

Disease management and forecasting in Fruit, Salad and Veg

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Subjects to be covered

- 1) Who are we?
- 2) Reducing approvals for fungicides combined with changing and untypical weather patterns
- 3) Spring Onions – Downy Mildew
- 4) Lettuce Downy Mildew
- 5) Spinach Downy Mildew
- 6) Chard Cercospora
- 7) Worldwide research
- 8) Enhanced resistance / Improved crop health
- 9) Spore (and pest) trapping Brassicas
- 10) Sugar Beet Cercospora
- 11) PODS (Precision Orchard Dosing System)
- 12) POME (Precision Orchard Management and Environment)
- 13) Spore Sense

Who are we?

Hutchinsons is one of the leading providers of agronomic advice, products and services in the UK

- › A **family** business, founded in 1938
- › Provide advice and products to over **one million hectares** of the UK's farmed area
- › Over **500** staff nationwide
- › A **forward-thinking**, can-do attitude
- › Specialist focus in **Fresh Produce**
- › More than **50 specialists** involved in **fruit and veg**



Reducing approvals for fungicides combined with changing and untypical weather patterns

This is leading to agronomists and growers to continually consider:-

- Variety selection
- Disease resistance / tolerance
- Crop density
- Leaf architecture
- Leaf colour
- Leaf wax levels
- Enhanced resistance
- Propylitic applications
- Forecasting / targeted application

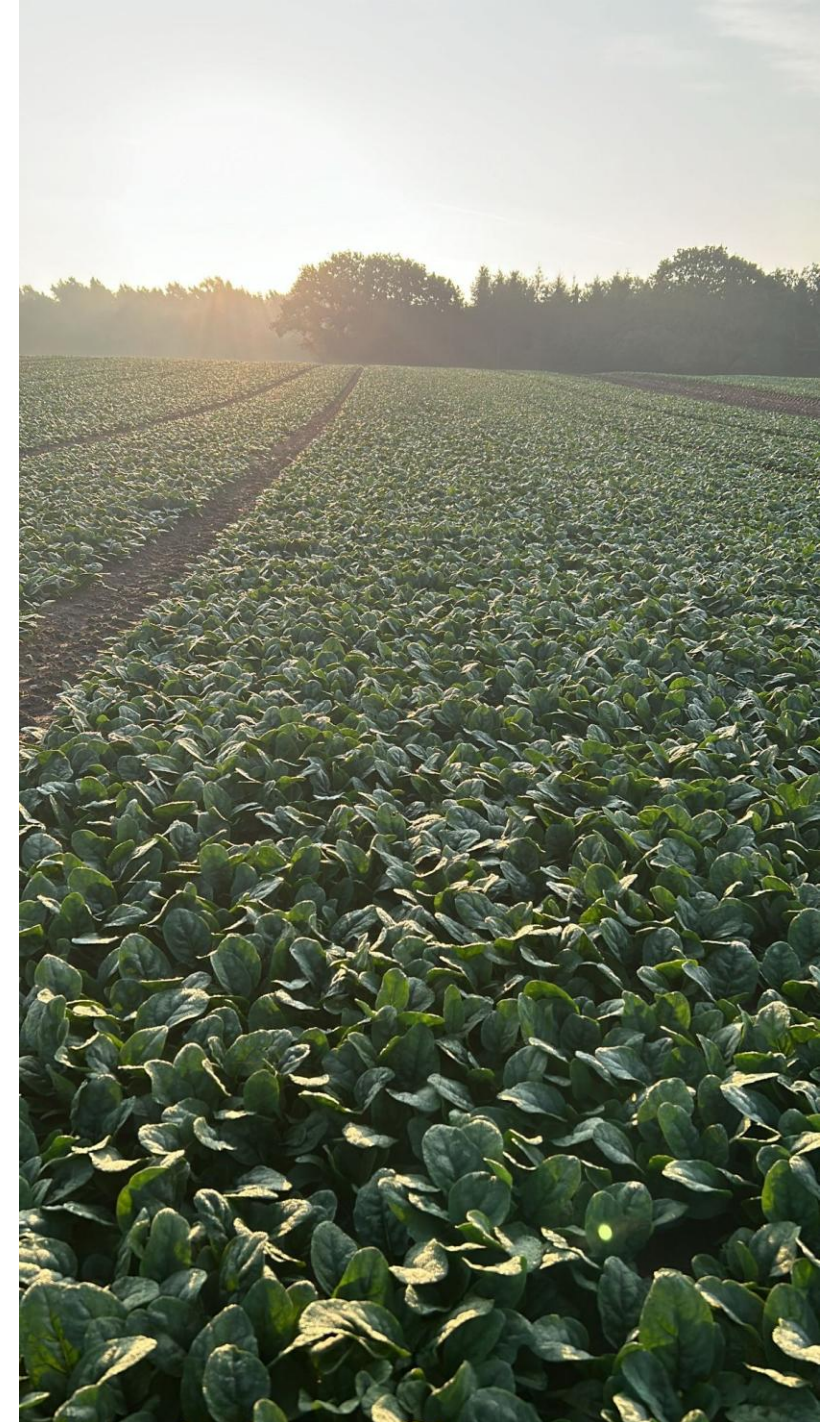
Spring onions – Downy Mildew
variety resistance (not genetic)
density, leaf colour and leaf wax
= spray program reduced by
2/3rds (plus less thrip issues)



Lettuce – Downy Mildew variety resistance (genetic), risk management = range of seed house material grown, increased prophylactic spray program and enhanced resistance



Spinach – Downy Mildew variety resistance (genetic), risk management = range of seed house material grown, leaf architecture, crop density, weekly spray program and enhanced resistance



Chard and bulls blood –
Cercospora protectant spray
program, enhanced resistance
but we still struggle



Research work worldwide

<https://calgreens.org/>



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Spinach downy mildew

Downy mildew (*Peronospora effusa*) is a major constraint to spinach production. The pathogen can produce wind-dispersed spores, and requires cool, wet conditions for infection. Increased canopy density and overhead irrigation create optimal conditions for the pathogen and subsequent spread of the disease. Low levels of disease incidence can lead to unmarketable spinach.

