



Control plant pests, diseases and disorders

AHCPMG302A

By the end of this topic, you should be able to:

- Assess pests and disease infestation
- Plan the implementation of control measures
- Implement control measures
- Monitor control methods

- Plants are exposed to a range of organisms:
 - Beneficial organisms, which benefit the growing process (e.g. pollination, maintenance of soil health, controlling pests)
 - Pests, which affect plant health by consumption of plant tissues
- For example:

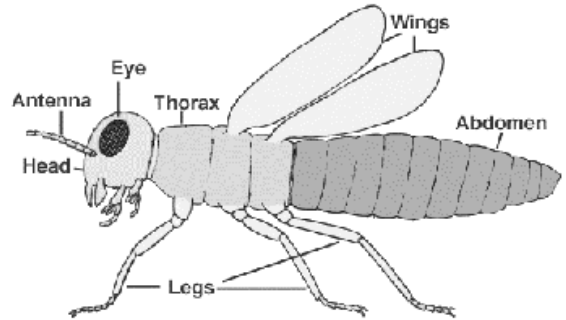
Beneficial organisms	Pests
• Beetles • Caterpillars • Some insects • Moths • Spiders	• Birds • Diseases • Some insects (e.g. aphids, dung beetles) • Mites • Weeds

- The presence of pests can be seen in various ways:
 - Pests are visibly seen on plants (e.g. caterpillars)
 - Damage to plants
 - Curled or wilted leaves
 - Fruit have sting marks
 - Leaves are eaten
 - White covering on leaves and stems

- Insects interact with plants in varying ways.
- Observing the damage caused to a plant gives clues as the kind of pest that has caused the damage.

Pest	Use of mouth
Aphids, assassin bugs, mosquitos	Piercing and sucking
Dragonflies, grasshoppers, beetles	Chewing
Housefly	Sponging
Moths and butterflies	Siphoning

- It is important to know the anatomy of insects (such as the grasshopper shown), so that you can distinguish them from other organisms – such as mites.
 - Mites are part of the arachnid or spider family
- The damage caused by insects and mites looks very similar but the control measures may be very different.



Feature	Insect	Mite
Legs	3 pairs	4 pairs
Body segments	3	2
Antennae	Yes	No
Simple eyes	Yes	Yes
Wings	Some	No

- Diseases in plants can be caused by micro-organisms, such as:

Bacteria	Fungi	Viruses	Nematodes
Causing: • Blights: Chlorosis, browning and death of plant tissues (e.g. leaves, branches, twigs or flowers) • Canker: Appearance of dead tissue • Galls: Swollen masses of abnormal tissue • Wilting: Loss of rigidity of non-woody parts of plants • Fruit rotting	Causing: • Canker: Appearance of dead tissue • Galls: Swollen masses of abnormal tissue • Ink spot: Causes blackening of leaves and flower stems • Mould/Mildew: White powdery spots • Rot: Decay roots, stems, wood flowers, and fruit • Rust: Brown pustules on the underside of leaves with yellow speckling on the upper leaf • Wilting: Loss of rigidity of non-woody parts of plants	Causing: • Canker: Appearance of dead tissue • Distortion: Irregularly shaped lesions • Scaling • Yellowing	Causing: • Visible nodules on plant roots May transmit and acquire viruses by feeding on infected roots

- It is important to note the following points about pests and diseases:
 - Nursery hygiene is extremely important, as disease can be spread in many ways:
 - On plant material
 - On the boots and clothing of workers or visitors
 - On tools, equipment, vehicles and machinery
 - In water
 - Via wind
 - Seeds can be affected by diseases – choose those certified as disease free
 - Not all excess plant material should be turned into mulch, as the mulching process does not eradicate pests and/or diseases
 - Pests and diseases can carry over from one season to the next

- Plant disorders arise from non-pathological causes, as opposed to plant diseases.
- Common plant disorders include:
 - Damage from ozone
 - Lack of nutrients
 - Poor light
 - Soil toxicity
 - Drought-like symptoms (including weakness) from salt damage
 - Scorched and brown leaves from frost damage
 - Silvery discolouration and tattered leaves from wind damage
 - Wilting from an imbalance of moisture (e.g. water-logging)

- When assessing pests, diseases and/or disorders, take note of the following details in your field notes:
 - Details of plant species affected
 - Signs and symptoms of pest/disease/disorder displayed
 - Location, scope, size and severity
 - Identification of the pest, disease and/or disorder
 - Beneficial organisms in the area
 - Environmental history in the area

Preparing to control pests, diseases and disorders

- When preparing to control pests, diseases and/or disorders, you should undertake the following:
 - Identify requirements (e.g. tolerable levels of infestation) by referring to:
 - Your client
 - Pests/diseases/disorders may exceed the client's aesthetic threshold (i.e. lower the appearance of the area)
 - For example: Nut grass present on a manicured turf area; Sow thistle in garden beds
 - The market
 - Pests/diseases/disorders should be treated when they exceed the economic threshold level [E.T.L.] and enters economic injury level [E.I.L.] (i.e. interfere with the utilisation of the area)
 - For example: Cobblers peg; Lantana
 - Environmental requirements
 - Pests/diseases/disorders should be treated when they exceed the environmental threshold (i.e. threaten the native plant population)
 - For example: Rubber vine on trees; Mother of millions; Water hyacinth
 - IPM requirements

