

Forecasting Foliar Diseases in Oilseed Rape

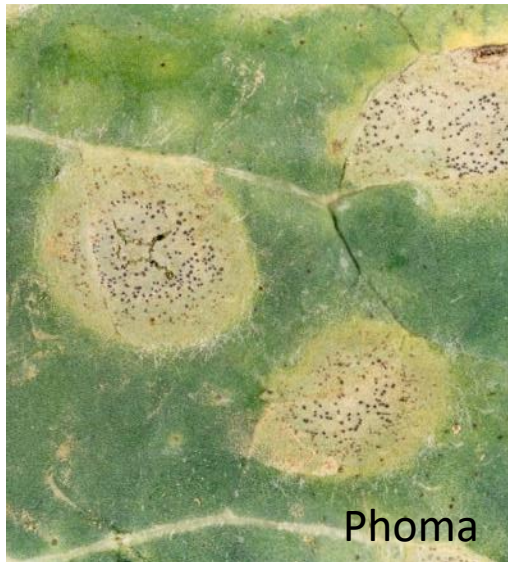
Jon West, Rothamsted Research



ROTHAMSTED
RESEARCH

Phoma leaf spot (*Leptosphaeria maculans*)

- Infects in autumn to produce Phoma leaf spots
- Early infection leads to severe stem cankers and yield loss at harvest
- Late infections not as important
- **Uncertainty as to when to treat?**



Phoma



Light leaf spot (*Pyrenopeziza brassicae*)

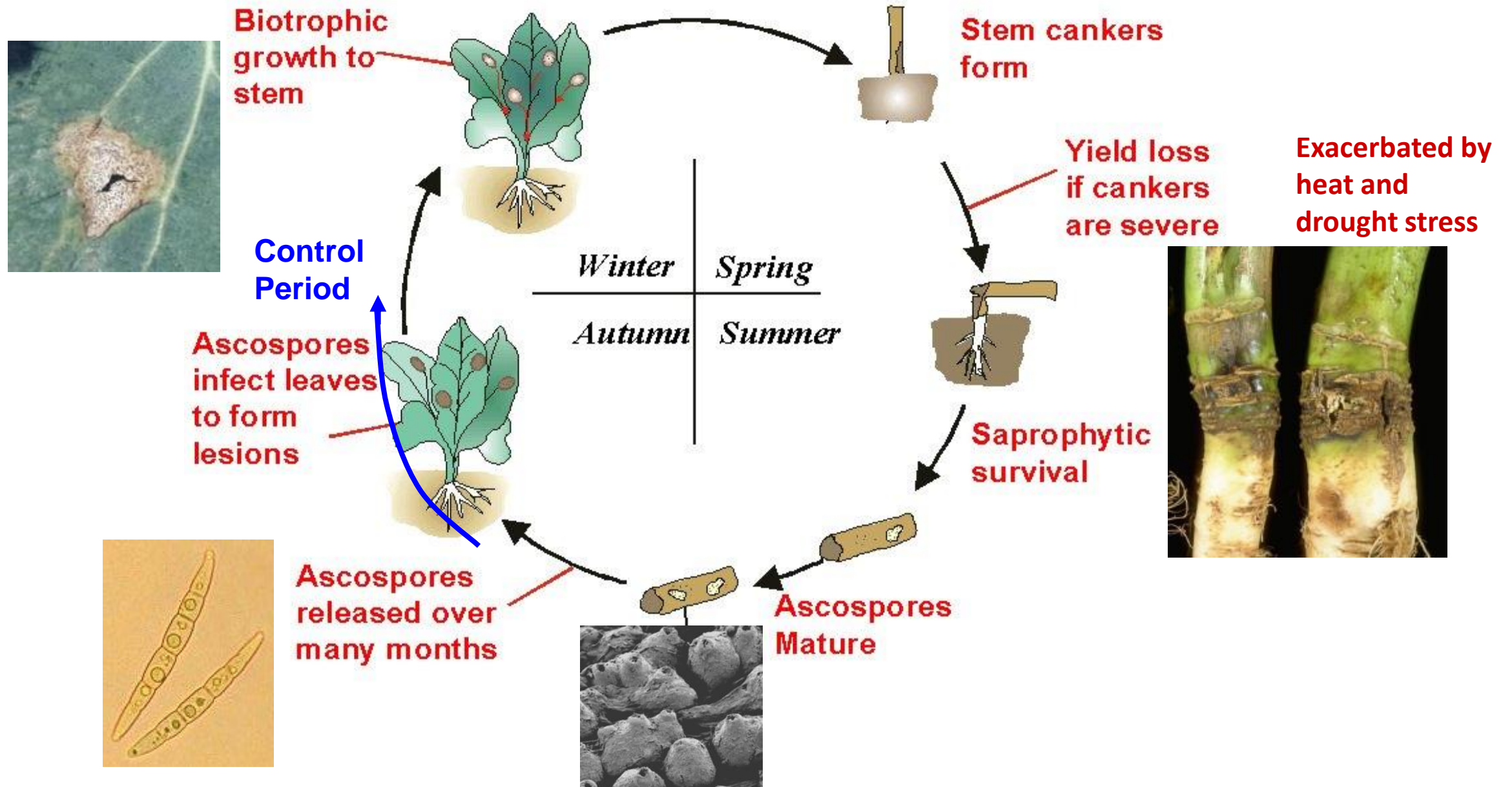
- Infects in early–mid autumn
- Disease symptoms not visible until winter
- Severity varies regionally and annually
- **Uncertainty as to whether treatment needed at all?**



