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Hygiene and disease avoidance underpin the management of Oomycete stem and root rots

Good routine hygiene, facilitated by use of effective sterilant treatments, remains the backbone of any effective Oomycete disease management strategy. Simply put – clean plants, clean containers and media, clean water and clean kit mean a clean

system and no disease. This may be ‘easier said than done’, but not impossible. In this factsheet, the main factors in maintaining good hygiene and disease avoidance are outlined with reference to more detailed factsheets and reports where relevant.



Figure 1. Dirty production area

Action points

- Good water management is key to successful Oomycete disease management. Reduce flooding to a minimum by good drainage, preventing waterlogging and avoid creation of still water and puddles.
- Make sure that water used for irrigation and washing down is clear of infective pathogen spores (see AHDB Horticulture Factsheet 22/15).
- Once opened, it is vital to keep packages containing unused growing system components, new containers or growing media covered to prevent them becoming contaminated with pathogen spores (eg placing plastic covers over opened bales of unused growing media).
- Unless clearly demonstrated to be pathogen-free, treat all containers, trays, troughs, standing out areas and irrigation lines with a suitable sterilant at the end of cropping, before reusing.
- Monitoring water, growing media, containers and other growing equipment for the presence for plant pathogens can save money and effort by indicating times when no pathogen material is present or pathogen activity is low.
- Maintain regular inspections of crops and, where feasible, eliminate diseased plants before they have an opportunity to develop as strong centres for inoculum production and disease spread.
- Keep paths and production areas in good condition and avoid the build-up of debris.
- Regularly disinfect tools, machinery and footwear.
- Bag up waste material, especially dead plants, plant parts and prunings etc, before removal, to avoid inadvertently redistributing pathogens in production areas.
- Keep all staff informed of and engaged with your hygiene and avoidance strategy to maintain ownership and vigilance.

Water

Water is essential for successful Oomycete infection, and disease can be reduced by avoiding the exposure of crops to free water using good drainage, optimised irrigation, the elimination of still water and puddles or the lifting of crops onto benches, troughs or raised beds. Even when crops are raised away from the ground, puddles and still water can still act as reservoirs of pathogen spores and potential points for dispersal via splash, vehicle and trolley wheels, staff footwear and possibly even hose lines.



Figure 2. Potential spread of Oomycete pathogens via staff footwear

Overly wet growing media and puddles containing algae encourage shore and sciarid flies, which are very mobile and can effectively spread infective Oomycete propagules in their excreta. As with Oomycetes, the numbers of these insects can be kept in check by avoiding over-watering, the clean and timely disposal of old growing media, thorough clean-ups between crops, avoidance of puddles and uncovered flows of nutrient solution/irrigation water, and, wherever possible, the removal of moss and algae.



Figure 3. Examples of undesirable puddles of water



Figure 4. Puddle in work area with the potential of spreading Oomycete pathogens via splash, vehicle and trolley wheels, staff footwear and even hose lines

Water can easily become contaminated with potential pathogen inoculum and is well known as a potent source of rapid and widespread Oomycete infection.

Nevertheless, this risk can be managed, and the sampling and testing of water for Oomycete pathogens and the range of treatments available for their effective elimination from water, are covered in AHDB Factsheets 21/15 and 22/15.

Incoming material

Always source and use the best quality, cleanest planting stocks possible/feasible. Depending on the supplier, incoming plant material can present a significant disease risk. If it is possible to do so, it is always good to keep new plants separate from other plant material, at least initially, to avoid spreading new pathogens. It is helpful to maintain strict hygiene, regular disease monitoring and ideally to use dedicated tools on such material until it is clear that it is safe and clean.



Figure 5. Plant debris left on Danish trolley

Danish trolleys in UK horticultural production are often widely travelled and remain uncleaned for long periods. Swab tests repeatedly show them to carry infective *Pythium* and sometimes *Phytophthora* spores. It is, therefore, wise to marshal incoming trolleys to a holding area, restrict their movement around the business and, where possible, to clean trolleys frequently.

Cleanliness and vigilance

It is often assumed that Oomycete pathogens, especially *Pythium* species, are always present. While this is a useful assumption to make in relation to constantly maintaining hygiene and vigilance, and is often true with untreated soil and surface water, it does not necessarily apply to soilless systems where *Pythium*, *Aphanomyces* and *Phytophthora* can be successfully excluded, and it certainly should NOT be used as a reason for regarding the sometimes tedious processes of good hygiene and pathogen avoidance as costly and futile.

On-site swab tests often reveal widespread distributions of mixed populations of potential disease-causing Oomycetes, especially species of *Pythium*, on paths, benches and standing out areas, on hose pipes, potting machines on nursery staff's footwear (even on cats' paws). However, AHDB-funded research has clearly shown that this pathogen load and, the associated disease risks can be reduced by about 70% with the implementation of simple hygiene measures.



Figure 6. Puddle that could be harbouring plant pathogens

These measures include:

- Keeping paths and production areas tidy and in good repair; cleaning away plant/crop debris
- Using plastic bags for disposal of waste materials to avoid cross-contamination during removal
- Use of sterilants to clean production areas in periods between crops and for cleaning footwear when moving from one area of the nursery to another – especially when moving into sensitive areas such as production beds or water treatment/storage areas
- Regular (annual) cleaning of greenhouse roofs and gutters to avoid the build-up of detritus and possibility of roof drips containing pathogen spores
- Securely covering stored opened containers of growing media or cleaned materials, tools and equipment as uncovered materials are readily contaminated by pathogen spores spread by splash, as well as in plant debris and dust
- Frequent clean-ups and crop monitoring, keeping records and rogueing-out diseased plants early
- Elimination of puddles and areas where still water can accumulate.

AHDB research has shown that maintaining a sustained reasonable effort keeps the concept of disease management on staff's minds and can achieve significant reductions in disease risk.

Good general husbandry

While vigorously growing, stress-free plants may not be resistant to Oomycete root and stem rot pathogens, stress often will make them more susceptible. For example, pot bound plants often sustain *Pythium* or *Phytophthora* infections and even small delays in potting on can result in a drastic increase in *Pythium* infection and disease. Waterlogging can also greatly increase the chances of Oomycete infection as well as assisting the spread of pathogen inoculum.

In the production of larger containerised plants, top-heavy plants need to be trimmed and/or given support to prevent them from falling over as this constitutes a major disease risk, especially in wet conditions when pathogens can either infect the shoots or gain entry to the top of the container.

Monitoring disease and staff training

Accurate recognition of symptoms by staff and regular monitoring and testing for pathogen inoculum are an important part of effective disease management. Early recognition of disease problems can save time, effort and money. It is good practice to routinely get 'unknowns' identified, firstly because this could give early notification of a potentially serious problem, if you sort out a problem immediately it may save extra work later. Secondly, because staff can learn and build their own experience and expertise. When hygiene measures are being taken, it is important to explain how they work and the reasons for them to all staff and to use clear signage to keep hygiene measures fresh in the mind.



Figure 7. Hygiene and disease avoidance good practice

Further information

AHDB Horticulture factsheets and publications

AHDB Factsheet 21/15: Testing water for plant pathogens.

AHDB Factsheet 22/15: Methods of water treatment for the elimination of plant pathogens.

'Baiting stored irrigation water to test for the presence of *Pythium* and *Phytophthora*': Instruction sheet for growers.

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