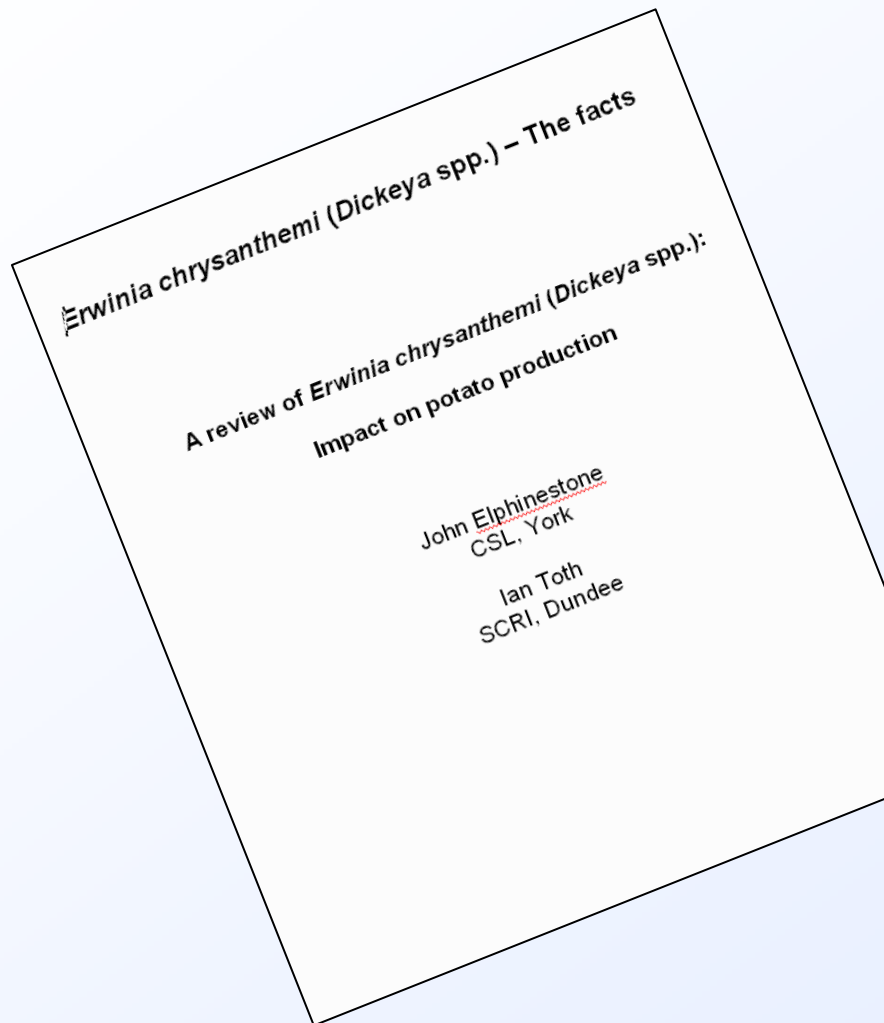


Erwinia chrysanthemi (*Dickeya* spp.) – the facts

Ian Toth & John Elphinstone



Is *E. chrysanthemi* a threat to the UK potato industry?



<i>Dickeya dianthicola</i>	<i>Erwinia chrysanthemi</i> bvs. 1, 7 & 9 <i>E. chrysanthemi</i> pv. <i>dianthicola</i>	<i>Dianthus</i> , potato , tomato, chicory, artichoke, <i>Dahlia</i> , <i>Hyacinthus</i> , <i>Iris</i> & <i>Kalanchoe</i> .
<i>Dickeya dadantii</i>	<i>E. chrysanthemi</i> bv 3	<i>Pelargonium</i> , potato , pineapple, <i>Dianthus</i> spp., <i>Euphorbia</i> , sweet potato, banana, maize, <i>Philodendron</i> & <i>Saintpaulia</i> .
<i>Dickeya zeae</i>	<i>Dickeya dianthicola</i>	Maize, potato , pineapple, banana, tobacco, rice, <i>Brachiaria</i> , & <i>Chrysanthemum</i>
<i>Dickeya chrysanthemi</i> bv. <i>chrysanthemi</i>	<i>E. chrysanthemi</i> bv 5 <i>E. chrysanthemi</i> pv. <i>chrysanthemi</i>	<i>Chrysanthemum</i> , chicory, tomato, sunflower & potato?

