



Wheat case study

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Integrated Pest Management in Europe

Paris, November 2010





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What was the objective of the wheat case study?

- How are diseases in winter wheat managed in different countries?
- Collect information on strategies and measures to control diseases in winter wheat
- Exchange the best practises, which support disease control strategies based on IPM

- Output:
 - Report and brochures
 - Guides for advisors and farmers (From Science to Field)
 - Input to Endure Information Centre
- Start of www.EuroWheat.org

From Science to Field
Wheat Case Study – Guide Number 1

Using Cultivar Resistance to Reduce Fungicide Input in Wheat

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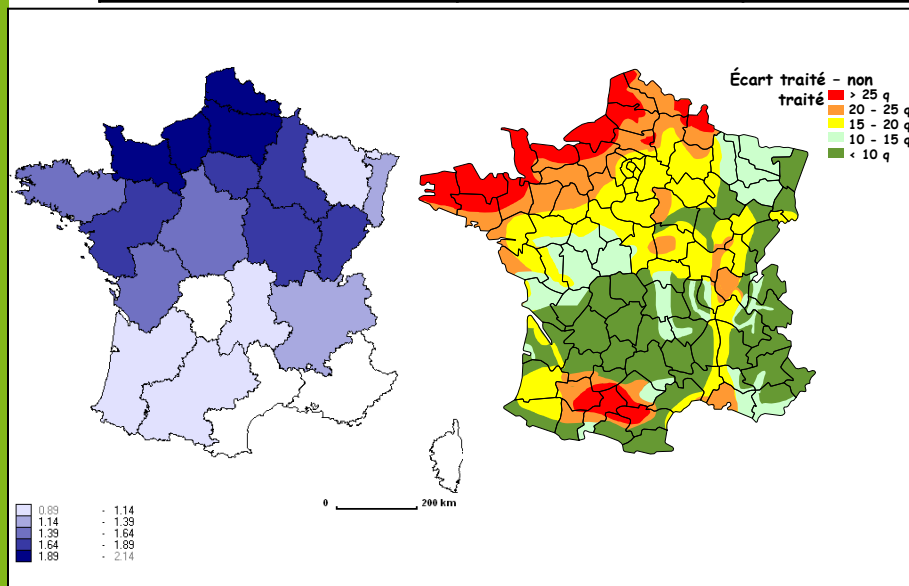
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Philippe Lucas and Bernard Rolland, INRA, France
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László Horváth, SZIE, Hungary



