

**Project title:** Brassicas: Development of Screening System to detect *Xanthomonas campestris* in seed and evaluation of pathogen resistance in seed parents of winter cauliflower

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**Location:** HRI Wellesbourne and Rosewarne, Cornwall

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## PRACTICAL SECTION FOR GROWERS

### Objectives and background

Black rot, caused by the bacterium *Xanthomonas campestris* pv *campestris* (*Xcc*), is a very serious problem on cauliflower in Cornwall and increasingly on all brassicas in other parts of the country. The increasing incidence of *Xcc* in the UK may be due in part to a succession of warmer summers but other factors including the uniform susceptibility of F<sub>1</sub> hybrids and increased likelihood of pathogen dissemination (from infected seed) in modern propagating systems have also been implicated.

Field symptoms in module propagated plants usually appear simultaneously throughout the crop with almost all plants infected with uniform severity. This differs from typical seed-borne infection in direct-drilled crops where infection occurs in randomly distributed patches, initiated from individual infected seeds and with evidence of disease gradients as the disease spreads and successive plants becoming infected.

The observation of uniform symptoms in crops grown from module propagated plants suggests that infection, possibly derived from infected seeds, has undergone an initial dissemination within the propagating system.

This report describes a project on *Xanthomonas campestris* pv *campestris* in Cornish cauliflowers with specific objectives to:-

- Evaluate seed test procedures
- Set up a seed-testing facility at Rosewarne
- Train Ms. Sarah Redstone, based at Rosewarne, in seed-testing procedures
- Detect and quantify seed-borne infection in a selection of the most widely grown cultivars
- To follow up a number of field crops which had been grown from both apparently-healthy and infected seed which had been tested during the previous year
- Identify and race type isolates of *Xanthomonas campestris* pv *campestris* from seeds, crops and cruciferous weeds as a possible means of determining the source(s) of infection
- To carry out glasshouse resistance screening of a selection of the most widely-grown cauliflower cultivars

### Summary of results

#### *Seed tests*

- The methods used were based on an International Seed Testing Association (ISTA) protocol but modified to improve the detection threshold, both in terms of % seed infection and pathogen numbers detected.
- A laboratory at Rosewarne was equipped to carry out seed tests and staff were trained
- Seed samples (12 x 5000 seeds of each lot) were tested at HRI Wellesbourne and the Rosewarne Laboratory, Cambourne.
- Infection was found in 12 of the 49 seed lots tested; 6 out of 27 in the first year and 6 out of 22 in the second year
- Infection levels were generally low and in most cases would not have been detected following the International Seed Testing Association procedures.

- The majority of infected seed lots contained only 0.0017% infected seeds (i.e. 1 infected seed in 59,000). The highest level detected was 0.011% (i.e. 1 infected seed in 9,000)
- In the second year infection was found in seed lots which had tested negative in the previous year.

#### *Crop follow-ups*

- Follow up of crops in the field which had been grown from seed tested in the previous year was inconclusive: disease was found in all crops examined regardless of seed infection level, cropping history or plant-raising system.
- Infected weeds were found, but it is likely that they were infected from the crop.

#### *Race typing*

- In the UK only two races have been detected with certainty.
- Race 1 (1A) was predominant, Race 4 was the earliest detected race (present as an isolate in the HRI culture collection from 1983).

#### *Resistance screening*

- All of the twenty-five varieties tested were fully susceptible to Races 1A and 4.
- All cultivars were less susceptible to Race 0 than turnip
- Some variability in susceptibility to Races 1B and 1C was found in both open pollinated and F<sub>1</sub> hybrid varieties, but is of little practical significance.
- Mature plants were more resistant than young plants.

#### **Action points for growers**

- Uniform crop infections with no evidence of infection patches or disease gradients are associated with module-raised transplants from propagating units.
- Growers and plant-raisers should only use tested seed
- No seed lot can be guaranteed to be free from infection even if it has been tested
- A negative result from a seed test implies that a seed lot has an infection level below the detection threshold of that test
- Levels of seed-borne infection are generally low suggesting that under propagating house conditions more stringent tolerance levels may be required than provided by the current ISTA protocol
- Seed tests can be carried out by HRI-Wellesbourne or NIAB (NB specify tolerance standard required)
- Only two races (Race 1 (1A) and Race 4) of *Xanthomonas campestris* pv *campestris* have been detected in Cornwall over the past 12 years with Race 1 predominant.
- Race 1 has recently been sub-divided into 1A, 1B, 1C. The frequency of each of these sub-types is unknown.
- The importance of non-seed sources of infection is unknown
- Circumstantial evidence suggests that cruciferous weeds are more likely to be infected by contact with infected *Brassica* crops than vice versa.