# *Xanthomonas* plant diseases: mitigating existing, emerging and future threats to UK agriculture

Bacterial Plant Diseases Programme


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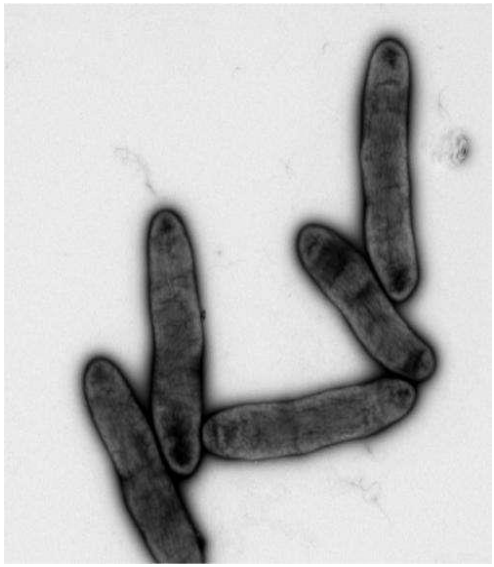
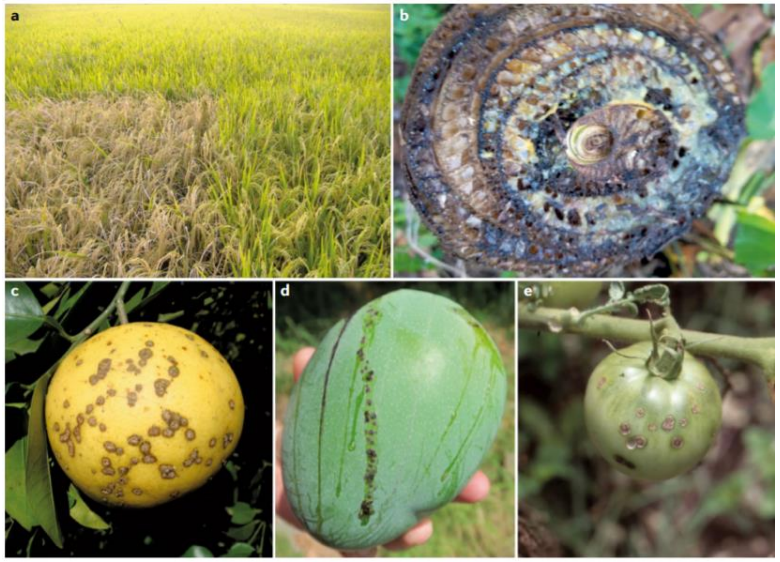
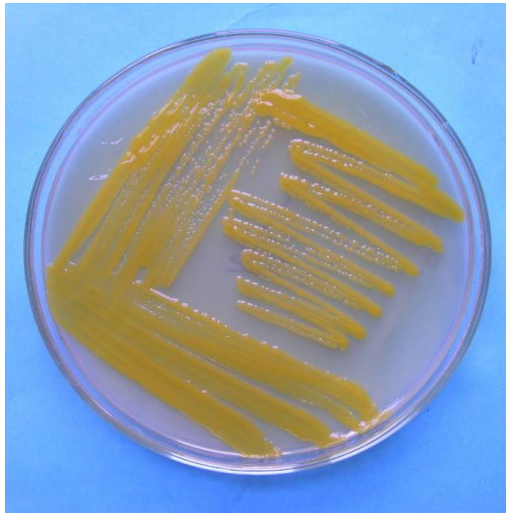
Department for Environment Food & Rural Affairs

# *Xanthomonas spp.*





- **Gram negative bacteria**
- **35 species**
- **Over 400 plant hosts (cereals, vegetables, ornamentals and trees)**

pathovar

***Xanthomonas campestris*** **pv.** ***campestris*** **race 1-9**

species

race

# *Xanthomonas* black rot of brassicas

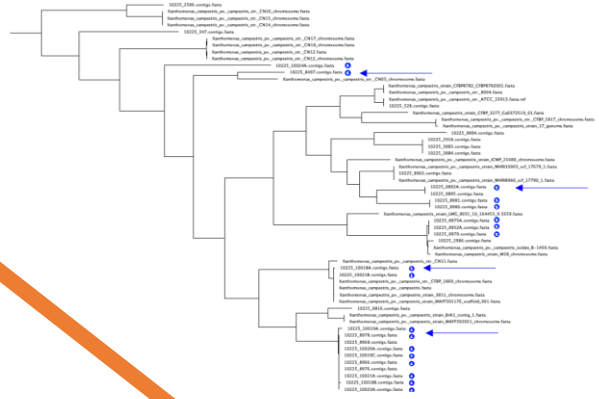
Image: Joana Vicente, UoW and Fera

***X. campestris* pv. *campestris (Xcc)* causes black rot – the most important bacterial disease of vegetable brassicas worldwide (can cause >50% yield losses)**

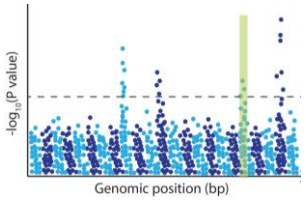
***Xcc* also causes black rot in oilseed brassicas but its importance is yet to be established due to its recent appearance and limited studies**

