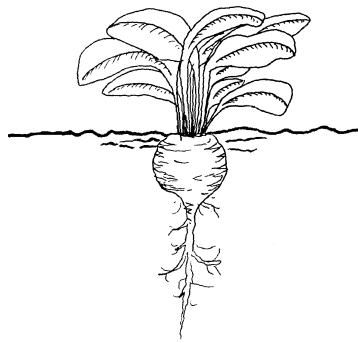


# SOIL FOR LIFE

*Build the soil, harvest the plants, feed the people, heal the planet*



## **Controlling garden pests with their natural enemies and diseases** **In other words, protecting plants *and* people**

*Garden pests and their natural enemies co-exist in balanced populations in well-managed organic gardens. All you have to do is sit back and let them get on with life, and you won't have a problem with losing your crops to the 'bad guys'.*

Nearly half of all the food produced in the world today is lost to insects despite the fact that the use of pesticides has increased so dramatically. In 1945, when pesticide use was very low in the USA, maize crop losses were around 3.5%. In the late 1990's, with one thousand times more pesticides being used, crop losses were estimated at 12.5%. (Pimentel, 1995)

Progress has not been made in the war against insects because they are developing immunities to pesticides, and because the natural predators and parasites are being destroyed along with them. So when you see some bugs in your veggie patch and you spray them with poison, it backfires on you. In a few days, or a few weeks, the same kind of bug is back again but, this time, there are more of them than before. Why does this happen?

You accidentally killed off the pest's natural enemies along with the pest. It is not always possible to kill off all the pests, apart from which you didn't spray the neighbourhood gardens that may harbour them, and so without any natural predators or parasites to hold them in check, those that didn't die, or those that flew in from elsewhere, are able to multiply without restriction.

Natural enemies do not usually reappear as quickly as the pest, and some insecticides are more toxic to predators and parasites than to the pests. At the same time, resistance to the poison sprays is developed. Individual insects have different levels of resistance to the sprays. Every time you spray an insect population, you change the balance between susceptible and resistant individuals. The resistant individuals survive and reproduce; most of the susceptible ones die. So it follows that the more pesticide you use to control the seeming problem, the faster you produce a population of resistant pests, and the faster you lose your entire crop.

**There is some good news though.** Convert your gardening methods to an organic approach and at least two-thirds of your pest problems disappear. Don't be tempted to think "What can I use instead...? What if ...?" This is the wrong approach. Rather think along the lines of avoiding pest problems by managing your gardening correctly. This is about good gardening practices like building healthy soil, planting mixed crops, following crop rotations and seasonal plantings, companion planting, using resistant varieties, creating physical barriers and/or traps and creating habitats for frogs, lizards and birds. Many ideas have been given in previous issues of this magazine.

Allow your garden to take control of itself, and populations of natural enemies will re-establish themselves. Pest problems will become history.

### What are natural enemies?

There are three types of natural enemies:

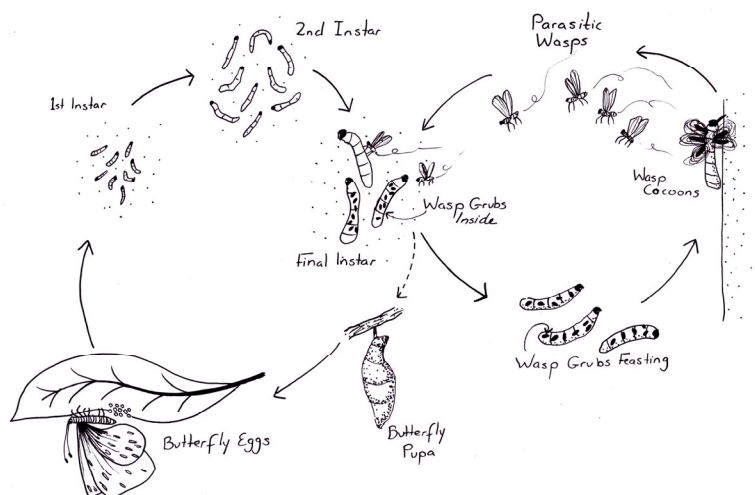
- Predators which eat insects. Predators include spiders, ladybirds (watch out for the imposter ladybirds that have turned vegetarian and attack potatoes, beetroot, spinach and members of the pumpkin family), and wasps, praying mantids, lacewings and dragonflies. Each predator can eat hundreds, even thousands, of insects in a lifetime. Some, like spiders, have been shown by DNA-based techniques which analyse their stomach contents, eat a wide variety of insects. For example, Money spiders (*Lynxyphiidae*) are prized by farmers in the UK for their voracious appetite for aphids. But aphids have little nutritional value and spiders need to eat other insects to balance their diet. Predatory insects (and arachnids) do not damage crops.
- Parasites. Most of these are insects that lay their eggs inside the body of a living insect called a host. The parasite feeds on its host until it finally kills it. Then the adult parasite emerges from the dead host and searches for more insects to lay its eggs in. Using parasites is a slower way to kill pests but it is effective. There are many examples of insect parasites in your own (unsprayed) garden. Take the time to find some of them.
- Diseases carried by viruses and fungi can infect insects and kill them. Because the disease is carried among the insect pests in your garden, whole populations can be wiped out quickly. For example, when caterpillars are a problem you can use a Bt spray which contains *Bacillus thuringiensis*, a soil-borne bacterium harmless to human beings and animals. The Bt bacterium produces a toxin which when ingested, causes the caterpillars to stop feeding, become ill and die. It is lethal to a variety of insects, particularly the larval forms of moths and butterflies and is quoted as being about 90% effective.

