

# NURSERY PAPERS

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## To dip or not to dip – Foot baths

### INTRODUCTION

**Nursery hygiene is the most basic platform for ensuring pest and disease-free growing areas and producing the best quality stock for sale to customers. Nursery hygiene issues in the propagation and production phases can cause problems that persist for the lifespan of the plants, which may be several decades in the case of woody species.**

Avoiding the introduction of pathogens to the hygiene-critical areas of the nursery is an obvious starting point in planning nursery hygiene protocols, and foot baths are commonly used to help achieve these objectives by preventing unwanted organisms entering nursery spaces. But foot baths should usually be considered a last resort, and only form a part of the overall hygiene strategy for any nursery.

System planning and workflow management should be considered before looking at foot baths or other “active” hygiene practices, including simple hand washing or sanitising before handling plants and other nursery materials. Before investing in infrastructure or implementing procedure changes, the best place to start is by asking questions about specific nursery areas.



*If a foot bath is present it should be used and maintained properly.*

## Planning questions – who, what, when where and why?

### WHO?

For every critical hygiene area in the nursery, consider who has access to the area. Not everyone needs to move through every propagation or production area, and excluding unnecessary personnel from designated clean areas will significantly reduce the risk of pathogen introduction and plant exposure. Do despatch staff have any need to enter propagation areas?

### WHAT?

Identify the specific biosecurity risks for the crops you’re growing – for example, general pathogens that could affect many nursery lines in the same space versus pathogens which would affect only a small number of species or varieties in the nursery. Consider how those organisms are introduced and transferred to plants, and how they spread between plants. This can inform your strategies for dealing with hygiene issues. Some hygiene practices will impact most, if not all, potential biosecurity risks, while other options will only be relevant for a few pathogens.

### WHEN?

Investigate daily workflows and how they impact access to critical hygiene areas in the nursery. The fewer areas people are exposed to before

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# Planning questions (continued)

entering the propagation and production areas, the less likely they are to come in contact with potential contaminants and carry them into clean areas. Try to move plants and other materials (and people, where possible) in one direction only. Moving plants back through the propagation or production cycle increases the risk of contamination being introduced into hygiene-critical areas.

## WHERE?

Clearly designate hygiene-critical areas so staff know the areas to avoid entering or moving stock or materials into. Store propagation materials, including plant material, propagation media, containers and fertilisers away from propagation areas where you're producing new plants. Include procedures about moving and storing materials in staff training. Don't forget to think about where these materials have come from, as well as where you've sourced stock material for propagation – these can be sources of pathogen contamination.

## WHY?

At each step of the propagation and production cycle, ask yourself what the intended outcome of the process is. Consider whether there are steps you can improve or eliminate steps to reduce the risk of pathogen introduction and plant exposure.



Appropriate signage should alert visitors BEFORE they enter the nursery.

# Successful foot bath implementation

**A foot bath is a very simple form of biosecurity that helps prevent the potential spread of disease. It can be a useful element to support your broader biosecurity strategy.**

The purpose of a foot bath is to reduce the load of microbes carried into critical-hygiene areas of the nursery. This particularly applies to areas where the climatic conditions are enhanced for plant propagation. These usually feature increased temperature and humidity compared to unregulated nursery areas. The conditions that promote young plant growth are also ideal for the growth of fungi and bacteria – and this presents a problem.

Take the following four steps to implement effective foot bath use in the nursery:

## 1. Strategic placement

Positioning foot baths at all entry points, including vehicle access points, pedestrian entrances, and transition zones between production areas, is essential to intercept potential contaminants. Additionally, installing foot baths within production areas achieves a level of internal biosecurity control by minimising cross-contamination between zones.

## 2. Clear signage and instructions

Providing prominent signage and clear instructions detailing foot bath protocols is crucial to promote compliance among nursery staff, visitors and contractors. Instructions should emphasise the importance of proper footwear hygiene, including thorough cleaning of footwear to remove soil and debris before entry, and ensuring adequate immersion time in the foot bath.

## 3. Regular maintenance and monitoring

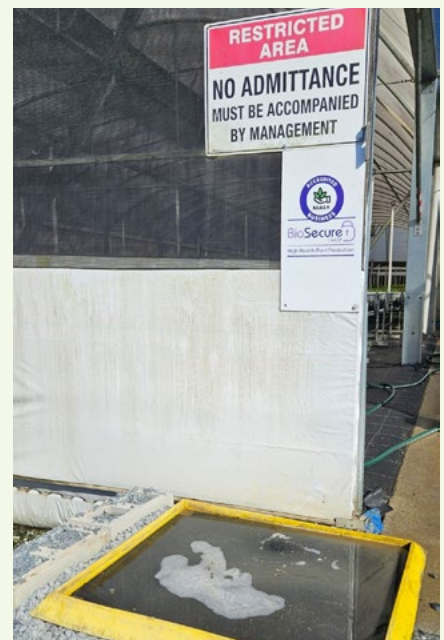
Routinely maintaining and monitoring foot baths is imperative. This entails monitoring disinfectant concentration levels, replenishing solutions as needed, and cleaning foot bath

surfaces to prevent biofilm formation and organic buildup. Regular inspections also enable prompt identification and rectification of any mechanical issues or deficiencies in foot bath infrastructure.

