Domain Committee "Food and Agriculture"

COST Action 863

Euroberry Research: from Genomics to Sustainable Production, Quality & Health

MONITORING PROGRESS REPORT
Period: from 01/06/2007 to 31/12/2008

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SUMMARY OF WGS ACTIVITIES: 2007 EARLY 2008

WG1 Report

In 2007, WG1 of the COST863s was concerned by updating data on genetic resources on all small fruits, by constructing a varietal evaluation network and by one small group meeting in UK.

GENETIC RESOURCES: Up-dating the data of the genetic resources,
Strawberry
Béatrice Denoyes-Rothan has updated the list of genetic resources of strawberry of 15 European institutes: Babtai, LTU, Rytis Rugienius; Piikkiö, FIN, Tarja Hietaranta; Taastrup, DNK, Torben Bo Toldam-Andersen; East Malling, GBR, David Simpson and Adam Whitehouse; Gembloux, BEL, Farvacque Stéphanie; Balandran, FRA, Laurence Bourrain; Douville, Ciref, FRA, Philippe Chartier; Wurzen, DEU, Erik Schulte; Pillnitz, BAZ, DEU, Monika Höfer; Skierniewice, POL, Edward Zurawicz and Agnieszka Masny; Pitesti, ROM, Mihail Coman and Paulina Mladin; Kostinbrod, BGR, Violeta Kondakova; Cesena, ITA, Walther Faedi; Ancona, ITA, Bruno Mezzetti; Málaga, ESP, José Frederico Sánchez Sevilla.
No information was obtained from: Stjordal, NOR, Jahn Davik; Balsgard, SWE, Karin Trajkovski; Aarslev, DNK, Holger Daugaard; Wageningen, NLD, Bert Meulenbroek; Basel, CHE, Martin Frei; Fertödi, ROM, Klara Nyerges ; Cluj-Napoca, ROM, Sebastian Cracea

Small berries
The list of contact persons for establishing the most exhaustive list of genetic resources of small berries has been updated by Mihail Coman responsible of genetic resources data in the COST 863 WG1.
Mihail Coman has started to draw up a list of the different small berry genetic resources, Ribes, Rubus, Vaccinium, Hipophae, Sambucus, Lonicera and Aronia, available in different European countries, Bulgaria, Denmark, Germany, Italy, Lithuania, Moldavia, Romania, Scotland, Hungary. This work will be presented as poster in the First Symposium on Hort. In Europe, to be held next 17 - 20 February 2008, Vienna, Austria.
In conclusion, the work on genetic resources is getting well. However, it is necessary to have an SGM in 2008 to have better coordination among European partners, and between European and American partners.

TRIAL EVALUATION:
Trial evaluation was difficult to organise in 2007 despite the contacts took along 2006 and the SGM organised in Forli in December 2006. Audrius Sasnauskas pointed that a SGM in September 2008 is necessary to optimize the coordination on this subject.
SGM IN EAST MALLING – UK – 5 & 6 December 2007. The SGM in East Malling was focused on genomics of small berries belonging to the Rosaceae family.

This SGM was an opportunity to exchange on Rosaceae and small fruit genomics. Through oral presentations, it was clear that strawberry is getting as a model in Rosaceae whereas the official actual model is peach. Tools are currently developed in strawberry such as molecular markers, SNPs, genetic populations, transformation.
Among the agronomical traits developed in oral presentations, flowering was the most recurrent.
Extensive conservation of long-range genome organization in Fragaria supports the use of the diploid Fragaria as a model system for studying genomics and molecular dissection of the much more complex octoploid F. × ananassa genome.

WG2 Report

In 2007 effectively 1 specific WG2 small group meeting was organised on the topic of propagation material. This meeting was dedicated to "Micropropagation of small fruits and true-to-typeness of in vitro regenerated plants". Topics discussed were: · 'Off –types' regenerated plants

· Genetic transformation
· Micropropagation and the production of healthy plant material
· Culture decline and new plant growth regulators
· 'In vitro ecology'
· Photoautotrophic micropropagation (PAM)
· Bioreactors and automatics
· Temporary immersion culture
· Unusual behaviour in micropropagation such as fasciation, vitrification etc.
· Commercial laboratories, yes or no?
· Quality issues in a tissue culture laboratory
· Could we publish a scientific paper about classical micropropagation in a SCI journal with IF more than 1?

Determination of possibilities and activities to achieve:

· Overview of problems associated with current situation - We have to connect our investigations with some research in cytology, histology, molecular biology etc to solve it.
· Control over berry micropropagation, milestones to be aimed for – all participants have to prepare a list of scientific papers of micropropagation on small fruits with references; list of commercial labs in own country; preparing a monography edited by COST 863 (if it is possible) with precise protocols for micropropagation of small fruits (strawberries, raspberries, blackberries, red and black currants and blueberries); to prepare a list of collection of small fruits and fruits in general in own institutions.
· Possibilities for network formation and cooperation – Suggestions: to exchange information and news about symposiums, seminars, meetings, new COST actions, new projects; to prepare a new project/topic for FP7; STSM between our labs; to exchange the plant material.

A small group meeting on the topic of plant health was cancelled because of the unavailability of accommodation for the meeting (within an earlier organised workshop in another frame). New opportunities for this small group meeting are under investigation.

This aims for the different sub-groups will in the frame of:

- Monographs on micropropagation (small fruits)
- Monograph on plant health and diagnostics (small fruits and strawberry).
- Monograph on quality testing and assurance in berries propagation materials.

WG3 Report

The main activity was the organization of a SGM – on small fruit production systems, held in Oeiras (PT), November 2007.

Pedro B. Oliveira, local organizer of the meeting, welcomed all the participants. During the first day of work different Portuguese and European experts had the chance to present their field of expertise and discuss the main lines of berry research that can be improved in Portugal. The discussion focused on possible cooperation in new proposals of integrated research on novel cultivation techniques in preparation both in Portugal and at European level. We had the opportunity to listen to twelve presentations on diverse themes: breeding, cultural practices and sustainable production, fruit quality and healthy compounds.

The Growers meeting at Odemira:

At this SGM we had the possibility to join a growers meeting at the South of Portugal and present researchers expertise to a large group of growers (140 people were present).
The meeting started with the final presentation of I&DE project AGRO 556 and three round tables in different fields of berry production:
Round table 1 “Strawberry production systems”
First we had the possibility to listen Gianluca Baruzzi speak about “The Italian strawberry industry”. For this round table six invited strawberry growers from different Portuguese growing areas were invited.
Round table 2 “Production systems for berries, other than strawberry” Fanny Pitsioudis made a presentation about “New primocane raspberries ‘Sugana’ and ‘Erika’. In this table six invited berry growers (raspberry, blackberry, blueberry and currants) from different Portuguese growing areas were also invited.
Round table 3 “Post-harvest and marketing”
At this round table Bruno Mezzetti presented the “Cost 863 - Euroberry for improving knowledge transfer in berry research” to six chief executives from the main Portuguese berry enterprises and than all aspects of berry production and organization were discussed.
The meeting ended with a final presentation by Derek Stewart on “Nutritional enhancement of soft fruit - recent advances”.

The last day of the meeting was used for a technical visit to “Herdade Experimental da Fataca” the research farm at the south west coast and two important berry growers. During this SGM on small fruit production systems was possible to discuss the main lines of research that we have in Portugal and update them with the knowledge of a small group of different European researchers. Also quite important was the contribution of all enterprises concerned with berry production. This is the only way that we can increase future research in a more coordinated manner.
As a follow up of the decision taken at the MC meeting in Zagreb, the SGM was organized with the objective of discussing the concept of sustainability and define the approach for delivering, in the course of the COST863 activities, a ‘Best practices recommandations’ documents for berry production in EU.
At the WG3 SGM organized at SCRI Dundee, a tentative schedule for the analysis of the survey and the preparation of the ‘Best practices ‘ document was established as follows :
· Full spreadsheet and questionnaire ready by October 2007, and dispatched to the country delegates.
· Information / filling in collected by end 2007
· First analysis by early 2008, for presentation of the preliminary results at SHE2008, COST Workshop.
For some problems related to the informatics organization the questionnaire still is not available, but it will be available within this year.

WG 4 Report
WG 4 during 2007 continued the activities decided during the two SGMs in 2006. The initiative of Geisenheim, Norway and Ancona, initiated at the SMG meeting for the evaluation of the research “Climate influences on health beneficial components of strawberry” in December 2006 at Geisenheim, Germany was attempted by exchanging fruit samples for common analyses. Work is currently in progress, but some improvements are foreseen for the 2008 harvest. Especially the procedure/logistics of sending frozen strawberry material for analsyses has to be improved, since several samples reached Geisenheim defrosted in 2007 and could not be used.
At the COST 863 SGM on “Validation of analytical methods for bioactive compounds in berries” WG 4 in December 2006 in Vienna, Austria, a two step ringtest was agreed upon to suggest specific techniques for the other WGs.

Jules Beekwilder coordinated the efforts to analyse strawberry samples as an initial common baseline. It has been decided to work initially on a large freeze-dried batch of strawberry fruit (Elsanta, supplied by Dundee), and perform "total phenolic content" analyses in 4 labs (Dundee, Wageningen, Ancona, Helsinki). In later stages, the analyses should be extended to other labs. Work is currently in progress, but some improvements are foreseen for the 2008 harvest.
The JM of WG3 & 4 took place in Nitra, at Institute of Plant Genetics and Biotechnology of the Slovak Academy of Science from October 1. – October 3., 2007 (please include a LINK to Book of Abstracts on the webpage). The Intl. Conference on "Vaccinium ssp and less known small fruits: cultivation and health benefits", which lasted from Oct. 30.
– Sept. 5., 2007 and included an Excursion to the High Tatras, was attended by 17 COST Participants (10 from WG 3 and 7 from WG 4) with a total number of Participants 48 from 16 countries (Canada, Belarus, Czech Republic, Estonia, Italy, Croatia, Lithuania, Poland, Russia, Slovac Republic, Austria, Belgium, Netherlands, Norway, Rumania, Switzerland). The organizers provided the Abstracts available for our Website.
There main themes were presented in plenary sessions and poster sessions:
1) sustainable production systems: state and trends in the control of crop properties COST 863: WG 3 presentations.
2) Sustainable berry production: state and trends in production practices
3) Nutritional value of berry fruits and impact on human health – COST 863 WG 4 presentations.
Member of WGs 3 and 4 convened for a common discussion about the future steps of the WGs to be taken still in 2007, and then in 2008.
The group-leaders reported about the activities currently being carried out. Margit Laimer (WG 4) reported on the first WG 4 meeting on "Bioactive compounds of berry fruits affecting human health" on the 21. – 23. April 2005, in Vienna Austria, from where different initiatives took their origin, either in direction of plant production conditions or in direction of laboratory analyses.
Rolf Nestby (WG 4) reported on the initiative of Geisenheim, Norway and Ancona, initiated at the SMG meeting for the evaluation of the research "Climate influences on health beneficial components of strawberry" in December 2006 at Geisenheim, Germany. Work is currently underway.
Margit Laimer (WG 4) reported on the Organisation of COST 863 Meeting on "Validation of analytical methods for bioactive compounds in berries" WG 4 in December 2006 in Vienna, Austria.
Jules Beekwilder (WG 4) reported on the agreements achieved so far to analyse strawberry samples as an initial common baseline, and indicated the chance to extent these analyses to raspberry, as addressed in QU 1 [Is anyone in WG 3 investigating the effect of organic farming on raspberry quality (contact with soil life, no fertilizers)] and Qu 3 [Is there any attempt to make a common experimental trial set-up?].
Maurizio Battino (WG 4) reported on the quite successful publishing strategy, e.g. Biofactors, 1. World Congress on Nutrition, and that this strategy should be followed also in future. The next platform we could have at the SHE Congress in February 2008 in Vienna and everybody was invited to submit interesting results to WG leaders for presentation.
Qu 2 [Is there any FP7 call we can apply for as common project?] To this issue we did not get any information.
Finally the question was raised, where WG 4 should hold its next meeting, and the present members were solicited to make proposals within the next 2 weeks. A kind proposal for May 2008 was submitted later on by the Latvian colleagues, which was evaluated at the MCM in Brussels.

