

United Oilseeds & AHDB Joint Seminar

Networking lunch

Thursday 21 February 2019

United Oilseeds & AHDB Joint Seminar 2019

Welcome and introduction

Chaired by Andrew Cragg, United Oilseeds

United Oilseeds & AHDB Joint Seminar 2019

Soil health and biology

Dr Amanda Bennett

Resource Management Scientist, AHDB

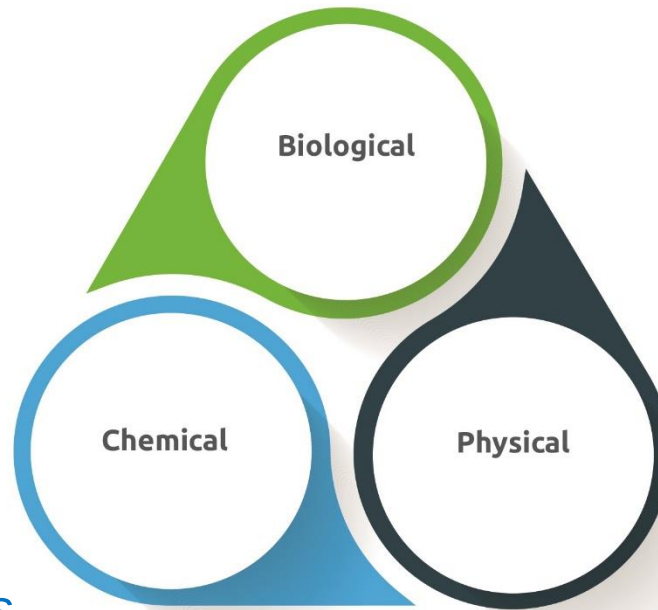


Overview: Healthy soils, healthy roots

- Principles to improve soil health
- Integrated management for soil-borne pathogens
 - *Rhizoctonia solani* AG2-1
 - Clubroot
 - Verticillium wilt
- AHDB-BBRO Soil Biology and Soil Health Partnership
 - Soil health scorecard

Know your soils: principles to improve soil health

- ✓ Feed the soil regularly through plants and OM inputs
- ✓ Move soil only when you have to
- ✓ Diversify plants in space and time



- ✓ Maintain optimum pH
- ✓ Provide plant nutrients – right amounts in the right place at the right time
- ✓ Know your textures and minerals – buffering capacity, free supply!

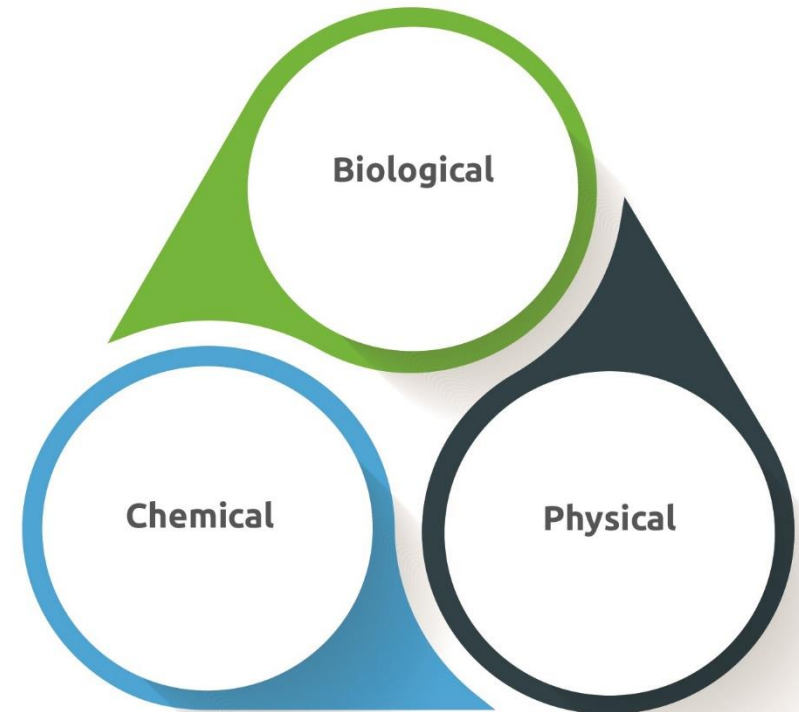
- ✓ Know your textures and understand limits to workability, trafficability
- ✓ Optimise water balance through drainage if necessary
- ✓ Improve soil structure, minimise compaction – effective continuous pore space

Integrated management for soil-borne pathogens

Approaches

- Seed treatments
- Cultural practices
- Varietal resistance/tolerance
- Field mapping
- Diagnostics?
- Improve soil health

Soil environment



Integrating control strategies against soil-borne *Rhizoctonia solani* in oilseed rape (ICAROS)



Dr Rumiana Ray, University of Nottingham

Partners: Syngenta & Nottingham University

(Jul 2016 - Nov 2019)

