

# CHAPTER 2

## Avoiding diseases and discouraging pests

By far the best means of controlling a disease is to avoid introducing it in the first place. There are a number of ways to care for a vegetable garden to minimise the risk of many diseases.

Think about disease and pest control as you plan your garden.

See also Chapter 7 – Insect pests and their control and Chapter 8 – Vegetable diseases and their control.

### Use good quality, healthy seed or seedlings

Always use seed well within the 'use-by' date. Old seed may not produce as many strong seedlings as fresh seed. If you are storing seed, keep it in cool, dry conditions. Often, bought seed has been treated with fungicide dust. The treatment details are printed on the seed packet. If the seeds are not treated or if you are determined to sow home grown seed, use the hot water treatment (see table, Chapter 2 page 15).

If you are planting seedlings rather than direct-seeding, always use healthy vigorous-looking plants. If seedlings are grown in contaminated soil, disease organisms may be carried on their roots at transplanting. Sometimes, the young plants will show symptoms of this infection. Burn any seedlings with swollen or damaged roots.

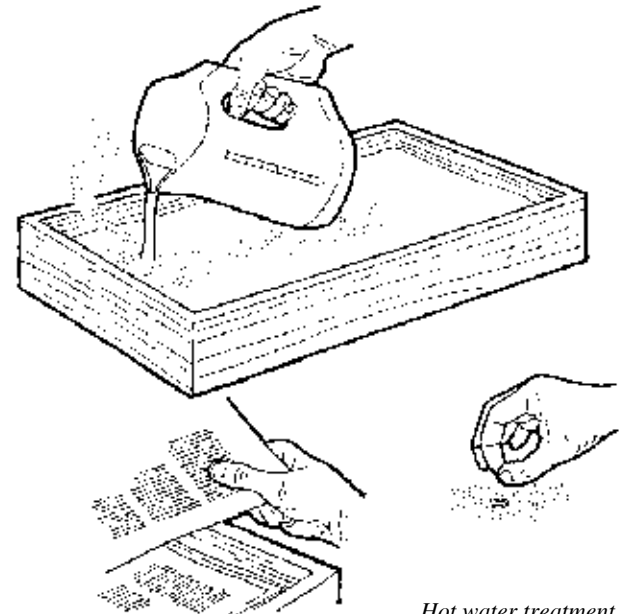
### Seed-bed hygiene

Grow seedlings in clean potting mixture in trays so that diseases do not spread from the seed-bed to the growing area. If you must re-use potting mixture, treat it with heat to kill any disease organisms.

If you grow seedlings in the garden, use raised seed-beds which shed surface water. This prevents contamination from disease organisms which may be present in run-off water.

### Heat treatment

- Fill the seed box with about 10 cm of mix and support it off the ground.
- Pour on boiling water as fast as the soil will take it up. Use 5 to 6 L per 30 cm by 30 cm section of soil surface.
- Cover with paper for at least an hour to retain the heat, then remove the cover and sow your seed as soon as the soil is cool again.



*Hot water treatment of soil in seed box*

## General hygiene

Follow general hygiene practices to reduce the development and spread of disease.

- Dig out diseased plants at the first signs and burn them.
- Keep the vegetable garden free of weeds. Weeds can often harbour vegetable diseases and insects which can spread disease.
- Destroy all diseased remains of plants. Diseased material, composted or dug in, is a source of disease in following seasons.
- In summer, keep any uncropped land dug over and weed free.
- Practice crop rotation. Avoid growing the same or related plants in the same position in successive years. See Chapter 7, page 87.

## Solarisation

High temperatures can help to control nematodes (eelworm) and some plant diseases which carry over in the soil. You can treat sections of garden bed by raking out any plant remains, moistening and smoothing the soil surface, then laying and firmly pegging down a sheet of thin, clear plastic. Leave this for at least a month, during mid-summer. The sun's heat will penetrate deep into the soil, killing many unwanted organisms.

## Vegetable seed treatments

Many organisms which cause vegetable diseases can be carried over between crops in or on contaminated seed. You can spread diseases to previously clean areas by planting contaminated seed. Packet seed sold commercially is the safest to use, but if you prefer to sow your own seed you can often control seed-borne organisms in some crops with hot water treatment.

Plants which are vegetatively propagated, that is, by tubers, bulbs and root separations, can also be contaminated. In some cases planting material can be treated to eradicate disease.

Disease-causing organisms can be carried in dirt and trash around seed or on the outside of the seed-coat. They can also be carried in the seed-coat or deep inside the seed tissues.

Sometimes contaminated seed is discoloured but signs of most disease-causing organisms can not be seen on seeds.