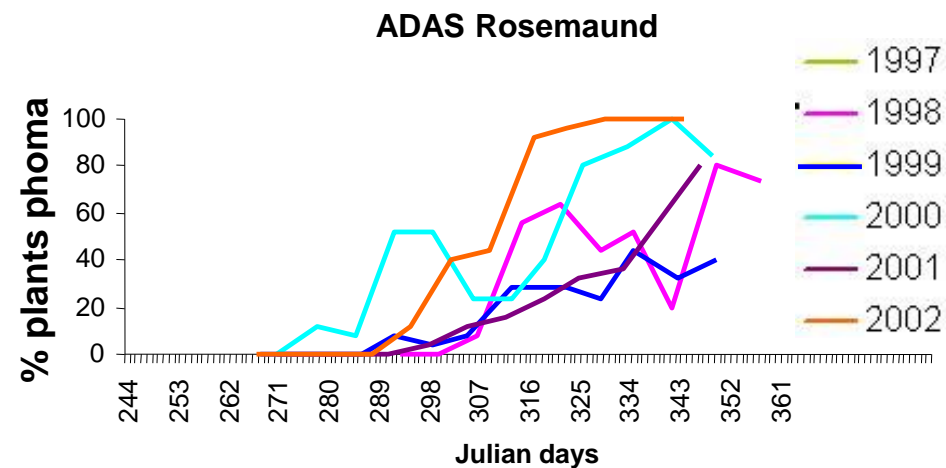
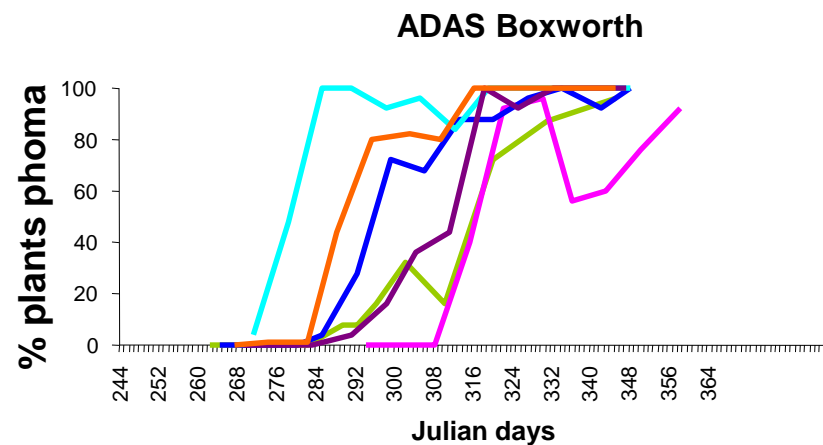
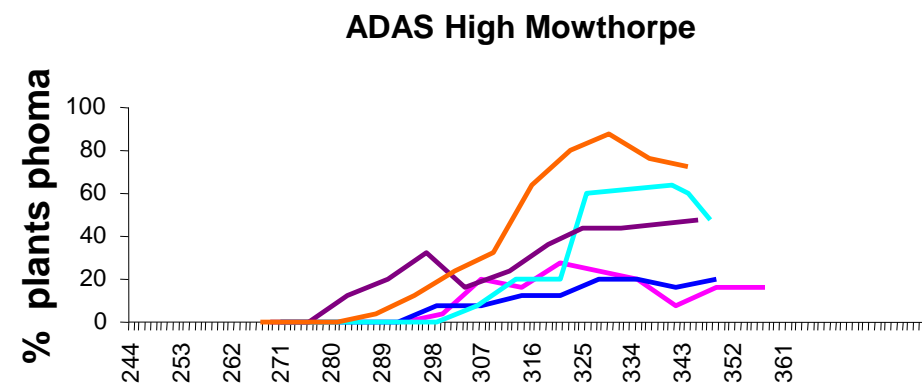
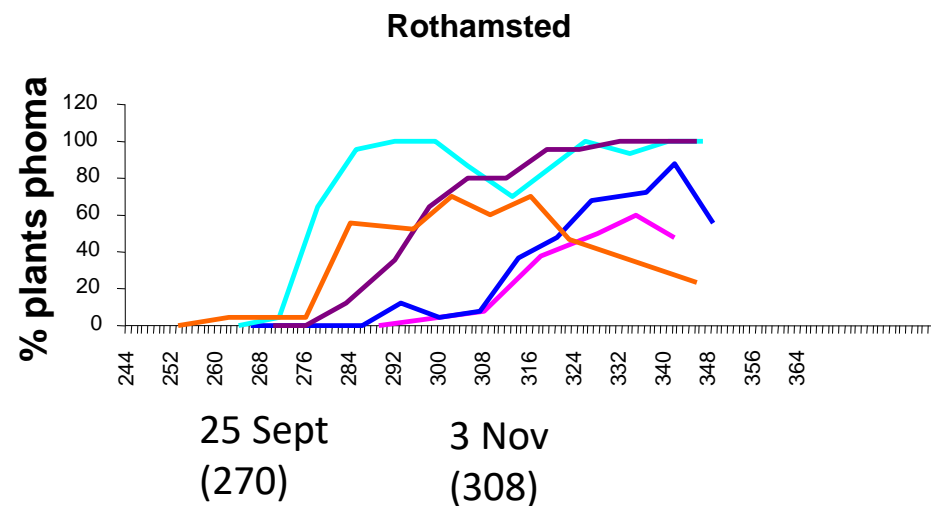
Light leaf spot



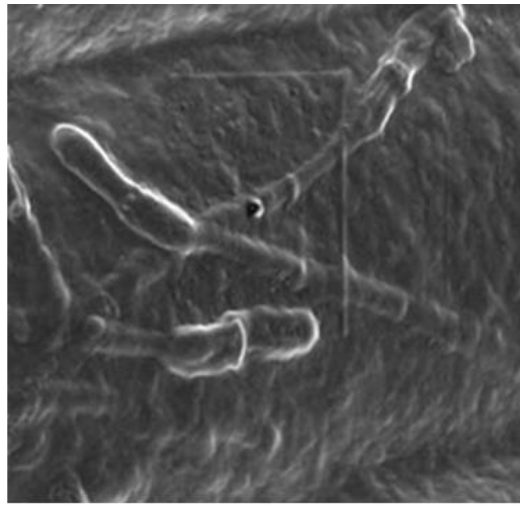
Epidemiology of *Leptosphaeria maculans* (phoma stem canker)



