Forecasting Foliar Diseases in Oilseed Rape

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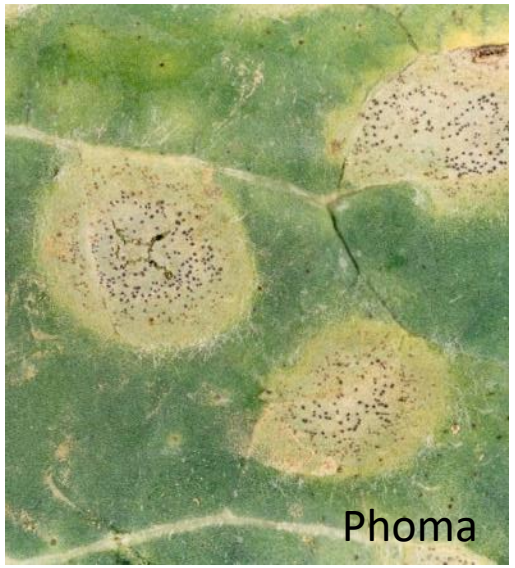
ROTHAMSTED RESEARCH

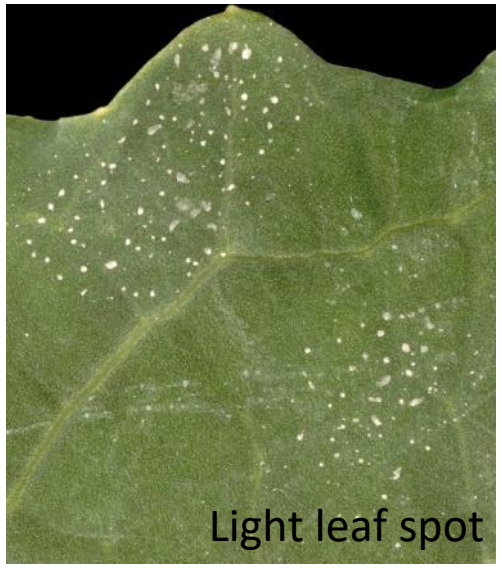
Phoma leaf spot (Leptosphaeria maculans)

- 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)

Biotrophic growth to stem

Stem cankers form

Yield loss if cankers are severe

Exacerbated by heat and drought stress

Winter | Spring

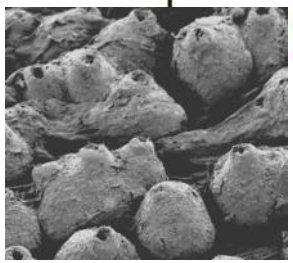
Autumn | Summer

Control Period

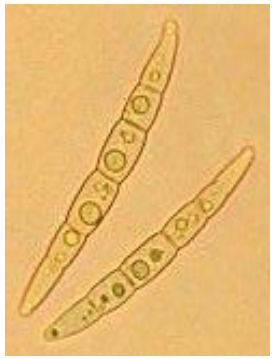
Ascospores infect leaves to form lesions

