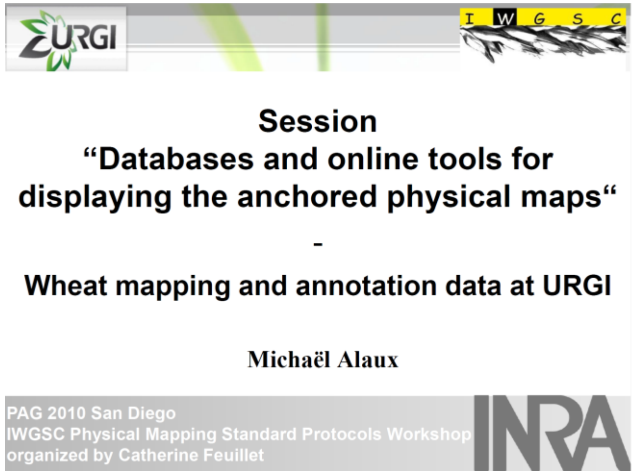
Find Genomic, Genetic and Phenomic Data for Wheat Using the WheatIS Data Discovery Tool

Michael Alaux *et al.*

Intro



Session
“Databases and online tools for displaying the anchored physical maps“
-
Wheat mapping and annotation data at URGI

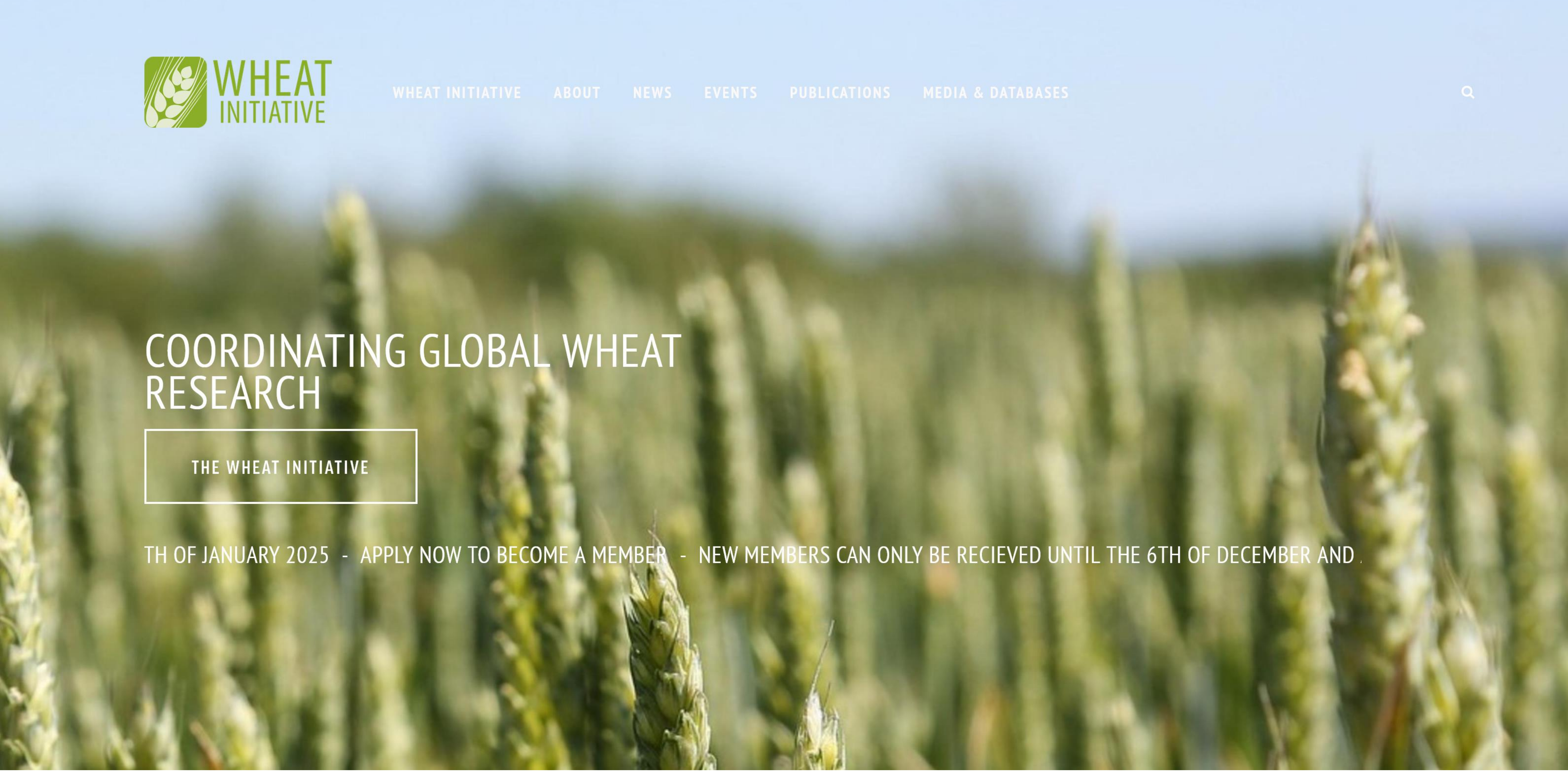
Michaël Alaux

PAG 2010 San Diego
IWGSC Physical Mapping Standard Protocols Workshop
organized by Catherine Feuillet

- Genomics data well managed thanks to the coordination of the IWGSC
- Need to find the other types of data (germplasm, phenotyping, genotyping, etc.) hosted in databases around the world
  → Wheat Information System

Outline

- What is WheatIS and how to use it to discover data ?
    - The Wheat Initiative
    - The WheatIS Expert Working Group
    - Data standards
    - Data discovery
    - Sharing experiences



COORDINATING GLOBAL WHEAT RESEARCH

TH OF JANUARY 2025 - APPLY NOW TO BECOME A MEMBER - NEW MEMBERS CAN ONLY BE RECIEVED UNTIL THE 6TH OF DECEMBER AND

https://www.wheatinitiative.org/

History

Coordinated by JKI (Germany)
scientific leader: Peter Langridge

Coordinated by INRA (France)
scientific leader: Hélène Lucas

HISTORY

2024

2023

2022 New Strategic Research Agenda

2021 10 years anniversary

2020 Alliance for wheat adaption to heat & drought (AHEAD)

2019 1st International Wheat Congress

2018 Transfer of WI office to Berlin, Germany

2016 German Federal Ministry of Food and Agriculture agrees to host WI

2015 Strategic Research Agenda

2013 Vision paper published; first EWGs established

2012 Establishing Committees

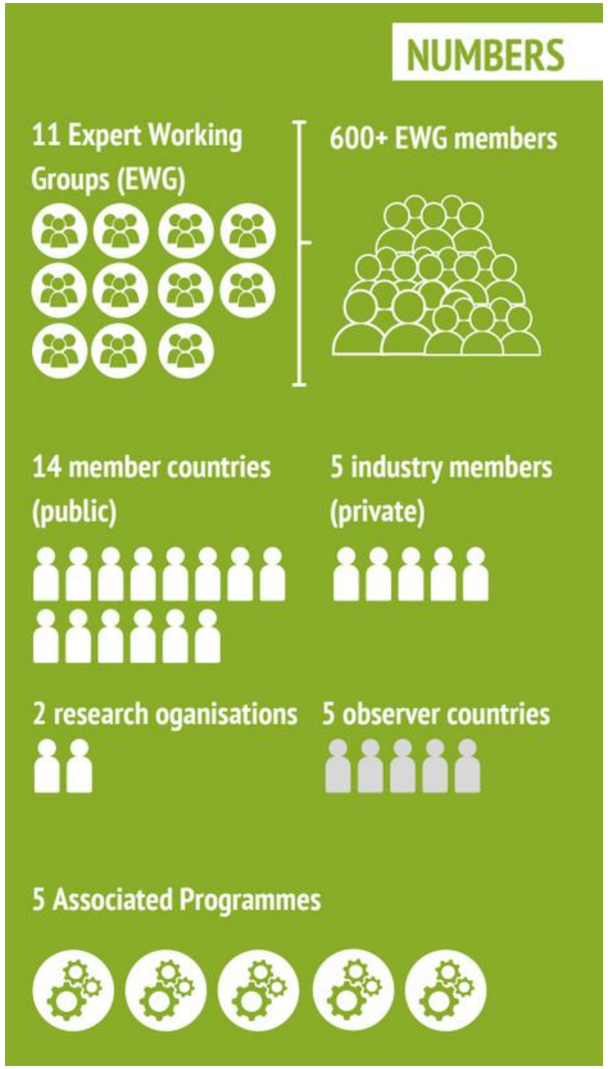
2011 Launched September 15, endorsed by G20 countries, based at INRAE in France

chair: Michael Alaux (INRAE-URGI)

chair: Taner Sen (USDA-ARS)

Launch of the Wheat Information System Expert Working Group
chair: Hadi Quesneville (INRA-URGI)

Organisation



NUMBERS

11 Expert Working Groups (EWG)

600+ EWG members

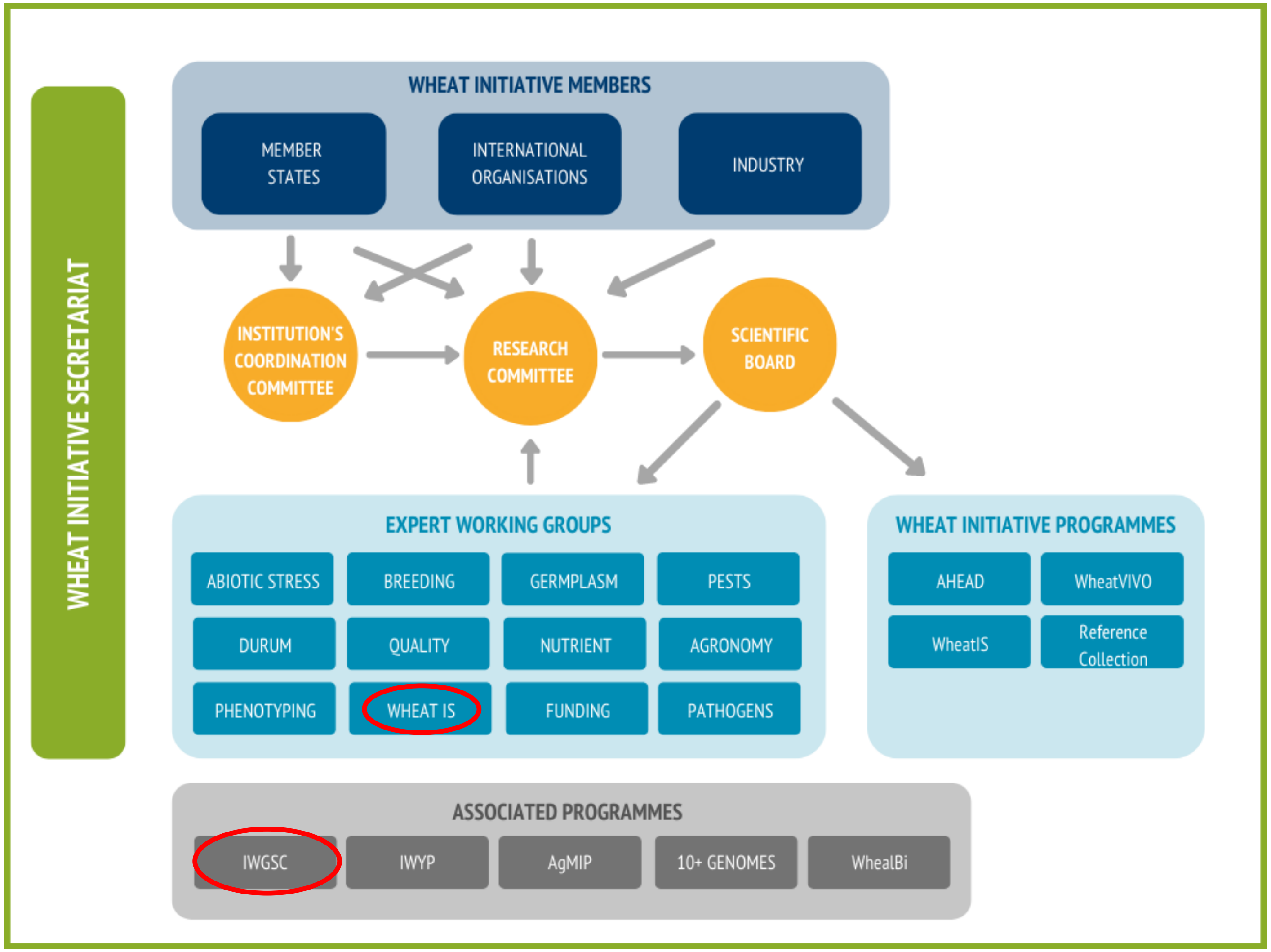
14 member countries (public)

5 industry members (private)

2 research oganisations

5 observer countries

5 Associated Programmes



WHEAT INITIATIVE SECRETARIAT

WHEAT INITIATIVE MEMBERS

- MEMBER STATES
- INTERNATIONAL ORGANISATIONS
- INDUSTRY

INSTITUTION'S COORDINATION COMMITTEE

RESEARCH COMMITTEE

SCIENTIFIC BOARD

EXPERT WORKING GROUPS

- ABIOTIC STRESS
- BREEDING
- GERMPLASM
- PESTS
- DURUM
- QUALITY
- NUTRIENT
- AGRONOMY
- PHENOTYPING
- WHEAT IS
- FUNDING
- PATHOGENS

WHEAT INITIATIVE PROGRAMMES

- AHEAD
- WheatVIVO
- WheatIS
- Reference Collection

ASSOCIATED PROGRAMMES

- IWGSC
- IWYP
- AgMIP
- 10+ GENOMES
- WhealBi

Strategic Research Agenda


STRATEGIC RESEARCH AGENDA

WHEAT INITIATIVE

July 2022

Meeting the Challenges Facing Wheat Production: The Strategic Research Agenda of the Global Wheat Initiative

by **Peter Langridge** [1,2,*], **Michael Alaux** [3], **Nuno Felipe Almeida** [4], **Karim Ammar** [5], **Michael Baum** [6], **Faouzi Bekkaoui** [7], **Alison R. Bentley** [5], **Brian L. Beres** [8], **Bettina Berger** [9], **Hans-Joachim Braun** [5], **Gina Brown-Guedira** [10], **Christopher James Burt** [11], **Mario Jose Caccamo** [12], **Luigi Cattivelli** [13], **Gilles Charmet** [14], **Peter Civáň** [14], **Sylvie Cloutier** [15], **Jean-Pierre Cohan** [16], **Pierre J. Devaux** [17], **Fiona M. Doohan** [18], **+ Show full author list**

[1] School of Agriculture, Food and Wine, Waite Campus, University of Adelaide, PMB1, Glen Osmond, SA 5064, Australia
[2] Wheat Initiative, JKI (Julius Kühn Institute), Federal Research Centre for Cultivated Plants, 14195 Berlin, Germany
[3] INRAE, URGI, Université Paris-Saclay, 78026 Versailles, France
[4] ASUR Plant Breeding, 60190 Estrées-Saint-Denis, France
[5] CIMMYT (International Maize and Wheat Improvement Center), Texcoco 56237, Mexico
[6] ICARDA (International Center for Agricultural Research in the Dry Areas), Rabat 10106, Morocco
[7] INRA (National Institute for Agricultural Research), Rabat 10090, Morocco
[8] AAFC (Agriculture & Agri-Food Canada), Lethbridge Research and Development Centre, Lethbridge, AB T1J 4B1, Canada
[9] Australian Plant Phenomics Facility, School of Agriculture, Food and Wine, University of Adelaide, Urrbrae, SA 5064, Australia
[10] USDA-ARS (United States Department of Agriculture—Agricultural Research Service), Plant Science Research, Raleigh, NC 27695, USA
+ Show full affiliation list
[*] Author to whom correspondence should be addressed.

