The molecular tools developed by the public research programs give us a better knowledge of the genetic diversity of the rose and thus allow us to better target our crosses in order to respond better to new economic and environmental issues. For example, implementation of the Labbé law requires hybrids and producers to offer varieties that are increasingly resistant to the various aggressors. The development of disease resistance tests (BelaRosa CASDAR project) now allows us to be more efficient and quicker in our selection. We are building a new agreement and together, after a long-term collaboration we will benefit from offering a more sustainable horticulture.»

Looking for partners?

Two contacts to support your projects:

Aurore Gauthier contact to support your R&D projects and to put you through
aurore.gauthier@vegepolys.eu

Tanegmart Redjala close interface with the laboratories of the Research Federative Structure Quasav.
tanegmart.redjala@univ-angers.fr
The researchers of the IRHS (Research Institute in Horticulture and Seeds) study the physiological and molecular mechanisms associated with these morphological or physiological characteristics. This knowledge is essential for the improvement of breeding programs and the development of innovative cropping systems. The IRHS works in collaboration with the GRAPPE (ESA-INRA) unit to better integrate consumer’s expectations into the innovation processes of professionals.

**Measurement of visual quality at the service of plant breeding**

The shape of the plant is an important ornamental criterion which determines its commercial value.

![Virtual plant 3D](image)

The CIFRE thesis carried out by the DESMARTIS nurseries in collaboration with the research units IRHS and GRAPPE made it possible to develop a method for objective measurement of the visual quality of a rose bush.

- This method is transferable to other ornamental species and allows to consider visual quality in your breeding programs.

**Control of branching through innovative ways**

The IRHS has elucidated genetic, physiological and molecular mechanisms underlying bud bursting and stem growth in response to various environmental factors:

- Branching depends on both genotype and environment: water supply and quality of light ('ARIAGE' CASDAR project + CIFRE thesis - Camille Li-Marchetti, realized in collaboration with ASTREDHOR).

![Blush Nolsette](image)

- The elongation of the roses can be controlled by the quality of the luminous spectrum.

![Nitrate +](image)

- In her thesis, Marie-Anne Le Moigne (2014-2017) investigates the involvement of amino acids in the nutrition of the axes growing in the rose bush.

Interests for the professionals:

- Improve technical itineraries by modulating environmental factors, to:
  - Set up or maintain a plant shape
  - Do without growth regulators
  - Produce organs or metabolites of interest.

- Select varieties for their architecture
Towards healthier ornamental plants!

The rosiers of Doué la Fontaine have teamed up with the IRHS researchers to understand the origins of graft falls. Several hypotheses have been studied (genetics, incompatibility with the rootstock, grafting technique, soil and climate conditions...). The results indicated that the climatic factors and the quality of the graft could explain in part this phenomenon (Regional Innovation Platform project on the rose bush, 2012-2016).

In partnership with rosiers and Végépolys R&D center, researchers of IRHS developed a routine greenhouse test to assess the resistance of rosebush varieties to black spot disease (BELAROSA project, 2013-2017).

The thesis of Diana Lopez Suarez (2017-2020) aims to identify marker genes for rose bush resistance to black spot disease.

As part of the PHYSI’HO collaborative project (2012-2017), the IRHS and hydrangea producers of Maine et Loire (Chauvin Hortensia, Hortensia France Production, Sicamus Productions) have identified physiological and molecular markers of resistance to a hydrangea disease.

Recurrent blooming, a controllable trait at last!

The GENIUS project, in collaboration with the nurseries and rose gardens Georges Delbard, deals with cellular engineering. It aims at technological improvement and innovation for the plants of a sustainable agriculture.

The molecular and physiological characterization of the recurrent flowering gene (Iwata et al, 2012, Randoux et al, 2013, 2014) opens interesting pathways for the control of flowering in the rose bush by the environment (Starter project INRA-BAP) and by biotechnological means (GENIUS Investissements d’avenir project, 2012-2018).

The fragrance of the rose at hand

In collaboration with the team of Sylvie Baudino (ByPAM, University of Saint-Etienne), the researchers identified the gene RhNUDX1 as responsible for perfume in rose (published in Science); this gene is a potential marker of perfumed varieties of roses!

Towards roses without thorns

In collaboration with the Flower Research Institute (Kunming, China), the IRHS studies and characterizes the genes involved in the appearance of thorns in the rose (Ningning Zhou Thesis, 2017-2020).
Examples of topics for collaboration

- Characterize the diversity of your genetic resources at the molecular level
- Improve your breeding programs on various ornamental species
- Improve cultivation itineraries to direct the shape of your plants or boost their production in metabolites
- Investigate the hormonal regulation of bud bursting
- Evaluate new cultivars of ornamental plants
- Assess the acceptability of your innovations and help you co-design your products with consumers
- Develop in vitro multiplication tools
- To develop alternative methods to fight pathogens and pests (biocontrol, elicitors, etc.)
- Identify markers for plant disease resistance

SUCCESS STORY - Hydrangea diseases, very promising results

« The winter storage of Hydrangea is a very sensitive and crucial phase in order to maintain the quality standard demanded by our customers. For many years now, we have struggled to reduce disease-related losses. Together with our colleagues from Angers and our research partners, (IRHS ArchÉ team, UP Ephor of Agrocampus Ouest and BIOGER unit of INRA-Grignon) we wanted to deepen our knowledge, hence the implementation of the collaborative project Physi’Ho. This project enabled us to work on three axes (plant physiology, characterization of the pathosystem and climate) to implement an anticipatory production strategy in order to better fight the disease. New lines of complementary research have been highlighted and they offer prospects for future work."

Strengthen your R&D team by recruiting a CIFRE PhD student (financial support by ANRT and CIR), a recent PhD graduate (financial support by CIR) or a working student (in contract of professionalization or apprenticeship)

Training for enterprises

- Physiology of horticultural plants: nutrition, development and stress responses
- Biotecnologies (in vitro multiplication, genomics, etc.)

Catalogue online : agrocampus-ouest/formation-tout-au-long-de-la-vie

- Main methods and statistic treatments for sensory analysis

Catalogue online : groupe-esa/formation-tout-au-long-de-la-vie

Services

- Understand and improve the perceived quality of your products.
  r.symoneaux@groupe-esa.com
- Evaluation of the resistance of a variety of rose bush to black spot disease.
  caroline.bonneau@vegepolys.eu
  Expertise of IRHS:
  laurence.hybrand-saint-ovant@inra.fr
- Study of genetic diversity? In support of your breeding program.
  fabienne.mathis@vegepolys.eu
  Expertise of IRHS:
  alix.pernet@inra.fr
- Co-innovate with the consumer.
  olivier.dubois@vegepolys.eu
- Conduct of trials in a controlled environment.
  alain.vian@univ-angers.fr
- In vitro multiplication.
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