, respondents argue that consumers are willing to pay up for organic products due to the perception of a higher quality, which often might also include superior sensory characteristics (e.g. better taste). However sensory attributes are rarely included into the marketing strategies of organic supply chain members. Thus only more aware actors, those who do execute the sensory analysis on their products, try to use sensory attributes in applied marketing strategies. On other hand, there is a high interest to increase the use of information about sensory characteristics of organic products among supply chain actors.

We argue that sensory analysis of organic products should be used to further develop the sensory quality of organic products. Information about sensory characteristics of organic products should be communicated to consumers to influence their perception of organic food and to become a prerequisite of competition in the organic sector.

Keywords: organic products, sensory characteristics, marketing strategies

Acknowledgement: *This study was performed in the framework of the European project ECROPOLIS "Organic Sensory Information System (OSIS): Documentation of sensory properties through testing and consumer research for the organic industry (Grant agreement no.: 218477-2, SEVENTH FRAMEWORK PROGRAMME).*

H-5

ECROPOLIS - TRANSPARENCY IN SENSORY PROPERTIES AND CONSUMER EXPECTATIONS IN ORGANIC FOOD

N. Barylko-Pikielna⁵, A. Bendini⁷, A. Bongartz^{3*}, K. Buchecker², M.L. Cezanne³, T. Gallina Toschi⁷, E. Kostyra⁵, S. Kremer⁸, U. Kretzschmar-Rüger¹, T. Obermowe⁴, P. Reichl⁶, A. Spiller⁴

¹ Research Institute of Organic Agriculture / FiBL, Frick, Switzerland (project coordinator)

² Verein zur Förderung des Technologietransfers an der Hochschule Bremerhaven e.V.-TTZ, Bremerhaven, Germany

³ Zurich University of Applied Sciences / ZHAW, Wädenswil, Switzerland

⁴ University of Göttingen - Department für Agrarökonomie und Rurale Entwicklung, Göttingen, Germany

⁵ Warsaw University of Life Sciences / WULS, Warsaw, Poland

⁶ AgroParisTech / APT, Massy, France

⁷ University of Bologna, Bologna, Italy

⁸ Wageningen University and Research Centre / A+F, Wageningen, The Netherlands

* Email: kcbuch@itz-bremerhaven.de; Tel: +49 471 30 99 33 13; Fax: ++49 471 30 99 33 19

Sensory properties of food products are an important market success factor in the European food sector especially on the organic market, where many producers and distributors of organic food claim superior tastes for their products compared to the conventional alternative. This argument is still subject to a hard debate, from an objective scientific perspective, but especially from the subjective consumer point of view.

Due to specific regulations for organic production (EC regulations, Codex Alimentarius, or standards of organic associations) organic products show considerable differences in sensory properties compared to conventional products. Because consumer preferences are largely dependent on their long-term nutritional habits, for new consumers expecting superior properties from organic products, these unfamiliar sensory experiences can lead to dissatisfaction (Buchecker et al. 2004). This is an important barrier for SMEs in the organic market to reach new consumer segments.

On the other hand sensory acceptance of organic products could be influenced and enhanced by a positive image of organic food.

The EC-funded project Ecropolis analyses this objectives in six European countries (Switzerland, Germany, Italy, Poland, The Netherlands, France) within six product groups (dairy-, meat-, bakery-, oil-, tomato-products and apples). Organic associations, researchers and organic SME's work together to evaluate the situation on the national market and identify Pan-Eeuropean effects.

The presentation reveals the national and the European sensory preferences in respect to the six product groups (preference mapping) by combination of objective dimensions (sensory description / QDA) with the subjective perception (marketing study) from consumers. Results give better knowledge about the consumer expectations of sensory quality in organic food. Furthermore these results combined with the impact of regulations and legislations on sensory properties give direct information for further product development or product improvement potential.

Furthermore the evaluation of potential of organic labeling on sensory preferences (image) gives recommendations for the sensory marketing for organic food, to obtain consumers emotions and to give clear information about proposed sensory differences in organic food, in order to achieve a clear segmentation from the conventional market.

The knowledge in these fields is very limited, so the main funding of the project Ecropolis is to develop the first Organic Sensory Information System (OSIS) an interactive and multilingual data base to increase the transparency of the sensory properties of organic food for different stakeholders and consumers.