Saprophytic survival

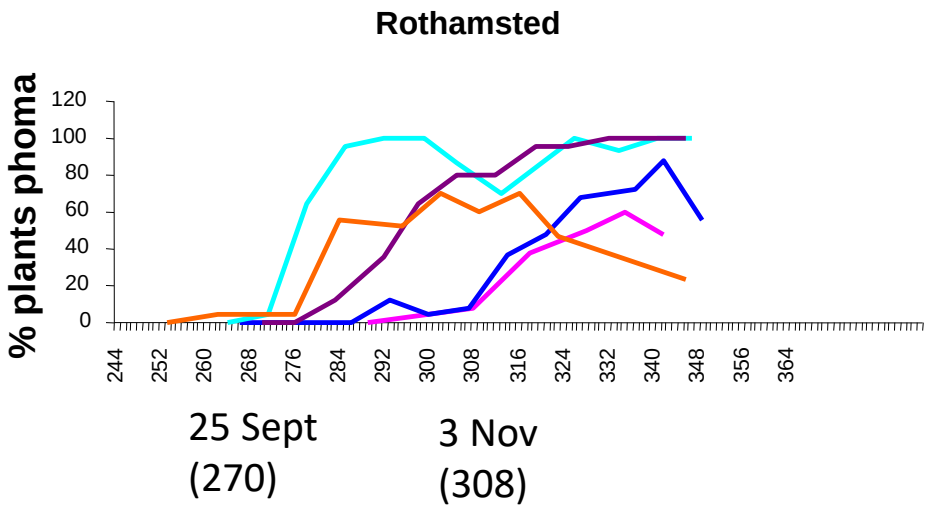
Ascospores Mature

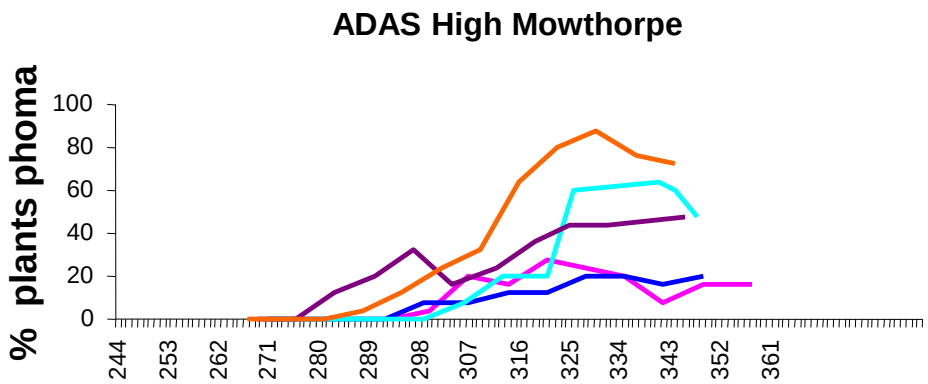


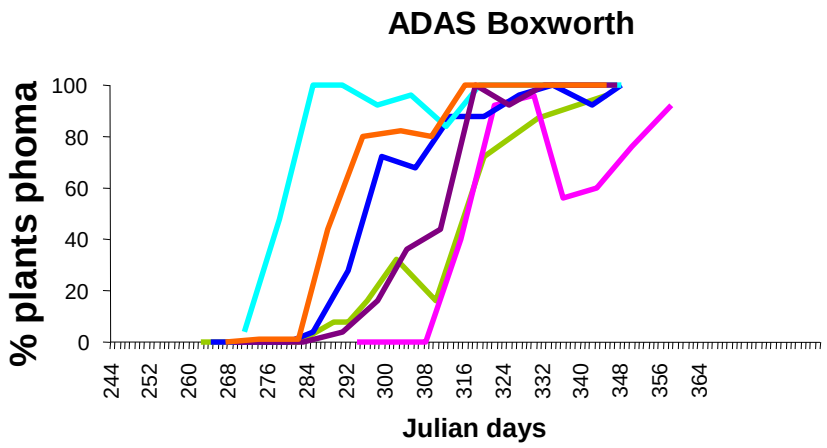
Ascospores released over many months

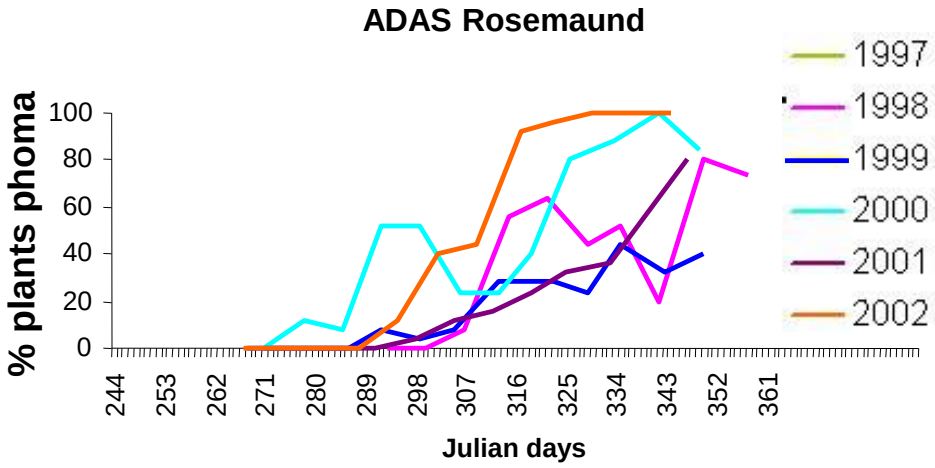


Annual variation in epidemic onset

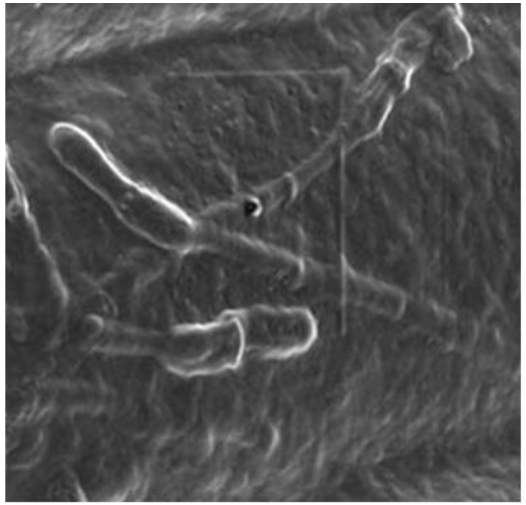








Light Leaf Spot



Pathogen hyphae grow in sub-cuticular space

Asexual sporulation produces conidia

Ascospores germinate and directly penetrate cuticle

Symptomless phase

Asexual reproduction

Autumn

Winter

Spring

Summer

