COST Action FA0807: Integrated Management of Phytoplasma Epidemics in Different Crop Systems
2nd Management Committee Meeting

Hotel Antemare
Sitges, Spain
31 January 2010 Start time: 15:30 End time: 18:30
Feb 2, 2010 start time 9:00, end time 15:00

1. Welcome to participants by the Chair
All the delegates present gave short introductions of their own activities.

2. Adoption of the agenda
The agenda preapproved by the EC and presented here was accepted without changes.

3. Grant Holder system and Budget
Introduction to the new system by the chair.
Announcement that the IPWG Committee and its president A. Bertaccini is the Grant Holder, not the University of Bologna. The book keeping is done by Anita Morselli. Official fiscal data: Comitato IPWG, via Marco Polo 12/2 Bologna Italy, President: Assunta Bertaccini Assistant Anita Morselli.
The Grant was approved with the budget document distributed by e-mail. Relocation of the budget according to the new plan was also approved. The meetings and activities scheduled for 2010 were laid out for approval together with the budget.

List of activities:
- the expenses for the printed abstract book of the Sitges (Spain) February 1-2, 2010 meeting will be charged on the dissemination of our COST budget.
-the training school on 'Identification of Psyllid vectors of phytoplasmas' organized by WG2 activities was approved.
-the training school on 'Grapevine Yellows vector sampling and monitoring' organized by WG2 activities was approved.
-the workshop on 'Phytoplasma taxonomy' organized by WG1-WG4 was approved as well the printing of abstracts that will be presented in a special section of abstract book of IOM2010 meeting.
-the workshop on 'Phytoplasma disease management' organized by WG3 was approved.
Budget and activities for 2010 were unanimously approved.
E-cost management system - presented by the chair. MC members were invited plus 29 WG participants. They had the right to accept/decline the invitation up until the starting date of the meeting. That is why the meeting budget could not be confirmed beforehand. The decision laid out that the airfare cost would be reimbursed, MC members have 3 days subsistence reimbursed, and the invited participants 2 days. No meals are covered. A vote was held on the procedure for reimbursement if the budget is overspent for the meeting. Proposal: a) save for the next meeting, b) a meal is reimbursed, c) undecided. Proposal (a) had the overwhelming majority of votes.

4. Status of the Action
All the countries except Bosnia and Herzegovina and Malta have signed the MoU for this COST Action. Prospective MC members from both countries contacted their NCPs and they supposedly have already finished all the procedures, but the results have not been recorded on

the official website yet. The list of non-COST reimbursed and non-reimbursed countries was presented and is available on the official COST web site. Institutions that have asked to join are:
Colombia: Prof. Liliana Franco, Universidad Militar de Nueva Granada, Bogotà
Oman: Prof. Jamal Khan, Sultan Qaboos University
Iran: Dr. Mahmoudreza Karimi, Khorasan Agricultural and Natural Resources Research Center, Department of Plant Protection, Toroque-Mashhad, Iran.
The Chair stated that for the new institutes it is necessary to provide the name of an appointed person, who must provide CV and a dedicated filled-in form. Approval of the MC members will be asked for through e-mail as application are not always near to a scheduled MC meeting.
STMS – 2 completed in 2009/10- Jelena Mitrovic Belgrade, Serbia to Berlin, Germany – Dr. Michael Kube; Luisa Filippin Treviso, Italy to Bordeaux, France – Dr. Sylvie Malembic.

5. Election of 2 Financial Rapporteurs

Elected unanimously among MC member:
Josef Spak (Czech Republic)
Kadrye Caglayan (Turkey)

6. Working plan for implementing the Action

General plan presented by the chair. Background / Problem statement: The increased threat from phytoplasma diseases due to climate change and increased exchange of propagation materials has resulted in a drive to bring together the European phytoplasma research groups into a coordinated Action. Brief reminder of MoU objectives: The main objective of this Action is the enhancement and exchange of scientific knowledge and technologies related to phytoplasma diseases aimed at developing strategies to detect and prevent biological invasion and spread of phytoplasma diseases of plants.

