HCERES

High Council for the Evaluation of Research and Higher Education

Research units

HCERES report on unit:

Fruit Biology and Pathology

BFP

Under the supervision of the following institutions and research bodies:

Institut National de la Recherche Agronomique - INRA

Université de Bordeaux

Evaluation Campaign 2014-2015 (Group A)

HCERES

High Council for the Evaluation of Research and Higher Education

Research units

In the name of HCERES,[1]

Didier HOUSSIN, president

In the name of the experts committee,[2]

Jean-François BRIAT, chairman of the committee

Under the decree No.2014-1365 dated 14 november 2014,

[1] The president of HCERES "countersigns the evaluation reports set up by the experts committees and signed by their chairman." (Article 8, paragraph 5)

[2] The evaluation reports "are signed by the chairman of the expert committee". (Article 11, paragraph 2)

Evaluation report

This report is the result of the evaluation by the experts committee, the composition of which is specified below.

The assessments contained herein are the expression of independent and collegial deliberation of the committee.

Unit name:	Fruit Biology and Pathology
Unit acronym:	BFP
Label requested:	UMR
Present no.:	1132
Name of Director (2013-2014):	Mr Thierry CANDRESSE
Name of Project Leader (2015-2019):	Mr Thierry CANDRESSE

Expert committee members

Chair:	Mr Jean-François BRIAT, CNRS, Montpellier
Experts:	Mr Stéphane BLANC, INRA, Montpellier
	Ms Christine FOYER, University of Leeds, UK
	Mr Jean-Pierre JACQUOT, Lorraine University (representative of the CNU)
	Mr Michael KUBE, Humboldt-University of Berlin, Germany
	Mr Patrick LAUFS, INRA, Versailles
	Mr Pere PUIGDOMÈNECH, CSIC, Barcelona, Spain
	Mr Christophe SALON, INRA, Dijon (representative of INRA CSS)

Scientific delegate representing the HCERES:

Mr Philippe MEROT

Representatives of the unit's supervising institutions and bodies:

Mr Pierre DOS SANTOS, Life and Health Sciences department of the University of Bordeaux

Mr Frédéric GAYMARD, INRA, Plant Biology and Breeding Department

Mr Christian LANNOU, INRA, Plant Health and Environment Department

Mr Roger MARTHAN (representative of the Doctoral School "École Doctorale des Sciences de la Vie et de la Santé" – SVS - ED n° 154)

1 • Introduction

History and geographical location of the unit

The Fruit Biology and Pathology Unit (BFP, UMR 1332) was created on the 1st of January 2011, and its major scientific topics concern plant metabolism, flower and fruit development, adaptation to the environment, and non culturable pathogens diversity and interactions with their host plants and vectors. BFP creation resulted from the fusion of two already existing research units: (i) the "Biologie du Fruit" unit (UMR 619) and (ii) the "Génomique, Diversité, et Pouvoir Pathogène" unit (UMR 1090) which were two joint units between INRA (Plant Biology Department, BV) and University Bordeaux I, and University Bordeaux Segalen, and INRA (Plant Health Department, SPE), respectively. Since then, the two universities have merged to form the University of Bordeaux and the INRA BV department has fused with the INRA Genetic and Breeding (GAP) department to give the Plant Biology and Breeding (BAP) department. BFP is therefore presently under the joint tutelage of University of Bordeaux and of two INRA departments (SPE and BAP). The 5 research teams of the two pre-existing units were conserved: "Fruit Organogenesis and Endoreduplication" (OrFE), "Functional Genomics of Fruit Development" (GFDF), "Metabolism" (META), "Plant Viruses" (VIRO) and "Mollicutes" (MOLLI). Furthermore during the course of the present contract INRA decided to restructure and to close down its "Unité de Recherche sur les Espèces Fruitières" (UREF) and to integrate most of its staff and activites into the BFP unit. As a consequence, the strawberry program of UREF was integrated into the OrFE team of BFP the 1st February 2012 (6 permanent people, 1 post doc and 2 PhDs). The same day two UREF secretaries were integrated in the Finance and Administrative team of BFP. Finally, on the first of January 2013 an UREF group working on cherry ("Adaptation of Sweet Cherry to Climate Change", A3C) integrated the BFP unit (12 permanent people, 1 contractual AI CDD, 1 PhD and 1 Post-doc). The BFP unit is, in its present form, a recently created research unit, aggregating already existing research teams. It is therefore a major initiative to regroup Plant Biology in Bordeaux. It is however important to notice that the size of the 6 research teams is very heterogeneous, and that large differences exist between the teams concerning the scientists / technicians ratio. Beyond regrouping, strategic structuring will be the challenge of the next contract. At the time of the visit (February 2015) BFP hosted 160 people (124 permanent people among whom 78% belongs to INRA and 19% to the University of Bordeaux); among non-permanent people, 14 are PhDs and 12 are post-docs. The BFP unit is located on the INRA campus of Bordeaux, in 5 inter-connected buildings and a 6th separated building (UREF Building). The rationalization of the space due to the BFP structuration (merging/integration of 3 pre-existing units) enabled to offer laboratory and office space to another research unit (UMR 5200 between CNRS and University of Bordeaux) working into the field of Plant Biology, and which came on the INRA campus in June 2012. This reorganization led to the location at the same place ("Green" campus on the INRA Bordeaux Center site) of all the Bordeaux research teams active in the Plant Biology fields. Such an organization undoubtly improves local collaborations between teams, as well as platforms emergence and development, but also national and international visibility, and attractiveness.

Management team

The management team of BFP is composed of a director, Mr Thierry CANDRESSE, and a vice director, Mr Christian CHEVALIER, who meet each Monday morning with the 6 research group leaders. This structure, called the "Bureau", is the operational management structure of BFP. One or two members of the administrative and financial team attend this weekly meeting of the bureau, insuring that decisions are promptly executed.

HCERES nomenclature

Domaine principal : SVE2_LS3 Biologie cellulaire et biologie du développement végétal

Domaines secondaires : SVE1_LS6 Immunologie, microbiologie, virologie, parasitologie ; SVE1_LS2 Génétique, génomique, bioinformatique ; SVE1_LS1 Biologie moléculaire et structurale, biochimie

Unit workforce

Unit workforce	Number as at 30/06/2014	Number as at 01/01/2016
N1: Permanent professors and similar positions	18	16
N2: Permanent researchers from Institutions and similar positions	24	23
N3: Other permanent staff (without research duties)	79	76
N4: Other professors (Emeritus Professor, on-contract Professor, etc.)	1	1
N5: Other researchers (Emeritus Research Director, Postdoctoral students, visitors, etc.)	5	5
N6: Other contractual staff (without research duties)	7	6
TOTAL N1 to N6	**134**	**127**

Unit workforce	Number as at 30/06/2013	Number as at 01/01/2015
Doctoral students	20	
Theses defended	27	
Postdoctoral students having spent at least 12 months in the unit	29	
Number of Research Supervisor Qualifications (HDR) taken	2	
Qualified research supervisors (with an HDR) or similar positions	**26**	**24**

2 • Assessment of the unit

Strengths and opportunities related to the context

- the BFP unit is an original initiative which has been successful in re-grouping a large part of the Plant Science community in the Bordeaux area. It leads to the presence of BFP in many national and international networks;

- BFP has a high visibility, enabling to be successful for obtaining competitive fundings;

- BFP has also a strong involvement in teaching and in the development and management of high-tech technological platforms. These platforms are good opportunities to improve and strengthen the partnership with private companies;

- BFP teams are working on species agronomically relevant (tomato, strawberry, sweet cherry, grapevine…), thus opening avenues to collaborations with private companies.

Weaknesses and threats related to the context

- links with companies for more applied research lines are not always optimized;

- so far no real integration between the Fruit biology theme and the Pathology theme;

- disequilibria in the composition of the research teams (Researchers vs Engineers + Technicians).

Recommendations

- although scientific production is quantitatively important, its quality could continue to be improved;

- interactions between research teams are heterogeneous and should be improved;

- improve internal communication and information flow between the various staff categories and between the direction and the staff;

- improve scientific and technical animation in order to strengthen the integration between the different teams and the exchange of technical competencies;

- promote collective discussions to elaborate a clear prospective strategic plan, and to favor inter-team projects and the emergence of the "next generation leaders". Beyond its succes in regrouping teams, the BFP challenge is now to structure the unit with a clear strategic plan;

- the direction of BFP should consider to optimize the distribution of engineers and technicians between the various research teams;

- platforms should help to continue strengthen links with companies;

- modeling is a key word coming up in the project of various research teams. Therefore, the unit could consider having a coordinated approach of how to implement "system biology" at the unit level rather than independent team by team initiatives.

3 • Detailed assessments

Assessment of scientific quality and outputs

Overall, the BFP unit claims a 60% investment in Academic research, ranging from 50 to 75% between the different research teams. Peer review publications are therefore a good indicator to assess the scientific quality of this unit. Over the considered period (June 2009-june 2014), BFP has produced 280 articles, 112 of them being published in journals of impact factor higher than 4, with a mean impact factor of 4.56. These publications have been cited in 95 countries, and apart France, 7 other countries have cited BFP publications more than 100 times over the period. The list of invitations to national and international meetings is impressive, and many biological resources are produced and managed by BFP, in order to be shared with the community.

It is therefore a very good to excellent production, both at the quantitative and qualitative levels.

Assessment of the unit's academic reputation and appeal

The BFP unit academic reputation and appeal is excellent. The unit is involved in numerous local, national and international networks. This led to the coordination of 3 EC and 1 national programs, and to the participation at 28 FP6, FP7 or ERAnet projects, and of 25 ANR projects, including 5 “Investissement d’Avenir” projects. This success in obtaining external fundings was accompanied by an excellent attractivity enabling to host or hire highly reputed scientists in the field. The excellent academic reputation and appeal of BFP is further evidenced by the creation of a joint international laboratory with the University of Tsukuba (Japan) with the principal aim to develop and to share structural and functional genomic resources in tomato. It enabled the hiring at BFP of an Assistant Professor originating from Japan, and the exchange of French PhD and master students, and of one INRA researcher, with the Gene Research Center of Tsukuba University.

Assessment of the unit's interaction with the social, economic and cultural environment

BFP is involved with private companies in various transnational programs, the most important being EU FP7 MARS project (coordinated by BFP) dealing with Plum pox virus resistance in Prunus, and federating 9 European academic laboratories and 8 small- to medium-size companies. Strong collaboration also exists with companies concerning the research programs developed with strawberry and sweet cherry, respectively. A strong potential based on the various platforms and tomato genetic resources exists, which has not yet been fully exploited to further develop fruitful interactions with companies. Overall partnerships with private companies resulted in 3 funded PhD fellowships during the period of the contract. The unit interactions with its environment are very good to excellent.