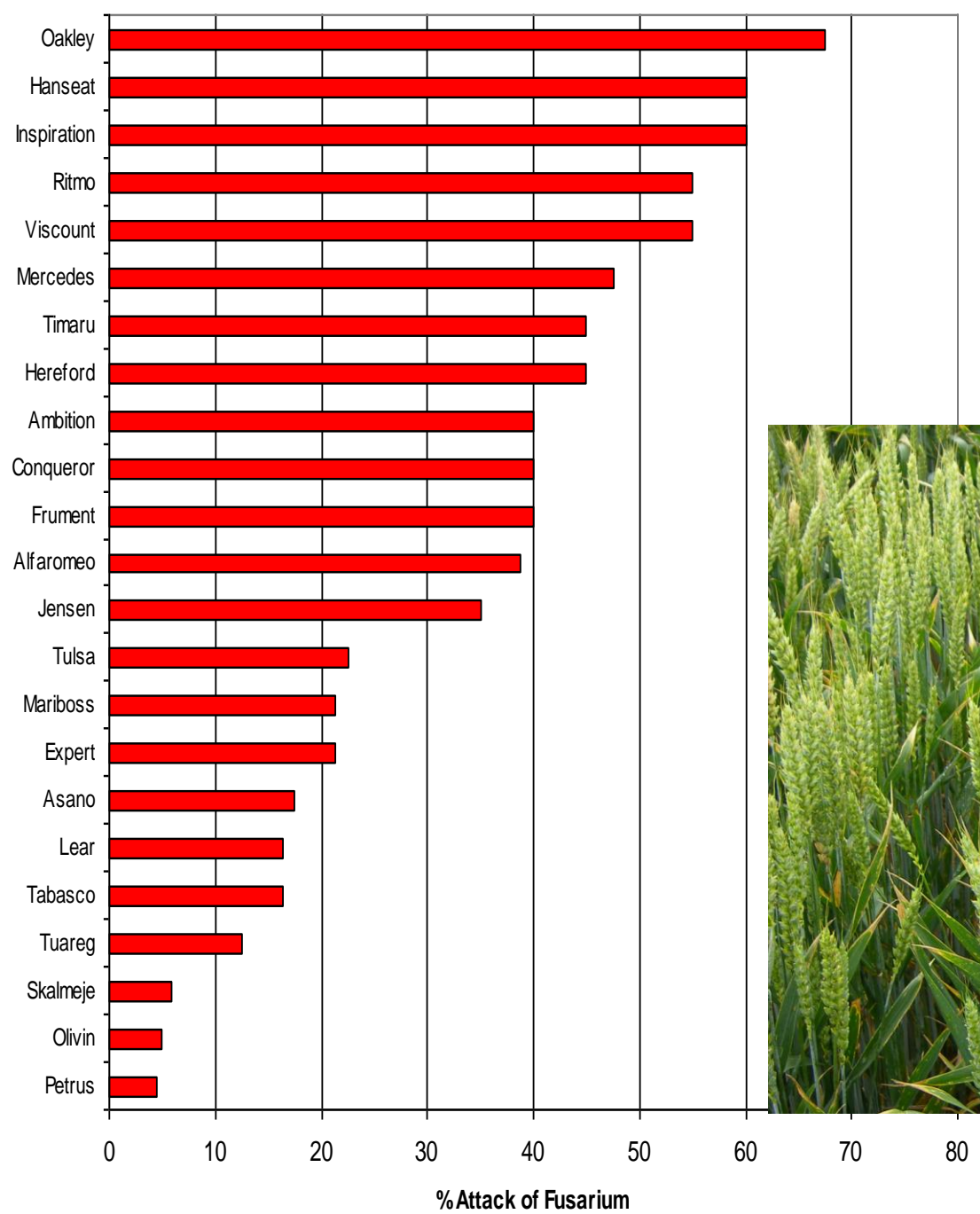
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Pesticide use on winter wheat in 4 countries

| | UK (2006) | France (2006) | Germany (2007) | Denmark (2007) |
|-----------------------|--------------|---------------|-------------------|-------------------|
| Herbicides | 2.43 | 1.5 | 1.9 | 1.71 |
| Fungicides | 2.26 | 1.6 | 1.9 | 0.56 |
| Insecticides | 1.08 | 0.3 | 1.2 | 0.15 |
| PGRs | 0.97 | 0.7 | 0.8 | 0.2 |
| Total | 6.74 | 4.1 | 5.8 | 2.62 |
| Yield (ton/ha) | 8.0 | 6.9 | 7.3 | 7.3 |



