



# ENDURE

European Network for Durable Exploitation of crop protection strategies

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## ***Deliverable DI2.14***

**EuroWheat - tool for the support of disease management in wheat. Major part of the platform is publicly available for end-users (plant breeders, agro-chemical companies, extension, farmers, etc.) supporting disease control strategies based on an IPM concept**

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<b>Dissemination Level</b>	
<b>PU</b> Public	<b>X</b>
<b>PP</b> Restricted to other programme participants (including the Commission Services)	
<b>RE</b> Restricted to a group specified by the consortium (including the Commission Services)	
<b>CO</b> Confidential, only for members of the consortium (including the Commission Services)	

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## Summary

A first version of EuroWheat was created during the first 12 month of the 2<sup>nd</sup> JPA ([www.eurowheat.org](http://www.eurowheat.org)). The vision was to create a platform containing the most important information about IPM in wheat disease management. The information contained in EuroWheat can be accessed in a number of different ways, e.g. through varietal information, fungicide efficacy information, decision support systems etc.

The platform is an integrated platform in the Virtual Laboratory of ENDURE. Seven partners and five countries have been taking part in the activity. These included: Aarhus University (AU, Denmark); Rothamsted Research (RRes, UK); Julius Kühn-Institut (JKI, Germany), The Plant Breeding and Acclimatization Institute (IHAR, Poland), Arvalis, (ACTA, France); Institut national de la recherche agronomique (INRA, France); Danish Agricultural Advisory Service (DAAS, Denmark). The framework of the website had been established in the early stages of the project and latterly the site has been refined, updated and de-bugged to ensure users are able to access information easily and successfully. The group held a workshop in Copenhagen in March 2010 to discuss content, review structure and improve and update content. At this workshop the profile of users was discussed and the mechanisms to further promote the site to end-users. During the rest of the year the partners have provided new information, updated current information and generally improved the performance of the website.

The EuroWheat website includes today:

- 1) Information on pathotypes and virulence of yellow rust using data from six countries including an interactive analysis tool.
- 2) Information on fungicide efficacy on 6 diseases has been collected from 5 countries - including an interactive tool for designing a table with selected data.
- 3) Existing DSSs dealing with wheat diseases have been described briefly including links to the original systems
- 4) Information on disease monitoring and control thresholds developed in 6 countries has been shared and can be compared.
- 5) Information on available reports from Endure (wheat case study) and different national brochures can be downloaded from the platform. The platform also contains links to an encyclopaedia of cereal diseases.

The group has collected further information on wheat cultivars including disease ranking and yield response to fungicide inputs. Information on Fusarium species present on the grain and cultivar susceptibility to Fusarium has been included. Information on users of the website is available and demonstrates considerable user numbers, indicating the value of the website to the industry. The goal is to combine existing and new information about IPM-based disease control in wheat, which is the most important arable crop in Europe. We believe that EuroWheat is providing significant added value for the European agricultural industry. EuroWheat contributes efficiently to implement wheat-specific guidelines for integrated pest management as required by the sustainable use directive 2009/128/EC, Article 14(5).

## **1. Performance of the platform**

### **1.1. Technical issues**

The EuroWheat research platform ([www.eurowheat.org](http://www.eurowheat.org)) consists of a MS SQL database server and a MS Web server, hosted by University of Aarhus. The disease and fungicide efficacy data are stored in a relational database. For EuroWheat key words are sustainability and added value i.e. the database can be and has been expanded to include more diseases and more fungicides. Data are harmonised and national data can be analysed in a pan-European context. This will stimulate partners continuously to upload new data. The system is prepared to provide results in different languages as this was identified as a potentially important barrier for dissemination to advisors and farmers.

### **1.2. Development of features on the platform**

The specialists and key persons from the activity interact closely with the system development group to ensure access to and compatibility with formats of national data, e.g. pathogen virulence, pathogen resistance to fungicides, host plant resistance and/or pesticide efficacy. This ensures sustainability throughout ENDURE and in the years thereafter.

### **1.3. Updating information**

Many of the features on the platform have been updated through the year but will need to be updated yearly in order to be relevant to end-users. This is particularly relevant for fungicide efficacy and virulence data. Each partner needs therefore to dedicate persons who are prepared to help with the yearly update. In most cases the information needs to be updated at the national level yearly anyway and therefore the effort to provide the information to the platform should only be a minor issue. The database relies to a great extent on already existing networks, which meet regularly.