Abstract:

In 2021, spinach downy mildew disease pressure remained relatively low and was similar to the three previous years. A total of 19 races have been described and the disease reactions of the 19 races on the standard set of spinach differentials

Project Title: Race diversity and the biology of the spinach downy mildew pathogen

CLGRB Annual Report

April 1, 2021 to March 31, 2022

June 1, 2022

Enhanced resistance / improved crop health

Products considered to reduce disease incidence

- Phosphite's
- Silicas
- Chitins
- Amino Acids
- Glycine Betaine
- Sulphur / Copper

Plus many others continually being proposed and developed

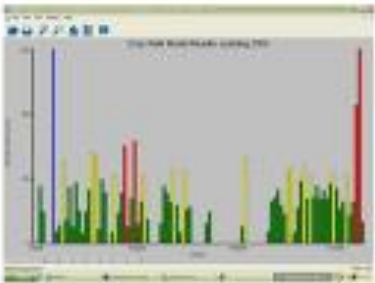
Spore (and pest) trapping brassicas

Brassica Alert & TrapView



Collect weather, pest & spore data

How do we do it? The Basic Process



Disease modelling software
To identify risk days
UK MORPH
NL DACOM
B DACOM??

Once all the information
is in, we get the
Message out.



Spore testing on affected days

*The format has changed over
the years, and 2023 will see
further changes...*



Brassica Alert & TrapView



BRASSICA ALERT 2022

Managed by Allium & Brassica Agronomy
Sponsored by Syngenta

Issue number 11 wbm 5th September

Monitoring period: week ending 2nd Sept 2022

	Ringspot	White Blister	Thrip
Spalding			
Kirton			
Fishtoft			
Old Leake			

General comments

Pest pressure has decreased since the last monitoring period, with Silver Y moth having the biggest drop. Thrip pressure remains on the Low / moderate threshold. The drier weather has also reduced the risk of leafspots and White blister, although forecasted showers for wbm 2nd Sept will increase leaf wetness and possible risk.

Crops should always be monitored regularly, by the grower or their agronomist. Information supplied by Brassica Alert is provided in good faith. It is neither intended, nor implied to be providing advice to growers on disease and pest management decisions.

Site	Diamond Back Moth	Silver Y Moth
Spalding	1	13
Surfleet	0	14
Wragg Marsh	0	11
Gosberton	2	12
Kirton	0	2
Kirton Holme	0	12
Fishtoft	0	42
Old Leake	0	16
Wrangle	0	6
Friskney	0	23

Key to table

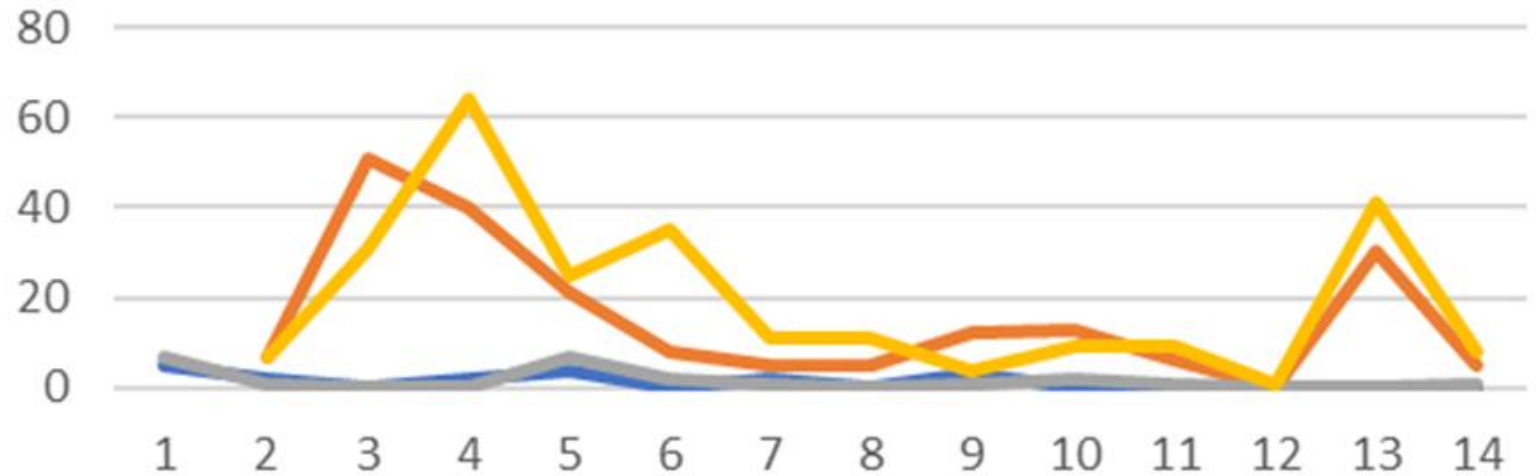
Green = Low risk, Amber = Moderate risk, Red = High risk.

Diamond Back & Silver Y moth: Risk is determined by pheromone trap counts. Low risk <10, Moderate risk 11-20, High risk >21

Thrip: Risk determined by sticky trap captures. Low risk <50, Moderate risk 51-150, High Risk >151.



Spalding 2022 - Moth Captures



- Standard Traps Diamond Back Moth
- Standard Traps Silver Y Moth
- TrapView Diamond Back Moth
- TrapView Silver Y Moth

Boston Pest & Disease Forecast 2024

Issue number: 6

Monitoring Period: 5th to 16th August 2024

Weather data recorded at Kirton.

