

# Effective Cleaning Practices to Prevent Diseases

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# What is a plant disease?

*A plant disease is a condition where a plant's normal functions are disrupted due to a living organism (pathogen) like a fungus, bacteria, or virus, or by environmental factors like nutrient deficiencies, causing abnormal growth or appearance in the plant.*



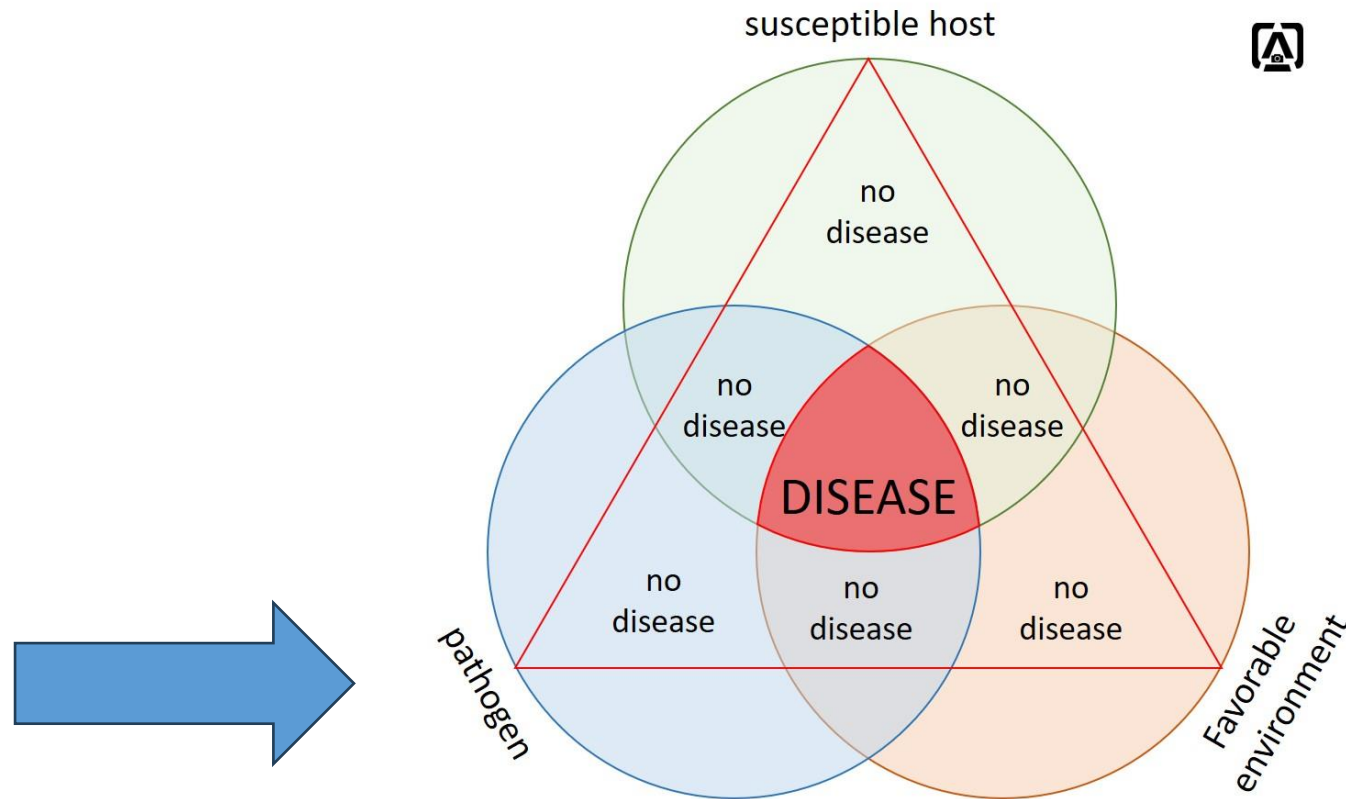
# Why should I care about diseases?



- **Plant stress:**
  - Lower yield
  - Changed susceptibility, performance, taste, appearance
- **Plant death**



# How can I prevent plant diseases?



**Plant disease is prevented when any one of these three components is eliminated!!**

# Chlorine Bleach

- ✓ Effective disinfectant if used properly; has a long history of use by growers.
- ✓ Recommended dilution: 1 part household bleach to 9 parts water (0.5% strength).



