Grower Summary

PC 291

Protected ornamentals: evaluation of control options for bacterial diseases of pot plants

Annual 2010

© Agriculture and Horticulture Development Board 2011. All rights reserved.

Disclaimer

AHDB, operating through its HDC division seeks to ensure that the information contained within this document is accurate at the time of printing. No warranty is given in respect thereof and, to the maximum extent permitted by law the Agriculture and Horticulture Development Board accepts no liability for loss, damage or injury howsoever caused (including that caused by negligence) or suffered directly or indirectly in relation to information and opinions contained in or omitted from this document.

No part of this publication may be reproduced in any material form (including by photocopy or storage in any medium by electronic means) or any copy or adaptation stored, published or distributed (by physical, electronic or other means) without the prior permission in writing of the Agriculture and Horticulture Development Board, other than by reproduction in an unmodified form for the sole purpose of use as an information resource when the Agriculture and Horticulture Development Board or HDC is clearly acknowledged as the source, or in accordance with the provisions of the Copyright, Designs and Patents Act 1988. All rights reserved.

AHDB (logo) is a registered trademark of the Agriculture and Horticulture Development Board. HDC is a registered trademark of the Agriculture and Horticulture Development Board, for use by its HDC division. All other trademarks, logos and brand names contained in this publication are the trademarks of their respective holders. No rights are granted without the prior written permission of the relevant owners.

The results and conclusions in this report may be based on an investigation conducted over one year. Therefore, care must be taken with the interpretation of the results.

Use of pesticides

Only officially approved pesticides may be used in the UK. Approvals are normally granted only in relation to individual products and for specified uses. It is an offence to use non-approved products or to use approved products in a manner that does not comply with the statutory conditions of use, except where the crop or situation is the subject of an off-label extension of use.

Before using all pesticides check the approval status and conditions of use.

Read the label before use: use pesticides safely.

Further information

If you would like a copy of the full report, please email the HDC office (hdc@hdc.ahdb.org.uk), quoting your HDC number, alternatively contact the HDC at the address below.

HDC
Stoneleigh Park
Kenilworth
Warwickshire
CV8 2TL

Tel – 0247 669 2051

HDC is a division of the Agriculture and Horticulture Development Board.

© Agriculture and Horticulture Development Board 2011. All rights reserved.

Project Number:	PC 291
Project Title:	Protected ornamentals: evaluation of control options for bacterial diseases of pot plants
Project Leader:	Dr Tim O'Neill
Contractor:	ADAS, FERA & HK Consulting
Industry Representative:	Fay Richardson, Coletta and Tyson
Report:	Annual report, 2010
Publication Date:	15th August 2011
Previous report/(s):	Annual report, 2009
Start Date:	1 July 2008
End Date:	31 December 2011
Project Cost:	£ 120,939

© Agriculture and Horticulture Development Board 2011. All rights reserved.

Headline

Occurrence of bacterial soft rot (*Pectobacterium carotovorum*) in cyclamen was found to be associated with particular batches of plants; incidence of the disease was greatest in batches where sciarid flies were present at potting and were not adequately controlled. Cuprokylt FL as a foliar spray significantly reduced bacterial leaf spot (*Xanthomonas hortorum pv. hederae*) on ivy.

Background and expected deliverables

A number of genera of bacterial pathogens cause disease in pot plants:

- Seed-borne *Xanthomonas* spp. e.g. on begonia, Pelargonium, Cheiranthus and Lavandula.
- *Pseudomonas* spp. causing leaf spots e.g. camellia, magnolia, Lonicera, Prunus and canna.
- *Pectobacterium* and *Dickeya* spp. causing soft rot and stem wilts e.g. on chrysanthemum, cyclamen, dahlia, dianthus, dieffenbachia, Euphorbia, hyacinth, kalanchoe, orchids, Pelargonium, Primula, sedum, and zantedeschia.
- *Agrobacterium* spp. causing crown gall of a range of ornamentals including chrysanthemum, roses, Euonymus, Prunus and many others.
- *Rhodococcus fascians* causing leafy gall on geranium.