6.1 Objectives and working program

- WG1. Database phytoplasma collections - Detection protocols
- WG2. Database for phytoplasma and vector presence in Europe - Vector identification
- WG3. Resistant cultivars. Best practice guidelines. Control strategies
- WG4. Phytoplasma genomics website. Coordination of efforts (model systems)

Innovative work presented also.

- Standardized protocols for phytoplasma detection
- Coordinated monitoring of phytoplasma/vector presence in Europe
- Establishment of a phytoplasma genomics platform

6.2 Working method - organization and management

6.2.1 Working Group 1: Detection / diagnostics

Altogether, 82 people have registered in WG1 and the list on www pages have to be updated. Out of these members, 54 were present in Sitges COST meeting.
There were 29 oral presentations and 10 posters presented. These presentations can be roughly separate into two sections:

1) Development of new or improved methods for phytoplasma detection. Examples: one-hour DNA extraction and loop-mediated isothermal amplification assay; real-time PCR assay for improved universal and group specific detection of phytoplasmas; a new real-time PCR detection system for AP, ESFY and PD phytoplasmas in fruit trees; specific detection of AP by a new real-time PCR method based on ribosomal protein gene; LNA probe – based real time PCR for the detection of phytoplasmas in *Solanum tuberosum*; QBOL – development of a new diagnostic tool using DNA barcoding to identify quarantine organisms in support of plant health.
2) New findings, detection, identification, characterization and genetic variability of phytoplasmas in different host plants.

31 people were present at the separate WG1 meeting, Tuesday 2nd February (9:00-12:00).
After an introduction by each participant, there was a discussion about separate tasks of WG1:
Task 1. Develop a database of available collections of phytoplasma strains and DNA collections in EU. Discussion led by Nicolaisen.
Task 2. Identify suitable marker genes for differentiation at species and subspecies level forming the basis of new diagnostic protocols. Discussion led by Bertaccini.
Task. 3. Develop new detection protocols for selected phytoplasmas and optimize and validate these and existing protocols. Discussion led by Franova.
The largest collection of phytoplasma isolates is in the lab of Bertaccini in Bologna (*in vitro* cultures), another one is in Bordeaux in lab of Malebic-Maher in periwinkle plants, also in Martini (Italy) greenhouse, small collection of phytoplasma isolates are kept in České Budějovice (Franova, Czech Republic) and Zagreb (Department of Biology, Škorić and others).
General discussion about methodologies for detection. The chloroform/phenol DNA isolation is the most convenient method for long-term storage of phytoplasma DNA. For phytoplasma universal detection, the most common protocol is the amplification of sequences of 16S-23S rDNA using primers P1/P7 – mF2/mR1, P1/P7 –F2n/R2, F1/R0-F2n/R2, F2/R2-fU5/rU3, P1/P7-F1/B6-F2/R2. For specific detection of phytoplasmas infecting grapevine and fruit trees, ribosomal protein genes are recommended. *Taq* polymerases of different firms are used, some are not recommended. For phytoplasma identification, RFLP with *Taq*I, *Mse*I, *Hha*I endonucleases are used after amplification with F2n/R2 primers. Phytoplasma classification according to RFLP profile is available in the paper of Lee *et al*., 1998, International Journal of Systematic Bacteriology, 48:1153-1169. Dullemans had a question about the possibility to have RFLP profiles on www pages. Diversity of one phytoplasma isolate and mixed populations of phytoplasmas was discussed (Skoric) – one population is usually predominant.
Mehle offered the possibility of a training school or workshop on new real time PCR for AP, ESFY and PD in fruit trees, with higher sensitivity than conventional PCR (Slovenia). Subsequently, a workshop on real time PCR assay for routine universal phytoplasma diagnostics with Taq Man probes in the lab, where Hodgetts (UK) is working was discussed. The most important phytoplasmas seem to be: ESFY, BN, FD and AP. However, protocol(s) for the universal, simple, quick as well as sensitive and specific phytoplasma detection should be very useful for everybody. The possibility of ring test among laboratories was not discussed.
Information about the workshop on phytoplasma taxonomy in Chianciano Terme, Italy was given by the Chair.