Ringspot Risk		White Blister Risk	
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	Diamond Back Moth	Silver Y Moth	Kirton Aphid suction trap data (update 18)	Number caught
<i>Old Leake</i>	3	1	Cabbage aphid (<i>Brevicoryne brassicae</i>)	3
<i>Butterwick</i>	2	0	Peach Potato Aphid (<i>Myzus persicae</i>)	0
<i>Frampton</i>	1	0	Black Bean Aphid (<i>Aphis fabae</i>)	1
<i>Algakirk</i>	1	0	Potato Aphid (<i>Macrosiphum euhorbiae</i>)	0

Holbeach St Marks	2	0
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Notes:

During the past two weeks, there has been a slight increase in Diamond Back moth, as well as Large and Small white Caterpillar.

Aphid numbers caught at the Rothamsted Suction trap, located at the Allium & Brassica Centre are slightly decreasing.

Ringspot has been generally low, however there have been some periods where risk has increased slightly.

Key to table

Green = Low risk, Amber = Moderate risk, Red = High risk.

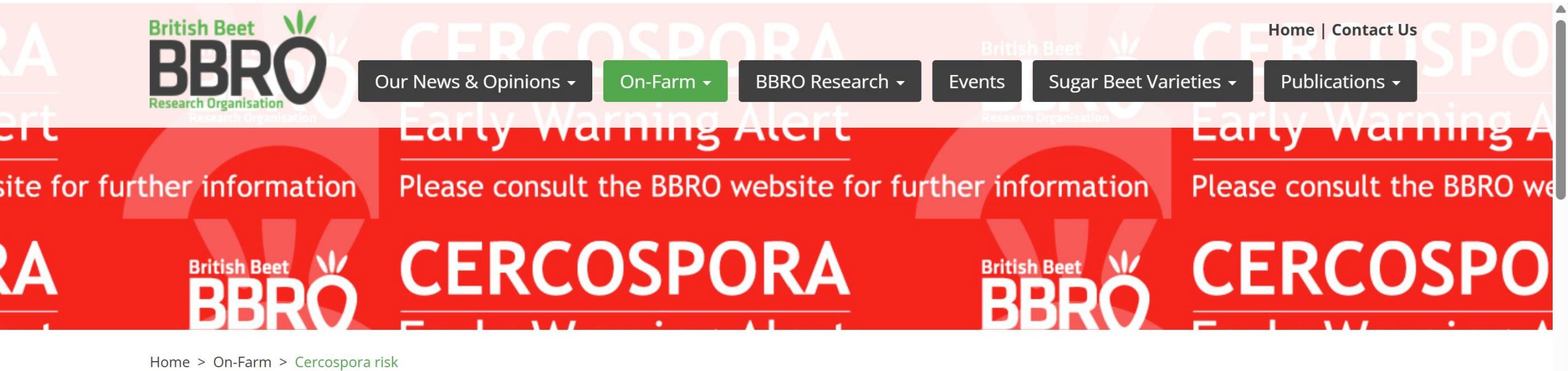
ALL disease forecasts are from climatic data only.

Diamond Back & Silver Y moth: Risk is determined by pheromone trap counts. Low risk <10, Moderate risk 11-20, High risk >21

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Sugar Beet

Cercospora risk forecasting



- The incidence of cercospora leaf spot has been rising in the UK leading to BBRO producing a risk forecasting model.
- As a relatively new disease to the UK the Cercospora Risk Forecast model is based on data collected from America and Europe. It is not yet known if isolates caught in the UK may react differently in our maritime climate.

- BBRO are monitoring levels of risk daily and where clear risk is identified growers will be contacted directly by text. However, they encourage all growers to be vigilant in their own areas as pockets of rain will add to the humidity pressures. They will also collecting weekly data from their spornado network to ascertain the presence of spores in the air. By overlaying the level of risk due to weather, the availability of spores and disease progression in 2024 BBRO hope to develop a robust warning system for use in future years.
- Leaf spores can develop from 5-21 days after infection. This depends on amount of inoculum and of course temperature and how wet the leaves have been. Spots typically appear on lower, older leaves first. Drought senesced or virus-infected leaves may also show symptoms quicker than healthy actively growing leaves.
- The information provided on the web site should be used as a guide and does not replace the need for individual crop monitoring.