Air-borne ascospores initiate epidemic

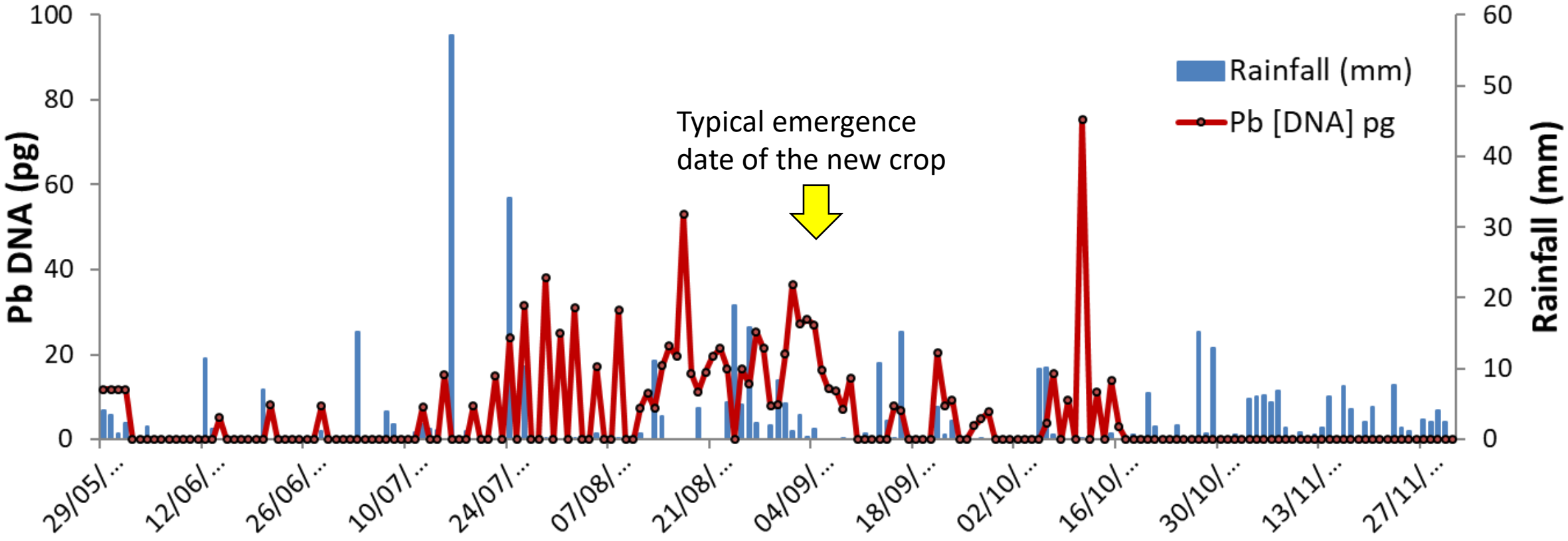
Sexual reproduction

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.

Evans et al 2018 AHDB Report No. PR587

• 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

• The original model also indicates effect of variety, sowing date and autumn fungicide applications

Website: https://cereals.ahdb.org.uk/crop-management/disease-management/oilseed-rape-disease-management.aspx

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Oilseed rape disease management