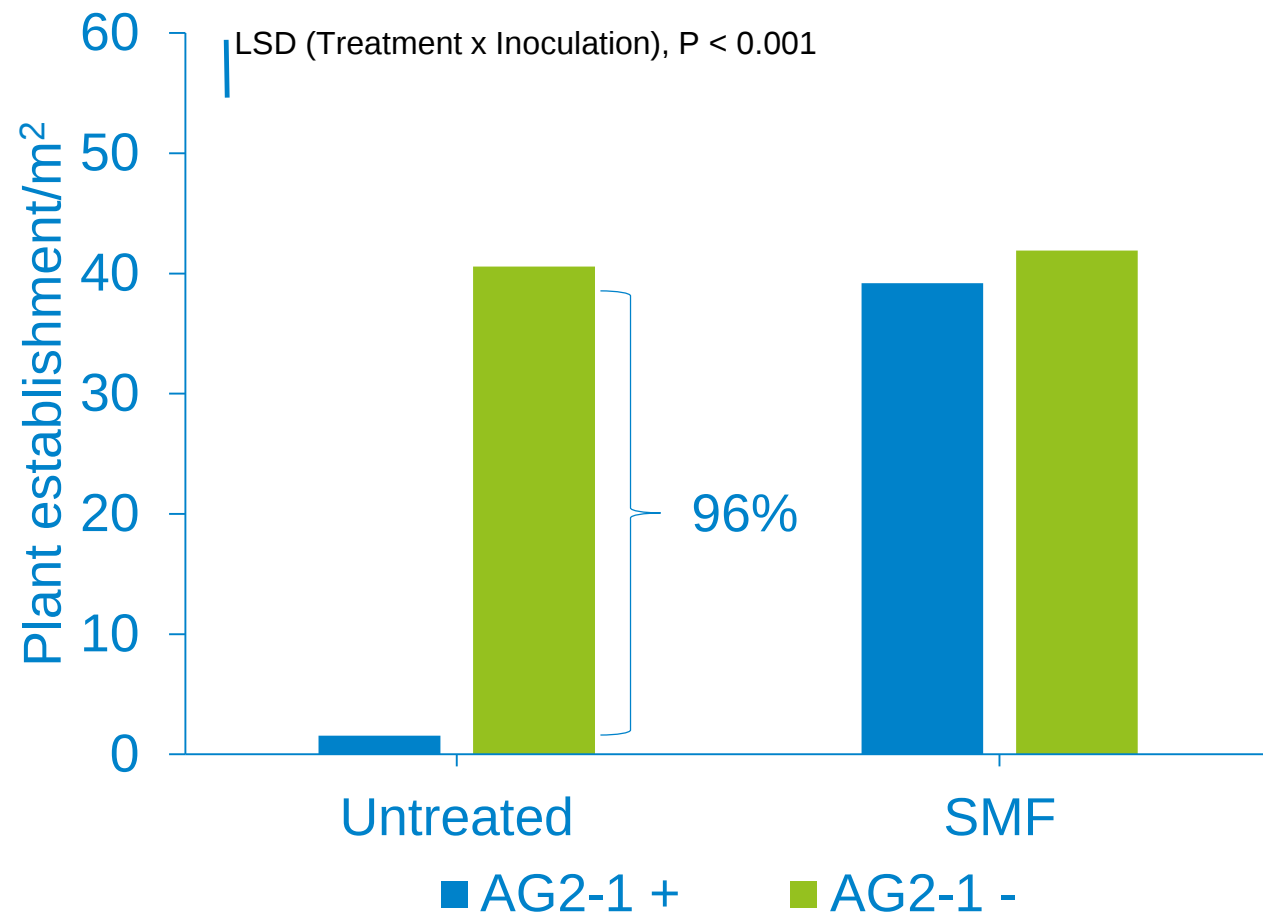
Damping off caused by *Rhizoctonia solani*

- AG 2-1 dominant in soils with OSR/wheat rotations
- Yield loss up to 30%
- Management options
 - Limited cultural control
 - No resistance to AG 2-1
 - Loss of active seed treatments
 - No registered seed treatments