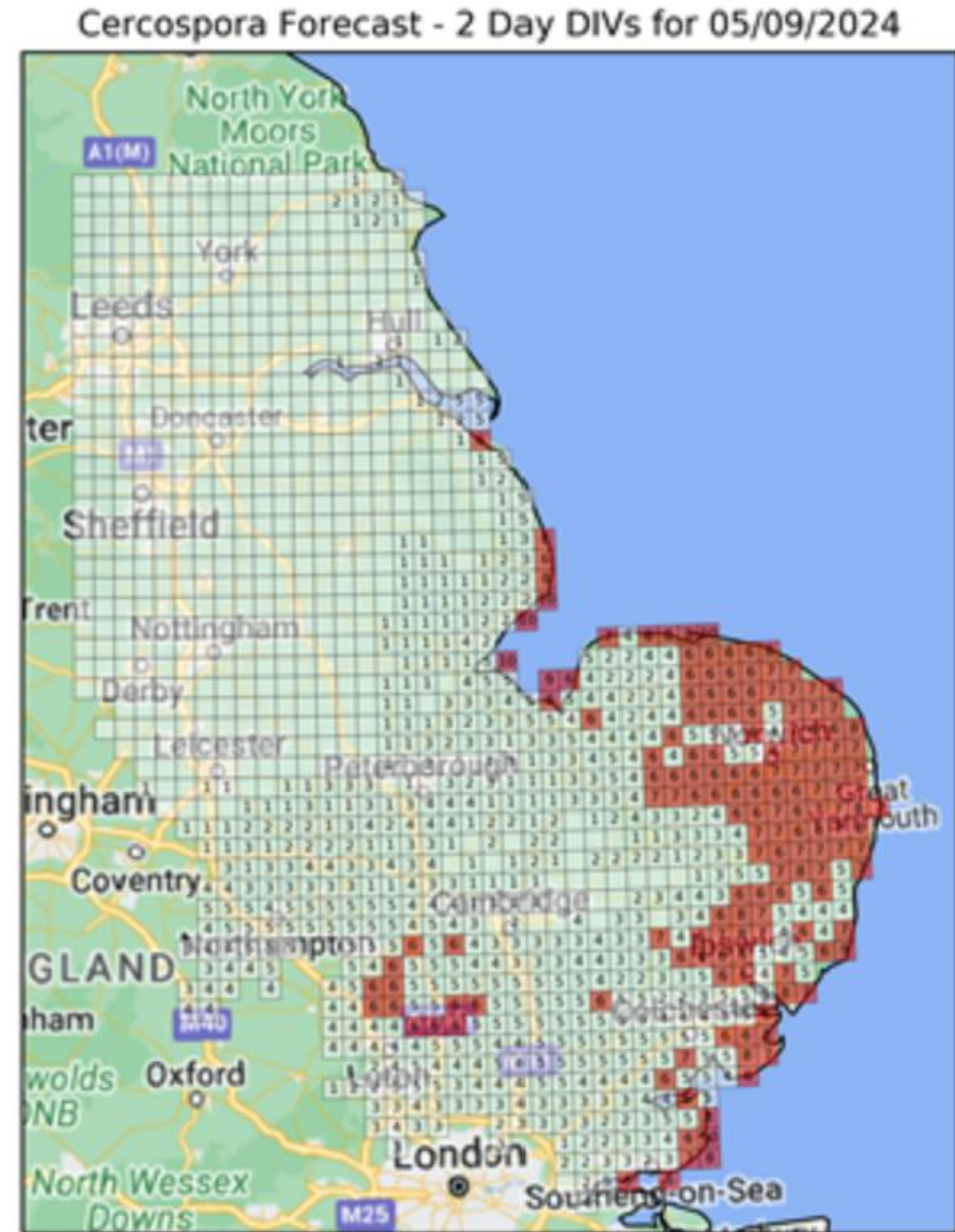


The numbers shown on the map indicates the level of risk to the crop of cercospora developing. When an area is deemed at risk the square will turn red, and should act as a prompt for you to check your crop for signs of cercospora. The map is only an indication of environmental conditions relating to increased disease pressure, it is not an indication of disease presence. Only spray if cercospora is found.

Values below 6 are not of a concern.

If maps have not been updated or missed it means they are blank, with no figures depicting any rising risk. Where a high risk (red square) is noted a direct email/text will be issued to the growers in that area.

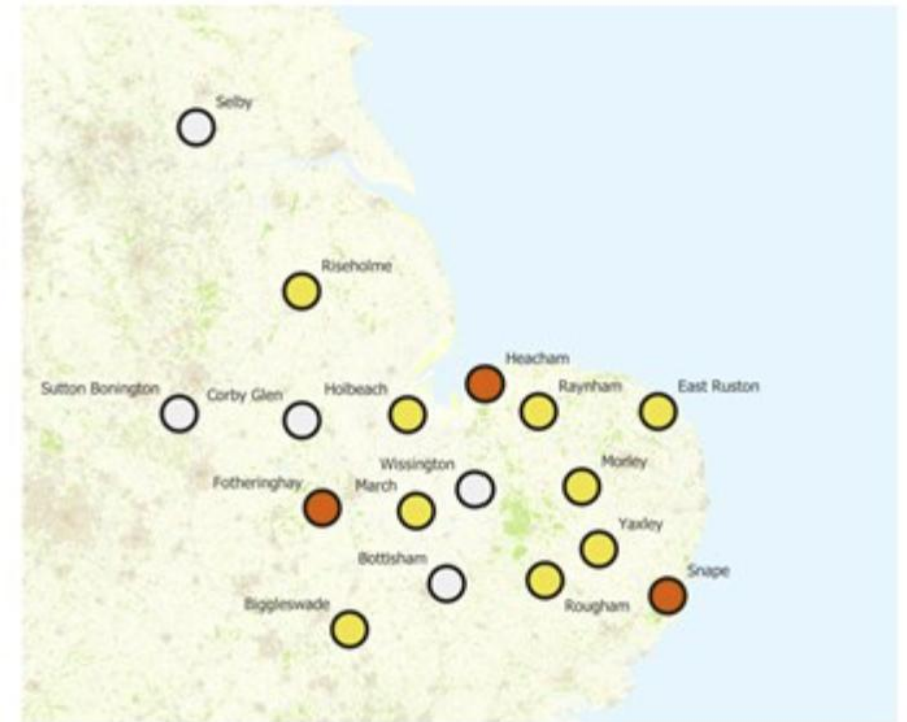
“High risk forecast on the 5th Sept. in areas known to have spore concentrations. Please check crop carefully and if spray and harvest intervals allow consider treatment”.



Example Cercospora Leaf Spot Monitoring report, showing both spores and disease found in crop.

2024 Cercospora Leaf Spot Monitoring

Week 33:
Monday 12/08/2024 to Sunday 18/08/2024



Site Status this week:

- No data available
- No cercospora spores detected via Spornado
- Cercospora spores detected via Spornado
- Cercospora detected in leaf sample (asymptomatic)
- Active cercospora lesions visible on crop
- Dashed circle = Fungicide applied this week

Displayed data are obtained from the BBRO crop monitoring network and are provided for guidance regarding progression of the Cercospora Leaf Spot (CLS) across the UK.

It is still vital that crop walking is regularly undertaken and fungicides only applied to crops once disease symptoms are observed following a recommendation from a BASIS trained advisor.

Note: During the period of twice-weekly spore catches, the marker is turned yellow if either sample tests positive for cercospora via qPCR.

