



**INRA**  
SCIENCE & IMPACT

**Plant Biology and Breeding Division**

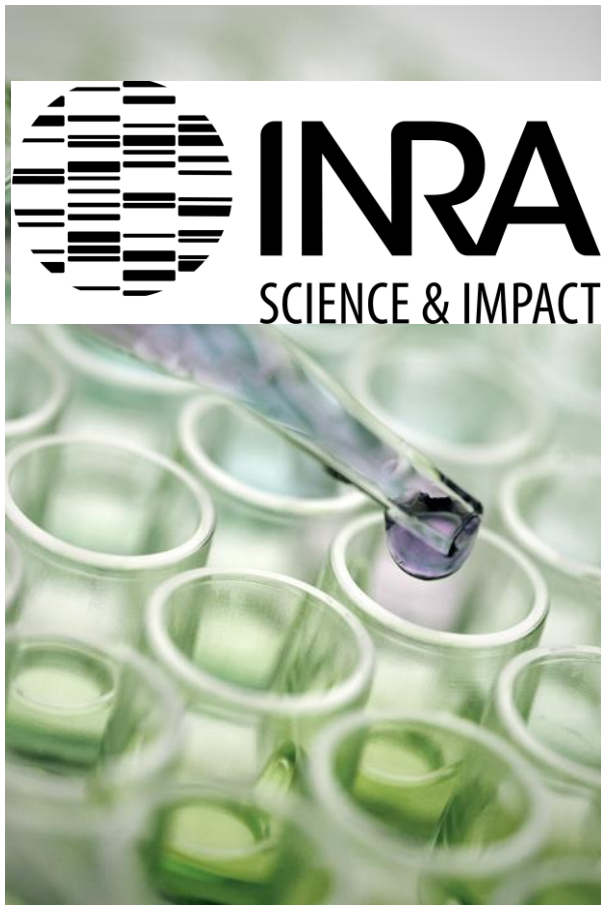


# **Biological resources in the Plant Biology and Breeding division of INRA**

**A-F Adam-Blondon**



# French National Institute for Research in Agriculture (INRA)



Food



Agriculture



Environment

# INRA's 2010-2020 strategy

## Implemented by 13 Research Divisions

### ALIMH

Nutrition, Food Safety & Consumer Behavior

### BAP

Plant Biology & Breeding

### CEPIA

Science & Process Engineering of Agricultural Products

### EFPA

Forest, Grassland & Freshwater Ecology

### EA

Environment & Agronomy

### GA

Animal Genetics

### MIA

Applied Mathematics & Informatics

### MICA

Microbiology & the Food Chain

### PHASE

Animal Physiology & Livestock Systems

### SA

Animal Health

### SPE

Plant Health & the Environment

### SAD

Science for Action & Sustainable Development

