EUROWHEAT.ORG – A SUPPORT TO INTEGRATED DISEASE MANAGEMENT IN WHEAT

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Winter wheat is the most important cereal crop in Europe and wheat diseases are commonly seen to have a major impact on yields, quality of grain and fungicide requirements.

EuroWheat collates data and information on wheat disease management from several countries aiming at analysing and displaying this information in a European context. It is expected to provide significant added value on a European scale by bringing together existing information from national programmes and ensuring that these data are in a format, which can be readily understood trans-nationally. The information is targeted to support local advisers, breeders and other partners dealing with disease management in wheat. The content of the platform can support IPM (Integrated Plant Protection Management) in a broad sense. The platform is open to all users. Only features, which are still under development, are behind login.

Partners in EuroWheat

The EuroWheat research platform is partly developed as a component of the ENDURE Virtual Lab activities (www.endure-network.eu).

EuroWheat partner institutions are: : Institut National de la Recherche Agronomique (INRA), Association de Coordination Technique Agricole (ACTA), ARVALIS - Institut du Végétal, : Julius Kuehn Institute - Federal Research Centre for Cultivated Plants, : Rothamsted Research (RRES), National Institute of Agricultural Botany (NIAB), :Plant Breeding and Acclimatization Institute (IHAR), :Aarhus University, Faculty of Agricultural Sciences (AU), Denmark Danish Agricultural Advisory Service (DAAS), :Jordbruksverket (SJV) Växtskyddscentralen, Servizio Fitosanitario - Emilia-Romagna Region (SFRER) Italy, St. István University (SZIU), Hungary Agroscope Changins-Wädenswil (ACW), Switzerland

Partnership is not restricted to the ENDURE network of excellence (NoE) and if you are interested to contribute with own data or information in the area described please contact: Lise Nistrup Jørgensen (LiseN.Jorgensen@agrsci.dk)

Public information in EuroWheat February, 2010

Fungicides

Many countries provide information about fungicide efficacy based on national field trials. EuroWheat has collected this information giving an overview of authorised products, their efficacy and resistance risk. It features:

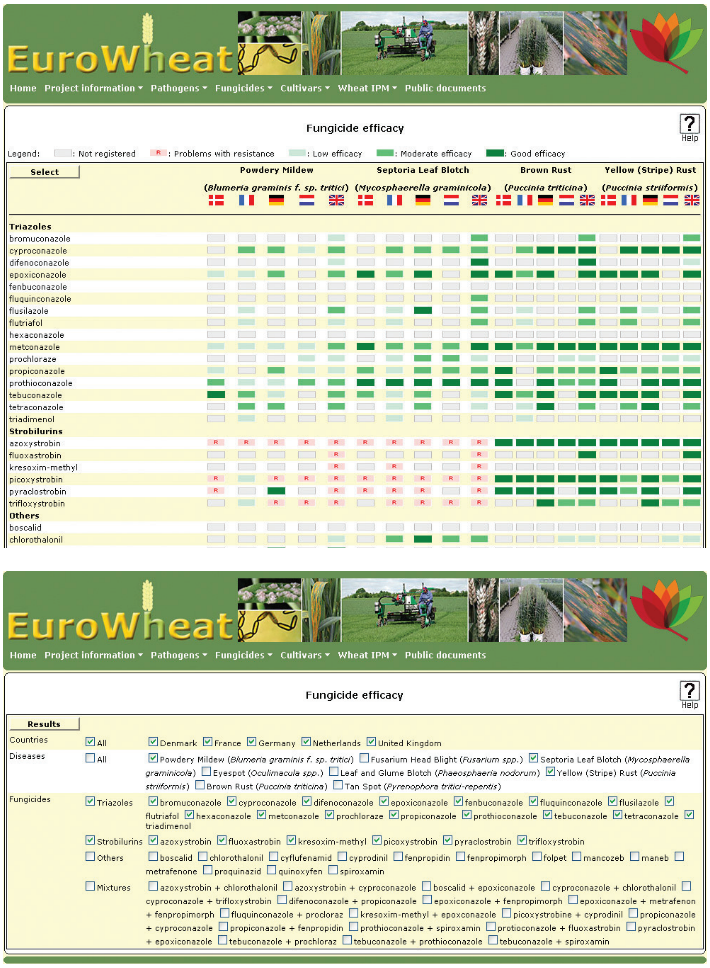

Figure 1. Five countries ranking of fungicides efficacy for control of different diseases