Keywords: sensory marketing, sensory properties, consumer preferences, organic regulations and standards, product improvement potential

H-6

HOW DO FRENCH CONSUMERS PERCEIVE ORGANIC LABELS IN WINE?**E. Ginon^{1*}, G. Ares², S. Issanchou³, A. Sutan¹ and R. Deliza^{3,4}**

¹ Lab. on Experimentation in Social Sciences and Behavioral Analysis (LESSAC), Group ESC Dijon - Bourgogne, F-21000 Dijon, France

² Sección Evaluación Sensorial. Departamento de Ciencia y Tecnología de Alimentos. Facultad de Química. Universidad de la República, Montevideo, Uruguay

³ Centre des Sciences du Goût et de l'Alimentation, UMR 6265 CNRS, UMR 1324 INRA, Université de Bourgogne, AgroSup Dijon, F-21000 Dijon France

⁴ Embrapa (Brazilian Agricultural Research Corporation) Labex Europe, Dijon, France

* Email: emilie.ginon@escdijon.eu; Tel: 33(0)380 725 890; Fax: 33(0)380 725 999

There is an increasing interest to reduce the use of pesticides in the French agriculture, and particularly in the wine production. In order to achieve this reduction it is necessary to align consumers' and producers' interests. Producers might only be willing to pursue environmentally friendly practices if they can gain an additional economic benefit for this effort. Meanwhile, consumers can only choose environmentally friendly products, and make rational decisions about the environmental impact of their choices if they are provided with accurate and understandable information. In this context, eco-labeling could be an effective mechanism to help achieving the above mentioned goals. There are many national and international eco-labels in France that are commonly used to communicate similar messages to consumers. This large number of labels raises the question of whether their messages are successfully conveyed. Besides, in July 2010 a new European organic-label was launched to replace the old one. On the other hand, only few wine producers work on organic agriculture and generally they do not show on the bottle their production practices.

The aim of the present study was to investigate how consumers understand the message beyond three logos: the French organic-logo, the former and the new European organic logos.

One hundred and forty wine consumers from Dijon - France were recruited to participate. They answered a questionnaire with several questions, among them: "What does a bottle of wine with this logo suggest you?" Consumers were recruited according to three age groups: 20 to 35 year old, 36 to 50, and 51 to 70, and balanced for gender. Responses were qualitatively analyzed and grouped into different categories. Frequency of mention of the categories was determined for each of the labels.

Results showed that consumers' responses for the three labels clearly differed. The French and the former European labels successfully conveyed their messages. Consumers declared that they expect a bottle of wine with those logos to be *organic/bio*, *natural* products, *produced without chemical products*. In the case of the former European label, few consumers indicated it as wines produced in European countries. On the other hand, the new European label was associated with words related to *nature* and *environment* but most consumers did not associate it with organic or environmentally friendly products. Consumers declared that this label indicates that wines are *produced within the European Union*. These results reveal that the new European label is not familiar to consumers yet.

The findings of this qualitative exploratory study suggest the need to inform consumers about the meaning of organic-labels, particularly new ones, and indicate that further research about this issue is needed.

Keywords: organic-labels, wine, consumer, perception

Acknowledgement: Ministère de l'Écologie, du Développement Durable, des Transports et du Logement, France-; Embrapa (Empresa Brasileira de Pesquisa Agropecuária) Labex Europe, Dijon, France.

**WORKSHOP 4 – DAIRY
PRODUCTS – QUALITY
AND HEALTH
IMPLICATIONS
(I-1 – I-7)**

I-1

CONTENT OF FATTY ACIDS, VITAMIN E AND CAROTENOIDS IN MILK AND HERBAGE AS AFFECTED BY SWARD COMPOSITION AND PERIOD OF GRAZING**M.K. Larsen^{1*}, X.C. Fretté^{1,3}, T. Kristensen², J. Eriksen², K. Søgaard², J.H. Nielsen^{1,4}**¹ Department of Food Science, Aarhus University, DK-8830 Tjele, Denmark² Department of Agroecology and Environment, Aarhus University, DK-8830 Tjele, Denmark³ Present address: Institute of Chemical engineering, Biotechnology and Environmental Technology, University of Southern Denmark, DK-5230 Odense, Denmark⁴ Present address: Arla Foods, DK-8260 Viby J, Denmark

* Email: mette.larsen@agrsci.dk; Tel: +45 8999 1142; Fax: +45 8999 1564

The quality of organic milk is affected by feed composition, and especially the high use of legumes has been identified as the reason for high levels of polyunsaturated fatty acids, carotenoids and tocopherols in organic milk.

Four different pastures composed of mainly white clover (WCL), red clover (RCL), lucerne (LUC) or chicory (CIK), respectively, were established to investigate the influence of sward composition on the milk quality of grazing cows. On three occasions during the grazing period (May, June and August), groups of 12 Holstein cows were grazing the pastures for two weeks. About 70% of the daily dry matter intake was pasture, and the remaining dry matter intake was a mixture of oats, hay and minerals (82%, 16%, 2%, respectively). The swards were sampled, and their feed quality as well as their composition of carotenoids, tocopherols and fatty acids was analysed. On each occasion, milk was sampled after two weeks of grazing, and the content of tocopherols and carotenoids as well as the composition of fatty acids was analysed.

The overall feed quality expressed as IVOMD (in vitro organic matter disappearance) and NDF (neutral detergent fibre) was affected by period and to a lesser extent by forage type. The content of carotenoids was higher in RCL compared to the other forages, while no effect of period was observed. Alpha-tocopherol was neither affected by period nor by forage type. Fatty acid content, in particular content of linolenic acid, decreased during the grazing period, and it was highest in RCL, intermediate in CIK and lowest in WCL and LUC.