### SAE2

Social Sciences, Agriculture & Food, Rural Development & Environment

8,290

Permanent staff

2,500

Researchers

1,800

PhD Students

186

Research Units

48

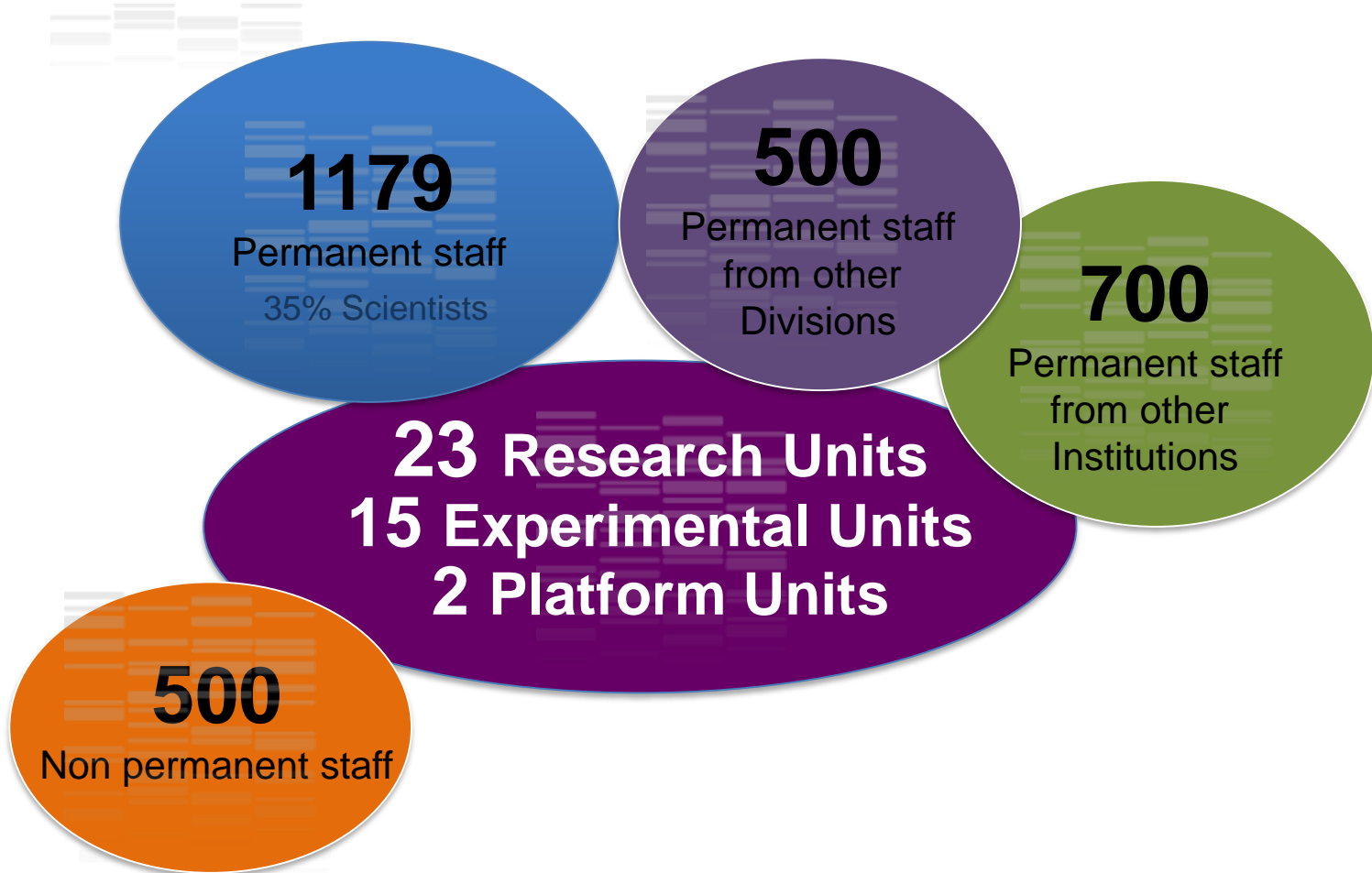
Experimental Units

880 M€

Budget in 2014

**...across 17 Research Centers  
scattered across the French territory**

# Plant Biology and Breeding division of INRA (BAP)



# The BAP Division

## Research conducted on several plant species

### ❖ Fundamental knowledge acquisition



119 FTE

### ❖ Economic importance (socio-economic partnerships) and international positioning



WHEAT



MAIZE



GRAIN  
LEGUMES



VEGETABLE



GRAPEVINE



FRUIT  
TREES

20-40 FTE @



RAPSEED



SUNFLOWER



ORNAMENTAL



FORAGE



MISCANTHUS

<10 FTE @

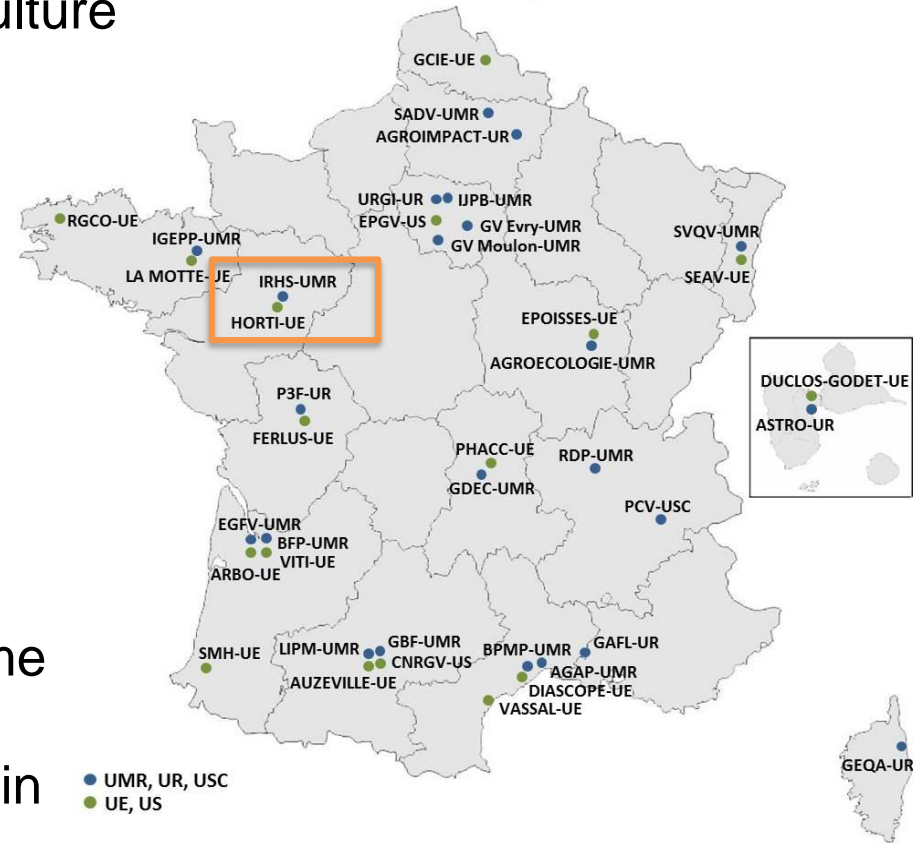
### ❖ Species-focused projects → integration of knowledge → up to varietal innovation for some of them

# INRA IRHS and HORTI units of the BAP division at Angers

- ❖ IRHS: Institute of Research for Horticulture and Seeds
