



# G AFL - Génétique et amélioration des fruits et légumes

## Rapport Hcéres

► **To cite this version:**

Rapport d'évaluation d'une entité de recherche. GAFL - Génétique et amélioration des fruits et légumes. 2017, Institut national de la recherche agronomique - INRA. hceres-02030548

**HAL Id: hceres-02030548**

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Submitted on 20 Feb 2019

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# HCERES

High Council for the Evaluation of Research  
and Higher Education

Department of Research Evaluation

report on research unit:

Génétique et Amélioration des Fruits et Légumes

GAFL

Under the supervision of  
the following institutions  
and research bodies:

Institut National de la Recherche Agronomique - INRA

Evaluation Campaign 2016-2017 (Group C)

# HCERES

High Council for the Evaluation of Research  
and Higher Education

Department of Research Evaluation

*In the name of HCERES,<sup>1</sup>*

Michel Cosnard, president

*In the name of the experts committee,<sup>2</sup>*

Pere Puigdomenech Rosell, chairman of the  
committee

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Under the decree N<sup>o</sup> 2014-1365 dated 14 november 2014,

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

<sup>2</sup> The evaluation reports "are signed by the chairman of the expert committee". (Article 11, paragraph 2)

## Evaluation report

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

The assessments contained herein are the expression of an independent and collegial reviewing by the committee.

**Unit name:** Génétique et Amélioration des Fruits et Légumes

**Unit acronym:** GAFL

**Label requested:** UR

**Current number:** UR 1052

**Name of Director (2016-2017):** Ms Véronique LEFEBVRE

**Name of Project Leader (2018-2022):** Ms Catherine DOGIMONT

## Expert committee members

**Chair:** Mr Pere PUIGDOMENECH ROSELL, center for research in agricultural genomics, Spain

**Experts:**

- Mr Stéphane BLANC, INRA, Montpellier
- Mr Glenn BRYAN, Hutton Institute, UK
- Mr Dominique DE VIENNE, Université de Paris-Sud
- Mr Jean-Christophe GLASZMANN, CIRAD, Montpellier (representative of CSS INRA)
- Mr François LAURENS, INRA, Angers (representative of supporting personnel)

**Scientific delegate representing the HCERES:**

Mr Steven BALL

**Representative of supervising institutions and bodies:**

Mr Peter ROGOWSKY, INRA - BAP

**Heads of Doctoral Schools:**

Mr Marc BOUVY, Doctoral School n°584, GAIA, Montpellier

Mr Olivier DANGLES, Doctoral School n°536, A2S, Avignon

Mr Christophe ROBAGLIA, Doctoral School n°62, SVS, Aix-Marseille

## 1 • Introduction

### History and geographical location of the unit

The INRA Research unit “Genetics and Improvement of Fruits and Vegetables” (GAFL) started in 1957 as “Station d’Amélioration des Plantes Maraîchères” located in the Domaine de Saint Maurice at Montfavet near Avignon. In 1998, it was fused with the “Station de Recherches Fruitières Méditerranéennes” that was founded in 1982 and located at the Domaine de Saint Paul. In 2007, the two units were physically merged in the Domaine de Saint Maurice with the construction of a new building and plant growing facilities that are completed with an experimental station of the Domaine Pins de l’Amarine located near Bellegarde.

The unit is located in one of the main European regions for the production of horticultural crops and in its surroundings, there is a rich tissue of seed companies and fruit breeders and nurseries. In the vicinity, there also exists a significant activity of interprofessional structures in the field of horticulture and fruit breeding and testing.

The plant systems studied are essentially Solanaceae (tomato, pepper and eggplant), Cucurbitaceae (melon) and Asteracea (lettuce) and Prunus (apricot, peach and their rootstocks). There is also a small amount of work on the model plant *Arabidopsis*.

### Management team

The GAFL has been directed by Ms Véronique LEFEBVRE with two deputy directors, Ms Nathalie BOISSOT and Mr Sébastien LE PIOUFLE, who is also the administrative manager.

### HCERES nomenclature

Principal : SVE Sciences du vivant et environnement

Secondaire : SVE2 Biologie Cellulaire, Imagerie, Biologie Moléculaire, Biochimie, Génomique, Biologie Systémique, Développement, Biologie Structurale; SVE1 Agronomie, Biologie Végétale, Écologie, Environnement, Évolution

### Scientific domains

The GAFL research projects deal with the genetic bases of productivity, quality and health of fruit and vegetables from Mediterranean basin. Researchers aim to understand the regulation of underlying genetic factors, particularly in response to the environment, and to explore the genetic diversity available, in order to develop sustainable horticultural production and maintain quality in different agricultural systems.