Erwinia

atroseptica

Pectobacterium atrosepticum

Symptoms:



Soft rot of progeny tubers – stolon end or lenticular rots

Similar for *chrysanthemi* and *atroseptica*

chrysanthemii in warm/dry conditions



Symptoms caused by *chrysanthemii* may appear later in the season than those of *atroseptica* as temperatures increase.

Initial wilting of top leaves

Desiccation of foliage

(*Verticillium*)

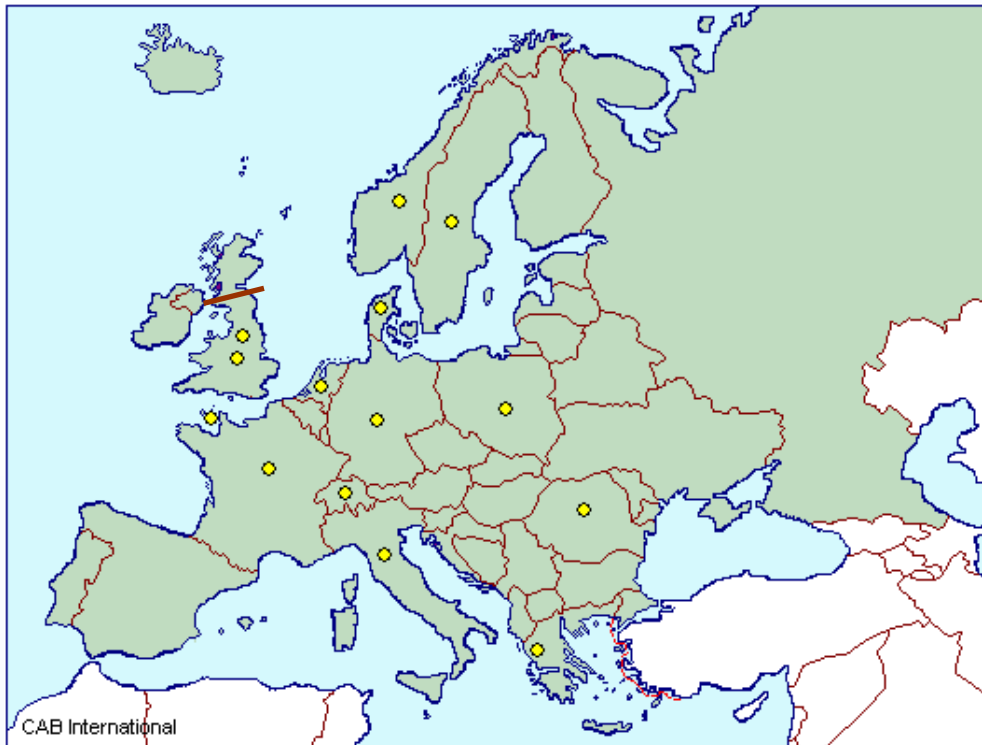
chrysanthemum in warm/dry conditions



External darkening / discoloured vascular system at stem base

Internal necrosis and hollowing of vascular tissues

Distribution in Europe



Distribution of *D. dianthicola* in Europe (CAB International, 2005).



- **Known on *Dianthus* for some time (carnation, pink and sweet william)**

Denmark, England, France, Germany, Italy, Netherlands, Norway, Poland, Romania, Sweden and Greece

Distribution in Europe

- **On potato**
 - First report from Netherlands early 1970's
 - Subsequent reports from Denmark, England, Finland, France, Hungary, Jersey, Slovenia, Spain, and Switzerland
 - Isolates from Netherlands, Hungary, England and Jersey all identified at CSL as *D. dianthicola*.

Distribution of *D. dianthicola* in UK

- First detected in England in 1990
- 40+ English cases detected in 14 counties
- All initially associated with crops from Dutch seed
- Found on Maris Piper seed crop in 2001
- Limited testing done on voluntary basis
- More widespread than official records suggest
- **Not found in Scotland**

Distribution in UK: Varieties involved

Variety	No. official cases
Sante	7
Marfona	5
Estima	3
Markies	3
Ostara	3
Accord	2
Saturna	2
Ausonia	1
Fambo	1
Lady Rosetta	1
Maris Piper	1
Nadine	1
Rembrandt	1
Xantia	1
Unknown	14
Total:	46

Risk assessment and economic loss

- Listed quarantine organisms
(*Dianthus* and *Chrysanthemum*)
- DEFRA PHSI inspections (1990-2006)
<1-30% wilting in seed stocks affected by *D. dianthicola*
- In Israel (2005 & 2006)
2-30% wilt and up to 30% soft rot of progeny tubers

- Recent reports of 30% wilting in Slovenia.
- Denmark - losses estimated at 10t per ha in one year.
- Switzerland - *chrysanthemi* more serious than *atroseptica* on seed.