Agronomy **2022**, *12*(11), 2767; **https://doi.org/10.3390/agronomy12112767**

Received: 26 September 2022 / Revised: 28 October 2022 / Accepted: 29 October 2022 / Published: 7 November 2022

https://doi.org/10.3390/agronomy12112767

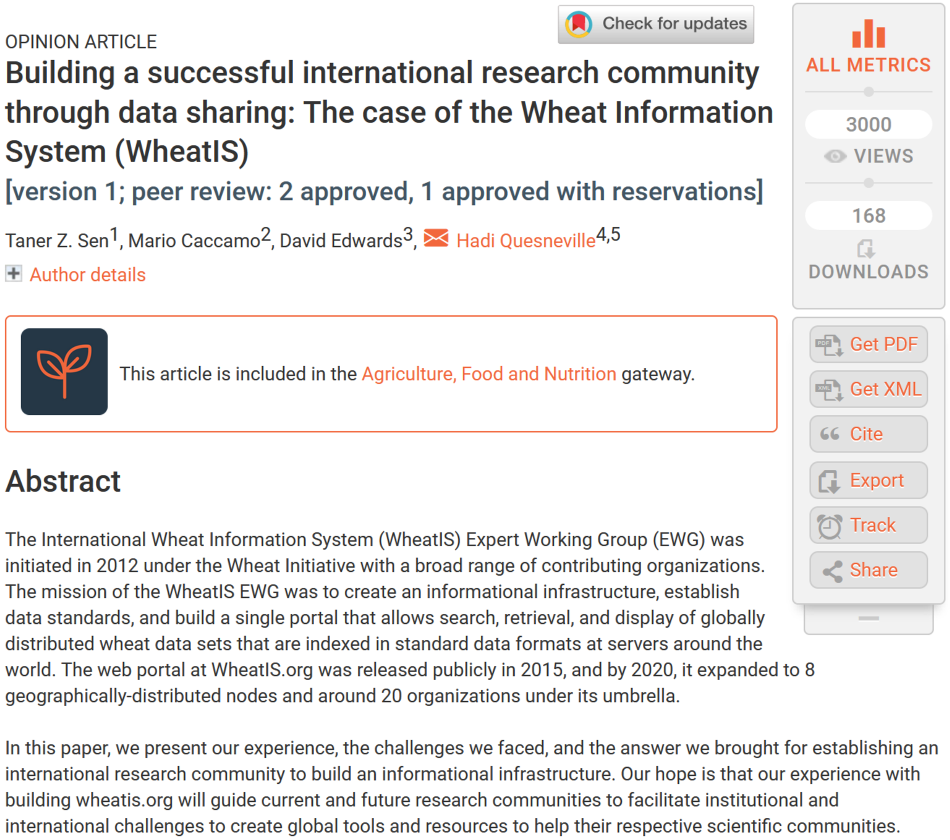
wheatIS

WHEAT INFORMATION SYSTEM

http://www.wheatis.org/

Build the community

- Building an expert working group
  - focus on recruiting diverse profiles covering important countries or geographical areas, institutions, interest groups and scientific fields for wheat research
- Seeking help from other communities
  - Wheat Data Interoperability Working Group was created as one of the Research Data Alliance working groups
- Surveys
  - usage of data standards in the wheat research community



OPINION ARTICLE

Building a successful international research community through data sharing: The case of the Wheat Information System (WheatIS)

[version 1; peer review: 2 approved, 1 approved with reservations]

Taner Z. Sen[1], Mario Caccamo[2], David Edwards[3], Hadi Quesneville[4,5]

Author details

This article is included in the Agriculture, Food and Nutrition gateway.

Abstract

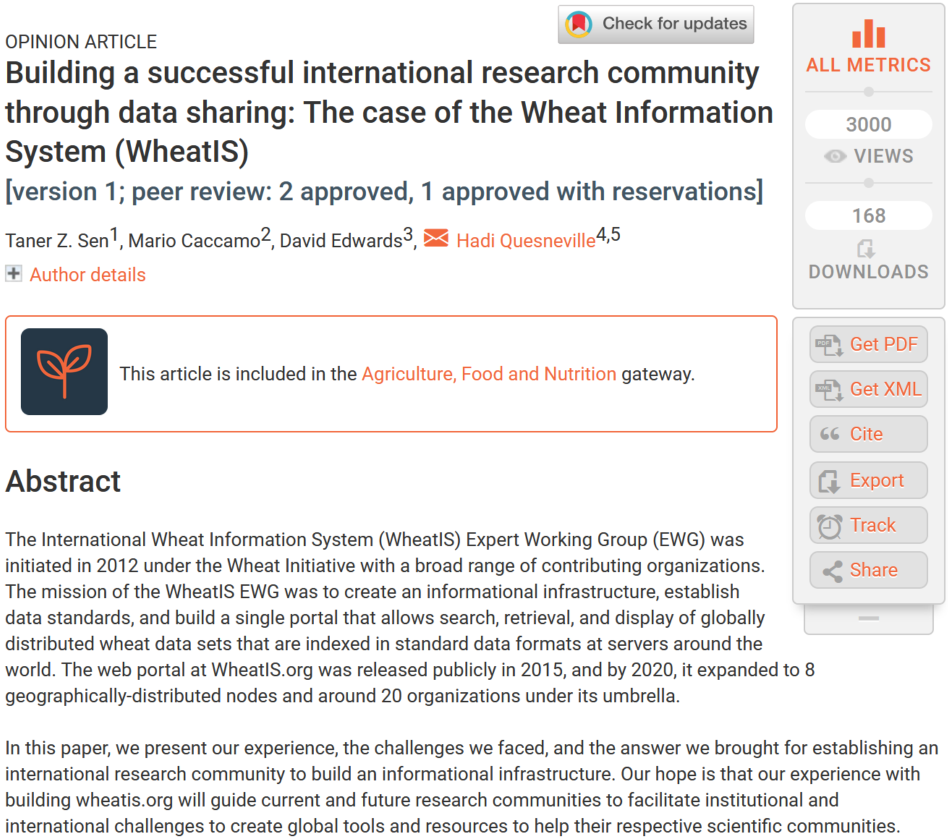
The International Wheat Information System (WheatIS) Expert Working Group (EWG) was initiated in 2012 under the Wheat Initiative with a broad range of contributing organizations. The mission of the WheatIS EWG was to create an informational infrastructure, establish data standards, and build a single portal that allows search, retrieval, and display of globally distributed wheat data sets that are indexed in standard data formats at servers around the world. The web portal at WheatIS.org was released publicly in 2015, and by 2020, it expanded to 8 geographically-distributed nodes and around 20 organizations under its umbrella.

In this paper, we present our experience, the challenges we faced, and the answer we brought for establishing an international research community to build an informational infrastructure. Our hope is that our experience with building wheatis.org will guide current and future research communities to facilitate institutional and international challenges to create global tools and resources to help their respective scientific communities.

https://doi.org/10.12688/f1000research.23525.1

Build the community

- Fundings
    - Meetings (e.g. annual meeting at PAG)
    - Workshops
- A successful result
    - WheatIS data discovery tool
- Outreach
    - Trainings
    - Website and social media
    - Joint actions with other EWGs



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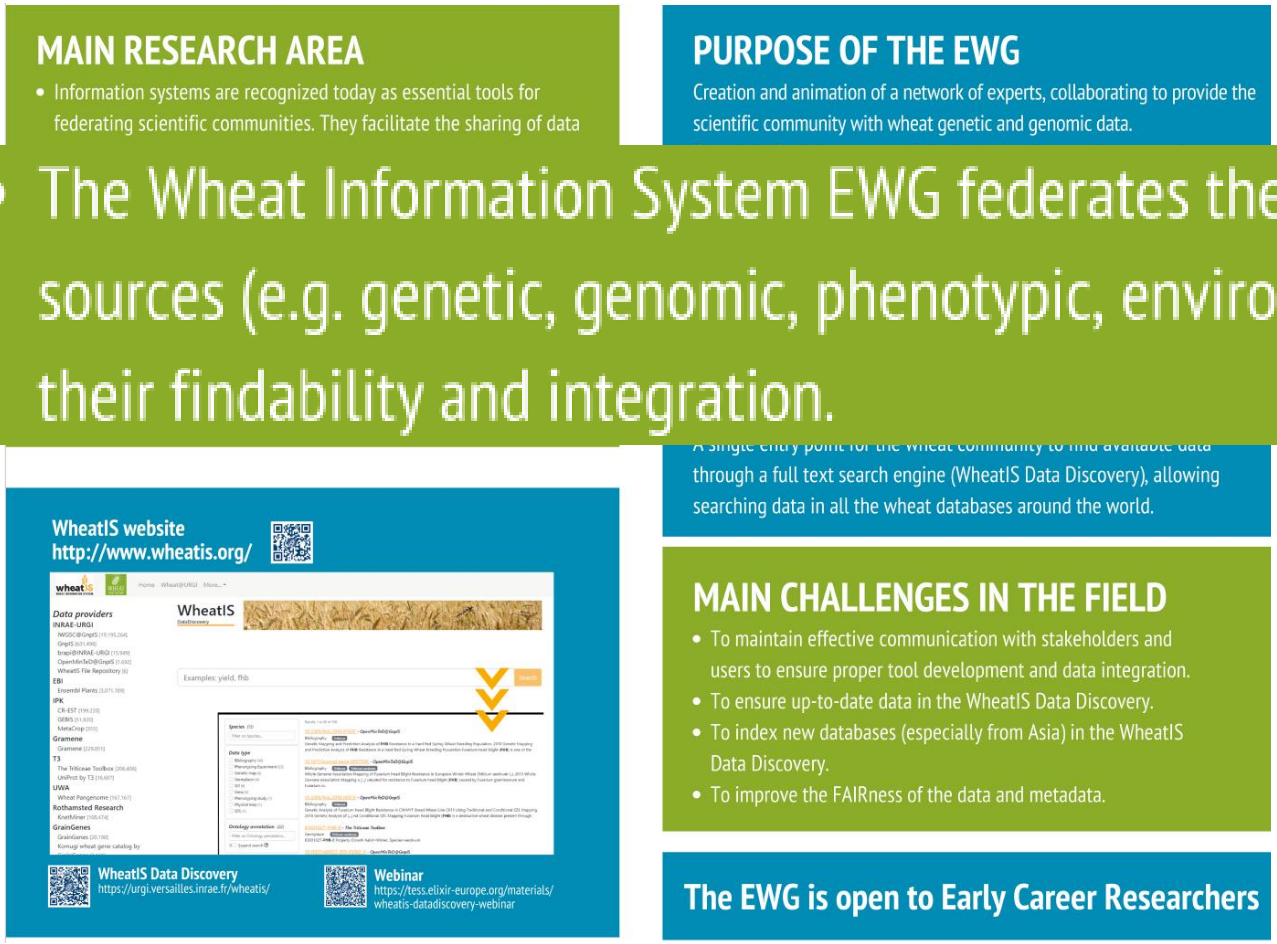
Expert working group



MAIN RESEARCH AREA

- Information systems are recognized today as essential tools for federating scientific communities. They facilitate the sharing of data

PURPOSE OF THE EWG

Creation and animation of a network of experts, collaborating to provide the scientific community with wheat genetic and genomic data.

A single entry point for the wheat community to find available data through a full text search engine (WheatIS Data Discovery), allowing searching data in all the wheat databases around the world.

WheatIS website
http://www.wheatis.org/

Data providers
INRAE-URGI
- IWGSC@GnpIS [19,195,264]
- GnpIS [631,490]
- brapi@INRAE-URGI [15,949]
- OpenMinTeD@GnpIS [1,492]
- WheatIS File Repository [6]

EBI
- Ensembl Plants [3,071,189]

IPK
- CR-EST [199,220]
- GEBIS [51,820]
- MetaCrop [355]

Gramene
- Gramene [229,851]

T3
- The Triticeae Toolbox [206,406]
- UniProt by T3 [16,607]

UWA
- Wheat Pangenome [167,167]

Rothamsted Research
- KnetMiner [108,474]

GrainGenes
- GrainGenes [20,100]
- Komugi wheat gene catalog by

WheatIS Data Discovery
https://urgi.versailles.inrae.fr/wheatis/

Webinar
https://tess.elixir-europe.org/materials/wheatis-datadiscovery-webinar

MAIN CHALLENGES IN THE FIELD

- To maintain effective communication with stakeholders and users to ensure proper tool development and data integration.
- To ensure up-to-date data in the WheatIS Data Discovery.
- To index new databases (especially from Asia) in the WheatIS Data Discovery.
- To improve the FAIRness of the data and metadata.

The EWG is open to Early Career Researchers

EWG CHAIRS AND CO-CHAIRS

rio CACCAMO
(NIAB)

Taner SEN
(USDA-ARS)

Sarah DYER
(EMBL-EBI)

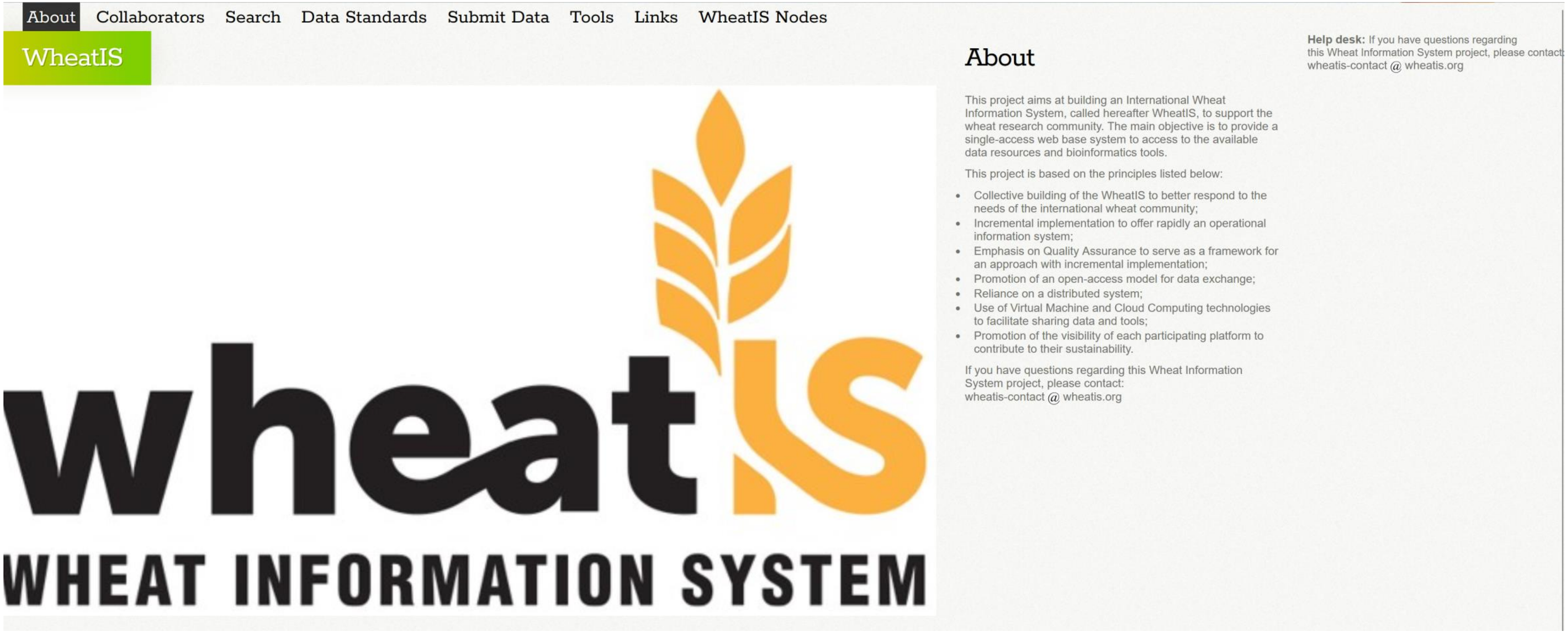
Dave EDWARDS
(UWA)

OME A
MBER
HEATTHEWORLD

- The Wheat Information System EWG federates the diverse information sources (e.g. genetic, genomic, phenotypic, environmental), allowing their findability and integration.

21 experts from Europe, America, Asia, Oceania including 6 early career researchers

Website



Help desk: If you have questions regarding this Wheat Information System project, please contact wheatis-contact @ wheatis.org

About

This project aims at building an International Wheat Information System, called hereafter WheatIS, to support the wheat research community. The main objective is to provide a single-access web base system to access to the available data resources and bioinformatics tools.

This project is based on the principles listed below:

- Collective building of the WheatIS to better respond to the needs of the international wheat community;
- Incremental implementation to offer rapidly an operational information system;
- Emphasis on Quality Assurance to serve as a framework for an approach with incremental implementation;
- Promotion of an open-access model for data exchange;
- Reliance on a distributed system;
- Use of Virtual Machine and Cloud Computing technologies to facilitate sharing data and tools;
- Promotion of the visibility of each participating platform to contribute to their sustainability.