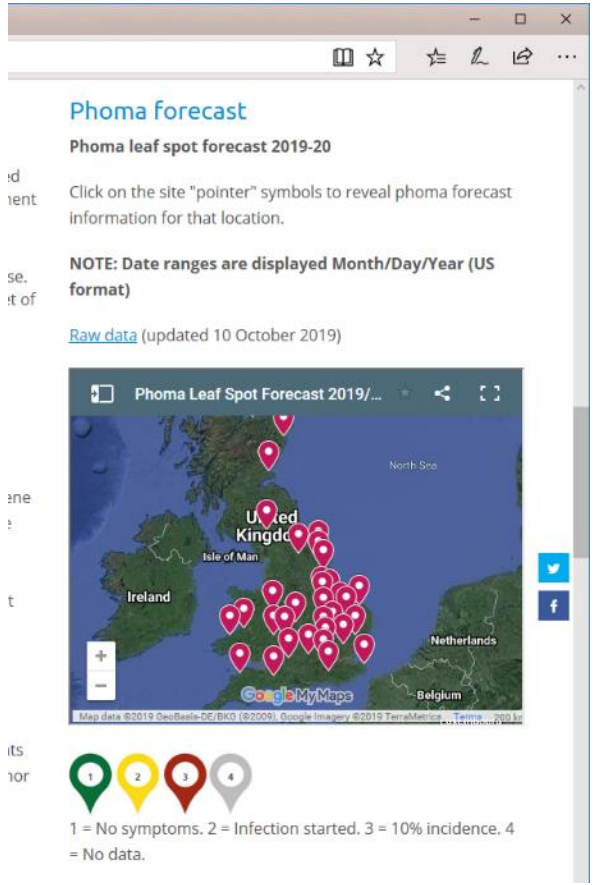
Key tools and publications

- Phoma and light leaf spot forecasts
- Oilseed rape guide
- Fungicide performance
- Recommended Lists

Sclerotinia infection risk forecasts

Regular reports on sclerotinia risk, alongside commentary c disease risk factors – such as stick and spore release inform are published during the mai period.

Wheat disease manager

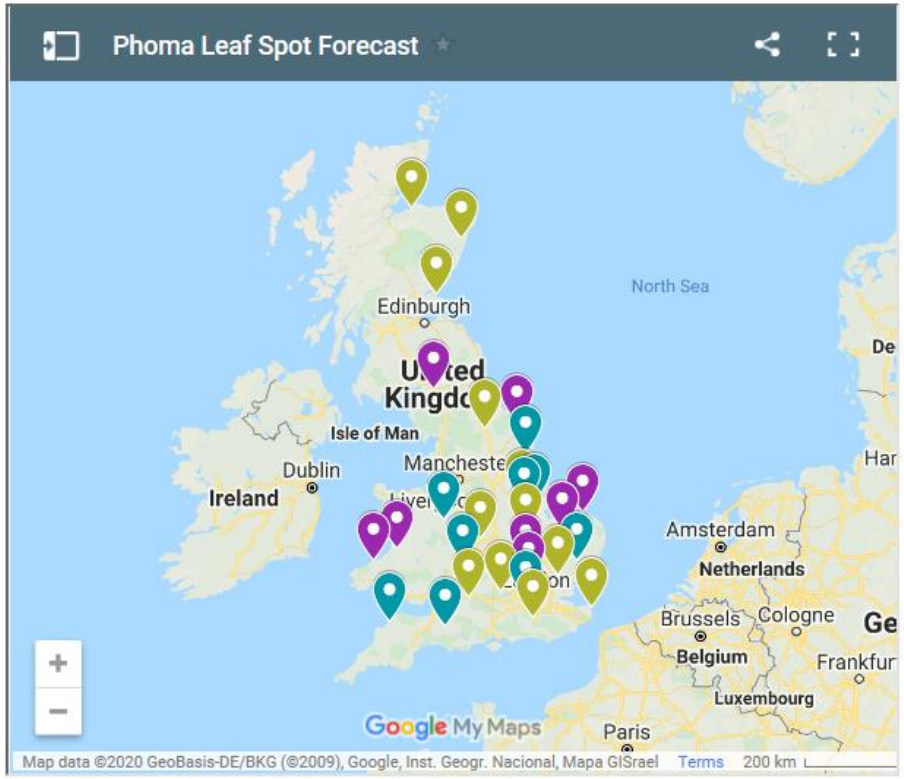


Scroll down to the Phoma forecast

https://ahdb.org.uk/phoma-leaf-spot-forecast

1st Oct 2020

Phoma forecast (autumn 2020)



Map pin colour	Phoma infection forecast status
	No symptoms
	Infection started
	10% incidence
	No data

Raw data (2020)