Assessment of the unit's organisation and life

The BFP unit is organised in a classical way. The director and vice director, meet each Monday morning with the 6 research group leaders. This structure, called the Bureau, is the operational management structure of BFP. One or two members of the administrative and financial team attend this weekly meeting of the bureau, insuring that decisions are promptly executed. Whenever needed, and according to the agenda, other persons can participate to the Bureau, heads of the Platforms for example. The Bureau is assisted by two councils. The unit Council, which is statutory and composed of elected people from all the components of the UMR, meets 2 to 3 time a year. The Strategic Council was created in early 2014 and is composed of the director, vice director, and of two representatives nominated by each research team; it is (will be) in charge of more strategic discussions, in particular related to the inter-team interactions and projects. However this Strategic council does not seem to be efficiently based on what the scientists and technicians reported to the committee during the visit. Also it appears that the information given by the group leaders to the people of their teams is very heterogeneous from one team to another. The BFP direction should improve the communication / information flow inside the unit. Additional small groups, under the authority of the director, are in charge of more specific tasks related to health and safety, quality iprocedures, buildings / infrastructures, web / intranet, life-long training and education…

Short appreciation on this criterion

The unit’s organization and life can be considered as very good.

Assessment of the unit's involvement in training through research

BFP is deeply involved in teaching and training students, and considers it is a strategic investment of the unit. The 7 Professors and 13 Assistant-Professors of BFP, assisted by the PhD "moniteurs" and the ATER deliver more than 4000 hours / year of courses, to which also participate the INRA scientists. Such a major effort led in structuring teaching of Plant biology at the University of Bordeaux, ultimately leading to the creation of the Plant Biology and Biotechnology (PBB) Master program (35 students / year). Over the 2009-2014 period, BFP hosted 54 PhD students (among them 17 were foreigners) and 37 post-docs.

Also a major output of the creation of the INRA / University of Tsukuba joint laboratory was the set-up in 2010 of an exchange program of students (10 students / year in each direction) between the University of Tsukuba and the University of Bordeaux. The success of this joint venture is attested by the fact that the University of Tsukuba chose to open its European Office in Bordeaux.

Short appreciation on this criterion

Involvement of BFP in training through research is excellent.

Assessment of the strategy and the five-year plan

The future of BFP strategy grounds in the past and present, and no major changes are planned: a strong emphasis will continue to be given to the development of the Research Team projects. This is a reasonable strategy based on the fact that the BFP structure is young and that profound changes occurred these last five years. At this step it is important to stabilize the structure to better develop it in the future. However, beyond its success in regrouping teams, the BFP scientific challenge for the next contract will be to structure the unit with a clear strategic plan enabling an added value exceeding the team by team activity.

The visibility and recognition of BFP will continue to be anchored on plant metabolism, flower and fruit development, adaptation to the environment, and on non culturable pathogens diversity and interactions with their host plants and vectors. This will clearly position BFP five year plan within the scope of systems and synthetic biology and of metagenomics. This strategy is clearly efficient as attested by the recent renewal of the INRA / University of Tsukuba joint laboratory, which will enable to host a new japanese assistant professor and PhD students at BFP. However, the recent creation of the Strategic Council is clearly a sign that the BFP direction wishes to pragmatically promote interacting programs between the research teams. Perhaps more important than joint research programs between teams, the amplification of transverse scientific animation around a theme of common interest for various teams (bioinformatics, modelling, creation of common biological resources, etc.) is clearly identified as a major task for the next contract, as well as the emergence of the next generation of group leaders, and eventually in the promotion of new research groups. This policy for the future does not seem so clear for most of the scientist and scientific staff and a strong input in the internal information flow should be considered.

From an infrastructure point of view, BFP will have in the future to accompany the development of the platforms and in particular of the Metabolomic platform. New equipment, including renewal of NMR (Nuclear magnetic resonance), and hiring two additional permanent positions to run the platform are clearly identified, and will require additional space for the platform. Space management will be included in a more general plan aiming to integrate the A3C group, coming from the past UREF unit, within the same group of buildings than the other teams of the units, and it is clearly an important operation to fully integrate the A3C group in BFP. This will imply re-organisation of laboratory and office spaces, and it should benefit from funding within the frame of the next CPER. Finally, the renewal of growth chambers, and of the greenhouses used by the Mollicutes team which are both old and obsolete, are identified as a priority by the BFP direction, but has not yet obtained full support within the frame of the next CPER.

Short appreciation on this criterion

Overall, the five year plan and strategy is very good.

4 • Team-by-team analysis

Team 1: Fruit Organogenesis and Endoreduplication (OrFE)

Name of team leader: Mr Christian CHEVALIER

Workforce

Team workforce	Number as at 30/06/2014	Number as at 01/01/2016
N1: Permanent professors and similar positions	5	5
N2: Permanent EPST or EPIC researchers and similar positions	2	2
N3: Other permanent staff (without research duties)	8	7
N4: Other professors (PREM, ECC, etc.)		
N5: Other researchers (DREM, Postdoctoral students, visitors, etc.)	1	
N6: Other contractual staff (without research duties)		
TOTAL N1 to N6	**16**	**14**

Team workforce	Number as at 30/06/2014	Number as at 01/01/2016
Doctoral students	3	
Theses defended	6	
Postdoctoral students having spent at least 12 months in the unit	7	
Number of Research Supervisor Qualifications (HDR) taken		
Qualified research supervisors (with an HDR) or similar positions	5	4

• Detailed assessments

Assessment of scientific quality and outputs

The Fruit Organogenesis and Endoreduplication (OrFE) team is a medium-sized team within the BFP unit, as it includes at the end of this contract 5 professors and assistant professors, 3 researchers (2 CNRS and 1 INRA), 2 engineers, 6 technicians and 3 PhD students. This team was strongly modified on the 1st of February 2012 when it integrated a group of about 7 members (including 5 tenured staff: 2 engineers including 1 engineer from CIREF, 3 technicians) working on strawberry and coming from the former UR419 UREF (Unité de Recherches sur les Espèces Fruitières). As a result of this fusion, this team is now formed by almost two equal parts, using either tomato fruit or strawberry fruit as models. In tomato, the group has a long and internationally well-recognized expertise in the study of the mechanisms associating the control of cell size (cell proliferation, cell expansion and endoreduplication) with

the size of the fruit. In strawberry, work concentrates on the determinism of floral induction, fruit development and quality. This part also involves the development of generic tools to exploit natural diversity and develop functional approaches in strawberry (collection of diploid strawberry EMS (Ethyl methanesulfonate) mutants for tilling, collection of wild strawberries, high-throughput genotyping array) and has a strong connexion with industrial partners in particular the CIREF (association devoted to breeding programme "Ciref Création Variétale Fraise Fruits Rouges"). The achievements of the team are presented in an integrated manner, mixing the two different plant models and following the process of fruit formation and development along two main research subjects: i) floral induction in strawberry and flower to fruit transition in tomato and Arabidopsis ii) tomato fruit growth with a strong emphasis on the functional role of endoreduplication and the study of its molecular regulators, and genetic determination of fruit quality traits in strawberry. The team describes in the report key achievements for all these subjects. In the wild diploid strawberry continuous flowering is associated with a non-functional FvKSN gene encoding a TFL1 ortholog while in the cultivated octoploid strawberry the same trait is controlled by a major QTL called FaPFRU that is non orthologous to FvKSN. Progress towards the identification of the FaFPRU locus are mentioned. Together, this shows that continuous flowering, one of the main targets of strawberry breeding programs has a different genetic basis in wild and cultivated species and leads to the identification of markers used for marker-assisted breeding. The distribution of endoreduplication in tomato fruit and its consequences at the cellular and molecular levels were finely characterised. Hence, a fluorescence in situ hybridization analysis was developed to quantify endoreduplication on sorted nuclei or in developing fruits, the latter being used to establish an endoreduplication map. Endoreduplication was shown to markedly affect nuclear organisation, with the formation of deep groves of the nuclear envelope and an increase in RNA transcription. The contributions of the APC activator CCS52A and the CDK inhibitor SlKRP1 to the regulation of endoreduplication and fruit development were also characterised in tomato.

Overall during the last contract, the OrFE team produced one international patent and 33 papers in peer-reviewed journals, of which at least half appear as major contributions of the team (with a member of the team being either last or first author), the other papers resulting from collaborations with other groups on the major research areas of the team or on more distant subjects. The overall quality of the publications is very good with an average impact factor of almost 6, though the team does not appear to have a leading position in the very best publications of the group. The team has an excellent national and international visibility both at the scientific and industrial level (strong connection with the strawberry industry). The team has built a solid and large collaboration network both at the national and international levels.

Short appreciation on this criterion

The OrFE team manages to produce very good/excellent basic science on complementary aspects of fruit formation (floral induction, floral to fruit transition, fruit development) in two fleshy fruit models, tomato and strawberry while having very strong connexions with groups of fruit breeders and producers. The team has a very good/excellent scientific production with papers regularly published in the best plant journals. This recently formed team is encouraged to further strengthen the exchanges between the two main research paths developed in the group (for instance by comparing similar processes in the two models and increasing the sharing of technical skills for functional gene analysis), to fully benefit from the unique combination of expertise present in the group and further reinforce their international leading position on the study of the development of fleshy fruits.

Assessment of the team's academic reputation and appeal

Members of the OrFE team (mostly the PI for the tomato part and the scientist that appears to coordinate the strawberry part, but also other members of the group) have given 23 invited talks in conferences or seminars. Among these, one can mention recurrent plenary talks in the meeting of the Society for Experimental Biology. In addition, they were selected 15 times for oral presentations in conferences and presented 22 posters. Altogether, this illustrates their very good effort in disseminating their results. They have developed a large network of national and international collaborations (with more than 20 groups altogether). About half of these collaborations are non-formal while the others are supported by funded projects. The group is part of 4 EU-funded projects, 1 on tomato and 3 on strawberry, one of which being coordinated by a team member. Team members also coordinated two ANR projects during the present contract. They have obtained 7 INRA funded projects and received regional and local support for 16 projects. Altogether, this very active and successful effort allowed the team to raise more than 1.5 million euros.

One of the OrFE team members benefited from a Marie Curie Reintegration Grant and the team hosted 3 temporary assistant professors (ATER), 10 post-docs, 6 PhD students and have 3 ongoing PhD theses. In addition they host several full time or temporary engineers or technicians coming from local or national associations of fruit breeders and producers. The OrFE team is part several national and international networks. The OrFE team organised in 2014 the recurrent International Berry School (IBS).

Together, members of the OrFE team were solicited to review about a hundred manuscripts and 25 projects (ANR, NSF, FWO, Bard…)

Short appreciation on this criterion

The OrFE team has a very good outreach and visibility both for the work performed in tomato and in strawberry. They have developed a dense network of collaborations both with basic science groups worldwide and with local or national Technical Institutes of fruit breeders and producers. They have been involved in numerous national and international projects for which members of the OrFE team are encouraged to take a stronger leading position to even further reinforce their international visibility and recognition.

Assessment of the team's interaction with the social, economic and cultural environment

The OrFE team has a very good/excellent level of interaction with the socioeconomic environment, mostly through their work on strawberry. The OrFE team hosts a CIREF Engineer who appears to work full time in the team and also hosted several temporary engineers or technicians for a total of about 2.5 years. Together with two technical institutes or companies (CIREF and INVENIO, an Aquitaine experimental Center for fruits and legumes), the OrFE team co-constructed FEDER (Fonds Européen de Développement Économique et Régional) projects submitted to the Region Aquitaine Council. Members of the OrFE team also regularly participate in the CIREF scientific council meetings. OrFE members authored two articles in journals intended for a professional audience. A PhD student of the OrFE team received a joint public-private fellowship (bourse CIFRE).

