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primefacts

FOR PROFITABLE, ADAPTIVE AND SUSTAINABLE PRIMARY INDUSTRIES

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On-farm hygiene and sanitation for greenhouse horticulture

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Options for pest and disease control range from basic cultural practices such as good sanitation and hygiene to biological and chemical control. Increasingly, options for effective chemical control are becoming limited due to resistance in the pests and pathogens, the discovery of toxic effects of certain chemicals and residue accumulation and breakdown differing amongst field and hydroponic growing conditions. Many growers are now taking up integrated pest and disease management (IPM) strategies, of which one component is limiting the use of harsh pesticides.

A keystone in IPM is crop hygiene. If plants are heavily infested with pests and diseases, control with biocontrol agents and soft chemicals is difficult. There are many basic practices which can be used to clean up pest and disease problems and to maintain a crop with lower pest and disease problems. In an ideal new farm situation the basics of implementing good farm hygiene practices are straightforward: use: clean seedlings; clean mix; clean water; and netting to prevent insects where appropriate; and only allow ‘clean’ people into the crop area. Eventually, however, most growers do have mounting problems with pests and diseases, the question is then what do you do? In fast rotation crops like lettuce and cucumber, there are some basic measures which can be put into place to reduce the spread and severity of pests and disease within and between crops.

The purpose of this Primefact is to outline some basic sanitation and hygiene practices which can readily be put into use on farms. Good sanitation and hygiene practices and related methods of pest and disease exclusion include:

- healthy plants
- scouting
- identifying pests and diseases
- roguing
- good working practices within a crop
- footbaths
- cleaning out structures between crops
- sanitisation of water
- clean media
- clean seedlings
- weed control
- algae control
- screening
- sealing surfaces
- clean cutting implements
- limiting visitors
- successive plantings
- controlling plant debris and finished crops.

Healthy plants

Healthy plants are less susceptible to many pests and diseases. Maintaining a balanced fertilising and watering program can help to reduce the occurrence and severity of pest and disease problems. However, even healthy plants can get pests and diseases.

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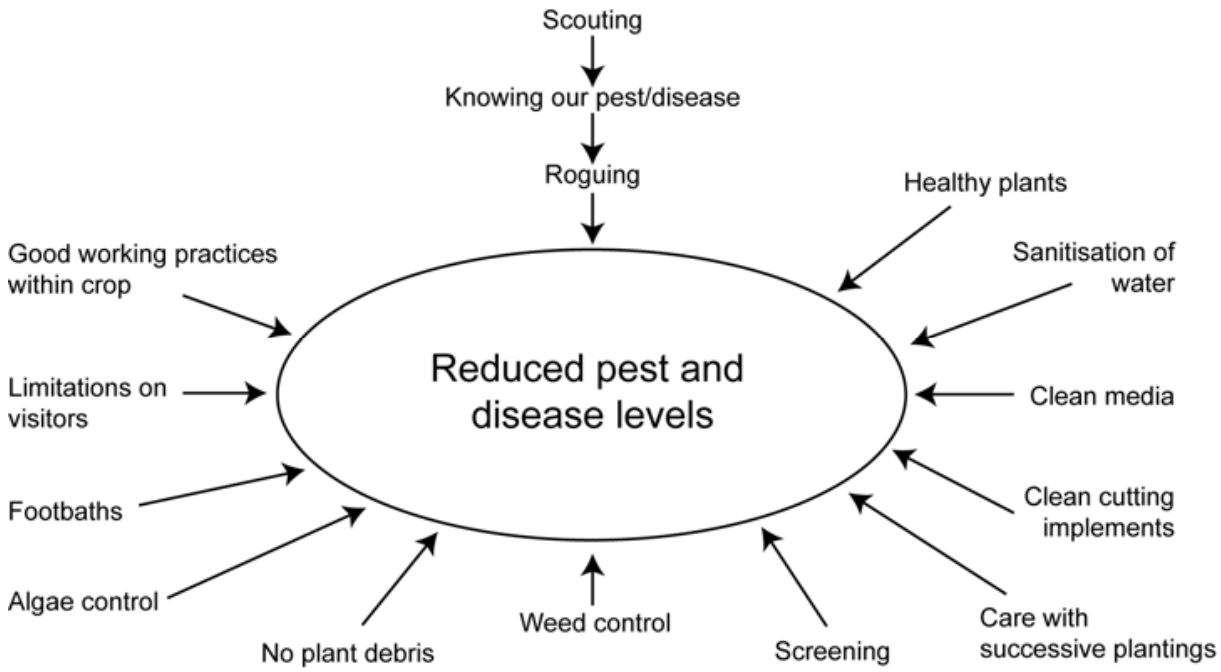

Figure 1. Good sanitation and hygiene methods can lead to reduced pest and disease levels.