REPORT ON COST SGM IN VIENNA FROM 17TH TO 20TH FEBRUARY 2008

The SGM on for the participation and presentation of "COST863 Activities to the FIRST SYMPOSIUM ON HORTICULTURE IN EUROPE", held Last 17 - 20 February 2008, VIENNA, AUSTRIA, under the aegis of European national horticultural societies and the International Society for Horticultural Science (http://www.she2008.eu/) was held at the University Vienna, organized by the Plant Biotechnology Unit at the Institute of Applied Microbiology (IAM), Dept. of Biotechnology, Muthgasse 18, A-1190, Vienna, Austria.

The aim of this SGM was to participate to this important event and to present in workshop included in the official program of the conference the main activities carried out by the COST 863 Action.

For this meeting there the requested 7 experts representing the Executive Board (Chairman, Vice-Chairman and WG Leaders), but also 2 other experts involved in the organization of the next activities of the Action, were present and contributed to the outcomes: 1) Bruno Mezzetti (Chairman COST863); 2) Rolf Nestby (Vice Chairman COST863 STSMs responsible); 3) Margaret Korbin (Vice Chairman COST863 EBA responsible); 4) Bert Van Duijn (COST863 WG 2 Leader); 5) Monique Bodson (COST863 WG 3 Leader); 6) Margit Laimer (COST863 WG 4 Leader); 7) Torben Toldam-Andersen (Associate professor, PhD.); 8) Mihail Coman (Fruit Research Institute Pitesti).

Highlight was the Workshop: **COST 863 - Euroberry Research: from Genomics to Sustainable HS 7**

Production, Quality & Health

After a short welcome by **Prof. B. Mezzetti** (Convenor: *Mezzetti Bruno*, Università Politecnica delle Marche, Italy & *Rolf Nestby*), all COST meeting attendees addressed the methodologies and the focus of their research work supported by a PowerPoint presentation.

From genome to berry fruit (presented by Bruno Mezzetti)

Denoyes-Rothan B., D. Simpson, M. Coman, A. Sasnauskas & B. Mezzetti

UREFV-INRA BP 81 Villenave D'Ornon, France, East Malling Research, United Kingdom, Fruit Research Institute Pitesti, Arges, Romania, Lithuanian Institute of Horticulture, Kaunas district, Lithuania, Università Politechnica delle Marche, Ancona, Italy

Quality assurance of planting material (presented by Bert van Duijn)

van Duijn Bert, Paivi Parika & Gina Ruzic

Fytagoras BV, Leiden, The Netherlands, MTT Agrifood Research Finland, Plant Protection, Jokioinen, Finland, ARI SERBIA, Fruit and Grape Research Centre, Čačak, Serbia

Sustainable berry production (presented by Bert van Duijn)

Bodson Monique, Pedro Bras de Oliveira, Gijs van Kruistum & Eamonn Kehoe

Gembloux Agricultural University, Laboratory of applied plant physiology and horticulture, Belgium, Estaçao Agronomica Nacional, Dpt Produaço Agricola, Oeiras, Portugal, Wageningen University and Research, Applied Plant Research, Location Lelystad, The Netherlands, Teagasc Soft Fruit, Enniscorthy, Ireland

Bioactive compounds of berry fruits affecting human health (presented by Margit Laimer)

Laimer M., G. Marzban, A. Herndl, J. Beekwilder, G. Mc Dougall, D. Stewart, J. L. Quiles E. Krüger, C. Atkinson, R. Nestby, T. B. Toldam-Andersen, E. Harsan, M. Heinonen, M.Olsson, Z. Juranic, M. Battino & B. Mezzetti

Plant Biotechnology Unit, IAM, Dept. Biotechnology, BOKU, Wien, Austria, Plant Research International, Wageningen, The Netherlands, Scottish Crop Research Institute, Invergowrie Dundee, UK, Institute of Nutrition and Food Technology, Department of Physiology, Granada, Spain, Research Centre Geisenheim, Department of Pomology, Germany, East Malling Research, East Malling, Kent, UK, Norwegian Crop Research Institute (Planteforsk), Kvithamar Research Centre, Stjoerdal, Norway, The Royal Veterinary and Agricultural University, Dept. Agricultural Sciences, Crop Science, Taastrup, Denmark, Fruit Research Station Cluj, Cluj Napoca, Romania, Department of Applied Chemistry and Microbiology, University of Helsinki, Finland, Dept. of Crop Science, Swedish University of Agricultural Sciences, Alnarp, Sweden, Institute for Oncology and Radiology of Serbia, Belgrade, Serbia and Montenegro, Inst. Biochemistry and Dept. of Environmental and Crop Science Medical School, Università Politechnica delle Marche, Ancona, Italy.

Specifically on this theme the following three major topics were presented:

1. **Development and standardisation of technologies** to determine the modes of action of berry derived phytochemicals, smart screens for berry crops in relation to nutritional relevance. The aim is to adapt the use of large scale functional genomics and standardised technologies to determine the modes of action of berry derived phytochemicals in relation to health relevant aspects, e.g. Trolox Equivalent Antioxidant Capacity (TEAC), FIA-TEAC, Determiantion of Total Phenol Content and Total Anthocyanin Content. The creation of genetic and proteomic allergen identification tools for a fast evaluation of individual sensitization patterns was addressed.
2. **Polyphenols in berries**: phytochemical profiling and the relation to quality in human health. A systematic evaluation of antioxidant features, i.e., total antioxidant capacity, total polyphenol contents, total anthocyanin contents, on different small fruit cultivars together with the typical parameters usually included in breeding programmes aiming to obtain improved berry patterns and contents. Participants of the SGM in December 07 had agreed on beneficial modifications of a few routine protocols for the extract preparation, and the determination of total phenolics and radical scavenging activity and to carry out an initial ring trial for harmonisation of their methodologies. To this purpose experimental material in the form of lyophilised Elsanta strawberries was used.
3. **Bioactive compounds of berry fruits affecting human health.** Tools to design breeding strategies were developed on the example strawberry in a collaboration between the University of Ancona and BOKU, Vienna. Data obtained will be influential in collaboration with other WGs of COST 863 to determine breeding strategies for bioactive compounds and antioxidant capacity in berries to enhance the nutritional quality of berry fruits.

In the frame of the FIRST SYMPOSIUM ON HORTICULTURE IN EUROPE further issues were discussed by Dr. Toldam-Andersen, this topic was introduced by a poster with the title: **Climate influences on fruit development and health beneficial components in strawberries,** *Toldam-Andersen T. B.[1], E. Krüger[2], H. Dietrich[3], B. Mezzetti[4], C. Carlen[5], B. Duralija[6] & R. Nestby[7]*

[1]Copenhagen Univ., Dept. of Agricultural Sciences, Denmark. [2]Research Centre Geisenheim, Dept. of Pomology, Germany. [3]Research Centre Geisenheim, Dept. of Wine Analysis and beverage, Technology, Germany, [4]Marche Polytechnic University Ancona, SAPROV, Italy, [5]Research Centre Agroscope Changins-Wädenswill, Switzerland, 6University of Zagreb, Department of Pomology, Croatia, [7]Bioforsk, Trondheim, Norway

In the same frame of the FIRST SYMPOSIUM ON HORTICULTURE IN EUROPE further issues on genetic resources were discussed by Dr. Mihail Coman, this topic was introduced by a poster with the title:

A survey of small fruit European germplasm

Coman M.[1], P. Mladin[1], B. Denoyes-Rothan[2], A. Sasnauskas[3] & V. Kondakova[4]

[1]Research Institute for Fruit Growing Pitesti, Romania, 2UREF – INRA BP 81 Villenave D`ornon, France,

[3]Lithunian Institute of Horticulture, Genetic and Biotechnology Department, Lithuania,

[4]Agrobioinstitute, Minister of Agriculture, Bulgaria.

Coordination of collaborative ring trials in the context of COST laboratories for selected methodologies routinely used for determination of polyphenolics in berry fruits

Further the participants tried to compare their protocols in order to clarify minor differences. All participants debated beneficial modifications of a few routine protocols for the extract preparation, and the determination of total phenolics and radical scavenging activity and agreed to start an initial ring trial for harmonisation of their methodologies. To this purpose experimental material in the form of lyophilised Elsanta strawberries will be provided by Dr. G. McDougall to all laboratories present in the Vienna meeting.

Participants defined this as an external standard for inter group trials in 2007 for the example of strawberry, that has to be prepared by one of the participant labs and shared with others as a reference standard. Experience gained in this initial setup will be applied to the Geisenheim/Ancona material, once it becomes available in the year 2007.

Dr. Beekwilder has agreed to coordinate this ring-trial for a pre-validation of simplified procedures.

The participants further agreed to provide these methodologies for breeders as soon as they are qualified and standardised for the COST members across Europe.

4. Coordination of activities in 2007

Participants supported the idea of the Brussels SGM from early December 2006 to present the COST 863 action in form of a flyer. The publication of research data from COST 863 in a COST booklet was also welcomed.

Contribution in Conferences and Meeting in 2007, where topics related to the activities of COST 863 are presented, were discussed. Further publication of selected topics by the COST participants were considered.

To support the local costs for the Workshop organization and publication of the papers there was the request to accept also to allocate 1500 Euro for the local organizers of the Conferences. This budget was not transferred to the organization of the congress because they preferred to have the registratration fees payied directly by the invited experts, that were reimboursed by COST.

COST EUROBERRY 863

WORKING GROUP 1 SMALL GROUP MEETING

MOLECULAR GENETICS AND GENOMICS IN BERRIES AND OTHER ROSACEOUS FRUIT CROPS

5th – 6th December 2007 East Malling Research, UK

COST delegates in attendance: J. F. Sanchez-Sevilla IFAPA-CIFA Malaga (ES), **M. Korbin** ISK (PL), **F. Dunemann**, BAZ-IOZ (DE), **C. Rosati** ENEA (IT), **A. Monfort** IRTA Cabrils (ES), **B. Denoyes-Rothan** INRA Bordeaux (FR), **J. Davik** BioForsk (NO), **M. Albani** Koln Max Planck (DE), **T. Hytönen** University of Helsinki (FI), **G. Cipriani** University of Udine (IT).