- ❖ HORTI: Experimental unit for Horticulture

- Quality and health of “specialty” crops: rose, apple, pears and carrots (collections managed by BRCs)
- Quality and Health of seeds
- Breeding programme
- Pathogen studies (and collections managed by BRC)

- ❖ Angers INRA center: organization of Public-private partnerships in the frame of pre-competitive poles: Vegepolys (specialty crops), Valorial (innovation in food)



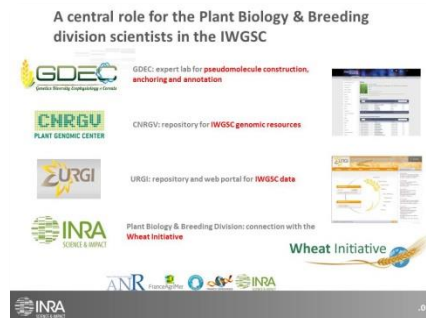
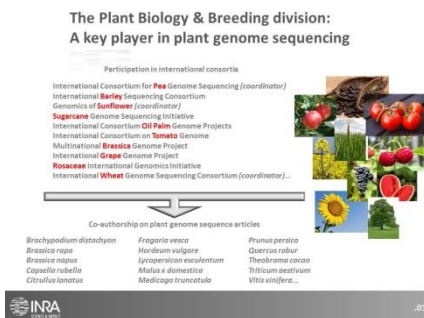


# Need of biological resources for BAP's research

- ❖ Genetic and molecular architecture of traits
- ❖ Mechanisms and the dynamics of plant evolution at different time scales
- ❖ Genome sequencing projects



- ❖ Panels of diversity (wild, cultivated)
- ❖ Populations evolving *in situ*
- ❖ Segregating populations
- ❖ Mutants
- ❖ Genomic resources (BAC libraries, full length cDNA libraries, etc...)