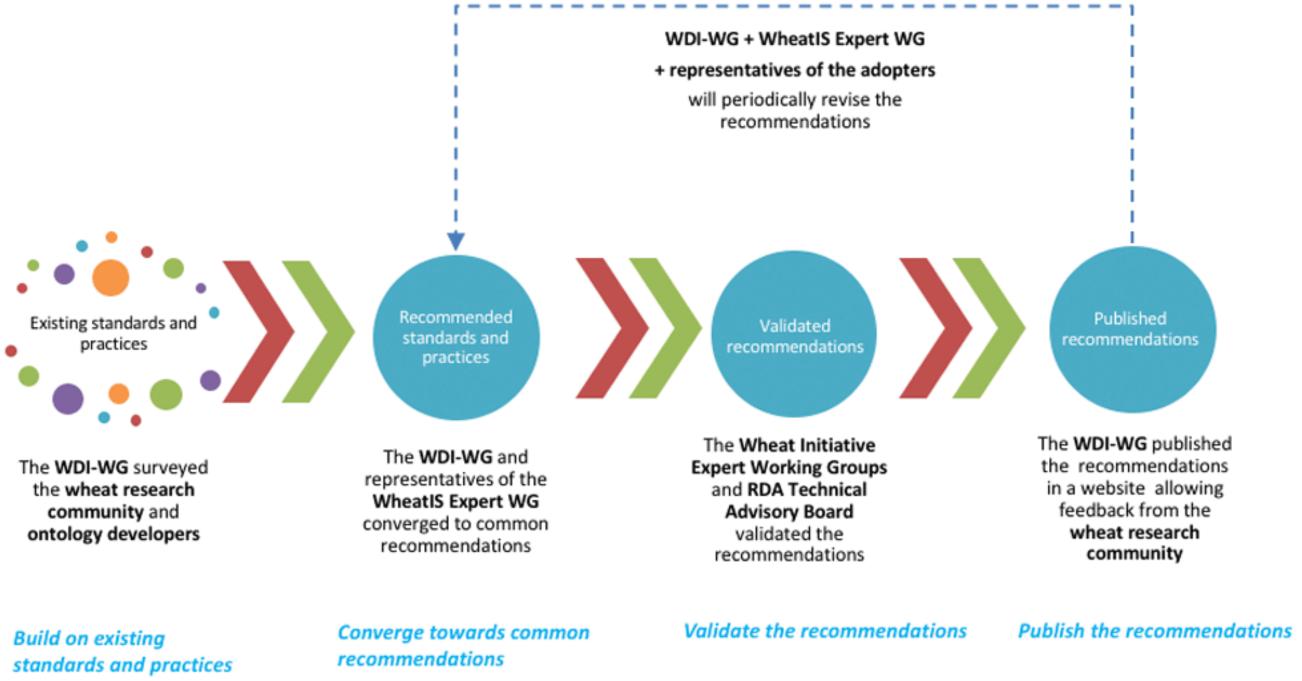
If you have questions regarding this Wheat Information System project, please contact: wheatis-contact @ wheatis.org

http://www.wheatis.org/

RESEARCH DATA ALLIANCE

RDA Wheat Data Interoperability Working Group

- Community driven methodology



WDI-WG + WheatIS Expert WG
+ representatives of the adopters
will periodically revise the recommendations

The **WDI-WG** surveyed the **wheat research community** and **ontology developers**

The **WDI-WG** and representatives of the **WheatIS Expert WG** converged to common recommendations

The **Wheat Initiative Expert Working Groups** and **RDA Technical Advisory Board** validated the recommendations

The **WDI-WG** published the recommendations in a website allowing feedback from the **wheat research community**

Build on existing standards and practices

Converge towards common recommendations

Validate the recommendations

Publish the recommendations

OPINION ARTICLE

REVISED **Developing data interoperability using standards: A wheat community use case [version 2; peer review: 2 approved]**

Esther Dzale Yeumo[1], Michael Alaux [2], Elizabeth Arnaud[3], Sophie Aubin[1], Ute Baumann[4], Patrice Buche[5], Laurel Cooper [6], Hanna Ćwiek-Kupczyńska[7], Robert P. Davey [8], Richard Allan Fulss[9], Clement Jonquet [10,11], Marie-Angélique Laporte[3], Pierre Larmande [12,13], Cyril Pommier [2], Vassilis Protonotarios [14], Carmen Reverte [15], Rosemary Shrestha[9], Imma Subirats[16], Aravind Venkatesan [12], Alex Whan[17], Hadi Quesneville [2]

Author details

This article is included in the Agriculture, Food and Nutrition gateway.

Abstract

In this article, we present a joint effort of the wheat research community, along with data and ontology experts, to develop wheat data interoperability guidelines. Interoperability is the ability of two or more systems and devices to cooperate and exchange data, and interpret that shared information. Interoperability is a growing concern to the wheat scientific community, and agriculture in general, as the need to interpret the deluge of data obtained through high-throughput technologies grows. Agreeing on common data formats, metadata, and vocabulary standards is an important step to obtain the required data interoperability level in order to add value by encouraging data sharing, and subsequently facilitate the extraction of new information from existing and new datasets.
During a period of more than 18 months, the RDA Wheat Data Interoperability Working Group (WDI-WG) surveyed the wheat research community about the use of data standards, then discussed and selected a set of recommendations based on consensual criteria. The recommendations promote standards for data types identified by the wheat research community as the most important for the coming years: nucleotide sequence variants, genome annotations, phenotypes, germplasm data, gene expression experiments, and physical maps. For each of these data types, the guidelines recommend best practices in terms of use of data formats, metadata standards and ontologies. In addition to the best practices, the guidelines provide examples of tools and implementations that are likely to facilitate the adoption of the recommendations.
To maximize the adoption of the recommendations, the WDI-WG used a community-driven approach that involved the wheat research community from the start, took into account their needs and practices, and provided them with a framework to keep the recommendations up to date. We also report this approach's potential to be generalizable to other (agricultural) domains.

https://doi.org/10.12688/f1000research.12234.2

RDA Wheat Data Interoperability Working Group

- Dissemination
  - Website
  - Agroportal for wheat ontologies
- Adoption

OPINION ARTICLE

REVISED **Developing data interoperability using standards: A wheat community use case [version 2; peer review: 2 approved]**

Esther Dzale Yeumo[1], Michael Alaux[2], Elizabeth Arnaud[3], Sophie Aubin[1], Ute Baumann[4], Patrice Buche[5], Laurel Cooper[6], Hanna Ćwiek-Kupczyńska[7], Robert P. Davey[8], Richard Allan Fulss[9], Clement Jonquet[10,11], Marie-Angélique Laporte[3], Pierre Larmande[12,13], Cyril Pommier[2], Vassilis Protonotarios[14], Carmen Reverte[15], Rosemary Shrestha[9], Imma Subirats[16], Aravind Venkatesan[12], Alex Whan[17], Hadi Quesneville[2]

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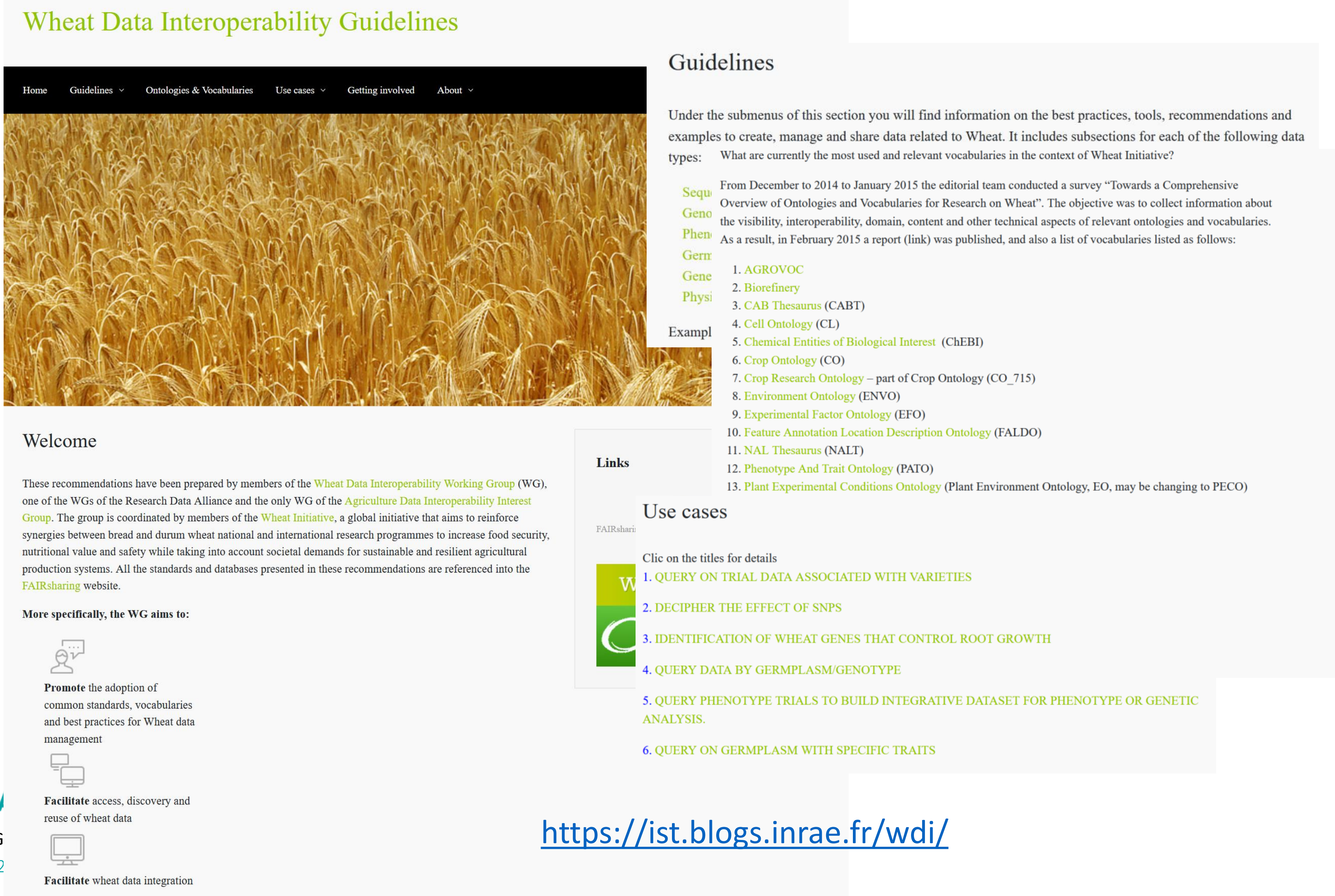
https://doi.org/10.12688/f1000research.12234.2

Dedicated website



Wheat Data Interoperability Guidelines

Welcome

These recommendations have been prepared by members of the Wheat Data Interoperability Working Group (WG), one of the WGs of the Research Data Alliance and the only WG of the Agriculture Data Interoperability Interest Group. The group is coordinated by members of the Wheat Initiative, a global initiative that aims to reinforce synergies between bread and durum wheat national and international research programmes to increase food security, nutritional value and safety while taking into account societal demands for sustainable and resilient agricultural production systems. All the standards and databases presented in these recommendations are referenced into the FAIRsharing website.

More specifically, the WG aims to:

Promote the adoption of common standards, vocabularies and best practices for Wheat data management

Facilitate access, discovery and reuse of wheat data

Facilitate wheat data integration

Links

FAIRsharin

Guidelines

Under the submenus of this section you will find information on the best practices, tools, recommendations and examples to create, manage and share data related to Wheat. It includes subsections for each of the following data types:

Sequ
Geno
Phen
Germ
Gene
Physi

Exampl

What are currently the most used and relevant vocabularies in the context of Wheat Initiative?

From December to 2014 to January 2015 the editorial team conducted a survey “Towards a Comprehensive Overview of Ontologies and Vocabularies for Research on Wheat”. The objective was to collect information about the visibility, interoperability, domain, content and other technical aspects of relevant ontologies and vocabularies. As a result, in February 2015 a report (link) was published, and also a list of vocabularies listed as follows:

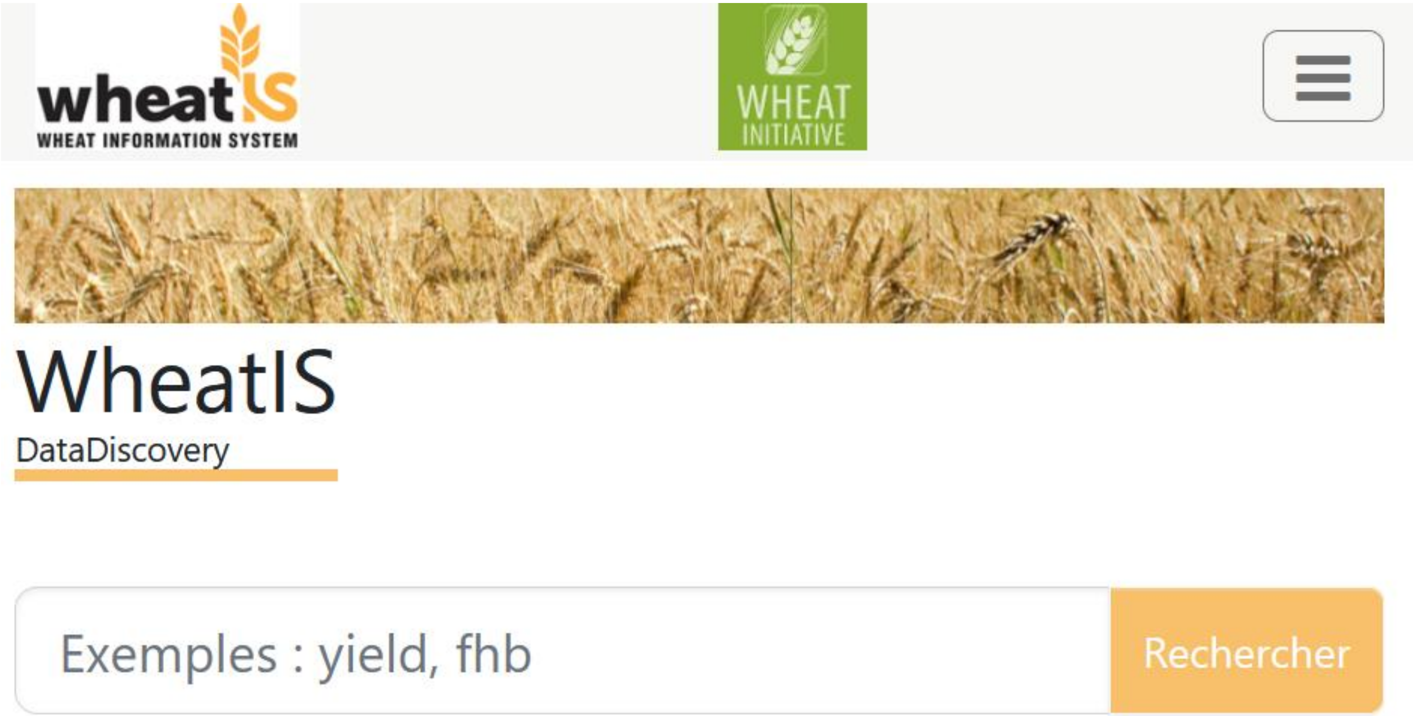
1. AGROVOC
2. Biorefinery
3. CAB Thesaurus (CABT)
4. Cell Ontology (CL)
5. Chemical Entities of Biological Interest (ChEBI)
6. Crop Ontology (CO)
7. Crop Research Ontology – part of Crop Ontology (CO_715)
8. Environment Ontology (ENVO)
9. Experimental Factor Ontology (EFO)
10. Feature Annotation Location Description Ontology (FALDO)
11. NAL Thesaurus (NALT)
12. Phenotype And Trait Ontology (PATO)
13. Plant Experimental Conditions Ontology (Plant Environment Ontology, EO, may be changing to PECO)