Also in attendance: P. Arús IRTA, Cabrils (ES), **N. Battey** Reading University, **J. Clarke** EMR, **F. Fernandez** EMR, **J. Graham** SCRI, **T. Kukokura** Reading University, **T. Robbins** Nottingham University, **D. Sargent** EMR, **D. Simpson** EMR, **T. Sonneveld** Nottingham University, **B. Sutherland** EMR, **K. Tobutt** EMR (all UK),

The meeting started with an introduction from host David Simpson, followed by his colleague Ken Tobutt giving an overview of molecular genetics research on rosaceous species at East Malling Research. This included projects on *Fragaria, Malus, Prunus, Pyrus, Rubus* and *Sorbus.* There then followed a series of 20 minute presentations from each of the UK delegates.

Nick Battey and Takeshi Kukokura presented the latest research from Reading University on the genetics of flowering in diploid *Fragaria*, a topic the generated much discussion among the COST delegates. Also on strawberry, Dan Sargent described the progress on developing the diploid *Fragaria* genetic linkage map, which has now been adopted as the international reference map and has resulted in collaboration within COST 836 between laboratories in UK, France, Spain, Norway and Italy. This talk also presented research on synteny studies between different rosaceous species and the development of transferable markers that have been mapped in *Fragaria, Malus and Prunus.*

Julie Graham and Feli Fernandez described molecular genetics work on *Rubus* at SCRI and EMR. Mapping research is focussing on genes and QTL for resistance to root rot (*Phytophthora fragariae* var *rubi*), raspberry aphid (*Amphorophora idaei*) and fruit ripening traits associated with differences in quality.

Other presentations on day 1 were focussed on rosaceous tree species. Talks from Ken Tobutt, Tim Robbins and Tineke Sonneveld described the lastest findings from their research on the molecular genetics of incompatibility in *Prunus* and *Pyrus*, while Feli Fernandez and Jake Clarke gave an update on progress with the reference linkage maps for *Malus* and *Prunus*, both of which involve a lot of collaborative research within Europe. Bruce Sutherland described the use of 10 microsatellite markers from apple and pear to study biodiversity in UK populations of wild *Sorbus aucuparia.* He had examined 860 individual trees from 44 sites and found that three distinct populations existed.

Day 2 continued with presentations from the 10 COST delegates, all of which were focussed primarily on *Fragaria*. Pepé Sanchez-Sevilla began by describing work by his team at Malaga, where they have developed a large number of novel microsatellite markers that have been used for genetic fingerprinting and have successfully distinguished between 92 *F.* x *ananassa* accessions. These markers have also been used to investigate genetic similarity between cultivars and for mapping a *F.* x *ananassa* population that is segregating for yield precocity and a number of fruit quality traits, including vitamin C content.

Margaret Korbin described work on the development of genetic markers for disease resistance. After providing an excellent review of ongoing work at several different laboratories around the world, she went on to describe work at Skierniwice that is focussing on the fungal root pathogen *Verticillium dahliae.* She finished by describing the resources and expertise that are required to analyse the mechanisms of genetic resistance in *Fragaria* and called for a international collaborative effort on this topic. This was followed by much discussion.

Following on from day 1, there were two more presentations on the molecular genetics of flowering in strawberry, with Maria Albani describing her work with the diploid *Fragaria vesca* in Germany and Timo Hytönen describing his work with the same species in Finland. Béatrice Denoyes-Rothan is also investigating this trait in *F.* x *ananassa* and the SGM was very useful to facilitate an exchange of ideas and results between these three researchers and the delegates from Reading University.

Amparo Monfort described her research on genetic maps, concentrating on the bin mapping approach, which has simplified and accelerated placing new markers on the diploid *Fragaria* reference map. She is collaborating with Dan Sargent and Béatrice Denoyes-Rothan for the mapping work and also described the research of her PhD student, who is developing a genomic library of near-isogenic lines with chromosome fragments of *F. nubicola** introgressed into a background of *F. vesca*. These are the two parental species of the diploid reference progeny.

Béatrice Denoyes-Rothan is working on comparative mapping between the diploid and octoploid *Fragaria* species and she has found a high level of colinearity between diploid and octoploid species. She is using markers from the diploid map to establish homeology between the octoploid linkage groups which is an essential step in further developing the octoploid maps as a useful resource for plant breeders.

Jahn Davik has recently returned from a sabbatical working with Bert Abbott's group at Clemson University, USA. He described the good progress he has made in developing a BAC library for *F. vesca*. With several groups in Europe working on linkage maps in *Fragaria*, the development of a physical map is a logical development and Jahn Davik will be visiting EMR on a STSM to work with Dan Sargent in January 2008.

Carlo Rosati reported on his work at ENEA on the molecular basis of the flavonoid pathway in strawberry, which is relevant to the nutraceutical properties of the fruit. Strawberry is being regarded as the model species for ripening research on non climacteric fruit. He described studies on the relationship between gene expression and the metabolite accumulation pattern in genotypes differing in fruit flavonoid composition and the effect of the growing environment on this.

Frank Dunemann described the work of his colleague Klaus Olbricht on differences in aroma profiles between Elsanta and the old German cultivar Mieze Schindler. They have crossed these two cultivars and have a progeny of 200 that is being characterised for volatiles. Variation in levels of methylbutanoat, linalool and methylanthranilat were described. Frank Dunemann also described the work of his own research team on molecular breeding research in apple, which is focussed on identification and mapping genes and QTL for resistance to scab and powdery mildew along with map-based and pedigree-based analysis of QTL for fruit quality traits.

Guido Cipriani presented an overview of work on the molecular genetics of *Fragaria* and *Prunus* at Udine. In strawberry they have developed 20 new microsatellites that have been screened on 16 species of *Fragaria*, covering all the ploidy levels. The majority showed good transferability and four were also transferable to some *Prunus* species. He also described the development of a diploid linkage map from a wide cross within *F. vesca*.

The final session of the meeting began with a presentation from Pere Arús on the European Rosaceous Genomics Initiative (ERGI). This was followed by a lengthy and lively discussion. ERGI has already been started but not all the delegates of the meeting were aware of it and there was a general consensus that it must develop further and become the focus for a stronger collaboration within Europe on this topic. It was agreed that a website was important and Dan Sargent and José Sánchez Sevilla agreed to help with the development of this. A mission statement would be agreed and all those interested in participating in ERGI would then be able to register on the website. There was much discussion about funding and the possibility of industry participation. It was agreed that this was desirable but might be difficult to achieve. Some delegates suggested that supermarkets and food retailers might provide funding but others thought that this was unlikely. Regarding the organisation of ERGI, there was a discussion on creating sub groups and it was agreed that these should be based on subject rather than species. Groups suggested included compounds related to fruit quality and healthy food, along with resistance to abiotic stress. It was also agreed that ERGI should aim

to facilitate the sharing of resources within Europe, particularly plant materials and mapping progenies. An annual meeting was suggested but it was felt that ERGI should support these meetings but not organise them directly.

The meeting closed at 16.30 and there was general agreement that it had been a very successful and interactive meeting that would help to promote greater collaboration on the molecular genetics of fruit crops in Europe.

* A recent publication by Gunther Staudt has shown that this accession was originally misclassified as *F. nubicola* and is in fact *F. bucharica*

SUMMARY OF WGS ACTIVITIES: MAY – DECEMBER 2008

COST EUROBERRY 863
WORKING GROUP 2 AND 3 SMALL GROUP MEETING, PLANT HEALTH IN CHANGING ENVIRONMENT,
JOKIOINEN, 19-20.5. 2008

1- Main achievements.

Meeting of researchers working on plant diseases in nursery material and fruit growing. Especially people working on hazardous diseases (Colletotrichum, Phytophthora, Xanthomonas) and their diagnostics and ecology. Meeting researchers working on biological and alternative control methods and those working with certification of planting material and production of healthy plants.

2- Progress in comparison with the state of the art - What do we have now?

We have a better view on the plant health problems and their future role in new production systems and plant propagation.

3- Objective reached - Understanding the problems:

Importance of plant diseases in the future strawberry production was emphasized. Changing conditions in plant production create new disease problems and may also increase importance of the already known diseases. However, there have been very few possibilities to get funding for research on diseases in the EU research programmes for plant protection topics. In FP7 for certain quarantine diseases like plum pox on fruits there has been an open call but nothing for quality diseases or small fruit diseases as a whole. More activities around plant diseases would be appreciated in the COST 863 to get possibilities for plant pathologists to meet around common subjects. Virus diseases were named as a subject for a small meeting and there can be more contacts between researchers working with *Colletotrichum* in Europe.

4- Related publications: Abstracts as a booklet on COST 863 web page.

5- No. Participants 16: COST delegates in attendance: Alan Bardet CTIFL (FR), Angela Berrie EMR (UK), Jane Debode ILVO (BE), Sezai Ercisli, Ataturk University (TR), Bert Evenhuis PRI (NL), Mirkka Kokkola Evira (FI), Jaana Laamanen MTT (FI), Elisabet Nilsson Elitplantstationen (SE), Christer Olsson Göteborg University (SE), Gianfranco Romanazzi, Marche Polytechnic University (IT), Josef Spak, Biology Centre (CZ), Arne Stensvand, Bioforsk (NO), Jan van der Wolf PRI (NL), Päivi Parikka, MTT (FI) Non-COST: Isa Lindqvist (FI), Anne Lemmetty (FI).

COST 863 SGM WG 3"SMALL FRUITS PRODUCTION SYSTEMS" 29 - 31 MAY 2008. PULA, CROATIA

Thursday 29th May

Pedro Oliveira suggested that during presentations topics could be selected that may be important to all regions, a 'connection'. Discussions will generate some key objectives of the 'personal' paper that will be written by the participants in 3-4 months time. All papers should have a common goal.

Identify influences on progress of the industry in each case, eg, Glen Ample in Norway, or tunnels in the UK.

All berries should be included for each region, including more 'minor' small fruit that are commercially important.

Suggestions on Day 1:

- Generate a manual, like the 'black book' in Huelva which is a blueprint for production in Spain, but for each country in Europe.
- Focus on each commodity (strawberry, raspberry, blueberry, etc).
- Approach from a commercial perspective, how cultvar choice and technology are driven by commerce. (eg, 'Camarosa' in Spain).

Also, the market doesn't make all the changes, they're not the only driving force:

- Consider climate change / fluctuating temperatures as a factor.
- Globalisation of food, economics and political are influencing factors, eg withdrawal of government subsidies forcing growers to grow other crops.
- Markets forcing growers to use low input systems, eg, reduce pesticide residues and the evolution of IPM.
- Marketing strategies.

The discussion of these topics was based on the following questions: Who is the driving force? Industry, consumer or technology?

While as general conclusion was the importance of COST action in bringing people together from other countries with a common problem or idea and come out with new specific solutions (brainstorming).

Friday 30th May

Discussion after presentations of all participants

The papers will be published in the journal *Pomologia Croatica* as a special issue, preferably as one volume.

Papers on production systems should be seperated according to commodity and importance of berry, eg, *Fragariae*, *Rubus*, *Ribes*, *Vaccinium*, other berries.

The final publication should be ready for the Symposium in Lisbon, August 2010.

A draft should be submitted at the end of 2008 to each coordinator.