Annual variation in epidemic onset



Light Leaf Spot



Pathogen hyphae grow in sub-cuticular space

Asexual sporulation produces conidia



Ascospores germinate and directly penetrate cuticle

Symptomless phase

Asexual reproduction

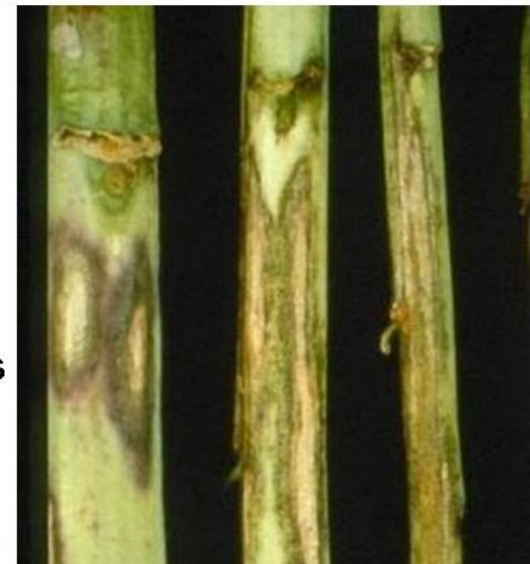
Air-borne ascospores initiate epidemic

Sexual reproduction

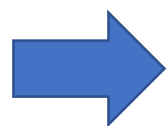
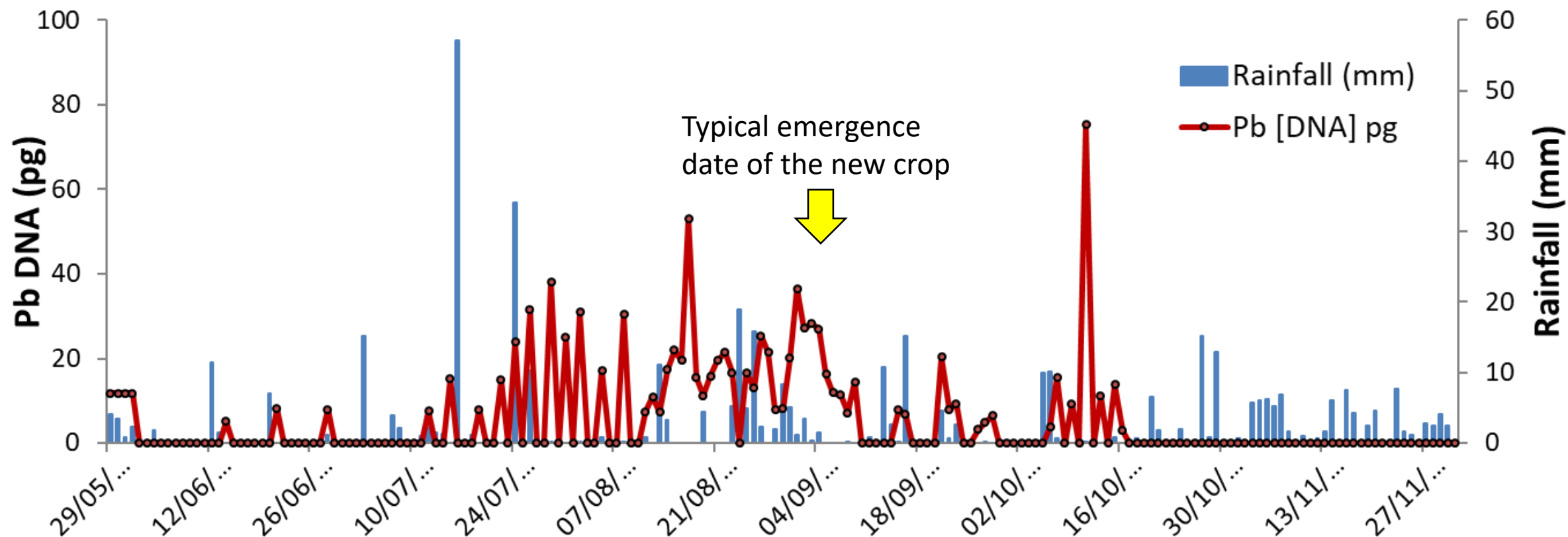
Secondary cycles

Apothecia develop on infected debris

Infection of leaves, stems, meristems & pods



P. brassicae spore release and rainfall at Rothamsted 2015



Pyrenopeziza brassicae ascospore release occurs before and during emergence of the new crop in the UK and declines to zero by mid-autumn. Symptoms appear in December typically.

- Optical sensing is not useful for these two diseases
- Airborne Inoculum detection is also not useful for LLS while Phoma can be predicted by a weather-based forecast

 Phoma and LLS need two different types of weather-based forecasts

Phoma leaf spot forecast

Forecasts the key date when 10% plants infected (economic spray threshold)

- Based on mean summer daily max temperature and cumulative rainfall from 15 July to 26 Sept