- When preparing to control pests, diseases and/or disorders, you should undertake the following:
 - Familiarise yourself with the work area
 - Identify any WHS hazards and assess risks (e.g. manual handling injuries)
 - Identify environmental hazards (e.g. damage to flora/fauna, waste)
 - Collaborate with others, as necessary:
 - Your supervisor: Ask questions and seek clarification, applying active listening
 - Your work team: Notify them (including your supervisor) of hazards within a timely fashion – especially emergency situations
 - Contractors and product suppliers: Coordinate activities to complete activities in a sequential, timely and cost effective manner
 - Experts: Seek guidance when identifying disorders and diseases from horticulturalists and government departments (e.g. Australian and State Departments of Agriculture)

Workplace risk assessment

- Risk is measured in terms of the seriousness of the possible **consequences** of the hazard and the **likelihood** that those consequences will occur, as in the matrix shown below:

Likelihood

- 1: Very Likely
- 2: Likely
- 3: Possible
- 4: Unlikely
- 5: Very Unlikely

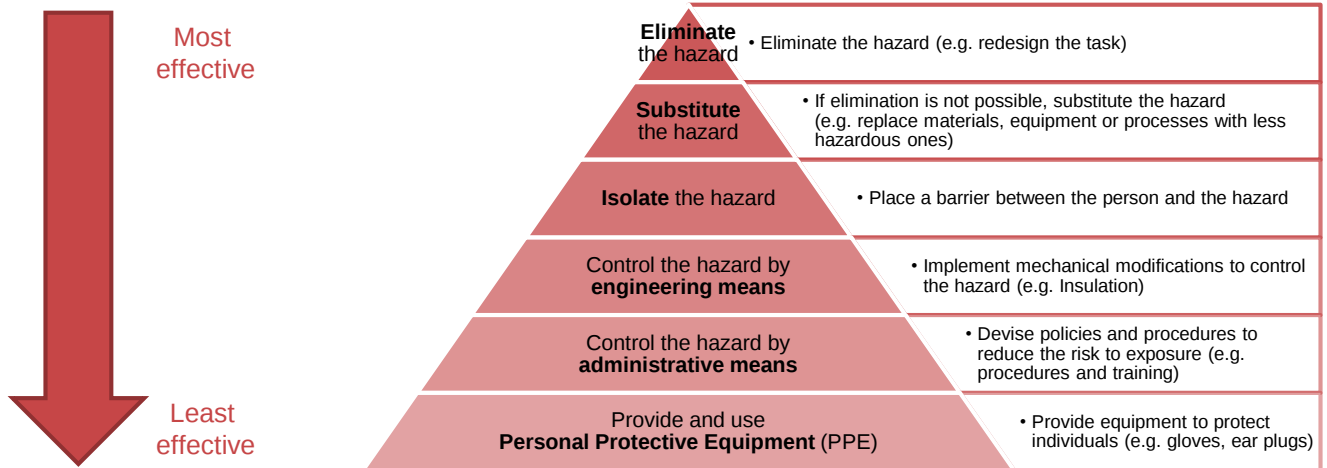
Consequences

- A: Death or Permanent Disability
- B: Serious Injury
- C: Lost Time Injury
- D: Casualty Treatment
- E: First Aid

Matrix	A	B	C	D	E
1	E	E	H	H	M
2	E	H	H	M	M
3	H	H	M	M	L
4	H	M	M	L	L
5	M	M	L	L	L

Workplace risk control

- The hierarchy of control gives priority to the order in which hazard and risk controls should be implemented.



- There are a range of different treatment options, including:
 - Cultural
 - Involves manipulating farming practices to suppress pests/diseases/disorders, while promoting plant development
 - Biological
 - Makes use of the pest/disease's naturally occurring enemies, such as insects and pathogens (e.g. fungi and bacteria)
 - Chemical methods (i.e. herbicides)
 - These have varying modes of action:
 - May speed up, stop or change the plant's normal growth patterns
 - May dry out the weed's leaves or stems
 - May cause the weed drop its leaves
 - Can be selective (affects particular weeds) or non-selective (affects all plants)

- There are a range of different treatment options, including:
 - Genetic
 - Planting pest-resistant varieties
 - Mechanical
 - Includes the use of covers/screens and vacuums
 - Physical
 - Includes hand weeding, slashing, burning, cutting, ripping

Refer to the IPM strategy, Codes of Practice and/or refer to a horticulturalist when selecting control measures for the infestation.