An international patent describing a new strategy to provide plant resistance to RNA viruses was jointly deposited by members of the OrFE and Viro team.

Members of the OrFE team regularly participate to the Salon Aquitec (a job salon in Aquitaine), and to different open days events.

Short appreciation on this criterion

The OrFE team, in particular the part working on strawberry has a long-lasting connection with 2 organisations gathering breeders and producers of berries and other fruits. Because of this tight connection, there is a rapid transfer of the knowledge from the lab to industry as illustrated by the use of markers derived from the identification of a locus controlling perpetual flowering in cultivated strawberry. The interaction of the OrFE team with the social, economic and cultural environment can be assessed as very good/excellent.

Assessment of the team's involvement in training through research

There are 2 professors, 3 assistant professors, and the team hosted 3 temporary assistant professors for one year each. These, but also post-doc and researchers provide around 1200 hours teaching/year. Beside this strong involvement OrFE members also have important functions in the organisation of teaching (organisation and hosting of some 1st and 2nd year Masters), or the overall running of the University of Bordeaux (head and deputy director of Faculty of Biological Sciences, Responsible for the Master program in Biology and Health, Member of the scientific board of the Doctoral School 154 (Life Sciences and Health), member of the board of University Bordeaux1 and of the board of Faculty of Life Sciences). This is clearly much more than what would be expected from an average team. A member of the OrFE team is the French person in charge for the organisation of an exchange program with the University of Tsukuba.

Six students completed their PhD during this contract and 3 more are currently hosted in the team. 62 students came to the OrFE team for internships (average duration 2.5 months). Members of the OrFE team participated to more than 50 PhD and 10 HDR defence committees. Because only 3 HDR are present in the team, researchers and assistant professors are encouraged to get their HDR to further increase the capacity of the team to host PhD students.

Short appreciation on this criterion

There is an excellent involvement of the OrFE team towards training through research. Members of this team are vey active in teaching but have also important responsibilities in organising teaching at the university.

Assessment of the strategy and the five-year plan

The scientific project of the team is mostly built on the results obtained during the last contract. The OrFE team wants to pursue and deepen at the genetic and molecular levels their study of the role of the IMA/MIF2 gene during floral termination and the balance between flowering and runnering in strawberry. Novel candidate genes controlling tomato fruit size will be functionally analysed. Beside this, a strong effort is proposed to further develop the genomic resources and functional genomic tools in strawberry, which will be used to perform new analyses of quantitative genetics and association genetics. Finally, the team has initiated a system biology approach to study the role of endoreduplication in tomato fruits, including a spatio-temporal characterisation of cell division and endoreduplication and the identification of the regulatory gene controlling fruit growth.

Short appreciation on this criterion

The project proposed by the group is logically built on previous results of the group and proposes to further deepen the control of floral induction and development, fruit development in tomato, strawberry and for some aspects Arabidopsis. The team proposes to develop a system biology approach to provide a better understanding of fruit growth. This very promising and challenging aspect could be further strengthened if coordinated with other systems biology approaches developed within the unit. The strategy is less clear in the case of strawberry. The team has identified interesting determinants of perpetual flowering in this species. To develop a strategy of quality trait analysis will probably be challenging in view of the complex genetic basis of cultivated strawberry. A strategy of complementing results in wild and in cultivated strawberry may be of interest. Overall the project can be assessed as very good.

Conclusion

- Strengths and opportunities:

The team has a clear scientific niche and is well recognized at the national and international level. The team member expertise is very complementary.

The strong connexion with the plant industries offers a unique opportunity to produce excellent basic science while developing tools and knowledge that can be rapidly used by partners.

- Weaknesses and threats:

Several members of the team have a strong involvement in teaching, which is good but very time consuming.

Several members of the team are expected to leave it (retirement) during the next contract, leading to uncertainties about the ability of the team to maintain its strong effort on different models and research themes.

The team is engaged in an ambitious system biology project, for which novel expertise needs to be found either within the team (via the recruitment of a dedicated scientist) or through external collaboration.

- Recommendations:

- reinforce the link between work performed on the two main plant models;

- strengthen the link with industrial partners allowing the application to alternative sources of funding;

- reinforce the international leading position through the coordination of international projects;

- set-up a strategy to recruit more technical staff and scientists to allow developing the current projects and anticipate the retirement of several team members.

Team 2: Functional Genomics of Fruit Development

Name of team leader: Mr Christophe ROTHAN

Workforce

Team workforce	Number as at 30/06/2014	Number as at 01/01/2016
N1: Permanent professors and similar positions	1	1
N2: Permanent EPST or EPIC researchers and similar positions	4	4
N3: Other permanent staff (without research duties)	6	6
N4: Other professors (PREM, ECC, etc.)	1	1
N5: Other researchers (DREM, Postdoctoral students, visitors, etc.)		
N6: Other contractual staff (without research duties)		
TOTAL N1 to N6	**12**	**12**

Team workforce	Number as at 30/06/2014	Number as at 01/01/2016
Doctoral students	1	
Theses defended	4	
Postdoctoral students having spent at least 12 months in the unit	2	
Number of Research Supervisor Qualifications (HDR) taken		
Qualified research supervisors (with an HDR) or similar positions	2	3

• Detailed assessments

Assessment of scientific quality and outputs

The team GFDF is a medium size group with around 6 scientists and 6 technicians, essentially from INRA but also two university assistant professors and a professor from Japan. The group works essentially on characters that define fruit development in tomato and vitamin and fruit cuticule biosynthesis. In these subjects they have published a number of articles in international journals. They have also developped an EMS mutagenised platform in microtom that is used for forward and reverse genetics following the TILLING procedure. This mixed activity has resulted in 40 articles most of them in collaboration with international groups, from those 12 articles have a member of the team either as a first or last author. In general terms, the team publishes an average of two articles of their work in high rated plant journals (Plant Cell, Plant Physiology or Plant Journal). It has also collaborated with the tomato genome project. The general activity of the group can be qualified as good. It is a group that has a very good network of international collaborations. It has a standing relation with Tsukuba and a professor of this Japanese university

working with them, they have taken part in collaborative projects such as the genome sequencing of tomato and they are active in the International Solanaceae SOL initiative that will have its meeting in Bordeaux this year.

Short appreciation on this criterion

The team GFDF is a medium size group with around 6 scientists and 6 technicians, essentially from INRA but also two university assistant professors and a professor from Japan. The group works essentially on characters that define fruit development in tomato and vitamin and fruit cuticule biosynthesis. They have also developped a EMS mutagenised platform in Microtom that are using for forward and reverse genetics following the TILLING procedure. In general terms, the team publishes an average of two articles of their work in high rated plant journals (Plant Cell, Plant Physiology or Plant Journal). The team has a continued activity, especially in collaborative work. The scientific quality and outputs can be qualified as good to very good.

Assessment of the team's academic reputation and appeal.

The GFDF team is mainly formed by INRA scientists with a small number of assistant professors of the university. They have taken part in international and French projects and in the majority of cases they do not have a function of leadership. They have taken part in a number of European projects and they have an ANR project on the genetic analysis of stress adaptation in tomato. They have many international collaborations from Japan to Argentina and they are going to organize the meeting of the Solanaceae SOL network in 2015. They have directed 4 PhD thesis and 5 postdocs, essentially from the laboratories they collaborate with. In general terms it can be considered that the teams reputation and appeal is very good.

Short appreciation on this criterion

The academic reputation and appeal of the team is very good. The team has a strong network of national and international collaborations. They are involved in a number of diverse projects, some of which have produced very good publications but others are not particularly productive. They are invited to international meetings and seminars. The team organizes the Solanaceae meeting in Bordeaux in 2015.

Assessment of the team's interaction with the social, economic and cultural environment

It could be expected that, because they have focused in the development of a TILLING platform, they would have many collaborations with industry. They only document a relatively small collaboration with Syngenta and they collaborate with academic groups. They have also presented two patents during the last period.

Short appreciation on this criterion

The interactions of the team with its environment are very good. They have a large network of international collaborations and contacts with industry. They have provided the use of the TILLING platform in tomato that may be an important tool to produce new alleles of genes of interest for both academic and industrial research.

Assessment of the team's involvement in training through research

There are 2 assistant professors in the team that has trained overall 4 PhD students and hosted 5 post docs.

Short appreciation on this criterion

Involvement of the team in training through research is excellent to outstanding. The team has a number of Ph.D. students and they have had five Ph.D. thesis during the last period. They have been promoting international collaboration of the unit and in particular that have been instrumental in the cooperation with Tsukuba University.

Assessment of the strategy and the five-year plan

The strategy that is presented appears to essentially be a continuation of what the team has already been doing, although they recognise that their productivity is not excellent. They also recognise that they have interesting

tools that will provide a way to maintain their present collaborations and that their present ANR project will open new perspectives.

Short appreciation on this criterion

The five year plan of the team is very good. The team presents a plan that is a continuation of present activities. They will probably continue a moderate to high activity. They should consider that tomato genetics is a very valuable and very competitive field from both scientific and industrial points of view and that they should concentrate in the most interesting projects in view of their past productivity.

Conclusion

- Strengths and opportunities:

The team is very strong in developing tools such as TilLLING and they have collaborated in a genome sequencing program. They have an excellent international network. Their funding capacity is good and that will allow them to continue their work in the next years. They are working in a system, tomato, that has a number of genetic tools, that have been developed in the recent years and that has a big academic and industrial interest.

- Weaknesses and threats:

The group appears disperse in a number of small projects that one by one will probably not produce a large impact in the next years. It is possible that they could build around the possibilities that their ANR project will open for them.

- Recommendations:

It is important not to disperse on too many small projects. The TILLING platform is a very useful tool that they may use to further develop their interesting international network of collaborations. They should offer their knowledge and tools to new industrial partners.

