# Keeping Plants Happy

Managing a plant pest – be it an insect pest, disease causing organism or a weed involves a multi-pronged approach in order to keep your plants healthy and hence happy. Reaching for a bottle of "cure-all" pesticide is not a solution and there is no such thing as a chemical that can solve all your problems. Sadly, most plant problems that were diagnosed at the Plant Health Laboratory, Agri-food & Veterinary Authority were actually a result of neglect.

A multitude of microscopic and submicroscopic pathogens and insects existing in nature can cause significant damage to plants. The first step in managing plant health problems is to identify the causal agent(s) correctly. Accurate diagnosis is dependent on getting sufficient information from the grower on the healthy versus unhealthy plants, presence of possible agents responsible for the problem and the surrounding environment, growing conditions and growing practices. This determines the appropriate laboratory tests to be conducted to obtain information on possible causal agents and for the final diagnosis. Diagnosis based solely on symptoms is risky and may lead to inaccurate conclusions.

**Examples of some observations that growers can take note of are:**

**Questions about the healthy plant**

- What is the genus, species names of the plant in question?
- Is the plant sensitive to certain environmental factors i.e. salinity, excess of deficient soil moisture etc.?
- What are the characteristics, appearance and growth habits of the healthy plant?
- How does the plant normally appear when grown under various conditions i.e. indoor vs outdoor?

**Questions about the unhealthy plant**

- What are the symptoms of the affected plant? What were the initial symptoms? When did the symptoms first occur?
- Which plant parts are affected?
- Are symptoms present only on exposed plant surfaces or also on protected, covered tissues such as unexpanded or unopened flowers?
- What is the distribution of the symptoms i.e only one side of the plant, only on older or newer leaves, only one plant affected etc.?
- How rapidly do early symptoms change into advanced ones?
- How long have the symptoms been present?
- Is a particular growth stage associated with the problem?

**Questions about the surrounding environment**

- Have there been any unusual weather patterns, changes of developments recently or in the past few weeks or months?
- Is there any evidence of stress factors ie. Temperature extremes, water stress or excess, salt buildup, pollution, wind or other mechanical damage etc?
- Has the soil been exposed to these stress factors as well?
- What type of fertilizers have you applied?
- How often & how much do you water the plant? How does the water drain of the site?
- Did the onset of symptoms correspond with any new cultural practice?

Plant pests are mainly bacteria, fungi, viruses, phytoplasmas, the larval stages (caterpillars) and adults of moths, beetles, thrips, mites, nematodes and weeds.

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For insects, the damage and loss of the plants usually arise from their feeding or during the course of completing their life cycles on the plants. Good cultural practices and farm sanitation, such as removing weeds and infected plant parts, and improving ventilation, can prevent or reduce the spread of infection.

**Symptoms or Signs of Insect and Pest Attack:**

| Types of Damage | Pests responsible |
|---|---|
| Chewed foliage, blossoms or fruits | • Larvae of moths & butterflies (caterpillars), Beetle larvae or adults, Grasshoppers & crickets, Snails & Slugs |
| Bleached, bronzed, silvered, stippled (flecked), streaked or mined leaves | • Leafhoppers, Plant bugs, Thrips, Aphids, Psyllids, Spider mites, Leaf miners |
| Distortion (swelling, twisting, cupping) of plant parts | • Thrips, Aphids, Eriophyid mites, Gall makers, Psyllids, Nematodes (root galls) |
| Dieback of twigs, shoot of entire plant: frass may issue from holes | • Borers (beetles or moths), Scales, Gall makers |
| Presence of insects or insect related products on plants: | |
| • Honeydew and sooty mould | Aphids, soft scales, leafhoppers, mealybugs, psyllids, whiteflies |
| • Faecal specks on leaves | Lace bugs, thrips, some leaf beetles, plant bugs |
| • Webs and rolled leaves | Webworms, leaf-rollers |
| • Cottony fibrous materials | Mealybugs, some aphids, plant bugs, some scales, some whiteflies |

Methods for control of plant diseases and pests vary depending on the plants, the pests and the causal agents. In general, control measures should be applied to entire plant beds or garden patch rather than just an individual plant. Damage and loss to one or a few plants are insignificant compared to the population. In most infectious disease incidents, cure of the disease is difficult once it has set in; therefore almost all methods are aimed at preventing and protecting against attacks.

A multi-pronged approach to keep your plants happy and healthy is to use Integrated Pest Management (IPM), which is an integrated pest and disease control strategy that combines the appropriate use of various control methods. Physical barriers of planting within a netted structure to exclude pests could be the first defence. Secondly, following good cultural and agronomic practices keeps your vegetables and plants in good vigour that they would not succumb to diseases and pest attacks. In addition, sticky traps (yellow or blue sticky boards) are non-chemical means of reducing the incidental pests within the structures. In IPM, pesticides are used only when absolutely necessary or as the last resort. Where possible, encourage the proliferation of beneficial insects.