Use cases

Clic on the titles for details

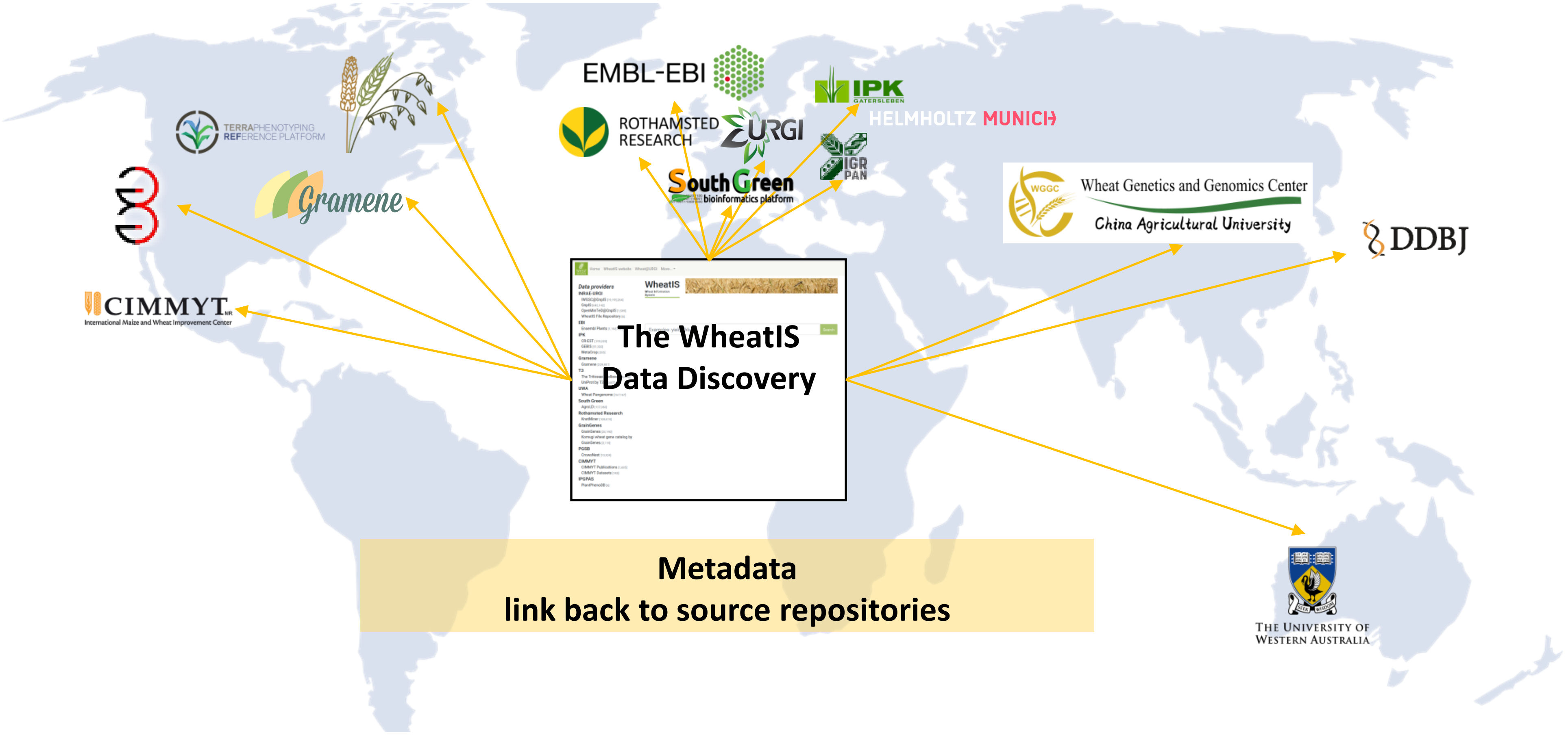
1. QUERY ON TRIAL DATA ASSOCIATED WITH VARIETIES
2. DECIPHER THE EFFECT OF SNPS
3. IDENTIFICATION OF WHEAT GENES THAT CONTROL ROOT GROWTH
4. QUERY DATA BY GERMPLASM/GENOTYPE
5. QUERY PHENOTYPE TRIALS TO BUILD INTEGRATIVE DATASET FOR PHENOTYPE OR GENETIC ANALYSIS.
6. QUERY ON GERMPLASM WITH SPECIFIC TRAITS

https://ist.blogs.inrae.fr/wdi/



https://urgi.versailles.inrae.fr/wheatis

Federated data portal



Data providers
INRAE-URGI
IWGSC@GnpIS
GnpIS
OpenMinTeD@GnpIS
WheatIS File Repository
EBI
Ensembl Plants
IPK
CR-EST
GEBIS
MetaCrop
Gramene
Gramene
T3
UniProt by T3
UWA
Wheat Pangenome
South Green
AgroLD
Rothamsted Research
KnetMiner
GrainGenes
GrainGenes
Komugi wheat gene catalog by GrainGenes
PGSB
CrowsNest
CIMMYT
CIMMYT Publications
CIMMYT Datasets
IPGPAS
PlantPhenoDB

The WheatIS Data Discovery

Metadata
link back to source repositories

Repositories

INRAE-URGI
- IWGSC@GnpIS [19,195,264]
- GnpIS [624,827]
- brapi@INRAE-URGI [15,949]
- OpenMinTeD@GnpIS [1,692]
- WheatIS File Repository [6]
- Research Data Gouv [4]

CAU
- TGT [5,041,169]
- wGRN [270,235]
- WheatUnion [105,200]
- pNOGmap [118]

EBI
- Ensembl Plants [1,954,199]

Gramene
- Gramene Plants [1,954,199]

IPK
- CR-EST [199,220]
- GEBIS [51,820]
- MetaCrop [355]
- e!DAL - PGP Repository [144]

Data type

IWGSC RefSeq

☐ Genome annotation [14,176,618]

☐ Gene annotation [2,861,241]

☐ Physical map feature [2,157,405]

JBrowse

InterMine

GBrowse

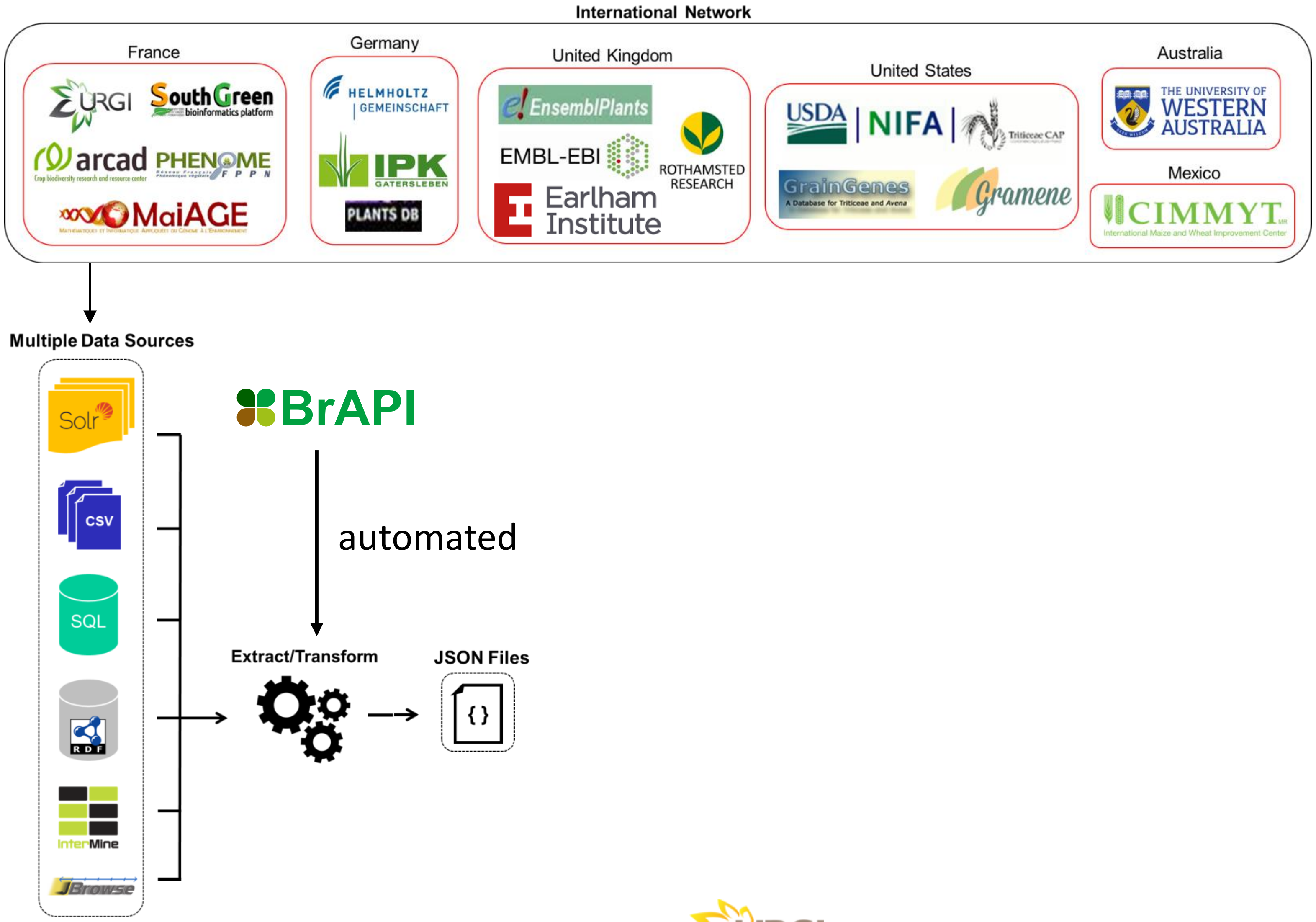
CIMMYT
- Publications Repository [1,741]
- Data Repository [374]

EVA
- brapi@EVA [710]

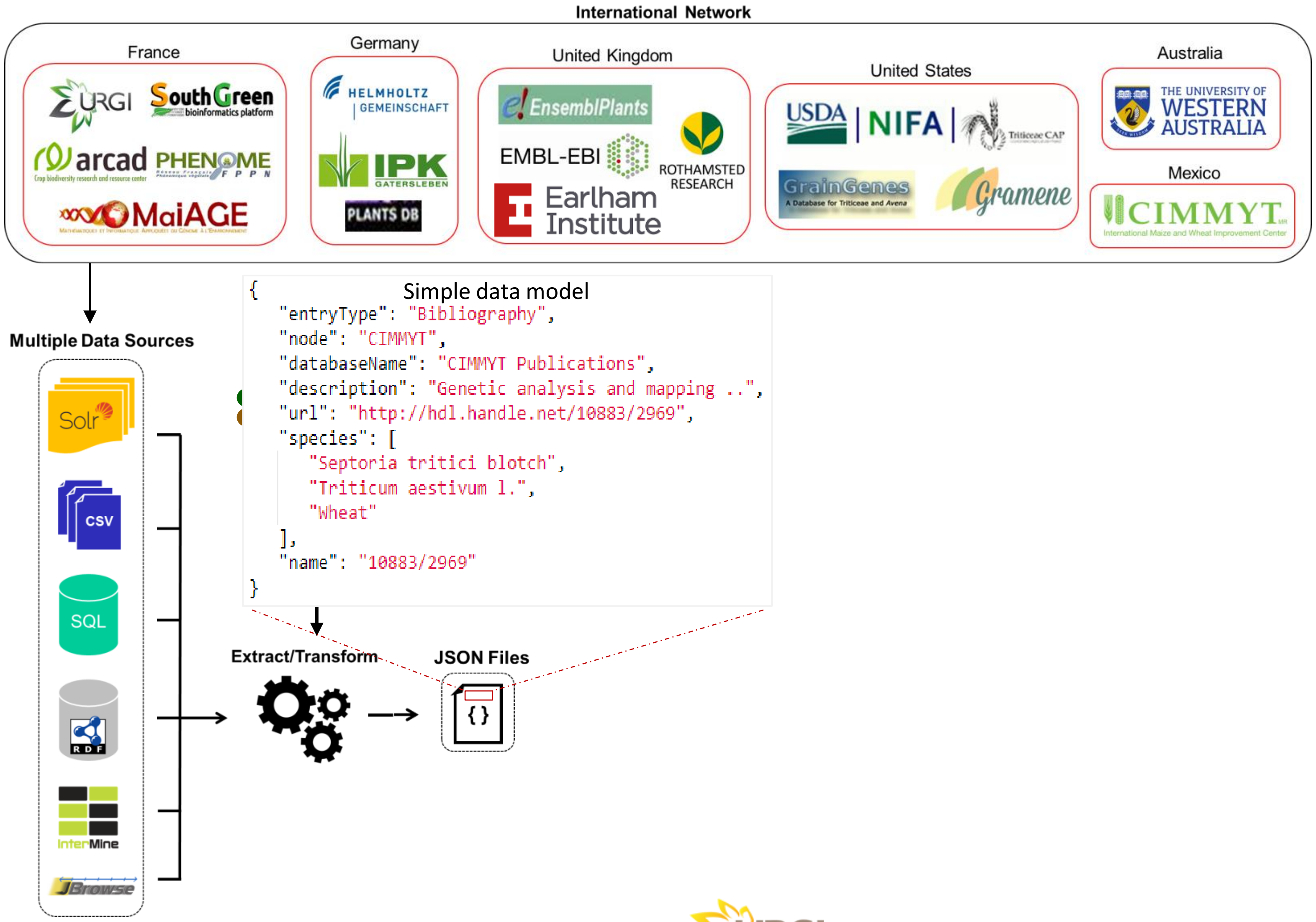
TERRA-REF
- brapi@TERRA-REF [284]

IPGPAS
- PlantPhenoDB [6]