Team 3: Metabolism

Name of team leader: Mr Yves GIBON

Workforce

Team workforce	Number as at 30/06/2014	Number as at 01/01/2016
N1: Permanent professors and similar positions	8	5
N2: Permanent EPST or EPIC researchers and similar positions	3	3
N3: Other permanent staff (without research duties)	8	7
N4: Other professors (PREM, ECC, etc.)		
N5: Other researchers (DREM, Postdoctoral students, visitors, etc.)	1	1
N6: Other contractual staff (without research duties)	3	3
TOTAL N1 to N6	**23**	**19**

Team workforce	Number as at 30/06/2014	Number as at 01/01/2016
Doctoral students	4	
Theses defended	4	
Postdoctoral students having spent at least 12 months in the unit	4	
Number of Research Supervisor Qualifications (HDR) taken		
Qualified research supervisors (with an HDR) or similar positions	5	4

• Detailed assessments

Assessment of scientific quality and outputs

The team metabolism is relatively large, at the end of this contract it comprised 8 professors and assistant professors, 3 researchers and at least 8 engineers and technicians. The distribution between INRA and university staff is relatively well balanced. At the end of the contract a group of three professors/ assistant professors will be leaving the structure. In the document they indicate that they decided to focus their efforts on one project, namely Fruit Integrative Modelling. Nevertheless, it is also stated that a significant part of the research dealing with epigenetics will be discontinued (this is the small group leaving). In addition they have performed some work that they qualify as miscellaneous *ie* associated with their metabolic analysis capacity and the Ibiza platform that they also manage. Concerning their mainstream project they have divided it into several subsections, growth and sample collection, enzyme and metabolite profiling in developing tomato fruits, sub-cellular compartmentation and modelling of fruit metabolism. The last part goes well into systems biology and is assisted by external modellers and mathematicians. A large part of the work has been done with tomato, but many studies were also performed with melon. Of the 5 papers

that they have selected as most significant two deal with melon, *ie* NMR and mass spectrometry spatial analysis of melon metabolites (Anal Chem), spatial and developmental combinatorial metabolomics (New Phytol). Two others deal with tomato, *ie* enzyme profiling in fruits, (Plant Physiol) and enzyme and carrier properties in relation to vacuole expansion (Plant Cell). The fifth paper is a review in Trends in Plant Sci. Overall, in the last contract the group has produced 68 papers. They are clearly lead or first authors in at least 16 of these papers, and at least three papers are the results of cooperation between this team and the GFDF team of BFP. Quite a number of papers result from a cooperation between the group leader and his former PI employers in Germany who are internationally renowned. Overall the scientific production is of very good to excellent quality with mean impact factors of the papers in peer reviewed journals close to 5. Between 2009 and 2015 the leaders of this group have had their work cited more than 1300 times for a combined 61 new papers which is excellent. Some of these papers still relies on earlier work of the team leader with the Golm group. Some other papers probably listed in miscellaneous also deal with other experimental models as poplar, Vitis, strawberry, pine moth etc… This team has very good national and international connections and recognition. In the future the team should expand its activities on its mainstream models and continue to gain its full autonomy, a way on which it is clearly engaged now.

Short appreciation on this criterion

A very good to excellent scientific production linked to their technical competence in metabolomics and excellent connection with top international labs of the domain. Team Metabolism is encouraged to concentrate on its favorite experimental models. The latest papers indicate that they are taking off on their own in tomato metabolomic analyses linked to vacuolar expansion in particular.

Assessment of the team's academic reputation and appeal

This point has been partially addressed above and the strong relations with the Golm lab outlined. Between 2009 and 2014 they have given 44 invited conferences, half of them in foreign countries, including US, UK, Spain, Germany, China, The Netherlands, Switzerland and India. In most of these, the group leader was the one invited but at least three other colleagues have also given regularly seminars in national and international conferences. There are also a large number of oral and poster communications which indicate that the group has been very active in disseminating its results. They have participated 6 international programs with a combined funding of ca 700 k€. The group leader has coordinated the Eranet EraSysBio+ FRIM project, which involved French, British, German, and South-African partners.They have been even more successful with the French funding system totaling 2.9 millions € over the contract period. The coordination of the Ibiza platform Metabohub (overall 3.4 million €) accounts for a large part of this financial bonanza. They have also obtained and sometimes coordinated (2) at least 10 regional grants with a total of ca 25 k€ for the team and 500 k€ for the platform equipment plus two small INRA contracts.

Team Metabolism has collaborations with 8 international laboratories in Germany, China, UK, US and Italy. They also report 16 French partners and their network is thus very broad. They have projects together with GFDF, OrFE, A3C and the Virus Teams of BFP. They participate actively to the local “Structures Fédératives de Recherches” and coordinate the French Metabolomics Network. They have organized 8 meetings, all in France. They are also participating to INRA Metaprograms. The team has hosted two senior scientists for a couple of months and 4 post docs. They have trained 4 PhD students who already defended their thesis and 4 additional students are still in the process of finishing.

Their expertise has been sought internationally for reviewing US, Russian and Czek grants. No international prizes are listed but there are invitations as honorary professor in China and for lecturing at College de France.

Short appreciation on this criterion

Remarkable output there. This team is extremely well recognized and used internationally for its metabolomics knowledge. The team has an extended national and international network and a strong international recognition. Excellent activity there.

Assessment of the team's interaction with the social, economic and cultural environment

One patent has been filed for the use of natural compounds against aphids. They have participated to Aquitec and Village des Sciences. They report partnerships with Syngenta, Bayer, Vanderhave, Biogemma and Physcsher but this is not further documented.

Short appreciation on this criterion

The involvement of the team in that area is very good. They are doing fundamental rather than applied research and selected to use the platform rather for cooperative projects than for service.

Assessment of the team's involvement in training through research

There are 3 professors and 5 assistant professors in the team, but three will be leaving in the next contract. They are of course heavily involved in teaching either at the undergraduate and graduate levels. The team has trained overall 8 PhD students (4 already finished) and hosted 4 post docs. BFP is involved in a remarkable international exchange program with Tsukuba but it is not clear if the metabolism team is involved in that aspect. The future of PhDs and post docs is not mentioned in the team report. A staggering number of Master students has been trained for metabolomics.

Short appreciation on this criterion

A very significant part of the staff is involved in teaching, but still the training numbers of PhD students are not huge with respect to that teaching potential. They are training a very high number of Master students in metabolomics. For this item the output is very good to excellent.

Assessment of the strategy and the five-year plan

Much of the project is wet lab experiments combined with modelling. They want to capitalize on their metabolomics capacities to study the environmental influence on traits as fruit set, biomass and quality. This will be done together with a team in Avignon, Molli, Orfe and GFDF of BFP. They want in particular to understand the paradox that enzyme capacities nearly always exceed fluxes. In the document the project is very general and it is not clear which steps they will take to modify those fluxes. The oral presentation did little to clarify this point. While from their past achievements and technical competence it is clear that they will continue to perform high standard research, a clear research plan is not available yet. What organism will they preferentially use? What steps will they take to modify the fluxes?

Short appreciation on this criterion

From their past achievements and technical competence it is clear that they will continue to perform high standard research, but a clear research plan is not ready yet. The team is rated very good for this section.

Conclusion

- Strengths and opportunities:

The team is very strong in metabolomics and associated services. They are extremely well recognized internationally. So far their funding capacity is excellent and they have created a remarkable metabolome network in France with very good international connections.

- Weaknesses and threats:

In the next contract three permanent members of the team are leaving. On the one hand this might weaken the team but on the other hand it might be an opportunity to center their work on metabolomics solely on tomato or melon (other crops have been mentioned in the oral presentation). They rely mostly on public funding for their grants, if this source dries up in the future they'd better look into alternative funding.

- Recommendations:

Do not disperse on too many experimental models. Providing service on the metabolome platform is fine but should not be detrimental to the mainstream project. Try to diversify funding and secure private funding. The platform should develop its own strategic vision and make plans for a specific research direction in addition to its role in providing a collaborating partnership to existing research programs, so that the team has a unique scientific identity, as well as being a preferred technology provider.

Team 4: A3C, Adaptation of Sweet Cherry to Climate Change

Name of team leader: Ms Elizabeth DIRLEWANGER

Workforce

Team workforce	Number as at 30/06/2014	Number as at 01/01/2016
N1: Permanent professors and similar positions		
N2: Permanent EPST or EPIC researchers and similar positions	2	2
N3: Other permanent staff (without research duties)	9	9
N4: Other professors (PREM, ECC, etc.)		
N5: Other researchers (DREM, Postdoctoral students, visitors, etc.)	1	1
N6: Other contractual staff (without research duties)		
TOTAL N1 to N6	**12**	**12**

Team workforce	Number as at 30/06/2014	Number as at 01/01/2016
Doctoral students	2	
Theses defended	1	
Postdoctoral students having spent at least 12 months in the unit	1	
Number of Research Supervisor Qualifications (HDR) taken	1	
Qualified research supervisors (with an HDR) or similar positions	1	1

• Detailed assessments

Assessment of scientific quality and outputs

A part of the team results arises from previous UREF programs. They rely on plant material from the key partner Bordeaux fruit experimental unit (Unité Expérimentale d'Arboriculture, UEA393). These researches led to numerous advances. Genetic analyses were performed on both *Prunus* (resistance in *Prunus* rootstocks) and chesnut. In *Prunus*, resistance genes to root-knot nematodes were located on Linkage Groups, a MAS was performed and a gene (MA) was cloned and functionally validated. In collaboration with Spain (CSIC, Consejo Superior de Investigaciones Científicas Zaragoza, Spain) genetic control of iron chlorosis in *Prunus* was analyzed (QTL analysis) and conducted to the identification of a candidate gene related to iron metabolism. On chestnut, the aim was to identify the genomic regions involved in the resistance to *Phytophtora* in two progenies (susceptible and resistant). A H2020 project (GRChestnut) is in the process of evaluation. Fruit quality traits were analysed in peach and sweet cherry. Sets of candidate genes were selected from the peach and mapped on peach and strawberry, which confirmed synteny. A larger set of CGs were mapped on the *Prunus* reference map. Analyses of the D locus responsible for the non-acid fruit

trait in peach were performed and RNA-Seq allowed detecting differential expression of one gene in the D locus. Analyses of peach texture were assessed in peach genotypes with contrasted texture and fruit shape in the frame of the EU FP6 ISAFRUIT project and allowed to identify compositional and structural differences between them. The peach S locus (dominant gene regulating flat *vs.* round fruit shape) was mapped and co-localized with a set of SSR markers used in breeding programs. In the EU FP7 FruitBreedomics project, the A3C team identified a set of SNPs located in the S locus. Additional studies on fruit species evolutionary history were conducted to understand mechanisms shaping the genetic polymorphism of cultivated species and of their wild relatives.

Results from the team are also related to A3C scientific project. Their research plans to identify the a) best phenotypic criteria to study phenology-related traits that can allow cherry varieties to adapt to climate change conditions, b) the genetic determinism of phenology-related traits and the molecular basis involved, c) models to predict phenological traits. A3C has used/developed a battery of tests for estimating both chilling requirement and heat requirement for flowering. These tests range from simple (*ie* monitoring of the phenology) to precise high-throughput descriptors (*ie* based on NIRS). In order to decipher the genetic determinism of phenology-related traits A3C has used complementary approaches (QTL detection, transcriptomics and association genetics). For these studies A3C relied on data arising from ongoing projects (*eg* QTL analyses used data from ISAFRUIT, SNPs developed in the RosBREED). This allowed A3C to identify stable QTLs, using fruit genome sequence data, to highlight CGs in major QTLs and identify key genes for chilling requirement and flowering date. Phenological models for predicting FD for sweet cherry all over Europe are developed in order to predict the timing of phenological events based on climate variables such as temperature and photoperiod. This work was conducted using tools from the CTIFL and in the context of COST Action FA1104. A3C studies key quality traits (rain-induced fruit cracking, fruit weight and firmness). Different phenotyping protocols (field and tunnels) were tested in order to characterize cracking tolerance/susceptibility in large segregating populations, which allowed in the field the detection of a high number of stable QTLs. In collaboration with Michigan State University A3C detected the FW2.2/CNR (cell number regulator) gene and A3C was the first to show a high correlation between cherry firmness and fruit weight. Acids and sugars were studied by conducting basic phenotypic and metabolomics analyses (collaboration Meta team).