### **1.4. Other elements**

Further, partners outside ENDURE have been invited to add information to the platform (e.g. from Sweden, Austria, Switzerland, The Czech Republic) in order to make the content of the platform relevant to a wider audience. National organizations (extension etc.) have been and will also in the future be invited to give further feedback on the usefulness of the platform and to suggest improvements and priorities for new developments.

## **2. Content on platform**

### **2.1. Introduction information**

The front page of the web page gives an overview of the content of the platform. All areas of the platform can be accessed via the front page (Figure 1). There is a link to the EuroWheat site from the main ENDURE website. All partners and persons involved in creating the platform are presented in order to understand who is contributing and responsible for the activity.

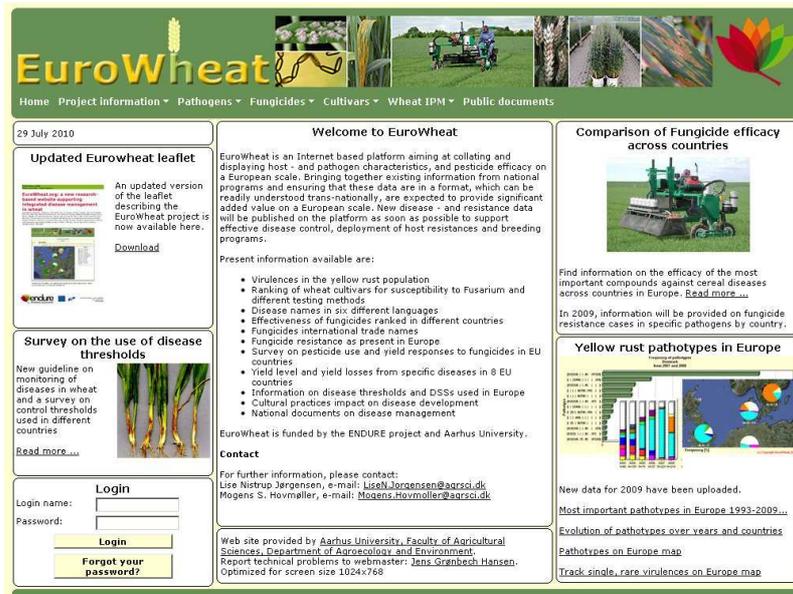


Figure 1. Home page of the EuroWheat website

## 2.2. Information on pathogens and pathotypes

At present the section contains information about yellow rust. In order to be able to give an updated situation on the development of pathotypes of yellow rust, which can potentially attack cultivars, the page provides information on the findings from different countries. Data on different pathotypes of yellow rust from 1993-2009 is now included for 6 countries. The data can be selected for specific countries and years and the ranked frequencies of pathotypes, number of different pathotypes etc. are shown in graphics. The evolution of pathotypes over this time period is now possible, together with a graphical representation of pathotypes across Europe. It is also possible now to track individual virulence factors on a European scale. Indications on the pathotypes potential for attacking specific key cultivars are also included. Information about Fusarium has also been added and it is hoped to include further information on other diseases including mildew, septoria and brown rust.