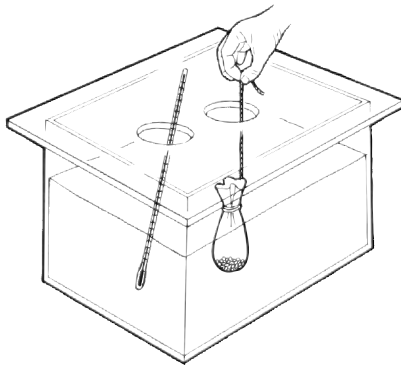
### *Disinfection*

Disinfection involves chemicals or heat. When the disease is attached to the seed-coat or is in its outer layers, a poisonous 'soak' such as a five minute dip in a 2 per cent bleach solution is used. However, if the organism is deep inside the seed, hot water treatment is best. (Chapter 2, page 15). Enough heat is applied to kill the organism without killing the seed.

Some diseases carried in soil or seed can be controlled by applying an approved fungicide dust evenly over the surface of the seed. Seal the seed tightly in a container such as a screw top jar and shake until the dust is evenly distributed. Use just enough dust to give good coverage.

### *Hot water seed treatment*

If you intend to use the hot water treatment, measure the water temperature and length of treatment time accurately, as too little may not kill the disease organism and too much may kill the seed. Maintain a constant temperature during the treatment, and use a large volume of water relative to the amount of seed. For example, you should use about 12 L of water per 150 g of seed.



*Hot water method of seed disinfection*

There are many ways to apply the hot water treatment. One is to make a simple water bath, from an insulated container with a lid. Make two small holes in the lid; through one, insert an accurate thermometer; through the other suspend the bag of seed, containing a weight to prevent it floating.

The procedure is:

- Pour boiling water into the container until it is about three-quarters full.
- Allow the water to cool to 1° Celsius above the required temperature.
- Tie the seed loosely in cheese cloth or muslin, allowing room for the seed to move.
- Suspend the bag in the water through the hole in the lid.
- Check the temperature continually. If necessary add small quantities of hot water to maintain the temperature.
- Stir the water frequently by raising and lowering the bag of seed.
- After the necessary time, remove the bag of seed and roll gently in a towel to remove the excess water.
- Spread the seed thinly on paper in the shade and allow it to dry.

## Companion planting

True companion planting means mixing species which are said to grow better in each other's company than alone – and avoiding mixing those which adversely influence each other.

Claims for the advantages of companion planting come mostly from home gardeners who have adopted this practice after reading gardening folklore.

The Department of Agriculture and Food has not conducted trials to assess the value or otherwise of companion planting and makes no recommendations. But for those vegetable gardeners interested in experimenting with it, here are some of the guidelines suggested by its advocates.

- Onions and related plants react badly on most other vegetables, particularly beans and peas – but they grow well with carrots.
- Carrots grow well with lettuce, broad beans, peas and radishes, as well as the onion family.
- Cabbages grow well with potatoes and cucumbers.
- Potatoes do not react well with tomatoes, but prefer beans, peas and celery as well as cabbage.
- Tomatoes grow well with asparagus, parsley and basil.
- Peas grow well with turnips, carrots, cucumbers, potatoes and sweet corn.
- Lettuce grow well with radishes and carrots.
- Celery and cauliflower grow well together. Celery also grows well with leeks and tomatoes.

## Pest-repellent plants

Another strongly-held belief is that certain plants, particularly herbs, can discourage insect pests from attacking vegetables planted near them. As with companion planting, the department has not tested these theories, but here are some of the popular beliefs.

- Marigolds of the *Tagetes* species, known as French or African marigolds, reduce nematode infestations.
- Southernwood, also known as 'ladslove', repels aphids and cabbage moth.
- Fennel repels flies and fleas.
- Thyme and dill repel cabbage moth.
- Rosemary repels leafhoppers, aphids and caterpillars.
- Mint is vulnerable to caterpillar attack but repels many other insects.
- Wormwood repels fruit fly.
- Tarragon helps repel snails.
- Garlic repels many insects.

## Garlic

Some home gardeners use garlic as a juice extract sprayed on to help protect garden plants and fruit trees.

The following recipe is used by some gardeners:

Finely chop or crush 90 g of garlic, mix it with two teaspoons of paraffin oil and allow it to soak for 24 hours.

Add 500 mL of water and a teaspoon of detergent and strain. This liquid can be stored in the refrigerator. When you use it, shake it well then add 15 mL (three teaspoons) to a litre of water to make up a spray.

The Department of Agriculture and Food has no information on the effectiveness or otherwise of this treatment.

## Hot water treatment of seed

Vegetable	Disease controlled (°C)	Water temperature (minutes)	Treatment time
Broccoli	Alternaria	50	20
Brussels sprout	Blackleg	50	20
Cabbage	Black rot	52	30
Cauliflower	Black rot	52	25
Capsicum	Bacterial canker	50	30
Carrot	Alternaria	52	10
Celery	Septoria	50	30
Eggplant	Alternaria	50	25
Onion	Downy mildew	50	25
Silver beet	Damping off	50	25
Spinach	Damping off	50	25
Tomato	Damping off	50	25
	Alternaria	55	25
Turnip		50	20
Radish	Alternaria	50	30
	Blackleg	50	20
	Black rot	52	25