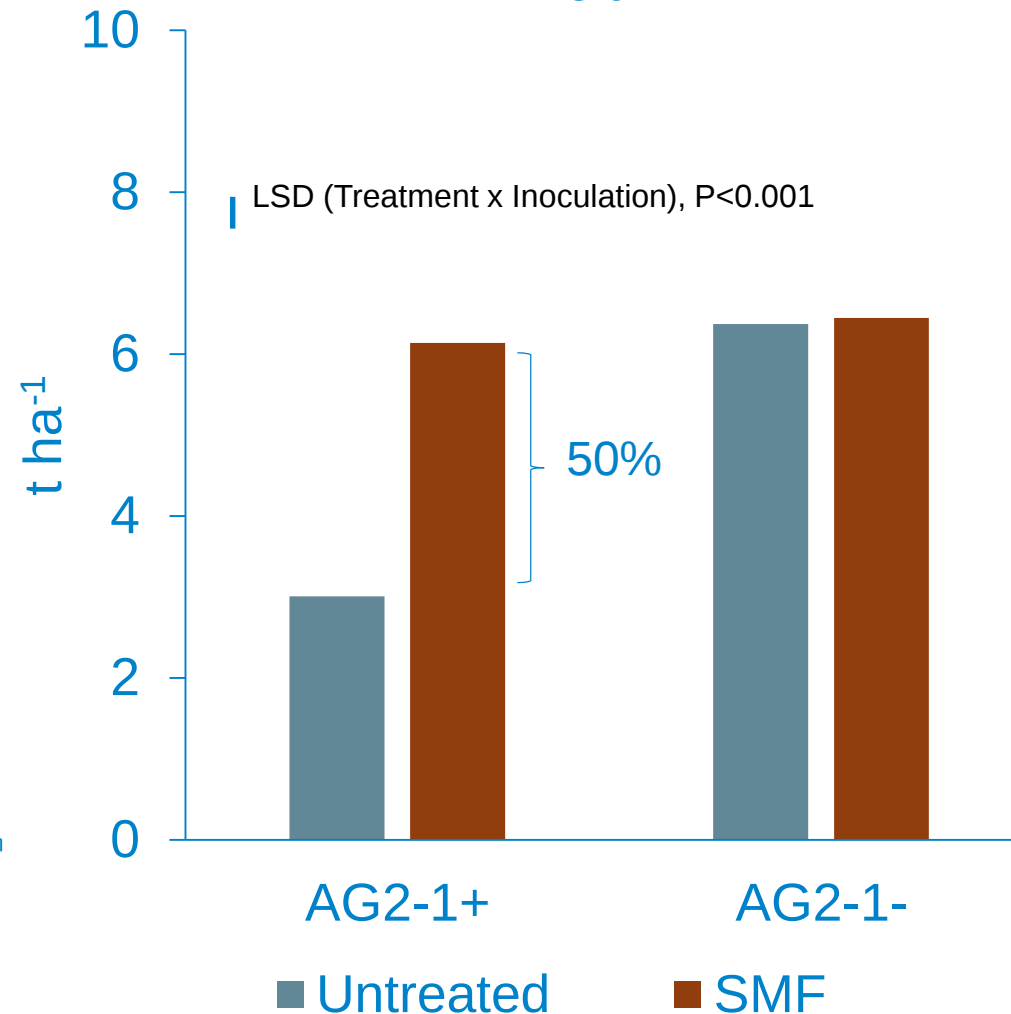


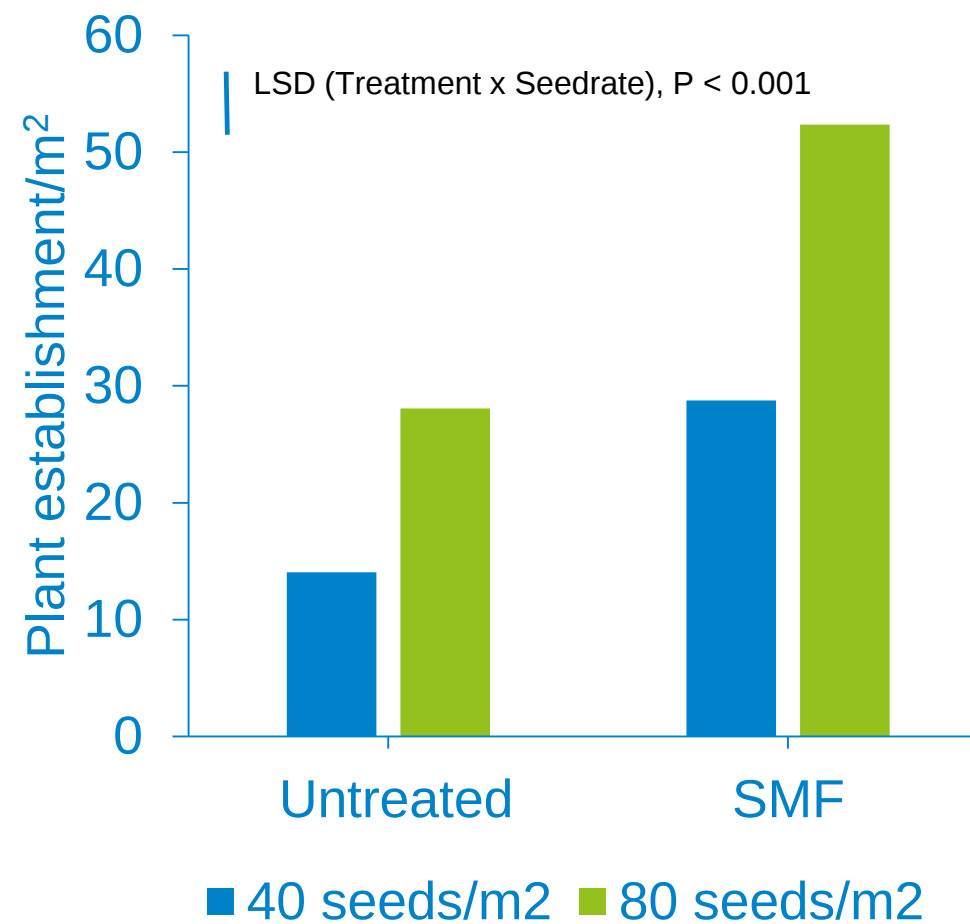


Establishment



Yield





Developing targeted management methods for clubroot through pathotyping and field mapping



Prof. Fiona Burnett, SRUC

Dr Julie Smith, ADAS

(Aug 2015 – Feb 2019)



The
University
Of
Sheffield.



LS Plant Breeding
Combining Excellence



Clubroot caused by *Plasmodiophora brassicae*

- Wide host range: oilseed rape, vegetable brassicas, cover crops, weeds
- Inoculum can survive in soil for 15 years, half life of 4.5yrs
- Exacerbated by close rotations
- Often goes undetected at field and national level
- Cultivar resistance based on single dominant gene and is being eroded
- Fungicide and bio-control options not available
- Limited management from agronomic strategies