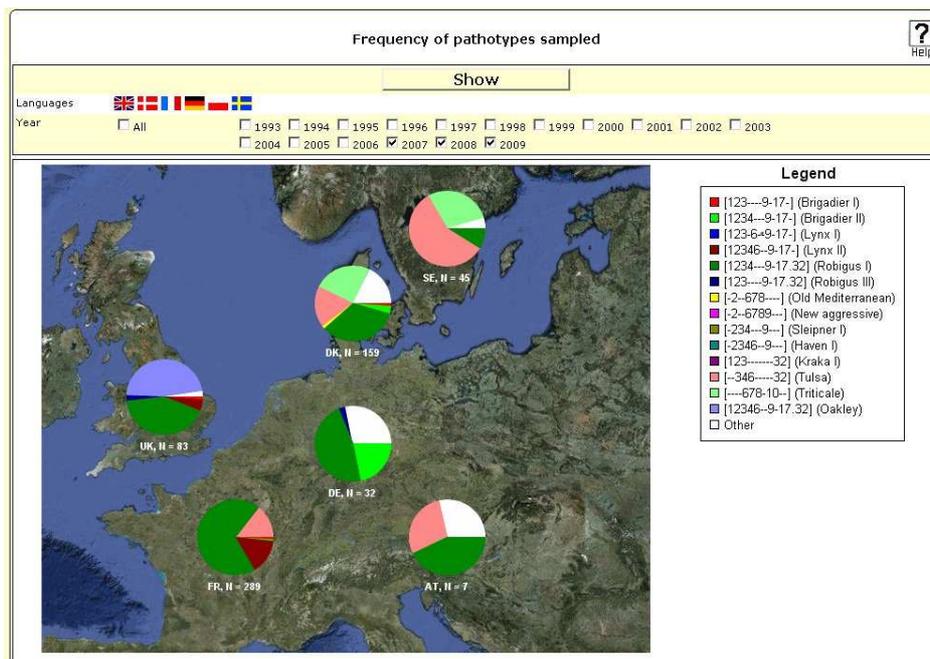


Figure 2. Representation of frequency of yellow rust pathotypes across Europe

## 2.3. Information on fungicides

One section on the platform deals with fungicide activity. Many countries have a national ranking of the fungicides' efficacy based on national testing of the products' performance. The different countries use either star-rating or colours to illustrate the level of efficacy. The system varies from 3-5 star systems and therefore the information cannot directly be translated from one system to the other. The following ratings have been decided for the Categories (as shown below).

White: Not registered

Red: Problems with resistance

Light green: Low efficacy

Medium green: Moderate efficacy

Dark green: Good efficacy

The screenshot shows a web interface titled 'Fungicide efficacy'. At the top, there are language selection flags (UK, DK, F, DE, NL, S) and a 'Help' icon. Below is a legend: White (Not registered), Red (Problems with resistance), Light green (Low efficacy), Medium green (Moderate efficacy), Dark green (Good efficacy). The main table has columns for diseases: Powdery Mildew, Septoria Leaf Blotch, Brown Rust, and Yellow (Stripe) Rust. Each column contains flags for the countries UK, DK, F, DE, NL, S. The rows list fungicides under the 'Triazoles' group: bromuconazole, cyproconazole, difenoconazole, epoxiconazole, fenbuconazole, and fluquinconazole. The efficacy is indicated by colored squares in the cells of the table.

Select	Powdery Mildew		Septoria Leaf Blotch		Brown Rust		Yellow (Stripe) Rust	
	UK	DK	F	DE	NL	S	UK	DK
<b>Triazoles</b>								
bromuconazole								
cyproconazole								
difenoconazole								
epoxiconazole								
fenbuconazole								
fluquinconazole								

Efficacy is characterised for 6 diseases

Powdery mildew, Septoria leaf blotch, Yellow rust, Brown rust, Tan spot, Eyespot

Fusarium head blight

Fungicides have been divided into 4 groups: triazoles, strobilurins, others, mixtures.

So far data have been provided from UK, DK, F, DE, NL, S,

A separate section under fungicides deals with fungicide resistance. This includes national information on resistance situations and recommendations as well as links to web pages dealing with fungicide resistance.

Specific information on pesticide consumption in winter wheat has been gathered from Germany, France, United Kingdom and Denmark. The method used for collecting data and calculating the TFI varies between the four countries and is based on sales data, representative surveys at farm level or national monitoring systems. The results indicate that there are large differences between pesticide usages in the four countries. Usage in Denmark is considerably lower than in the other countries, and United Kingdom is the country with the highest usage. The reason for the significant differences cannot be explained specifically, but several elements are considered important, including:

- 1) differences in pest and disease infestations;
- 2) differences in climatic conditions;
- 3) differences in operating policy action plans that focus on reducing the use of pesticides;
- 4) differences in the organisation of advice to farmers and the proportion of farmers relying on company-based advice;
- 5) differences in pesticide prices.

A section on 'Yield response to fungicides' has been added to attempt to explain differences between countries in the EU. The level of yield response to fungicides varies significantly from year to year and between countries. The reasons for the different responses are related to e.g. disease pressure, yield levels, climatic conditions and level of resistance in the grown cultivars. The yield response information originates from cultivar trials and averaged cross cultivars and locations. These are represented graphically on the site (Figure 3).