- ✗ Corrosive, can damage plastics and metals with repeated use.
- ✗ Requires longer soaking time and rinsing afterward.
- ✗ Phytotoxic to some plants.
- ✗ Ventilation is needed when using bleach.
- ✗ Chlorine bleach is less stable than other disinfectants for greenhouse surfaces.
- ✗ Recommended for pots or flats, but not walls, benches, or flooring.
- ✗ Short-lived solution: the chlorine concentration reduces by half every two hours.
- ✗ Must be prepared fresh before each use to ensure effectiveness.

# Isopropyl Alcohol (70%)

- ✓ Very effective sanitizer.
- ✓ Acts immediately upon contact.
- ✓ It can be used as a dip or swipe treatment on knives and cutting tools.
- ✓ No rinsing with water is required.

✗ Not suitable for soaking pots, flats, walls, benches or flooring due to flammability.



# Quaternary ammonium chloride salts

- ✓ Kills bacteria, fungi, viral plant pathogens and algae.
- ✓ Can be used on floors, walls, benches, tools, pots, and flats.
- ✓ Physan 20® can also be used on seeds, cut flowers, and plants.
- ✓ Active solutions tend to foam; when foaming stops, they are no longer effective.
- ✓ No rinsing off with water is needed after application.
- ✗ Contact with organic matter will inactivate Q-salts → KleenGrow™ offers higher organic tolerances and longer residual activity on hard surfaces.
- ✗ Prepare fresh solutions frequently, ideally twice a day.



Quaternary Test Kit



# Hydrogen Dioxide and Peroxyacetic Acid

- ✓ Kills bacteria, fungi, algae, and their spores immediately on contact.
- ✓ Approved for disinfecting greenhouse surfaces, equipment, benches, pots, trays, tools, and plants.
- ✓ SaniDate® 12.0 can be applied through irrigation systems.
- ✓ OxiDate® and SaniDate® are certified organic products.

- ✗ Strong oxidizing agent; do not mix with other pesticides or fertilizers.
- ✗ All surfaces should be thoroughly wetted before treatment.
- ✗ Concentrate is corrosive, and can cause eye and skin irritation.
- ✗ Can cause phytotoxicity if applied above labeled rates or on stressed plants.





# Others

- ✓ Kills virus, bacteria, fungi, and some spores immediately on contact. One of the best virucides in the market.
- ✓ Non- corrosive when used according to recommendations.
- ✓ Effective in the presence of organic matter.
- ✓ Biodegradable.

- ✗ Potential phytotoxicity if improperly diluted or applied to close to plants.
- ✗ Can be more expensive than other disinfection options.
- ✗ Short shelf life once mixed.
- ✗ It requires careful handling and the use of PPE to avoid health risks.
- ✗ Improper disposal could lead to environmental concerns, particularly in water systems.



## Active Ingredients

Potassium peroxymonosulfate .....	21.41%
Sodium Chloride.....	1.50%
Other ingredients .....	77.09%
Total ingredient .....	100.00%