Location	2020 forecast	2019 forecast	Difference 2020-2019	Latitude	Longitude
KINLOSS	10/11/2020	08/10/2020	33	57.6494	-3.5606
DYCE	19/10/2020	22/10/2020	-2	57.2036	-2.1886
LEUCHARS	15/10/2020	14/10/2020	2	56.377	-2.862
CARLISLE	16/09/2020	11/09/2020	5	54.89549	-2.93531
FYLINGDALES	29/09/2020	19/10/2020	-20	54.362	-0.673
LEEMING	12/10/2020	20/10/2020	-8	54.296	-1.53
LECONFIELD	02/10/2020	13/10/2020	-11	53.87718	-0.44691
WADDINGTON	19/10/2020	10/10/2020	9	53.16625	-0.52427
CONINGSBY	02/10/2020	09/10/2020	-6	53.094	-0.171
CRANWELL	07/10/2020	05/10/2020	2	53.031	-0.502
WEYBOURNE	26/09/2020	23/10/2020	-27	52.94454	1.133602
SHAWBURY	04/10/2020	13/10/2020	-8	52.794	-2.663
MARHAM	28/09/2020	14/10/2020	-15	52.651	0.569
WITTERING	14/10/2020	01/10/2020	14	52.6111	-0.459
COLESHILL	13/10/2020	05/10/2020	9	52.48	-1.689
TRAWSGOED	27/09/2020	09/10/2020	-12	52.33518	-3.95938
ABERPORTH	28/09/2020	29/10/2020	-31	52.139	-4.571
WATTISHAM	08/10/2020	14/10/2020	-6	52.123	0.961
BEDFORD	28/09/2020	15/10/2020	-16	52.10673	-0.42279
PERSHORE	07/10/2020	06/10/2020	1	52.09363	-2.13995
ANDREWSFIELD	10/10/2020	14/10/2020	-4	51.896	0.453
ROTHAMSTED	13/09/2020	06/10/2020	-23	51.80814	-0.36136
BENSON	13/10/2020	15/10/2020	-2	51.62	-1.097
LYNEHAM	11/10/2020	08/10/2020	4	51.5031	-1.9924
HEATHROW	08/10/2020	10/10/2020	-1	51.479	-0.449
MANSTON	18/10/2020	21/10/2020	-2	51.3422	1.3461
CHARLWOOD	23/10/2020	09/10/2020	14	51.15	-0.2333
CHIVENOR	05/10/2020	11/11/2020	-37	51.089	-4.149
YEOVILTON	07/10/2020	23/10/2020	-16	51.006	-2.64

Ten top tips for phoma management

1.Select varieties with strong resistance to diseases, including phoma (see the AHDB Recommended Lists).
2.During autumn, monitor oilseed rape for phoma leaf spots (prioritise susceptible varieties and backward crops).
3.Look on the underside of leaves; if white tufts (mycelium and spores) are present, the symptom is downy mildew, not phoma.
4.Note that crops usually start to breach treatment thresholds in October.
5.A fungicide applied as close as possible to a threshold helps maximise its effect.
6.AHDB fungicide performance data includes information on product efficacy against phoma.
7.Treat varieties with lower resistance ratings for stem canker (7 and below) and backward crops first, when 10–20% of plants have phoma leaf spot.
8.Only treat varieties with high resistance ratings for stem canker (8 to 9) if more than 20% of plants have phoma leaf spot.
9.When reinfection occurs, consider a second spray – typically, four to ten weeks after the first spray.
10.Adjust spray programmes to account for any late-autumn fungicide (November) required for light leaf spot control.

How to manage phoma leaf spot and stem canker in oilseed rape

Phoma Leaf Spot Forecast

Weather-based prediction of date of 10% OSR plants affected with phoma leaf spot
69 views

All changes saved in Drive

Add layer Share Preview

Phomaforecast2020summary for ...

Styled by Tag

- No symptoms (12)
- 10% incidence predicted (10)
- Infections taking place (7)