Specific guidelines are required on structure of the papers.

- Specific topics with common graphs and figures.
- Standard production figures.
- Follow visual figures on cultivation techniques in Belgium. (see Annex)
- Map for each production region.
- Selected experts for each crop to collate papers:
  - *Fragariae*: Els Desmet
  - *Rubus*: Nikki Jennings
  - *Ribes*: provisional suggestion Edward Zobravic, Poland

- *Vaccinium*: Pedro B. Oliveira
- Other berries: Sezai Ercisli

Follow structure proposal for the presentations as proposed by Pedro.

- History
- Current industry methods
- Current status of the industry
  - Production area
  - Total yield production for each region for last 10 years (1997 - 2007)
  - Proportion of fresh and processing (including frozen)
  - Map with indication of concentration areas
  - Current cultivars
  - Statistics if available
  - Import / export (distuinguishing processed fruits from the fruits intented for fresh market.)
  - Current problems and issues of the industry (must be careful with 'future' predictions)

Participants:

Boris Duralija, University of Zagreb, Department of Pomology. Strawberry, wild berry fruits several projects with students and extension projects

Zoran Šindrak, University of Zagreb, Department of Pomology. Plant breeding and assistant to Boris Duralija.

Erika Kruger, Geisenheim University, Germany. Small fruit and COST Action, WG4 berries in Northern and Southern Europe also climatic stress of strawberries.

Jean-Phillipe Bose, France. Strawberry varietal evaluation, chilling.

Tomasz Jecz, Poland. Strawberry breeding particular molecular breeding.

Anita Sonsteby, Norway. Applied research with growers, season extension, mainly strawberry now in raspberry.

Miltiadis Vasilakakis, Greece. Strawberry post-harvest physiology, stress.

Sedat Serce, Turkey. Strawberry, genetic resources (increasing yield, early season).

Els Desmet, Belgium. Applied research, variety tests, new technologies, fertilisers, IPM, growing techniques

Nikki Jennings, Scotland. Rubus breeder, concentrating on red raspberry.

Sezai Ercisli, Turkey. Mulberry and other small fruits, raspberry cultivation in Turkey.

Jose Lopes Medina, Spain. University of Huelva, strawberry agronomy.

Pedro B Oliveira, Portugal. Applied research, flower differentiation on raspberry, season extension.

COST 863 EUROBERRY WG2 SMALL GROUP MEETING

MAY 23, 2008 HOSTED BY UNIVERSITÀ POLITECNICA DELLE MARCHE, ARBORICOLTURA GENERALE E COLTIVAZIONI ARBOREE, ANCONA, ITALY.

The aim of the small group meeting (SGM) was to discuss, define and design three monographs in the frame of three sub topics within WG2 of COST 863 Euroberry. The monographs are publications covering a complete subject up to the most current status in science and development. The three sub-topics within WG2 to be addressed in the SGM are:

- Plant health and diagnostics
- Plant Propagation
- Nursery Plant management and physiological quality

For the monograph on a Plant Propagation topic already progress was made following the earlier held SGM in Nitra in 2007. For the monograph on the other topics a similar line and approach will be followed and was discussed during the SGM.

For each of the other topics a well defined subject for the monograph is defined based on practical, scientific, economical and social aspects. Consequently, an exact outline of the chapters in the monographs was determined followed by assignment of the different chapters to different authors (ideally recruited from the participants in COST 863). Editors of the monographs will be the participants in the SGM. In addition, the practical aspects of the production and publishing of the monographs were discussed.

Introduction to the monograph concept and outline of the monograph for the Plant Propagation topic.

Bert van Duijn gave an introduction to the concept and aim, as described above.

Joseph Spak remarked in addition: there is real need for modern book on diseases of small fruits. From his experience: publisher choice important, but also determines the topic more or less. APS published in 1998 kind of monographs in cheap series, which is compact but not updated..

For Strawberry viruses; only expertise in US.

The topic selection most important, must be able to manage and must be clearly limited and also necessary.

Bruno Mezetti remarked in addition: general plan for working group very important. Make special event, early planning etc, other meetings.

Two options: COST publication, other way via publisher (book or journal) and involve other specialists.

Define book topic, chapter etc, organize meeting around this topics and invite also other non cost contributors and may be a publisher.

Davide Neri remarked in addition: prefer a publication inside cost, scientific and technology paper on solving problem; all around Europe production with different methods, 8 different plants based on limited ways to propagate, different expectancy. Make people speak the same language about plant quality. Easy to manage, easy for the farmers, etc. Handbook, but easy to manage. Aiming for standardization.

Defining subject for Plant health and diagnostics.

Defining subject for plant health and diagnostics

- pests could be included when they are vectors of viruses (gall mites, whiteflies, maybe thrips, nematodes) and discussed in these chapters. Also some pests such as nematodes and mites are quality pests in propagation material.
- Plant species: Strawberry, raspberry, currants, highbush blueberry

The title was defined as: Emerging disease problems in European berries

1. Development of quarantine pathogens in Europe (EPPO)
2. Phytoplasmas in small fruit (Spak and Franova)
3. The main fungal and bacterial diseases of small fruit in Europe
4. Emerging diseases on strawberry
5. Emerging diseases on raspberry and blackberry
6. Emerging diseases on currants
7. Emerging diseases on highbush blueberry

1. The chapter should describe the situation of quarantine pathogens of small fruit. Which are the main threats in small fruit now and potential threats in the future. There are also many pathogens, especially viruses on the list which are very rarely detected or not reported at all during the recent years. The writer could be from EPPO.
2. Phytoplasmas in berry fruit are a topic more and more discussed. Effective detection methods have been developed also for phytoplasmas. There are no comprehensive publication of European situation at the moment.
3. The main fungal and bacterial diseases small fruit: the presence in European small fruit, importance in planting material, diagnostics
4. About emerging diseases: the contents of the chapters was not really discussed, however, they should include description of diseases, their status in Europe and diagnostics of plant material.

Defining subject for Nursery Plant management and physiological quality.

Title decided on:

Guide for Plant Management in the Nursery and Physiological Quality Assurance

Editors

Eamonn Kehoe, Davide Neri, Bert van Duijn, Philip Lieten

General introduction (*Editors*)

Information about the plant production systems for different berry crops

What is quality in plant propagation

Topics covered by the book

Quality assurance systems (NAK, CAV)

Plant physiology parameters *(Davide Neri):* Flower induction and differentiation, Everbearing, June bearing, Winter production, Plant architetcture, Dormancy

How plant quality can be managed in the nursery (*Philip Lieten, Eamonn Kehoe, Stefano Musacchi*)

Plant nutrition, Chilling and light requirements, Digging date, Pot production, Cold storage, Differences between strawberry and the other main berries

Nursery plant classification (*Gianluca Savini, Davide Neri, Gianluca Baruzzi, Philip Lieten, Eamonn Kehoe*) Fresh plants, Frigoplants, Tray plants, Waiting bed plants, How to fit plant quality in the production systems (INRA, Spanish, ……..), Description of different production systems, Physiological requirements for each systems, Agronomic parameters

Different country nursery production systems (*Country delegates*) Poland, The Netherlands, UK and Ireland, Spain, France, Italy, Finland

Methods to evaluate plant quality parameters (Bert van Duijn, Davide Neri), Architecture, Plant dimensions, Dormancy, Conclusion: Can we create a standard?

References and Glossary in Italian, German, English, Spanish, French, Turkish

Publication and production matters

All will contact diverse authors and ask the first response from authors: before June 30.

Based on the responses etc a decision will be made on the type of publication: COST Monograph, Book via publisher, or Special Issue of a Journal.

Further matters:

It was discussed to organize an event about plant quality with the European nursery system before the end of the COST. At that time we should be able to present the book on plant quality and to make the maximum dissemination to professionals.

For the disease matters (as outlined in the proposal for the book) a COST meeting should be organized next year. Preparation and planning should take place soon.

After the discussion a short excursion in the evening to the field trials for strawberries of the university was organized.

Of all these activities only the preparation of the monography on 'berry in vitro technology' was started.

SGM OF WG1

'IMPROVEMENT OF CONSERVATION AND CHARACTERISATION OF SMALL BERRIES GENETIC RESOURCES'

PARIS – 15-16 MAY 2008

SGM WG1, REPORT OF THE MEETING in Paris, in the "AgroParisTech" France

All abstracts and presentations are available in the .pdf document named Cost863-SGM-Paris-May-2008.pdf

This meeting was organised for optimizing the management of Genetic Resources. Specific themes were discussed: Maintenance in good health condition, evaluation, and record management.

For better discussion on management quality of genetic resources, Teresa Barreneche, a scientist that is in charge of the European Prunus was invited.

To obtain a better overview of the largest genetic resources of small fruits in the world, Nahla Bassil from the USDA-ARS National Clonal Germplasm Repository in Corvallis (United States of America) was invited.

Thirteen experts were present (see list on the web). They presented their work (see presentations or abstracts attached). Their presentations or abstracts will be placed on the web site of Cost863.

1. GENETIC RESOURCES IN GENERAL

Inventory of European Genetic Resources of Small Fruits (except strawberry)

The ICDP, Pitesti, Romania, had started an inventory of the small fruits accessions existing in different countries of Europe. Paulina Mladin presented the results of this inventory.

To date, data were collected from 10 countries: Bulgaria, Denmark, Germany, Hungary, Italy, Lithuania, Moldova, Portugal, Romania, and Scotland.

Twelve fruit species were included in this inventory: Blackberry, Blueberry, Chokeberry, Cornellian cherry, Currant, Elderberry, Gooseberry, Honeysuckle, Raspberry, Ribes spp., Rose hip, and Seabuck-thorn.

Inventory of European Genetic Resources of Strawberry

Béatrice Denoyes-Rothan presented the updated list of strawberry accessions available in Europe.

Fifteen countries updated their lists. The current list was compared to the previous list updated during the previous cost (2003). Numerous genotypes have been lost (as for example in Finland due to *Colletotrichum acutatum*) or not yet conserved. New genotypes were introduced. These new genotypes came mainly from breeding programmes.

The synonym list was updated but synonymy is uncertain in some cases.

Pedigree is missing for numerous genotypes.

Presentation by Nahla Bassil of "The Corvallis Genebank, Management and Evaluation of Small Fruits (directed by Kim Hummer)".

In the US, there are 8 clonal repositories.

The National Clonal Germplasm Repository at Corvallis, Oregon, is a genebank that preserves invaluable plant genetic resources of temperate fruit, nut, and specialty crops.
(http://www.ars.usda.gov/main/site_main.htm?modecode=53581500).

The Corvallis Repository collects, maintains and characterizes collections representing global diversity of hazelnuts, strawberries, hops, mint, pears, currants, gooseberries, raspberries, blackberries, blueberries, cranberries, and other minor crops. Cultivars (clones) are stored as growing plants, while wild species populations are generally preserved as seed.

Details of the presentation of Nahla Bassil are given in the .pdf of her presentation.

Discussion followed the presentation. The organisation in Europe is very different from the one in the USA since in Europe collections are preserved throughout network of institutes involved in genetic resources whereas in the USA, one location, financed by a federal budget, is devoted to this activity.

