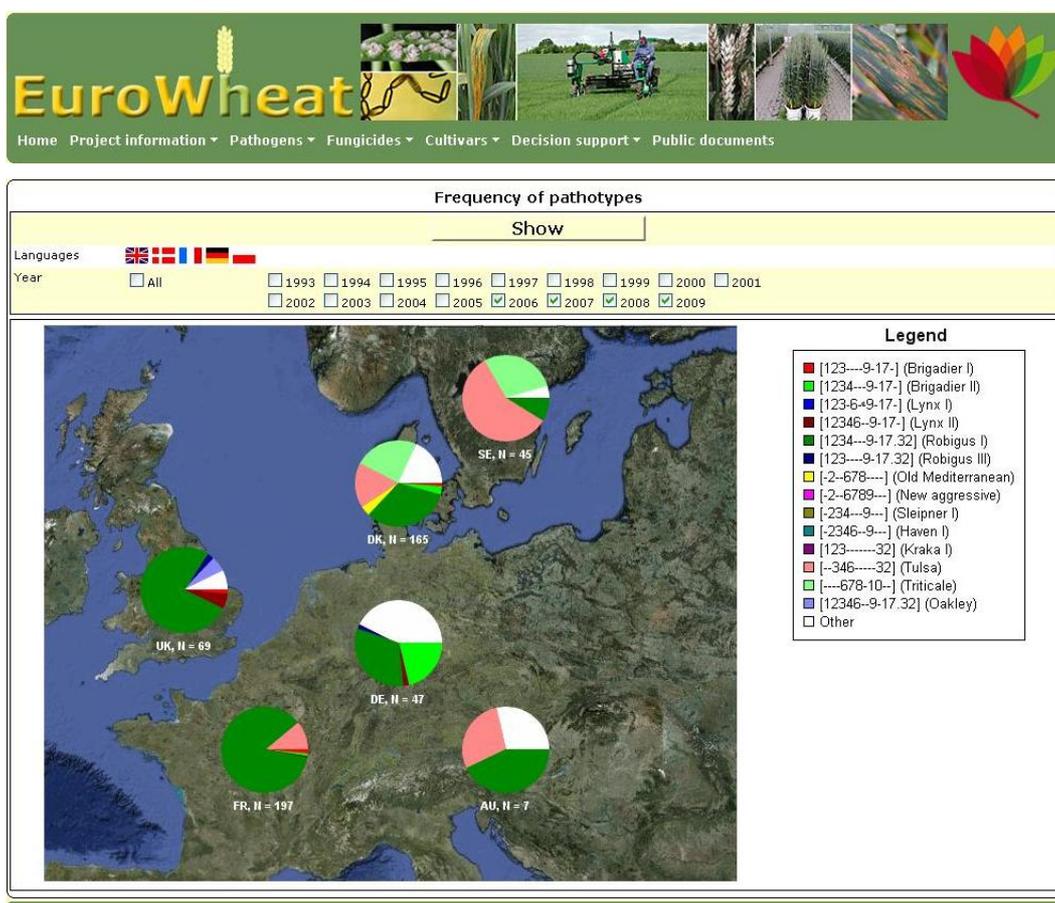


# EuroWheat.org: a new research-based website supporting integrated disease management in wheat

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Distribution of yellow rust pathotypes (races) in Europe 2006-2009. Each colour refers to a unique race. © www.eurowheat.org.

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## Information for advisers, breeders and industry

Winter wheat is the most important cereal crop in Europe. However, grain yield and quality is often restricted by disease epidemics, which may be managed through deployment of resistant varieties, fungicide applications or farming practices in general. A new website is assisting farmers and advisors in disease management practices.

EuroWheat.org collates data and information on disease management practices from several countries and aims at analysing and displaying this information in a European context. Bringing together existing information from national programmes and ensuring that data are in a format which can be readily understood trans-nationally, the website is expected to provide significant added value on a European scale.

The information is targeted at local advisers, plant breeders and industry engaged in disease management in wheat, and supports Integrated Pest Management (IPM) practices. The website includes sections regarding fungicides, decision support, pathogens, cultivars and yields, and general information on disease management as shown in the following examples. They can also be found on the website: [www.eurowheat.org](http://www.eurowheat.org).