Among other activities, A3C is part of the Prunus European Cooperative Programme for Genetic Resources network and manages its Data Base. A3C drives the sweet cherry breeding program and implements MAS approaches, while exploring new possibilities, such as genomic selection. Genotyping at the most promising QTLs is underway. Sub-sets of individuals presenting the best and worst allelic combinations will be selected. These genotypes will be phenotyped for MAS validation purposes. In collaboration with CEP Innovation, A3C had a commitment to produce a large number of new hybrids planted in the field. The most promising sweet cherry hybrids, represented by two clones per genotype, from INRA or any other interested breeder (including foreign programs), are evaluated in three multiple sites with common phenotyping protocols. Under GEVES supervision, A3C conducts DUS (Distinction, Uniformity, Stability) studies for sweet cherry varieties, as well as for their associated rootstocks. The A3C team, in close collaboration with UEA393, has the obligation of conserving a DUS reference sweet cherry varieties present both in the French and European varieties catalogues.

Short appreciation on this criterion

- the team is multidisciplinary, with strong complementarity strong skills/expertise at all levels of integration scale;

- A3C generated a range of valuable results, towards CG identification and functional validation, for fruit quality traits;

- A3C has a range of collaborations, local (Meta team, UEA393 etc), national (LIPM Toulouse, UMR BIA, INRA Nantes, URGV Evry, UMR AGAP) and international (CSIC, Zaragoza, Spain; Michigan State University; Sainstbury Laboratory, UK);

- A3C is part of the *Prunus* ECP/GR network and manages its Data Base;

- the scientific production is of good to very good quality with mean impact factors of the papers in peer-reviewed journals close to 3. During the 2009-2014 period the team produced 31 publications;

- publications are performed for 60% in excellent or exceptional journals, with a volume and a good level of quality productions in disciplinary and thematic areas;

- overall the scientific quality and outputs are rated good to very good.

Assessment of the team's academic reputation and appeal

Among projects where A3C was involved, the team a) participated to one US (RosBREED) and three EU (FP6 ISAFRUIT; FP7 FruitBreedomics and STONE) projects, two COST Actions (873 and 1104), b) was involved in the proposal of two EU H2020 projects among which one as coordinator (DivCherry). A3C coordinated the Cost 1104 and participated to Isafruit, which shows a very good level of involvement in research projects, for a combined substantial funding of ca 400 k€. Moreover A3C participated to six national projects and among them four as coordinator a combined funding of ca 150 k€. This shows the very good level of academic reputation of the team, demonstrating that it is well incorporated in various networks. A3C has also obtained regional grants with a total of ca 95 k€ for the team and 500 k€ for the platform equipment plus two small INRA contracts. A3C members participated in the evaluation of four international projects.

A3C is involved in a very large network of collaborations that led to publications involving partners as co-authors, namely 27 among the 30 publications (10 with French, 11 with European and 6 with other international partners). For 12 of these joint publications, team members are either first or senior authors, reflecting A3C team leadership. The expertise of A3C team was solicited for the publication of several chapters of three books. A3C members reviewed 42 papers during this period. The group leader of the A3C team is associated editor of two international journals (Tree Genetics & Genomes; BMC Genomics) and had the responsibility of editing 140 publications.

A3C members gave 13 invited conferences in foreign countries where the group leader was mostly the one invited. All together, A3C members gave 18 oral presentation (and around 33 poster communications) and among 5 in France, in national and international conferences.

The team hosted five senior scientists, mostly from South America, for a couple months and 1 post doc with CEP Innovation. They have trained 2 PhD students who already defended their thesis and 2 additional students began in 2014.

Team members participated in scientific committee of three congresses.

A3C has two patents on prunus and apricot.

Short appreciation on this criterion

- collaborations are numerous not only in France but also internationally;

- production in peer reviewed journals is very good as it is led by a few scientists that regularly publish at more that the mean level;

- A3C members gave a range of invited lectures at international conferences, showing the very good level of the team;

- A3C coordinates the COST Action FA1104 which provides partners and network from the private sector with very good interactions;

- although A3C team members are not so much coordinating international projects, they are involved in several very good key projects and networks;

- overall the the team's academic reputation and appeal are rated very good.

Assessment of the team's interaction with the social, economic and cultural environment

The team collaborates with CEP Innovation, which is editor of INRA sweet cherry varieties and financially supports the A3C breeding program. A3C also works closely with producers associations (AOPs cherry, plum and walnut) and technical institutes (Ctifl, BIP, Stations Régionales). Interaction between A3C and the private sector is included in the COST Action FA1104 (socioeconomic and dissemination issues). Moreover the A3C team is an expert of the DUS tests for sweet cherry and rootstocks.

Short appreciation on this criterion

- A3C has strong and close relationships with the socio-economic sector of fruit species;

- the COST Action FA1104 is a key factor for very good interactions between A3C and the private sector;

- A3C team members participate to the scientific boards or expertise committees of several private and public structures;

- overall the interactions of the team with its environment are rated very good.

Assessment of the team's involvement in training through research

A3C had two PhD students and two arrived 2014, took part in five projects. PhD student having finished their project have at least one publication. Knowing that the number of searchers is low in this team, this is a very good involvement in training. Moreover, A3C members took part to PhD defence juries.

UREF and A3C team welcomed research 46 students over the past 5 years including 10 Master 2 students and 7 students from engineer schools. In the frame of COST Action FA1104, 4 foreign students made short term scientific missions in the team. In addition a PhD student from Spain was welcomed during three months.

Four A3C team members were involved in the management and activities of the Prunus GRC, which is a certified IBiSA platform.

Short appreciation on this criterion

- although the amount of PhD trained is very good, the committee recommends that A3C members have more HDR;

- A3C members are involved in student training, through three main activities: teaching, internships and international programs;

- UREF and A3C team welcomed a large range of research students;

- the implication of A3C in coordinating the COST Action FA1104 gives very good opportunities to welcome/assist foreign students for scientific missions in the team;

- A3C team members were involved in the management and activities of the Prunus GRC;

- overall involvement of the team in training through research is rated very good.

Assessment of the five year plan and strategy

A3C studies sweet cherry adaptation to climate change. The research relies on integrative biology approaches using multidisciplinary approaches. The choice of this species is justified on one side by its high sensitivity to climatic changes (increases in temperature which affects production *via* phenology and its relation with blooming and pollinators; increases in precipitation responsible of losses due to fruit cracking), on the other side by availability of large genetic resources.

In this context the work of the team is focused on phenology and fruit cracking, trying to identify the associated key mechanisms and their molecular basis/mechanisms. The aims are to highlight genetic mechanisms involved in phenology and fruit cracking traits, their interaction with environment. Through modelling and defining ideotypes, then using MAS, A3C aims to select high quality fruit cherry varieties adapted to climatic conditions, taking into account fruit quality traits.

The objectives are therefore related to fundamental questioning in the perspective of satisfying producers and consumers.

A3C research activities will be conducted through a large collaborative network developed within the COST Action FA1104.

Short appreciation on this criterion

The project is of very good quality and realistic. It is based on many key collaborations.

A3C research project relies on integrative biology approaches using multidisciplinary approaches.

The team should precise the way they can contribute to, and feed themselves, on modelling for defining ideotypes. Specially, some collaborations, discussions either with other BFP teams (apart from the Metateam) for

example concerning cuticule (with GFDF) or even outside the BFP Unit (*eg* with UMR EGFV Bordeaux, on fruit quality traits) could benefit to the team research.

Conclusion

Strengths and opportunities:

- multi-disciplinary team with integrative and complementary approaches;

- availability of valuable genetic resources and collaboration with the UEA393;

- strong support and dialog with private sectors;

- international leadership and partnerships through the COST Action FA1104;

- adaptation to climate change has gained both regional, national and international interest;

- participation to the sequencing of the sweet cherry genome.

Weaknesses and threats:

- difficulties associated with cherry tree long growth cycle;

- lack of physiology expertise within the team highlights the necessity to collaborate within the unit or outside for gaining them, especially on fruit quality traits;

- funding proves to be difficult to obtain, and in particular only short term projects are funded which is incompatible with research on perennials.

Recommendations:

- continue the efforts devoted for coordination of emblematic international projects;

- enlarge the capacity to host PhD students through HDR within A3C researchers;

- precise the strategy concerning modelling for defining ideotypes for fruit quality traits. Search for more collaborations on that topic.

Team 5: Plant viruses

Name of team leader: Mr Thierry CANDRESSE

Workforce

Team workforce	Number as at 30/06/2014	Number as at 01/01/2016
N1: Permanent professors and similar positions	1	1
N2: Permanent EPST or EPIC researchers and similar positions	7	6
N3: Other permanent staff (without research duties)	20	19
N4: Other professors (PREM, ECC, etc.)		
N5: Other researchers (DREM, Postdoctoral students, visitors, etc.)	1	
N6: Other contractual staff (without research duties)	3	3
TOTAL N1 to N6	**32**	**29**

Team workforce	Number as at 30/06/2014	Number as at 01/01/2016
Doctoral students	5	
Theses defended	6	
Postdoctoral students having spent at least 12 months in the unit	10	
Number of Research Supervisor Qualifications (HDR) taken		
Qualified research supervisors (with an HDR) or similar positions	8	7

• Detailed assessments

Assessment of scientific quality and outputs

The team "Plant virus" develops a multidisciplinary program composed of several distinct subprojects, combining remarkably fundamental and translational research. All activities are centred on RNA viruses which represent over 90% of plant viruses.

The group activity is defined along two main lines: i) the identification of mechanisms and factors controlling plant virus interaction, with translational research toward plant resistance and ii) the development and the use of tools to describe and analyse viral diversity, with translational development in diagnostic.

Concerning the mechanisms of plant-virus interaction, researches of this group are based on the paradigm that the identification of genes responsible for susceptibility in host plants later allows to find/create variations in these susceptibility genes and thereby generates new putative recessive resistance. This approach is both providing new knowledge on the process of virus cycle into plant hosts and potential application to interfere. The group proved

successful in the past particularly on the example of translation initiation factors eIF(iso)4E interacting with the Vpg, and more recently used Genome Wide Association to identify new candidates (rpv1, RTM, sha3…). These programs are developed both on the At/Potyvirus (LMV, PPV) biological model and on perennial Prunus trees infected by another potyvirus (PPV). The research projects are aslo dealing with resistance breaking and the mechanisms explaining it, as well as with virus intra-plant movment that is often connected to plant resistance. These researches are overall extremely well supported by EU, other international and national funding agencies, and we can cite EU FP6 plant virus network (ResistVir), SharCo EU FP7 project, EU Stone project, EU MARS Project and ANR Plant-KBBE COBRA etc… (other INRA and Region projects are also regularly funded).

