

Genomic, genetic and phenomic plant data at the INRA URGI : GnpIS.



Training on Triticeae



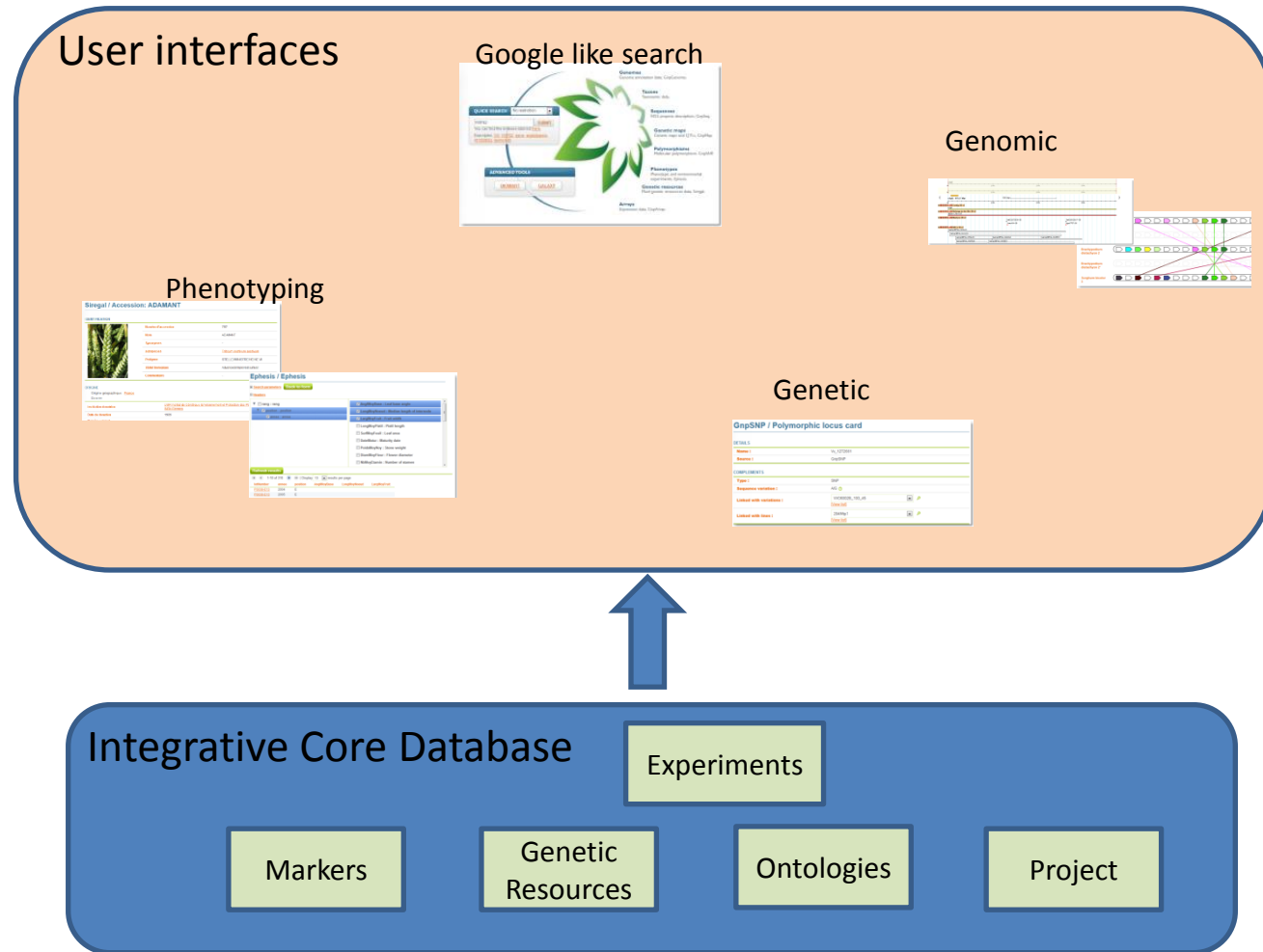
- GnplS presentation
- Part I, Wheat Genomic resources
 - **Quick tour of private sections**
- Part II, Genetic resources and Phenotyping
- Part 3 : Data set building with Biomarts

GNPIS PRESENTATION



- Information system

- Integrative
- Multi thematic
 - Genetic
 - Genomic
 - Phenotyping
- Multispecies