Update issued: 28/08/2024 V24.33.1.XD

Rimpro

Rimpro

- Decision support system for the management of key pests and diseases of apple and grapes

Weather data

Connect your weather station in minutes to the RIMpro platform, we can interface with 20 different types of stations.

Remote field monitoring

Monitor the weather and follow the development of pests and diseases through RIMpro's cloud services.

Real-time information

The models are updated every 30 minutes and use the most recent weather forecast for your location.

Disease models

We offer more than 20 models that have been tested and validated by experts. We constantly update our disease models with new scientific knowledge, practical experiences, and user feedback.

Risk calculations

For each disease and pest, a risk severity indicator is calculated to help you make smart treatment decisions.

RIMPRO Models offered:-

Apples

- Apple scab (*Venturia inaequalis*), Apple powdery mildew (*Podosphaera*), Apple canker (*Neonectria*), Fire blight (*Erwinia*) Sooty Blotch, *Marssonina coronaria*, Pear scab (*Venturia pyrina*), Pear Brown Spot (*Stemphylium vesicarium*), Codling moth (*Cydia pomonella*), Apple sawfly (*Hoplocampa*), Pear Psylla Rosy, Apple Aphid (*Dysaphis plantaginea*), Thinning for apple and pear

Grapes

- Downy mildew (*Plasmopara*), Grape black rot (*Guignardia*), Grape powdery mildew (*Uncinula necator*)

Stone Fruit

- Cherry leaf spot (*Blumeriella jaapi*), Brown Rot (*Monilinia* spp.)

- RIMpro does not just warn you of the current weather situation. The models are “population models”, which means that they follow the pest and disease development in your crop over the production season, in subsequent generations, and during infection cycles



A population model

RIMpro follows the development of pests and diseases during the whole growing season in your orchard/vineyard. Each new risk calculation takes into account what happened at the beginning of the season.



Real time informations

The models are updated every 30 minutes. With each new run the system looks for the most recent data from your weather station and uses the most recent weather forecast for your location.



An account for each type of user

Growers and consultants can create an account. Growers can connect to their weather station and form ‘user groups’ to share model output. Consultants can connect all weather stations in their network and share graphs with their clients.



Use less pesticide

See when there is a risk for each pest/disease and spray only when necessary. Within the Apple scab, Downy mildew, and European canker models, you can enter your spray program and see fungicide depletion depending on weather and plant growth. Renew your treatment only when necessary.

POME

What is POME?



Precision Orchard Management for the Environment

- 4-year, £4.5M project. Commenced 2024
- Funded by Innovate UK, DEFRA, commercial partners

Aim: to use cutting-edge technology to digitally examine fruit trees in fine detail, allowing inputs to be targeted in a way that could transform UK orchards.

Fewer inputs

Increasing orchard production efficiency

Reduce environmental impact

Increased yield and grade-out

Creating sustainable profitability

Why? What can POME deliver?

- Sweet spot for apple size is 6 apples in a bag – 63-68 mm + quality = Class 1
- Fruit outside this tight size range is drastically reduced in value

⇒ **Hitting target spec critical for fruit growers to not lose money**
– but nature is not uniform!

POME aims to deliver the ability to improve that uniformity:

- ✓ Match thinners/setters/growth regulators to individual tree requirements to optimise fruit size range
- ✓ Estimate fruit loading and yield to evaluate thinning efficacy to date and target expensive hand-thinning
- ✓ Detect disease early (before humans) to allow better, more targeted control
- ✓ Apply crop protection products precisely to achieve P&D control using lower doses per hectare
 - Reduce impact on non-target organisms
 - Operate within a narrower risk envelope (helping retain/attain product approvals)
 - Modest saving in crop protection spend possible
- ✓ Estimate yield to underpin more confident marketing of available crop



PODS

Developed from PODS (104610)

Precision Orchard Dosing System

- Many of same partners as POME
- Innovate UK project 2019-2022
- Developed a functioning prototype orchard scanning and precision application system
 - Scan apple orchard at blossom (LIDAR + image)
 - Analyse + create plan for variable application of thinners/fruit setters
 - Precision apply the products in-field



PODS sprayer



- Dose adjustment prescription map created on TASC software from LAI (NIAB) + Blossom density (Outfield) data, with tree positions data (Outfield)
- Using dose adjustment algorithm developed by Hutchinsons, NIAB, and TASC
- Running on NP Seymour's variable rate spray machine
- Nozzle output varying according to prescription map
- Video shows nozzles switching in correct places

Principles of POME

1



2



3

Gather Data

about the health
and growth of
orchard trees
autonomously

Analyse & Interpret

to generate a user-
friendly digital map of
the orchard
highlighting variations

Develop Application System

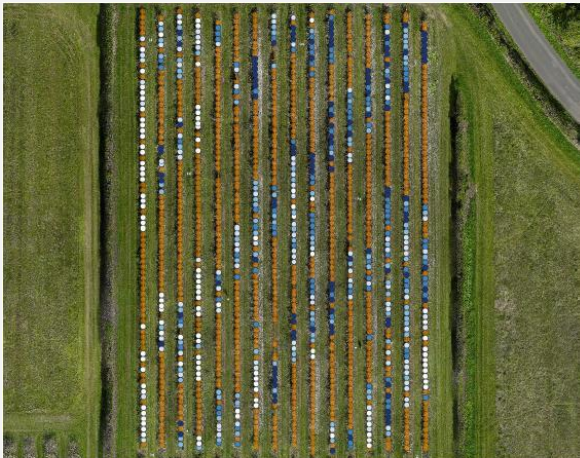
using the digital maps generated
to vary inputs according to the
specific requirements of
individual trees

Autonomous data gathering – 3 ways

Drone mapping

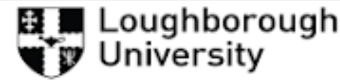


- Individual tree geo-location
- Tree size, blossom density, fruit load



Map showing individual tree fruit counts, displayed onto tree level map of the orchard