Regarding viral diversity, the group is very active both through traditional sequencing and diagnostic, and through the development of NGS pipelines. Notably, they have analyzed the natural variability of PPV and created a database ("Sharco") with over 800 isolates, allowing for example the reconstitution of the evolutionary history of the PPV strain-M, the discovery of new cherry-adapted variants etc… This database is made available to the community. They have set up a NGS approach widely applicable to any plant sample, based on dsRNA deep sequencing. This has led to translational diagnostic research, with the creation of a platform for detection and diagnostic opened to many institutional and private partners, as well as to fundamental research on viral metagenomics and initiation of molecular ecology. Fundamental NGS-related projects are those in Kerguelen Islands and horticultural settings in Aquitaine (France), with the aim to compare the two drastically different environmental context: dominant dsRNA virus in Kerguelen and more ssRNA in highly anthropized environment.

Finally, the group also has interesting activities (more marginally developped but rather significant) in the area of Bio- and Nano-technological applications. Some group members are actively leading researches on the use of plant viruses as functionalized nano-particules, and others are involved in the development of an internal platform for expressing foreign proteins in plants, seemingly to the benefit of other groups in the unit.

The scientific production is quantitatively excellent with 10 to 20 papers per year, very numerous book chapters and edited books. The impact of the journals is very good, but could be further improved, based on the large size of the group, on the elevated number of permanent staff and thus on the capacity to maintain long-term original project and to sustain the level of risk often associated with novelty. There is an impressive number of invited seminar/conferences, for various group members, and plenty of communication in national and international meetings (15-20 per years, plus posters). This is a sign of an intense activity for communicating scientific results. It is noteworthy that 2 patents were produced during the period, illustrating an elegant combination of fundamental and translational research.

Short appreciation on this criterion

The scientific output is very good to excellent. The scientific production is quantitatively remarkable, members of the group are regularly invited around the world to present their results, and the collaboration network is very impressive. The quality/originality of scientific production could be further improved, and the group certainly has the capacity to occasionally make major breakthroughs in the field and thus target even higher profile journals.

Assessment of the team's academic reputation and appeal

There are several undisputable criteria attesting the outstanding academic reputation and appeal of this group. The group is giving huge amounts of invited conferences and seminars internationally, they communicate their results extremely frequently and everywhere, they obviously attract lots of visiting scientists, post-docs and students. A remarkable point is the ANR-Chaire d'Excellence for A. Abbott (Clemson University), who spent nearly two years in the lab, further connecting with the consortium for sequencing of peach.

The group has an incredibly long list of collaborations; most of them are generating co-signed papers, so are clearly validated as efficient collaborations. Most (or at least many) of these collaborations are in fact sollicited from outside labs, attesting again the visibility and reputation of this group in plant virology.

Among the numerous projects granted by EU and other funding entities, the group is often coordinator or INRA representative, further confirming its strong national and international reputation and impact.

Short appreciation on this criterion

The group appears highly attractive for foreign scientists, post-docs and PhD Students. The group is leading major European and other international projects, and its members are invited very frequently to conferences and

expert panels, at the international level. Hence, that this group academic reputation and appeal in the international plant virology community is outstanding appears evident.

Assessment of the team's interaction with the social, economic and cultural environment

Through various research programs, notably the EU funded project(s) on PPV-Prunus interactions, the group transfers the genetic data and resources on new putative resistance to SMEs. A good example is the marker assisted selection program launched on apricot in the project EU MARS which gathers 9 labs and 8 SMEs. The development of large bank of Prunus natural accessions, and of artificial EMS mutants, are made available and tested in the field in Bulgaria for searching for new recessive resistance.

The group is involved in the analysis for safety of the use of trangenic Prunus in the field and is producing new Prunus lines resistant to PPV, which has an important societal impact.

NGS approaches for identifying new RNA virus (based on dsRNA analysis) have been set up and are now provided as a platform opened to (and indeed used by) seed companies, technical institutions, extension services, grower groups and diagnostic service providers.

Involvement in expert panels is important, in particular for Sharka and other quarantine and/or invasive viruses (EFSA Panel for example).

Short appreciation on this criterion

The group has an excellent to outstanding participation to social, economic and cultural environment by providing information on the impact of GMOs, and by working on risk assessments, participating in various expert panels for national, european and international institutions. In addition the group also provides materials, technologies and facilities to the economic network, notably through its NGS-diagnostic platform, and genetic resources.

Assessment of the team's involvement in training through research

The investment of the group in teaching and training through research is excellent with regard to the small number of university staff. The group is hosting a remarkable number of students, over a hundred in the period, including a high number of PhDs (for a French standard). They do also have a remarkable list of post-docs and visiting scientists. They participate in training schools in various disciplines and countries.

Short appreciation on this criterion

The involvement of the members of the plant virus group in teaching and training through research is excellent. They are key in teaching plant sciences at the university and managing the doctoral school, they give training courses in various locations throughout the world and host a high number of visiting scientists, post-docs and students.

Assessment of the strategy and the five-year plan

The group proposes to continue most of the previous research lines with a few inflexions. A Tobacco/PVY action is planned as a single collaborative effort with industry. One part of the Sharka disease project will be given up after retirement of a scientist. The activity on plant virus (potyvirus) movement will be further developed, and the group has initiated a line of research concerning the role of basal plant defense against viruses. There is also a will to move from the descriptive research on virus diversity towards pertinent virus-ecology questions, though they were not detailed at this point.

Regarding inflexions compared to the past period, the strategic arguments are often related to the capacity to raise funds. While it is clear that this is a basic requirement, the group should also put forward the will to maintain or develop some risky projects (even if not funded specifically). The size of the group, the number of permanent staff and the available mutualized funds likely allow such strategic decision, at least for a while, and this would perhaps allow to invest on a few novel ideas, some of which would likely pay off in the longer term.

Some more specific comments (not exhaustive) are given next on some of the inflexions proposed: the project on intrinsic disorder in protein and its putative role in virus adaptation appears to have very good potential, that on

potyvirus movement might be set in a more ambitious/original perspective because of the international competition in the field, and that on basal plant resistance needs to be developed further than the "proof of concept" (which is likely already the case, but was not developed in the document and presentation). The development proposed in virus ecology is based on the technical expertise of the group, and key conceptual questions remain to be defined or exposed (they were not clearly stated in the document and presentation). The group already has a number of collaborations with ecology labs, and it is undoubtedly in the process.

Short appreciation on this criterion

The group basically proposes to continue successful lines of research and this makes the overall project very good to excellent, just like that they pursued for the last 5 years. This next 5 years plan does not firmly and definitely announce the end of many subprojects, but nevertheless proposes a few new orientations. As it is written, one criticism could be that the group often leaves the decision of the fate of a subproject to its capacity to attract funds. Some of the projects in this situation appear to be conceptually original and therefore deserve an extra effort to be maintained and actively pursued.

Conclusion

- Strengths and opportunities:

- multidisciplinary complementary approaches;
- nice balance of fundamental and translational research;
- strong involment in training through research;
- strong visibility, academic reputation and attractiveness;
- important number of permanent staff and support scientists.

- Weaknesses and threats:

The publication strategy might be slightly twisted towards higher impact journals. The group generates very good and abundant results but a "spark" in a big journal once in a while would be a plus.

- Recommendations:

The group should continue its balancing of mechanisms and diversity studies and of fundamental and translational research. This in itself is an original strategic positioning that is extremely favourable and that should be carefully maintained.

The group might want to shift its publication strategy to target higher impact journals. A collective decision should be made on whether a project should be maintained or discontinued with more scientific and visionary arguments than the fact that it is going to be funded or not. Long periods of "bumping against a wall" (whetheher this wall is technical or conceptual) in a project are sometimes key to produce results in the longer term that are exceptionally novel.

Team 6: Mollicutes

Name of team leader: Mr Alain BLANCHARD

Workforce

Team workforce	Number as at 30/06/2014	Number as at 01/01/2016
N1: Permanent professors and similar positions	3	4
N2: Permanent EPST or EPIC researchers and similar positions	6	6
N3: Other permanent staff (without research duties)	11,5	11,5
N4: Other professors (PREM, ECC, etc.)		
N5: Other researchers (DREM, Postdoctoral students, visitors, etc.)	1	3
N6: Other contractual staff (without research duties)	1	
TOTAL N1 to N6	**22,5**	**24,5**

Team workforce	Number as at 30/06/2014	Number as at 01/01/2016
Doctoral students	5	
Theses defended	6	
Postdoctoral students having spent at least 12 months in the unit	5	
Number of Research Supervisor Qualifications (HDR) taken	1	
Qualified research supervisors (with an HDR) or similar positions	5	5

• Detailed assessments

Assessment of scientific quality and outputs

The Mollicutes Group, at the onset of 2015, consists of 25 members, including 4 leading scientists (PR, DR). The majority of the staff members belong to the INRA.

Since 1971, research activities have focused on the field of Mollicutes, starting with Spiroplasma spp. This field of research then moved on to related bacteria, including mycoplasmas and in particular phytoplasmas, and other parasites of plant phloem. Thereby, research on the Mollicutes group reacted to newly emerging areas of research within the Mollicutes and economic pressure caused by these bacteria, which made it possible to combine different scientific research questions and to apply improved diagnostics in grapevines. Research was performed at a high level, continuously integrating new techniques such as genome engineering, and it was possible to combine knowledge of spiroplasmas, mycoplasmas and phytoplasmas under one umbrella. As a consequence, research topics included evolution, gene expression and pathogen genomics as part of the study of Mollicutes.

Scientific progress was made in the transmission of Spiroplasma citri, requirements for translation in the minimal cell, the detection and taxonomy of phytoplasmas, phytoplasma-host interactions, the modification of the 23S rRNA of Mycoplasma capricolum and the application of synthetic biology approaches. The Mollicutes bacterial class includes the most important model organisms for synthetic cell approaches, thus enabling the application of these techniques to questions such as the minimal cell concept and genome engineering.

The Mollicutes group took on this challenge successfully and was able to establish and integrate this important field of research as an important long-term investment for successful research for the next few years. Insights obtained from research into genomics and transcriptomics have been used to analyse pathogen-host interactions, a topic which covers the field of pathogen-insect vectors in the case of *Spiroplasma citri* and its leafhopper vector, as well as problems in "Flavescence dorée" transmission. Furthermore, the group has invested in pathogen-host interaction.

This represents an excellent and leading international research unit in the field of Mollicutes through high levels of publications and citations reported to date; for example, team members published 65 peer-reviewed articles in the period 2009-2014, including two high-ranking articles in PloS Genetics and Nucleic Acids Research. Leadership and responsibility are visible through the authors' positions (first and last position), and, furthermore, published results and works in progress have been presented at several important international conferences. As a result, the work of the unit has been recognised within the research community for a considerable amount of time. In addition, their research results have had long-term impacts, dealing for instance with basic research questions such as the minimal gene set required for translation and the hot topic of synthetic biology. Furthermore, research over the last five years includes the application of various state-of-the-art techniques (e.g. NGS) which now dominate research on Mollicutes.