Behind the scene



Behind the scene



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   "databaseName": "CIMMYT Publications",
   "description": "Genetic analysis and mapping ..",
   "url": "http://hdl.handle.net/10883/2969",
   "species": [
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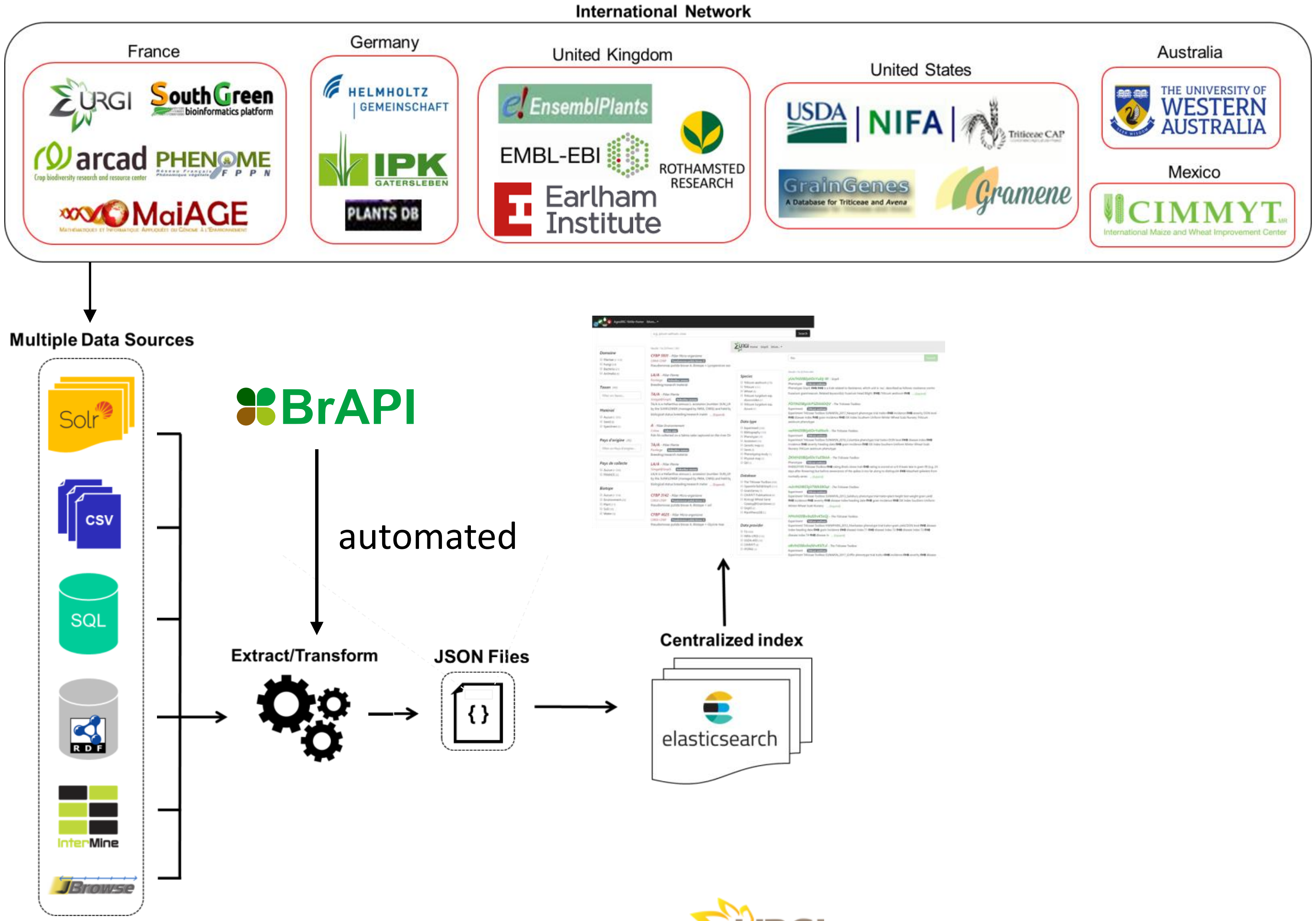
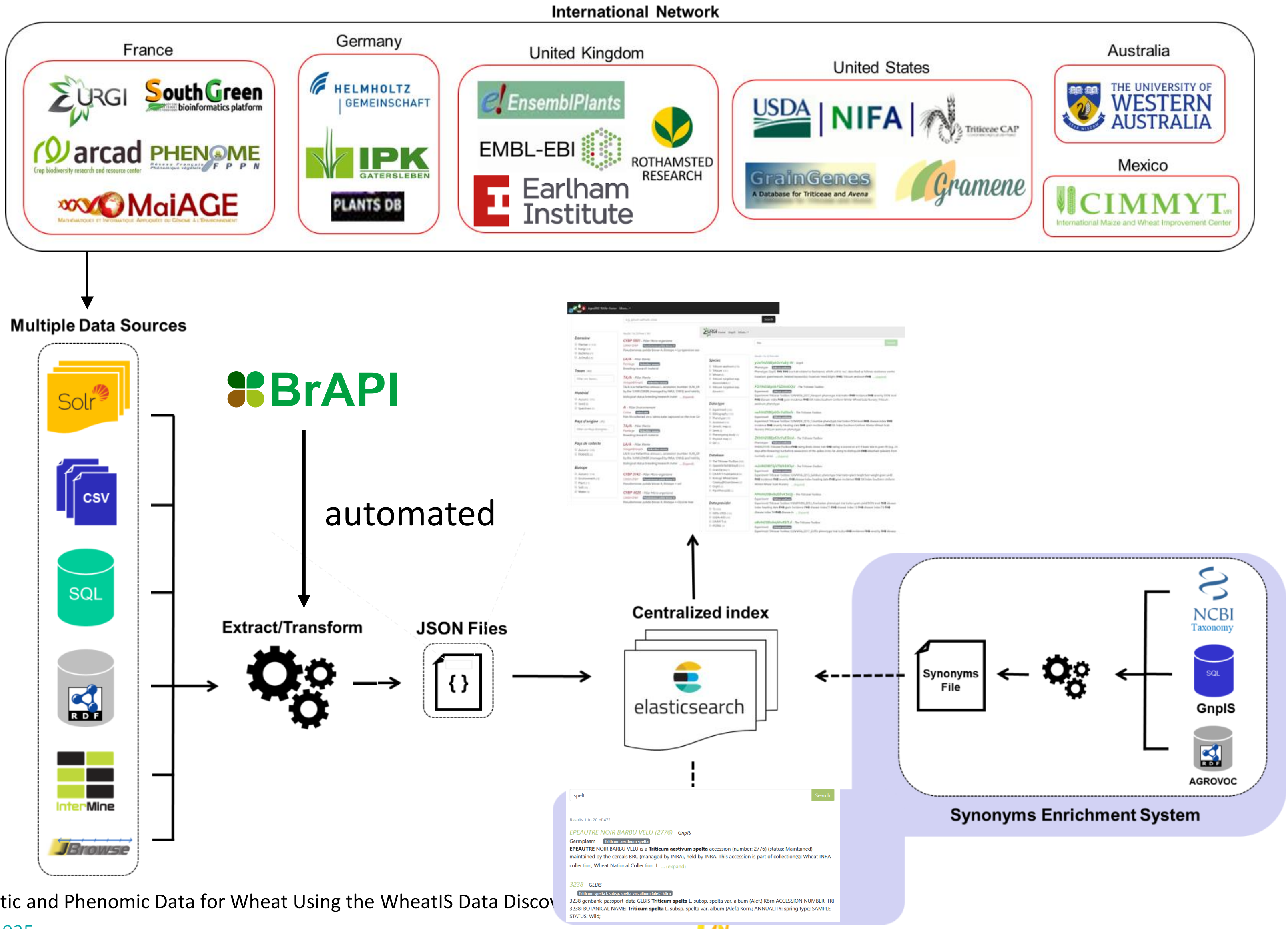
      "Triticum aestivum l.",
      "Wheat"
   ],
   "name": "10883/2969"
}
```

Behind the scene



Behind the scene



spelt

Search

Results 1 to 20 of 472

EPEAUTRE NOIR BARBU VELU (2776) - *GnpIS*

Germplasm Triticum aestivum spelta

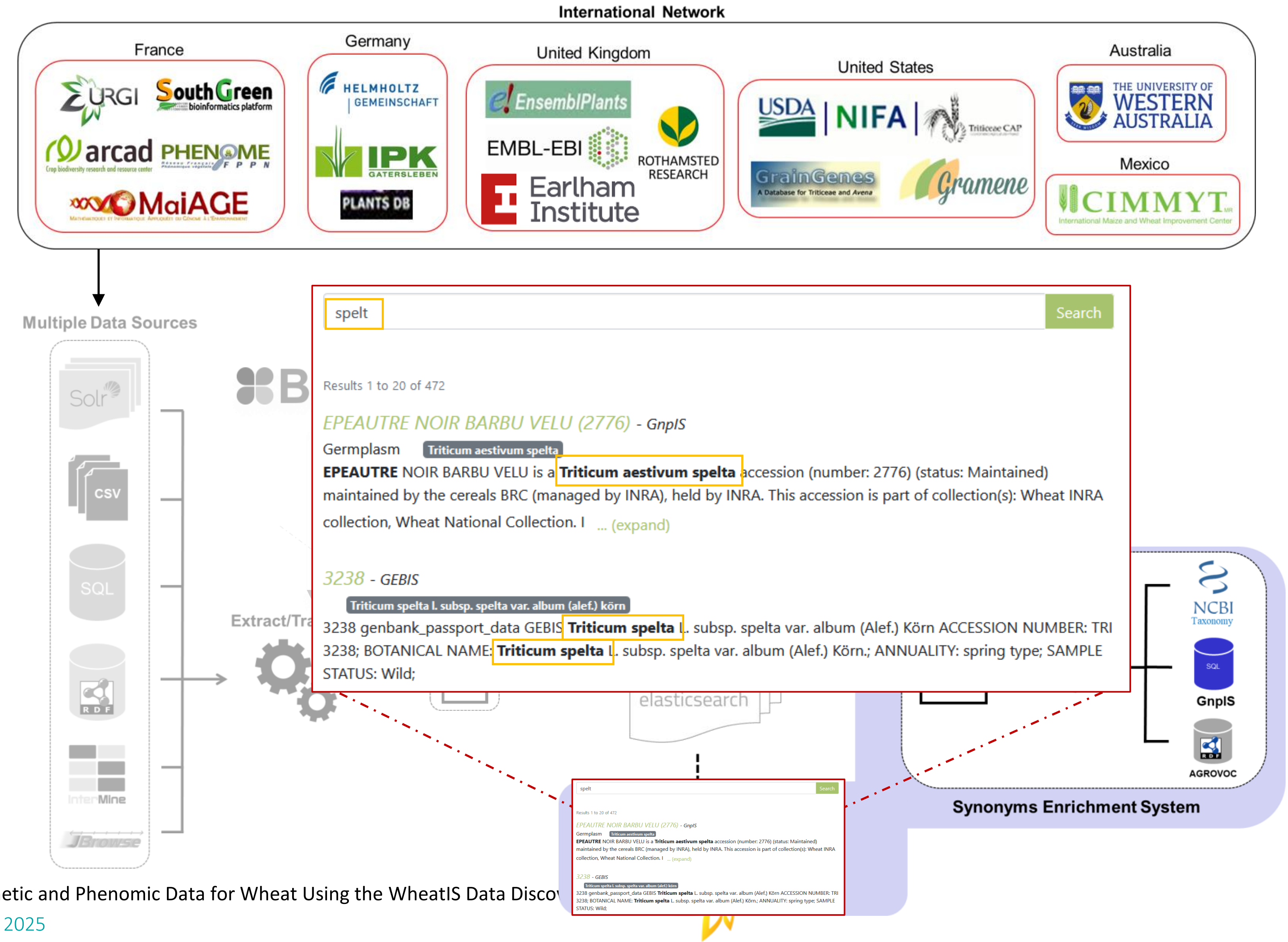
EPEAUTRE NOIR BARBU VELU is a **Triticum aestivum spelta** accession (number: 2776) (status: Maintained) maintained by the cereals BRC (managed by INRA), held by INRA. This accession is part of collection(s): Wheat INRA collection, Wheat National Collection. I ... (expand)

3238 - *GEBIS*

Triticum spelta l. subsp. spelta var. album (alef.) körn

3238 genbank_passport_data GEBIS **Triticum spelta** L. subsp. spelta var. album (Alef.) Körn ACCESSION NUMBER: TRI 3238; BOTANICAL NAME: **Triticum spelta** L. subsp. spelta var. album (Alef.) Körn.; ANNUALITY: spring type; SAMPLE STATUS: Wild;

Behind the scene



Results 1 to 20 of 472

EPEAUTRE NOIR BARBU VELU (2776) - *GnpIS*

Germplasm Triticum aestivum spelta

EPEAUTRE NOIR BARBU VELU is a **Triticum aestivum spelta** accession (number: 2776) (status: Maintained) maintained by the cereals BRC (managed by INRA), held by INRA. This accession is part of collection(s): Wheat INRA collection, Wheat National Collection. I ... (expand)

3238 - *GEBIS*

Triticum spelta l. subsp. spelta var. album (alef.) körn

3238 genbank_passport_data GEBIS **Triticum spelta** L. subsp. spelta var. album (Alef.) Körn ACCESSION NUMBER: TRI 3238; BOTANICAL NAME: **Triticum spelta** L. subsp. spelta var. album (Alef.) Körn.; ANNUALITY: spring type; SAMPLE STATUS: Wild;

Data exchange format

BrAPI

- /brapi/v1/germplasm GET
- /brapi/v1/germplasm/{germplasmDbId} GET
- /brapi/v1/variables GET
- /brapi/v1/locations GET
- /brapi/v1/locations/{locationDbId} GET
- /brapi/v1/studies/{studyDbId}/germplasm GET
- /brapi/v1/studies/{studyDbId}/observationvariables GET
- /brapi/v1/trials GET
- /brapi/v1/trials/{trialDbId} GET

elixir-europe/**plant-brapi-etl-faidare**

Harvest and index meta data from BrAPI endpoints for data access through the plant-faidare data lookup portal (https://github.com/elixir-europe/plant-faidare).

https://github.com/elixir-europe/plant-faidare

or

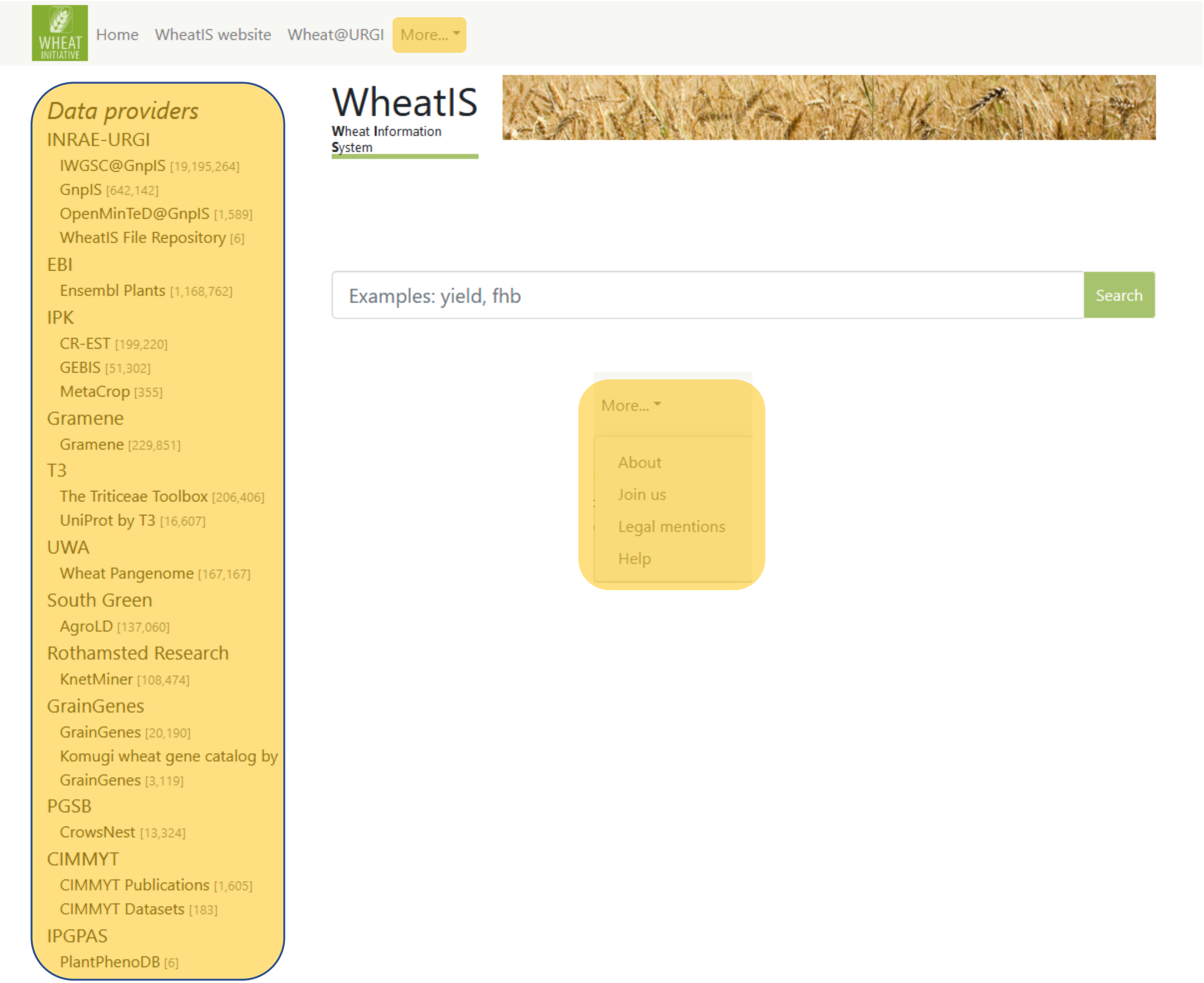
TSV Field JSON

- `name`
- `url`
- `description`
- `entryType`
- `species`
- `node`
- `databaseName`

- WheatIS species list: Aegilops*, Hordeum*, Triticum*, Wheat*
- Format: JSON or TSV, as you wish!
- Web server: HTTP of FTP, as you wish!

https://urgi.versailles.inrae.fr/wheatis/join

Demo



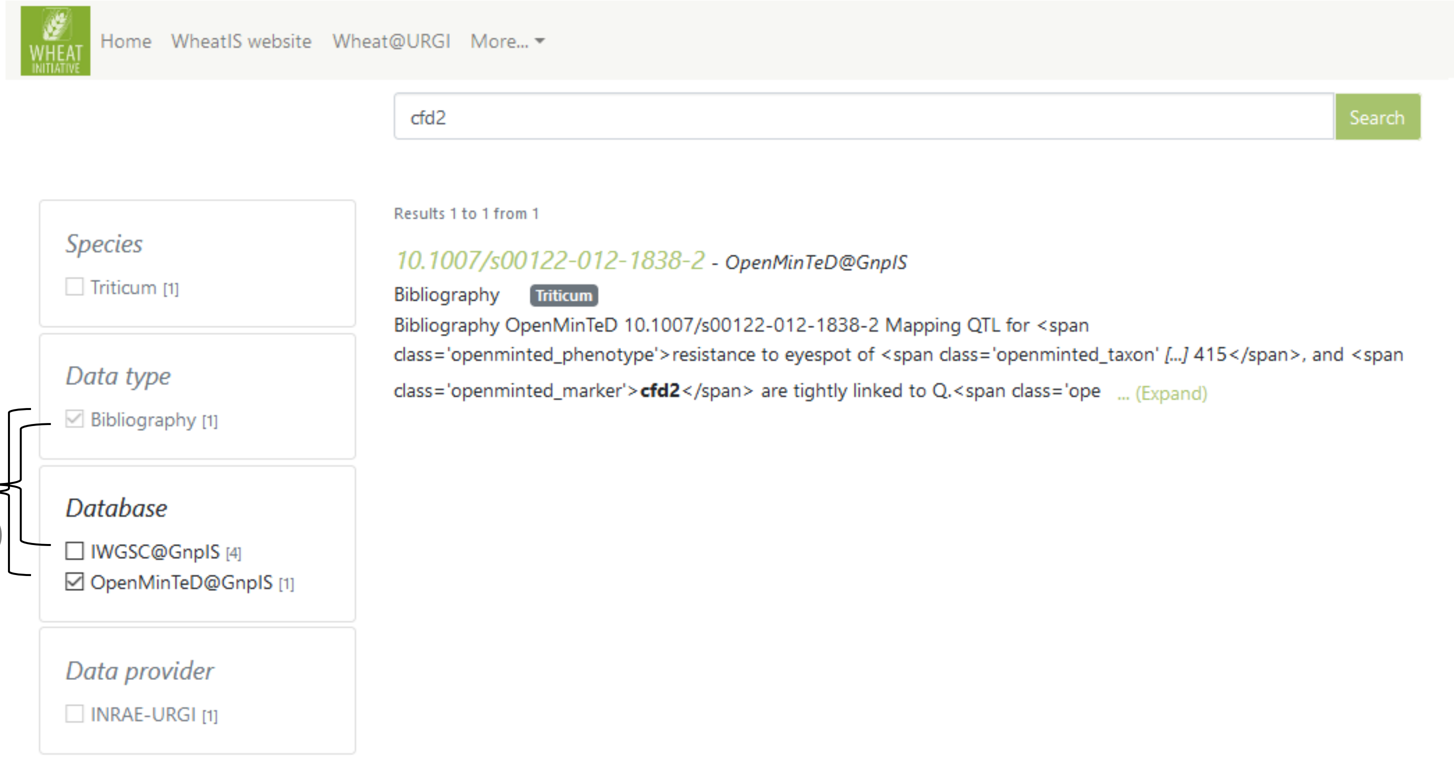
WheatIS

Wheat Information System

Data providers

- INRAE-URGI
  - IWGSC@GnpIS [19,195,264]
  - GnpIS [642,142]
  - OpenMinTeD@GnpIS [1,589]
  - WheatIS File Repository [6]
- EBI
  - Ensembl Plants [1,168,762]
- IPK
  - CR-EST [199,220]
  - GEBIS [51,302]
  - MetaCrop [355]
- Gramene
  - Gramene [229,851]
- T3
  - The Triticeae Toolbox [206,406]
  - UniProt by T3 [16,607]
- UWA
  - Wheat Pangenome [167,167]
- South Green
  - AgroLD [137,060]
- Rothamsted Research
  - KnetMiner [108,474]
- GrainGenes
  - GrainGenes [20,190]
  - Komugi wheat gene catalog by GrainGenes [3,119]
- PGSB
  - CrowsNest [13,324]
- CIMMYT
  - CIMMYT Publications [1,605]
  - CIMMYT Datasets [183]
- IPGPAS
  - PlantPhenoDB [6]

Demo



cfd2

Species
☐ Triticum [1]

Data type
☑ Bibliography [1]

Database
☐ IWGSC@GnpIS [4]
☑ OpenMinTeD@GnpIS [1]

Data provider
☐ INRAE-URGI [1]

Results 1 to 1 from 1

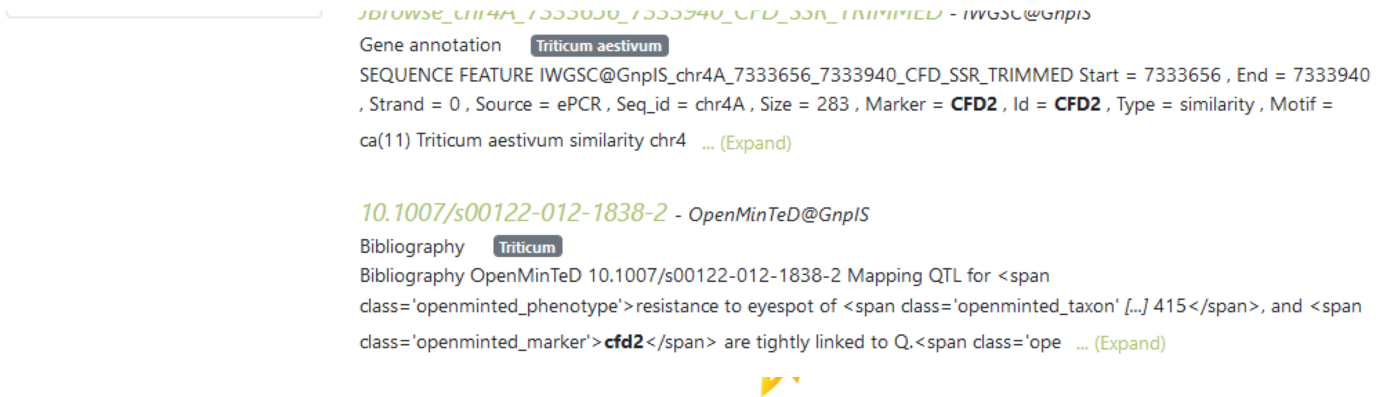
10.1007/s00122-012-1838-2 - *OpenMinTeD@GnpIS*

Bibliography **Triticum**