The scientific projects on the current contract cover four main aims:

- i. to analyse genetic diversity and molecular evolution of loci controlling agronomic traits by integrating the genome sequence information available;
- ii. to decipher the genetic and molecular bases of plant resistance to pests and pathogens in order to propose durable management of plant health;
- iii. to understand the genetic and molecular bases of the fruit quality in a stressful environment;
- iv. to propose new variety innovations, by reinforcing the link between research programs and breeding programs, and by integrating knowledge on the genomes sequences.

The unit develops integrated approaches by coordinating efforts and expertise in genetics, genomics, pathology, physiology, biochemistry, ecophysiology, modelling, bioinformatics, statistics and breeding.

Unit workforce

Unit workforce	Number on 30/06/2016	Number on 01/01/2018
N1: Permanent professors and similar positions		
N2: Permanent researchers from Institutions and similar positions	12	12
N3: Other permanent staff (technicians and administrative personnel)	75	70
N4: Other researchers (Postdoctoral students, visitors, etc.)	2	
N5: Emeritus	1	
N6: Other contractual staff (technicians and administrative personnel)	6	
N7: PhD students	9	
<b>TOTAL N1 to N7</b>	<b>105</b>	
Qualified research supervisors (HDR) or similar positions	8	

Unit record	From 01/01/2011 to 30/06/2016
PhD theses defended	18
Postdoctoral scientists having spent at least 12 months in the unit	6
Number of Research Supervisor Qualifications (HDR) obtained during the period	3

## 2 • Assessment of the unit

### Global assessment of the unit

The plants which are the specificity of the work of GAFL are horticultural crops and fruit trees. The main target of the work of the unit is therefore a set of characters of interest for the corresponding sectors. These characters are essentially quality and pathogen resistance traits. They are studied using genetic and physiological tools which correspond to the main expertise of the research teams of the unit. In this field there are interesting opportunities to study the genetic basis of important characters as it has been shown by the unit in species such as tomato and melon. The unit is in this sense well placed in the international arena to produce results of fundamental scientific relevance and it has been shown to be very successful in integrating itself in European networks and to collaborate with French and European groups in order to achieve results of wider interest. Among other projects, the unit has taken part in the international project of sequencing and annotation of the tomato and pepper genomes, their groups have isolated a number of new genes involved in agronomic traits in melon and tomato and they have used tomato, a species whose genome is known and where a rich genetic information is available, to analyse the physiological basis of water stress. The genetic basis of the durability of plant resistance to pathogens, mainly virus, aphids and nematodes has been studied for pepper and melon (not tomato). Since 2011 the unit has published 180 publications in peer reviewed international journals, essentially in the field of *Plant Science*, *Genetics and Agronomy* and they have supervised 28 PhD and 57 Master students. Most of the publications having the highest impact have been done in collaboration with other international or French groups.

At the same time the unit has continued to produce plant materials of interest for the agricultural sector. Horticulture is important in the Provence area and seeds for this sector represent around 25% of the value of seed sales in France. This value may be lower when compared with larger arable crops such as maize but it has a significant economic and social impact in the region and overall in Southern Europe. The unit has a very good tradition of collaboration with the sector and during the period analysed the unit has registered 14 plant varieties, 7 in apricot, 3 in peach and smaller numbers in tomato, eggplant and pepper. It has also developed a number of genetic markers for traits of interest for breeding that have been transferred to the industrial sector. It appears that the breeding activity has been decreasing during the last years within the unit, probably because this is the work of specific seed companies that in some cases are present in the local area.

As a whole the unit has increased its scientific productivity during the recent years and it is a European reference for horticulture and fruit crops. It faces a number of challenges that its members will have to face. The unit has lost a number of important members of its scientific and technical staff during the recent years. The INRA direction has committed itself to replace some of the positions of the technical staff. To attract new scientists it will be important that the unit actively works to invite young postdocs using the different ways (European, French or Regional) that may exist. At the same time some important infrastructure such as greenhouses, growth chambers and bioinformatics hardware will need to be improved to favour the new approaches that will need to be developed in the near future. A new structure is proposed that will try to better organize its work and optimize its resources. It is an important opportunity for all scientists of the GAFL unit.