6.2.2 Working Group 2: Epidemiology and vector ecology

Session in the meeting of February 1st chaired by Phyllis Weintraub and Barbara Jarausch.
Task 1. Establish tools to identify vector species. Wilson: there is a world-wide shortage of taxonomist; even common species are not being identified, much less new species. Germany and central Europe have a good book “The Leafhoppers and Planthoppers of Germany” – excellent in German and English. However, south of the Alps or east or west of Germany, it doesn’t work. Molecular tools – there are primers for a number of *Reptalus* spp and *Hyalesthes* spp. Advantage of these markers is for identifying females and nymphs; morphologically only adult males can be identified to species. A number of barcoded (mt CO1) species in the database. We will have a ‘Phytoplasma Vectors Symposium’ as part of the European Congress of Entomology in Budapest in August 2010. Sauvion - who has done the barcoding? For psyllids there is a specialist at Montpellier involved in the QBOL project. For information www.qbol.wur.nl. Bagnoli - In Italy Alma is an expert and on a few other species. Jarausch B. - Need molecular tools to verify the morphological identification. In Neustadt species-specific primers have been developed during a common project with the Suisse taxonomist Daniel Burkhardt for some important *Cacopsylla* species such as *C. picta*, *C. melanoneura*, *C. mali*: online psyllid key www.psyllidkey.com or www.psyllidkey.eu.

Bertin and Bosco will produce a checklist of known species and use CO1 as marker for insect identification. Wilson and Sauvion volunteered and were subsequently voted to coordinate this task. Twenty or so specimens of each putative species will be sent to Wilson for identification and then to Sauvion for the molecular work. A database for psyllids using the already existing SEEranet database as template will be produced.

Task 2. Monitor the presence of phytoplasma diseases and their putative vectors in defined regions throughout Europe. Delic and Tedeschi – description of the situation and known vectors and plant hosts in different regions in Europe. Weintraub suggested concentrating on fruit trees and grapevine because the majority of researchers in the COST action are focused on these. Trapping methods vary. Krüger pointed out that there are two aspects: qualitative, i.e. presence/absence of vectors and quantitative, i.e number of individuals per vector species, where trapping methods would have to be standardized. Trapping methods vary. Delic and Tedeschi will continue as task leaders and will write a protocol for the information to be sent and. based on these information will establish a database on presence of phytoplasmas diseases and vector species in different European regions.

Task 3. Provide data about the infectivity of vector species towards the establishment of a risk assessment system. Maixner report that infection pressure, crop susceptibility, culture practices and environment are all impact on the risk assessment. Abiotic and biotic factors, culture practices. Need to focus on economically important crops/diseases i.e. grapevine and fruit crops Standardize collection methods. Proposal to make a list of 'do's' and 'don'ts' with regard to modifying the infection pressure. Identify points of common interest look for editorial board where major diseases are represented and collect from others in their field. Should be combined with WG3. Maixner will write a protocol and send to Jarausch B. and Ermacora (ESFY), Tedeschi and Jarausch B. (AP), Riedler-Bauer (BN), Mori and Bosco (FD), Barbara and Rosemarie (PD).

Task 4. Monitor differences in vector populations to verify correlations between vector populations and efficiencies in disease spread. Sauvion. Focus on sampling why, when, where, how, at what scale? To really understand the distribution of a species, need high density of sampling. Understand gene flow barriers. Use ESFY and vector *C. pruni* as the example model system. Jarausch B. Different from Task 1 we are not looking for tools to distinguish between species, but for populations, perhaps microsatellite to discriminate. Bosco. One thing is to identify the genetic variation in a vector spp. and another to correlated variation with vectorability. Genetic variability does not imply anything with regard to vectorability. Do a population analysis because there are problems to be solved, then you start looking for genetic differences. Need to focus on species that have an unsolved problem, e.g. *Hyalesthes*. Not important to focus on *S. titanus* because it is a recently imported species – molecular published molecular analysis shows no differences in microsatellites from populations from different locations. Maixner important to focus on the problems as Bosco mentioned. Need to define other problem areas. Tedeschi (*Cacopsylla melanoneura*) and Sauvion (*C. pruni*) will get samples from all over Europe, write a protocol for density of sampling. Maixner and Imo will work on *Hyalesthes*.