Tractor-mounted sensors



- Hyperspectral imagery, NDVI, LIDAR
- Variations in tree health / development

LU – Sensor Tower Configuration



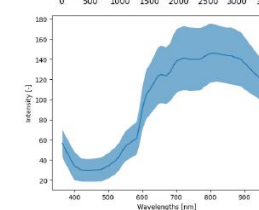
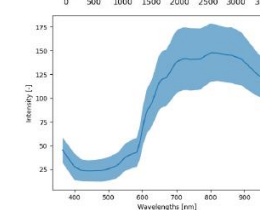
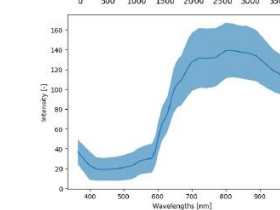
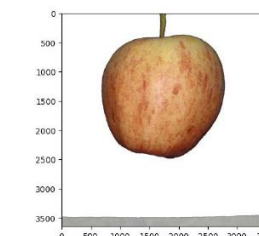
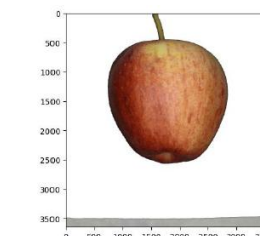
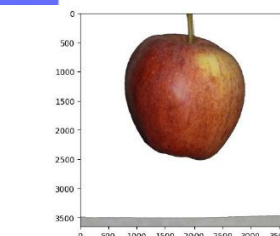
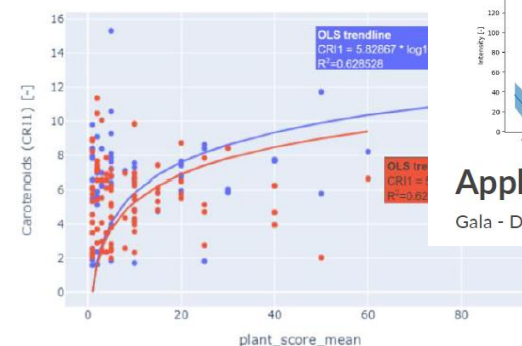
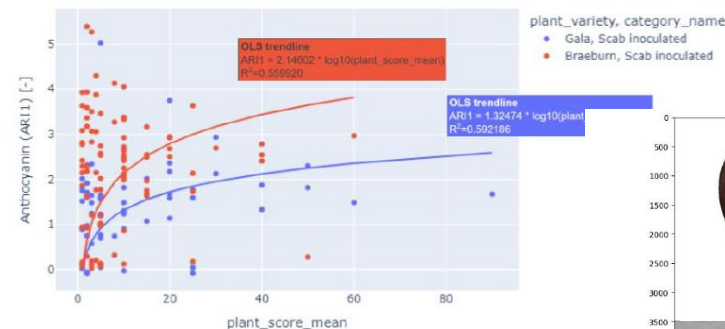
Nocturnal ground robots



- Hyperspectral imagery, NDVI, LIDAR
- Variations in tree health / development
- Night-time under standardised light



Data validation



Apple Maturity

Gala - DELTA

Hyperspectral analysis of apple maturity by variety

NIAB INDIA Installation

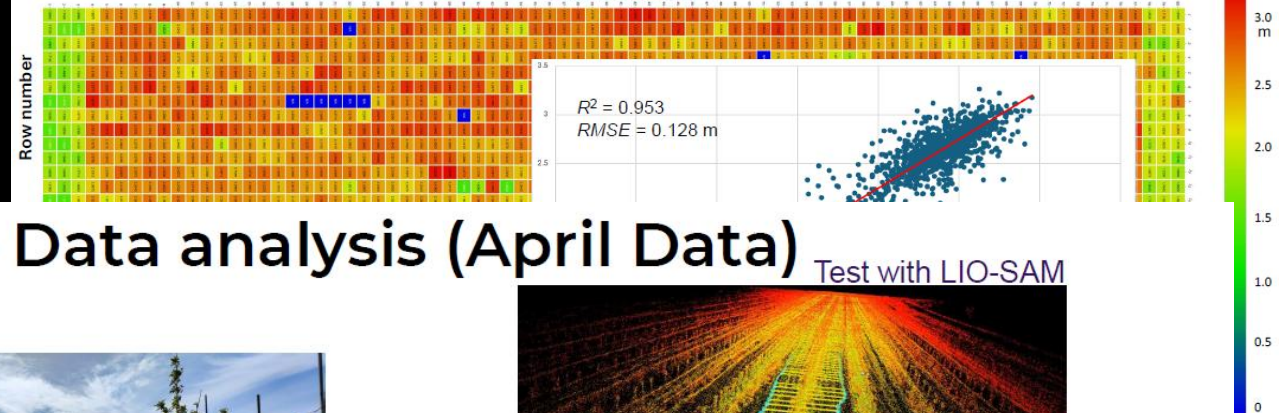
Tracking Disease development over time

Using anthocyanin & carotenoid remote measurement to identify apple scab

Analysis and Interpretation

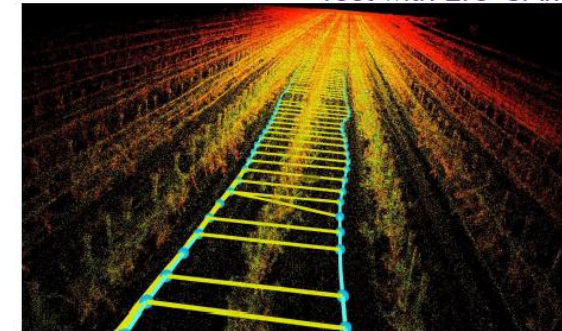
Quantification of canopy height of apple trees