From the discussion, it emerges that there is a will to exchange data (for example, molecular markers) in order to optimize the preservation of the small berries collections.

Concerning strawberry genotypes, plant exchange requires test detection of viruses and phytoplasmas.

2. QUALITY APPROACH FOR THE MANAGEMENT

Teresa Barreneche presented the quality approach implemented in the *Prunus* Genetic Resources Center (GRC) of INRA.

This center is one of the 13 GRC of INRA's Genetic Resources network that is involved in the conservation of nearly 50 species..

The *Prunus* GCR is especially in charge of the management of French national collections of *Prunus* genetic resources. These collections were identify by the French national *Prunus* network composed of 12 partners (nurseries, NGO, research institutes, public conservation structures, etc) spread all over the country. The main goal of the *Prunus* GCR is to collect, preserve, evaluate and distribute the genetic resources of *Prunus* species and especially those of cultivated *Prunus* as plums, peaches cherries, apricots and almonds and the information related to the genetic resources of these species. Therefore the implementation of a quality management system is critical. The details of the processes map of the *Prunus* GRC and of the strategy developed to implement quality documentation are given in T. Barreneche's pdf presentation

Discussion:

Management quality is very different according to the different countries.

In Spain, at IFAPA, they have a policy to go toward traceability with a phytosanitary policy.

Experts agreed that in Europe, there is no need for a strawberry phytosanitary passport. However, different practices occur in Europe. For example, in Germany, an inspector signs a document.

Data direct scoring will facilitate (1) the summary of the data and (2) the comparison of the data between countries (if a same sheet is used to describe the plants).

Barcoding, already used at Corvallis institute or in Bordeaux for *Prunus* germplasm conservation, could be a good opportunity to breed the traceability of the genotypes in the conservation of collections.

Phytosanitary quality management for genetic resources: Position of the countries is very different and depends on the budget available for this aspect. (for example, in USA, quality of viruses and others diseases (see on their web site); In IFAPA, Spain, observation of symptoms on plants; detection for 7 viruses and soil fungus (use of cultivation on agar medium); In Finland, there is at present no funding for organizing the phytosanitary management). In many countries gene bank matrials are just kept as field collections without phytosanitary management.

To clean the strawberry material: in Corvallis, thermotherapy at 50°C.

3. INFORMATIONS ON THE EUROPEAN PROJECTS ON GENETIC RESOURCES

Tarja Hietaranta and Béatrice Denoyes-Rothan presented the two GENRES projects that were submitted in the second call of Genetic Resources from DG AGRICULTURE at end of June 2006.

The presentations of these projects are available on the web site of the Cost action.

4. STRUCTURE IN GENETIC RESOURCES

José Federico Sánchez Sevilla presented his results on the structure of the strawberry genetic resources.

Unlike other important crops analyzed so far for genetic diversity and population structure, the brief history and the particularities of strawberry genetics have limited the genetic characterization of this crop.

They used 10 EST-SSRs to analyze the phylogenetic relationships and structure of 92 selected strawberry cultivars with widely diverse origins. They also investigated the effect of breeding on the genetic diversity of this polyploid species. Results will be published soon.

Discussion: these results showed that it is really important to better characterize our genetic resources (phenotypically and genotypically) in order to select core collections.

5. CHOICE AND USE OF DESCRIPTORS AND THE CULTURE TECHNIQUES FOR MAINTAINING GENETIC RESOURCES

Monika Hoefer presented her work regarding the importance of choosing descriptors. Her work was a co-operation project with the strawberry breeding group and the University of Applied Science / Dresden. The aim was the comprehensive evaluation of the material and the development of a database. For identification of strawberry cultivars, leaves, flowers and fruits are the most important morphological parameters.

Another part of Monika Hoefer's presentation involved describing the "Fruit Gene bank Dresden-Pillnitz"

Native fruit species in Middle Europe

Importance of the fruit species for the fruit production in the past and present time

Discussion:

Based Monika Hoefer's results, it appears that some descriptors are very sensitive to the environment and others less sensitive. Monika recommended easy to use descriptors for description of large genetic resources.

The following discussion ensued about secondary descriptors:

- Disease incidences are sensitive to the environment but very interesting to note;
- Photos of the genotypes: everybody agree on the importance of images, especially if some descriptors are absent because they are sensitive to the environment. However, some genotypes could be very different according to their location or their mode of cultivation. The image has to specify the origin of the culture of the genotype. Another proposition is to keep the best photo, i.e. the photo of the genotype in its best environment (Elsanta, photo from a Northern European countries and Marmolada, photo from Southern European countries).
- In a database, is it possible to have different sources for the description of the same genotype?
- There are descriptors that could be interesting for breeding, e.g. appearance of the fruits. These descriptors are very subjective. However, they can give elements to explain why some genotypes are so attractive.
- References: It would be useful to include references in the descriptor lists.

The list of the strawberry descriptors used in the GenBerry project will be available on the web site.

6. OTHER POINTS

Mulberry: Sezai Ercisli will prepare a sheet of descriptors of mulberry.

Discussion on the network of evaluation of genotypes of strawberry or other small berries species: Some expert underlined that we should not be too strict on the choice of the varieties. This network will give results that can lead to a better understanding of the consequences of global change.

Bordeaux, 10 June 2008

Béatrice Denoyes-Rothan

REPORT ON COST 863 WORKSHOP ON **BERRY PRODUCTION IN CHANGING CLIMATE CONDITIONS AND CULTIVATION SYSTEMS IN GEISENHEIM, GERMANY, FROM 29TH TO 31ST OCTOBER**

The workshop was held as a WG´s joint meeting and was supported by the International Society of Horticultural Science (ISHS) at the Geisenheim Research Center, Section of Pomology, Germany, from 29-31 October 2008.

More than 70 researchers, consultants and representatives of the berry industry from 23 countries all over the world, but mainly European countries, attended the meeting.

The objective of the workshop was focused on the future production of *Fragaria*, *Rubus*, *Ribes* and *Vaccinium* in Europe under the impact of climate change and modern cultivation systems. In 26 oral lectures and 17 posters the influence of climate changes and cultivation systems were presented and discussed with regard to berry physiology and cultural management, dynamics of diseases, pests and beneficials, breeding strategies and fruit quality and the nutritional value of berry fruits, respectively.

This workshop was the first scientific meeting in Europe which focused on climate change and berry production.

1. Climate change and modern cultivation systems

The climate change was defined in most presentations as an increase in temperatures over the next decades of 1-4°C, higher variations in rainfall with higher frequency of drought periods, a higher frequency of extreme events and less frost and snow during winter. However, the frost risk in spring may not be reduced because higher temperatures may lead to earlier flowering and the exposure to frost risk will be probably longer.

Several presentations focused on the consequences of the changes on growth, crop physiology, flower induction, chilling completion and over-chilling problems. The flowering period will be earlier in colder regions in the future compared to now and later in warmer regions due to the longer duration for chilling completion. Another problem that was observed in warmer regions is the flower abortion especially after warm winters. The production peaks can be modified with climate changes as predicted for the strawberry production in Spain with consequences for market aspects. The fruit quality could be influenced by higher levels of sunburn due to higher temperature and high radiation. For the northern regions of Europe and regions of higher altitudes, climate change can stimulate berry production.

As for changes in production systems, the berry production under plastic tunnels and in greenhouses will continue to increase in the future. In addition, out of season production will also become more important due to better market opportunities These expensive production systems have to be optimised for each species and cultivar in order to guarantee the best growing conditions and crop management. The double cropping with ever-bearing cultivars and/or with adapted cultivation procedures would be an interesting strategy to lower the production costs as was shown for raspberries and blackberries.

2. Pests and diseases

A small number of presentations dealt with the impact of changing climate and berry production systems on pests and diseases. Especially in Northern countries an increased incidence of berry pests could be observed in the last years when mild winters favoured over-wintering of insects. Also, in the Nordic countries new diseases and more problems with already common diseases are expected on all berry species due to higher rainfall, higher temperature and an increase of international plant trade. Another general aspect that could be a major issue for the future might be the pesticide restrictions leading to a growing importance of resistance breeding against pests and diseases, as well as the development of efficient biological control methods. These were shown for raspberries.

3. Breeding strategies

In the breeding session, programs focused on the selection of genotypes with good environmental adaptation to water stress and still winter-hardiness in the Eastern part of Europe. In addition, identification of QTL´s linked to the mode of flowering of strawberry and the impact of the seasonal environmental variations on the flowering.

4. Fruit quality and nutritional value

Varying pre-harvest factors such as production system, deficit irrigation, physiological stages of the plant were shown to be sometimes important and sometimes not significant for sensory and nutritional fruit quality. More information is needed to increase fruit quality of berries in the future.

The final discussion highlighted the need for further research and collaborations. Contributions from representatives of the berry industry were highly valuable The most important research topics on berry crops were defined. These are

- a better knowledge on requirements for flower initiation and chilling completion of the most important cultivars.
- the development of better models for predicting these processes.
- information on an efficient use of water in protected environments.
- research of pre-harvest effects on fruit quality and
- the development of efficient biological control systems.

Breeding for higher plant plasticity by out-breeding strategies might be a possibility to get cultivars with higher tolerance to climate injuries. Furthermore, basic knowledge on genes controlling mechanisms related to increased adaptability to these changes may help breeders to find more tolerant cultivars against climate, pest and disease stress.

As an outcome of the workshop all papers given at this meeting will be published in 2009 in a Proceedings of the Acta Horticulturae series, issued by the ISHS in 2009.

Erika. Krüger and Christoph Carlen

REPORT OF THE WG1 « FROM GENOME TO BERRY FRUIT » – JUNE 2007 – DECEMBER 2008

0RGANIZER OF THE MEETINGS HELD FROM JUNE 2007

1- Main achievements

From middle 2007, WG1 of the COST863s was concerned by two small group meetings:

(1) In UK (December 2007), 'Genomics in Rosaceae'

(2) In France, Paris on the 'Improvement of conservation and characterisation of small berries genetic resources'.

SGM in East Malling – UK – 5 & 6 December 2007. 'Collaboration in molecular genetics and genomics research'

The SGM in East Malling was focused on genomics of small berries belonging to the Rosaceae family.

This SGM was an opportunity to exchange on Rosaceae and small fruit genomics. Through oral presentations, it was clear that strawberry is getting as a model in Rosaceae whereas the official actual model is peach. Tools are currently developed in strawberry such as molecular markers, SNPs, genetic populations, … Among the agronomical traits developed in oral presentations, flowering was the most recurrent.

Extensive conservation of long-range genome organization in *Fragaria* supports the use of the diploid *Fragaria* as a model system for studying genomics and molecular dissection of the much more complex octoploid *F.* × *ananassa* genome.

SGM in Paris – France – 15-16 May 2008. 'Improvement of conservation and characterisation of small berries genetic resources'

This meeting was organised for optimizing the management of Genetic Resources. Specific themes were discussed: Maintenance in good health condition, evaluation, and record management. Two external experts have been invited: Teresa Barreneche, INRA UREF, Bordeaux, France "Management quality of genetic resources" and Nahla Bassil from the USDA-ARS National Clonal Germplasm Repository in Corvallis USA "Overview of the largest genetic resources of small fruits in the world".

Thirteen experts were present. Three main themes have been discussed.