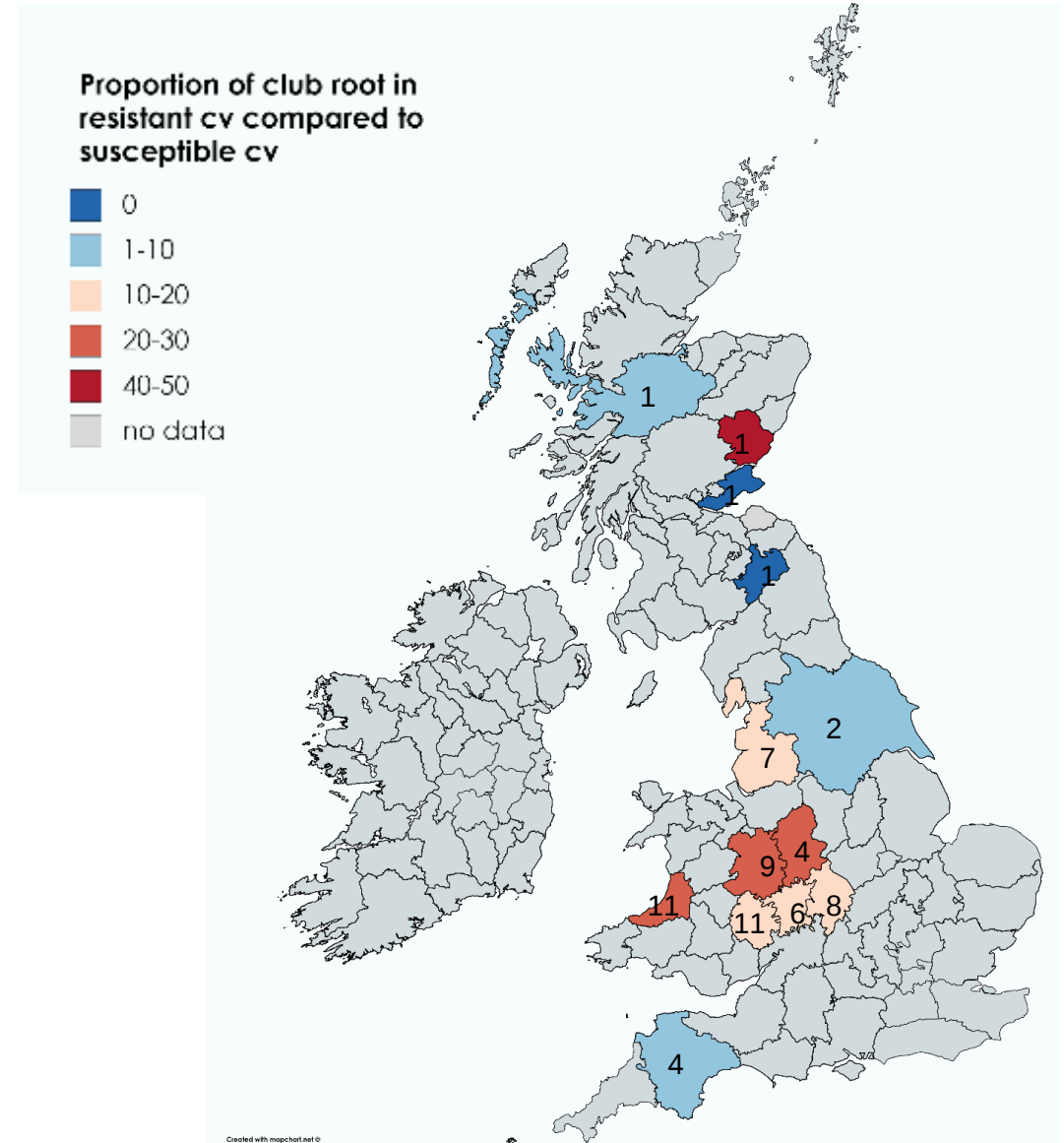
Prevalence of resistance breaking strains present in the UK