# Genetic resources managed in the BAP division

## Genomic resources



307 libraries for 65 plant species

Priority to biological resources connected to research activities at INRA

## Model species



75,100 accessions

Conservation of :

- Patrimonial resources
- Resources related to specific research projects

## Crops and forage



55,938 accessions

## Vegetables



37,796 accessions

## Fruit species and rose

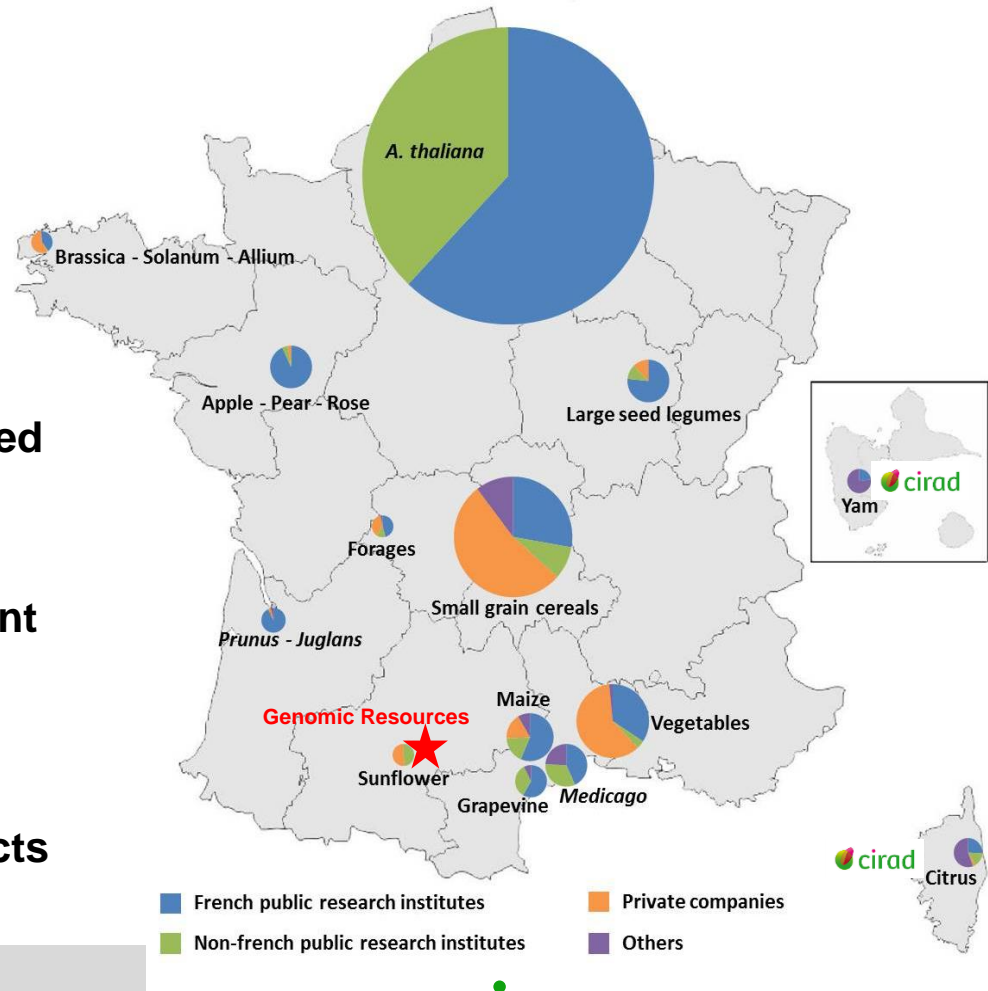


28,752 accessions



# 15 Biological Resource Centers for management

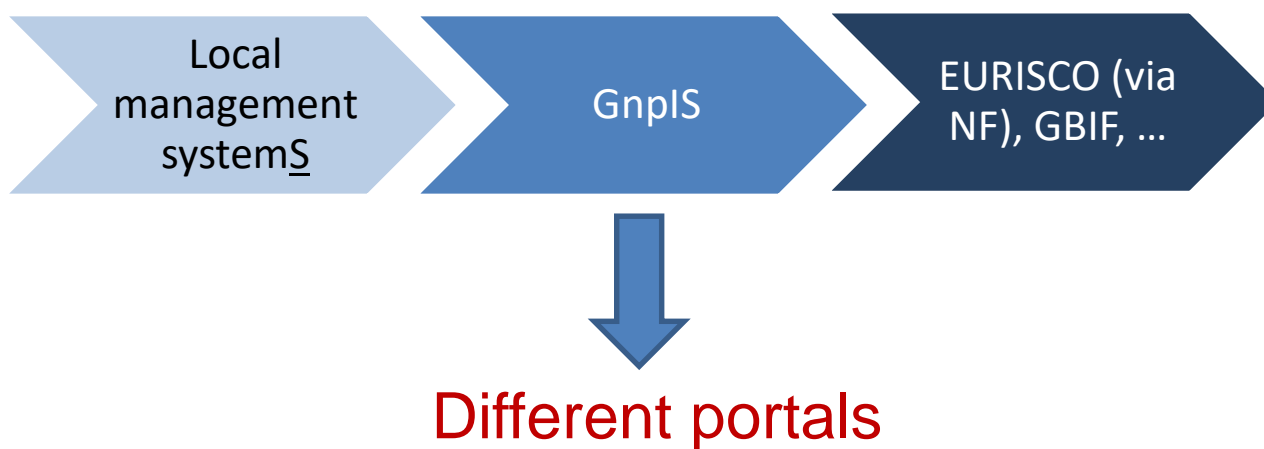
- Two BRC in collaboration with CIRAD
- 12 engineers and 51 technical staff