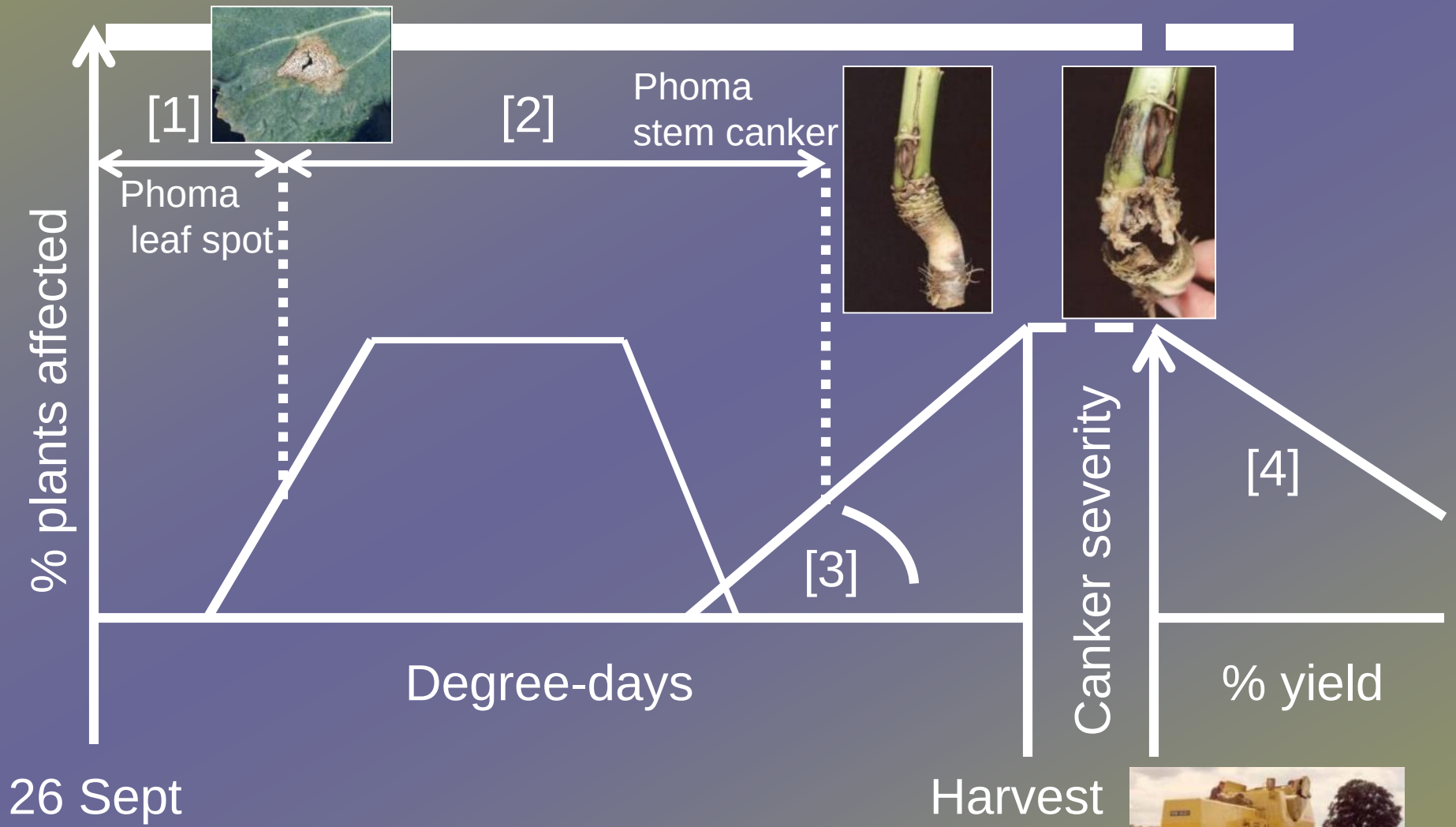
2 Oct 2020 Update

8 Oct 2020 Update

22 Oct 2020 Update

Extended Stem canker forecast

4 phase model



Evans et al. 2008. *Journal of the Royal Society Interface*.

https://ahdb.org.uk/lightleafspot

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Light leaf spot

Pathogen

Pyrenopeziza brassicae

Hosts

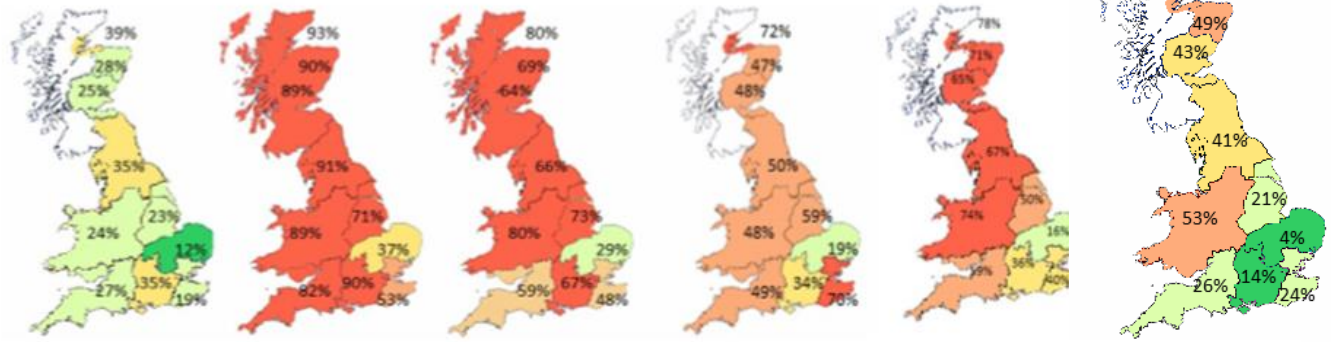
Light leaf spot (LLS) is an important disease of winter oilseed rape in Germany, France, Poland and the UK. In Scotland and parts of Northern England, LLS (*Pyrenopeziza brassicae*, anamorph, *Cylindrosporium concentricum*) also affects vegetable brassica crops. This web page focuses on the disease in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