User interfaces

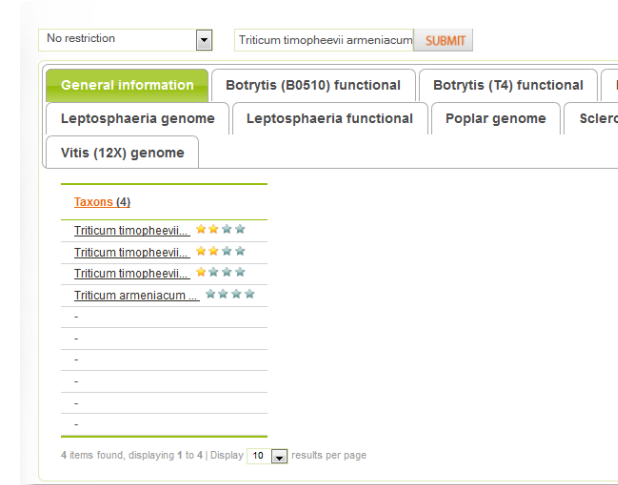
- Query, navigate, export data
 - Integrative/transversal tools
 - Thematic tools.



User interfaces

Integrative and transversal tool

- Quick search interface
 - URGI development
 - Apache Lucene : full text search
 - Google like search on GnpIS
 - Entry point for thematic tools
 - Wheat portal <http://wheat-urgi.versailles.inra.fr/>
- Advanced search : Biomart
 - Datamart
 - Aggregation/Computation of GnpIS core database
 - Designed for a specific questioning : fact with attributes with dimension for filtering.
 - Multicriterion based dataset building
 - Available data marts
 - Genetic maps (markers, Qtls), Polymorphisms (snps, genes), Genetic and Phenotype resources with Genes annotations
 - Grapevine structural and functional annotation with Genetic maps (genetic markers)
 - Wheat, structural annotation with Genetic maps (genetic markers..) and Polymorphisms (snps)
 - Genes functional annotation
 - Arabidopsis Thaliana TAIRV10, Zea mays ZmB73, Populus trichocarpa, Botrytis cinerea T4, Botrytis cinerea B0510, Sclerotinia sclerotiorum, Leptosphaeria maculans
- Advanced Search and pipeline: Galaxy



Dedicated thematic interfaces

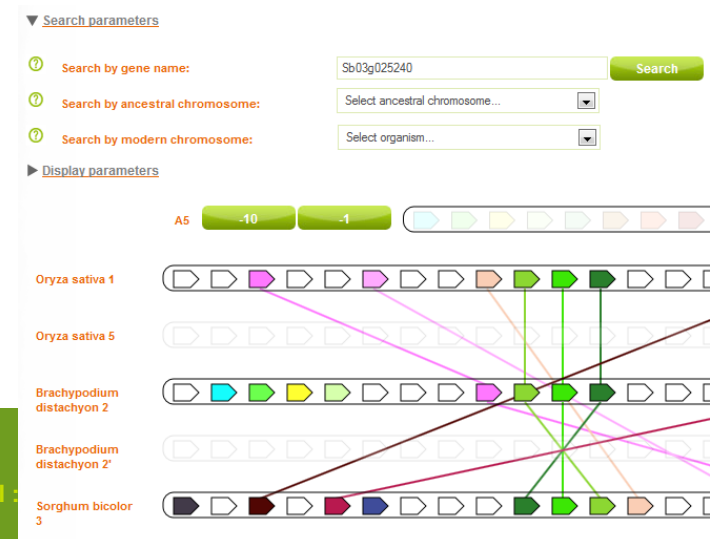
Genetic

- Gene expression
- Genetic maps, markers and QTLs
 - MetaQTL
- Sequence
 - DNA Polymorphisms
 - Genotyping
 - NGS Sequence
- Phenotyping
 - Genetic resources, passports
 - Primary phenotypes
 - Phenotyping experiment (G*E)

Dedicated thematic interfaces

Genomic

- Gbrowse
 - Genome with annotations (partners, consortium, public)
 - Markers, SNP (URGI)
 - SNP Clustering and mapping via MapHits (URGI)
 - Transposable elements (URGI)
- Sequence Retrieval System (SRS) or MobyE
 - Blast or Blat against URGI databanks.
- Genome Report System (GRS)
 - Gene annotation integration interface.
- Synteny viewer (URGI, GDEC J. Salse)



WHEAT GENOMIC RESOURCES



Exercise 1.1

- Entry point <http://wheat-urgi.versailles.inra.fr>
- I want all information on loci Xcfb6012-3B
 - Any marker ? If yes :
 - Type, name
 - What are the positions on the Genetic Maps ?