Bibliography OpenMinTeD 10.1007/s00122-012-1838-2 Mapping QTL for resistance to eyespot of <span class='openminted_taxon' *[...]* 415, and **cfd2** are tightly linked to Q.<span class='ope ... (Expand)

Union
(OR query)

Intersection
(AND query)



JBrowse_chr4A_7333656_7333940_CFD_SSR_TRIMMED - IWGSC@GnpIS

Gene annotation **Triticum aestivum**

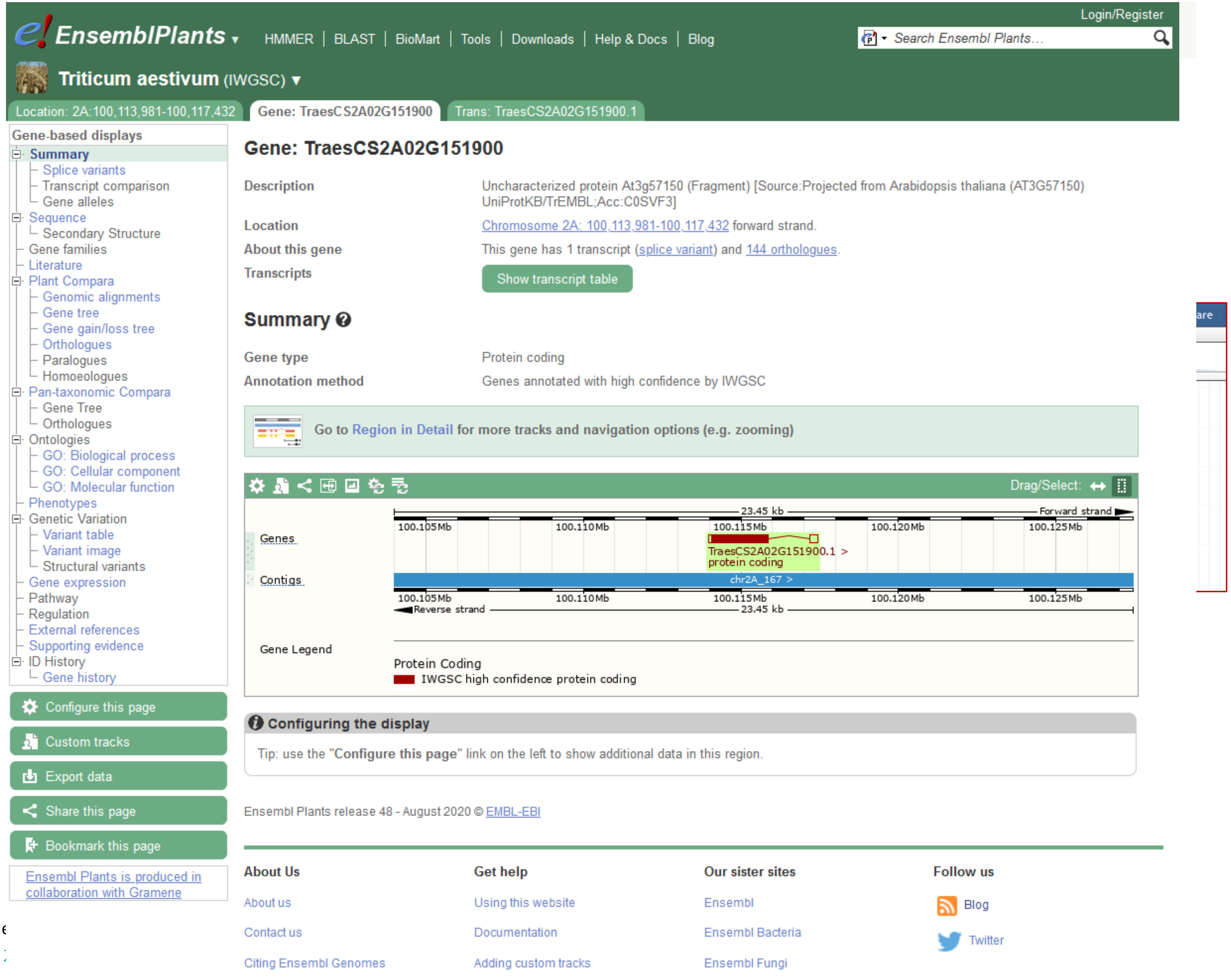
SEQUENCE FEATURE IWGSC@GnpIS_chr4A_7333656_7333940_CFD_SSR_TRIMMED Start = 7333656 , End = 7333940 , Strand = 0 , Source = ePCR , Seq_id = chr4A , Size = 283 , Marker = **CFD2** , Id = **CFD2** , Type = similarity , Motif = ca(11) Triticum aestivum similarity chr4 ... (Expand)

10.1007/s00122-012-1838-2 - *OpenMinTeD@GnpIS*

Bibliography **Triticum**

Bibliography OpenMinTeD 10.1007/s00122-012-1838-2 Mapping QTL for resistance to eyespot of <span class='openminted_taxon' *[...]* 415, and **cfd2** are tightly linked to Q.<span class='ope ... (Expand)

Demo



Gene: TraesCS2A02G151900

Description Uncharacterized protein At3g57150 (Fragment) [Source:Projected from Arabidopsis thaliana (AT3G57150) UniProtKB/TrEMBL;Acc:C0SVF3]

Location Chromosome 2A: 100,113,981-100,117,432 forward strand.

About this gene This gene has 1 transcript (splice variant) and 144 orthologues.

Transcripts

Summary

Gene type Protein coding

Annotation method Genes annotated with high confidence by IWGSC

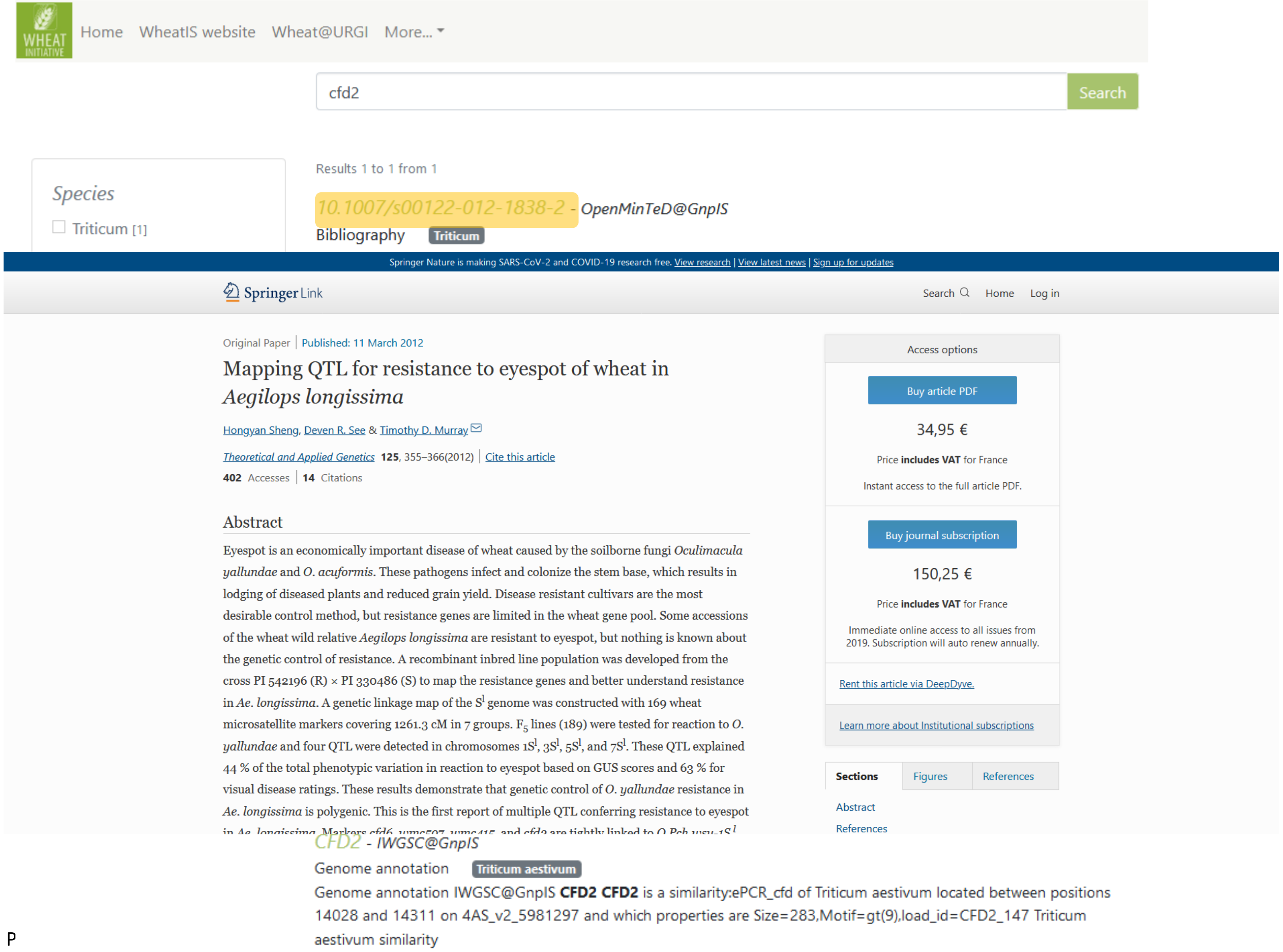
Go to Region in Detail for more tracks and navigation options (e.g. zooming)

Configuring the display

Tip: use the "**Configure this page**" link on the left to show additional data in this region.

Ensembl Plants release 48 - August 2020 © EMBL-EBI

Demo



Species

☐ Triticum [1]

Results 1 to 1 from 1

10.1007/s00122-012-1838-2 - *OpenMinTeD@GnpIS*

Bibliography Triticum

Original Paper | Published: 11 March 2012

Mapping QTL for resistance to eyespot of wheat in *Aegilops longissima*

Hongyan Sheng, Deven R. See & Timothy D. Murray

Theoretical and Applied Genetics **125**, 355–366(2012) | Cite this article

402 Accesses | **14** Citations

Abstract

Eyespot is an economically important disease of wheat caused by the soilborne fungi *Oculimacula yallundae* and *O. acuformis*. These pathogens infect and colonize the stem base, which results in lodging of diseased plants and reduced grain yield. Disease resistant cultivars are the most desirable control method, but resistance genes are limited in the wheat gene pool. Some accessions of the wheat wild relative *Aegilops longissima* are resistant to eyespot, but nothing is known about the genetic control of resistance. A recombinant inbred line population was developed from the cross PI 542196 (R) × PI 330486 (S) to map the resistance genes and better understand resistance in *Ae. longissima*. A genetic linkage map of the S^l genome was constructed with 169 wheat microsatellite markers covering 1261.3 cM in 7 groups. F_5 lines (189) were tested for reaction to *O. yallundae* and four QTL were detected in chromosomes $1S^l$, $3S^l$, $5S^l$, and $7S^l$. These QTL explained 44 % of the total phenotypic variation in reaction to eyespot based on GUS scores and 63 % for visual disease ratings. These results demonstrate that genetic control of *O. yallundae* resistance in *Ae. longissima* is polygenic. This is the first report of multiple QTL conferring resistance to eyespot in *Ae. longissima*. Markers *cfd6*, *wmc507*, *wmc415*, and *cfd2* are tightly linked to *Q.Pch.wsu-1S^l*

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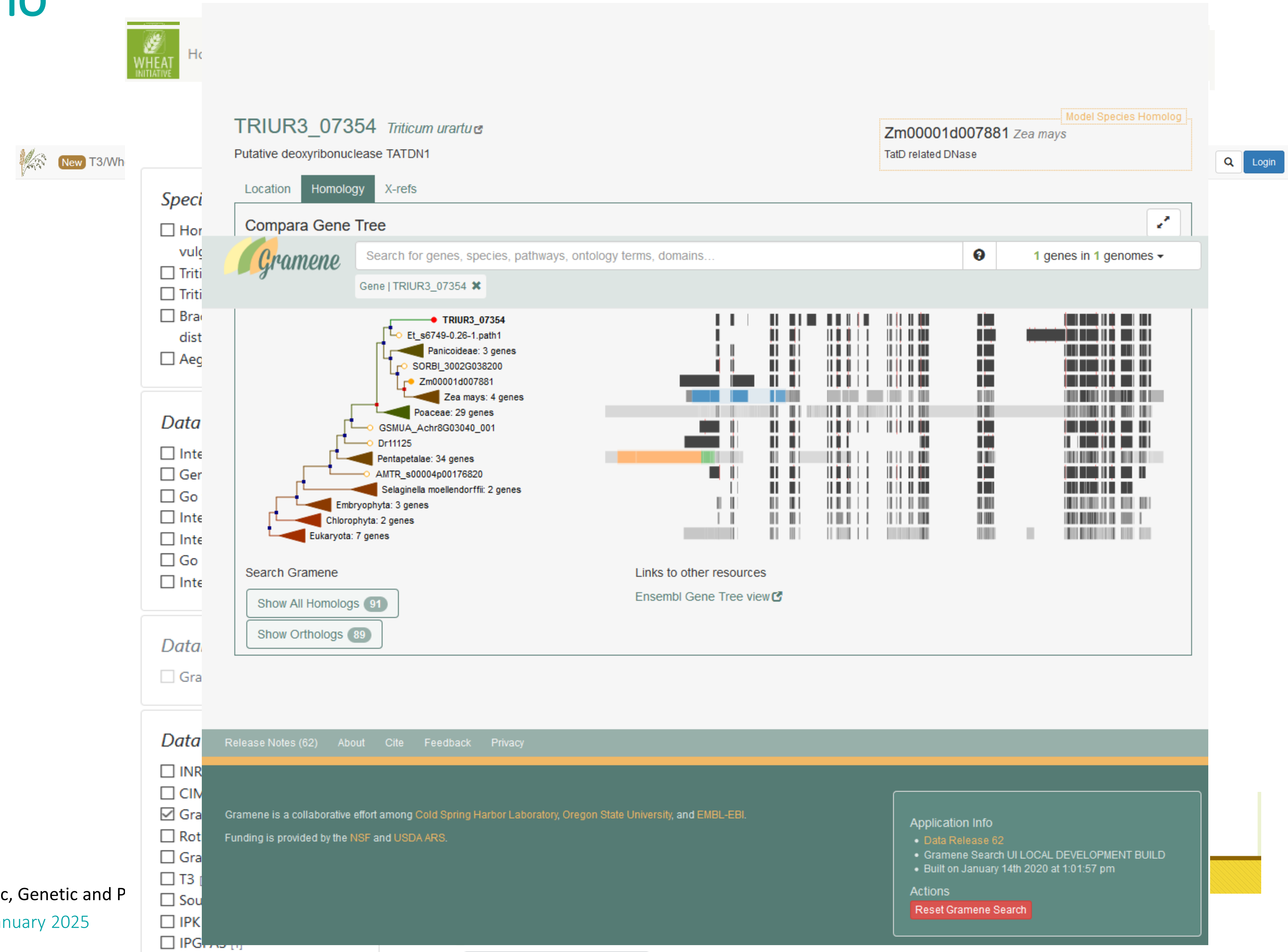
CFD2 - *IWGSC@GnpIS*

Genome annotation Triticum aestivum

Genome annotation IWGSC@GnpIS **CFD2 CFD2** is a similarity:ePCR_cfd of Triticum aestivum located between positions 14028 and 14311 on 4AS_v2_5981297 and which properties are Size=283,Motif=gt(9),load_id=CFD2_147 Triticum aestivum similarity

Demo



TRIUR3_07354 *Triticum urartu*

Putative deoxyribonuclease TATDN1

Model Species Homolog

Zm00001d007881 *Zea mays*

TatD related DNase

Location | Homology | X-refs

Compara Gene Tree

Search for genes, species, pathways, ontology terms, domains...

1 genes in 1 genomes