Scouting

Regular daily/weekly checking of crops for the presence of pests and diseases is essential for maintaining the healthiest, cleanest crop possible. Early detection of pests and diseases allows for quick intervention and can prevent problems from developing that may require chemical applications. The use of sticky traps (changed weekly) to monitor insect levels at different areas within a crop is essential for checking for pest incursions and helps with decision making about the release of beneficial insects and/or chemical applications.

Know your pest and disease problem

It is crucial to accurately identify what pests and diseases are in your crop. There are many published posters and handbooks on the pests and diseases of hydroponic crops which can serve as guides. Often with some growing experience it is possible to identify many common disease symptoms and disorders but occasionally new disease outbreaks occur. It is recommended that you contact an expert (district horticulturalist or extension officer) or send samples to a diagnostic laboratory for accurate testing if unusual or very severe problems develop.

Roguing

The simplest method of treating diseased plants often is to get rid of the problem – remove the infested leaves or even the whole plant(s) from the growing area, and treat surrounding plants with preventative chemicals (if possible). However, the removal of infected plants depends on the disease. It would be unnecessary to remove a whole cucumber plant because of a lesion of powdery mildew on a leaf. Alternatively it is essential to remove virus-infected plants because they serve as virus reservoirs, allowing infection to spread. It is also essential to remove plant debris infected with the fungus *Botrytis* in tomato crops – the spores will easily spread and often cause fruit ghost spotting which makes the fruit unmarketable.

Figure 2. Tomato fruit infected with Botrytis*.*

Botrytis spores will also infect flowers and freshly cut stems after de-leafing in all greenhouse vegetable crops.

Good agricultural practices within the crop

Care should be taken when removing leaves, fruit and flowers from plants as many diseases can be spread by touching plants. It is recommended that farm workers start work in the areas of the crop which are the most disease free and work towards the area with disease if a disease is present as this limits moving the disease to non-diseased areas.

For the same reason if a greenhouse/field has a disease it should always be worked in at the end of the day rather than at the beginning, as working in the diseased areas first can be picked up on hands, tools and clothing, thereby spreading the disease. If this is not possible disposable gloves, suits and booties should be worn for each area. If an easily transmittable disease such as bacterial canker is thought to be present, care should be taken to routinely change gloves, as often tomato plants may be infected with the canker bacteria but not yet show symptoms.

Footbaths

Footbaths are an easy and effective way of removing pathogens present on shoes and soil adhered to the shoes. Footbaths should always be wet, have active sterilising (disinfectant) solution in the mat and be relatively clean. If the footbath mat is dry, it is not effective. Care should be taken to rinse off footbaths on a regular basis to ensure that they do not get clogged up with plant debris and soil. The chemical solution should be changed on a regular basis depending on the product used.

Figure 3. Clean footbaths are excellent for sanitising workers' boots.

Cleaning out structures between crops

One of the most effective ways of reducing disease carryover from one crop to the next is by cleaning out and disinfesting structures between plantings. To effectively clean: all biological matter (plants, soil, algae, etc.) should be removed; all water pipes and hoses should be descaled and flushed with appropriate chemicals to remove pathogens; all surfaces should be washed down and rinsed with disinfectants. The surfaces cleaned should include hydroponic channels, the space between plant rows, sides of greenhouses, pathways, etc. When a crop is finished, an adequate length of time should be left between removing the plants and putting in a new crop to allow full scrub down of structures to remove infectious fungi, bacteria and viral particles. Using a high pressure hot water unit with detergent is a good way to clean down and sanitise surfaces.

Sanitisation of water

A good way of reducing the occurrence and spread of many diseases is to use clean water. This often is not possible in recirculating nutrient growth conditions and/or when dam or bore water is used. If a water-borne disease problem is thought to be occurring it is recommended that the water be tested for pathogens such as species of *Phytophthora*, *Pythium* and *Fusarium* before the expense of sanitising the water is undertaken. Water sanitisation using chemicals and/or ultra violet (UV) light has been shown to be effective at reducing the levels of *Phytophthora*, *Pythium* and *Fusarium*. The effectiveness of these treatments at removing all pathogens is dependent on the initial level of pathogens in the solution and may also be affected by other factors such as water turbidity, pH, and debris. It may be necessary to filter the water to remove debris and insoluble particles before sanitisation when water quality is very poor.