Symptoms

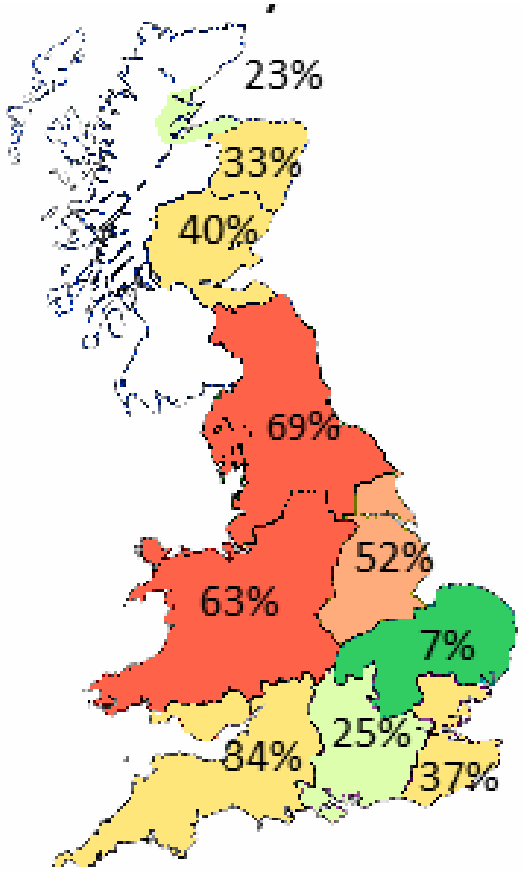
Light Leaf Spot Regional Forecast (Oct 2019)

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

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



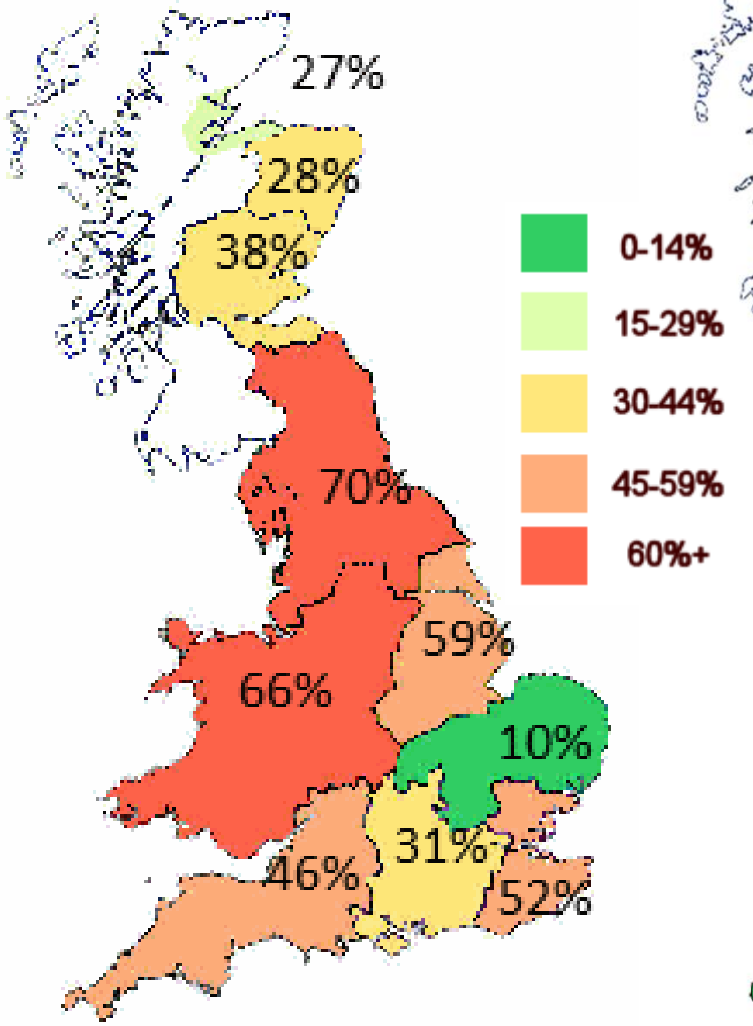
2013/14 2014/15 2015/16 2016/17 2017/18 2018/19