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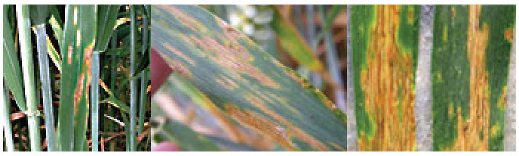
Septoria leaf blotch



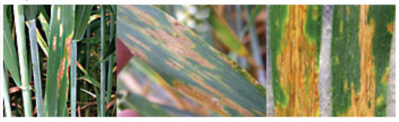
Mycosphaerella graminicola AHDB/HGCA photos

	4 days with more than 1 mm rain from GS 32 to 71 (Susceptible cultivars), 5 days with more than 1 mm rain between GS 37 and 71 (Moderate resistante cultivars). Or, attack on 3rd leaf from GS 45 to 60 (all cultivars).
	20-30 mm or 4-5 precipitation days counted from GS 32.
	After GS 32 + rain. No specific threshold.
	No specific threshold.
	From GS 32> 20 % of the third leaf visible with symptoms. (the last leaf emerged is counted if visible).
	30% (in some regions 40%) plants attacked on the upper 4 leaves from GS 32 to 37 or 10 % from GS 39 to 61; additional use of meteorological data required.
	Tillering: 30-50% leaves with lesions or 1% leaves with fruiting bodies, Stem elongation: infected 15-20% area of 2nd leaf or 1% leaves with fruiting bodies, Heading: infected 10% area of flag leaf or 1% leaves with fruiting bodies.
	No specific threshold.

The disease is often easy to find during winter and early spring. The severity depends on precipitation, and due to a long latent period (3 weeks) the control threshold is linked more to rain events than to symptoms in the crop. If several rain events occur during elongation (from GS 32), the risk is considered high. In more resistant cultivars the threshold is higher and the count of rainy days can be delayed to GS 37. Occasionally the disease appears despite few rain events and therefore the 3rd leaf can also be used to decide whether to spray or not during heading and flowering. Attacks of economical importance are very common in major regions with regular precipitation events during elongation of the crop. This gives to a large extent rise to more or less routine treatments.

Figure 2. Recommended thresholds for control of septoria leaf blotch in different countries

Septoria leaf blotch



Mycosphaerella graminicola AHDB/HGCA photos

Resistance genes	Varieties with good resistance are known, and help to reduce disease levels. Specific genes are known and described but also non-specific resistance genes are known to be of importance. [5]
Previous crop	High proportions of wheat in the crop rotation increase the proportion of inoculum and risk for attack. In areas with lots of wheat the level of ascospores will be high.
Sowing date	Early sowing is known to increase disease level in autumn, which again can result in higher disease levels in spring and summer. Late sowing can decrease disease levels as the epidemic is generally delayed. [28]
Tillage	Ploughing has been found to increase the risk of septoria compared with minimal tillage. This might be related to an increased N-mineralization following ploughing which can stimulate a more severe attack. [27]
Debris and volunteers	Debris may directly influence disease levels as ascospores are released from crop debris in the autumn. Volunteers are not important as source of inoculum as they will typically be destroyed before the attack becomes visual.
Nitrogen level	High nitrogen amounts increases to some extend the susceptibility of the crop. The effect is not believed to be of major importance within commercially used rates (120-200kg/ha). [34,35]
Nitrogen strategy	Spilt strategies have been seen to reduce the attack compared with single applications. [34,35]
Crop density	Low crop density stimulates septoria development as the disease is spread up the crop by rain splash, which is more effective in thinner crops. Dense crops may reduce rain splash but have in some trials been found to increase the risk, possibly due to higher humidity in the crop. [28]
Landscape	No information available
Soil type	No information available.
Weather	Dry weather reduces the risk as the disease needs 48 hours of humidty to stimulate development. Optimal temperatures are 15-20°C

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Figure 3. Impact from cultural practices on control of septoria leaf blotch

- Fungicide efficacy ranking – eight wheat diseases ranked by five different countries
- Review on problems related to fungicide resistance
- List of fungicide trade names and actives in different countries, given as a searchable feature
- Survey on pesticide use and yield responses to fungicides in some EU countries

Wheat IPM

Under this heading information and links to relevant disease management tools are given. Currently it features:

- Overview and links to decision support systems dealing with wheat diseases in Europe
- Wheat disease thresholds recommended in eight countries
- Information and thresholds for seed borne diseases
- Overview and documentation of cultural practises reducing specific diseases

Pathogens

Pathogen characteristics such as virulence and aggressiveness play a significant role in evaluating the risks of disease epidemics in cultivars possessing various sources of disease resistance. Since many of the most damaging pathogens, such as the rusts, may be spread by the wind across national borders, updated information about pathogen features in neighbouring countries serve as an 'early warning' for farmers. It features:

- Overview and analysing tool for wheat yellow rust virulence pathotypes in Europe (six countries)
- Fusarium head blight: how to minimise attack and mycotoxins
- Cultivar resistance to Fusarium head blight, including ranking of cultivars

Cultivars and yields

The cultivars grown vary to a great extent between countries. Grain yield may vary significantly across cultivars and environments due to the genetic yield potential and environmental stresses, including climate and disease pressure. It features:

- Links to national cultivar databases
- Yield levels in different countries

Control thresholds (Figure 2)

Control thresholds are important tools when deciding when to apply a fungicide in an IPM concept. Methods for monitoring and specific thresholds used in different countries have been summarised for 6 diseases.

Cultural practice (Figure 3)

In order to minimise disease problems several cultural measures have been found and described. General principles for IPM are given and specific information on 8 diseases is included, including references.

Early warning system for wheat yellow rust (Figure 4)

Wheat yellow rust exists in a range of genetic variants, known as "pathotypes" or "races", which are subject to continuous evolution, e.g., depending on mutation rates and selection forces influenced by resistance genes in European wheats.

EuroWheat offers a presentation of yellow rust pathotype data in three different ways: as pie charts according to geographical area and time (year), and as bars and stacked bars, respectively, showing pathotype frequency data according to sampling year. Finally, the frequency of individual (and rare) virulences can be displayed as pie charts, e.g., in order to reveal first detection of a new virulence (not shown). These yellow rust characteristics across Europe and the resulting risks for attacks in wheat varieties in the different areas do support plant breeders and extension services by providing broader selection criteria in their breeding programs and a better basis for choice of variety at the farm level.

Responses to fungicides (Figure 5)

Different countries have different disease pressure and therefore also different needs for fungicide application. Data from national variety trials indicates that the yield responses varies considerably between year and countries. This partly explains the significant differences in fungicide use between countries.