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The following is a summary of Plant Health Management Tips:

***Sanitation*** (hygienic agro-practices)
Follow good agronomic practices with a mind to lower disease presence by following proper sanitation, drainage, fertiliser and weed control programs. Remove all dead, diseased and pest infested plant trash to be incinerated and not to be recycled in compost. Prune away dead and unhealthy stems and branches. Remove weeds to reduce sources of disease and shelters for pests. Also observe recommended sowing density and plant distances. When planting a susceptible variety of vegetables, it is advisable to implement crop rotation to some other crop types to reduce the chance of disease occurrence or build up of specific pests with continuous monocultures. Allow the soil to rest; leave it to fallow or sun between planting.

## *Maintain Plant Vigour*

Plants in healthy growing conditions are usually able to resist pests better. Apply fertilisers and water in optimum amounts but not excessively especially in poorly drained soils or media. Do not overcrowd seedlings and plants so as to allow adequate air circulation. Proper ventilation reduces humidity and moisture levels, which are conditions favourable for disease development.

## *Resistant Varieties*

Some plants are more resistant to pests and diseases than others. Plan and select hardy plant varieties for the garden. Plant a variety of plants in the garden so that a population of certain pests will not prevail.

## *Natural Predators*

Allow the natural predators to flourish around your plants by minimising the use of pesticides. Some wasps, ants, spiders, lacewings, ladybird beetles and even birds are natural enemies of pests and can act as controls. Adults or larval stages of these insect predators feed on target plant pests. Protect the adults, egg clusters, larvae and pupae of these insect predators on our plants if you see any of these.

Figure 1: Eggs, larva and adult of ladybird beetle

Figure 2: Eggs, larva and adult of lacewing

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## *Traps, Screens and Protein baits*

Sticky traps are useful physical method of reducing pest populations. Yellow plastic corrugated boards with a coat of tacky glue (polybutene) or vaseline cream make effective sticky traps for flying insects of whiteflies, thrips, leafhoppers, gnats etc. Netted screens will physically exclude pests i.e. small insects and moths. Large fruit vegetables or fruits may be wrapped with opened ended plastic or paper bags to screen off fruit flies. Alternatively, protein baits can be applied to plants besides fruit trees to attract fruit flies away from your fruits and to feed on these protein baits. These baits act as stomach poisons killing the fruit flies.

Figure 3: Yellow sticky trap

## *Pesticides*

Use pesticides only when necessary as in when situation begins to run out of control for quick knock down of pest or disease populations. Fungicides are used against fungi, nematicides against nematodes, bactericides against bacteria and insecticides against insects. ***Pests and diseases should be properly identified and diagnosed for the appropriate pesticides to be used for effective control.*** Misuse of pesticides or frequently, the wrong use of insecticide for disease problem could lead to build-up of pest resistance to the chemical rendering it no longer effective or simply killing the beneficial insects.

## *Phytosanitation*

Unknown to most people, there is an over-arching system in place that screens the import of plants before you see them in the retail nurseries. It is a preventive measure that safeguards the plant health in Singapore i.e. the first line of defense for keeping plants healthy in Singapore. The Agri-Food and Veterinary Authority of Singapore (AVA) is the government agency that works relentlessly to ensure that plants and planting materials imported are certified free from exotic plant pests before they are allowed in. It also maintains a watchful eye on invasives through plant pest surveillance programmes in high risk sites i.e. parks & premises near port of entries or nurseries with high import volume.

A major challenge of their work is to raise public awareness of the adverse impact of invasive plant pests. Everyone has a part to play in keeping plants happy and healthy in the Garden City. Buying an exotic plant species from overseas or internet and bypassing regulations to add to your collection might appear innocent on the surface. So is with discarding it once it succumbs to plant pests. But this pathway is an open invitation to potential invasive plant pests that sadly, once introduced undetected, are here to stay for a long term and could even wipe out a particular susceptible native plant species/variety.

Therefore, to keep your plants happy, you need to be a responsible plant owner. You have a vital part to play from how you bring in/buy your plant, ensuring that you do not neglect them and using an integrated pest management approach to

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ensure their well-being and that of the environment. To join the fight against invasive plant pests and be a member of the Plant Health Surveillance Network – contact AVA_Planthealth@ava.gov.sg for more information.

## Common Plant Pests:

Figure 4: Aphids

Figure 5: Mealybugs

Figure 6: Shot hole damage on leaf caused by flea beetle

Figure 7: Scale infestation

Figure 8: Mining trails caused by leafminers tunneling through the leaves.

Figure 9: Damage caused by wood borers on tree trunk

Figure 10: Bagworms infestation

Figure 11: Viral ringspots on orchid leaves.

Figure 10: Thrips infestation

Figure 11: Anthracnose on leaf.

Figure 12: Viral mosaic symptoms on palm frond.

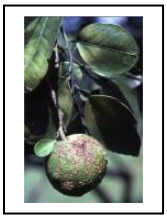

Figure 13: Bacterial cankers on lime fruit.

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