Bacterial diseases causing significant losses on individual nurseries in recent years include cyclamen bacterial soft rot *(Pectobacterium carotovorum*), poinsettia bacterial leaf spot (*Xanthomonas axonopodis* pv. *poinsettiicola*), wallflower bacterial wilt (*Xanthomonas campestris* pv. *campestris*) and geranium bacterial wilt *Ralstonia solanacearum*.

Some control is possible through crop management, including avoiding high temperatures, waterlogged growing media, and mechanical and pest damage. Good nursery hygiene can also reduce the risk of persistent bacterial disease problems. At present there are no chemical controls recommended for bacterial diseases other than copper fungicides, which provide limited protective control.

There is opportunity to make use of recent developments elsewhere in bacteriology to improve the control of bacterial diseases of protected ornamentals in the UK, particularly the areas of induced host-resistance, phage therapy and accurate detection and quantification of bacteria. This project aims to assess the benefit of some chemical and biological

© Agriculture and Horticulture Development Board 2011. All rights reserved.

interventions that could increase the options available to growers for management of bacterial diseases.

The expected deliverables are:

- Greater awareness by growers of bacterial diseases and their management.
- An illustrated Factsheet on the control of bacterial diseases on protected ornamentals.
- Sound data on the potential benefits of resistance inducers and phage therapy for the control of bacterial diseases on ornamentals.
- Potential benefits to growers of reduced losses through the use of biological or chemical intervention, subject to regulatory approval where required.

Summary of the project and main conclusions

Occurrence of P. carotovorum in young cyclamen plants

Little direct evidence was found to support the hypothesis that cyclamen bacterial soft rot arises from latent infection by *P. carotovorum* in plug plants supplied by specialist propagators. Out of 22 batches of cyclamen cv. Halios Flame Mix supplied in 2009 by five propagators between weeks 19 and 28 (mid-May to mid-July), no visible symptoms of soft rot were found at plant receipt and only one batch tested positive for the bacterium in a laboratory test on macerated young plants, where *P. carotovorum* was recovered at a low level from one of five sub-samples. This hypothesis will be re-examined in 2010 by visual examination and testing of a greater number of plants.

Association of cyclamen bacterial soft rot with delivery batches of young plants

Around 100 cyclamen plants cv. Halios Flame Mix from each of the 22 batches supplied to a nursery by five propagators between weeks 19-28 were assessed for bacterial soft rot in a growing-on test. Plants were potted into 13 cm pots and assessed every 2 weeks up to marketing for bacterial soft rot; the disease was confirmed by examination of collapsed plants for corm soft rotting and smell typical of the disease. Collapsed plants were removed from the trial as they were assessed. Bacterial soft rot was first observed 8 weeks after potting of the first delivery and at that time affected plants from just one propagator. Losses increased with time and eventually occurred in plants from four of the five suppliers (Table 1). Cumulative losses were significantly greater in plants from propagator C (9.7%) than other suppliers (nil to 1.2%). Losses to bacterial soft rot averaged over all propagators were

© Agriculture and Horticulture Development Board 2011. All rights reserved.

greatest in the first two deliveries (9.2% and 6.0% respectively) than later deliveries (1.4 to 0.2%).

Sciarid fly were found associated with some of the early batches of plants delivered and, after recognition of the problem, deliveries were all treated with Nemasys (*Steinernema kraussei*) for control of this pest, applied as a soak from week 23. It is suggested that the high level of bacterial soft rot which developed in the first delivery may be associated with grazing damage to young plants by sciarid larvae that increased their susceptibility to infection by *P. carotovorum*. The effect of other factors, such as differences in leaf loss or occurrence of corm bruising at mechanical planting, cannot be discounted as an influence on final losses to the disease and are being investigated in current work.