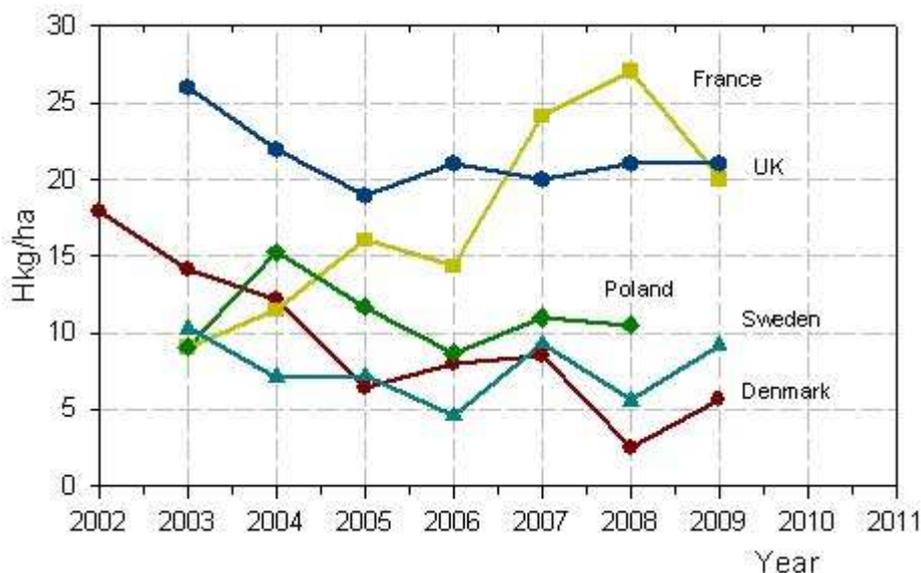


Figure 3. Yield response to fungicide treatment (averaged across sites and cultivars).

## 2.4. Information on cultivars

This part has been developed and has varietal resistance ratings for 5 countries (UK, Denmark, France, Poland and Switzerland). Information on the known resistance genes for seven diseases (yellow rust, powdery mildew, brown rust, septoria tritici, tan spot, glume blotch and fusarium head blight) is now included in the cultivar section.

## 2.5. Information on DSS, thresholds and cultural practices

Based on information from other ENDURE activities dealing with DSS, all systems dealing with disease management in wheat have been extracted and described briefly. Another section deals with monitoring and assessments for diseases. It describes how monitoring should be done for specific diseases including information on specific control thresholds for six diseases: (powdery mildew, yellow rust, brown rust, eyespot, septoria leaf blotch and tan spot). Thresholds from 6 different countries are uploaded.

There is guidance given on the use of cultural control methods and how they may reduce the need for pesticides.

## 2.6. Information on public documents

This part contains relevant documents on disease management in wheat. Papers originate from national programmes. There is still a dominance of information coming from UK. HGCA has a major production of leaflets to UK farmers and much of this information, since it is written in English, is also easily accessible to other countries.

## 3. Users of the platform

The platform aims to be a place where advisors and scientists around Europe can exchange information on disease management in wheat. Extension services from DK and France are involved in the project and expected to contribute with proposals to stimulate a user friendly version of the platform. Currently most elements are publicly accessible on the platform. Parts which are still under development are only available to a closed audience.

Current traffic on the EuroWheat website is very high – with over 3,500 unique visitors to the website in the first 6 months of 2010. Data on web traffic is shown below.

	1/1/10 – 15/6/10
EuroWheat	
Page Loads	9792
Unique Visitors	3565
First Time Visitors	3006
Returning Visitors	559

#### 4. Future activities

Many of the collaborators continue to update information on the website. Measures must be put in place if the website is to continue to be regularly updated into the future. All partners in the European Research Group (ERG), the official successor of ENDURE, are in agreement that ENDURE tools like EuroWheat should be maintained and discussions to that end continue.

#### 5. Conclusion

The EuroWheat platform must be considered a success – it has brought together researchers and extension workers from many parts of Europe; it has added value to information existing in individual countries and has provided much information that is of use to, and is being used by, advisers throughout Europe. Researchers involved in the project have also seen the added value gained by collaboration which hopefully will continue beyond the life of the project. Successes such as EuroWheat ensure that policy makers and funding bodies can see that European networking in applied plant protection research can work successfully and that this supports the implementation of IPM within the scope of National Action Plans as demanded by the SUD 2009/128/EC.