Exercise 1.1, solution

- Loci Xcfb6012-3B

Wheat

Wheat physical map: 3B v1

Wheat physical map: 3B v2

Genetic mapping

[Loci \(1\)](#)

[Xcfb6012-3B](#) ★★★★★

1 items found, displaying 1 to 1 | Display results per page

Wheat

GnpMap / Locus card

LOCUS DETAILS

Locus name : Xcfb6012-3B

Marker name : [CFB6012](#)

Marker type : SSR

Gene function (manual annotation) : -

MARKER DETAILS

Marker name : CFB6012

Taxon : [Triticum aestivum](#)

Marker type : SSR

Marker origin : amplicon

Target : INRA07

Origin laboratory : Institut National de la Recherche Agro

Remark : CFT6012

MAPPED LOCI

Mapped loci: [2](#)

Locus name	Map name	Taxon	Linkage group	Distance	Reliability (source name)
Xcfb6012-3B	Neighbour3B_080407	Triticum aestivum	3B	7.4	framework
Xcfb6012-3B	ReCS_090305	Triticum aestivum	3B	7.5	non_framework

CROSS REFERENCES

Cross references : 1

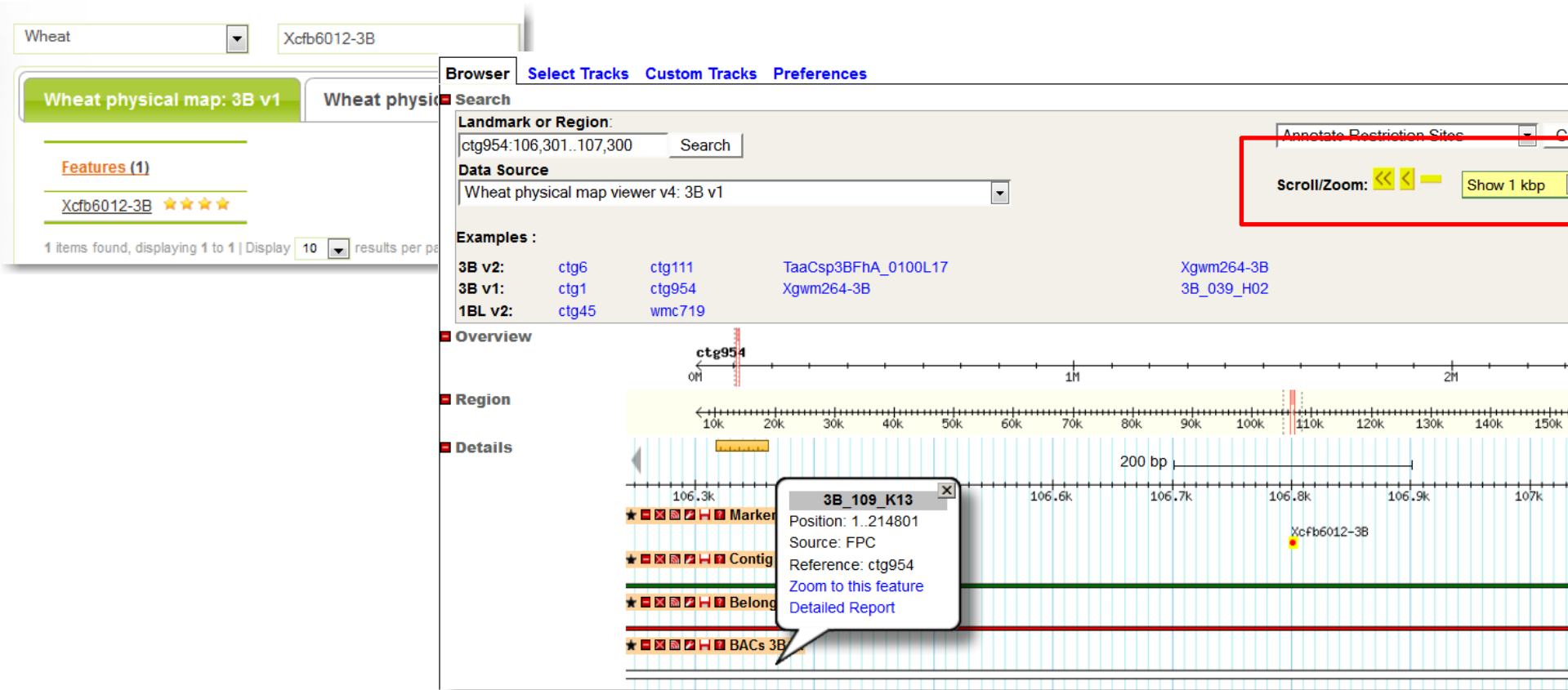
Db name	Reference name	Reference value
Browse Wheat physical map : 3B	name	Xcfb6012-3B