Task 5. Establish the importance of different means of disease spread, such as seed transmission and transmission by root bridges. Ember and Ulubas Serce. A table of seed/tuber transmission was presented, root bridges were discussed. Need to study the evidence of seed transmission with uniform testing. Tuber transmission in potato– existence has been proven. Need to establish rate based on different varieties. How does storage affect transmission? Root Bridges – determine transmission rate in different varieties, planting density effects, and evaluate extension of root bridges in older and younger orchards. Is this a real source of infection? Protocol of experimental design evaluation, and id methods. Put the table on the website. Make a protocol and send to all.

6.2.3 Working Group 3: Phytoplasma control in crop systems

The tasks of WG3 as described in the MoU have been redefined based on the analysis of the questionnaires of the WG3 members. The new tasks (see website) have been sent to all WG3 members by mail and no contradiction has been expressed to the WG leaders so far.
The objective of the first WG3 meeting is to discuss and start the implementation of the tasks.
The WG leaders proposed to elect subtask leaders who are experts for the respective task and who are best placed to manage the tasks.
WG3 will be particularly involved in the preparation of a congress for plant protection services, advisors, nursery men etc. which will be one of the major deliverables of the COST action. Recommendations for phytoplasma control strategies have to be presented on this congress. Therefore, the work of WG3 has to be focused on the preparation of this congress. The MC decided to hold this congress attached to the 2nd IPWG meeting at Neustadt (Germany) in September 2011.
The next WG3 meeting has already been scheduled by the MC. It will be held at Ancona (Italy) on 23/24 September 2010. Topics which need deeper discussion among the WG3 members should be defined and shall be treated in preference on the WG3 meeting in Ancona.
Needs for further research activities as well as needs for interaction with other WGs should also be defined.
Task 1. Resistance. Natural resistance to phytoplasmas is mostly reported for fruit tree phytoplasmas. Strategies to use the natural resistance in new breeding programs have been presented on the plenary meeting. However, as resistance screening is a long lasting work no additional work can be initiated in the framework of this COST action. Nevertheless, a valuable and important task is the collection of existing data about the susceptibility or resistance of different species and cultivars. Caglayan informed about the current work in Turkey on different combinations of rootstocks and local cultivars of apricot to observe the response to ESFY infection. Jarausch W. proposed to prepare a simple database for phytoplasma resistance in fruit trees which can be published on the website. As resistance might be affected by different phytoplasma strains and as the resistance mechanism is not understood, there is a need of interaction with WG1 and WG4 regarding phytoplasma strain diversity and there is a need of interaction with WG4 regarding phytoplasma-plant interactions. Angelini discussed the problems in finding and defining resistance to phytoplasmas in grapevine. A resistance screening by graft inoculation - as it is applied for fruit trees - is not possible. Thus, most of the available data are based on field data after infection by natural transmission. Angelini proposed to collect first information about susceptibility. The data should be collected with cultivar and clonal information as well as with information about the level of susceptibility (susceptible, medium or resistant). A database similar to fruit tree resistance shall be established. Angelini was elected as coordinator of task 1 regarding grapevine phytoplasmas. Jarausch W. indicated the interest to test the resistance under laboratory conditions. This approach has been successfully applied for apple. He raised the question whether a similar approach is also feasible for grapevine and emphasized the need to find a system to study BN and FD resistance. Angelini suggested vectors as an alternative system.
Task 2. Effects of biotic and abiotic environmental factors on disease and symptom development. Schweigkofler led the discussion on the possible role of bioactive compounds in the control of phytoplasma diseases. Jarausch W. expressed his wish that the COST action should achieve a critical revision of the available data on the efficiency of bioactive compounds. For this, data about the efficiency of bioactive compounds have to be collected first. Scheigkofler has been elected as leader of this subtask. Musetti introduced the phenomenon of recovery in fruit trees and grapevine. Recovery is particular interesting in apple and grapevine where it can account for a mean of 20% of diseased plants. Under certain circumstances recovery can be a stable phenomenon. However, the plant remains mostly infected in the root system. Thus, the question to be addressed in the COST action is: Is it possible to use recovery as a strategy for