Milk yield was neither affected by period nor by forage type. Milk fatty acid composition and content of alpha-tocopherol and carotenoids showed minor differences between forage types and sampling occasions. However, multivariate analysis of these data showed grouping according to sampling occasion, but no clear grouping according to forage types.

Despite the differences in composition of forage and in composition of milk, it was not possible to predict milk content of specific fatty acids, carotenoids or tocopherols from the feed content of these compounds. This was partly explained by differences in feed digestibility.

Comparison of the milk with previous studies showed higher concentrations of beneficiary compounds such as linolenic acid (12 mg/g fatty acids), conjugated linoleic acid (13 mg/g fatty acids), carotenoids (6 µg/g milk fat) and alpha-tocopherol (21 µg/g milk fat), and it was concluded that all the forages tested could be used in production of a milk with such properties.

Keywords: pasture, milk, fatty acids, tocopherol, carotenoids

I-2

COMPARATIVE MILK PROTEOMICS AND METABOLOMICS: A PILOT STUDY ON EFFECTS OF ROUGHAGE AND FARMING-STYLE ON COW MILK

S. Mosler¹, J. Wohlers¹, D. Kusche¹, T. Baars^{1*}

¹ Department of Biodynamic Agriculture of Kassel University, Witzenhausen, Germany

* Email: baars@uni-kassel.de

Aside from commercial exploitation, cow milk actually serves nutrition and defence, development and adaptation of calves. This is reflected in its complex composition, consisting of proteins/peptides and metabolites (sugars, organic acids, lipids, amino acids and vitamins). As a novelty besides fatty acid analysis, we applied proteomics and metabolomics, focusing the ensemble of minor proteins and non-lipid metabolites within a whey sample. Proteins were analysed by electrospray nanoflow liquid chromatography tandem mass spectrometry, non-lipid metabolites by gas chromatography time-of-flight mass spectrometry. Raw data was subjected to bioinformatics, compound database matching and multivariate statistics. The resulting constituent profile data was characteristic for each sample.

Feeding may affect level profiles of fatty acids, amino acids and antioxidants. Here, we focused on the effect of roughage types such as silage and hays either rich or poor in structure, pasture and ley, respectively, on milk composition in pooled samples from various herds and farms. For instance, the cross-over comparison of hays of ley vs pasture showed one third of minor whey proteins and half of the metabolites to be altered markedly.

This pilot study revealed large potential of this combined omics approach to differentiate milks from different origins and feeding regimes. Such omics data can help to elucidate and evaluate effectors of milk composition and determinants of milk quality.

Keywords: milk proteomics, milk metabolomics, minor whey proteins, non-lipid metabolites, feed effects

I-3

THE POTENTIAL OF ORGANIC MILK - FATTY ACID AND ANTIOXIDANT PROFILES OF BIODYNAMIC AND CONVENTIONAL MILK FROM LOW- AND HIGH-INPUT SYSTEMS IN SUMMER AND WINTER**D. Kusche¹ and T. Baars^{1*}**¹ Department for Biodynamic Agriculture, Kassel University, Witzenhausen, Germany

* E-mail: baars@uni-kassel.de; Tel: 0049-5542981610; Fax: 0049-5542981609

Before the background of consumer assumptions of a higher quality and a better health value of organic food the status quo of organic milk quality was assessed. In a system comparison, milk of contrasting biodynamic and conventional dairy farms was evaluated in summer and winter to understand relevant system characteristics affecting milk quality. Farm milk samples were taken bimonthly within 12 months. The 24 farms were grouped in four system groups, each of six farms: biodynamic low- (BLI) and high-input (BHI) and conventional low- (CLI) and high-input (CHI). Current feeding, pasture and performance of the cows were registered. The fatty acid (FA) profiles as well as selected antioxidants (AO) were analysed. Both LI systems fed their cows in summer essentially with grass and in winter with hay, while both HI incorporated different shares of silages from grass (clover) and maize and showed higher levels of concentrates. Milk from all four systems could be differentiated and differences ($p < 0.001$) were present for a range of important FAs (PUFA, OBCFA, TFA, n3 and CLA) and AOs (α -tocopherol and β -carotene). CHI as a representative of nowadays modern conventional milk production showed consistently lowest concentrations of relevant FAs in both seasons. BLI and CHI showed the most contrasting differences in their milk composition due to the highest intake of grass (summer) res. hay (winter) and the renunciation of maize- and grass silages and high levels of concentrates in BLI compared to the total mixed ration (TMR) based diet in CHI. In an intermediate position were BHI and CLI with partly overlapping quality characteristics. In a forward stepwise regression origin (B vs. C) could be separated in summer through n3, CLAc9t11 and the C18:1t11/C18:1t10-ratio (CVcorrect 0.80) and in winter through the C18:1t11/C18:1t10-ratio and middle chain FAs (CVcorrect 0.74). The intensity level (LI vs. HI) could be separated in summer through CLAc9t11 and CLAt11t13 (CVcorrect 0.89) and in winter through C18:3c9,12,15 and α -tocopherol (CVcorrect 0.94). Our findings were consistent with other milk studies who made regional comparisons. However, it might be difficult to differentiate organic milk from milk of conventional LI systems. The inherent potential of milk product quality was shown by BLI in summer when cows had full access to pasture. We concluded that - whether in organic or conventional systems - an orientation to a lower intensity and a system characteristic incorporating a pasture based feeding management and a renunciation of TMR, lead to an improved milk product quality in terms of the FA and AO profiles. Intensification of organic dairy systems will threaten the possibility to differentiate organic from conventional milk. The diet of a ruminating animal should therefore be grass based and extensive grass-based systems offer the best orientation for a quality-oriented organic dairy production in the future.