Exercise 1.2

- Display loci Xcfb6012-3B 's region on 3B V1 physical Map
- Is Xcfb6012-3B 's located on any physical BAC, is there any nearby annotation ?
 - Find Xcfb6012-3B contigs and deletion bin
 - Identify the First physical BAC
 - On Annotation Browser (Wheat annotation viewer v2), find one mRNA colocalised with this physical BAC and display the sequence
 - What QTL is colocalised on this BAC. What is the associated Trait ?

Exercise 1.2, solution

- Display loci Xcfb6012-3B 's region on 3B V1 physical Map
- Is Xcfb6012-3B 's located on any physical BAC ?



The screenshot displays the 'Wheat physical map: 3B v1' interface. The search bar shows 'Xcfb6012-3B' and the search results list 'Xcfb6012-3B' with a 5-star rating. The 'Overview' section shows a genomic map with a scale from 0M to 2M. The 'Region' section shows a zoomed-in view of the 106.3k to 107k region. The 'Details' section shows a zoomed-in view of the 106.6k to 107k region. A tooltip for '3B_109_K13' is visible, showing its position (1..214801), source (FPC), reference (ctg954), and links to 'Zoom to this feature' and 'Detailed Report'. The 'Xcfb6012-3B' locus is highlighted in the map.

- Is Xcfb6012-3B 's located on any physical BAC, is there any nearby annotation ?
- Copy / paste 3B_109_K13 in Landmark

ctg0005b.1 ctg0011b.1 ctg0079b.1 ctg0091b.1 ctg0382b.1 ctg0464b.1

Browser Select Tracks Custom Tracks Preferences

Search

Landmark or Region: ctg0954b.1:1..1,000,000 Search

Examples: TAA_ctg0954b.00250.1, Xsts80-3B, ctgD_rep_0033, Tae_1272250, cfp5001, pg4in2F1-ex3R1, QTL_FHB_SumStoa_BLW_3B.

Data Source Wheat annotation viewer v2

Overview

Region

Details

ctg0954b.1: 3 mbp

1

- NOTE SSR CFB012 previously colocalised with Xcfb6012-3B

QTL DETAILS

QTL name	QTL_FHB_SumStoa_BLW_3B
QTL detection	composite interval mapping
Measure	FHB_SumStoa_BLW
Experimentation	SumStoa_BLW
Trait name	FHB

4

resistance to *Fusarium graminearum*

Browser Select Tracks Custom Tracks Preferences

Search

Landmark or Region: ctg0954b.1:2,865,343..3,097,000 Search

Examples: TAA_ctg0954b.00250.1, Xsts80-3B, ctgD_rep_0033, Tae_1272250, cfp5001, pg4in2F1-ex3R1, cfb6001, QTL_FHB_SumStoa_BLW_3B.

Data Source Wheat annotation viewer v2

Overview

Region

Details

ctg0954b.1

50 kbp

2860k 2870k 2880k 2890k 2900k 2910k 2920k 2930k 2940k 2950k 2960k 2970k 2980k 2990k 3000k 3010k

★ ★ ★ ★ ★ DIP allele_tower (GnpSNP)

★ ★ ★ ★ ★ SNP (GnpSNP)

★ ★ ★ ★ ★ SNP allele_tower (GnpSNP)

★ ★ ★ ★ ★ DIP (GnpSNP)

★ ★ ★ ★ ★ BAC

3B_109_K13

TAA_ctg0954b.00470.1 is a mRNA spanning from 2931924 to 2935328. Click for more details.