(1) The first part of the meeting was concerned by the "Genetic Resources in general". Three presentations have been made from Paulina Maldin, ICDP, Pitesti, Romania on the Inventory of European Genetic Resources of Small Fruits (except strawberry); Béatrice Denoyes-Rothan, INRA France on the Inventory of European Genetic Resources of Strawberry, and from Nahla Bassil USDA USA on the Corvallis Genebank, Management and Evaluation of Small Fruits, which is directed by Kim Hummer".

From discussions, it emerged that the organisation in Europe is very different from the one in the USA since in Europe collections are preserved throughout network of institutes involved in genetic resources whereas in the USA, one location, financed by a federal budget, is devoted to this activity.

In addition, there is a will to exchange data (for example, molecular markers) in order to optimize the preservation of the small berries collections. Concerning strawberry genotypes, plant exchange requires test detection of viruses and phytoplasmas.

(2) The second part of the meeting was concerned by "The quality approach for the management".

Teresa Barreneche presented the quality approach implemented in the *Prunus* Genetic Resources Center (GRC) of INRA (see minute for the details).

In discussion, it appeared that the management quality is very different according to the different countries. When possible, data direct scoring will facilitate (1) the summary of the data and (2) the comparison of the data between countries (if a same sheet is used to describe the plants). Barcoding, already used at Corvallis institute or in Bordeaux for *Prunus* germplasm conservation, could be a good opportunity to breed the traceability of the genotypes in the conservation of collections.

For the "Phytosanitary quality management for genetic resources", the positions of the countries are very different and depend on the budget available for this aspect. In many countries gene bank matrials are just kept as field collections without phytosanitary management.

To clean the strawberry material: in Corvallis, thermotherapy at 50°C.

(3) The third part of the meeting was concerned by "The choice and use of descriptors and the culture techniques for maintaining genetic resources".

Monika Hoefer presented her work regarding the importance of choosing descriptors. Her very interesting work was discussed. It appears that some descriptors are very sensitive to the environment and others less sensitive. Monika recommended easy to use descriptors for description of large genetic resources.

The following discussion ensued about secondary descriptors: (i) Disease incidences are sensitive to the environment but very interesting to note; (ii) Photos of the genotypes: which image? from which country when different description exist? (iii) What about descriptors that could be interesting for breeding, e.g. appearance of the fruits?

Joint Meeting in Zurich – Swizerland - Bioactive compounds in berry fruits: genetic control, breeding, cultivar, analytical aspects and human health.- 3-6 December 2008

This meeting allowed scientist with different backgrounds, genetic, genomics, biochemistry, discussed together.

2- Progress in comparison with the state of the art - What do we have now?

The WG1 is going well.

It misses for this year a SGM on Variety Network that will occur at the beginning of 2009.

Proposition have been done for a SGM on flowering (or use of carbohydrates in strawberry?).

3- Objective reached

One of the main objectives in the WG1 is to reduce the gap on genomics between European countries. The SGM as the meetings allowed to reduce this gap. Another attractive point limit this gap is the STSM between countries. The WG1 was very active on this part.

COST 863, WG1 + WG4 JOINT MEETING

BIOACTIVE COMPOUNDS IN BERRY FRUITS: GENETIC CONTROL, BREEDING, CULTIVAR, ANALYTICAL ASPECTS AND HUMAN HEALTH

C. Carlen, P. Crespo

The Joint Meeting was held in the frame of the EU-COST Action 863 "Euroberry Research: from Genomics to Sustainable Production, Quality and Health". About 50 researchers and representatives of the berry industry from 20 countries (Europe, USA, New Zealand) attended the meeting, which was organised by Christoph Carlen, Pamela Crespo and their team at the Agroscope Changins-Wädenswil Research Station ACW, Conthey-Switzerland. The meeting was held at the Swiss Federal Institute of Technology in Zurich from the 3rd to the 5th December 2008.

The objective of the joint meeting was to discuss the relation of bioactive compounds in Fragaria, Rubus, Ribes and Vaccinium with genetic control, breeding, cultivars, analytical aspects and human health. Different aspects were treated such as:

- How do genetics and genomics contribute to a better knowledge on bioactive compound in berry fruits? (Session 1
- Does variability exist in germplasm or collections and how can this variability be used for breeding programmes?
- Analysis to measure bioactive compounds in berry fruits and their agronomic improvement?
- How may bioactive compounds benefit human health?

To have a general international overview on breeding strategies and the importance of bioactive compounds for human health following experts were invited to give a presentation:

- Prof. Dr Kevin Folta, Plant Molecular and Cellular Biology Program on berries, Horticultural Sciences Department, University of Florida, USA (Strawberry genomics new impacts in basic biology and crop science).
- Dr. Jean Francois Hausman, Centre de Recherche Public – Gabriel Lippman EVA, Luxembourg (Investigating genetic diversity, nutritional quality and bioactive compounds of berry species collection grown in Russia).
- Dr Rodger Hurst, Leader of the Healthy Berry Programme, HortResearch, Auckland, New Zealand (Bioactive compounds in Berries: Factors influencing bioactive compounds in berries).

– Prof. Dr. Gary Williamson, Functional Food, Department of Food Science, University of Leeds, England (Bioactive compounds: Bioactive compounds: absorption and effects on human health).

Main achievements

In one of the sessions the presentations were focused on the contribution of genetics and genomics to a better knowledge on bioactive compounds in berry fruits. The findings for strawberries, a rapidly growing and early fruit-setting plant, on gene functions should translate well to other *Rosaceae* species, where such studies are more difficult to realise. So strawberry can be considered as a model plant for other important fruits species of the *Rosaceae* family.

Analysis of cultivated strawberry gene and genome structure reveal that the haploid strawberry genome is remarkably small, containing characterisable repetitive regions and gene structures similar to Arabidopsis. The analysis of the haploid genome helps to get a better understanding of the octoploid genomic system. Gen expression studies have characterised the spatial and developmental pattern of the expression of genes of the flavonoid pathways, in parallel to biochemical investigations on enzyme activity and main metabolites. Such studies on genotypes with different polyphenol composition grown in different environmental conditions may help to understand better the regulation of the different pathways of polyphenols. Furthermore, the investigation of quantitative trait loci (QTL) will help to have better knowledge of the inheritance and thus improve the breeding efficiency for fruit quality traits. QTLs were detected for these traits, but they were mainly different from one year to another. Other tools for breeder mentioned in some presentation were molecular markers such as AFLP and SSR.

Quite a lot of oral presentations and posters showed that there is a big variability in polyphenol content and composition of the fruits between cultivars, wild populations, progenies derived from different crosses, accessions in collections of strawberries, raspberries, blackberries, blueberries and *Ribes* species. This variability is an important source for breeding programs. In some presentations it was shown that wild populations have higher content of polyphenols in the fruits than cultivars. The environmental conditions such as altitude and production system (greenhouse to open field, drought stress, BHT treatments, dipping fruits in hot water) had quite a big influence on the content of polyphenols and the antioxidant capacity of the berryfruits.

Methods to analyse antioxidant capacity were shown aiming to get results in a quicker way with less reagents and solvents (micro plate method and short column abbreviated mass spectroscopic (SCAMS) techniques).

The aim of the last session was to develop and extend the knowledge and understanding of the berryfruit phytochemicals and how they may contribute to enhancement of human health and well-being. Health attributes of berries being investigated include regulation of inflammation and how this affects digestive health and physical fitness. Another topic presented was the understanding of the absorption and metabolism of such health related compounds. The small intestine is the major site of absorption for intact polyphenols, the colonic microflora plays a major role in metabolism of larger polyphenols to smaller compounds, which can then efficiently be absorbed. This combination of intact and metabolised polyphenols give a much higher concentration than any individual chemical compound. This consideration is important for berries where a large number of compounds are present. The neuroprotective antioxidant activity of *Rubus* species was analysed in an oxidative stress-induced model of neurodegeneration cells. The results correlated well with the ORAC/total polyphenols ratio. The *Rubus* fruits revealed to be a promising source of natural antioxidants. Another presentation confirmed the important role of polyphenols in relation to strawberry consumption by enhancing red blood cells resistance to oxidative stress, in vitro and in vivo.

Progress and open questions

The final discussion highlighted the needs for further research and collaborations. Concerning the benefits for human health, an important question for breeders and agronomists is on what compounds they should focus. There are still lacks on this aspect and up to now it is not possible to give a clear answer for berries. Clinical studies with berries differing in their polyphenol compounds can help to answer such questions. Further studies are also necessary on the bioavailability of polyphenols, their absorption and their importance for health and well-being such as the reduction in inflammatory effects. Another question was, if it is possible to reach a toxic level of polyphenols by eating fruits. It seems that by eating fruit and vegetables this is not possible. It is more a risk with functional foods, i.e. when polyphenols are added to foods.
Different studies showed that there is a high variability in fruit polyphenols between berry species, cultivars, wild populations, progenies derived from different crosses and accessions in collections of strawberries. However, there is still a high unexplored potential. Furthermore, the influence of pre- and post-harvest factors on polyphenol compounds is not sufficiently documented.
Functional genomic is are already an opportunity to better understand the underlying mechanisms of the pathway of different interesting compounds. Functional genomics combined with transgenic could be an alternative for solving problems, specifically for increasing some quality aspects in the fruits as well as for low input and sustainable productions. Cisgenic approach could help to reduce public fears together with better information of the public of such techniques and related risks.
In conclusion, it is important for the future to merge expertise on health related compounds. Knowledge on socio-economical aspects, consumer behaviors, marketing, beneficial effects of the consumption of berryfruits on health and well-being, variability due to genotypes, growing and shelf life conditions and on adapted breeding procedures in combination with functional genomic should be put together and discussed in order to develop a common strategies with all the stakeholders.

The organisers acknowledge all the participants for their presentations and the fruit-full discussions during the meeting. Abstracts of the papers given at this meeting are available at http://www.euroberry.it/documents/wgm08/Book%20of%20abstractsZurich08.pdf, on the COST863-Euroberry-website.
Special thanks are addressed to the COST Office in Brussel and to the State Secretariat for Education and Research SER of Switzerland for supporting the meeting.

SHORT TERM SCIENTIFIC MISSION (STSM) 2007- 2008
REPORT by Rolf Nestby (second Vice-chair and STSMs coordinator)

Report of 2007/2008 for Short Term Scientific Mission (STSM) - application period 1 June 2007 to 31 May 2008,

During this period five applications have been approved and one rejected*. Following a short description of the activities carried out by the different experts.

Aurélie Petit*, Plant Research Engineer, Ciref Création Variétale Fraises Fruits, France, submitted a summary application to COST. The application was rejected, since a full application was not submitted early enough to meet the time frame for reviewing. The applicant was encouraged to apply for a later mission.

Sara Tulipani, Marche Polytechnic Unversity, Bologna Italy was approved for a STMS.
Host: Gordon McDougall, SCRI, Scotland, UK. Period: 19 November to 19 December 2007. Title: Phenolic metabolites from strawberries in human plasma during a mediumterm consumption study, and metabolic profiling of ripe fruits from the same selected cultivar.