phytoplasma-disease control? Musetti presented the need to know more about plant-phytoplasma interactions linked to recovery, to address questions on this subject interaction with WG4 is needed. Schweigkofler asked about the physiological basis of recovery. Torres highlighted that the actual legislation does not allow measures linked to recovery if the plant remains phytoplasma-infected. Musetti was elected to coordinate this subtask of recovery.

Task 3. Improvement of vector control. Maixner presented a general discussion of the sub tasks of task 3 with special attention to the control of grapevine phytoplasma vectors.

1. Collection of data about the currently applied control strategies
- which elements of control strategies to collect?
- where does the information comes from (published / unpublished data)?
- how to present the data in the COST action (database vs guidelines)?
- who collects and evaluates the data (e.g. editorial board)?
2. Analysis of the effectiveness of available environmentally sustainable insecticides
- where do the data come from (field trials, empirical knowledge, publications)?
- development of new and innovative control strategies
- implications of alternative host plants on the development of effective control strategies. (particularly important in the control of BN = habitat management)

It was generally agreed that the major task is the collection of data about the different control strategies for the different diseases and countries. The results should be presented as general guidelines and not in form of a database. There is also the need of an editorial board which collects and evaluates the data. Belien has been elected as coordinator for the guidelines of control of fruit tree phytoplasmas. Maixner has been elected as coordinator for the guidelines of control of grapevine phytoplasmas. Belien and Maixner will form the editorial board and will organise the data collection and prepare the next WG3 meeting. It was decided to send out a questionnaire to collect the information on control strategies available in each country. In the MC meeting it has been decided to combine this questionnaire with questions about disease severity and other items which will be asked for by WG4.

Task 4. Recommendations for best practices in disease control. This task includes also the definition of control measures to prevent the introduction of a new phytoplasma disease into a region, e.g. into Europe. An example of a new disease threat was presented by Bianco for almond witches' broom in Lebanon. Caglayan: a survey for this disease has to be started in neighbouring countries, e.g. in Turkey, in order to start eradication measures as soon as possible. Another prerequisite for control measures would be the identification of the vector. This is a link to WG2. Further research activities are needed to better understand this disease. This disease raises also questions about the homogeneity of quarantine rules in the different COST countries. Caglayan further discussed task 4 regarding the recommendations for best practices in disease control. She proposed the collection of data for the recommendations for different crop systems and for the different countries. The results could be presented in a form of database. She emphasizes the importance of task 4 especially for newly emerging diseases and was elected coordinator of task 4. Torres: there is also a need for the compilation of the different legislations that actually regulates the fruit and grapevine crops.

Task 5. Control strategies using the interactions of endophytes with the phytoplasma. Bianco explained that the interactions as well as the endophytes can be quite variable. The understanding of this interaction of endophytes with the phytoplasma is still at the beginning. The feasibility, reliability and the absence of risks have to be proven yet. In order to evaluate the feasibility of control strategies based on endophytes the available data have to be collected and revised. Bianco has been elected task leader and shall propose strategies to fulfill task 5 until the WG3 meeting.