Keywords: system comparison, organic milk, fatty acid profile, organic product quality, health

Acknowledgement: *Many thanks to Prof. Dr. G. Jahreis and his team at the Friedrich Schiller University in Jena for the opportunity to use the laboratory facilities for the analysis of the fatty acid profiles. We are very grateful for the financial support of this research project to Software AG Stiftung, Damus e.V. and Bäuerliche Gesellschaft Nordwestdeutschland e.V.*

I-4

RUMINANT FATTY ACIDS IN BREAST MILK: RELATIONS WITH ORGANIC DAIRY CONSUMPTION AND PROTECTION AGAINST ALLERGY DEVELOPMENT IN THE CHILD

C. Thijs^{1*}, A. Müller², L. Rist³, A. P. Simoës-Wüst³, I. Kummeling¹, B. Snijders¹, M.A.S. Huber⁴, P. Dagnelie¹, P. von den Brandt¹

¹ Maastricht University, School for Public Health and Primary Care (CAPHRI), Department of Epidemiology, Maastricht, The Netherlands

² Department of Food Chemistry, University of Hamburg, Germany

³ Paracelsus-Hospital Richterswil, Switzerland

⁴ Louis Bolk Institute, Driebergen, The Netherlands

* Email: c.thijs@maastrichtuniversity.nl; Tel: 31 43 3882389; Fax: 31 43 388 4128

Background. The KOALA Birth Cohort Study (The Netherlands) has shown that children who regularly used dairy products from organic origin have a lower risk of childhood eczema at age 2 years. This was also found for organic dairy products used by lactating mothers. Interesting candidates to explain the protective effects of dairy products are ruminant fatty acids, especially vaccenic acid (*trans*-11-C18:1, a *trans*-fatty acid) and rumenic acid (*cis*-9,*trans*-11-C:18:2, a conjugated linoleic acid isomer).

Methods. We determined the proportion of fatty acids in breast milk of 310 mothers from the KOALA study, and followed up their children until age 2 years for development of eczema and allergy. Eczema was determined by repeated parent-reported questionnaires, and by trained research assistants at a home visit at age 2 years. Blood was collected and tested for specific IgE against the three most common food allergens (age 1 and 2) and five airway allergens (age 2 years). Results were analysed with multivariable logistic regression analysis, adjusting for potential confounding factors.

Results. Ruminant fatty acids were proportionally more abundant in breast milk of mothers with a higher consumption of dairy products, especially those from organic origin. In the children, the risk of eczema in the first two years and allergy at age 1 year was lower when the proportion of ruminant fatty acids was at the higher levels in the breast milk. This was independent of the omega-3 fatty acids, which were also found to be inversely associated with the risk of eczema and allergy.

Discussion. The protective effect of omega-3 (fish oil) fatty acids against the development of eczema in preschool children was already shown in children in earlier studies. Experiments in mice have suggested that also ruminant fatty acids could have similar protective effects. In the KOALA Birth Cohort Study we have now confirmed this in children.

The present results explain the protective effect of dairy from organic origin. But also omega-3 fatty acids content differs between dairy products, depending on their origin and milk processing. This may compensate for low intake from other sources like fatty fish and thus contribute to protection against allergy.

For further information: www.koala-study.nl/researchers.html

Key words: breast milk, ruminant milk, fatty acids, organic food, allergy

I-5

INFLUENCE OF MILK YIELD AND LACTATION PHASE ON FATTY ACIDS COMPOSITION OF MILK FROM ORGANIC FARMS**T. Sakowski^{1*}, B. Kuczyńska², E. Metera¹, K. Słoniewski¹ and B. Romanowicz¹**

¹ Department of Animal Science, Institute of Genetics and Animal Breeding, Polish Academy of Science, Jastrzebiec, Poland

² Department of Cattle Breeding, Faculty of Animal Science, Warsaw University of Life Sciences, Warsaw, Poland