★ ★ ★ ★ ★ Contig

★ ★ ★ ★ ★ mRNA

★ ★ ★ ★ ★ ISBP

★ ★ ★ ★ ★ SSR

cfp5067 cfp5068 cfp5069 cfp5070 cfp5071 cfp5072

cfb6008 cfb6006 cfb6011 cfb6013

cfb6009 cfb6007 cfb6010 cfb6012 cfb6018

1062

Overview

Region

Details

ctg0954b.1

50 kbp

2870k 2880k 2890k 2900k 2910k 2920k 2930k 2940k 2950k 2960k 2970k 2980k 2990k 3000k 3010k 3020k 3030k

★ ★ ★ ★ ★ QTL

★ ★ ★ ★ ★ DIP allele_tower (GnpSNP)

★ ★ ★ ★ ★ SNP (GnpSNP)

★ ★ ★ ★ ★ SNP allele_tower (GnpSNP)

★ ★ ★ ★ ★ DIP (GnpSNP)

★ ★ ★ ★ ★ BAC

3B_109_K13

★ ★ ★ ★ ★ Contig

QTL_FHB_SumStoa_BLW_3B

Positions : 2108439 .. 3109940

Length : 1001502

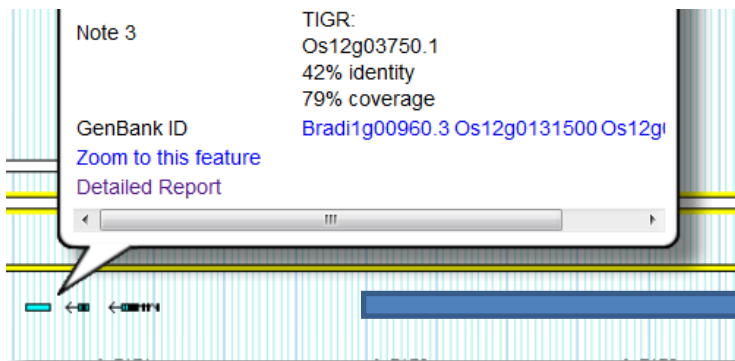
[Zoom to this feature](#)

[Detailed Report](#)

[Link to GnpMap](#)

3

- Consortium private area
- Free registration from wheat web site
 - <http://wheat-urgi.versailles.inra.fr/Register>
- Blast : SRS
- A quick tour
 - Sytneny viewer
 - Wheat dedicated portal



☐ Upload from file :

☒ Paste/Create your own sequence(s) or type in the sequence ID(s) :

```

TCAGCTTACC AGTATAATTA CAGATTCAAG CTTGTAAAGT
AGAAATTCTT TTCTCCCCTC AGTGCAAGTT ATTGAAATCG
CCCATATAGA GGACCATTAT TTTACCCAG AGCAGGAGGA
ATGGTTTGAA CAACTAACCT CTGTCGAAAA AATTGTGTTT
GATAATTGTT ATTTTCTTGA ACGACTCCCT TCTACACTAG
GCAGACTGCG CTCCTTAAAG GTACTTCATA TCATGACAAA
ACCACTGGCC CCGAGAGAAA ATTTCCACA GAACTCCAA
GAATTTATTA TGCATGGATT TCCAGTTGAG GCAGAAAATG
ATTTCAAACC TGGAGGATCA GCTTGGATAA ACATTCTCA
TGTTCCATAC ATCCGTCTTA ATGGGAAGAC GATCCAAAAT
CGACAAATGG ATGCTGCCTC ATCGTCTTCA AACCACAAA TTTGA
  
```

☐ Save my sequence in USERDNA

PART II, GENETIC RESOURCES AND PHENOTYPING



Exercise 2.1

- Important : be careful not to accidentally order semences on Siregal interfaces.
- I want to study *Hordeum vulgare*.
 - What are the available resources on *Hordeum* genus?
 - What are the available subspecies (Siregal thematic interface recommended)

Exercise 2,1, solution

No restriction

EST libraries (1)	EST samples (1)	Taxons (94)
AB038526	AB038526	Hordeum pusillum Nut...
-	-	Hordeum murinum ssp...
-	-	Hordeum marinum ssp...
-	-	Hordeum chilense Roe...
-	-	Hordeum bulbosum L...
-	-	Hordeum brachyanther...
-	-	Hordeum vulgare L...
-	-	-
-	-	-
-	-	-
-	-	-

1 2 3 4 5 6 7 8 9 10 | 94 items fou

[Log in](#)

My basket 0 item(s)