Task 6. Cross protection strategies. Seemüller led the discussion on cross protection. He gave an overview about the work done with aster yellows, ESFY and apple proliferation. He pointed out that phytoplasma-phytoplasma interactions might be involved in recovery, latency and

irregular symptom development. Jarausch W. stated that at the current state of knowledge cross protection based on mild strains of a quarantine organism appears not applicable. However, the research on cross protection yields new insights into phytoplasma genomic variability and phytoplasma interactions. Thus, there is a clear link to WG4. The available data – especially regarding ESFY – should be collected and critically reviewed, but further discussions on cross protection strategies are needed and should be coordinated by Kiss.

6.2.4 **Working Group 4: Phytoplasma / host interactions**

A questionnaire was circulated among the ca. 40 members of WG4. Responses from 28 members were received. In emails prior to the Sitges meeting it was discussed how to achieve the four WG4 tasks. 17 participants attended the WG4 meeting at Sitges.

Task 1. Integrate genomics and bioinformatics information into a single website to allow password-protected access for all members of this Action. Genome sequence information and links to databases and websites that contain phytoplasma genome sequences are already available on the COST website. WG4 members discussed how the website can be used to better advertise the phytoplasma-plant-insect system to the general public. The website should contain the following information (i) a list of countries and why the research is important to that country, also list where phytoplasmas have been found; (ii) Risk assessment – new vector/phytoplasma, identification of virulence factors (common initiative with WG2); (iii) Applied aspects and risk assessments (future problems and how they can be addressed) and (iv) interesting aspects of phytoplasma research, including (a) Phytoplasma have double hosts, which is unusual; (b) their interference with plant development (Can we use phytoplasmas to learn about plant development?); (c) Phytoplasma interference with plant-insect interactions (it is unclear how non-host resistance works and how phytoplasma alter this interaction, and phytoplasmas could be used as a tool to acquire this knowledge); (d) Phytoplasma diversity – genome evolution (negative point raised was how difficult it is to work with phytoplasmas as they are non-culturable which makes it expensive. However, this can also be seen as a positive because of new sequence technologies. Also, the majority of bacteria cannot be cultured and there is an interest to learn about the unculturable organisms; phytoplasmas could serve as a model for those); (e) Genome diversity – phytoplasma do not have good DNA repair system, enables investigations of genome evolution and how this allows phytoplasma adaptation to hosts; (f) Investigate phytoplasma insect transmission by studying mutants impaired in insect transmission (these mutants can be obtained by serial grafting of phytoplasma-infected plants without involvement of insect vectors). Should we include a database of available mutants on the website?

WG4 can take initiative to sequence more phytoplasma genomes. Sequencing is becoming cheaper; Illumina sequencing costs are 1,000 to 2,000 € per genome. Hence, it may be possible to sequence phytoplasma genomes without applying for large grants. Additional sequences will provide good knowledge of metabolic functions, and is useful for proteomics. The aim may be to obtain phytoplasma draft sequences for each clade, and provide access to the data as soon as it is available through the COST website. One grant was submitted, but was rejected because budget was too high; the proposal included closure of some of the genomes and this takes time and salary costs for personnel. Thus, draft sequences may be better, and these would be useful for identifying more virulence factors. However, whereas sequencing is relatively inexpensive, obtaining enough phytoplasma DNA is often not straightforward and may be time consuming. It was suggested that PhD students may be involved in projects to identify, isolate and sequence phytoplasmas. Students may get involved through the STSM program and may drive the DNA isolation and subsequent sequencing and comparative genome analyses. This way progress can be made soon. We will have to identify students who are interested in genomics and bioinformatics. We can organize a specific workshop on genomics and bioinformatics, and invite interested students to participate and take on genome sequencing of specific phytoplasmas.