Light leaf spot forecast

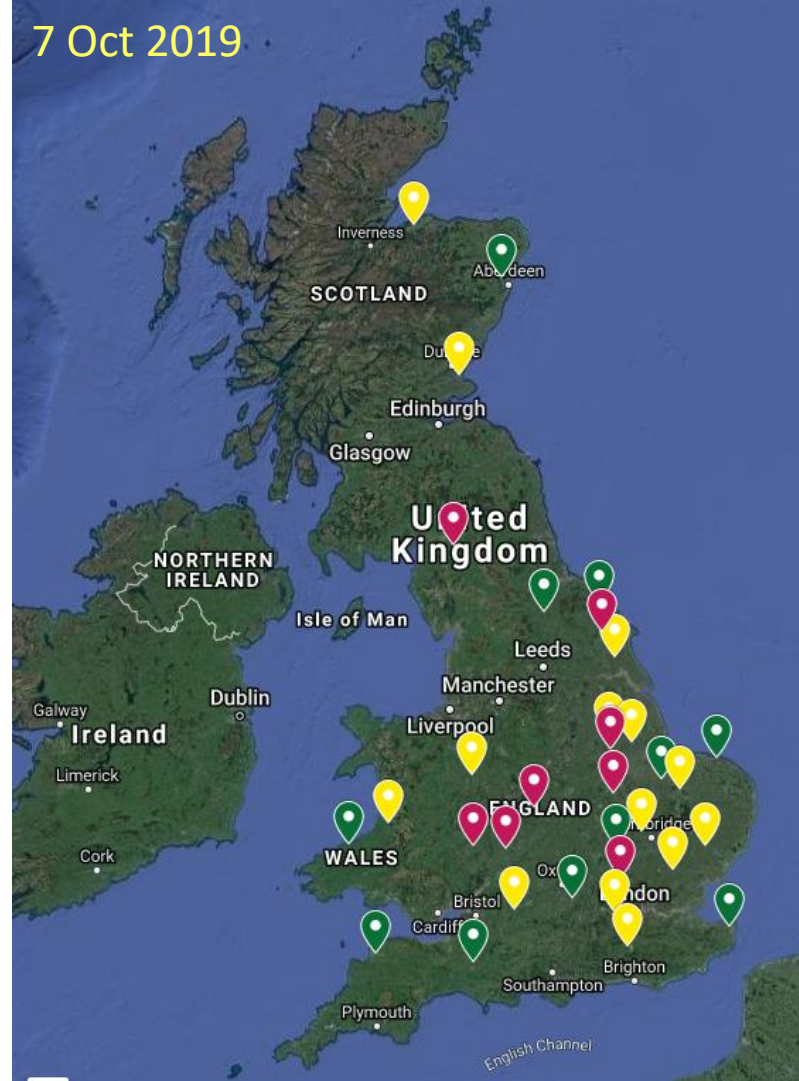
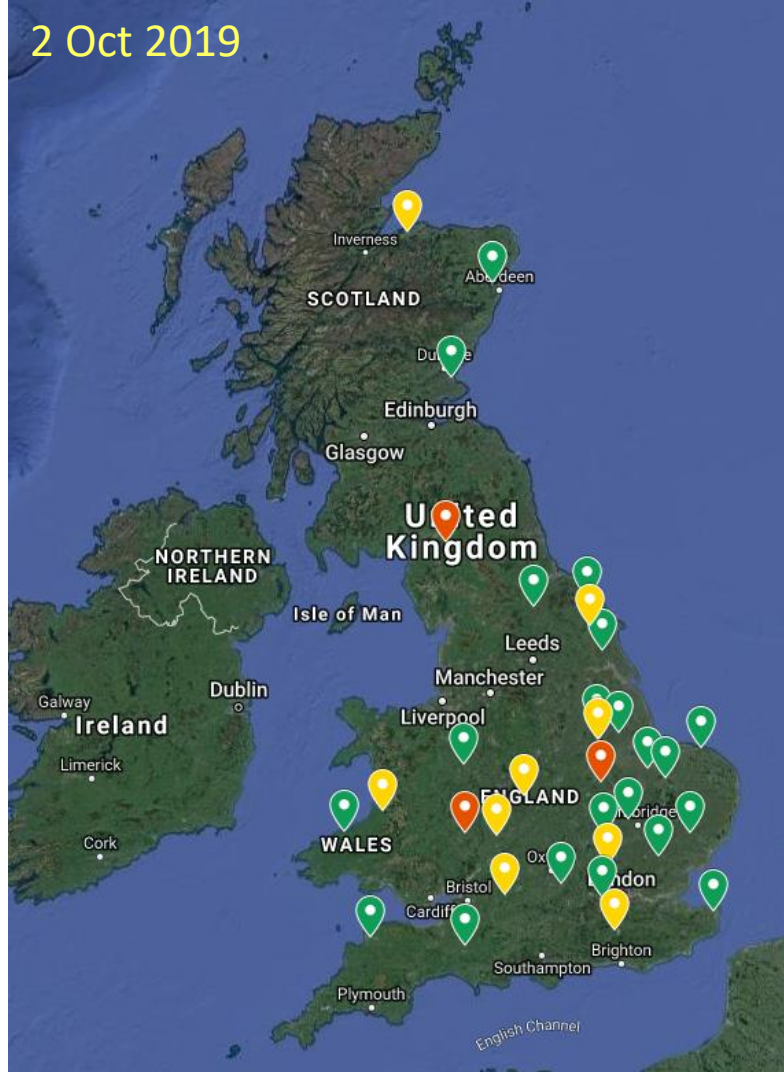
Forecasts the risk (in autumn) of a severe epidemic the following spring

- Based on the amount of disease the previous season plus mean summer temperature and mean autumn rainfall (historic rainfall data used initially but is updated in the spring with the real winter rain data)
- The regional forecast predicts the proportion of OSR crops (with a disease resistance rating of 5) that will have more than 25% (application threshold) disease incidence in the spring
- A customised forecast also on the AHDB website takes account of variety, sowing date and autumn fungicide applications