Fungicide use versus disease pressure/ yield response

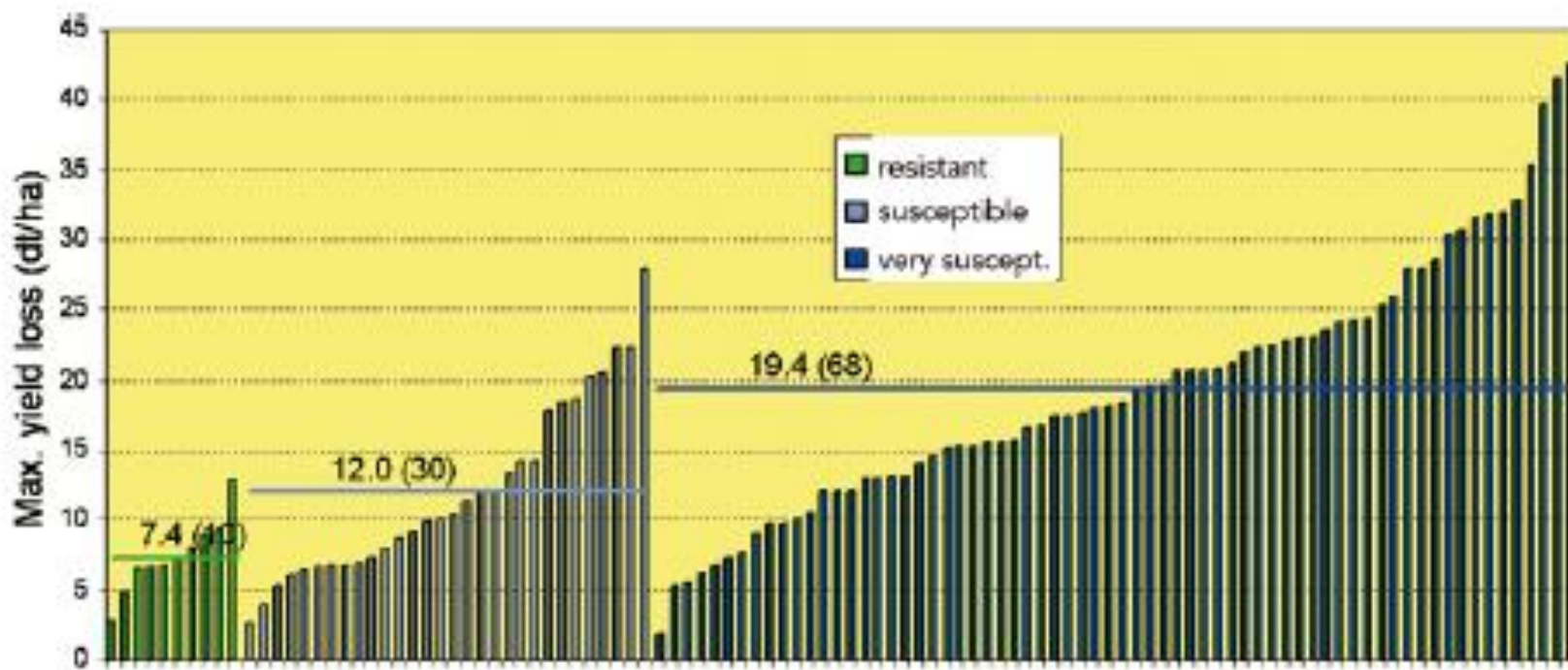


Variety resistance
Key element in diseases
practice –addressing IPM



Significance of cultivar resistance

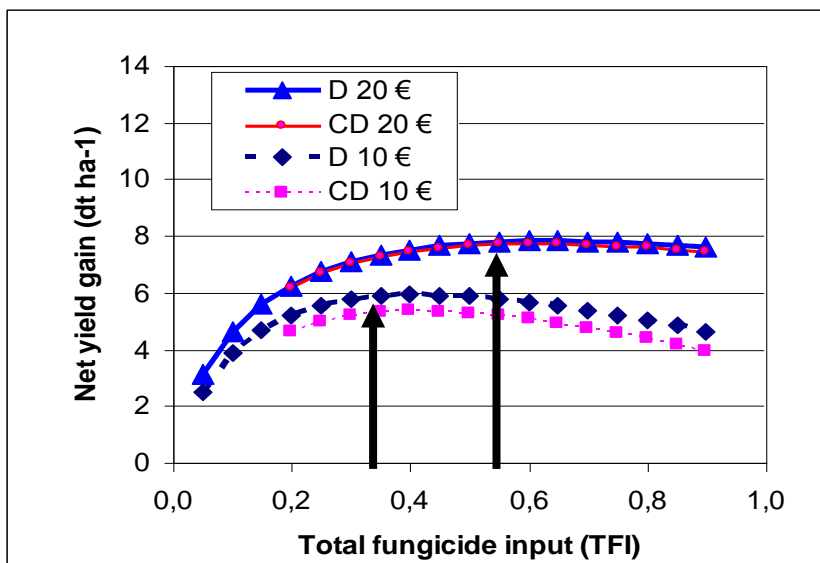
With respect to yield losses



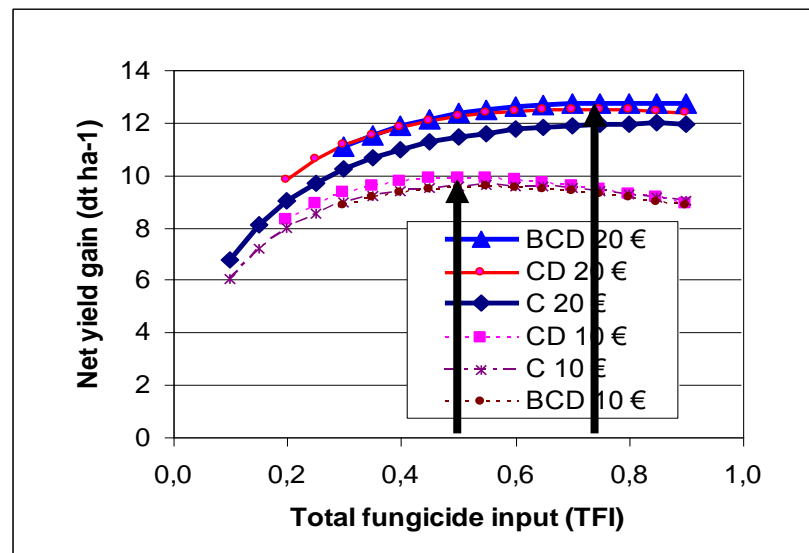
Source: 108 trials in France

Cultivar resistance and fungicide requirement

Resistant cultivar



Susceptible cultivar

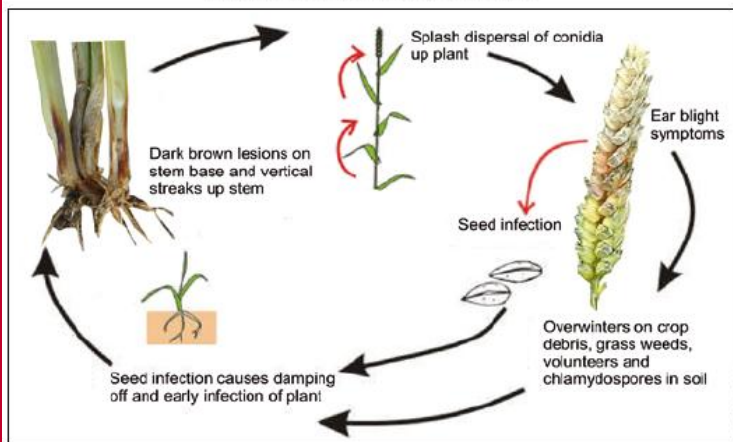


A: GS 25-31, B: GS 32-36, C: GS 37-50, D: GS 51-64

Fusarium is a good case where IPM is needed!



Typical life cycle of *Fusarium* species in wheat.






DON risk assessment grid on wheat ARVALIS-Institut du végétal 2008

| Previous crop | Tillage | Varietal susceptibility | Risk category |
|---------------|--------------|-------------------------|---------------|
| | Ploughing | Low susceptibility | 1 |
| | | Medium susceptibility | 1 |
| | | Susceptible | 2b |
| | No ploughing | Low susceptibility | 2a |
| | | Medium susceptibility | 2a |
| | | Susceptible | 2b |
| | Ploughing | Low susceptibility | 2a |
| | | Medium susceptibility | 2a |
| | | Susceptible | 2b |
| | No ploughing | Low susceptibility | 2a |
| | | Medium susceptibility | 2a |
| | | Susceptible | 3 |
| | Ploughing | Low susceptibility | 2a |
| | | Medium susceptibility | (2a) 2b |
| | | Susceptible | 3 |
| | No ploughing | Low susceptibility | (3) 4 |
| | | Medium susceptibility | (4) 5 |
| | | Susceptible | (5) 6 |

Figure 4: Decision key for DON risk (Source: Arvalis, France)

Information is worth very
little if not updated!

www.EuroWheat.org disease management with focus IPM

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02 November 2009