~75 commercial fields sampled

‘Mendel’ resistance breaking strains identified

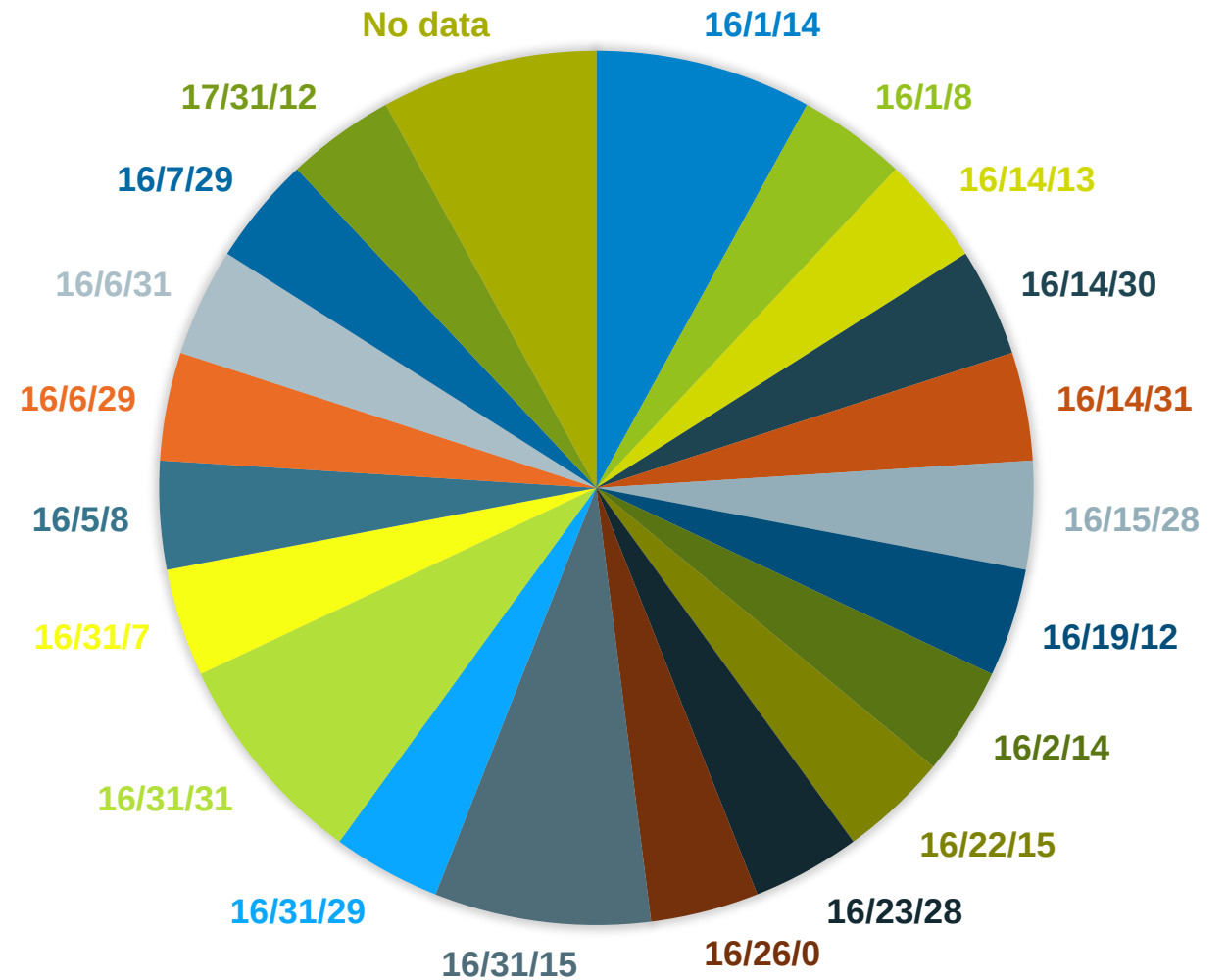


Photo credit: ADAS

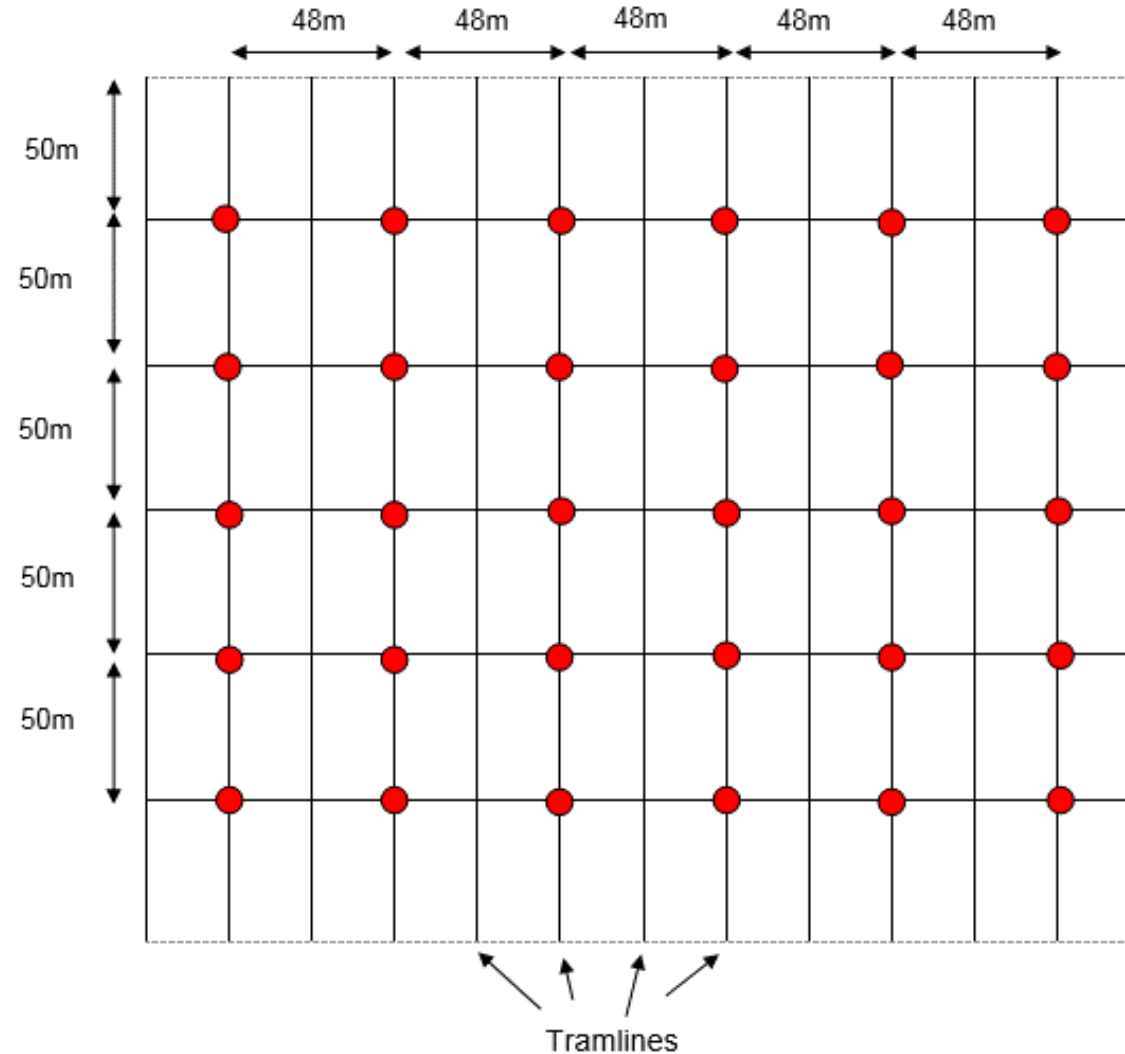


Diversity of pathotypes in the UK

European clubroot differential set



Impact of inoculum density on yield - when would patch treatment be economic?

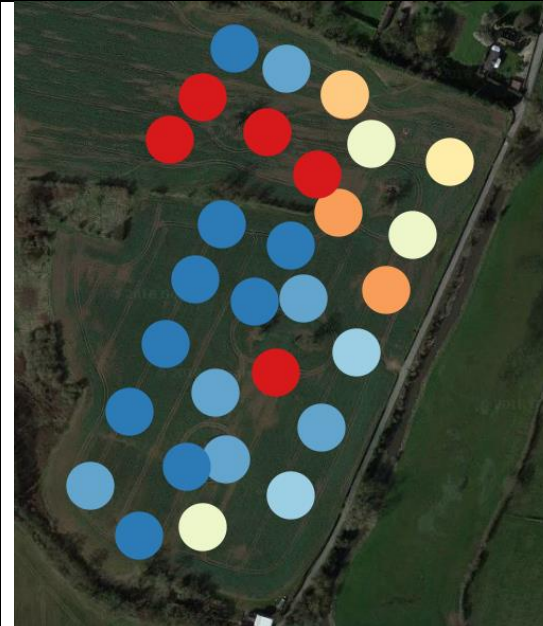


Congrieve

Staffordshire



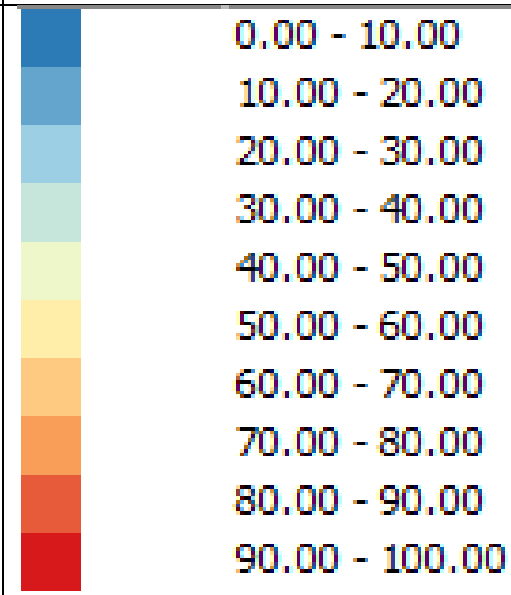
Congrieve, January 2018 – club root severity index (0-100)