Gene | TRIUR3_07354

Search Gramene

Show All Homologs 91

Show Orthologs 89

Links to other resources

Ensembl Gene Tree view

Release Notes (62) | About | Cite | Feedback | Privacy

Gramene is a collaborative effort among Cold Spring Harbor Laboratory, Oregon State University, and EMBL-EBI.

Funding is provided by the NSF and USDA ARS.

Application Info

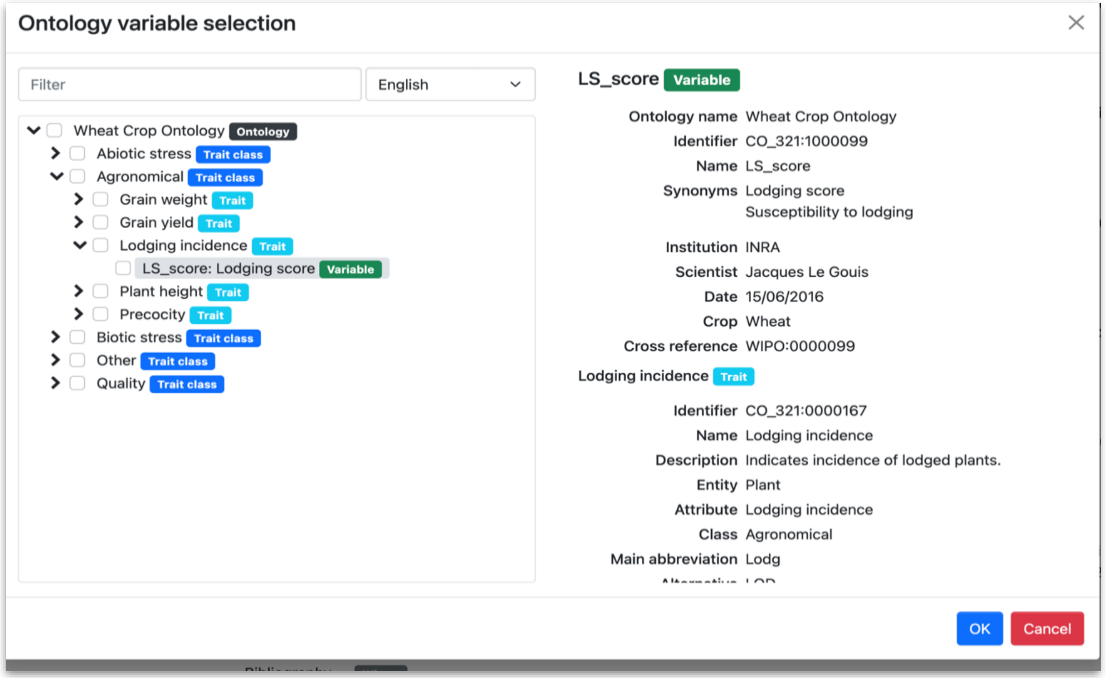
- Data Release 62
- Gramene Search UI LOCAL DEVELOPMENT BUILD
- Built on January 14th 2020 at 1:01:57 pm

Actions

Reset Gramene Search

New features: ontology annotation

- Link literature with experimental data (genotyping, phenotyping…) using ontology annotation
- Corpus of ~1600 wheat open access publications
- Text mining ontology: Wheat Trait Ontology
- Experimental data ontology: Crop Ontology



Ontology variable selection

Filter

English

- ☐ Wheat Crop Ontology Ontology
  - ☐ Abiotic stress Trait class
  - ☐ Agronomical Trait class
    - ☐ Grain weight Trait
    - ☐ Grain yield Trait
    - ☐ Lodging incidence Trait
      - ☐ LS_score: Lodging score Variable
    - ☐ Plant height Trait
    - ☐ Precocity Trait
  - ☐ Biotic stress Trait class
  - ☐ Other Trait class
  - ☐ Quality Trait class

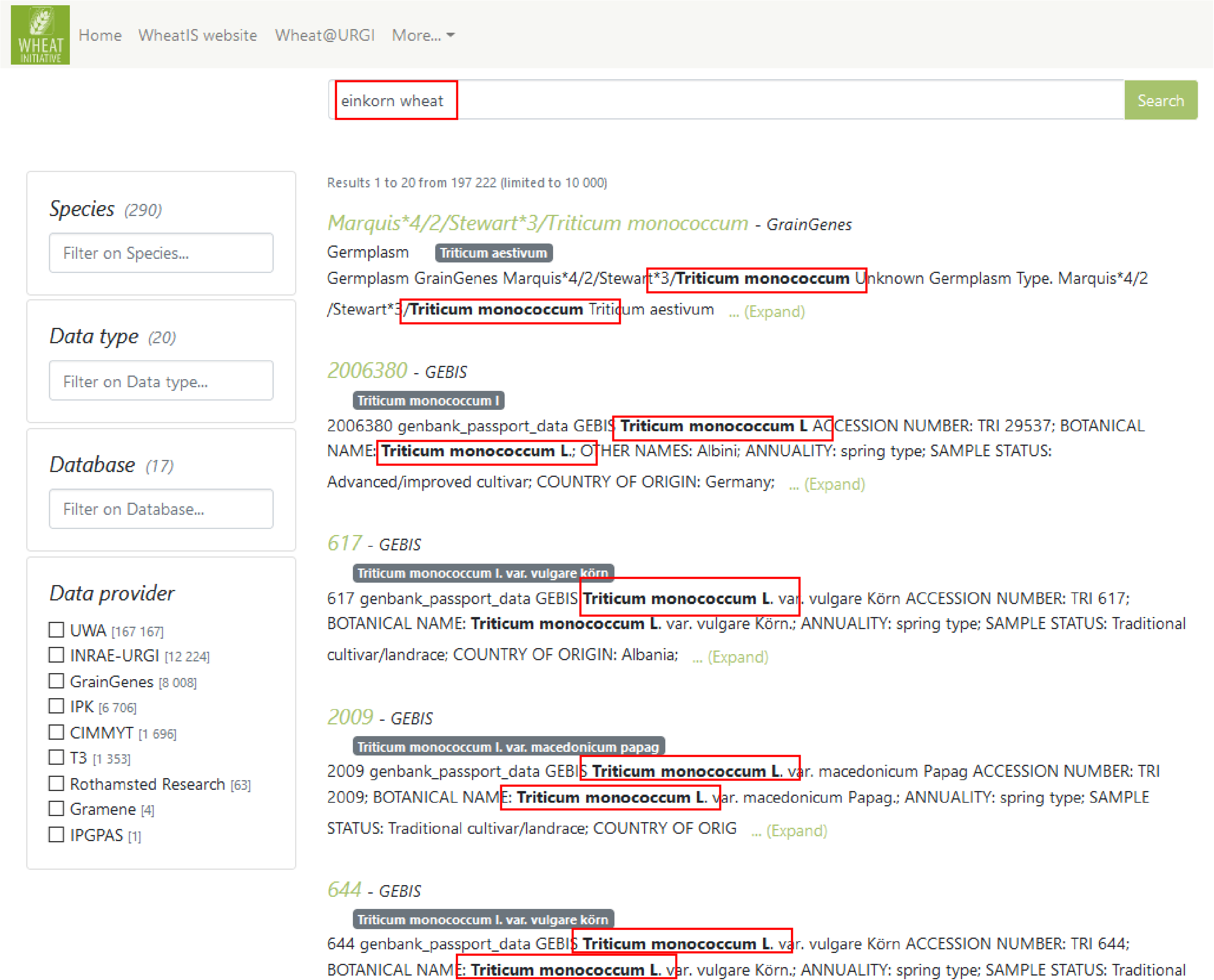
LS_score Variable

Ontology name	Wheat Crop Ontology
Identifier	CO_321:1000099
Name	LS_score
Synonyms	Lodging score Susceptibility to lodging
Institution	INRA
Scientist	Jacques Le Gouis
Date	15/06/2016
Crop	Wheat
Cross reference	WIPO:0000099

Lodging incidence Trait

Identifier	CO_321:0000167
Name	Lodging incidence
Description	Indicates incidence of lodged plants.
Entity	Plant
Attribute	Lodging incidence
Class	Agronomical
Main abbreviation	Lodg

New features: synonym enrichment



Species *(290)*

Data type *(20)*

Database *(17)*

Data provider

- ☐ UWA [167 167]
- ☐ INRAE-URGI [12 224]
- ☐ GrainGenes [8 008]
- ☐ IPK [6 706]
- ☐ CIMMYT [1 696]
- ☐ T3 [1 353]
- ☐ Rothamsted Research [63]
- ☐ Gramene [4]
- ☐ IPGPAS [1]

Results 1 to 20 from 197 222 (limited to 10 000)

*Marquis*4/2/Stewart*3/Triticum monococcum* - *GrainGenes*

Germplasm **Triticum aestivum**

Germplasm GrainGenes Marquis*4/2/Stewart*3/**Triticum monococcum** Unknown Germplasm Type. Marquis*4/2 /Stewart*3/**Triticum monococcum** Triticum aestivum ... (Expand)

2006380 - *GEBIS*

Triticum monococcum l

2006380 genbank_passport_data GEBIS **Triticum monococcum L** ACCESSION NUMBER: TRI 29537; BOTANICAL NAME: **Triticum monococcum L.**; OTHER NAMES: Albini; ANNUALITY: spring type; SAMPLE STATUS: Advanced/improved cultivar; COUNTRY OF ORIGIN: Germany; ... (Expand)

617 - *GEBIS*

Triticum monococcum l. var. vulgare körn

617 genbank_passport_data GEBIS **Triticum monococcum L**. var. vulgare Körn ACCESSION NUMBER: TRI 617; BOTANICAL NAME: **Triticum monococcum L**. var. vulgare Körn.; ANNUALITY: spring type; SAMPLE STATUS: Traditional cultivar/landrace; COUNTRY OF ORIGIN: Albania; ... (Expand)

2009 - *GEBIS*

Triticum monococcum l. var. macedonicum papag

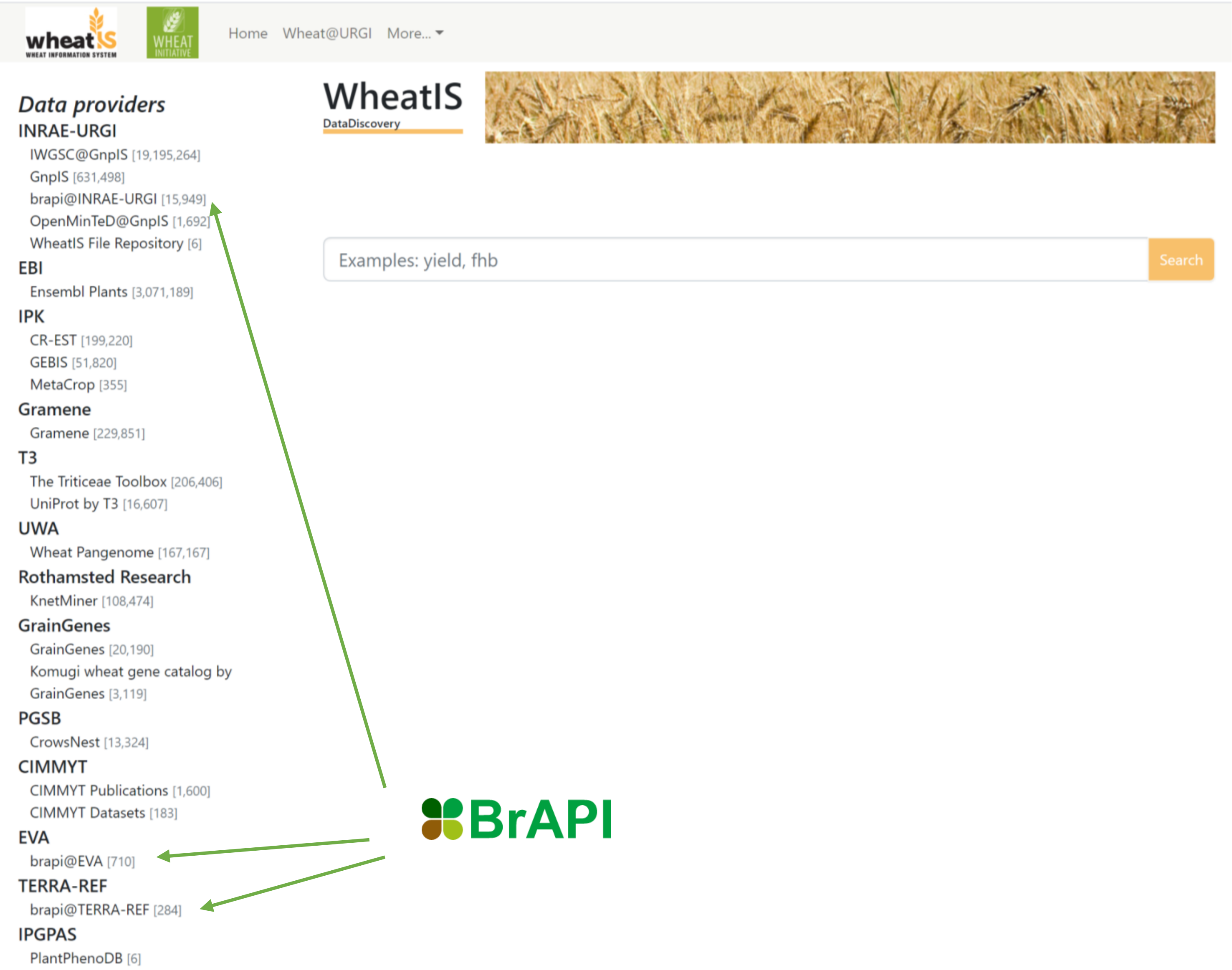
2009 genbank_passport_data GEBIS **Triticum monococcum L**. var. macedonicum Papag ACCESSION NUMBER: TRI 2009; BOTANICAL NAME: **Triticum monococcum L**. var. macedonicum Papag.; ANNUALITY: spring type; SAMPLE STATUS: Traditional cultivar/landrace; COUNTRY OF ORIG ... (Expand)

644 - *GEBIS*

Triticum monococcum l. var. vulgare körn

644 genbank_passport_data GEBIS **Triticum monococcum L**. var. vulgare Körn ACCESSION NUMBER: TRI 644; BOTANICAL NAME: **Triticum monococcum L**. var. vulgare Körn.; ANNUALITY: spring type; SAMPLE STATUS: Traditional

New features: BrAPI sources



Data providers

INRAE-URGI
- IWGSC@GnpIS [19,195,264]
- GnpIS [631,498]
- brapi@INRAE-URGI [15,949]
- OpenMinTeD@GnpIS [1,692]
- WheatIS File Repository [6]

EBI
- Ensembl Plants [3,071,189]

IPK
- CR-EST [199,220]
- GEBIS [51,820]
- MetaCrop [355]

Gramene
- Gramene [229,851]

T3
- The Triticeae Toolbox [206,406]
- UniProt by T3 [16,607]

UWA
- Wheat Pangenome [167,167]

Rothamsted Research
- KnetMiner [108,474]

GrainGenes