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2nd Workshop



Participants at the 2nd EuroWheat workshop at Julius Kuehn Institute, Berlin, Germany, 11th-12th March 2009.

Survey on the use of disease thresholds



New guideline on monitoring of diseases in wheat and a survey on control thresholds used in different countries

[Read more ...](#)

Welcome to EuroWheat

EuroWheat is an Internet based platform aiming at collating and displaying host - and pathogen characteristics, and pesticide efficacy on a European scale. Bringing together existing information from national programs and ensuring that these data are in a format, which can be readily understood trans-nationally, are expected to provide significant added value on a European scale. New disease - and resistance data will be published on the platform as soon as possible to support effective disease control, deployment of host resistances and breeding programs.

Present information available are:

- Virulences in the yellow rust population
- Ranking of wheat cultivars for susceptibility to Fusarium and different testing methods
- Disease names in six different languages
- Effectiveness of fungicides ranked in different countries
- Fungicides international trade names
- Fungicide resistance as present in Europe
- Survey on pesticide use and yield responses to fungicides in EU countries
- Yield level and yield losses from specific diseases in 8 EU countries
- Information on disease thresholds and DSSs used in Europe
- Cultural practices impact on disease development
- National documents on disease management


EuroWheat is funded by the ENDURE project and Aarhus University.