16-April-2024
Column number



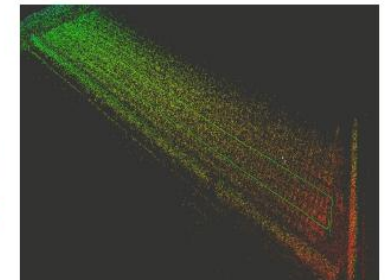
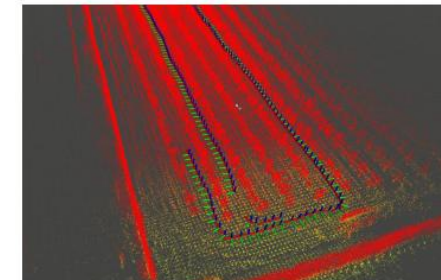
LU – Data analysis (April Data)

Test with LIO-SAM

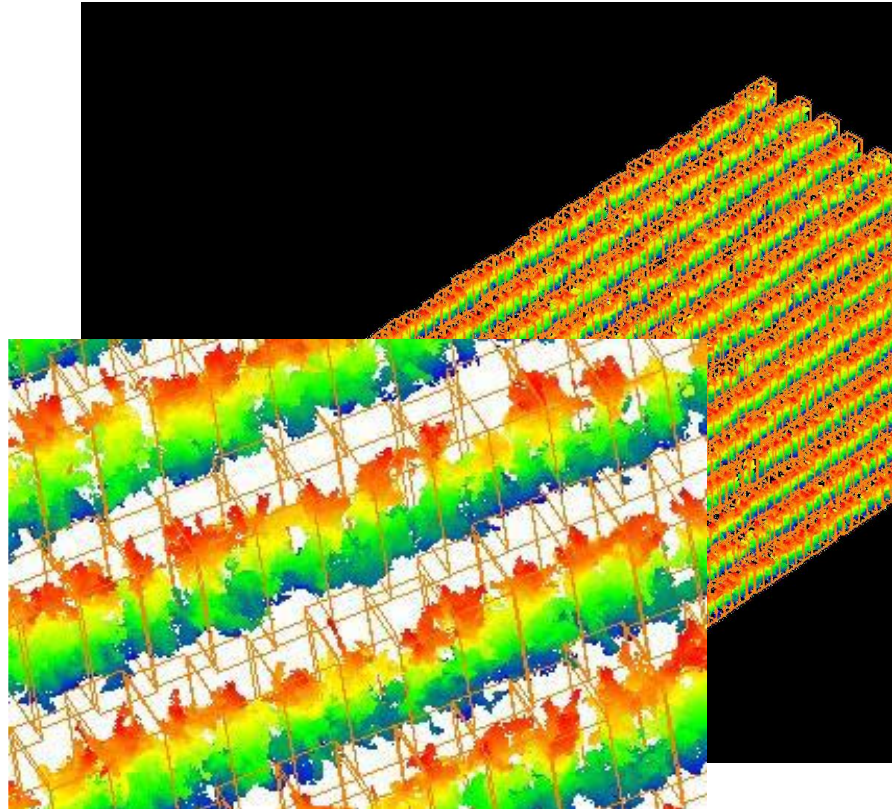


Test with DLO

Test with PIN-SLAM

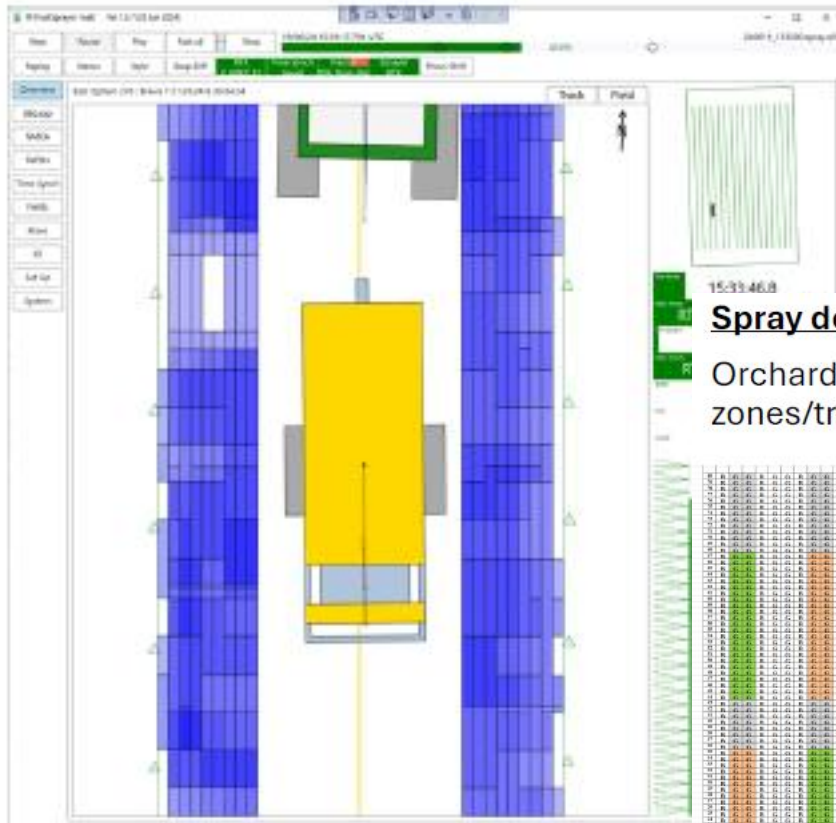


Low vegetation density



Segmented trees using 3D bounding boxes (24th

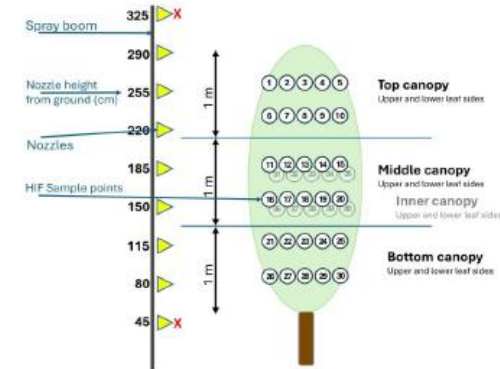
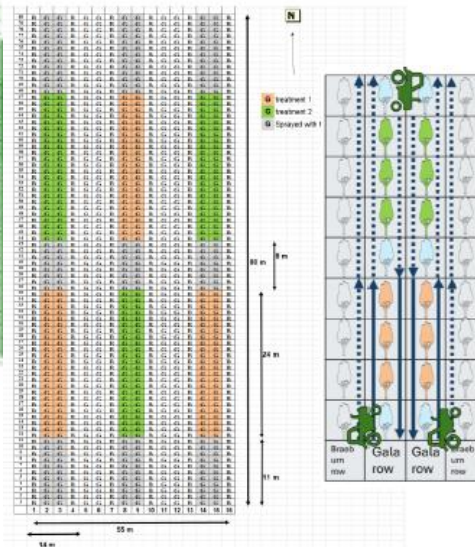
Developing variable application system



Developing application prescription maps

Spray deposition trial

Orchard area is 50 x 80 m, plot area is 7 x 24 m (2 rows), 3 plots/treatment, 8 trees/plot sampled, 4 canopy zones/tree.



HSE Health and Safety Executive



HUTCHINSONS
CROP PRODUCTION SPECIALISTS



HUTCHINSONS
CROP PRODUCTION SPECIALISTS

Summary and next steps

- Ambitious project with great potential and world-leading partners
- Great progress, building on PODS Innovate UK
- Lots of data collected 2024, basics of principles established