Congrieve, April 2018 – club root severity index (0-100)



Congrieve, June 2018 – club root severity index (0-100)

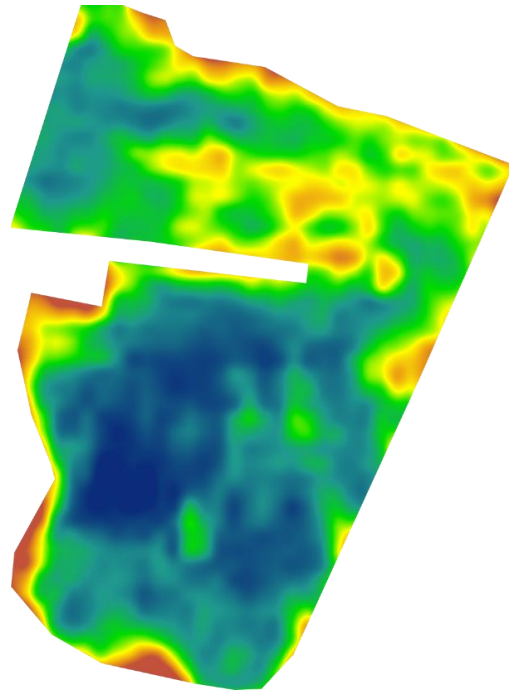
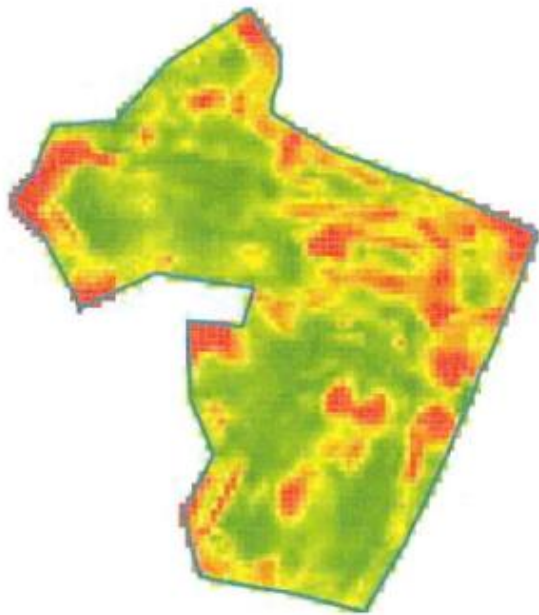


Congrieve, Clubroot severity index key (0 – 100)

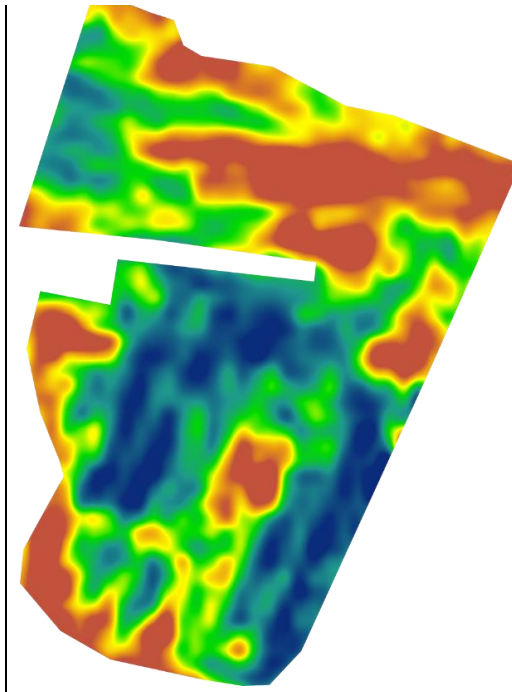
Congrieve

Staffordshire

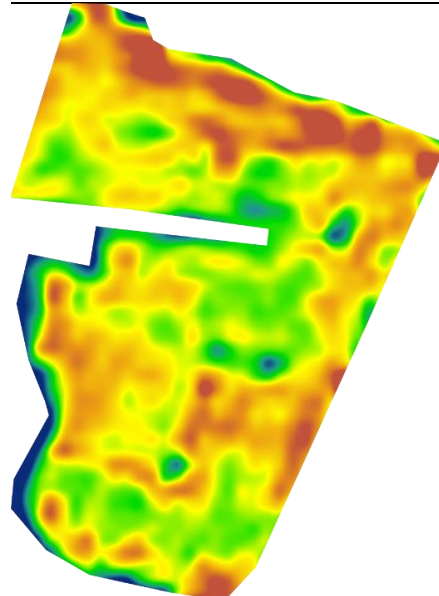
Yield map



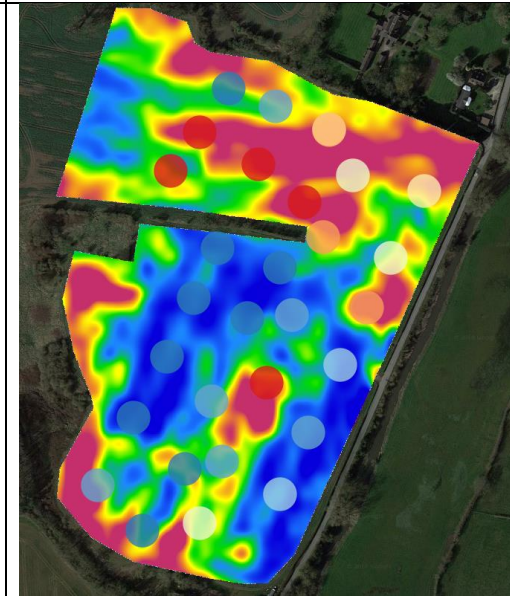
Congrieve, January 2018, NDVI map



Congrieve, April 2018, NDVI map



Congrieve, June 2018, NDVI map



Congrieve, April 2018, NDVI map overlaid with clubroot severity scores

Evaluation of resistance levels to Verticillium wilt in UK oilseed rape varieties, and relevance to productivity