## 4. Training and education

Investing in comprehensive staff training and education programs fosters a culture of biosecurity awareness and accountability within the nursery. Training initiatives should cover proper foot bath use, handling disinfectants, recognising biosecurity risks, and protocols for reporting incidents or variations from standard operating procedures. Training should reach all personnel entering the nursery environment, including employees, visitors and contractors. The foot bath will only be effective if it is used every time people access growing areas.

Ideally the foot bath will reduce bacterial and fungal contaminants, but can also reduce insect and weed introductions into propagation and production areas. Importantly, baths for feet alone might need to be supplemented with vehicle baths at nursery entry points for both external and internally used vehicles, including trolleys and electric carts (see below).



Foot baths must be maintained to ensure disinfectant levels are at the right concentration and volume to be effective.



# Effective disinfectant chemicals

**Selecting the appropriate disinfectant is essential to the success of foot bath protocols. Several factors influence the choice of disinfectant, including efficacy, safety, compatibility and environmental impact. Boots should be cleaned and rinsed before disinfecting for maximum protection. Common disinfectants used in foot baths include:**

## 1. Quaternary ammonium compounds (Quats)

Quats are widely used for their broad-spectrum antimicrobial activity and residual efficacy. They eliminate diverse pathogens while posing minimal risk to humans and the environment. Moreover, Quats are relatively stable and compatible with many footwear materials, making them suitable for routine foot bath use. There are a range of compounds classified as Quats however not all are the same with some being highly toxic to plants – reading the label is essential.

## 2. Chlorine-based solutions

Chlorine-based disinfectants, such as sodium hypochlorite (bleach), diluted to a 1% solution offers potent antimicrobial properties and rapid

action against pathogens. However, concerns regarding corrosiveness, material compatibility, and environmental safety means chlorine requires cautious use.

## 3. Hydrogen peroxide

Hydrogen peroxide is prized for its broad-spectrum efficacy, rapid biodegradability and minimal environmental impact. It acts by generating reactive oxygen with antimicrobial effects, making it a viable option for foot bath applications. Excessive organic matter or soil on boots or tyres can reduce the effectiveness of this disinfectant.

## 4. Peroxygen compounds

Products such as Virkon S are effective against a wide range of bacteria, fungi, viruses and spores, making it a potent disinfectant with broad-spectrum activity. It is generally effective for up to seven days in solution. It also has a low likelihood of irritation or toxicity for humans in its diluted form.

Each disinfectant presents unique advantages and limitations. You need to consider safety, material compatibility and ease of use, when selecting the optimal formulation for your foot bath. Generally, disinfectant products' effectiveness decreases if they become dirty or diluted.

# Other considerations

## 1. Footwear compatibility

Disinfectants used in foot baths have varying degrees of compatibility with different footwear materials. Abrasive or corrosive formulations can compromise the integrity of footwear, leading to premature wear and tear. Select disinfectants that strike a balance between efficacy and footwear compatibility to minimise adverse effects.

## 2. Resource allocation

You need dedicated resource allocation to implement and maintain disinfecting foot baths. Consider allocating resources such as infrastructure, personnel and operational expenses.

You'll need to budget for:

- foot bath equipment, disinfectant solutions and ancillary supplies
- staff time for installation, monitoring and maintenance activities
- ongoing operational costs, including replenishing disinfectant solutions and replacing worn components.

## 3. Risk assessment and adaptation

Conducting regular risk assessments enables nurseries to identify emerging threats, assess vulnerabilities, and refine biosecurity strategies. Flexibility and adaptability in response to evolving biosecurity challenges, such as the emergence of new pathogens or changes in pest distribution patterns, are essential for maintaining the efficacy of foot bath protocols. Incorporating feedback mechanisms, incident reporting procedures and post-implementation reviews facilitates continuous improvement and adaptive management practices within the nursery environment.



*Dual foot bath and vehicle bath with safety rail.*



# Vehicle baths



*Vehicle baths must be of a sufficient size that wheels completely come in contact with disinfectant.*

**The primary function of vehicle baths is to disinfect external surfaces of vehicles and equipment, effectively removing adherent soil, organic matter and potential biosecurity threats. Using high-pressure sprayers or immersion systems, vehicle baths deliver disinfectant solutions to neutralise a broad spectrum of pathogens, including bacteria, fungi, viruses and nematodes.**

As for foot baths, vehicle bath effectiveness is reliant on appropriate disinfectant concentration and sufficient immersion time. Baths must be deep enough and long enough that a vehicle's wheels are immersed in the treatment completely while driving through.

Strategic placement of vehicle baths at key entry and exit points ensures systematic decontamination of incoming and outgoing vehicles, preventing the inadvertent introduction or spread of pathogens within the nursery environment. Entrances from external roadways, loading docks and equipment storage areas represent critical junctures where vehicle baths exert maximal biosecurity impact.

By enforcing mandatory vehicle decontamination procedures, nurseries establish a robust barrier against the transmission of diseases, pests and weed seeds that pose biosecurity threats to plant health and nursery productivity.

## MORE INFORMATION

Visit the Greenlife Industry Australia website ([www.greenlifeindustry.com.au/communications-centre?category=rd-updates](http://www.greenlifeindustry.com.au/communications-centre?category=rd-updates)) for more information on biosecurity.

Past Nursery Papers: [www.greenlifeindustry.com.au/communications-centre](http://www.greenlifeindustry.com.au/communications-centre)