Contact

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Web site provided by Aarhus University, Faculty of Agricultural Sciences, Department of Agroecology and Environment.
 Report technical problems to webmaster: [Poul Lassen](#).
 Optimized for screen size 1024x768

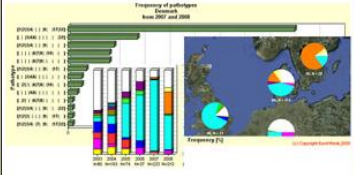
Comparison of Fungicide efficacy across countries



Find information on the efficacy of the most important compounds against cereal diseases across countries in Europe. [Read more ...](#)

In 2009, information will be provided on fungicide resistance cases in specific pathogens by country.

Yellow rust pathotypes in Europe



New data for 2008 have been uploaded.

Most important pathotypes in Europe 1993-2008...

Evolution of pathotypes over years and countries

[Pathotypes on Europe map](#)

Information on non-chemical control measures for control of wheat diseases

Cultural practices impact on disease development



Non-chemical control of wheat diseases

Select  to change information in the right hand info box

-  Eyespot
-  Yellow rust
-  Brown rust
-  Powdery mildew
-  Septoria leaf blotch
-  Tan spot
-  Fusarium head blight
-  Take-all

In relation to minimizing disease risk the following elements are known to be of major importance:

- Diversification of crop rotations.
- Use of resistant cultivars and/or variety mixture.
- Removal of debris.
- Reduced use of nitrogen.
- Optimal sowing conditions and timing.

Important links

AHDB/HGCA :

[The Encyclopaedia of Cereal Diseases](#)

[Wheat Disease Encyclopaedia](#) To find references indicated in the hard brackets, please select the Help Icon in upper right corner.

Fusarium head blight



Fusarium spp [AHDB/HGCA photos](#)

| | |
|-----------------------|--|
| Resistance genes | Varieties with good resistance are known, and may help to reduce disease levels. Several non-specific genes are used and described e.g. Fhb1 from Chinese spring wheat. Different types of resistance are described: Resistance to initial infection (type I), resistance to pathogen (type II), ability to degrade mycotoxins (type III and IV), or resistance to grain infection (type V). Tall cultivars are often seen to be less susceptible (longer distance for inoculum to spread). Compact heads are known to increase the risk of attack. Open flowering increase the risk of infection. [1,7,8,22,32,36,41] |
| Previous crop | Maize as previous crop has been found to increase the risk of fusarium head blight. Wheat has also been found to potentially increase the risk in some regions. [14,36] |
| Sowing date | Not found to be of specific importance |
| Tillage | Ploughing decreases the risk by removing inoculum. Minimal tillage significantly increases the risk when wheat follows maize or wheat. [3,31] |
| Debris and volunteers | Crop debris on the surface increases the risk of disease development. [3,27,36,39,42] |
| Nitrogen level | No information available |
| Nitrogen strategy | No information available |
| Crop density | No information available |
| Landscape | No information available |
| Soil type | No information available |

Information on control thresholds for wheat diseases in different countries

Control thresholds for wheat leaf diseases used in different countries

Monitoring for diseases in wheat

Select  to change information in the right hand info box

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

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.

General principles for disease development

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.

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.

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.


General principles used for assessing diseases


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


Yellow rust




Puccinia striiformis [AHDB/HGCA photos](#)


 >1 % plants with attack. GS 29-60 (S). >10 % plants attacked after GS 61-71 (S)


 >1 % plants with attack or foci (S) GS 29-59. >10 % plants with attack (R)

 At first symptoms.

 1-2 % severity or foci present.

 From GS 31: at first symptoms. Before GS 31: if spots are present and they are active.

 First foci present.

 At GS 30-31: 25-30 % tillers with lesions

 First symptom occurrence on the upper 2 leaves.

Crops must be inspected carefully for small patches of infection (foci) before, and during, stem extension. Look out for the disease on all green parts between GS 29 and 60 and once the disease is seen in the crop, it is recommended to spray. The most recently emerged leaves always appear disease free between

Conclusion

- Good process
- Good outputs
- Added value to national information
- Still much to do!
- Hope to get the chance to continue the networking!?
- Continue development of EuroWheat