* Email: t.sakowski@ighz.pl; Tel: +48227561711; Fax: +48227561417

We carried out a study to investigate influence of milk yield and lactation phase on the fatty acids (FA) profile of organic milk. 50 primiparous cows from four Polish organic farms, matched in size, location, and agricultural zone, were selected for observations. Farms differed with milk production level. Cows were loose housed and fed *ad libitum* with grass-clover silage and hay, concentrates (cereals and legumes) during indoor season and also grazed on grass-clover pastures during outdoor season. Milk samples were taken during four lactation stages: "beginning", "peak", "full" and "end". Daily yield of energy corrected milk (ECM) and body condition (BCS) were scored for every cow on the day of milk sampling. Milk samples were analyzed for basic chemical composition with infrared spectroscopy and FA methyl esters profile using gas chromatography. Data was statistically analyzed with univariate fixed models, including fixed effects of farm and season, and fixed regression on ECM, for each lactation phase.

The results showed that all cows were in good body condition. The average BCS ranged from 3.12 to 3.77, depending on farm and lactation phase. This indicates that all the farms had sufficient feed resources to cover the energy requirements of the cows.

In the first lactation phase, the highest content of mono and poly-unsaturated FA (MUFA and PUFA) was found on farms W and G II. The MUFA and PUFA content (g/100g of milk fat) was 31.89 and 4.22 for the former and 31.52 and 4.45 for the latter.

In the second lactation phase, MUFA and PUFA content were found to be 26.73 and 4.36 g/100g fat for farm J, and 27.90 and 4.29 g/100g fat for farm GII, respectively.

In the third lactation phase milk with the highest content of MUFA and PUFA was produced on G II farm (26.34 and 4.71 g/100g fat, respectively).

The content of CLA (c 9 t 11) in milk fat was also the highest on this farm (1.18 g/100g fat).

In the fourth lactation phase, cows' milk yield decreased. Differences in fat composition between farms were not significant.

The highest content of CLA (c 9 t 11) was observed in late lactation (from 0.96 to 1.49 g/100g fat).

Keywords: ECM, BCS, CLA, MUFA, PUFA

Acknowledgement: Research realised within the project BIOFOOD - innovative, functional products of animal origin no. POIG.01.01.02-014-090/09 co-financed by the European Union from the European Regional Development Fund within the Innovative Economy Operational Programme 2007–2013.

I-6**RAW MILK CHALLENGES AND EHEC****T. Baars^{1*}, D. Kusche¹ and L. Gramann¹**¹ Department of biodynamic Agriculture, Kassel University, Witzenhausen, Germany

* E-mail: baars@uni-kassel.de; Tel: 0049 5542981610; Fax: 0049 5542 981608

Nowadays raw milk has almost completely disappeared from the daily diet. In risk assessments the potential damages for human health after consumption of raw milk and raw milk products are judged as greater than the advantages. In Germany it is no longer allowed to deliver raw milk into homes for the elderly and children of kindergarten, because in these age groups the highest sensitivity is found. Health risks of raw milk products are caused by a range of zoonotic diseases, like *Campylobacter*, *Listeria* or Enterohämorrhagic strains of *Escherichia coli* (EHEC). However, recent research on positive health effects of raw milk intake showed that there is increased evidence that raw milk protects for asthma and allergies in young children. Here we are dealing with a classical risk assessment: whether raw milk promotes health or might be a health hazard, and whether the risk balance should be reconsidered.

In a literature review the ecology of EHEC was described and 27 cases of EHEC related disease cases (as individuals or as a group of patients) were analysed for their scientific consistency in connecting raw milk consumption with diseased people. 20 cases described over the last 10 years could be used after introduction of several scientific criteria: presence of a case and control group, doses-effect relation, relevant interview over time, only milk related case, bacteriological proof of EHEC-strains through the chain. These criteria were important to show a proven evidence of causality. In 50% of the cases an unambiguous epidemiological relationship could be made with the contaminated raw milk, which was taken by the patients.

In Germany legal raw milk is sold as so-called Vorzugsmilch. Before the 2nd World War this type of milk was offered as 'child milk' or 'health milk' additionally to pasteurized milk. Farms delivering Vorzugsmilch are strictly controlled for the hygiene and udder health. In two studies the average level of EHEC in Vorzugsmilch is less than 0.6-1.7% compared to 1.9-11.9% in 'general' raw milk samples. To reduce the health risk completely, official state bodies advise cooking all milk before consumption. In comparison to other food vehicles, like lamb meat or vegetables, the overall EHEC risks of raw milk are low. In contrast, the risks for young children during zoovisits (such as caressing animals) or playing in sandboxes might be bigger than the risks from drinking a controlled Vorzugsmilch.

Due to an improved control of zoonotic diseases and with respect to the increased evidence that raw milk protects against asthma and eczema, the balance between risk and advantage could be changed to reflect the benefits of highly controlled raw milk after acceptance of certain hygienic quality standards. Possibilities to improve the security of raw milk in the future might involve the so-called quick on-farm measurements (within 24 hours) of f.i. E.coli levels in bulk milk.