Consider the severity of the problem and cost effectiveness (i.e. materials, resources, time)

Treatment options

- Chemical treatment options are selected based on the type of pest.
- For example:

Herbicide	Used to kill unwanted plants
Insecticide	Used for killing insects
Pesticide	Used to attract and then destroy/mitigate pests

- When preparing, handling, using and disposing of chemicals, refer to the following documents:
 - Product labels for active constituent details and application information
 - Safety Data Sheets (SDS) for hazard/risks and safe usage information (e.g. handling, transport, disposal, emergency and spill requirements)
- Be aware of signage/labels, such as:



Acute toxicity



Corrosive



Flammable



Danger to
human health



Warning

Treatment options

- Integrated Pest Management (IPM) involves a range of methods to stop pests.
- Integrated Pest Management involves using more than one method to control a particular problem
 - The aim is to lower long term risks to the environment (e.g. chemical resistance)
 - Well considered IPM is generally more cost-effective in the long run as well

Control measures need to be selected in full consideration of WHS and environmental implications

Treatment options

- A range of machinery, tools and equipment can be used when taking/interpreting samples and applying treatments, such as:

Machinery	Tools	Equipment
• Light vehicles • Quad bike • Tractor	• Magnifying glass • Reference sources (e.g. books/online) • Nets • Shovels • Beating tray • Pitfall traps • Sticky cards or traps	• Sprayers (e.g. backpack, boom, hand-held) • Injection systems • Mouth aspirator

- Follow the steps outlined below when controlling pests, diseases and/or disorders:
 - Use Personal Protective Equipment (PPE), such as:
 - Gloves
 - Face shield
 - Goggles
 - Protective clothing
 - Work boots

Select and maintain PPE in accordance with workplace policies and procedures, SDS and chemical product labels

- Follow the steps outlined below to control pests, diseases and/or disorders:
 - Prepare and apply treatment methods
 - Follow environmental requirements
 - Apply chemicals only when weather conditions are ideal
 - Protect non-target plants with guards or shields
 - Substitute less toxic chemicals
 - Observe re-entry periods
 - Follow WHS requirements
 - Training/manual for instructions on safe calibration and equipment use
 - Obey withholding periods to ensure chemical product integrity is maintained

- Equipment is calibrated in varying ways. For example:

Backpack sprayer

- Fill tank with water, closing caps taps and lids
- Pump the handle to pressurise the tank
- Look for leaks
- Check the spray stream, making adjustments as required to avoid spray drift

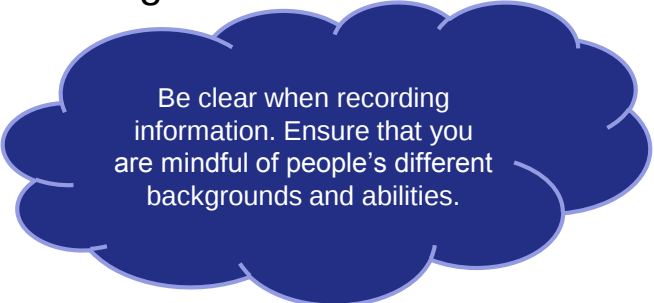
Boom spray

- Clean the filter/nozzles/tank
- Check the pump and pressure gauge
- Fill the tank with clean water and prime the spray unit
- Measure and perform calculations
 - Swath width
 - Liquid put out by single nozzle
 - Liquid put out by all nozzles combined
 - Time take to travel 100m
 - Spray application rate
- Calculate the amount of fertiliser you need to add to the tank

- Control methods should be monitored to determine their effectiveness
 - Refer to specified industry, WHS and enterprise standards to determine if treatments are functioning as expected
- Adjustments should be made to control measures, as necessary to meet enterprise specifications
 - As per IPM control measures, this may involve applying another control measure

- Apart from eradicating pests, diseases and/or disorders, treatments may have a range of other unwanted effects, including:
 - Chemical spillage
 - Surface run-off
 - Changes in soil structure
 - Soil contamination
 - Leaching and contamination of the water table
 - Reduction in habitat
 - Spray drift and damage to off-target organisms/produce
 - Droplet drift: Direct airborne movement of liquid droplets away from intended target
 - Vapour drift: Airborne movement of vaporised chemicals from a sprayed area
 - Unwanted consequences for humans and animals

- The law requires a number of records need to be kept when treating pests, diseases and/or disorders, including:
 - Name of operator
 - Treatments applied
 - Date/time and location of application
 - Rate of application
 - Equipment settings
 - Pest numbers
 - Numbers of beneficial organisms
 - Accident and dangerous occurrence reports



Be clear when recording information. Ensure that you are mindful of people's different backgrounds and abilities.

Refer to the relevant legislation for your state.
For example, in Queensland refer to the *Agricultural Chemicals Distribution Control Act 1966* (Qld)

- As part of clean-up processes, you should:
 - Shut down, maintain, clean and store tools and equipment according to manufacturer's specifications
 - Report identified hazards and faults within a timely fashion
 - Dispose of materials that cannot be reused or recycled
 - Ensure you implement environmentally safe practices
 - Follow Safety Data Sheet (SDS) requirements