- Next steps:
 - Harvest data collection
 - Further data processing and validation
 - Address technology / equipment communication challenges

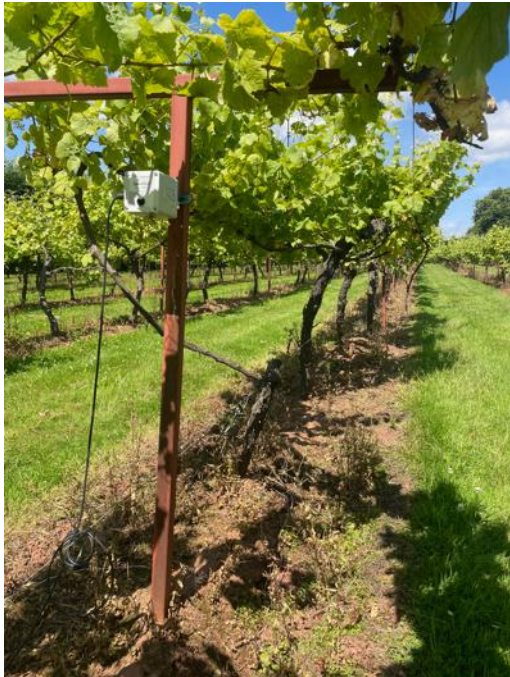


Spore Sensing

SporeDetect – spore sampling network

SporeDetect

- *Established a network of spore samplers in apple and vine crops during 2024*
- *Targeting the quantification of spores from *Venturia inaequalis* and *Plasmopara viticola**
- *Migrate to the automated SporeSentry instrument in 2025*



SporeSentry Instrument

SporeDetect

- *Instrument based on cyclone air sampling*
- *Battery allows testing once per day*
- *User changes consumable cartridge once per week*
- *Receive daily data wirelessly*



Air Intake

User touch screen interface

Disposable consumable comprising:

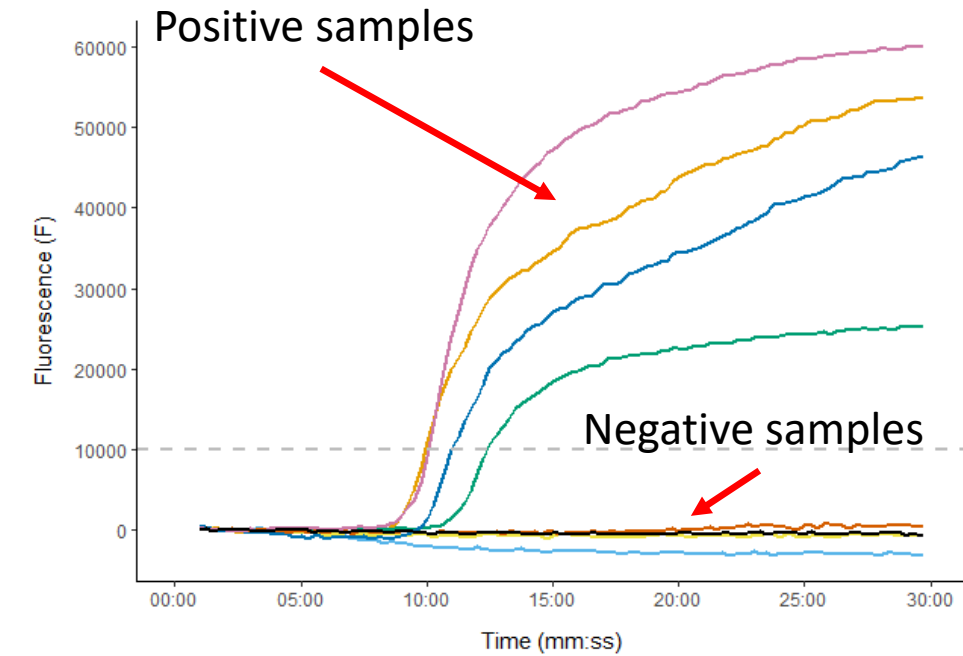
1. Cyclone
2. LAMP tests

SporeSentry – proof of principle

SporeDetect

SporeSentry instrument in greenhouse with wheat infected with Septoria

= Detection of spores



Thank you