



# Good Horticultural Practice for the Prevention and Control of Impatiens Downy Mildew (*Plasmopara obducens*)

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**This document serves to provide growers with guidance for the prevention, management and control of impatiens downy mildew and complements the HDC Factsheet 05/04 (originally published in 2004 and updated in March 2009) entitled 'Impatiens downy mildew'.**

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## Key action points

- Try to ensure any starting plant material is disease free.
- Isolate impatiens material by method of propagation and/or supplier.
- Label batches of plant material noting supplier, planting date etc.
- Provide good air circulation and ventilation in glasshouses.
- Try to avoid long periods of high humidity and leaf wetness.
- Avoid watering crops late in the day.
- Regularly monitor crops and make arrangements for any suspicious plant material to be sent for diagnosis.
- Apply a routine preventative fungicide programme to minimise disease risk, especially during periods when environmental conditions are favourable for downy mildew infection.
- Should the disease be confirmed on site, immediately dispose of diseased material in sealed bags or bins and arrange for it to be destroyed.
- Practice good nursery hygiene by cleaning up plant debris between crops and at the end of the season and use appropriate disinfectants.

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## Background information

In 2003 outbreaks of downy mildew were reported on both seed raised and vegetatively propagated cultivars of *Impatiens walleriana*. Infection by the pathogen was predominantly found in 'mature' ready for sale plants or material planted outside, where plants were sometimes almost completely defoliated by the disease.

In 2004 there was only one reported case of the disease and in 2005 and 2006 no cases were reported. The pathogen reappeared on *I. walleriana* cultivars at relatively low levels in 2007; however in 2008 the disease was widespread in

material planted outdoors and was also found within growing crops on nurseries, which had to be either treated or disposed of as appropriate. The apparent absence of the pathogen in 2005 and 2006 was most likely the result of less favourable environmental conditions; although improved seed and/or stock plant management and better monitoring in commercial crops may have played a part. Since the pathogen can be present in plant material before symptoms appear, continued vigilance is essential, especially when environmental conditions are favourable for the disease

(high humidity levels, leaf wetness, moderate temperatures etc.).

Following the first finding of *P. obducens* in 2003, the pathogen was subject to emergency phytosanitary measures by Defra Plant Health Division pending completion of a Pest Risk Analysis. Following completion of the Analysis ([www.defra.gov.uk/planth/pra/pobducens.pdf](http://www.defra.gov.uk/planth/pra/pobducens.pdf)) and widespread industry consultation, the

general consensus was that impatiens downy mildew could be effectively managed and controlled in much the same way as the other downy mildew pathogens affecting ornamental crops. In 2005, Defra Plant Health Division agreed to industry calls for the disease to be no longer identified as of statutory concern, thus removing the threat of crop destruction.

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### How to recognise the disease

Symptoms of downy mildew on *I. walleriana* are typically paling or yellowing of the foliage and a downward curling of the leaves as shown in Figure 1. On closer inspection, a white 'downy' fungal growth may be visible on the underside of the leaf as shown in Figure 2.

As the disease develops, plants often

become stunted and defoliated by the disease. As already mentioned, it is important to be aware that the pathogen may be present in the crop in advance of any visible symptoms, so it is advisable to regularly monitor crops for plants with reduced vigour and if necessary submit such suspect plants for accurate diagnosis.



1 Leaf paleness and curling



2 White downy sporulation

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### Risk to other crops

Most downy mildew pathogens are plant genera-specific and therefore they will not spread to infect other plant genera on the same nursery. The pathogen responsible for impatiens downy mildew is specific to

certain species and cultivars within the *Balsaminaceae*; at present this appears to be mainly *Impatiens walleriana*. However, there have been occasional, although unconfirmed, reports of the disease on

*I. hawkeri* 'New Guinea' types and on *I. hybrida*, therefore these crops should also be closely monitored.

Importantly the pathogen could potentially also infect wild species within the genus such as *I. noli-tangere* (a weed

species in certain parts of the UK) and *I. glandulifera*, the Indian or Himalayan balsam that has successfully colonised many river banks and other water courses in the UK.