Keywords: raw milk, risks assessment, EHEC

I-7

IMPROVING THE FATTY ACID COMPOSITION IN ORGANIC DAIRY FARMING IN WINTER DIETS**J. Wohlers¹, D. Kusche² and T. Baars^{2*}**¹ Kwalis, Fulda, Germany² Department of biodynamic Agriculture, Kassel University, Witzenhausen, Germany

* Email: baars@uni-kassel.de; Tel: 0049 5542981610; Fax: 0049 5542 981608

Three cross-over design feeding trials were fulfilled during winter at biodynamic dairy farms to evaluate the effects of silage versus hay, hay of ley versus hay of permanent pasture and fodder beet versus wheat as an additional source of energy. In all cases milk was sampled from 10-12 cows per group and the change of diet was made after three weeks. Milk sampling took place after 2 and 3 weeks after the change of the diet. Fatty acids in milk fat were analysed by gas chromatography and 65 different FAs could be distinguished.

If totalized FAs as PUFA, CLA, n3 and n6-levels were taken as main criteria to distinguish in between the different fodder regimes. Improved FA levels ($P < 0,05$) were found from hay of leys compared to hay of pasture (PUFA, CLA, n3 and n6 were respectively 25.8 vs 30.6; 6.3 vs 7.8; 11.1 vs 13.6 and 10.5 vs 11.7) due to the higher levels of clover in leys plus the better drying conditions of the green fodder. Reduced levels were found through feeding of fodder beet compared to wheat (respectively 27.9 vs 31.1; 4.8 vs 5.9; 12.0 vs 12.5 (NS); 14.3 vs 15.7). The overall low levels on unsaturated long chain FAs in this trial showed that this type of fodder ratio (hay plus fodder beet or wheat) gave high levels of saturation in the rumen. No significant differences were found in the third trial between diets based on hay or silage (respectively 29.2 vs 34.3 (NS); 6.1 vs 8.2 (NS), 9.3 vs 11.5 (NS) and 16.4 vs 19.7 (NS)), here the short chain and medium chain FAs were significantly higher through feeding of hay, whereas alpha linolenic acid was higher in silage. The relatively low levels of desired FAs depended on the poorer quality of both silage and hay. The overall indications that milk from silage had a better quality than milk from hay could be explained by the difference in ripening and colour of the fodder as well as differences in pasture quality.

It can be concluded that during winter the overall level of FA quality of organic milk is poor compared to levels described in literature when cows were pastured or had access to fresh green fodders. In winter the possibility of affecting the FA profile is present, although effects are limited. Ripe fodder and fodders with high levels of sugar and starch negatively affect the FAs strived for. Solutions to improve the desired FA composition can be reached by the feeding of oil seeds, for instance linseed.

Keywords: milk fatty acids, winter diets, organic dairy farming

INDEX

A

Aberg M..... 104

A

Adamczyk M..... 110
 Aguzzi A..... 80
 Acharid A..... 34
 Alewijn M..... 36
 Alm J..... 46
 Aloisio I..... 71
 Apprich S..... 62, 130
 Ares G..... 150
 Arncken C.M..... 103
 Asiola D..... 148
 Athmann M..... 95, 139
 Aureli G..... 38
 Azzini E..... 29, 69, 72, 100, 131, 132, 135

B

Baars T..... 54, 61, 154, 155, 158, 159
 Babička L..... 106
 Baggesen D.L..... 27
 Bagi F..... 74
 Bach Knudsen K.E..... 119
 Baiamonte I..... 29, 70, 89
 Bakker M.H..... 48
 Baldicchi A..... 80
 Bärberi P..... 72, 100
 Barbieri S..... 146
 Barylko-Pikielna N..... 77, 149
 Battistelli A..... 80
 Baumgart L..... 148
 Bavec A..... 133
 Bavec F..... 111, 133
 Bavec M..... 111, 133
 Beck A..... 31
 Bellina V..... 116
 Bellon S..... 73
 Bendini A..... 77, 146, 149
 Benedettelli S..... 28, 134
 Benhamouche N..... 67
 Bentivenga G..... 38
 Bergström A..... 46
 Betti L..... 93
 Biavati B..... 71
 Billova V..... 83
 Birlouez-Aragon I..... 32, 34
 Blanco-Penedo I..... 118
 Bočarov-Stančić A..... 74
 Bodroža-Solarov M..... 74, 75
 Bonanno A..... 116
 Bongartz A..... 77, 149
 Bosi S..... 28, 71, 134
 Bradley D..... 112
 Brasili E..... 43
 Braun-Fahrländer Ch..... 59, 130
 Bregola V..... 28, 71, 134
 Briviba K..... 45

Bub A..... 45
 Budakov D..... 74
 Bügel S..... 47, 54
 Buchecker K..... 77, 94, 149
 Büchele G..... 130
 Burlingame B..... 23
 Busscher N..... 33, 54
 Butler G..... 26, 44
 Bysted A..... 109
 Bügel S..... 37