- GrainGenes [20,190]
- Komugi wheat gene catalog by GrainGenes [3,119]

PGSB
- CrowsNest [13,324]

CIMMYT
- CIMMYT Publications [1,600]
- CIMMYT Datasets [183]

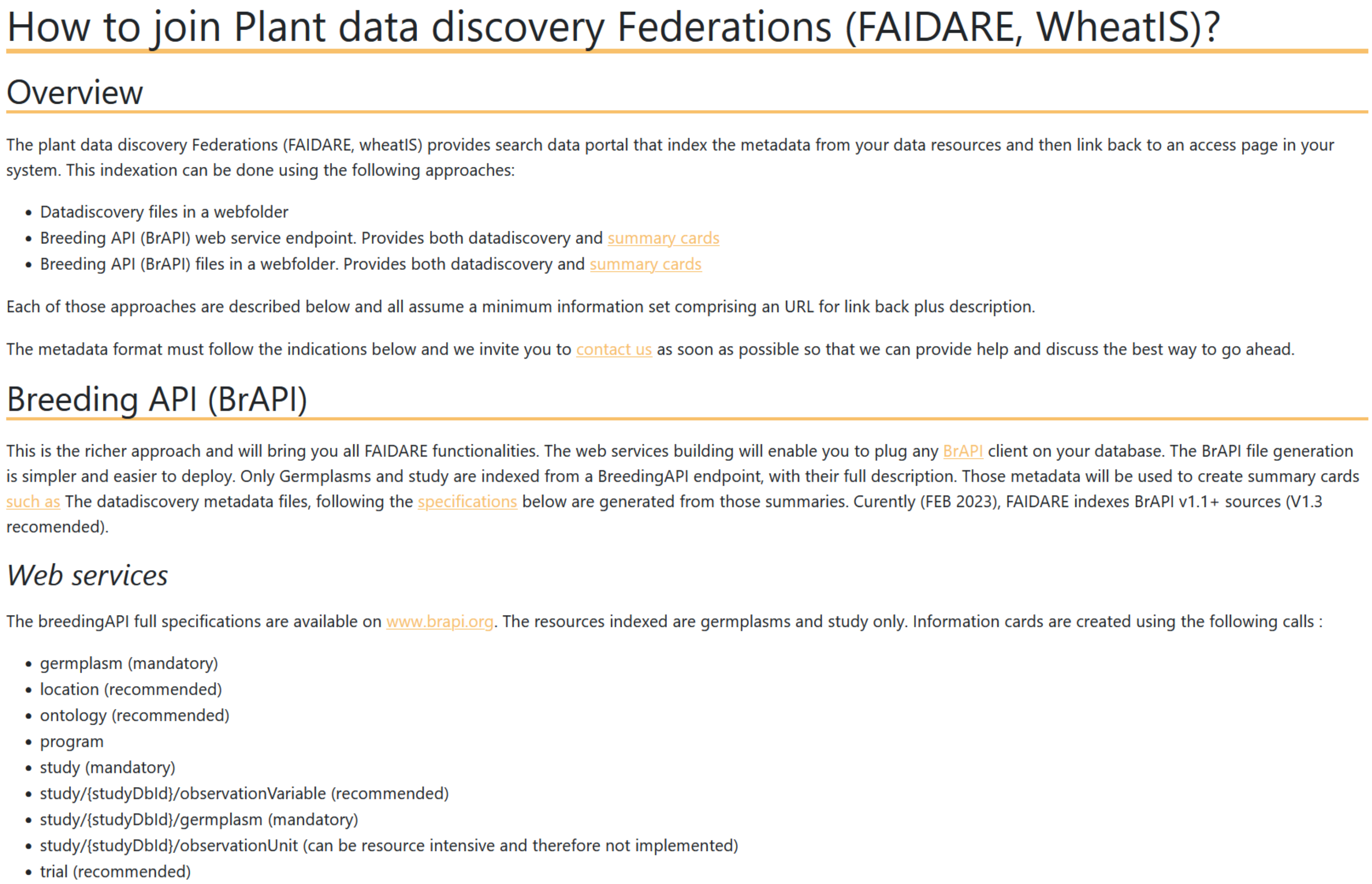
EVA
- brapi@EVA [710]

TERRA-REF
- brapi@TERRA-REF [284]

IPGPAS
- PlantPhenoDB [6]

BrAPI

How to join ?



How to join Plant data discovery Federations (FAIDARE, WheatIS)?

Overview

The plant data discovery Federations (FAIDARE, wheatIS) provides search data portal that index the metadata from your data resources and then link back to an access page in your system. This indexation can be done using the following approaches:

- Datadiscovery files in a webfolder
- Breeding API (BrAPI) web service endpoint. Provides both datadiscovery and summary cards
- Breeding API (BrAPI) files in a webfolder. Provides both datadiscovery and summary cards

Each of those approaches are described below and all assume a minimum information set comprising an URL for link back plus description.

The metadata format must follow the indications below and we invite you to contact us as soon as possible so that we can provide help and discuss the best way to go ahead.

Breeding API (BrAPI)

This is the richer approach and will bring you all FAIDARE functionalities. The web services building will enable you to plug any BrAPI client on your database. The BrAPI file generation is simpler and easier to deploy. Only Germplasms and study are indexed from a BreedingAPI endpoint, with their full description. Those metadata will be used to create summary cards such as The datadiscovery metadata files, following the specifications below are generated from those summaries. Curently (FEB 2023), FAIDARE indexes BrAPI v1.1+ sources (V1.3 recomended).

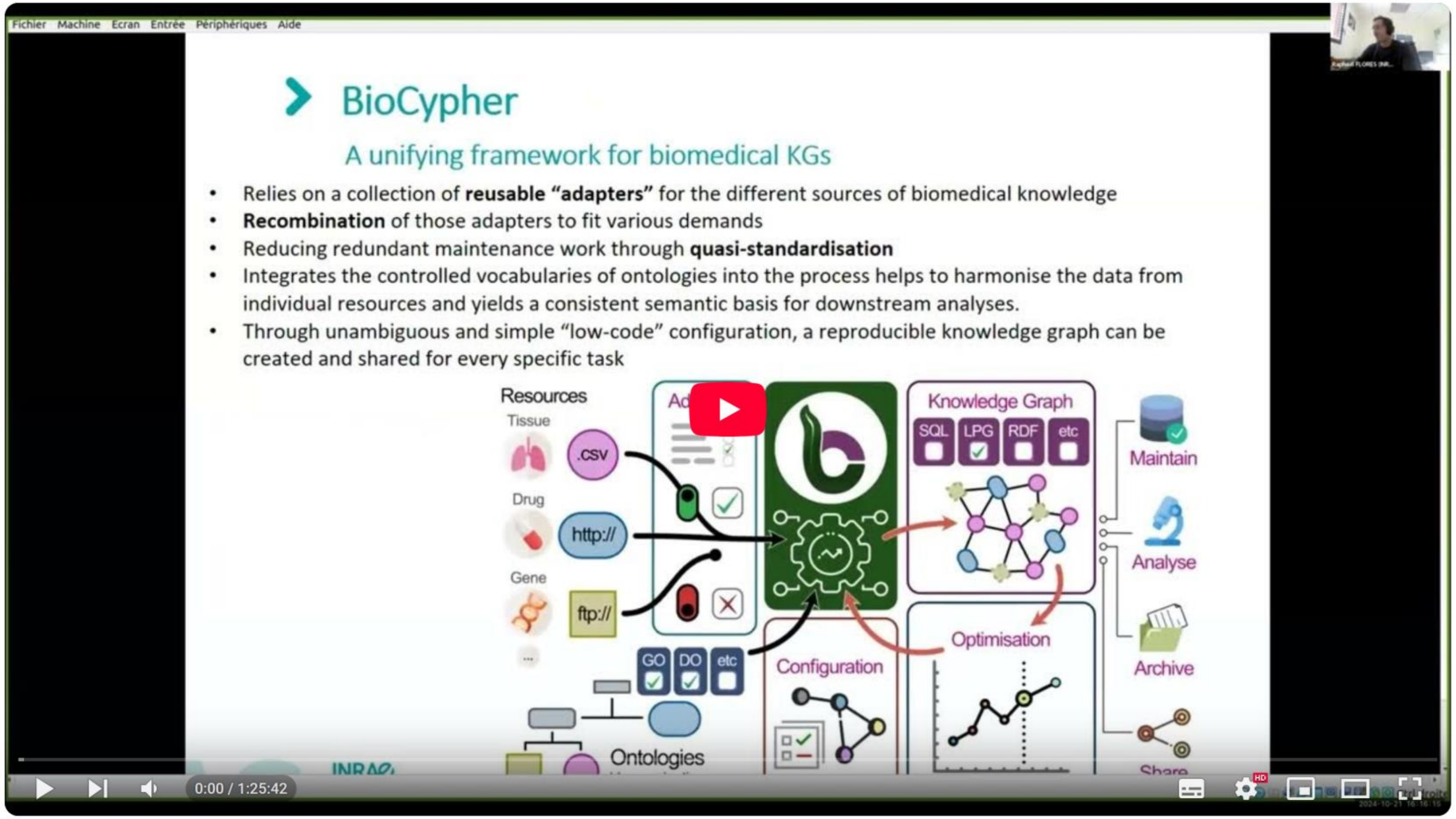
Web services

The breedingAPI full specifications are available on www.brapi.org. The resources indexed are germplasms and study only. Information cards are created using the following calls :

- germplasm (mandatory)
- location (recommended)
- ontology (recommended)
- program
- study (mandatory)
- study/{studyDbId}/observationVariable (recommended)
- study/{studyDbId}/germplasm (mandatory)
- study/{studyDbId}/observationUnit (can be resource intensive and therefore not implemented)
- trial (recommended)

https://urgi.versailles.inrae.fr/wheatis/join

Experiences about AI in wheat bioinformatics



BioCypher

A unifying framework for biomedical KGs

- Relies on a collection of **reusable "adapters"** for the different sources of biomedical knowledge
- **Recombination** of those adapters to fit various demands
- Reducing redundant maintenance work through **quasi-standardisation**
- Integrates the controlled vocabularies of ontologies into the process helps to harmonise the data from individual resources and yields a consistent semantic basis for downstream analyses.
- Through unambiguous and simple "low-code" configuration, a reproducible knowledge graph can be created and shared for every specific task

WheatIS EWG half-yearly meeting AI

Acknowledgements


EWG CHAIR AND CO-CHAIRS

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Josh Stein
Kellye Eversole

Teresa Saavedra
Sylvie Cloutier
Peter Langridge

All data and metadata providers !

Funded by the European Union

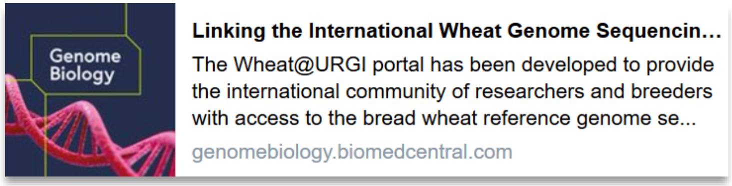
WheatIS data discovery

https://urgi.versailles.inrae.fr/wheatis

Related publications:

Alaux et al., *Genome Biology* 2018

https://doi.org/10.1186/s13059-018-1491-4



Genome Biology

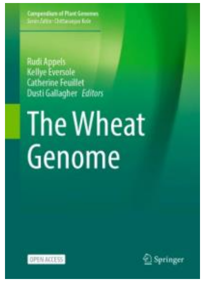
Linking the International Wheat Genome Sequencin...

The Wheat@URGI portal has been developed to provide the international community of researchers and breeders with access to the bread wheat reference genome se...

genomebiology.biomedcentral.com

Alaux et al., The Wheat Genome book 2023

https://doi.org/10.1007/978-3-031-38294-9_2



Compendium of Plant Genomes

Rudi Appels
Kellye Eversole
Catherine Feuillet
Dusti Gallagher *Editors*

The Wheat Genome

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