Wheat case study

Lise Nistrup Jørgensen

Aarhus University

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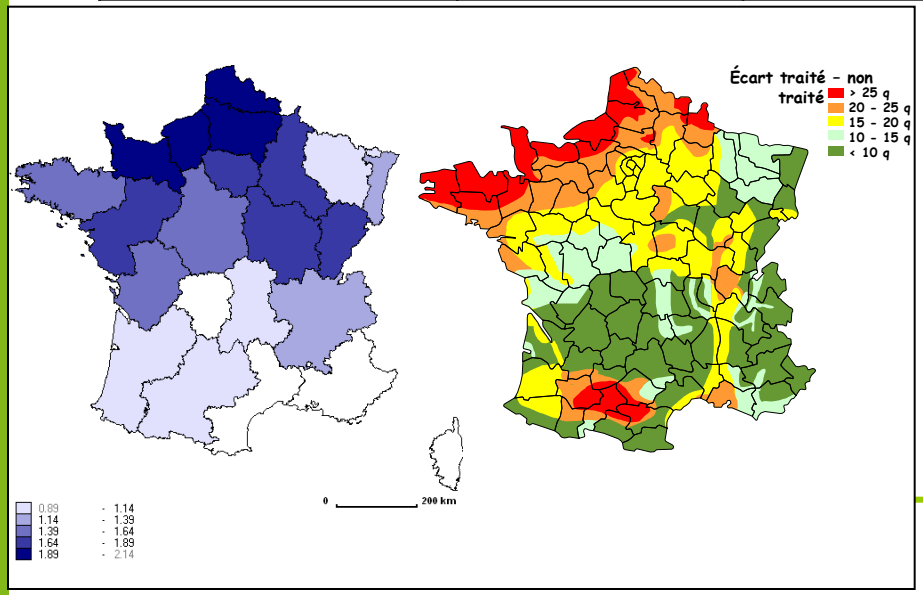
What was the objective of the wheat case study?

- 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

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

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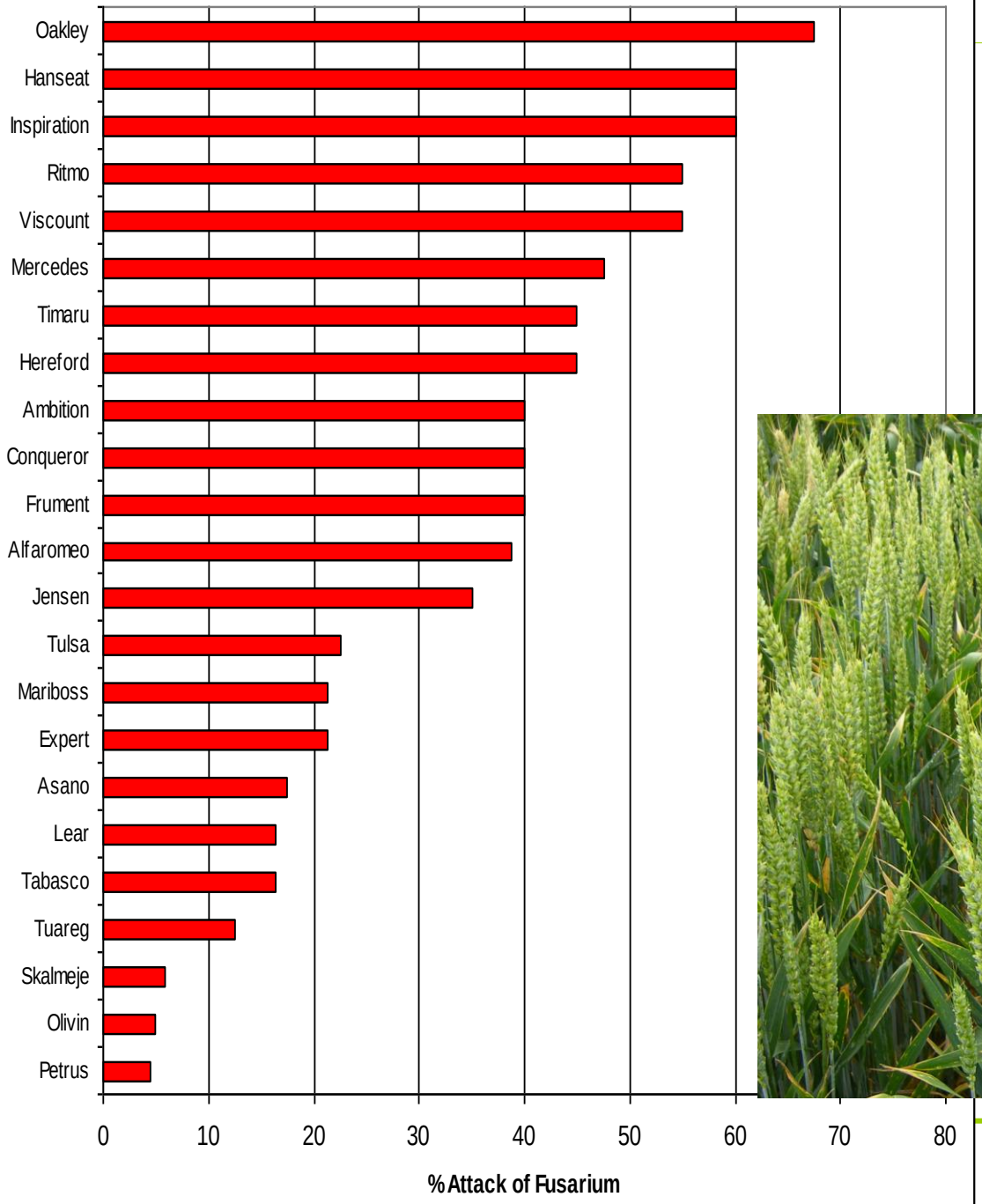