- >30,000 plant accessions distributed each year (21% to the private sector, 24% abroad)
- >2,600,000 genomic samples distributed to more than 300 laboratories in 32 countries
- Each BRC is well inserted in its relevant French, EU and/or international networks
- Financial support driven by species-oriented networks and research projects



## Catalogs and Information systems

- <http://cnrgv.toulouse.inra.fr/fr>
- <https://urgi.versailles.inra.fr/siregal/siregal/grc.do>

# INRA Data management for genetic resources



# Phenome – FPPN distributed information system

## Data discovery

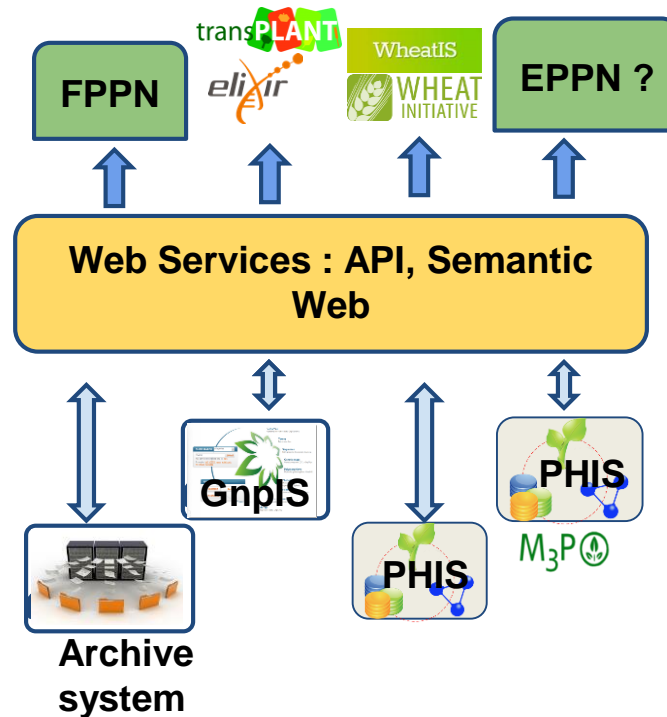
- Public metadata only
- Cheap integration