EuroWheat has developed a concept and method that makes it possible for selected pages and tools to be integrated into national information systems and in the local language. This has been done to try and overcome barriers for dissemination to end-users.

## Fungicides

The platform gives an overview of which fungicides are authorised where, as well as information about efficacy and resistance. It features:

- > Fungicide efficacy ranking in eight wheat diseases by several different countries
- > A review of problems related to fungicide resistance and links to fungicide resistance platforms
- > A list of fungicide trade names in several different countries.

## Decision support

Control thresholds are important tools when deciding when to apply a fungicide in an IPM programme. The methods used for monitoring and the specific thresholds used in different countries are summarised for six wheat diseases. The website features:

- > An overview and links to wheat decision support systems in Europe
- > Disease thresholds for six diseases including control recommendations for several countries.

**Right: Control thresholds for powdery mildew in eight countries.**

Control thresholds	
<p><b>Monitoring for diseases in wheat</b></p> <p>Select  to change information in the right hand info box</p> <ul style="list-style-type: none"> <li> Eyespot</li> <li> Yellow rust</li> <li> Brown rust</li> <li> Powdery mildew</li> <li> Septoria leaf blotch</li> <li> Tan spot</li> </ul> <p>Field monitoring is an essential activity in order to optimize diseases management and apply IPM at farm level. Many countries have well-established control thresholds, which can be used as background for deciding whether or not to apply a fungicide. This guideline describes, how to do assessments and gives examples of thresholds recommended in different countries.</p> <p><b>General principles for disease development</b></p> <p>Following infection, the fungus develops for some time in the plant before symptoms appear. Latent period varies between the different diseases from 4-5 days to 3 weeks. Symptoms on lower leaves are generally less important compared with symptoms appearing on yield-forming upper leaves. Most control strategies aim at keeping the 3 upper leaves free from diseases.</p> <p>Disease development is very complex and the severity of diseases in a season depends on the amount of disease inoculum, weather and the variety's genetic ability to 'resist' that pressure. A higher fungicide dose is needed when disease pressure is high and varietal resistance is low. Conversely, a resistant variety facing low disease pressure may not require any treatment.</p> <p>Unfortunately disease forecasting is not a very precise discipline. Therefore risk assessment is often reduced to estimating, if risk of disease development is nil, low, moderate or high. Threshold is however still believed to be of good value, when the risk has to be decided.</p> <p><b>General principles used for assessing diseases</b></p> <p>When a field is assessed, it is important either to take out plant samples which are representative of the field (often around 100) or to make a visual assessment in the crop at 10-20 localities in the field depending on the size, in order to get a full picture of the disease level. Walk across the field (use the tramlines) and make sure to cover both high risk and low risk areas of the field. The crop ideally has to be assessed every week or 10 days starting at GS 30/31 and finishing at flowering. If the crop has been sprayed with a fungicide, an interval of around 10-14 days can normally be allowed before the crop has to be monitored again. Nevertheless, the estimation of particular diseases using field assessments can be very difficult or less valuable. Thus, in cases such as eyespot or Septoria leaf blotch further tools are helpful or even necessary. Forecasting systems based on weather as well as specific field and epidemiological data enable advisors and quite a number of farmers to make more reliable decisions via computer.</p> <p><b>Cereal - and wheat disease encyclopedias:</b></p> <p>HGCA: <a href="#">The Encyclopaedia of Cereal Diseases</a> <a href="#">Wheat Disease Encyclopaedia</a></p>	<p><b>Control thresholds used in different countries</b></p>  <p><b>Powdery mildew (<i>Blumeria graminis</i> f. sp. <i>tritici</i>)</b> HGCA photos</p> <ul style="list-style-type: none"> <li> &gt;10 % plants attacked from GS 29 in susceptible cultivars. &gt;25 % plants attacked from GS 29 in resistant cultivars. After GS 40 no further mildew treatments are recommended</li> <li> &gt;10 % plants attacked from GS 30 in susceptible cultivars (S) &gt;25 % plants attacked from GS 30 in resistant cultivars. After GS 40 no further mildew treatments are recommended</li> <li> After GS 31-32 with lesions on leaf 3</li> <li> Average of 3-5 % severity on upper leaves</li> <li> 60% plants attacked on the upper 3 leaves from GS 35 to 61, in some regions (e.g. Bavaria) with reference to only one of the upper leaves depending on the GS</li> <li> Susceptible varieties: &gt; 20 % of F3, or F2 or F1, with symptoms (5% of each leaf attacked). Other varieties:&gt;50 % of F3, or F2 or F1, with symptoms (5% of each leaf attacked)</li> <li> Tillering: 70% plants with first disease symptoms, Stem formation: 10% plants with first disease symptoms, or, Heading: first disease symptoms on 2nd leaf, flag leaf and head</li> <li> 10-12 mildew spot uniformly distributed on the upper 2 flag leaves</li> </ul> <p>Mildew is generally most important at early growth stages in spring. Risk is often linked to specific regions and soils where the farmers from experience need to be very alert. The risk is often considered to be high on late sown crops, near hedges and on sandy soil. Look out for the disease on all green parts between GS 29 and 55. The control threshold early in the season is low in susceptible cultivars. Effective control using specific mildewicides requires treatments at low disease levels. Autumn attack may be found but is not considered to have economic importance. Control is not regarded to be economical after heading. Keep a check on national ranking of the cultivars susceptibility in order to be aware if you have a high or low risk situation. Mildew is so visible that the likely amount of damage may be overestimated. Low levels of attack as often seen around heading on the lower part of the crop are regarded not to have economic importance.</p>