Variety resistance
Key element in diseases practice –addressing IPM

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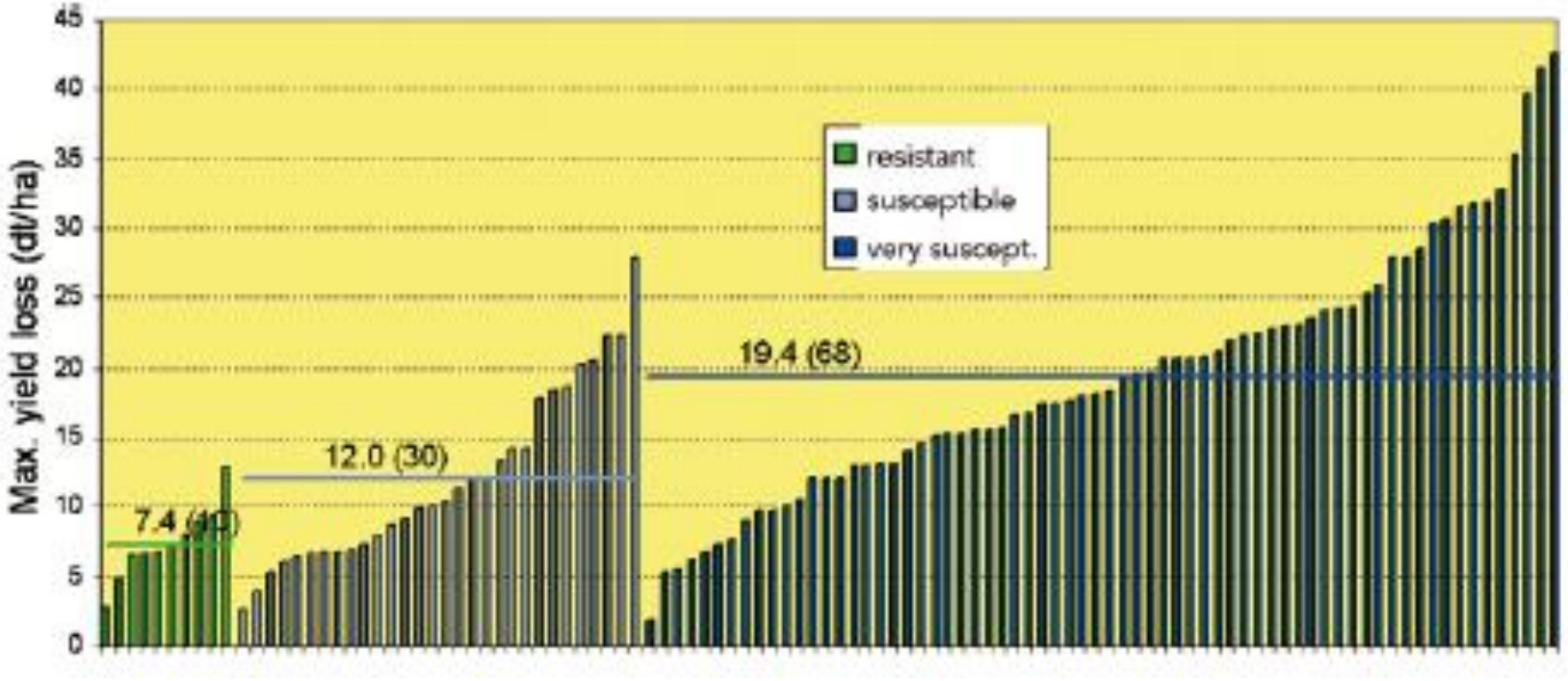
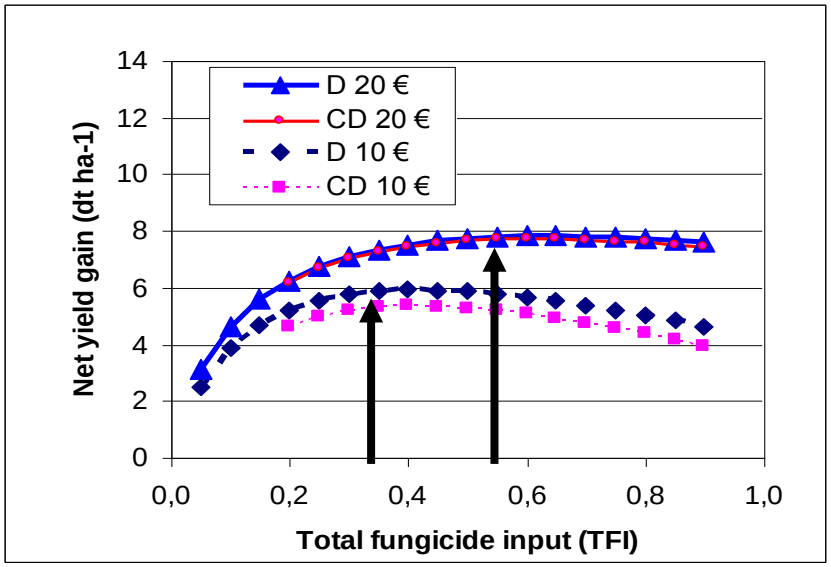
Significance of cultivar resistance
With respect to yield losses