C

Camerini M..... 38
 Campanelli G..... 82
 Canavari M..... 146, 148
 Castellini C..... 30, 123
 Catasta G..... 131, 132
 Ceseviciene J..... 39
 Cezanne M.L..... 77, 149

Ç

Çitak D..... 84, 85

C

Cohen M..... 129
 Czapllicki S..... 117, 121

D

D'Aloise A..... 70
 D'Evoli L..... 69, 80, 107
 Dagnelie P..... 156
 Dal Bosco A..... 30, 123
 Dalsgaard A..... 27
 Danielewicz H..... 130
 Dawczynski C..... 60
 Degen C..... 60
 Deliza R..... 150
 Dernini S..... 23
 Di Cesare L.F..... 82
 Di Ferdinando S..... 29, 81, 107
 Di Gioia D..... 71
 Di Grigoli A..... 116
 Di Miceli G..... 116
 Di Silvestro R..... 28, 71, 134
 Dijk W..... 48
 Dinelli G..... 28, 71, 93, 134
 Donini L.M..... 131
 Drachmann T..... 128
 Dresbøll D.B..... 76
 Dressler C..... 99
 Durazzo A..... 69, 72, 135
 Dvořák P..... 105

E

Emanuelson U..... 101, 118

Eriksen J. 153

F

Fall N. 101, 118
 Famiani F. 80
 Ferrari V. 82
 Filipčev B. 75
 Finamore A. 43
 Finotti E. 72, 100, 107, 132
 Foddai M.S. 29, 69, 72, 100, 132, 135
 Forkman B. 140
 Forslund A. 27
 Fretté X.C. 153
 Frissur C. 148
 Fritz J. 95, 139

G

Gabrielli P. 80, 81, 107
 Galazka M. 102
 Gallina Toschi T. 77, 146, 149
 Gambelli L. 107
 Garaguso I. 69
 Gauthier H. 73
 Geier U. 94
 Genuneit J. 130
 Ghiselli L. 28
 Giambalvo D. 116
 Ginon E. 150
 Girgzdiene V. 56
 Gołembiewski M. 108
 Gottardi F. 146
 Gramann L. 158
 Guarino Amato M. 30, 123
 Guiducci M. 72, 100

H

Hagedorn T. 131
 Hajšlová J. 35, 102, 105, 106
 Halekoh U. 37, 41, 47, 109, 120
 Hallmann E. 40, 90, 102, 110
 Heederik D. 130
 Hellgren L.I. 128
 Hemmerling S. 55, 147
 Hera A. 83
 Hollmann K. 99
 Horak E. 130
 Hrženjak V. 133
 Huber M.A.S. 48, 49, 54, 115, 156
 Hurajová A. 102
 Hussain A. 127
 Husted S. 37, 47, 104, 109
 Huusfelt Larsen E. 104

I

Ibing S. 99
 Intorre F. 69, 131, 132, 135
 Issanchou S. 150
 Ivanov K. 68

J

Jacobs D.R., Jr. 25
 Jacobsen M. 37, 41
 Jahreis G. 60, 155
 Jaudszus A. 60
 Jensen A.N. 27
 Jensen K.K. 140
 Jensen S.K. 128
 Johansson E. 127
 Jørgensen H. 37, 41, 119, 120
 Jurgoński A. 117, 121
 Juśkiewicz J. 117, 121

K

Kahl J. 32, 33, 34, 54, 96
 Kapolna E. 37, 47, 104
 Kelderer M. 70
 Kidmose U. 76
 Kmieciak O. 102
 Kneifel W. 62, 130
 Knuthsen P. 37, 104, 109
 Kokornaczyk M.O. 93
 Köpke U. 95, 139
 Kostyra E. 77, 149
 Krawinkel M.B. 58
 Kremer S. 77, 149
 Kretzschmar-Rüger U. 31, 32, 77, 149
 Kristensen H.L. 76
 Kristensen K. 37
 Kristensen T. 153
 Krtková V. 102, 105
 Kuczyńska B. 108, 122, 157
 Kuhnt K. 60
 Kuktaite R. 127
 Kummeling I. 156
 Kusche D. 54, 61, 154, 155, 158, 159
 Kuzdraliński A. 78

L

Lapajne V. 133
 Lardschneider E. 70
 Larkin T. 145
 Larsen E.H. 37, 47
 Larsen M.K. 153
 Larsson H. 127
 Lauridsen C. 37, 41, 119, 120
 Laursen K.H. 37, 47, 104, 109
 Leifert C. 44
 Leistrumaite A. 39
 Lipowski J. 90
 Lo Scalzo R. 82
 Lombardi-Boccia G. 80, 81, 107
 Lorenzen P.C. 130
 Loss G. 130
 Lucarini M. 80, 81
 Luik A. 141
 Lukas M. 99
 Lundh T. 118