**MOST IMPORTANT!**





# Heating Methods

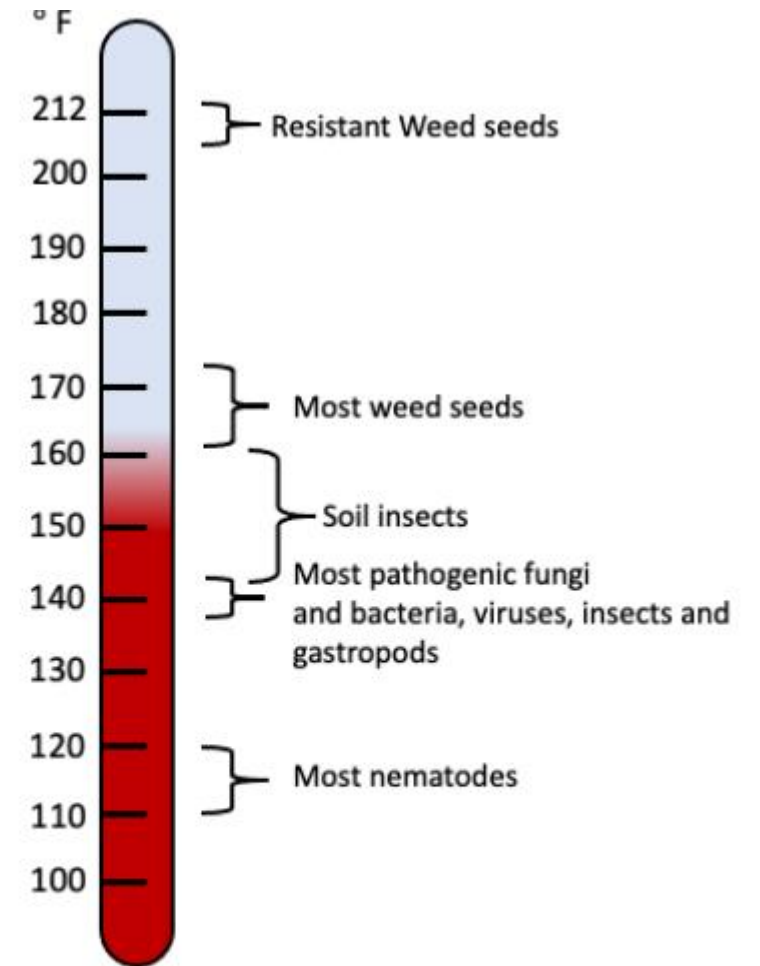


- ❖ good tilth
- ❖ neither too wet nor too dry
- ❖ **80°C/176°F for 30 min**

- ❖ Hot water
- ❖ Aereated steam
- ❖ **60°C/140°F for 10 min**



Source: Horticultural Development Company



**Figure 2. Generalizing the temperatures required to kill common plant pathogens, pests, and weeds. Heat treatment can be used to kill unwanted pathogens on tools.**