Preferences

No restriction

- Small grain cereals GF

Main

- HOME
- ABOUT

Global queries

- TAXONS

Queries

- ACCESSION
 - Simple
 - Passport

Documentation

- USER GUIDE

No restriction

EST libraries (1)	EST samples (1)	Taxons (10)
AB038526	AB038526	Hordeum vulgare L...
-	-	Hordeum vulgare_bar...
-	-	Hordeum vulgare spon...
-	-	Hordeum vulgare vulg...
-	-	Hordeum vulgare var...
-	-	Hordeum vulgare conv...
-	-	Hordeum vulgare L_s...
-	-	-
-	-	-
-	-	-

Siregal / Taxons

La recherche a été restreinte sur: [CEREALS](#) [\[Help\]](#)

Query parameters :
Scientific name : Hordeum

[GnpArray](#)

[GnpMap](#)

[GnpSNP](#)

[GnpSeq NGS](#)

[Siregal](#)

9 items found, displaying 1 to 9 | Display results per page

#	Nom scientifique	Auteurs	Noms communs	Objets liés
1	Hordeum jubatum	-	-	-
2	Hordeum jubatum jubatum	-	-	-
3	Hordeum L.	-	Barley, Orge	-
4	Hordeum murinum	-	-	-
5	Hordeum murinum murinum	-	-	-
6	Hordeum persicum	-	-	-
7	Hordeum vulgare	-	-	9
8	Hordeum vulgare spontaneum	-	-	-
9	Hordeum vulgare vulgare	-	-	461

Exercise 2.2

- Is there any winter cultivar for *Hordeum vulgare vulgare* ?
 - What is Adri cultivar pedigree/genealogy ?
 - What are the Accessions related to Astrix ?

Exercise 2.2, solution

Siregal / Accession query

QUERY PARAMETERS

The query will be restricted on : [CEREALS](#) [\[Help\]](#)

Identification [Show all] | [Hide all]

Accession number (+)

Accession name (*)

Taxonomy

Scientific name (+)

Phenotype

Descriptors :

[Susceptibility to Puccinia striiformis f. sp. hordei](#)
[Growth class](#)
[Days to heading \(Counted as days from sowing\)](#)
[Scale of 1000 kernels weight](#)
[Susceptibility to Puccinia recondita \(Leaf rust\)](#)



Siregal / Accession: ADRI

IDENTIFICATION

Numéro d'accension	10103
Nom	ADRI
Synonymes	-
subspecies	Hordeum vulgare vulgare
Pedigree	LIGNEE 248/ ASTRIX
Statut biologique	Advanced/improved cultivar
Commentaire	-



Pedigree

Genealogy relationship with (*)

[Susceptibility to Puccinia striiformis f. sp. hordei](#)

Collection

4 items found, displaying 1 to 4 | Display 10 ☐ results per page

#	Accession number	Accession name	Taxon	Biological status	Country	Basket
1	10103	ADRI	Hordeum vulgare vulgare	Advanced/improved cultivar	FRA	+
2	9334	ELAN~DESPREZ	Hordeum vulgare vulgare	Advanced/improved cultivar	FRA	+
3	9476	MONIX	Hordeum vulgare vulgare	Advanced/improved cultivar	FRA	+
4	10096	TEAM	Hordeum vulgare vulgare	Advanced/improved cultivar	FRA	+



Exercise 2.3

- Find Hordeum related experimental data.
 - Ephesis thematic interface recommended
- Export sample ID, steml and 1000grain data for Harmal and CamB1

Exercise 2.3 solution

Ephesis / Ephesis

[Search parameters](#) [Back to form](#)

Headers

- ☐ Task : task
 - ☐ Replication : replication
 - ☐ Pot : pot
 - ☒ Sample : sample

Refresh results

1-133 of 133 | Display 200 results per page

lotNumber	Sample	IPGPAS:steml	IPGPAS:1000grain
CamB1	1	47.3	40.9
CamB1	1	43.2	39.2
CamB1	1	42.2	38.1
CamB1	1	37.2	38
CamB1	1	43.4	35.4
CamB1	1	42.4	34.8
CamB1	1	59.9	35
CamB1	1	57.7	41.5
Harmal	1	37	42.4
Harmal	1	38.3	38.9
Harmal	1	40.5	37.2
Harmal	1	36.2	39.8
Harmal	1	43.6	39.3