Consequently, the Mollicutes team has been at the forefront of this internationally competitive area of research.

Short appreciation on this criterion

The team is characterised by its excellent scientific quality and output, and the overall expertise of the team is recognised at national and international levels. Moreover, a number of relevant research fields complement each other, in regards to content and technical expertise, under the Mollicutes umbrella.

Assessment of the team's academic reputation and appeal

The group is well-established in this research field, and as a result national (e.g. CBiB) and international co-operation have contributed to scientific output. Team members are frequently asked to present and discuss their research results at international meetings, and their overall impact can be estimated by the 20 or so invited talks and more than 50 international oral presentations conducted to date. This expertise is also highlighted by the group members enormous involvement as reviewers for research manuscripts and funding agencies. Furthermore, team members hold leading positions within national and international networks, including the coordination of the two ANR-funded projects (EVOLMYCO, SYNBIOMOL), five INRA-funded projects, seven regional projects, various local projects and two others.

Responsibility in a leading position has also been taken in one international project besides participation in several other programmes (e.g. COST actions, NSF-BREAD). Corresponding to the field of research, the unit has also taken part in organising a national meeting on "Flavescence dorée". The Mollicutes team is an attractive prospect for graduate students and international scientists joining the team for a limited time. The group's expertise is also in demand, exemplified by the organisation of several other national and international meetings as members of scientific boards.

Beside these activities, the group has worked on the well-known MolliGen database and takes care of a huge phytoplasma strain collection cultivated in *Catharanthus roseus*, both of which are highly important to the international research community.

In addition, two team members have been honoured with international awards (2010, 2014) for their contributions to the field, whilst the high impact of the team members can be also judged by their positions on editorial boards and extensive work as reviewers of manuscripts for international research journals (including high-impact journals) and grant applications.

Short appreciation on this criterion

Outstanding reputation in this field of research is characteristic of the team. Thereby, they are clearly separated from the other groups of the community working in mycoplasma and phytoplasma research worldwide. Group members were honoured for their scientific contributions. They lead studies in several categories, and as a consequence many people recommend their participation in projects. Furthermore, they have established very well-recognized national and international networks.

Assessment of the team's interaction with the social, economic and cultural environment

The team has been part of dozens of national and international networks for over a decade, during which time several successful national and international co-operations have been established. This is not limited to the academic sector and also includes co-operation with the industrial partner Sediag.

The team shares the latest widely applicable research results with the public, and several team members also communicate the importance of their work on radio and TV and in the press, which is an outstanding achievement. Moreover, the team also organizes meetings with winegrowers and technicians, thereby ensuring the transfer of knowledge, and stays in touch with target groups in agriculture. In particular, the phytoplasma research and the strong co-operation with the winegrowers in France have to be highlighted. The local funding of the team also shows the success of this strategy.

Short appreciation on this criterion

Research of the team is not separated from public recognition and outreach. Public outreach activities are used to maintain contact and to justify the work, and therefore expertise is also applied in the field of agriculture. The impressive impact of the team, efforts and success are excellent to outstanding in this field.

Assessment of the team's involvement in training through research

The team has hosted 74 guests for internships, including undergraduate, postgraduate and PhD students. Team members have also taken part in organising and supervising international training events (e.g. four training schools), thus also highlighting their expertise and faultless commitment.

Short appreciation on this criterion

The supervision of scientists and graduate students, as well as the participation in and hosting of training programs, is routine. Hence, the team's involvement in training through research can be considered very good to excellent.

Assessment of the strategy and the five-year plan

The scientific mission for the period of 2016-2020 aims at providing new insights into phytopathogenic Mollicutes, by applying techniques including genome engineering and synthetic biology. As a result, the team continues on its quest and can provide answers to questions with respect to the topic’s evolution, gene expression, host interaction and minimal cells. The hoped-for results will be of general interest in microbiology and molecular biology, and phytoplasma research will be of particular interest due to its emerging economic importance in Europe. Topics will be connected to questions relating to epidemiology, using technical approaches and objectives of the highest level.

Short appreciation on this criterion

The excellent five-year plan extends the previous strategy. Cutting edge technologies (genome engineering, synthetic biology) will be applied to the field of mycoplasma/phytoplasma research for the first time beside new challenges in grapevine phytoplasmoses.

Conclusion

- ## Strengths and opportunities:

This is an excellent to outstanding international research team dealing with Mollicutes. The strength of the unit is based on its complementary team structure.

- ## Weaknesses and threats:

Dependence on public national and European funding sources can become a problem.

- ## Recommendations:

A long-term strategy will be needed for handling increasing international competition in this field of research. The development of such a strategy should include co-operation with private companies.

5 • Conduct of the visit

Visit dates:

Start: Wednesday 11th February 2015 at 8:30 am

End: Thursday 12th February 2015 at 1:40 pm

Visit site: UMR 1332 Biologie du Fruit et Pathologie – Centre INRA Bordeaux-Aquitaine Bât. IBVM

Address: 71, av. Edouard Bourlaux - CS 20032 - 33882 VILLENAVE D'ORNON CEDEX - France

Specific premises visited:

The visit was very well organised and the committee thanks the BFP direction and its staff for having facilitated their work on site. In addition to the formal scientific presentations, and meetings with the various categories of personnel, the BFP direction, and with the tutelage representatives, the committee took time to go through the buildings and to specifically visit the Metabolomic platform.

Programme of visit:

February 2015, the 11th

8:30 am	Welcome
8:45	Welcome (closed-door) visiting committee with the HCERES scientific advisor; principles and modalities of the evaluation
Scientific Part	
9:15	HCERES representative: the role and procedures of HCERES (Mr Philippe MEROT)
9:30	Director of the unit: presentation of the past activities and project
10:20	Scientific Presentation team 1-OrFE - Mr Christian CHEVALIER
11:10	*Break*
11:30	Scientific Presentation team 2-GFDF - Mr Christophe ROTHAN
12:20	Scientific Presentation team 3-META - Mr Yves GIBON
1:10 pm	buffet / discussion (including a close-door meeting)
2:50	Scientific Presentation team 4-A3C - Ms Elizabeth DIRLEWANGER
3:40	Scientific Presentation team 5-VIRO - Mr Thierry CANDRESSE
4:30	Scientific Presentation team 6-MOLLI - Mr Alain BLANCHARD
5:20	Scientific Presentation PlatForm Métabolome - Ms A. MOING et Mr D. ROLIN

Meeting with the representatives of the 2 managing bodies and doctoral school

6:00 pm	Discussion with the representatives of the 2 managing bodies
6:25	Meeting with the representative of the doctoral school
6:40	Close-door meeting of the visiting committee, preparation of tomorrow
7:10	End of the visit for the 11/02

February 2015, the 12th

8:30 am	Discussion with the head of the unit
Discussion with the staff	
9:00	Meeting with the permanent researchers and teachers
	Meeting with the engineers, technicians, administrative
	Discussions with students and post-docs, CDD ingenieers
10:40	Private meeting of the visiting committee (with lunchbox)
1:40 pm	End of the visit

6 • Supervising bodies' general comments

Objet : UMR BFP comments and answers to HCERES Report
S2PUR160009862 - BIOLOGIE DU FRUIT ET PATHOLOGIE - 0755361V.

Villenave d'Ornon, le 13/5/2015

UMR BFP comments and answers to the HCERES Report

UMR BFP Part

The staff members of UMR BFP thank the Panel for the interactions and for their analyses and recommendations many of which are considered relevant and useful. Overall the evaluation process was a smooth one, in large part thanks to the professionalism of Panel members. A general feeling is however that time constraints on the evaluation of a large Unit such as BFP have reached a level where the whole exercise becomes a source of frustration for both panel members and evaluated team members. In particular, the limited time devoted to each team (45 minutes) may not have allowed Panel members to grasp all information in some cases, resulting in some misunderstandings. Again, we wish to stress that this is not a reflection on the expertise or professionalism of Panel members but rather on the evaluation process itself and in particular on its time constraints.

Three general points deserve a comment from our UMR. The first one concerns what we collectively analyze as an **imbalance in the analysis of teams** for various criteria. Despite the detailed justifications, it is sometimes difficult to understand the differences in rating observed between teams that have performed, in our view, in a similar fashion. Our analysis if that this reflects the weight of individual rapporteurs and the probably too limited time available to integrate the report and compare achievements between teams.

The second point we wish to discuss is the general feeling that the Panel may have been somewhat frustrated by not being presented the **UMR project** and the **individual teams projects** in sufficient detail, resulting in a less favorable evaluation of project than for our past activities. This may have resulted from misunderstandings on whether the Panel was mandated to evaluate the UMR and Teams projects for the next five years. Although we did include some project elements, we also decided that our presentation of these aspects would be limited in scope and details, which may have resulted the Panel more critical vision of the project part of the evaluation.

The third point concerns the Panel recommendation to "*structure the unit with a clear strategic plan enabling an added value exceeding the team by team activity*" and the weakness identified as "*so far no real integration between the Fruit biology theme and the Pathology theme*". While we agree with the Panel that the UMR should provide **added value and not just be the sum of its teams**, we wish to stress that the extensive development of collaborations "between the Fruit

biology theme and the Pathology theme" was not in the mandate of the UMR. Given the central

respective research objects (fruits, non culturable pathogens) the full scale development of such collaborations would likely have resulted in convoluted projects or in divergence from our central research objects, an option not welcomed by the UMR stakeholders. At the same time, a range of collaborations, frequently on more technical aspects, have been built between plant biologists and pathologists (resulting already in joint publications and in one patent, for example) and presented to the Panel. We will continue this strategy of "opportunistic" development of collaborations between fruit biologists and pathologists but, again, do not plan or wish to put such developments at the center of the UMR project and, rather, agree with the Panel that "*Perhaps more important than joint research programs between teams, the amplification of transverse scientific animation around a theme of common interest for various teams (bioinformatics, modelling, creation of common biological resources, etc.) is clearly identified as a major task for the next contract*".

The other recommendations of the Panel concerning our UMR are seen as very useful and as valuable external advice and go along some of the lines we had identified when preparing the report. We therefore intend to collectively evaluate, during 2015, how these recommendations can be best put in practice, in particular concerning the imbalance in technical staff between teams and the need to further improve communication and scientific animation within the UMR.

OrFE Team

Members of the "Fruit organogenesis and Endoreduplication" team and its Group Leader appreciate the overall very positive comments from the Evaluation committee. We acknowledge the relevance of its scientific recommendations, to which we entirely subscribe and intend to make full use of. We have indeed already taken steps towards enhancing the exchanges between our two biological models, tomato and strawberry. This started indeed with the sharing of technical skills to put efforts into the improvement of the strawberry transformation technique for instance, and other molecular biology or genomics analyses.

As far as the team involvement in **training through research** is concerned, the Evaluation Committee estimated that the team does "*clearly much more than would be expected from an average team"*, and then stated that it represents a weakness and a threat as it is *"very time consuming*". The Group Leader does subscribe to this perception (especially as himself is a full scientist), and must confess he complains (silently) about the absences of team members during the heavy teaching periods. However the Group Leader is keen to acknowledge that the "*very good/excellent basic science*" produced by the team, as stated by the Evaluation Committee, could not be so without the high motivation of the team members despite their heavy academic duties and their ability to attract and train highly dynamic Master and PhD students. Two assistant-professors from the team have planned to defend their HDR in the coming new contract: care will be taken that this commitment will be fulfilled.