## Data exchange

- Data files: Minimum information & standard formats
- Data integration: deeper standardization

## Dataset Publication

- DOI



# Towards distributed information systems



**WheatIS:** the information system of the International Wheat Initiative (coord. H. Lucas): (chair: H. Quesneville)



Google-like query tool allowing to retrieve information in the databases of the transnational **TransPLANT** infrastructure (coord P. Kersey, EBI)



Information system for French Plant Phenotyping Network (**Phenome**, coord F. Tardieu)



Building a portal for the french crop **germplasm collections** (ARCAD-FEDER, J-L Pham coord)

# Ontologies / Thesaurus

## References Ontologies

**PATO**

- Area
- ...

**Plant Ontology**

- Leaf
- ...

**Unit Ontology**

- cm2
- ...



## Applied Ontologies

### Crop Ontology

**Wheat**

<b>Leaf Area</b> <ul style="list-style-type: none"> <li>• Unit : cm2</li> <li>• Method</li> </ul>	<b>Yield</b> <ul style="list-style-type: none"> <li>• Unit : t/ha</li> <li>• Method</li> </ul>	<b>Rust</b> <ul style="list-style-type: none"> <li>• Scale</li> <li>• Method</li> <li>• Stage</li> </ul>
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**Vitis**

<b>Budbreak date</b>	<b>Young Shoot: aperture of tip</b> <ul style="list-style-type: none"> <li>• OIV:001</li> <li>• Scale:1-3-5</li> <li>• UPOV:3</li> </ul>
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## Thesaurus