Table 1: Effect of propagator and delivery week on cumulative losses to bacterial soft rot in 22 batches of cyclamen cv. Halios Flame Mix grown on one nursery – 2009

Propagator	Number of plants with bacterial soft rot (of 96) by delivery week					Mean (%)
	19-20	21-22	23-24	25-26	27-28	
A	1	2	3	0	0	1.1
B	-	2	1	0	0	1.2
C	30	18	2	1	1	9.7
D	5	4	0	1	0	1.8
E	-	0	0	-	0	0
Mean (%)	9.2	6.0	1.4	0.4	0.2	

Nursery sources of P. carotovorum

Samples of irrigation water, slime from irrigation lines and sand from beneath capillary matting, taken from a nursery where bacterial soft rot was present, all tested negative for *P. carotovorum.*

Early symptoms of bacterial soft rot in cyclamen

In July and October 2009, samples of cyclamen plants with different suspect symptoms of bacterial soft rot were tested for *P. carotovorum* by laboratory tests. The bacterium was recovered from 2 out of 13 samples tested in July and from 11 out of 22 samples tested in October. The most reliable early symptom of *P. carotovorum* infection of cyclamen was found to be a slimy, malodorous rot, usually originating in the upper part of the corm.

© Agriculture and Horticulture Development Board 2011. All rights reserved.

Although petiole blackening, usually with associated wilting and yellowing of leaves, was found quite commonly in the crop, *P. carotovorum* was rarely recovered from the petiole or corm of plants with this symptom.

Evaluation of treatments for control of bacterial leaf spot of ivy

A literature review in year 1 identified a number of chemical treatments with reported protective value against bacterial infections in ornamentals. A greenhouse trial was established to assess the potential of five preventative treatments to control leaf spot on ivy caused by *Xanthomonas hortorum* pv. *hederae*. Foliar sprays of copper oxychloride as Cuprokylt FL at 0.5% significantly reduced the disease. Treatments with potassium phosphite (Farm-Fos 44), fosetyl-aluminium (3.75 g per L Aliette 80WG), azoxystrobin (1 ml per L Amistar) or 10 mM methyl jasmonate failed to reduce development of leaf spot in comparison with untreated controls. Two applications (before and after inoculation) with copper oxychloride (0.5% Cuprokylt FL) were more effective than a single preventative spray.

Financial benefits

UK cyclamen production is around 16 million plants per year (4-6 million large-flowered and 10-12 million mini-cyclamen) valued at around £16 million (industry estimate, 2008). Assuming an average of 5% of plants are lost to bacterial soft rot (*Pectobacterium carotovorum*), the potential savings to growers by introduction of effective control measures would be worth around £800,000 per annum.

In 2007 and 2008, several UK nurseries growing poinsettia suffered losses caused by *Xanthomonas* leaf spot, affecting young plants from at least two different suppliers. Severely affected plants were unmarketable, others required more labour to remove affected leaves and product was also downgraded. This disease is currently notifiable to PHSI. Information on treatments that prevent and/or reduce spread of this disease is therefore likely to be well received by growers.

Action points for growers

1. Several potentially very damaging diseases of pot plants are caused by bacteria including soft rot of cyclamen and a leaf spot of poinsettia. Growers should be able to recognise symptoms of potentially damaging bacterial diseases.

© Agriculture and Horticulture Development Board 2011. All rights reserved.

2. Due to the lack of approved products with proven bactericidal activity, it is suggested that plants affected by bacterial diseases are removed promptly.

3. There is circumstantial evidence that sciarid fly in young cyclamen may be associated with subsequent increased levels of bacterial soft rot. Check young plants arriving on a nursery for sciarid fly and take measures to control damage to corms caused by sciarid larvae (e.g. treat plants with Nemasys).

4. A slimy soft rot of cyclamen corms, usually originating in the upper part, is a good indication of bacterial soft rot caused by *Pectobacterium carotovorum* (see Figure 1 below). Leaf petiole blackening is not a reliable indicator of the disease.

5. Foliar sprays of copper oxychloride (eg Cuprokylt FL) can significantly reduce bacterial leaf spot of ivy caused by *Xanthomonas hortorum* pv. *hederae.* Use of Cuprokylt FL on protected ornamentals is currently permitted under the Long Term Arrangements for Extension of Use of Pesticides; check the approval status before use on a crop and test spray a small batch of plants first before more widespread use.

Figure 1 Bacterial soft rot symptoms in cyclamen

© Agriculture and Horticulture Development Board 2011. All rights reserved.