2019/20 Phoma leaf spot forecast

<https://ahdb.org.uk/phoma>



← 10% incidence predicted



Tag

10% incidence predicted

Site

Rothamsted, Herts

Prediction date 2018/19+B1:B32

10/7/2018

Prediction date 2019/20

10/6/2019

Prediction date 2019/20 on 7Oct

10/6/2019

Proposed solution

10/6/2019

current date

10/18/2019

Diff

-12

Lat

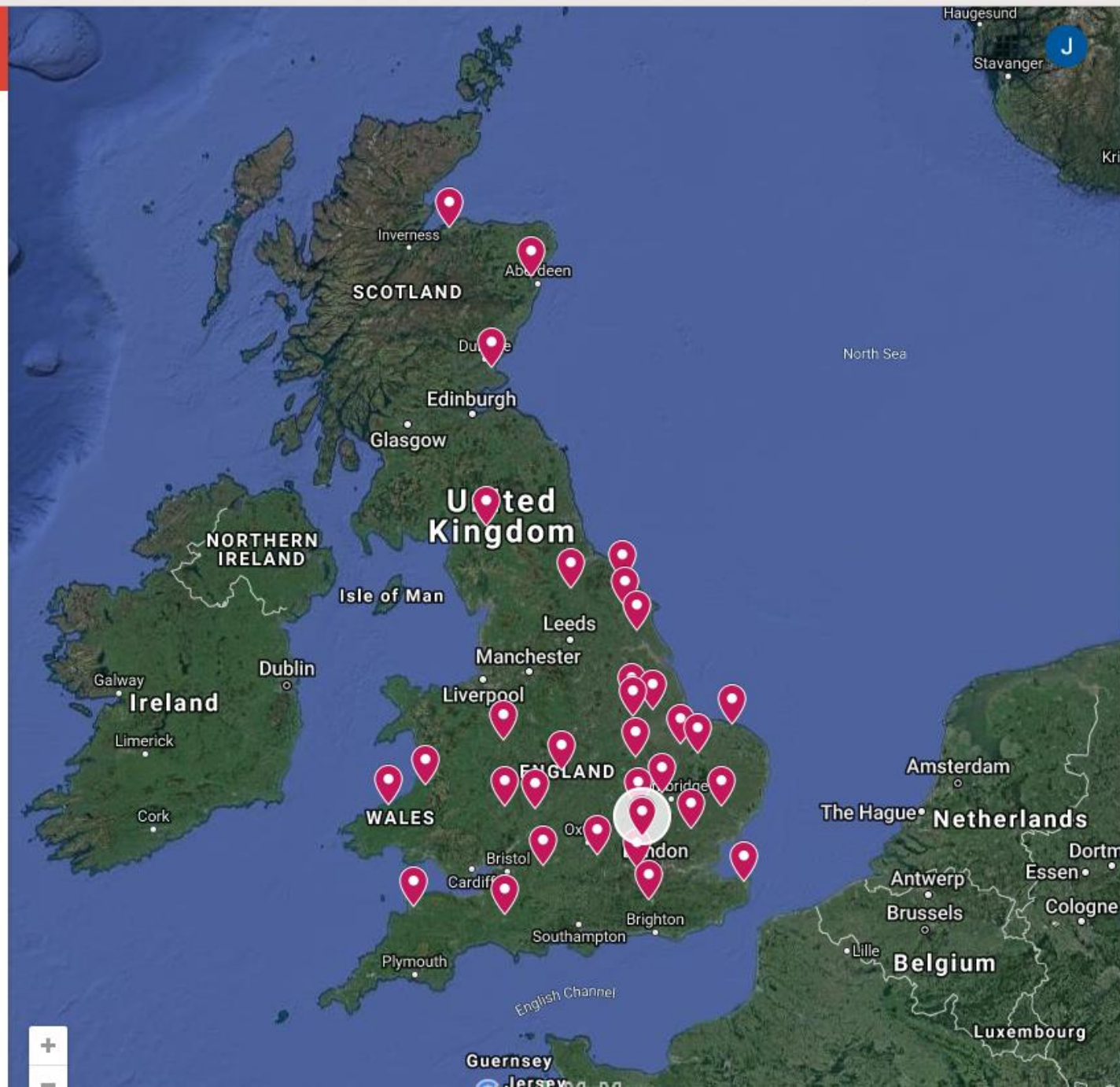
51.808139

Long

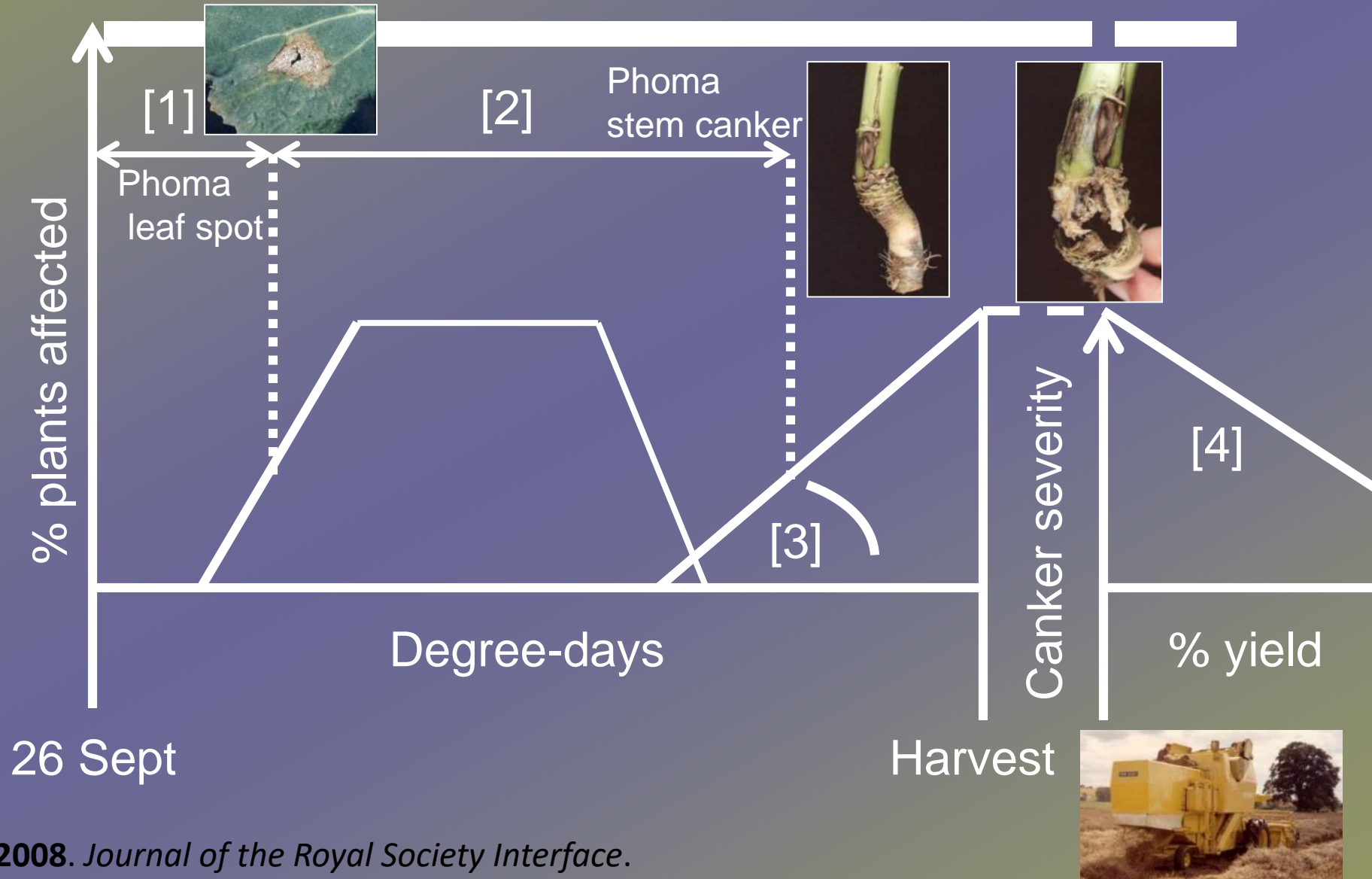
-0.361363

difference between this and last year

-1



Extended Stem canker forecast 4 phase model



<https://ahdb.org.uk/lightleafspot>

Home > Knowledge Library > Light leaf spot

Light leaf spot

Pathogen

Pyrenopeziza brassicae

Hosts

Light leaf spot (LLS) is an important disease of winter oilseed rape in Germany, France, Poland and the UK. In Scotland and parts of Northern England, LLS (*Pyrenopeziza brassicae*, anamorph, *Cylindrosporium concentricum*) also affects [vegetable brassica crops](#). This web page focuses on the disease in oilseed rape.

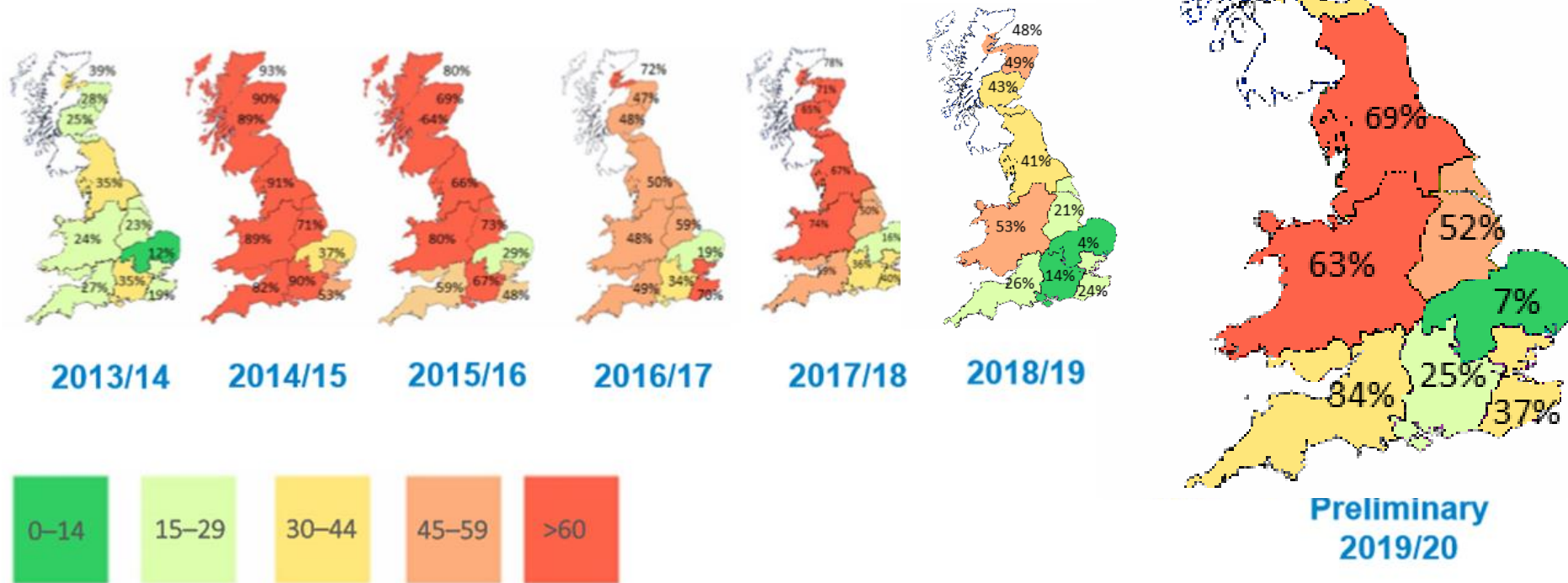
Symptoms



Light Leaf Spot Regional Forecast (Oct 2019)

Welham S. et al (2004) Plant Pathology, 53, 713–724

- Final forecasts (2013–19)
- Preliminary forecast (2019/20)



- Issued in autumn, the preliminary forecast shows the proportion of the oilseed rape crop (disease resistance rating of 5) estimated to have more than 25% of plants affected by LLS in the spring.
- The preliminary forecast uses previous season pod incidence data and deviation from the 30-year mean summer (July/August) temperature data.
- In spring, the forecast is updated to account for the deviation in winter rainfall from the 30-year mean.

lesions, surrounded by black speckling, can appear. Under humid conditions, white spore masses can also form. Under conducive conditions, the disease can spread to and distort pods. These may turn brown and shatter prematurely.

Life cycle

The fungus enters its sexual stage on crop debris. Small structures (less than 1mm in size), called apothecia, develop and release airborne spores (ascospores). These can be blown for several miles and infect young oilseed rape crops in the autumn. On living plant tissue, asexual spores (conidiospores) are produced. On leaves, very small white spots (spore masses) can be seen. Spores are spread by rain and, thus, can only move relatively small distances. Consequently, the disease tends to develop in patches. As leaves senesce during stem extension, the resulting crop debris allows the pathogen to enter the sexual stage again. This can produce a further flush of wind-dispersed spores. Pathogens that produce more than one infection cycle per crop cycle, such as LLS, are called polycyclic diseases.

Importance

Historically, LLS was most serious in Scotland and the north of England. However, the importance has increased in recent years throughout England. LLS incidence has been very high across the UK over the last decade (2008–18).

