

### Topics covered in this section

- Why control pests?
- Definition of terms
- Pesticide safety (pets, wildlife and sensible spraying)
- Pesticide development

### Why control pests?

The public are often concerned about the use of pesticides and not always presented with a balanced view. It is important to be able to provide reassurance about research and safety aspects (covered later) and to remind ourselves of the need to keep pests under control.

If left to their own devices, weeds, pests and diseases will damage the health or appearance of cultivated plants, to a greater or lesser extent. The situation tends to be made worse by the way in which we grow plants - as gardeners by crowding a mixture of plants into a small plot, or, as farmers by growing a large area of the same crop.

Problems likely to be encountered by gardeners and growers if pests are uncontrolled include the following:

- **Reduced yields.** Pest attack can severely reduce the yields of vegetable, fruit and flower crops; sometimes the entire crop is obliterated. Apart from feeding on the plants, pests can, through spoilage, reduce yields considerably - and spread virus diseases.
- **Reduced quality.** Even a minor reduction in quality can make all the difference to commercial growers. To the gardener, quality aspects may not be so important but it is still soul destroying to spend time and money growing plants and then have your efforts ruined.
- **Competition.** Weeds will deprive cultivated plants of water, space, light and nutrients. They will also spoil the overall appearance of the garden.
- **Public health.** Pesticides are used extensively throughout the world against insects bearing potentially life-threatening diseases. In this country they protect public health by controlling rodents which can spread disease as well as spoil stored food. They are also used against flies, which can spread diseases, and nuisance pests such as wasps and lice.

Pesticides are not the only solution to these problems. However, combined with good growing conditions, attention to hygiene and other sound cultural practices, they are an effective and labour saving tool in the war against pests.



PESTS CAN REDUCE YIELDS SIGNIFICANTLY



CATERPILLAR DAMAGE TO CABBAGES

### Definitions of terms used

The words 'Pest' and 'Pesticide' are often misinterpreted, being only associated with insect pests and their control. This is not the case. In the horticultural and agricultural sense, a **pest** is any organism causing harm to cultivated plants or stored food products. Included in this category are fungi, bacteria, viruses, weeds, slugs, snails, mice, rats etc. A **pesticide** is any material used to kill, control or diminish pests. Thus, weedkillers, fungicides, moss control agents, insecticides, molluscicides, etc are all pesticides. Note even organic agriculture allows certain pesticides to be used for pest and disease control.

- **Weed killers (Herbicides):** Weedkillers kill plant tissue. They can have either contact or systemic action and may be **residual** and/or **selective**.
- **Insecticide:** Chemical applied to plants or soil around them to control insect pests (e.g. aphids, capsids, sawfly). An insecticide may have contact, stomach-acting, systemic or residual action.
- **Fungicide:** Chemical used for the control or prevention of fungal diseases. Generally, fungicides are more effective in tackling plant diseases when applied before the onset of attack - i.e. as a preventative measure although fungicides can also have a curative action. Fungicides may either be contact or systemic in their mode of action.
- **Molluscicide:** Products used for the control of slugs and snails.
- **Rodenticide:** Products used for the control of rats and mice.

# PEST CONTROL AN INTRODUCTION

- **Active Ingredient:** The element of a pesticide product which controls the pests concerned (e.g. glyphosate) is the active ingredient in several well known weedkillers.
- **Formulation:** The active ingredient is combined with other materials which make it easier to apply, improve its effectiveness and ensure its safety in use. The finished product may be in an aerosol or granular form, formulated as a wettable powder, emulsifiable concentrate and so on.
- **Concentrate:** The formulated pesticide may be supplied in a concentrated form for the gardener to dilute accurately before applying. Concentrated products are cost effective where there is a large area of plants to be treated or weeds to control.
- **Ready to Use:** Ready to use products are already diluted and require no measuring or mixing. Typical ready to use products include: powders, aerosols, slug pellets, "guns" and granular weed and feed treatments. Ready-to-use products are not only convenient and quick to use, they can also prevent problems with wastage and disposal as it is difficult to mix smaller quantities of sprays when using concentrates. Thus it is better to use a ready-to-use product if there are only a few plants or weeds to be treated.
- **Contact:** A contact pesticide is active on the surface parts of the plant, thus:
  - A contact insecticide will kill the insects with which it comes into contact
  - A contact herbicide will only control the parts of the plants that are treated
  - A contact fungicide works on the surface of the plant and either controls the existing infection and/or protects the leaves (like a mac) from further infection

As they only kill what they touch, good coverage is essential for contact pesticides. Contact insecticides and fungicides tend to have relatively short harvest intervals.