The Evaluation Committee felt that "the strategy is less clear in the case of strawberry". Working on complex traits in polyploid species is indeed a challenge we identified. This is the reason we have developed over the last years several collaborations aimed at developing new tools such as chip arrays for high throughput genotyping (90K SNP Affymetrix for the cultivated octoploid strawberry). Using this array, we can study the genetical architecture of the balance between sexual and asexual reproductions or the genetical architecture of fruit quality traits. In addition, and despite the complexity of the octoploid strawberry, we have already been able to develop markers linked to anthracnose resistance (Lerceteau-Kohler et al. 2005) and, more recently, to perpetual flowering (Gaston et al. 2013). As far as fruit quality is concerned, we developed markers linked to SSC that are already used in breeding programs (US NSF RosBREED project). In accordance with the Evaluation Committee suggestion, a strategy of synergizing results in wild and in cultivated strawberry is indeed already developed by our Team for the study of the balance between sexual and asexual reproduction on the one hand, and for the study of fruit quality on the other hand, especially through the development of our collection of EMS mutants.

As the Evaluation Committee underlined, several members of the team are expected to retire or have already retired. This situation is especially true concerning the strawberry research activities and, specifically, for activities related to greenhouse strawberry plant culture and strawberry collection handling. One technician already retired and a second one will retire in about 2-3 years. Even though the BAP Division of INRA may rapidly open a permanent scientist position in the team (in genomics at the interface between strawberry and tomato research), we are fully conscious that the research activities on strawberry will not be sustainable (and will be terminated) without the recruitment of a greenhouse technician.

The OrFE team has proposed a "Systems Biology" approach to study the role of endoreduplication during tomato fruit growth. As recommended by the Evaluation Committee, this challenging project will be developed in coordination with the other BFP Teams, Metabolims for fruit growth modelling and, as already started, GFDF for the analysis of endoreduplication mutants. The ambition and pace of development of this project will be dependent on our ability to attract funding, which will directly impact our ability to host dedicated post-Ddoctoral scientists. Whether the BAP Division of INRA is able to open the above mentioned permanent scientist position in genomics will also directly impact the team strategy.

GFDF Team

We wish to thank the members of the committee for their very valuable comments on the work of the GFDF team and their very positive perception of several aspects of our activity. Reading the report in detail, we however realized that we probably did not insist enough on several points in our report and oral presentation. This probably led the committee to a somewhat altered perception of our activity in the context of UMR BFP.

Scientific activity: As stated by the committee, we (GFDF team) "*recognize that our productivity is not excellent*" while the BFP scientific productivity as a whole is considered as "*very good to excellent*". The GFDF team is actually the smallest team of BFP, with the A3C team; during the period considered, it included 11 permanent staff, one non-permanent staff plus 5 PhD students and post-docs (shared with the OrFE team, for a total of 17 man-month). The facts regarding GFDF productivity are: our small team (9.2 % of BFP permanent staff), produced 40 publications (14.3% of BFP) with a mean impact factor of 5.85 (4.56 for BFP), among which 25 publications with an IF>4 (22.3% of BFP). We would like the committee to acknowledge the fact that, within BFP, GFDF is not particularly underperforming.

Industrial partners: Regarding collaborations with industry, the committee indicates "*They only document a relatively small collaboration with Syngenta*". Actually, on tomato and in BFP, we had the largest collaborations with industry through the European EUSOL (9 SMEs and 8 industrial partners), ERAPG (1 industrial partner) and ANR Adaptom (2 industrial partners) projects. In addition, we are the only team conducting a tomato research project directly funded by an industrial partner. One explanation for this feature is that the main partners in our field of research are seed companies. As a plant physiology lab, not working on agronomy, we must find a way to interact directly with industry, which could be more easily done via genetics approaches (alleles-of-interest etc.). Furthermore, we never "*focused in the development of a TILLING platform*" as a service to industry. To date, most of the funding from industry for TILLING in tomato does not go to TILLING itself but to the establishment of EMS mutant populations in industry elite lines, which is often carried out in low-cost foreign countries. Such an approach has never been part of the objectives of the GFDF team, which focuses its activity on fruit biology using a miniature tomato cultivar and developed or used the necessary tools accordingly.

As we all know, working with industry is not that obvious, even in crop species, as industrial objectives can change very rapidly, affecting long term research projects (e.g. the vitamin C topic for nutritional value of the fruit is no longer a major target as it was few years ago). Companies can even disappear before the project has been funded (e.g. for the cuticle projects) or lawyers can consider that, to have access to the results, waiting for publications is cheaper than funding the project (sic). We would gladly welcome any suggestions from the committee on the best way to increase our interactions with industrial partners.

Strategy: We wish to thank the committee for the very positive comment "*The five year plan of the team is very good*". We now know that the strategy we developed for isolating mutations of interest by mapping-by-sequencing can be very successful and can provide new and original results that can give rise to highly ranked publications and to contacts with industry. While we agree on the need to focus as much as we can our strength on a limited number of projects (one way is to transfer staff from platforms to research), we are convinced that focusing on only one or two projects would be risky when, in the current scientific context, funding opportunities evolve rapidly. To take an example, fruit size/development is currently not a priority for industry and it will likely be difficult to fund as a plant fundamental research project, when compared to other plant models. However, it remains at the core of our project because it addresses major scientific questions related to early fruit development and quality. Together with the other topics (vitamin C and cuticle), it is also a component of the control of fruit yield in unfavourable environments, which becomes a major issue e.g. in the ANR Adaptom project on "fruit yield under water limitation". We plan therefore to continue to focus our activities on these three tightly linked topics.

Metabolism Team

The Metabolism team thanks the members of the committee for their valuable comments and feels that the evaluation is largely positive. However, the team is puzzled by some of the recommendations that seem to be based on misunderstandings:

- The major point is that our **project** was considered as immature ("a clear research plan is not ready yet"). We are sorry that the committee would not understand what was meant, but for us the project is very clear. One recommendation from HCERES guidelines was to keep the description of the project very short and we realise that describing a Systems Biology project is not easy, especially when considering that there is no consensual definition of Systems Biology.
- We don't see why Epigenetics leaving the group would be a threat or a weakness. This was a strategic decision aimed at strengthening the group by improving its focus. The decision to stop this topic was actually in line with previous AERES recommendations (it was considered "risky").
- It is mentioned that we mostly rely on **public funding** and that we should diversify our funding. Well, firstly we think we have for a large part already secured funding for the next 5 years (ANR IA projects run until 2019), so we don't see the point of a risk of funding "drying up" in the next future; secondly, we mentioned that we have several service and collaboration projects with companies that are presently running. We are sorry that we could not share more information regarding these partnerships because of confidentiality issues.
- The committee recommends us not to disperse on too many **plant models**. For us, this does not really make sense, as we want to focus on primary metabolic pathways not on species (the topology of primary metabolism is the same among plant species but it is the way it is controlled that makes the difference). Anyway, as mentioned during the presentation we will keep using tomato as our main model, but we also plan to investigate further fruit species as we are convinced that comparing species for the programming and integration of metabolic pathways with growth and fruit quality will identify essential regulation points.

Besides, it is unclear whether the committee encourages or discourages the group leader to maintain a strong collaboration with Golm. It is worth mentioning that the previous evaluation committee saw this collaboration as very positive.

A3C Team

The team would like to thank the Panel for its conclusions, totally in agreement with our SWOT analyses. The Panel underlines that A3C is a multi-disciplinary team that lacks physiology expertise. As this expertise is becoming crucial for the development of our project and considering that in 2020 the team will include only 7 people with only 2 researchers and 2 engineers, we are convinced that the recruitment of a researcher having this expertise will be critical for the viability of the team.

The team thanks the Panel for its recommendations:

- - "*continue the efforts devoted for coordination of emblematic international projects"*: we already answered to a H2020 call as project coordinator in 2014 and we will continue to apply to further EU calls
- - "*enlarge the capacity to host PhD students through HDR within A3C researchers"*: for the moment B Wenden is involved with E. Dirlewanger in the co-supervision of two PhD students and she is planning to candidate for **HDR** in a few years. As the Panel probably knows PhD students supervision experience is required to apply for an HDR.
- - "*precise project the strategy concerning modelling for defining ideotypes for fruit quality traits. Search for more collaborations on that topic"*: the strategy for **modelling approaches** relies on short and long term objectives. As a first step, phenological models are being optimized for sweet cherry by B. Wenden in close collaboration with modelers working in forest and fruit trees in France and in Europe. These optimized models will provide tools to better study phenology and thus to refine the definition of ideotypes. In addition, in order to develop useful models for designing ideotypes but also to support SAM, it is essential to integrate more genetic data into the models. Accordingly, B. Wenden is gathering genetic and molecular data to improve the current models. This is conducted in close collaboration with all A3C members but also with other European research groups. One of the objectives for the next years is to identify and build new collaborations with teams developing fine molecular-based models.

The overall picture from this evaluation was received very positively from all the team and the team is convinced to enhance its effort in the same direction for the next five years.

Plant Virus Team

The Plant Virus team wishes to thank the Panel for its detailed analysis and for its valuable suggestions, in particular concerning the project part (although our presentation of this part was quite limited). We have overall few comments on what we consider a very positive evaluation of our collective efforts.

One point which we would like to stress concerns the recommendation that "*collective decision should be made on whether a project should be maintained or discontinued with more scientific and visionary arguments than the fact that it is going to be funded or not*". We feel that through a misunderstanding, the Panel got the impression that projects were only developed if funded, leaving no room for **strategic vision and investment** by the team. In fact our policy is, and has been for a long time, to fully share funding within the team, in order precisely to develop research seen as strategic, even if not financially supported at a given time. As an example of this strategy, outside of a Ministry PhD grant, the project on intrinsic disorder in viral proteins has been developed totally for the past 3 years on mutualized team funding. We do consider, however, that this cannot be an unchecked and unlimited process and that projects should be revisited periodically. As a consequence, we feel that after a period (which as illustrated by the intrinsic disorder project can be

several years) a project has to find its momentum and funding or that we have to draw conclusions from our repeated inability to sustain it through external funding.

Mollicutes team:

The Mollicutes team wishes to thank the Panel for its analysis and for its valuable suggestions. We have only one comment on what we consider a very positive evaluation of our collective efforts.

This comment concerns the "**Assessment of the team's academic reputation and appeal**". We are happy that the panel highlighted our efforts to keep "*a huge phytoplasma strain collection cultivated in* Catharanthus roseus*, […] important to the international research community*". Unfortunately, as indicated for the UMR (see above), keeping this collection, and other biological materials (insect vectors) in old and obsolete greenhouses represents a significant financial drain on the team ressources and a potential risk of losing important biological material. So far, we are still looking for the means to modify this situation.

T. Candresse, DU UMR 1332 BFP