Dr Jane Thomas, NIAB

Dr Faye Ritchie, ADAS

(June 2015 – Nov 2018)

In-kind support from breeders:

Bayer Crop Science, BSPB, DEKALB, DLF Seeds, DSV, Dupont-Pioneer, Elsoms, Grainseed, KWS, Limagrain, LS Plant Breeders, Monsanto UK Ltd, RAGT Seeds, Saaten Union, Senova, Syngenta

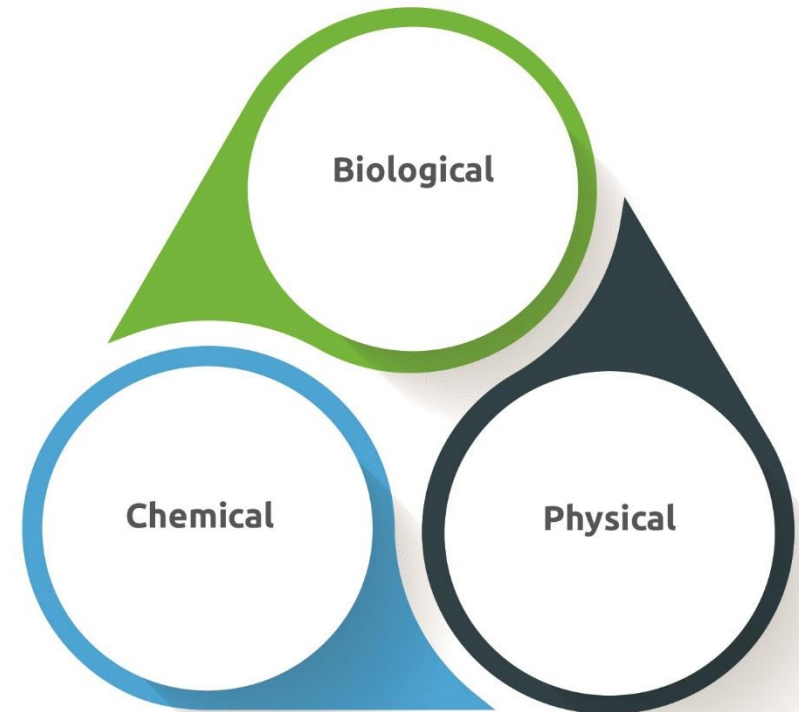


Integrated management for soil-borne pathogens

Approaches

- Seed treatments
- Cultural practices
- Varietal resistance/tolerance
- Field mapping
- Diagnostics?
- Improve soil health

Soil environment



AHDB GREATsoils programme

www.ahdb.org.uk/greatsoils

Soil Biology and Soil Health Partnership



Soil Biology and Soil Health Partnership

- Five years to deliver linked knowledge exchange and research on soil biology and soil health
- Building on work already carried out

Aims to:

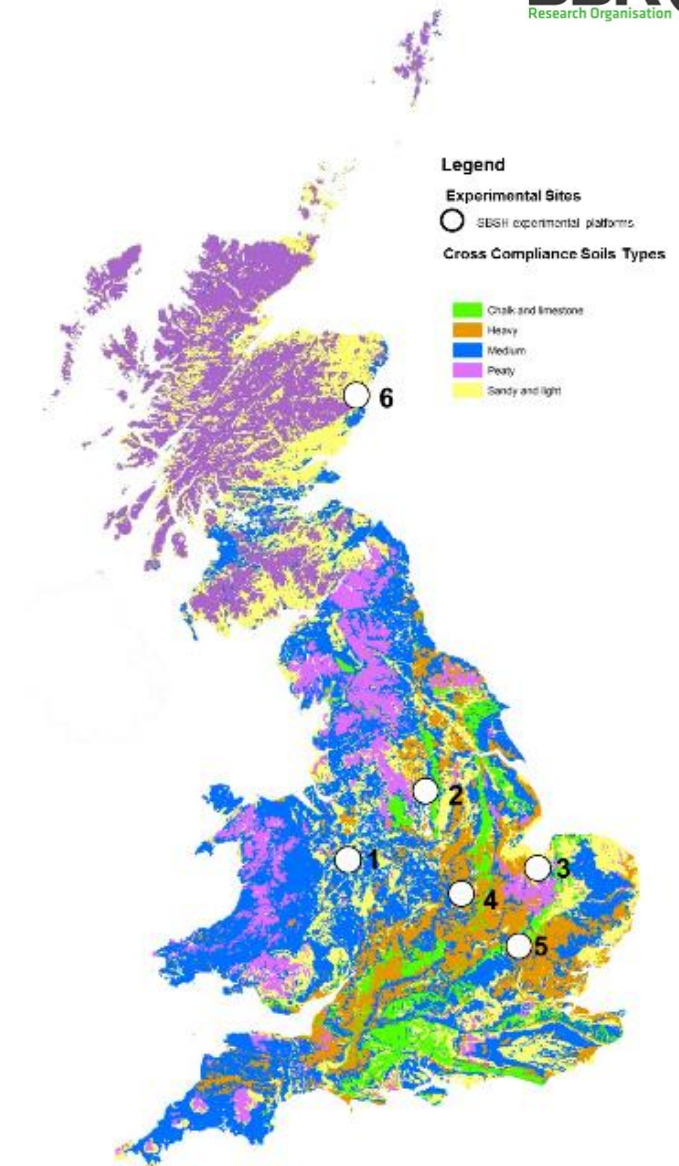
- Improve on-farm understanding of soil health by sharing current academic and industry knowledge in usable formats
- Develop and validate indicators of soil biology and soil health in research trials and on-farm

Testing and developing measures of soil quality: what is on the scorecard?