Task 2. Identify model systems in which to co-ordinate effort and research funding to enhance understanding of phytoplasma/host interactions. It may not be the best approach to identify (a) model system(s) as scientists often investigate particular phytoplasmas because of their economical importance and frequently don't have access to funding for studying a model system. Also, the process of "selection of a model system" creates competition rather than collaboration. Therefore, it may be better to focus on specific research aims instead. These aims may include: (i) Determine conserved aspects of phytoplasmas, such as conserved virulence factors and transcription factors (the latter may be useful for designing methods to control phytoplasma infection of plants and insects); (ii) Identify the phytoplasma "Achilles' heel" that can be targeted for controlling phytoplasmas; (iii) Development of a phytoplasma microarray for phytoplasmas diagnostics (It was commented that one group already has funding for such a project; microarrays may not be suitable for all purposes, especially for quarantine phytoplasmas); (iv) Development of methods to improve phytoplasma DNA isolation (suggested possibilities: removal of phytoplasma using microcapillaries straight from the phloem, and collaborate with nanotechnology labs that develop artificial phloem cells that can be used to culture phytoplasma). Nevertheless, a model system is useful for some purposes. Arabidopsis offers an important range of tools and available collection of mutant as well as knowledge on gene functions. Marzachi presented a comparative table of the main advantages of the pathosystems currently studied in COST laboratories taking in account the following aspects: phytoplasma genome information, plant host genomic information, insect vector reared. No specific decision or action was decided at this time. Actions may be taken as soon as there is some clarity of what grant programs become available within the EU or elsewhere (discussed below).

Task 3. Establish a link between phytoplasma genomics achievements and insect vector transmission. This task will require interactions with WG2 (discussed in break-out sessions below), and is also dependent on EU and other grant programs.

Task 4. Co-ordinate research activities on the molecular basis of phytoplasma diseases in plants and insects. This task will be covered by organizing meetings, workshops and STMSs (see also below).

Tasks 2 and 3 are difficult to manage without research funding. Thus, we will have to discuss opportunities for research funding first, and then see how we can address tasks 2 and 3 in research proposal(s). Foissac presented an overview of current grant programs in the EU – Conclusion: Currently not much programs available that are relevant to us, however new programs will be launched at the end of the year.

The WG 4 meeting also had breakout sessions and outcomes of these sessions were as follows:

Session 1. Seeking funding for collaborative projects. Conclusions: (a) Important to start collaborations; (b) we should make use of the Marie Curie postdoctoral fellowship scheme; (c) Provide information for funding programs on the website; (d) Contact sequencing companies (TGAC in Norwich has CCC funding and is looking for sequencing projects). Marzachi will circulate table listing funding possibilities that is to be completed by WG4 members and others.

Session 2. COST website relating to WG4. This should have the following information: (a) basic biology of phytoplasma; (b) hard data on economic losses – distribution map including financial losses, which phytoplasmas are found in each country; (c) list of current problems so it is easy to abstract information when required; (d) predictions of phytoplasma movement under the heading of phytoplasma risk assessment. Also include insect distribution data, link with WG2; (e) impact on global food security; (f) include images of phytoplasma disease symptoms; (g) insect photos (link to WG2/Mike Wilson's website); (h) phylogeny - Include links to accession numbers, make new sequencing data password protected; (i) list of WG meetings and other meetings of interest. Include a section where people can upload a brief report of meetings they have attended; (j) links to publications; (k) link to workshops and relevant training courses. These data will be collected by sending e-mails to all members with a standard format of questions to make

compilation of data easier and more efficient. Matt Dickinson and Saskia Hogenhout will generate a questionnaire and format the answers for uploading onto the EU-COST website.
Session 3. Training workshops for students (discussion group contained only students). The following courses were found useful: (a) bioinformatics course, practical based (3/4 days); (b) microscopy from tissue preparation through to microscopic techniques; (c) proteomics; (d) phytoplasma taxonomy and systems biology; (e) young scientist development from grant applications through to career opportunities; (f) new technology. Many of these courses are quite general and students may be able to sign up for many of these courses already. Information for relevant courses may be listed on the EU-COST website. There is an opportunity to organize an EMBO workshop at the John Innes Centre.
Session 4. Meetings. Suggested format of a meeting was as follows: Selected oral presentations for WG4 followed by a poster session in the early afternoon, second day all WGs meet. WG4 could attach a meeting to the end of the IPWG meeting in Neustadt in September 2011. We will need to organize time and room.
Session 5. Connecting to other WGs. Each working group will be contacted individually to ask whether they would feel the need to connect with WG4, and then organize common meetings/workshops. Seruga and Kube will contact WG1 leaders, Foissac will contact WG2 leaders and Bisognin will contact WG3 leader to set up exchanges such as: Molecular markers, determination of biological properties (insect transmission, plant symptoms), strains from collection, isolation of new strains with specific properties, common meetings or workshops, STSMs.