**Systemic:** Absorbed into plant tissues, systemic insecticides are particularly effective at controlling sap-feeding insects. Both systemic insecticides and systemic fungicides tend to give longer control or protection. A systemic weedkiller is absorbed by the plant and translocated to all parts of the plant, including the roots. It is therefore better to use a systemic herbicide for the control of deep-rooted and perennial weeds (see 'Weed killers' section for further details)

**Stomach-acting:** a term to describe the way in which certain insecticides, rodenticides and molluscides effect the target pest. For example a stomach-acting contact insecticide will kill pests which eat sufficient quantity of the treated plant material.

**Harvest Interval:** The period of time which must elapse between spraying and harvesting.

## Pesticide safety

Some people are concerned about the use of pesticides. Like all other chemicals, pesticides should be treated with respect and not abused, but the risks associated with pesticide use are often exaggerated out of all proportion, especially when compared with those of the many domestic products and foods we use or consume. Extensive tests are performed throughout the development stages of pesticides (see next section) to minimise risks to humans, animals and the environment. Legislation covering not only the development, but also the marketing, selling, storage and use of pesticides is very strict and comprehensive.



▲ I I THESE ITEMS HAVE THE POTENTIAL TO BE HARMFUL



BURNT TOAST HAS CARCINOGENIC PROPERTIES

Many household cleansing agents are strong irritants. Alcohol can cause birth defects if pregnant women drink it. Common salt, weight for weight, is more toxic than many garden chemicals, especially when they are diluted. Many fruits and vegetables contain toxins which are far more potent than garden chemicals: foods such as nuts, burnt toast and charred meat have carcinogenic properties which would be unacceptable in a pesticide.

Our body has evolved so that it can cope with a certain amount of natural and man-made toxins and, provided we eat a balanced and sensible diet, there is no need to be overly concerned about what we eat. These comparisons should illustrate that pesticides, used sensibly, should not give rise to unnecessary concern.

## Pets and wildlife

Where pesticides are used as directed, they present no significant threat to pets and wildlife. It is important that pesticides are stored safely and, as is the case with most chemicals, that pets are excluded from the area whilst mixing and application is in progress. As an added precaution, it is advisable to keep grazing animals away from treated areas until sprays have dried on the leaves of treated plants or until products such as granular weed and feeds have been watered into treated grass ( i.e. one to two days following treatment). Some weed killers can make poisonous weeds such as Ragwort more palatable to livestock, advice on this is contained on the product label.

Meticulous care should be taken to avoid contaminating ponds and water courses, both directly by over-spraying and indirectly, through run-off. It is best to spray later in the day to minimise harm to bees and other beneficial insects and to avoid spraying plants which are in full flower.

**Slug pellets:** eaten in sufficient quantity can be harmful both to pets and wildlife. If they are applied sparingly over an area, as directed, this ensures that animals cannot eat enough to do them any harm. (As a guideline, the average distance between pellets should be no less than 8cm. Gardeners do not need to apply slug pellets any more thickly to effect control.) On no account should they be put on the ground in heaps.

#### **Sensible spraying**

**Timing:** The best times to spray are early in the morning (between 8.00 am and 10.00 am) or in the evening (between 6.00 and 8.00pm) in summer. During these periods there are fewer beneficial insects on the wing and bees are not active. It is also cooler and the sun is not hot enough to scorch wetted plants. To avoid drift of pesticides, do not spray when it is very windy or if it is totally calm (especially if it is hot, as thermals can lift spray droplets and move them several miles). It is also important to avoid spraying in rain as the pesticide will be washed off or too dilute to be effective.

**Choice of product:** Ensure that the product used is suitable for the control of the pest in question and for use on the plants requiring treatment. For food crops, check the harvest interval, especially if the crop is approaching maturity, to make sure enough time elapses between treatment and harvest.

**Spraying equipment:** Sprayers should be cleaned before use to avoid contamination with other pesticide products. Many professionals keep a separate sprayer or watering can just for herbicides and use another sprayer for insecticides and fungicides. They should be washed out thoroughly after use. Use a suitably sized sprayer. It is also best to have one with an adjustable nozzle. Normally sprays are most effective applied as small droplets until just before the point of run-off, when droplets start to run-off leaves).