Risk factors

- Crop residues are a source of inoculum
- The amount of stem and pod infection in the summer and summer temperatures are important factors in the risk to following crops
- There is some evidence for transfer of LLS from the surface of contaminated seed. Therefore, the use of home-saved seed from heavily infected crops is not advised
- Varieties with lower disease resistance ratings are more susceptible (especially those with a resistance rating under 6)

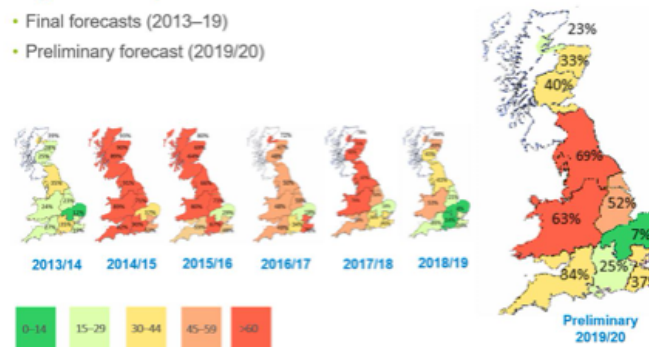


Latest light leaf spot forecast

LLS forecast maps, including the preliminary forecast for 2019/20

Light leaf spot forecast data

- Final forecasts (2013–19)
- Preliminary forecast (2019/20)



- Issued in autumn, the preliminary forecast shows the proportion of the oilseed rape crop (disease resistance rating of 5) estimated to have more than 25% of plants affected by LLS in the spring.
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How risk compares to recent years. [Download as a PDF.](#)

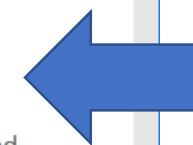
Customised LLS forecast

To take account of variety, sowing date and autumn fungicide applications, produce a customised forecast to provide a better indication of risk.

[Access the customised forecast service](#)

You can register to be [notified by e-mail](#) when an updated forecast is released. You can also get updates via Twitter (@LeafSpot)

[More questions than answers for](#)



Link for customised crop-specific forecast

Customised Light Leaf Spot Forecast (Oct 2019)

First Step

Click name to select area:

- » [Rest of Scotland](#)
- » [Moray Firth](#)
- » [Grampian](#)
- » [Lothian/Fife/Angus](#)
- » [Borders and North of England](#)
- » [East of England](#)
- » [Wales and the West of England](#)
- » [East Anglia](#)
- » [South East of England](#)
- » [South of England](#)
- » [South West of England](#)

or click map to select area:

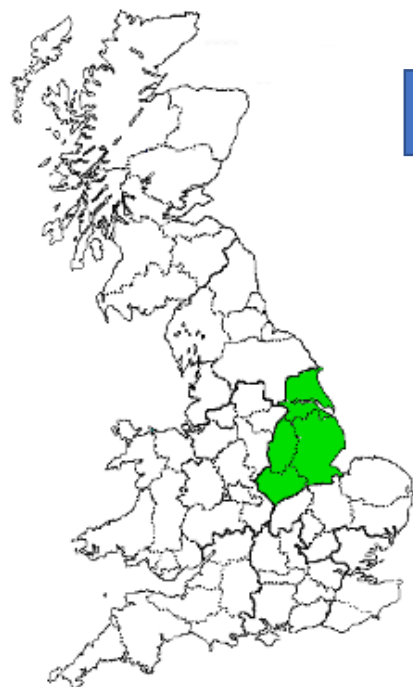


[Disclaimer](#)

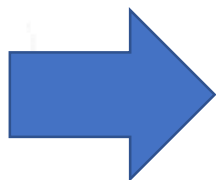
Step 2: Select Variety

Forecast for East of England

Choose a variety



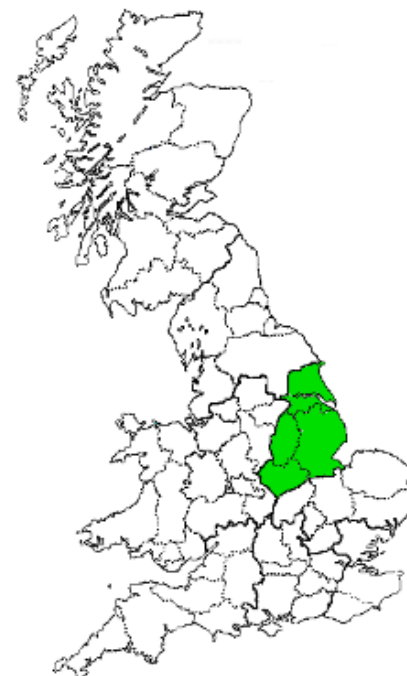
Cultivar resistance rating, 0 - low, 9 - high



Choose a variety

Alizze (7)
Annalise (6)*
Anastasia (7)
Aquila (6)
Architect (6)
Aspire (7)
Arrow (7)*
Ballad (6)
Barbados (8)
Broadway (7)
Butterfly (7)
Campus (6)
Crome (6)
Django (6)*
DK-Expansion (6)
DK-Expedient (5)*
DK-Exsteel (7)
DK-Imagis CL (6)*
DK-Pliny (5)*
DK-Secret (7)*
DK-Serafin (7)*
Elevation (6)
Elgar (7)
Ergo (5)*
Flamingo (7)
George (6)
Halexia (6)*
Kielder (7)
Mentor (6)

Forecast for East of England



Cultivar resistance rating, 0 - low, 9 - high

Step 3: Select Date Sown

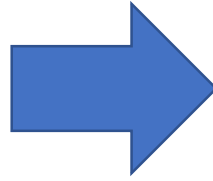
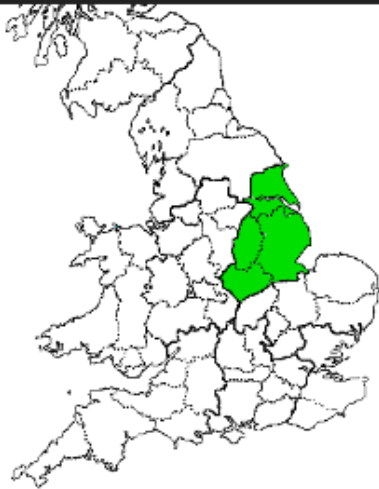
Forecast for Ballad:6

Forecast for E

Forecast for East of England

Sowing date:

Before 14th August
14th August - 20th August
21th August - 27th August
28th August - 3rd September
4th September - 10th September
11th September - 17th September
After 17th September