M

Maciejczak M.....	148
Mäder P.....	103
Madsen K.H.....	109
Maiani G.....	69, 72, 100, 131, 132, 135
Mark A.B.....	37, 47
Marotti I.....	28, 71, 134
Marszalek K.....	90
Martin B.....	132
Marzec M.....	78
Matt D.....	141
Mattioli S.....	30, 123
Mayer J.....	103
Mazollier C.....	73
Melloni S.....	38
Mengheri E.....	43
Metera E.....	108, 122, 157
Mie A.....	46, 104
Migliori C.....	82
Mlakar B.....	133
Mlakar S.G.....	133
Moane S.....	145
Moneta E.....	70
Montel M.C.....	132
Moscattello S.....	80
Mosler S.....	154
Mourvaki E.....	30, 123
Mugnai C.....	30, 123
Müller A.....	156

N

Nardo N.....	29, 70, 89
Narin I.....	84, 85
Navarrete M.....	73
Neri B.....	131
Nicoli S.....	89
Nielsen J.....	109
Nielsen J.H.....	153
Niggl U.....	24
Nilsson U.....	104
Nobili F.....	69
Nordström A.....	46
Novotná H.....	35, 102

O

Oates L.....	129
Obermowe T.....	55, 77, 147, 148, 149
Ogrodowska D.....	117, 121
Olsson M.....	104
Oreshkova D.....	86

P

Palomba L.....	69, 131, 132, 135
Pankova S.....	68
Paoletti F.....	29, 32, 70, 89
Paoletti S.....	29, 81, 107
Peetsmann E.....	141
Pencheva I.....	86
Penvern S.....	73

Perenzin M.....	72, 100
Petersen R.A.....	128
Peykova L.....	86
Plizzari L.....	72, 100
Ploeger A.....	33, 53
Prieto-Linde M.L.....	127
Prins H.A.B.....	48
Priotti S.....	80
Puppel K.....	108

Q

Quaranta F.....	38
Quinn R.....	71

R

Raff M.....	128
Raffo A.....	70, 89
Raguzzini A.....	135
Rasmussen S.K.....	47
Reichl P.....	77, 149
Rembiałkowska E.....	40, 54, 90, 102, 110
Rist L.....	156
Roasto M.....	141
Robačar M.....	133
Romanowicz B.....	122, 157
Roos T.....	61
Roselli M.....	43
Rosenlund H.....	46
Ross A.....	99
Rüfer C.E.....	45
Ruggeri S.....	30, 123
Ruzgas V.....	39

S

Sakowski T.....	108, 122, 157
Sandøe P.....	140
Sautereau N.....	73
Seal Ch.....	44
Segura-Carretero A.....	28
Seidel K.....	32, 54
Schinkowski N.....	99
Schmid O.....	31
Scholz K.....	55
Schulzová V.....	35, 102, 105, 106
Simonović Z.....	133
Sinesio F.....	32
Skuskis V.....	56
Slepetiene A.....	39
Śloniewski K.....	108, 122, 157
Snijders B.....	156
Søegaard K.....	153
Solarska E.....	78
Søltøft M.....	37, 104, 109
Soylak M.....	84, 85
Sozanska B.....	130
Spiller A.....	55, 77, 147, 148, 149
Stenius F.....	46
Stergiadis S.....	44
Stojšin V.....	74
Stolz H.....	148

Storm C.	27
Stracke B.A.	45
Strassner C.	99
Sundrum A.	42
Sutan A.	150
Szymona J.	79

Š

Šimurina O.	75
Štraus S.	111

T

Taddei F.	38
Taupier-Letage B.	54
Thijs C.	156
Tholstrup T.	128
Thorup-Kristensen K.	76
Tchamitchian M.	73
Tobin R.	145
Tornambè G.	116
Toti E.	131, 132
Tres A.	36
Tsvetkova D.	68
Tufi S.	81
Turk K.	133
Tüzen M.	84, 85

U

Urban L.	73
---------------	----

V

Václavík L.	35
------------------	----

van de Vijver L.P.L.	57, 115
van der Veer G.	36
van Neerven R.J.J.	130
van Ruth S.	36
van Veggel R.	148
Velimirov A.	54
Venneria E.	69, 131, 132, 135
Vizioli V.	29
von den Brandt P.	156
von Mutius E.	130
Vučković J.	74

W

Waser M.	130
Watzl B.	45
Weber J.	130
Weibel F.P.	103
Werner L.B.	128
Whittaker A.	28
Wiegant F.A.C.	48
Williams G.	112
Wohlers J.	154, 159

Y

Yilmaz E.	84, 85
----------------	--------

Z

Zadernowski R.	117, 121
Żakowska-Biemans S.	142, 148
Załęcka A.	54, 96
Zduńczyk Z.	117, 121

NOTES

NOTES

NOTES

NOTES

NOTES

NOTES



ISBN 978-80-7080-779-8