**BreedWheat**

- Leaf Area
- **BreedWheat Method**
- Yield



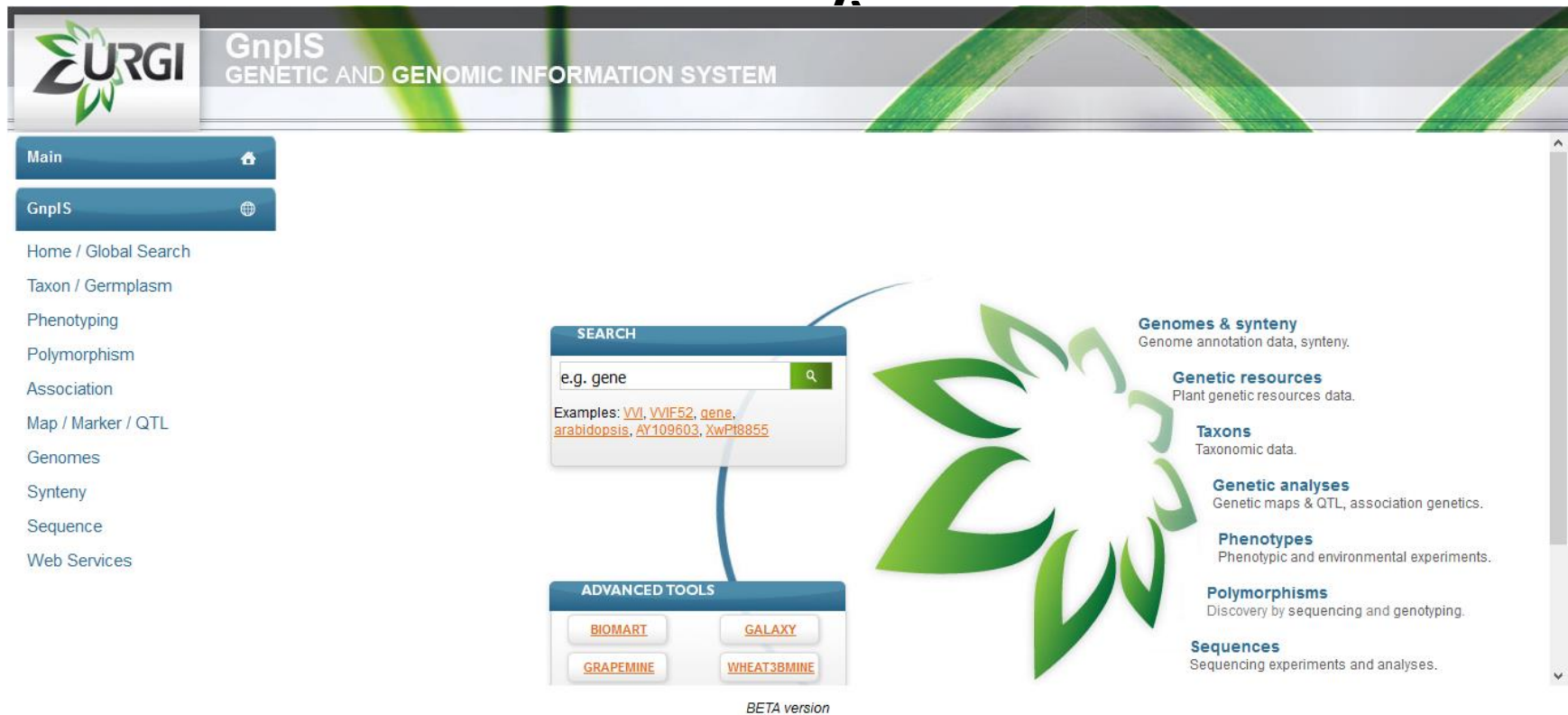
**Phenome**

- Leaf Area
- Budbreak date



# Our INRA database GnplS

(<https://urgi.versailles.inra.fr/gnpi>)



The screenshot displays the GnplS web interface. At the top, the URGi logo is on the left, and the text 'GnplS GENETIC AND GENOMIC INFORMATION SYSTEM' is on the right. Below the header, a left sidebar contains navigation links: 'Main' (with a home icon), 'GnplS' (with a globe icon), 'Home / Global Search', 'Taxon / Germplasm', 'Phenotyping', 'Polymorphism', 'Association', 'Map / Marker / QTL', 'Genomes', 'Synteny', 'Sequence', and 'Web Services'. The main content area features a 'SEARCH' box with a search bar containing 'e.g. gene' and a magnifying glass icon. Below the search bar, it lists examples: 'VVI, VVIF52, gene, arabidopsis, AY109603, XwPI8855'. To the right of the search box is a large green stylized flower logo. Below the search box is an 'ADVANCED TOOLS' section with four buttons: 'BIOMART', 'GALAXY', 'GRAPEMINE', and 'WHEAT3BMINE'. On the far right, a vertical list of database categories is shown: 'Genomes & synteny' (Genome annotation data, synteny), 'Genetic resources' (Plant genetic resources data), 'Taxons' (Taxonomic data), 'Genetic analyses' (Genetic maps & QTL, association genetics), 'Phenotypes' (Phenotypic and environmental experiments), 'Polymorphisms' (Discovery by sequencing and genotyping), and 'Sequences' (Sequencing experiments and analyses). At the bottom center, the text 'BETA version' is displayed.

URGi

GnplS  
GENETIC AND GENOMIC INFORMATION SYSTEM

Main

GnplS

Home / Global Search

Taxon / Germplasm

Phenotyping

Polymorphism

Association

Map / Marker / QTL

Genomes

Synteny

Sequence

Web Services

SEARCH

e.g. gene

Examples: [VVI](#), [VVIF52](#), [gene](#), [arabidopsis](#), [AY109603](#), [XwPI8855](#)

ADVANCED TOOLS

BIOMART

GALAXY

GRAPEMINE

WHEAT3BMINE

BETA version

Genomes & synteny  
Genome annotation data, synteny.