Kaspars Kampuss, Latvia State Institute of Fruit-Growing was approved for a STSM. Host: Rex M. Brennan, SCRI, UK. Period: 7-25 January 2008. Title: Studies of the molecular methods for diversity studies and marker assisted selection of Ribes germplasm.

Jahn Davik, Norwegian Institute for Agricultural and Environmental Research, Norway was approved for a STSM. Host: Daniel James Sargent, East Malling Research, UK. Period: 13-27 January 2008. Title: Characterization of the Scandinavian Fragaria vesca germplasm using molecular markers.

Emilia Ondruskova, Institute of Plant Genetic and Biotechnology, SAS, 94911 Nitra, Slovak republic, was approved for a STSM. Host: Laimer Margit, University fur Bodenkultur Wien, Austria. Period: 25.02- 25.05 2008. Title: In vitro cultivation and transformation of selected Vaccinium species.

Damianos Neocleous, Agricultural Research Institute, Nicosia(CY). Host: Miltiadis Vasilakakis, Faculty of Agriculture, Aristotle University of Thessaloniki (GR). Period: 01.05-01.06 2008. Title: Effects of hyperosmotic stress and type of fertilization on strawberry fruit quality.

Reports

Sara Tulipani, Jahn Davik and Kaspars Kampuss have finished their missions and have all delivered reports that are approved. Sara Tulipani and Kaspars Kampuss were invited to present a lecture based on their STSM at the MC meeting 3-4 March 2008 in Huelva Spain.

New applications

Few other applications are now under evaluation

The webpage

The link to STSM under the webpage of Euroberry is adjusted according to the comments given in the report of 31. december 2007.

Budget and account per 31 Dec. 2007 : Euro 14 500

Grants

Tulipani	1600 Euro
Kampuss	1800 Euro
Davik 1720 Available: Euro 5130 (- 540)	
Ondruskeva	2500 Euro
Neocleous	2250 Euro
Sum	9870 Euro

Report of 1 June 2008 to 31 Dec 2008. Short Term Scientific Mission (STSM)

Applications Approved: (J. Diamanti was granted in the previous budget period)

Jacopo Diamanti, Università Politecnica delle Marche. Host: Kruger-Steden Erika and Helmut Dietrich; Geisenheim Research Centre, Germany. Period: from 07/04/2008 to 15/04/2008. The aim was to discuss common protocols on the analytical methods to be used to test strawberry fruit nutritional quality in relation to the effect of climate conditions.

Franco Capocasa, Università Politecnica delle Marche Dip SAPROV was approved for a STSM. Host: Els Desmet, Research Centre Hoogstraten. Period: from 16/06/2008 to 13/07/2008. The aim of this STSM was to understand to process of breeding, the nursery, the different cultivation systems to the marketing of strawberries in Belgium. The emphasis of the STSM is to learn more about the different cultivation systems in Belgium.

Djurdjina Ruzic, Fruit Research Institute,32000 Cacak(RS) was approved for a STSM. Host: Carmine Damiano ,Fruit Tree Research Center of the CRA,00134 Rome(IT). Period: 04/05/2009 to 19/05/2009. The aim was to study the potential of preservation of the selected genotypes by: Ca -alginate pearls (encapsulation); vitrification technique; encapsulation-dehidration technique.

Daniel James Sargent, East Malling Research, New Road, East Malling, Kent ME19 6BJ, UK. Host: Dr Amparo MONFORT, IRTA Cabrils, Ctra de Cabrils s.n., 08348 Cabrils (Barcelona) Spain. Period: 03/10/2008 to 03/11/2008. The aim was to develop superpools from strawberry BAC library, colonies grown and arrayed into cultures. DNA extracted, diluted and arrayed. Validation PCR: Superpools screened with previously mapped markers. BACs containing specific markers identified.

Lucélia Tavares,Instituto de Tecnologia Química e Biológica, Universidade Nova de Lisboa,Oeiras(PT). Host: Dereck Stewart,Scottish Crop Research Institute,Dundee, DD2 5DA, Scotland(GB). Period: 10/08/2008 to 23/08/2008. The aim of this STSM was to apply mass spectrometry (HPLC-PDA and LC-MS) for identification of metabolic compounds defined by their mass to charge ratio (m/z) in extracts obtained from Portuguese endemic Rubus spp. tissues (fruits, leaves and roots).

Applications under evaluation:

Jon Stavang, The Norvegian Institute for Agricultural and Enviromnmental Research. Horticulture and Urban Greening Division, Ullensvang, Lofthus, Norway.

Dr Damianos Neocleous, Cyprus. Title: 'Antioxidant response of strawberry plants under stress conditions'. Start date 26/01/2008.

Ilian Badjakov, Research specialist, Laboratory of Functional Genetics AgroBioInstitute bul. Dragan Tsankov 8, 1164 Sofia, BULGARIA. Host: SCRI, Dundee, Scotland.

Reports

Franco Capocasa, Daniel James Sargent and Lucelia Tavares have all delivered reports, which are accepted.

The webpage

The link to STSM under the webpage of Euroberry is adjusted according to information from the COST secretary in the report period.

Budget and account per 31 Dec. 2008

Budget Euro 14 500 ?? 1. June 2008 to 31. May 2009.

Grants

Diamanti 540 (previous budget period!)

Capocasa	2430
Ruzic	1800
Sargent	1540
Tavares	2300
Sum	**8070 (sum of the running budget period)**
Diamanti	540
Sum	**8610**

Rolf Nestby (second Vice-chair)

SGM: EUROPEAN BERRY ASSOCIATION (EBA) MEETING

The main achievement

State of the art and the progress. The agricultural research is unique in the sense that results are aimed to benefit both farmers and consumers (end-buyers). Modern agricultural becomes more and more specialized and gives many abilities in the area of the practice forced through by new technology, changing of climate and demands of the society.The suitability of these new (as well as old) agri-aspects can be easily shown during close collaboration between balanced networks of scientists and farmers of various crops. Such collaboration has the potential to bridge the knowledge-gap regarding current possibilities, dilemmas and problems faced by the farmers. The problems are solving individually or within small competitive organizations.

During the SGM in Skierniewice opportunity of putting this collaboration into a system for future collaboration (EBA – European Berry Association) was identified as promoting continuous dialogue between farmers or farmer's organizations and scientists. A closer dialogue and collaboration between farmers and scientists will have several advantages such as better identification of farmers with the research and support of research by them, and decreasing animosity against scientists who may regarded as detached from "real life". On the other hand, participants discussed potential dangers of such collaboration between scientists and farmers connected with wider range of agricultural research than this defined as a bottleneck for selected farmers (basic sciences and big international projects), proper division of the role in this cooperation (generation of methodology) as well as conflict of interests between farmers and customers and between different small farmers' organizations.

Number of participants. Twenty seven persons participated in the meeting, 9 and 11 of them were defined as COST group representatives and SME experts, respectively. Seven persons from RIPF were join the meeting as a guests. In frame of session with individual presentations participants talked about berry production of their maternal countries, general information concerning economical aspects of berry productions as well as different models of growers' associations.

What do we have now. To recognize the market situation necessity of creation of basic database was undertaken. This database has to contain information about small berry production systems and organization, relations between farmers and consumers, and the role of small

farmers associations. In a consequence of SG EBA meeting special questionnaire covering all these aspects was created in the Research Institute of Pomology and Floriculture in Skierniewice and the first presentation summarizing results obtained from all COST-Action 863 partners was showed on the MM meeting in Brussels 2008. The action will be continued to prepare appropriate background for further activity. Additionally, special letter of intent for EU Commission was prepared to support EBA system for competitive European berry production. No related scientific papers was written.
Dr. Margaret Korbin

of the meeting, which was held in the Research Institute of Pomology and Floriculture in Skierniewice, was recognition of the opportunities and creating background for research-based collaboration between scientists and farmers under umbrella of COST-Action 863.

DISSEMINATION OF RESULTS

The major dissemination activities carried out for 2007-08 corresponded with the abstract booklets prepared for each meeting, now all available on euroberry webpage. With the aim to keep also an scientific level of dissemination, the following publication activity and conferences participation, was also carried out.

A joint paper prepared as outcome of the COST section organized in the Barcelona Human Health World Congress, is in press on **J. of Nutrition** (very high IF).

A common paper related to COST863 STSM activities was published on **J. Agri. Food Chemistry** (*2008,13;56(3):696-704)* as a proceeding of 2007 International Berry Healthy Benefits Symposium held in June 2007 at OSU Oregon (USA). This publication was in line with the idea to promote high quality publications dissemination for the success of our action. This is crucial for the Action and for the success of the Action, being an important aspect considered in the evaluation.

Quite consistent was the contribution of different experts of COST 863 to international conferences. In fact, COST863 organized a Workshop in the ISHS – SHE (www.she2008.eu), held in Vienna (AU) February 17- 20. The Workshop included a short presentation of the Action by the Chairman, followed by the four WG Leaders presentation and a general discussion. At this conferences, several COST863 experts also contributed with oral or poster presentations.

Last March 3-4, the MC meeting was held in Huelva (SP), combined with the ISHS VI Strawberry Symposium. Also in this case, several COST863 experts also contributed with oral or poster presentations. In general, this event was quite important as an opportunity for the action to present results and the network to scientific experts of the berry sector coming from different parts of the world.

Several papers from COST863 experts will be included in the Acta Horticulturae that will be published both from the Wien and Huelva ISHS symposium. Experts joining the Action also published several papers on scientific journals by mentioning the link with the COST863 action, a complete list of these related papers will be available on the webpage.

Furthermore, the major and common shared dissemination tool is the Action webpage (www.euroberry.it), which is updated with all the information related to the different activities and reports of STSMs and SGM. This year was also opened a forum that in the next period should become a new tool of communication within the berry scientific community and external stakeholders. The large contact with the public will be implemented through the web berry dedicated forum that thanks to the identification of a moderator (Eamonn Keohe) will develop different common discussion topics.

Other publications in press

A publication program was proposed including the following priorities:

- The preparation of an **Acta Horticulturae** was stated by Erika Kruger by collecting all the papers related to oral and poster presentation of the Workshop on 'Berry production in changing climate conditions and cultivation systems' held in Geisenheim, Germany, from 29th to 31st October, 2008. The publication of the Acta is expected for the spring of 2009.
- WG2 **Monography** on 'Berry Tissue Culture' coordinated by Djurdjina Ruzic (Serbia), for the publication of the monography was decided to allocate a budget up to 2999 euro. All the chapter are ready and were delivered to two external reviewer (J.F. Housman, reporter of the Action and expert of plant in vitro technology, and B. Panis, chairman of the COST Action on Criopreservation). The publication of the monography I expected for the next spring 2009.
- WG4 Dott. Battino (sub-leader) prepared a new special issue on berry bioactive compounds to be published in early 2009 on **Biofactor.** In 2005 we already had the publication of another

special issue on the same scientific journal of the nutrition biochemistry area with a quite good IF, including 8 papers of the WG4 members. This issue was costless and completely dedicated on the activities carried out by the group belonging to WG4. This publication resulted with a relevant impact for the entire group, for increasing berry consideration in this research area and more in

- The preparation of another special issue of the **ACS (Agriculturae Conspectus Scientificus**) Journal, related to the Croatian Horticultural Society, was started by Boris Duralija, University of Zagreb. This as a result of the meeting held in Pula (May 2008) on 'berry cultivation systems'. Also in this case about 10 papers will be included and publication is expected in early 2009.