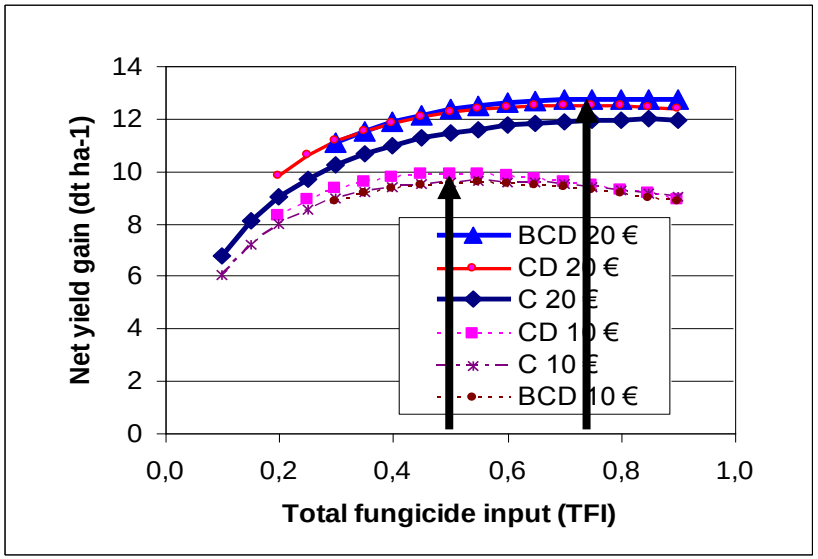
Source: 108 trials in France

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

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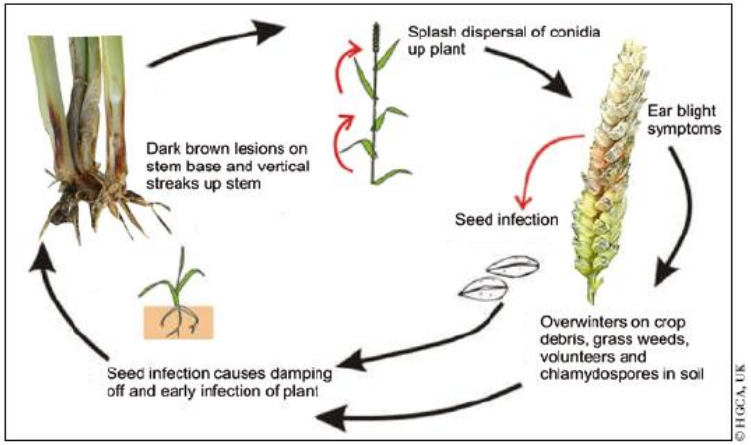
Fusarium is a good case where IPM is needed!

Typical life cycle of *Fusarium* species in wheat.