**Avoid disposal:** It is best to avoid having to dispose of either concentrated chemicals or those which have been diluted for use in the garden. The advice below is taken from the Fact Sheet 'Safe Disposal of Garden Chemicals' - copies of this Fact Sheet are available from the Crop Protection Association website at [www.gardencare.org.uk](http://www.gardencare.org.uk)

With regard to concentrates, gardeners should not buy more than they need - they should check their stocks to make sure they do not already have a suitable pesticide before buying another. Only the required amount should be purchased. Ideally, concentrates should be used up within two years. (Often, a small bottle is sufficient to last most gardeners for this length of time).

When mixing a concentrate, users should try to estimate the minimum they will need for the job - it is better to under-estimate than mix too much. If only a small area is to be treated, it is often better, and more cost effective, to buy a ready-to-use product. Once a concentrate is diluted, the mixture cannot be stored and any remaining must be disposed of safely, (see below). A ready-to-use product contains stabilisers and may be stored for two years without deterioration, provided the storage conditions are satisfactory.

**Disposal of unwanted concentrates:** Small quantities (ie less than 125ml or 5 fl oz) of approved products may be diluted as if for use and disposed of by spraying onto bare soil. (Note that some weedkiller products are residual and areas may not be able to be cropped for up to 12 months - this information will be on the product label).

Larger quantities of garden chemicals in solid or liquid form should be disposed of properly. Contact the local authority waste disposal section, who will advise which household waste sites can take garden chemicals, or whether they have any special arrangements for collection and disposal of hazardous household waste.

Further advice is available from the regional offices of the Environment Agency in England and Wales, the Scottish Environment Protection Agency in Scotland or the Department of Environment (NI) in Northern Ireland.

**Disposal of surplus spray solutions and spray rinsings:** Apply to flat, uncultivated areas in the garden or onto gravel paths. When selecting the disposal site, take into account any risk to neighbouring property or wildlife habitats. Note any label precautions relevant to pets and wildlife and do not dispose of on areas near or around ponds, watercourses, marshy areas, ditches or near wildlife habitats. Never pour any chemicals (diluted or undiluted) down drains, sinks or lavatories.

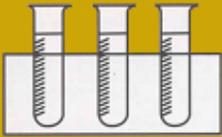
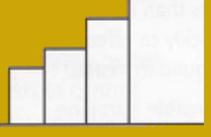
**Disposal of empty pesticide containers:** Where these are not sealed (aerosols and some trigger sprays are sealed) they should be rinsed ideally three times (filling with water to about a third of the container's volume for each rinsing). If possible, the rinsing should be included with the spray solution; otherwise dispose of the washings as if they were surplus spray solution and spray rinsings (see above).

Dispose of cleaned and empty containers through normal household waste disposal routes. Garden chemical containers are not suitable for recycling.

#### NOTES

# PEST CONTROL AN INTRODUCTION

## Pesticide development

Stages	Chemical and bio-chemical research	Biological testing	Development of product	Registration	Sales and marketing
					
Years					
1	Design and make new compounds	New compounds are tested for chemical activity; selected compounds are tested in the greenhouse			An informal patent might be applied for
2			The compounds are also tested for their toxicity on e.g. insects, soil, fish		
3		Selected compounds tested in the fields in trial plots			
4			Investigations of formulation and manufacture		Investigation of market potential
5		Full developmental programmes to test effectiveness of selected compounds			
6			Safety evaluation completed		
7			Environmental impact investigated Residue levels identified	Production of documentation needed for the registration process	Plan most efficient route to a commercial product
8					
9					

It is a very lengthy (and costly) process to develop a pesticide. It takes, on average, at least ten years before a pesticide reaches the marketplace and the costs involved are in excess of £100 million. For every product which finally reaches the marketplace at least 30,000 others will have been tested and rejected at some stage during the development process.

The main development stages are given below. Chemicals are rejected at various stages throughout this process.

**Initial research:** Identification of compounds which have potential for use as pesticide products.

**Biological testing:** New compounds tested for effectiveness (glasshouse, and field trials).

**Development of product:** Further tests performed with respect to safety aspects. Impact upon users, consumers, plants, animals and the environment taken into account.

**Registration:** Documentation issued for registration process.

**Sales and marketing:** Products satisfying registration requirements reach marketplace.