Source: University of Hawaii



# What should I clean?





# When should I clean?

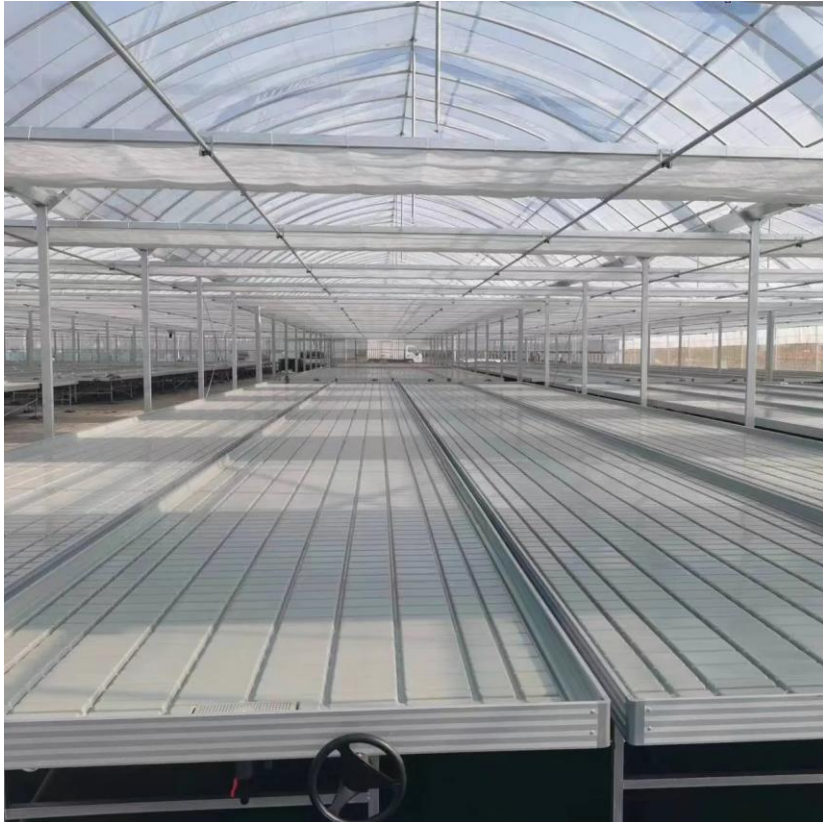


Source: Farmbiosecurity





# When should I clean?



**EMPTY**

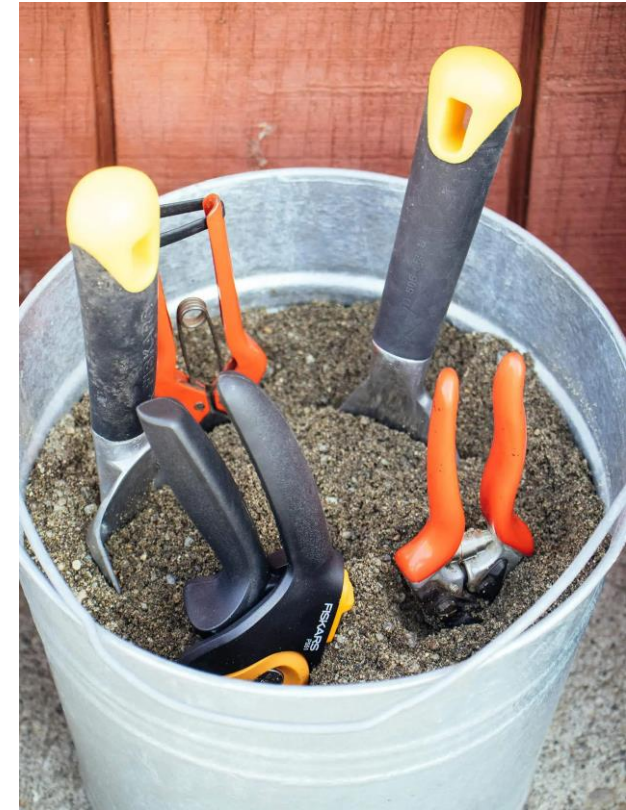
**NO PLANT DEBRIS**

**NO ORGANIC MATTER**



Source: Horticultural Development Company

# Exclusion





# Decontamination Stations



Source: OMAFRA



Source: OMAFRA



Source: Royal Brinkman



**Figure 3. Decontamination station containing footbath, brushes, and hand-spray bottle with 70% isopropyl alcohol to clean and sanitize footwear and clothes prior to greenhouse entry.**

Source: University of Hawaii



# After it is Clean, Keep it Clean!

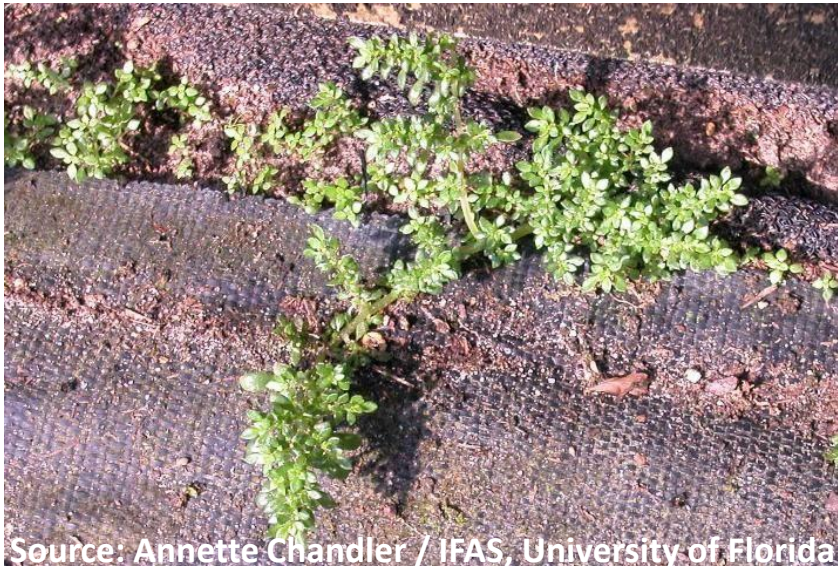
**"It's not the cleanest person who cleans the most, but the one who makes the least mess."**





# After it is Clean, Keep it Clean!

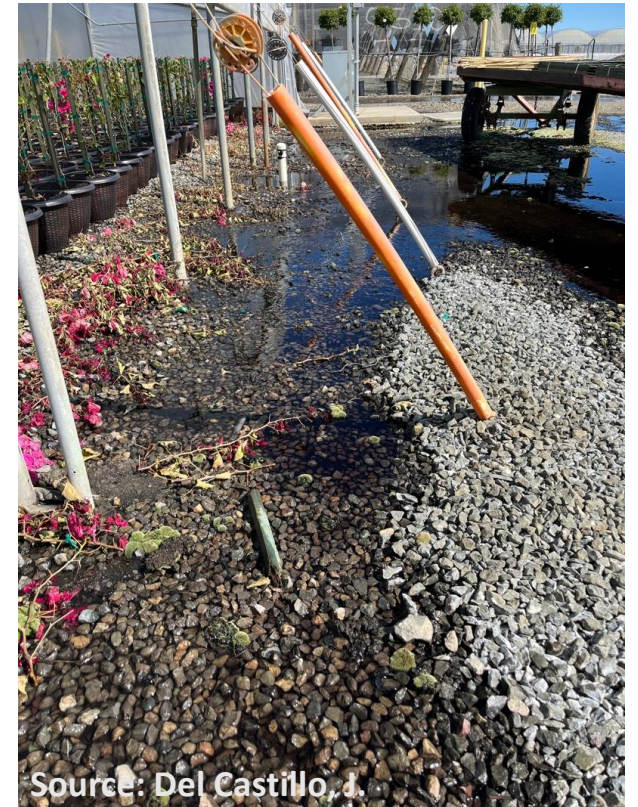
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Source: Annette Chandler / IFAS, University of Florida



Source: Del Castillo, J.



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