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

Previous crop	Tillage	Varietal susceptibility	Risk category
Cereals, oilseed rape, flax, peas, beans, sunflowers	Ploughing	Low susceptibility	1
		Medium susceptibility	1
		Susceptible	2b
	No ploughing	Low susceptibility	2a
		Medium susceptibility	2a
		Susceptible	2b
Sugar beet, potatoes, soya, others	Ploughing	Low susceptibility	2a
		Medium susceptibility	2a
		Susceptible	2b
	No ploughing	Low susceptibility	2a
		Medium susceptibility	2a
		Susceptible	3
Grain maize, sorghum (forage maize)	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)

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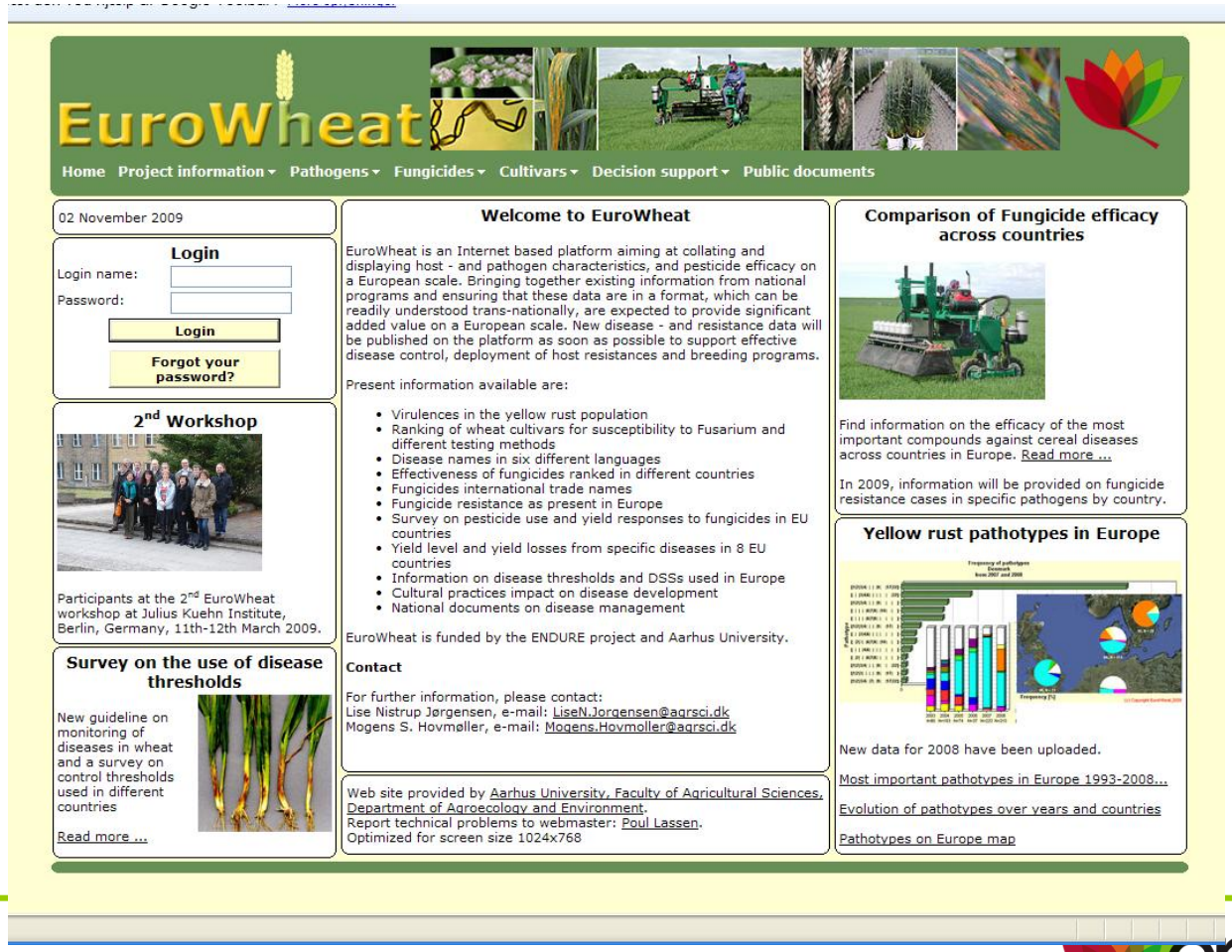
Information is worth very little if not updated!

www.EuroWheat.org
disease managment with focus IPM



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

Cultural practices impact on disease development

Help

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 ℹ to change information in the right hand info box

- ℹ Eyespot
- ℹ Yellow rust
- ℹ Brown rust
- ℹ Powdery mildew
- ℹ Septoria leaf blotch
- ℹ 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

Denmark	>1 % plants with attack. GS 29-60 (S). >10 % plants attacked after GS 61-71 (S)
Sweden	>1 % plants with attack or foci (S) GS 29-59. >10 % plants with attack (R)
Netherlands	At first symptoms.
United Kingdom	1-2 % severity or foci present.
France	From GS 31: at first symptoms.Before GS 31: if spots are present and they are active.
Germany	First foci present.
Poland	At GS 30-31: 25-30 % tillers with lesions
Italy	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