CONCLUSION

The 2007-2008 period of activity of COST863 showed a very high level of country participation, of scientific contributions at the different group meetings, of technical and scientific exchanges promoted with the STSMs. The high scientific level was also demonstrated by the scientific publications produced by several experts. A strong integration among different scientific areas was initiated. During this last year this aspect was even further implemented thanks to the participation of different experts from non EU countries (e.g. New Zealand, Canada and USA). This larger integration will be further expanded in the last period of the Action.
The main difficulty of this action still remains the management of such a large and diverse group. However the increased budget availability of the last period offered many more opportunities of integrating the major groups. The level of budget now available is the minimum for the management of such an Action. Under these conditions we should be able during the next years of the Action to achieve several common scientific results and improve technology transfer and communication in the whole European berry production chain.

SUMMARY OF THE EXPENSES:

TOTAL BUDGET JUNE 07 - MAY08						
Expected budget 54.000 fixed + 2000 per signatory country: **54000+62000=116000**						
	Experts	Days	xdiem	Cost	date	
WG3-4 JM Nitra - Propagation	15	3	986	14786	oct-07	
SGM-WG1 Genomic East Malling UK	10	3	745	7452	dic-07	
WG2-3 SGM Lisbon System of production Lisbon	6	3	764	4582	nov-07	
SGM Board Blx January 16	6	2	667	4000	gen-08	
SGM - SHE08 Wien February 18	8	2	757	6052	feb-08	
MC Huelva and WG meeting	35	3	986	33250	mar-08	
Support for the Meeting				1500		
WG2 SGM Ancona 23/05/2008	3	2	969	2907	may-08	
WG1 Bordeaux 15 May 2008	13	3	838	10899	may-08	
W2-3 Diseases Finland 20/05/08	13	3	859	11164	may-08	
WG3 SGM Croatia 29/05/08	14	3	992	13891	may-08	
GASC Web				2000	Expected	
STSMS x 7				11210	14500	-3290
				123693	116000	7693
				Costs	Expected	variation

TOTAL BUDGET AND PLAN JUNE 08 - MAY09					
TOTAL budget planned : 154000 euro					
	Experts	Days	xdiem	Costs	Date
Climate WS Geisenheim	35	3	813	28456	oct-08
WS support				2000	
WS ActaPubblication				6000	
WG1-4 JM Zurich	30	3	838	25154	dic-08
GASC Web				2000	
Meetings in preparation (estimate number of experts and costs)					
WG1 Variety Network Lithuania	15	3	820	12300	gen-09
WG2-3 Biotic Abiotic Stress Sofia	35	2	820	28700	feb-09
MC SME Lisbon	42	2	820	34440	mar-09
WG2 Meeting on in vitro techniques Cacak Serbia	15	3	820	12300	may-08
STSMS x 7	8		1600	12800	
Estimated Budget Requested				164150	
Estimated Budget available				154000	
Request of increased budget				-10150	

LIST OF PUBLICATIONS COST 863 - 2007 AND 2008 (TO BE IMPLEMENTED)

Austria

1. Battino M., Beekwilder J., Denoyes-Rothan B., Laimer M., McDougall G.J. and B. Mezzetti 2008. Bioactive compounds in berries relevant to human health. Am. J. Clin. Nutr. submitted.
2. Marzban, G., Herndl, A., Pietrozotto, S., Banerjee, S., Obinger, C., Maghuly, F., Hahn, R., Boscia, D., Katinger, H. and Laimer, M. (2009): Conformational changes of Mal d 2, a thaumatin-like apple allergen, induced by food processing. FOOD CHEM, 112, 803-811; ISSN 0308-8146
3. Marzban Gorji, Anita Herndl, Fatemeh Maghuly, Hermann Katinger, Margit Laimer (2008): Mapping of fruit allergens by 2D electrophoresis and immunodetection. EXP REV PROTEOMICS, 5, 61-75; ISSN 1478-9450
4. Marzban, G., Herndl, A., Kolarich, D., Maghuly, F., Mansfeld, A., Hemmer, W., Katinger, H. and Laimer, M., (2008): Identification of four IgE-reactive proteins in raspberry (Rubus ideaeus L.). MOL NUTR FOOD RES, 52, 34; ISSN 1613-4125
5. Marzban, G., Herndl, A., Maghuly, F., Katinger, H., Laimer, M. (2008): Allergie auf Obst: Diagnose wird exakter. ErnÃ¤hrungsmedizin, 1, 34-36; ISSN 1563-2873

France

6. Rousseau-Gueutin M., E. Lerceteau-Köhler, L. Barrot, D. J. Sargent, A. Monfort, D. Simpson, P. Arús, G. Guérin, and B. Denoyes-Rothan . 2008. Comparative genetic mapping between octoploid and diploid *Fragaria* species reveals a high level of colinearity between their genomes and the essentially disomic behavior of the cultivated octoploid strawberry. Genetics 179, 2045-2060.

Latvia

7. Kampuss K., Strautina S. Kampuse S. 2007. Red and White Currant Genetic resurces in Latvia, Proc.XXVII IHC-SI Plant Gen.Resources Acta Hort 760, ISHS.P. p.397-403
8. Moročko I., Fatehi J. 2007. Molecular characterization of strawberry pathogen *Gnomonia fragarae* and its genetic relatedness to other *Gnomonia* species and members of *Diaporthales//* Mycological Research . Volume 111. Issue 5, pp.603-614
9. Skrivele M., Kaufmane E., Rubauskis E., Strautina S. 2008. Overview of fruit and berry growing in Latvia //Proceedings of international scientific conference:Sustainable fruit growing: from plant to product, Jurmala – Dobele, pp.5-14
10. Georgieva M., Kondakova V.2008.Micropropagation of highbush blueberry *(Vaccinium corymbosum)* //Proceedings of international scientific conference:Sustainable fruit growing : from plant to product, Jurmala – Dobele, pp.134 - 141
11. Strautina S., Kampuss K., Krasnova I. 2008. Investigation of raspberry cultivars and hybrids Ina Latvia. //Proceedings of international scientific conference : Sustainable fruit growing: from plant to product, Jurmala – Dobele, pp.122 – 126
12. Krzewinska D., Borkowska B., Treder V., Tryngiel – Gač. 2008. Effect of some cultural practices on growth and yield of cranberry (Vaccinium macrocarpon Ait.): preliminary study. //Proceedings of international scientific conference : Sustainable fruit growing: from plant to product, Jurmala – Dobele, pp.198-206
13. Seglina D., Krasnova I. Ruisa S, Strautina .S., Heidemane G..2008. research on antioxidant activity of berries grown Ina Latvia //Proceedings of international scientific conference : Sustainable fruit growing: from plant to product, Jurmala – Dobele, pp.265-273

14. Višķelis P., Lanauskas J., Seglina D., Ruisa S. 2008The changes of biochemical content Ina seabuckthorn (*Hippophae rhamnoides* L.) during ripening. //Proceedings of international scientific conference : Sustainable fruit growing: from plant to product, Jurmala – Dobele, pp.274 – 282

Lithuania

15. N. Uselis, J. Lanauskas, P. Viskelis, A. Valiuskaite. 2008. "Braskiu veisliu tyrimas auginant balta plevele mulciuotose kapiliariniu budu laistomose lysvese". Sodininkystes ir darzininkystes mokslo tyrimai. 21: 81-88.
16. A. Valiuskaite, E. Surviliene, L. Raudonis. 2008. "Effect of Mycostop on Fusarium Root-Rot Agents of Raspberry". Sodininkyste ir darzininkyste. 27 (1): 47-51.
17. A. Sasnauskas, R. Rugienius, T. Siksnianas, N. Uselis, L.Raudonis, A. Valiuskaite, A. Brazaityte, P. Viskelis, M. Rubinskiene. 2008. "Small Berry Research According to COST 863 Action". Sodininkyste ir darzininkyste. 27 (2): 389-400.
18. A. Sasnauskas, R. Rugienius, T. Siksnianas, N. Uselis, L.Raudonis, A. Valiuskaite, A. Brazaityte, P. Viskelis, M. Rubinskiene. 2008. "Small Berry Research According to COST 863 Action". Abstracts of international scientific conference "Actualities in Plant Physiology". 109-110.
19. Coman M., Mladin P., Denoyes-Rothan B., Sasnauskas A., Kondakova V. 2008. A survey of small fruit European germplasm. Book of Abstract. SHE First Symposium on Horticulture in Europe. Vienna 17th-20th February P. 260-261.
20. Lukoseviciute V., Rugienius R., Zalunskaite I, Sasnauskas A., Stanys V. 2008. Strawberry cold hardening investigations in vitro. Book of abstracts. VI International Strawberry Symposium, ISHS. Huelva, Spain. 3-7 March, P. 217.

Italy

21. Battino M., Mezzetti B., 2007. Update on fruit antioxidant capacity: a key tool for Mediterranean diet. Public Health Nutrition, 9(8A):1099-103. 1–6 DOI: 10.1017/S1368980007668554.
22. Battino M., Tulipani S., Capocasa F., Mezzetti B., 2007. Qualità, nutritional value and therapeutical properties: highlights in fruit research. Hungarian Medical Journal, 1: 25-30.
23. Tulipani S., Mezzetti B., Capocasa F., Bompadre S., Beekwilder J., Ric de Vos C.H., Capanoglu E., Bovy A., Battino M., 2008. Antioxidants, phenolic compounds and nutritional quality in different strawberry genotypes. J. Agr. Food Chemistry, 13;56(3):696-704
24. Capocasa F., Scalzo J., Mezzetti B., Battino M., 2008. Combining quality and antioxidant attributes in the strawberry: the role of the genotype. Food Chemistry, 111:872-878.
25. Battino M., Beekwilder J., Denoyes-Rothan B., Laimer M., McDougall G.J., Mezzetti B., 2009. Bioactivities of berries relevant to human health. J. of Nutrition, in press.
26. F. Capocasa, M. Bordi and B. Mezzetti, 2009. Comparing Frigo and Fresh Plants in not Fumigated and Heavy soil: the Response of 10 Strawberry Genotypes. Int. Strawberry Symposium Huelva (SP). Acta Hortic., in press.
27. J. Diamanti, F. Capocasa, M. Battino and B. Mezzetti, 2009. Combining Quality and Antioxidant Attributes in the Strawberry: the Role of Genotype. Int. Strawberry Symposium Huelva (SP). Acta Hortic., in press.
28. E. Montironi, E. Costantini, F. Mourgues, C. Rosati and B. Mezzetti, 2009. Engineering Strawberry Anthocyanin Levels by Transformation with Late Flavonoid Pathway Genes. Int. Strawberry Symposium Huelva (SP). Acta Hortic., in press.
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Combined Effect of Genotype and Storage. Int. Strawberry Symposium Huelva (SP). Acta Hortic., in press.
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Serbia

31. Leposavić A., Cerović R. (2008): Climate Change and the Production of Small Fruits in the Republic of Serbia. Book of Abstracts of Workshop on „Berry Production in Changing Climate Conditions and Cultivation Systems", Geinsenheim (Germany).

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