Clean growing media

Using disease-free potting media can significantly reduce the risk of disease developing. It is important when new media arrives that it is stored in a soil-free area away from possible contaminated material already on the farm from the previous crop. Re-using media is not encouraged unless the second planting is of a different crop to the first, for example cucumber then tomato. The continual replanting and re-use of media bags can lead to many disease problems including anthracnose in tomato.

Clean seedlings

It is important before planting that new seedlings are examined for pests and diseases. If pests or diseases are observed in low numbers a preventative early spray or the release of biological agents can prevent problems at a later stage in the crop. It is crucial upon the arrival of new seedlings, that the seedlings are stored in a soil-free area away from the current crop (if a crop is in) and away from weeds. New seedlings are readily colonised by pests and diseases.

Algae control

It is important that algal levels are kept to a minimum in hydroponic crops as algae can act as buffers, preventing effective chemical sanitisation such as bleach. Algae on the ground can also act as a food source for fungus gnats. Fungus gnats can directly reduce plant growth by larval feeding of roots but they can also spread spores of plant pathogens.

Weed control

Weeds in and around crops can act as alternative hosts for a number of insect species and can harbour viruses, allowing the quick and easy spread of virus disease into crops. Regular removal of weeds within and around crops can reduce pest pressure and reduce virus incidence. It is particularly important with tomato spotted wilt virus (TSWV) and western flower thrips (WFT) to remove alternative weedy hosts from areas around crop fields/ greenhouses. The use of weed-proof matting under non-sealed benches in greenhouses can also reduce weed levels.

Figure 4. Weeds around greenhouses are hosts for pests and diseases and should be removed.

Sealing surfaces

The use of sealed cement paths and surfaces within greenhouses allows for easy cleaning to reduce pathogen propagules. Many plant pathogens such as bacteria and fungi can reside in soil paths for long periods of time; cement or a sealed surface which can be readily cleaned down improves the ability to eradicate pests and pathogens between crops.

Clean cutting implements

Many diseases, especially viruses and bacteria, are transmitted on cutting implements (secateurs, knives, etc.). Care should be taken to routinely sterilise cutters using a disinfecting solution such as bleach, alcohol, or other commercial product.

Screening

In greenhouses, one easy way of reducing pest incidence is to screen all openings and ensure there are no rips or tears in the plastic covering. Screening with whitefly or thrips grade mesh significantly reduces the amount of thrips, whiteflies, Rutherglen bugs, moths and aphids. Another advantage of screening is that it helps to keep biocontrol insects trapped inside.

Controlling plant debris

Although plant debris (old removed leaves, unmarketable fruit, etc.) can serve as a reservoir for some beneficial insects, debris almost always encourages higher disease levels. It is recommended that plant debris be removed from the area where crops are grown.

Figure 5. Old plant debris should be removed from the farm as it can act as a source of diseases and pests.

Successive plantings

Care should be taken to allow an adequate break between crops to allow for the cleaning out of structures, etc. It is not recommended that successive plantings of the one crop be made within the one field/greenhouse at the same time – having new plants directly next to old plants allows pests and diseases from old plants to migrate to the new plants. If successive plantings within the one greenhouse/field are undertaken, a plant-free zone or barrier should be placed between the crops.

Plant-free zones

Plant-free zones are bare areas where no crops are grown. Care should be taken to ensure that weeds are not allowed to grow in these areas. Plant-free zones provide buffers between cropping areas and can help to prevent the spread of diseases.

Visitors and farm staff

Another method of introducing new pests and diseases onto farms is by visitors and farm staff. Pests and diseases can be moved on contaminated clothing and even on mobile phones. Care should be taken to minimise moving between farms on any given day. It should be encouraged that workers only work within the one farm site per day to prevent potential pest and disease spread. Similar precautions to working within a crop should be applied to visitors; it should be assumed that visitors are contaminated and care should be taken to include the use of disposable gloves (only used on that farm) and hygiene jackets. Shoes should be sprayed or covered in booties to prevent the movement of pathogens. Footbaths should be used on entry to farms to prevent the movement of soil-borne pathogens.

Further information

Keep it clean. Reducing costs and losses in the management of pests and diseases in the greenhouse. Jeremy Badgery-Parker. Industry and Investment NSW.

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