		Traffic light benchmarks?
Existing indicators included	pH	✓
	Routine nutrients	✓
	Bulk Density	✓
	Penetrometer resistance	✓
Less common indicators evaluated and framework for interpretation developed	Visual assessment of soil structure (VESS)	✓
	Soil organic matter / loss on ignition (LOI)	✓
	Respiration: Solvita test	✓
	Earthworms	✓
New indicators developed and tested	Total N	X
	Microbial biomass carbon (MBC)	✓ partial
	Potentially mineralisable nitrogen (PMN)	✓ partial
	DNA measures of pathogens and soil health	X
	Nematodes	✓ partial
	Microarthropods	X

Soil health assessment sites: Arable and ley/arable rotations

1. Harper Adams
 2. Gleadthorpe
 3. Terrington
 4. Loddington - Tillage
 5. Boxworth - Drainage
 6. Craibstone
- 10-20 years of
repeated organic
material additions
- a. Crop rotation x fertiliser; 90+yrs
 - b. Crop rotation x pH; 60+yrs.



Initial 'scorecard' results

Samples taken October 2017 in 2 year G/C ley before spraying & cultivation for WW in 2018

Attribute	Control	FYM (23yrs)	Slurry (23 yrs)	Green compost (13 yrs)	Green/food compost (6 yrs)	Food-based digestate (9 yrs)	<i>P</i>
pH	6.4	7.0	6.4	7.0	6.2	6.5	<0.001
Ext. P (mg/l)	56	73	53	60	59	65	<0.05
Ext. K (mg/l)	80	311	194	187	140	167	<0.001
Ext. Mg (mg/l)	44	87	75	63	66	48	<0.001
LOI (%)	3.0	4.1	3.6	4.0	3.7	3.4	<0.01
Bulk density (g/cm ³)	1.40	1.34	1.43	1.29	1.46	1.43	NS
VESS score	1.2	1.4	1.3	1.1	1.3	1.5	NS
PMN (mg/kg)	22.9	90.2	23.8	43.1	37.7	42.5	<0.01



High risk – need to investigate urgently



Moderate risk – need to investigate further



Low risk – continue to monitor

Assessing soil health using DNA

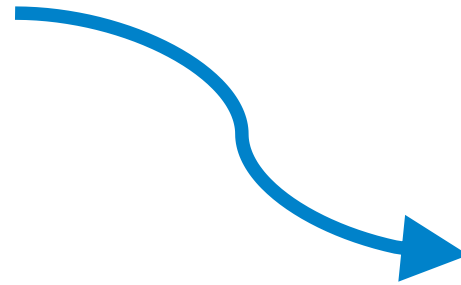
- Can we replace many of the biological assays with analysis of a single DNA sample?
- Issues being addressed initially – representative sample size, cost and interpretation
- Sample size and cost being evaluated in a comparative experiment
- Interpretation by analysing the same samples as the ‘traditional’ assays

PhD Studentship: Predicting crop disease from molecular assessment of the distribution and quantification of soil-borne plant pathogens

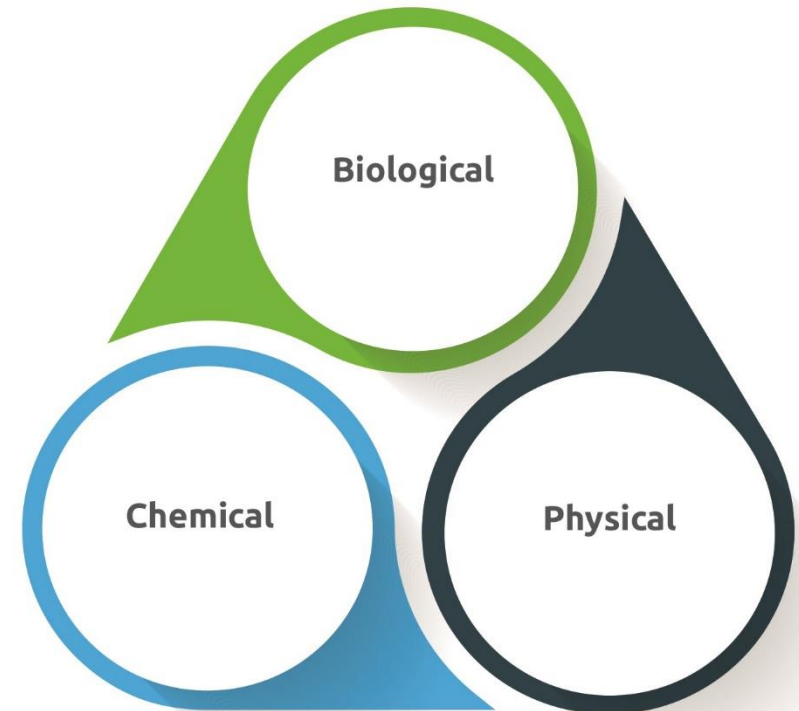
Integrated management for soil-borne pathogens

What can I do now?

- Improve soil health
- Field mapping – know your soils
 - Investigate poor areas
 - Dig a hole
 - Pull up a plant to look at roots
- Cultural practices
 - Extend and diversify rotations, vary seed rate
- Varietal resistance/tolerance
- Seed treatments



Soil environment



A vibrant landscape photograph featuring a lush green field in the foreground, with a narrow path or furrow leading towards the horizon. The sun is low on the horizon, creating a warm, golden glow and casting long, soft shadows. The sky is filled with scattered clouds, some of which are illuminated by the setting or rising sun. In the distance, rolling hills and a few small buildings are visible. The overall mood is peaceful and inspiring.

**‘Inspiring our farmers, growers
and industry to succeed in a
rapidly changing world’**

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Thank You

Chaired by Andrew Cragg, United Oilseeds