PART 3 : DATA SET BUILDING WITH BIOMARTS



- Siregal thematic interface limitation
 - Growth class annotated data filter only.
 - To add value filter
 - Biomart now
 - Planned development for siregal thematic interface
- Go to Biomart
 - <http://urgi.versailles.inra.fr/biomart/martview/300678dcd6dcb13b10e1dc6b318d6a84>
 - Choose genetic resources dataset
- I want all Spring accession of genus triticum
 - Growth class = %Spring%

Exercise 3.3

- Genetic resources dataset Phenotypes are Primary phenotypes
 - Constant for all individuals
 - Assumed more or less independant from the environment
 - Fruit size, fruit color, Mean LAI, etc...
- I want to study the variability of Primary phenotypes in experiments.
 - Prunus has a lot of public data
 - Exercise 3.2: I want all prunus with medium fruit size.
 - Exercise 3.3: Get all experiment data

New	Count	Results
Dataset 26 / 129799 Entries		
Genetic resources		
Filters		
Genus : Prunus L.		
Phenotype : Fruit size		
Phenotype Value (% for wildcard) : %medium%		
Attributes		
Accession name		
Taxon		
Collection code		
Phenotype		
Phenotype value		
Link to Siregal		

Exercise 3.3 solution

New

Count

Results

★ URL

Dataset 26 / 129799 Entries

Genetic resources

Filters

Genus : Prunus L.

Phenotype : Fruit size

Phenotype Value (% for wildcard) : %medium%

Attributes

Accession name

Taxon

Collection code

Phenotype

Phenotype value

Link to Siregal

Export all results to

File

XLS

☒ Unique results only

Go

Email notification to

View

150

rows as

HTML

☐ Unique results only

Accession name	Taxon	Collection code	Phenotype	Phenotype value	Link to Siregal	Phenotype	Phenotype value
Madame Guttin	Prunus domestica L.	PLUM_NATIONAL_COLLECTION	Fruit size	medium moyen	13891	Fruit flesh color, L* value	
Madame Guttin	Prunus domestica L.	PLUM_NATIONAL_COLLECTION	Fruit size	medium moyen	13891	Fruit width	
Quetsche verte	Prunus domestica L.	PLUM_NATIONAL_COLLECTION	Fruit size	medium moyen	13944	Fruit weight	
Quetsche verte	Prunus domestica L.	PLUM_NATIONAL_COLLECTION	Fruit size	medium moyen	13944	Fruit width	33.9915
Ovale jaune	Prunus domestica L.	PLUM_NATIONAL_COLLECTION	Fruit size	medium moyen	13947	Fruit flesh color, b* value	
Ovale jaune	Prunus domestica L.	PLUM_NATIONAL_COLLECTION	Fruit size	medium moyen	13947	Fruit cracking percentage	0.05
Ovale jaune	Prunus domestica L.	PLUM_NATIONAL_COLLECTION	Fruit size	medium moyen	13947	Fruit flesh color, a* value	6.5137315
Verdanne	Prunus domestica L.	PLUM_NATIONAL_COLLECTION	Fruit size	medium moyen	13905	Fruit weight	34.425
Verdanne	Prunus domestica L.	PLUM_NATIONAL_COLLECTION	Fruit size	medium moyen	13905	Fruit weight	
Verdanne	Prunus domestica L.	PLUM_NATIONAL_COLLECTION	Fruit size	medium moyen	13905	Fruit weight	25.975
Verdanne	Prunus domestica L.	PLUM_NATIONAL_COLLECTION	Fruit size	medium moyen	13905	Fruit flesh color, b* value	
Verdanne	Prunus domestica L.	PLUM_NATIONAL_COLLECTION	Fruit size	medium moyen	13905	Fruit height	40.082
Verdanne	Prunus domestica L.	PLUM_NATIONAL_COLLECTION	Fruit size	medium moyen	13905	Fruit cracking percentage	0
Berudge	Prunus domestica L.	PLUM_NATIONAL_COLLECTION	Fruit size	medium moyen	13917	Fruit weight	28.818182
Reine-Claude Davion	Prunus domestica L.	PLUM_NATIONAL_COLLECTION	Fruit size	medium moyen	13895	Fruit weight	23.3

- **Data**

- 8 years of Triticea French phenotyping experiments (novembre)
- Private data for national projects.
- Wheat for all thematics

- **Development**

- Improved searching capabilities
 - Project driven (10 national projects)
 - Thematic
 - Transversal entry point
- Association genetic
- Integration with Distributed search systems : Transplant.
- Integration with Phenome, Ephesis as an integrative portal for FPPN.