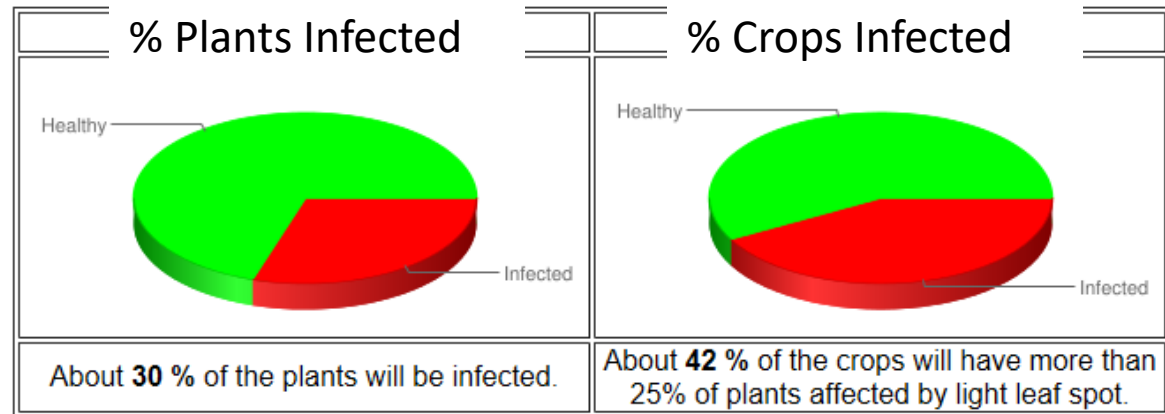


Step 4 - Light Leaf Spot Forecast in Winter Oilseed Rape

Customized forecast for a farm in East of England

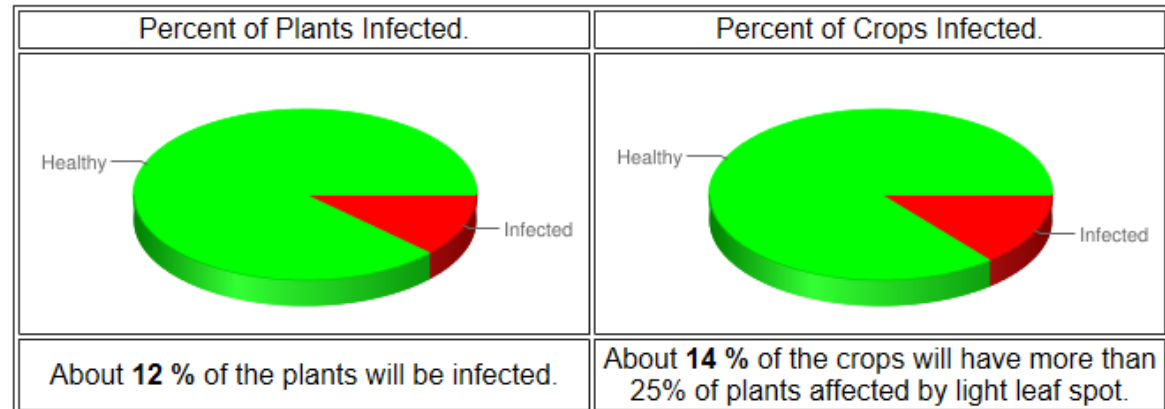
Cultivar	Ballad
Resistance Rating	6
Week Sown	28th August - 3rd September

If no Autumn fungicide spray applied



No
autumn
fungicide

If Autumn fungicide spray was applied



With
autumn
fungicide

Summary

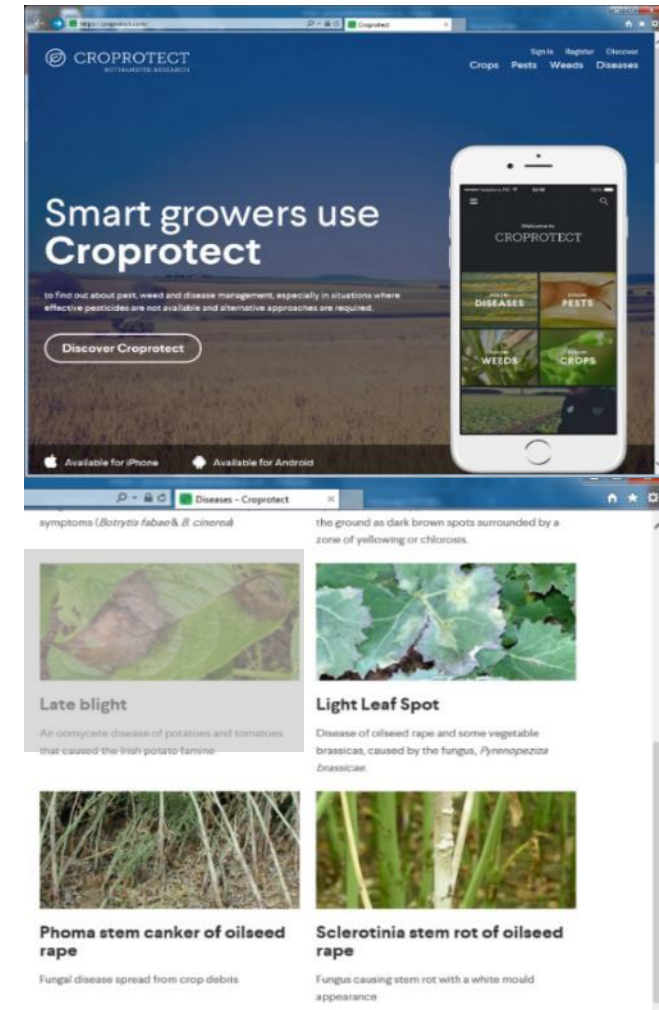
Growers/advisors are advised to monitor crops around the prediction date to check for themselves

Forecasts encourage applications only when necessary

LLS forecast highlights advantages of host resistance and fungicides

As part of IPM, this improves disease control, reduces the carbon footprint of crop production, increases durability of varietal resistance and fungicide life-span

- Croprotect App



Thanks To

Neal Evans (The Voluntary Initiative)

Judith Turner (Fera)

Gail Canning (Rothamsted)

AHDB

Bruce Fitt, Sue Welham & Andreas Baeirl