Biology, Survival and Spread of the Pathogen

Factors influencing disease development

- Mostly similar to those for *atroseptica*

- Varietal susceptibility / resistance
- Damage and lack of cleanliness at grading
- Poor soil drainage
- Presence and level of pathogen on seed
- Damage to sprouted seed
- Over-irrigation
- Wet spring / summer weather
- Damage at harvest
- Lack of adequate ventilation at storage

- **Temperature**

- higher temperatures (>25°C)?
- *chrysanthemii* versus *atroseptica* years
- Climate change?

- **Level of pathogen on tubers**

- lower levels leading to disease?

- **Agressiveness**

- more aggressive?
- more readily move in plant vascular system?

- **Varietal resistance?**

Spread

- **In potato**

- Latently infected seed tubers

- **In other host plants**

- Other crops - infected propagated vegetative material
- Spread from ornamental plants / glasshouse crops?
- Other secondary hosts / weeds?
- Water courses and associated weeds?

- **In water courses used for irrigation**

- Found in Sweden, Netherlands, Finland, Florida and Australia
- In Sweden isolates shown to infect potato
- Found on *Solanum dulcamara* (brown rot)
- Are they same species as found on potato in N. Europe?
- Australia found different *Dickeya* spp. identical to those on potato after irrigation.

Survival

- **Over-wintering**

- In plant-free soil – few months – less than *atroseptica*
- In plant debris
- In alternative plant hosts (weeds etc)
- In irrigation water and associated weeds

Diagnostics

- To detect latent infections
- To check pathogen levels
- To check pathogen identify

• Selective growth media

– *D. dianthicola* lack of growth on CVP?

• Antibody-based methods

– ELISA – limited detection
- Enrichment ELISA (Dutch)

Taqman

- Real-time PCR

Control Statutory

No specific *chrysanthemii* control measures on potato in any country

chrysanthemii is seed-borne like *atroseptica* – controlled largely through seed classification (UK and EU legislation)

Soft rot and blackleg tolerances based on visual inspection

No official post-harvest diagnostic testing programmes for *chrysanthemii* or *atroseptica*

Voluntary testing in some countries offer useful decision support

No attempt to classify *chrysanthemii* / *atroseptica* infections

Israel – *chrysanthemi* diagnostic testing being pursued
- Zero tolerance expected in near future (based on diagnostics)

On-farm

Largely same as for *atroseptica*
– insufficient data for *chrysanthemi*-
specific measures

BPC guide – “Managing the risk of
blackleg and soft rot” →

Joining the Safe-Havens Scheme

However, diagnostics, avoiding over-
irrigation and managing infected
alternative plants may be particularly
useful in controlling *chrysanthemi*



Threats

Experts in at least 10 European countries consider disease caused by *chrysanthemii* to be an increasing problem.

It is likely that it also poses a threat to UK potato production.

Does the same threat extend to protected Scottish seed regions?

Will it survive and cause disease under Scottish conditions?

Threat will depend upon:

The mode and frequency of its introduction to the UK.
(Safe-Havens Scheme)

Its current distribution within the UK, especially within seed potato production.

Its ability to establish in the environment (e.g. on alternative hosts).

The mode and likelihood of spread within and between crops (including the importance of spread through irrigation water).

The relative aggressiveness of *D. dianthicola* on potato under UK conditions now and in the future.

Opportunities

Scottish seed free from *chrysanthemi*?

- Advantage for seed exports
- Advantage for GB ware potato growers

Summary

- Is *chrysanthemii* a threat to the UK potato industry?
- *chrysanthemii* will be a problem for Scotland in the future unless measures are taken against it NOW.
- Safeguard against *chrysanthemii* infections – **Follow best practice guidelines** and **join the Safe-Havens Scheme**
- Be vigilant particularly when exporting to warmer countries

Erwinia chrysanthemi (Dickeya spp.) – The facts

A review of *Erwinia chrysanthemi* (*Dickeya* spp.):
Impact on potato production

John Elphinstone
CSL, York

Ian Toth
SCRI, Dundee