Genetic resources  
Plant genetic resources data.

Taxons  
Taxonomic data.

Genetic analyses  
Genetic maps & QTL, association genetics.

Phenotypes  
Phenotypic and environmental experiments.

Polymorphisms  
Discovery by sequencing and genotyping.

Sequences  
Sequencing experiments and analyses.



# The INRA BRC portal : GnplS-Siregal

<https://urgi.versailles.inra.fr/siregal/s>

The screenshot displays the Siregal Genetic resources portal. The left sidebar contains navigation menus: 'Log in', 'Preferences' (with 'All species' and 'Select one...' dropdowns), 'Main' (with 'HOME'), 'Documentation' (with links to User Guide, How to Order, Data Submission, FAQ, Genetic Resources, Module News, and Release Notes), and 'Other GnplS data' (with links to Data Submission, GnplS Portal, Genomes, Sequences, Genetic Maps, Polymorphisms, Phenotypes, Association, Genetic Resources, and Plant Synteny). The main content area is titled 'Siregal Genetic resources' and includes a description of the system, a note about the BRC's role, and a list of two types of data associated with accessions: multicrop passport descriptors and specific data. It also provides links to the project web page and the GnplS module. Below this is a grid of four categories: Fruit species (Citrus fruits BRC), Model species (Arabidopsis BRC), Vegetable species (Potato BRC), and Crop species (Maize BRC). The right sidebar features a 'News' section with updates from June 04, 2014, February 05, 2014, and September 06, 2013, detailing new module versions and changes.

**Siregal**

## Genetic resources

Siregal, the Plant Genetic Resources Information System of the National Institut for Agronomical Research (INRA), France presents accessions managed by INRA Biological Resource Centers (BRC) and some of the French networks for crop genetic resources. Some of these accessions can be ordered.

The BRC are not commercial suppliers of plant material. They distribute in general small amounts of plant materials mainly for research, development and biodiversity preservation activities.

The main data associated to accessions are of two types:

1. multicrop passport descriptors (common to all plant species): taxonomy, country of origin, biological status (wild, mutant, hybrid...), pedigree...
2. specific data (may be different for each species group) : morphology (size, shape, colour, ...), agronomy (yield, quality, ...), resistance to diseases, ...

You can access the [project web page](#) and the [GnplS module](#) displaying all GnplS genetic resources.

Fruit species	Model species	Vegetable species	Crop species
 <a href="#">Citrus fruits BRC</a>	 <a href="#">Arabidopsis BRC</a>	 <a href="#">Potato BRC</a>	 <a href="#">Maize BRC</a>
			

**News**

**JUNE 04, 2014**

The genetic resources module 14.1 is now available. See the [release notes](#) page for more information about changes.

Changes:

- adding links to query forms on the home page
- improvement of BRC card
- improvement of distribution display on Accession card

**FEBRUARY 05, 2014**

The genetic resources module 13.3 is now available. See the [release notes](#) page for more information about changes.

Changes:

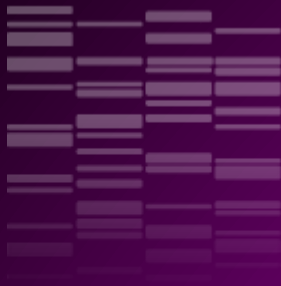
- creation of a home page for GnplS genetic resources
- adding visuals for Siregal (website dedicated to BRC) and for accessions managed by BRC
- layout for "How to order" documentation

**SEPTEMBER 06, 2013**

The genetic resources module 13.2 is now available. See the [release notes](#) page for more information about changes.

Changes:

- possibility to search accessions either relating to a particular BRC, or independently of a BRC
- update of links between accessions and lines, for wheat and grapevine
- display of ecological data on



**Thank you for your attention**