6.2.5 STSM

Presented by Matt Dickinson – clarification of the STSM procedures is available on the web. He stressed that the STSM scheme does not cover all the costs. The action first sends a letter of approval. Reports are sent after the completion of the STSM and **after** that young researchers are reimbursed.
Summary of completed and funded missions for 2009/10 is given. Details will be available on the web according to the format that should be discussed. In what form reports should be on the website? Each STSM user will be asked to contribute the first version of the report or a condensed one for the web under the agreement that the data can be released this way.
Six more STSMs are already approved for 2010.

6.2.6 INTERNET/WEB site

The substitute for Martin Verbeek is Annette Dullemans at this MC meeting. She gave a short talk about setting up the webpage. The discussion on the technical points regarding the web:
The webmasters prefer to get their data from the action chair before putting it on the web (e.g. WG leaders should send it to the chair first for approval and than it goes to the web).The chair has formatted also the documents in the same way in order to keep the uniform format. Weintraub – there should be a standard format for data that should be fed to the web. Efforts will be made to make up the formatting. Some extra bullets are added in order to improve the visibility of the website. Interactivity is needed. There is now the search option on the front page. Hogenhout - Google cannot find this COST action webpage – maybe it should be enabled by inserting keywords in every page. Bertaccini – a note that it can be always found through IPWG. Spak – past and future meetings should be announced at the webpage with pdf of the presentations. Authors should decide on the amount of information that can be published in order not to break the copyright laws. He also suggests to put the cost action number in the publications whenever is applicable. It adds up to the cost outputs. Also, besides the pdfs of the abstracts, some elements of the actual talks could be put on the website.
Any contribution for the webpage should reach the WG leaders by Feb 28, but it should be voluntary. Deadline for WG leaders to send the information to the Chair is March 10, 2010. The

copyright issues should be considered and for that reason there should be an agreement confirmed from the author that the pdf's purpose is to be published on the COST web.
Bertaccini – COST office asks for new grant subjects. The next general COST meeting is in Lithuania in March 25, 2010 and activities of the actions, including this one, will be reported by the chairs. Information fed into the web will be used for this report.

7. Place and date of future meetings

For 2011 – Barbara and Wolfgang Jarausch are organizing the second IPWG meeting in Neustadt in the second week of September (12-15). Hotels and conference rooms are already booked. Attached to the IPWG meeting the COST meeting for the growers is scheduled for Friday 16th September. The second scientific meeting of COST and the third MC meeting will be intergrated into these meetings.
Also the budget outline for 2011 was discussed briefly.

8. Non-COST countries

Kerstin Kruger from South Africa, Uni. Pretoria, participated in the discussion with a short overview of the occurrence of phytoplasmas in her country. In 2006, there was the first GY report in SA and AY-B was found. It is a quarantine pest for them but they have recorded it spreading ever since. Now 2 programs for control exist. They have little experience with phytoplasmas (Stellenbosch group – diagnostics, spread, and Pretoria group – vector research). The COST action is a chance for them to get help and gain expertise. Montano –Brazil, overview of the situation of phytoplasmas recorded in citrus and other crops in Brazil.

9. Any Other Business

Hogenhout – number of PhD students and postdocs should be known and the info should be distributed. MC members should forward the information for each group to the Chair. The training school requirements by those students – should be found out. Maybe they could be stimulated to organize the schools by themselves.
For future MC meetings, in order to obtain budget savings, only one MC member from each county will be reimbursed and they should agree on which one will attend. For bigger meetings involving scientific sessions and MC meetings, both MC members from each country will be reimbursed. This was approved unanimously.