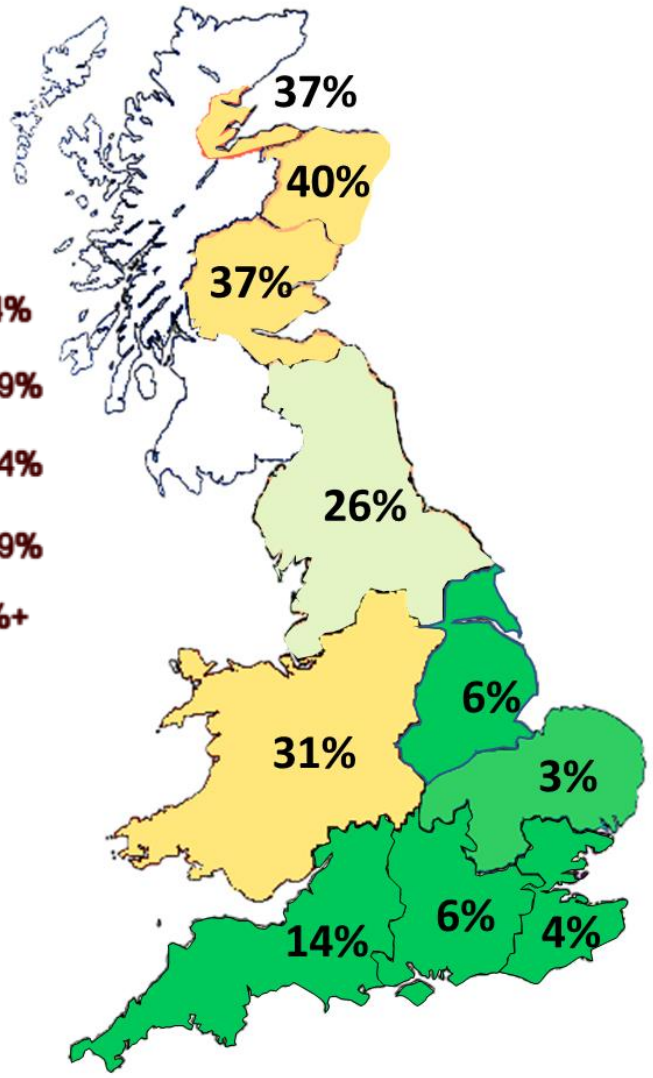
Preliminary 2019/20

- 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.

Final 2020



Preliminary 2021



Forecast scenario	1	2	3	4	5
Location	Resistance rating of 5 Sowing date during week commencing 1 September No autumn fungicide	Scenario 1 with autumn fungicide	Scenario 1 with early-sown crop (mid-August)	Scenario 1 with later-sown crop (mid-September)	Scenario 1 with relatively disease resistant crop sown (rating of 8)
Grampian	37%	13%	42%	31%	15%
Aberdeenshire	40%	15%	45%	34%	16%
Fife	37%	13%	42%	31%	15%
North of England	26%	7%	31%	21%	8%
West of England and Wales	31%	10%	36%	25%	11%
East Anglia	6%	1%	10%	2%	3%
East	3%	1%	4%	1%	1%
South	6%	1%	10%	2%	3%
South East	4%	1%	5%	1%	2%
South West	14%	4%	18%	11%	4%

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Summary

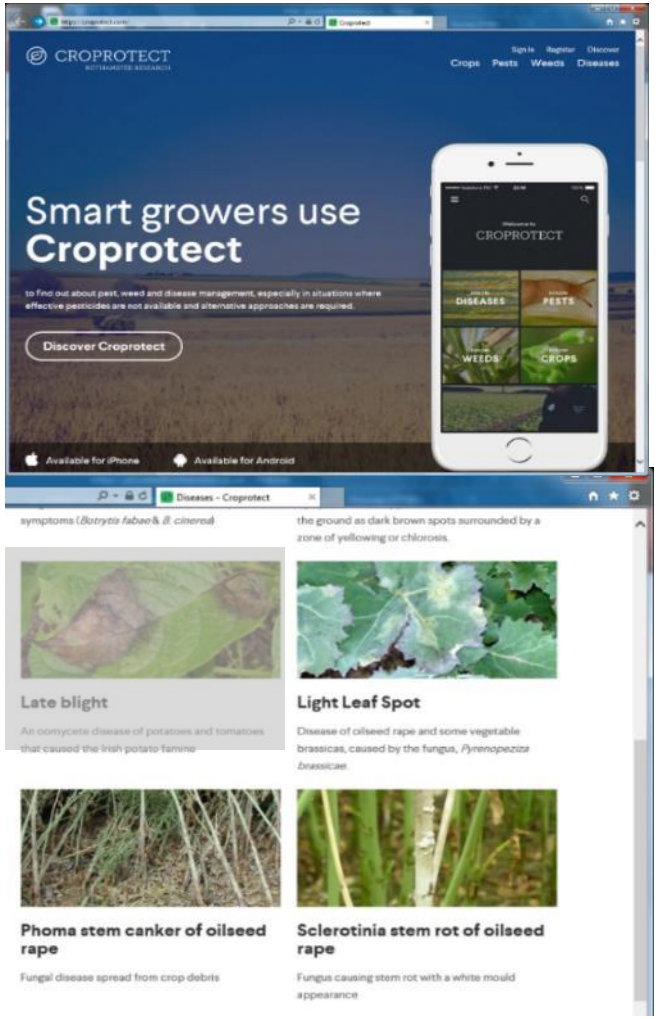
Growers/advisors are advised to monitor crops around the prediction date to check for themselves

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