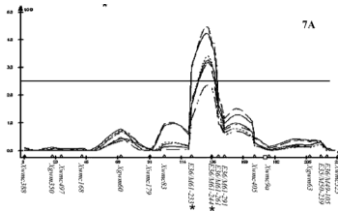
# Project overview

**WP1.** Improve knowledge of *Xanthomonas* bacterial pathogens through the use of genomics



**WP2.** Identify, characterise and map resistance to *Xcc* in *Brassica* spp.



Yorknowledgebase.info
York Oilseed Rape Knowledgebase
Bancroft group, University of York
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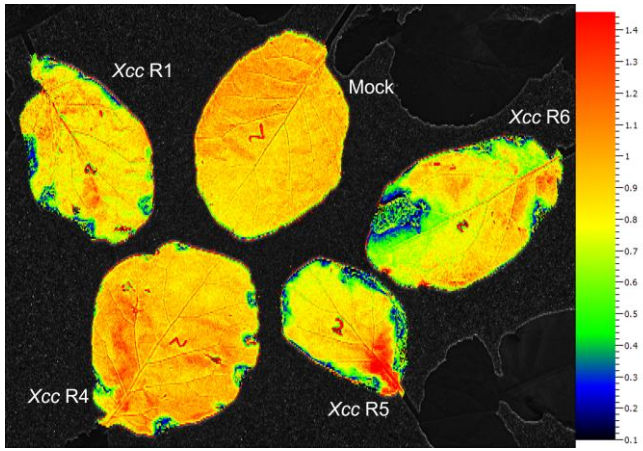
Xanthomonas Threats Consortium

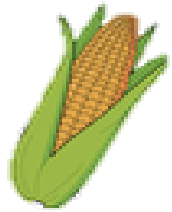
**WP3.** Use molecular and imaging tools to study host range, fitness and mode of infection and improve knowledge on transmission and biological control


Image: John Sidda, UoW


Image: John Walsh, UoW




**WP4.** Carry out pest risk analysis for *Xanthomonas* threats to UK crops



# The *Brassica* Diversity Fixed Foundation Sets (DFFS)

Xanthomonas Threats Consortium

**Warwick Genetic Resource Unit**
**>6000 *Brassica* accessions**
**much genetic redundancy**

→

**Diversity Foundation Sets (DFS)**
**Reference sample representing available diversity**

→

**Diversity Fixed Foundation Sets (DFFS)**
**Genetically homozygous (fixed) immortal lines**

Image: R. Sampson, WHRI 2002

→

**Screen DFFSs developed for *B. napus*, *B. oleracea*, wild C genome relatives with the most important *Xcc* races 1, 4, 5 and 6**

# Screening for resistance to *Xcc* in *B. napus*

Xanthomonas Threats Consortium


**Table 1. Phenotypes of 189 *Brassica napus* DFFS lines after challenge with four races of *Xanthomonas campestris* pv. *campestris*.**

| | No. individuals (*B. napus*) | | | |
|---|---|---|---|---|
| **Resistance status** | **Race 1** | **Race 4** | **Race 5** | **Race 6** |
| Susceptible | 152 | 47 | 156 | 160 |
| Partially Resistant | 18 | 19 | 9 | 9 |
| Resistant | 0 | 107 | 3 | 0 |
| ? | 19 | 16 | 21 | 20 |

- **Identified 8 lines with multi-race resistance**
- **Identified 1 line with resistance to races 4, 5 and 6**
- **Identified 3 lines that have resistance to both race 1 and race 4, the most prevalent races of *Xcc* in vegetable brassicas**

# Screening for resistance to *Xcc* in *B. oleracea*

Xanthomonas Threats Consortium

**Table 2. Phenotypes of 140 *B. oleracea* DFFS lines after challenge with four races of *Xanthomonas campestris* pv. *campestris*.**

| | No. individuals (*B. oleracea*) | | | |
|---|---|---|---|---|
| **Resistance status** | **Race 1** | **Race 4** | **Race 5** | **Race 6** |
| Susceptible | 63* | 51* | 67 | 82 |
| Partially Resistant | 0 | 2 | 5 | 8 |
| Resistant | 0 | 1 | 2 | 3 |
| ? | 77 | 86 | 66 | 47 |

***systemic infection seen frequently**

- **We have a number of lines we need to repeat due to issues with soil composition and germination**

# Future work

Xanthomonas Threats Consortium

- Complete the screening of the *Brassica* DFFSs
- Test *Brassica* lines identified to have resistance to multiple races with additional *Xcc* isolates
- Image *Xcc* infection in resistant and susceptible *Brassica* lines
- Characterise and map resistance to *Xcc* in *Brassica*. Target resistance genes can be fed into ECHTC
- Complete the sequencings of >900 xanthomonads to identify genetic determinants of virulence, pathovar and race type and to better define taxonomy
- Investigate transmission routes and biocontrol methods for *Xcc* in *Brassica*
- Carry out PRAs for emerging and future *Xanthomonas* threats to UK agriculture

# The Team

WARWICK
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Xanthomonas Threats Consortium

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*Xanthomonas*

Xanthomonas Threats Consortium

# More about the project and the Bacterial Plant Diseases Programme at……

https://bacterialplantdiseases.uk/xanthomonas-threats/

Bacterial Plant Diseases Programme

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