## Monitoring for diseases in wheat

For the diseases eyespot, yellow rust, brown rust, powdery mildew, septoria leaf blotch and tan spot, the user selects the icon  to change information on the right hand of a dedicated web page. On the previous page is an example of the information available for powdery mildew.

## Cultural practice

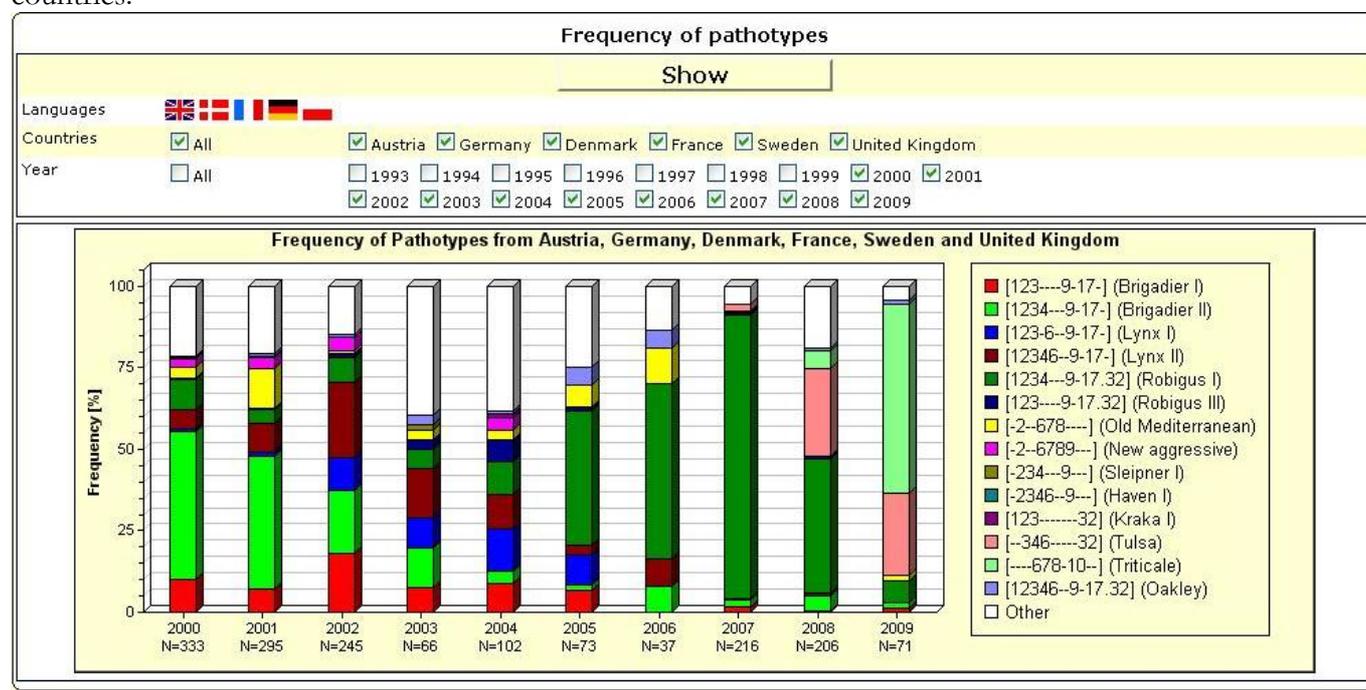
To minimise disease problems, several cultural measures have been recognised and described. General principles for IPM are given. It features:

- > Specific information on cultural measures that have an impact on seven diseases
- > References to the information described can be extracted from the pages.

## Pathogens

Pathogen characteristics such as virulence and aggressiveness play a significant role for evaluating the risks of disease epidemics in varieties possessing various sources of disease resistance. Since many of the most damaging pathogens, such as 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:

- > Frequency of pathotypes of yellow rust across Europe
- > A summary of pathogen virulence characteristics for wheat yellow rust pathotype (‘race’) distribution in six European countries (1993-2009 for Denmark, 2000-2009 for six countries).
- > Historical information about virulence structure and race dynamics in yellow rust is shown. This information is used to assess risk of yellow rust epidemics in currently grown varieties (see table below).
- > *Fusarium* head blight: which *Fusarium* species produces which mycotoxins and how to minimise attack and mycotoxins
- > *Fusarium* head blight: Ranking of cultivar disease resistance in three groups, with data from five different countries.



## Varieties and yield gains

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

- > Links to national variety databases
- > Yield levels in wheat and estimated yield losses from specific diseases in different countries
- > Survey on pesticide use and yield responses to fungicides in EU countries.

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## Summary

The EuroWheat research platform has been developed as a collaboration between Aarhus University and its ENDURE partners. The platform contains information about disease management in winter wheat in the areas of fungicide efficacy, fungicide resistance, yellow rust virulence, cultivar susceptibility to *Fusarium* head or ear blight, control thresholds, decision support systems, cultural methods for disease control and impact on grain yields. National data from several countries have been collected and shared. Bringing together existing information from national programmes in a common format will benefit advisers, plant breeders and the scientific community.

The EuroWheat partner institutions are:

- > Institut national de la recherche agronomique (INRA), France
- > Association de coordination technique agricole (ACTA), France
- > ARVALIS - Institut du vegetal, France
- > Julius Kuehn Institute - Federal Research Centre for Cultivated Plants, Germany
- > Rothamsted Research (RRES), United Kingdom
- > National Institute of Agricultural Botany (NIAB), United Kingdom
- > Plant Breeding and Acclimatization Institute (IHAR), Poland
- > Aarhus University, Faculty of Agricultural Sciences (AU), Denmark
- > Danish Agricultural Advisory Service (DAAS), Denmark
- > Jordbruksverket (SJV), Växtskyddscentralen, Sweden.
- > Servizio Fitosanitario - Emilia-Romagna Region (SFRER), Italy
- > Szent István University (SZIU), Hungary
- > Agroscope Changins-Wädenswil (ACW), Switzerland

## For further information please contact:

Partnership in EuroWheat.org is not restricted to ENDURE members. If you are interested in contributing your own data or information please contact: [LiseN.Jorgensen@agrsci.dk](mailto:LiseN.Jorgensen@agrsci.dk)

## About ENDURE

ENDURE is the European Network for the Durable Exploitation of Crop Protection Strategies. ENDURE is a Network of Excellence (NoE) with two key objectives: restructuring European research and development on the use of plant protection products, and establishing ENDURE as a world leader in the development and implementation of sustainable pest control strategies through:

- > Building a lasting crop protection research community
- > Providing end-users with a broader range of short-term solutions
- > Developing a holistic approach to sustainable pest management
- > Taking stock of and informing plant protection policy changes.

Eighteen organisations in 10 European countries are committed to ENDURE for four years (2007-2010), with financial support from the European Commission's Sixth Framework Programme, priority 5: Food Quality and Security.

## Website and ENDURE Information Centre:

[www.endure-network.eu](http://www.endure-network.eu)

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