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## Key steps for prevention

### 1 Starting material

*Seed grown crops:* many downy mildew pathogens have been demonstrated to be seed borne and, whilst it has not yet been confirmed in the case of *P. obducens*, there is at least one reported case of seed transmission in the literature. Due to this potential risk, seed raised crops should be grown using a preventative cultural and fungicide programme to minimise the risk of infection arising on seedlings.

*Vegetatively propagated crops:* there is a strong likelihood that the disease came into the UK, potentially in symptomless form, in cutting raised material. Therefore, as in the case of seed grown crops, cutting raised plants should also be treated with an effective preventative cultural and fungicide control programme.

Growers seeking to purchase seed raised or cutting raised plant material should request evidence of preventative cultural and fungicide treatments made to the plant material. This serves to establish if any control measures have been made and to ensure further fungicide control measures do not increase the risk of disease resistance through repeat application of the same chemical type.

Upon receipt of plant material, as far as is practically possible, isolate seed material from cutting raised material

and also segregate cutting material from different sources. Ensure batches of plants are labelled upon receipt and that the labels remain with the crop throughout its life on the nursery. This provides full traceability back to the supplier in the event of problems with impatiens downy mildew.

### 2 Cultural techniques to minimise risk

Downy mildew pathogens require long (usually over 5 hours) periods of high humidity and leaf surface moisture for the initial infection process. Generally, disease symptoms are seen 10–14 days after infection, but they could take longer under cooler conditions. The risk of infection can therefore be reduced by ensuring good air movement around the plants, through adequate plant spacing, good levels of ventilation and the use of fans placed over the crop. Avoid rapid drops in temperatures within growing structures as this can lead to the development of condensation on the crop. Watering the plants early in the day will allow more rapid drying of the foliage prior to nightfall and hence further minimise infection risk. Avoid transporting wet plants long distances in poorly ventilated lorries as this could encourage sporulation and further infection.

In terms of nutrition, don't let crops starve, especially towards the point of marketing as this could make the plants more prone to disease establishment generally.

Remove any self-seeded impatiens plants from bed edges, paths etc. on the nursery on a regular basis and check any wild species of impatiens growing adjacent to the nursery for signs of the disease.

Ensure seed and cutting raised crops are regularly inspected for signs of the disease and dispose of any infected plants into sealed bags or covered bins to prevent localised spread of the disease. If confirmation is required, submit plants for laboratory diagnosis.

In 2008, over-wintering spores were found on infected impatiens for the first time. This finding increases the risk of pathogen carry-over between crops and it is therefore important to clean up all plant debris during crop production and at the end of the season (this includes outdoor display beds of impatiens). Routine use of disinfectants will also help improve general nursery hygiene and minimise the risk of pathogen carry-over between crops and seasons.

### **3 Chemical control options**

There are various chemical control options available and these are listed in detail in the updated HDC Factsheet on impatiens downy mildew. As there remains a potential risk of infection either on the seed or cuttings it is important to apply an early preventative treatment (pre- or post-sowing/post-rooting) and this is perhaps best achieved using a drench application of

a systemic fungicide such as metalaxyl-M (eg Subdue), propamocarb hydrochloride (eg Filex, Proplant) or fosetyl-aluminium (eg Aliette 80 WG). Due to the systemic nature of these products this should provide some 10–14 days protection from the disease. After this period the use of protectant fungicides such as mancozeb (eg Karamate Dry Flo Newtec) or the strobilurin fungicides (eg Amistar) would be useful to keep the plants protected and minimise the risk of fungicide resistance occurring. A further systemic fungicide application could be applied prior to dispatch of the young plants.

Following transplanting the plants should be treated with a high volume spray of a systemic fungicide to provide good protection, ensuring an alternating programme of fungicides from different mode of action groups are used. As mentioned above, a programme of protectant fungicides can then be applied during production and if necessary a systemic fungicide can be applied prior to dispatch.

Some of the above mentioned fungicides possess a label recommendation for use on ornamental crops, others only have a specific off-label approval and are used at growers own risk. If in doubt always test spray a small number of plants first as some fungicides may be phytotoxic, whilst others may leave a spray deposit and give rise to quality issues.

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