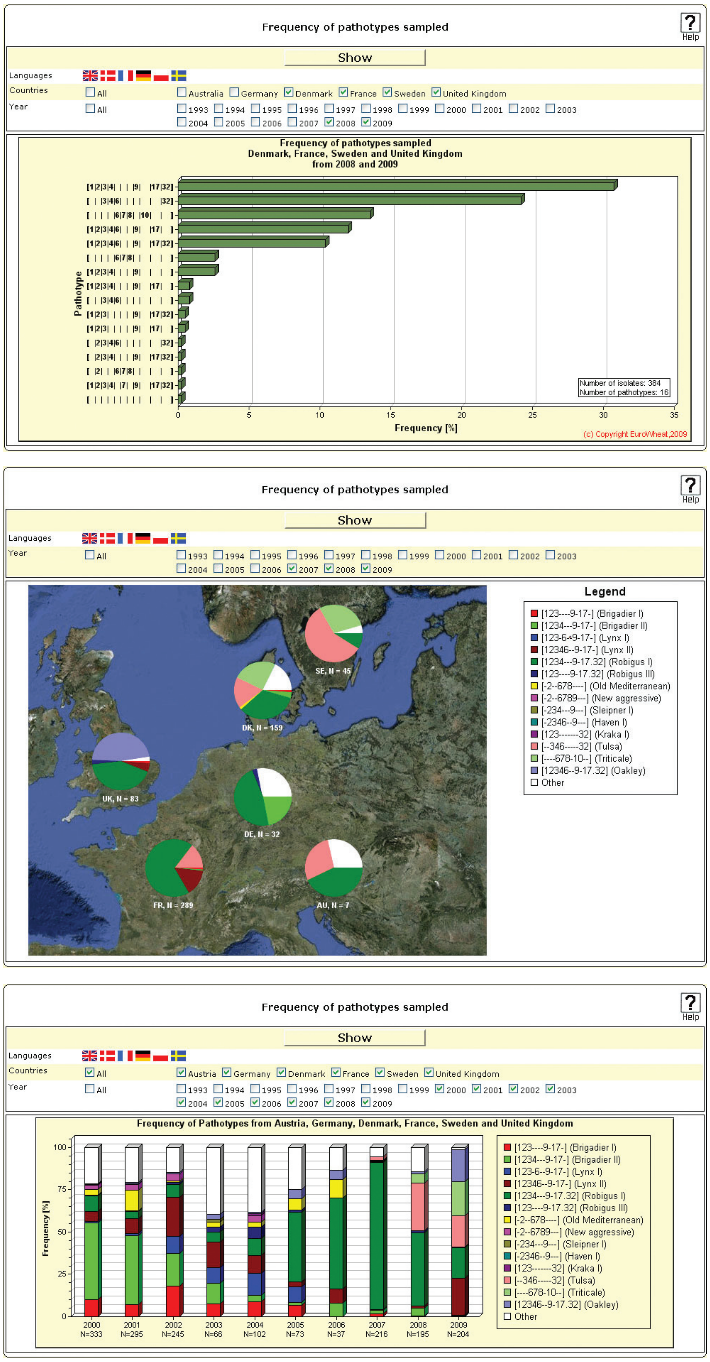

Figure 4. Pathotypes of yellow rust found in different countries and years

General information material on disease management

EuroWheat contains several useful links to national documents on disease managements, making it easy for advisers and other people with interest in the subject to collect relevant information on the topic.

Examples of pages and content in EuroWheat are given on the below.

Fungicide efficacy (Figure 1)

Data give an overview on authorised fungicides and their efficacy including information on fungicide resistance. Data have so far been collected from 5 countries.

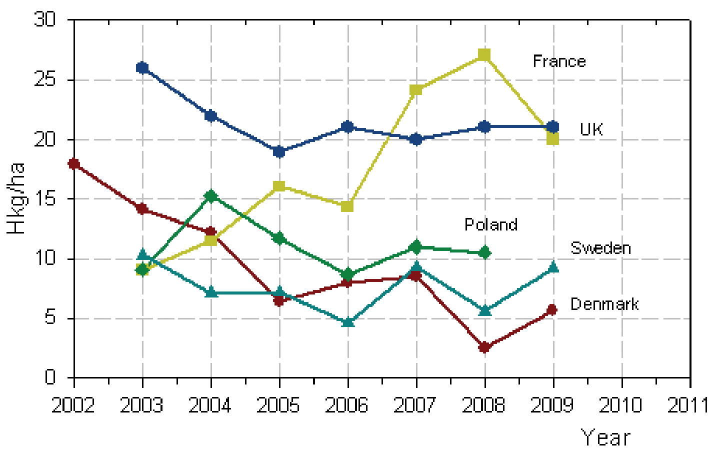

Figure 5. Page giving information about national yield responses to fungicides and consideration with respect to choosing control strategy

Technical issues of EuroWheat

A first version of EuroWheat was established during the first 12 month of the activity. The vision was to facilitate a platform containing the most important information about wheat disease management in an IPM context. The platform is based on a template of a web and database system developed by Aarhus University and previously applied for the platforms Euroblight and EuroWheat. They share the same database and several database and web applications. Several interactive applications and information pages have been implemented on EuroWheat

Some of the applications can be integrated directly into other platforms adopting local languages and information only relevant for specific countries. As major label text strings etc have been translated into several languages, so it is possible to adopt the platform for local conditions. This is, for instance, the case for tables containing information on "Fungicide efficacy" and control threshold for leaf diseases.

General information on ENDURE

ENDURE, European Network for the Durable Exploitation of Crop Protection Strategies, is a so-called "network of excellence (NoE)" which is financed by EU's 6th Framework Programme. The aim of ENDURE is to create a European research network that will also exist after the funding of ENDURE ceases at the end of 2010. The research activities aim to achieve a better understanding of pest biology and the interaction between plants and their pests and, based on this knowledge, to develop new, innovative control strategies in which dependence on effective pesticides is reduced compared to the present. This can be achieved by combining analytical and system-based approaches and by promoting collaboration between biologists, agronomists, economists and sociologists. Another important goal of ENDURE is to ensure that new knowledge is communicated to all relevant parties: farmers, advisers, the industry, politicians and, not least, consumers.

Similar articles that appeared in *Outlooks on Pest Management* include – 2008 **19(5)** 206; 2009 **20(6)** 268