The Cabbage White butterfly (*Pieris brassicae*) is a common site in the vegetable garden and illustrates a number of examples of biological control in action. This species was accidentally introduced to the Western Cape from Europe (first sightings were reported in 1994) and it has since become a significant pest, particularly to small-scale farmers and home gardeners. Its green, black and yellow larvae cause a lot of damage to the mustard family (Cruciferae), particularly cabbage, broccoli, cauliflower and rocket, and also to nasturtiums. Interestingly its preferred local food plants are also introduced species.

The butterfly tolerates both hot and cold weather, seems unperturbed by the raging south-easters and broods continually through the year, laying up to 125 eggs at a time. Populations surge in the cold months. It has the potential to become a serious pest.

Mother Nature, left to her own devices, has deftly stepped in with a few nifty solutions for its extermination, at best, or to keep its population in check:

- Argentine ants – aggressive aliens – have been observed to feed on, and carry away, the first instar (newly hatched) larvae; one way to curb population growth.
- Two species of Tachinid fly larvae have been recorded as parasitising the Cabbage White caterpillars. The adult looks like a small hairy housefly and survives on the nectar of flowers, but the larvae live as parasites on other insects. They do this in one of two ways. Small, white, oval eggs are laid on the outside of a caterpillar of another species. The eggs hatch into tiny maggots which bore into the living victims and devour them – first the body juices, then the fat, and finally the vital organs. The victim succumbs, and eventually only one brawny, hairy adult tachinid emerges. The other maggots were out-competed. Other tachinids lay lots of tiny eggs on the surface of food plants and these are swallowed by grazing caterpillars. The



emerging maggots bore through the gut wall and proceed to feed, leaving the poor victim's vitals to the end. In order to get the air they require, they pierce the body wall of the host and send their own breathing tubes to the surface or connect directly to the respiratory apparatus of the caterpillar.

- If you have a vegetable patch you may have noticed butterfly pupae attached to the wall of your house. Periodically you'll have the joy of watching the crumpled adult emerge, blow up its wings and take off into the garden. Often however, these cocoons remain intact; nothing ever comes out of them. That is a sign that Nature is at work or, should I say, that wasps – 'ecowarriors' in the caterpillar war – are doing their job. Cabbage White populations are checked by a tiny, indigenous, parasitic wasp, *Pteromalus puparum*. The female wasp lays her eggs in the body of the final larval stage of the caterpillars and the her grubs feast on the tissues of the host. They follow the same pattern of consumption as the Tachinid maggots – it would be unwise to kill the host before the grubs are fully developed – and attack the nervous system last of all. The caterpillar remains alive, and fresh, until just before the wasp grubs are ready to pupate and then they start nibbling at the brain. This brings about changes in the caterpillar's behaviour and it leaves the food plant and migrates up any vertical surface in the vicinity, in a premature attempt to pupate. The wasp grubs finally kills the ailing caterpillar, and emerge to spin tiny cocoons covered in a golden nets which will protect the pupating wasp larvae from attack by other parasites. Clusters of these cocoons can often be seen on vertical structures in and around your garden and home. You would have to very observant to notice the little black wasps that emerge from them to continue their life cycle.

Unfortunately, as was mentioned earlier, populations of the Cabbage White butterfly increase quite dramatically in autumn and winter because the wasps do not tolerate the cold quite as well, and their activity levels are reduced. As the saying goes, '*when the cats are away, the mice do play*'.

So successful are these techniques that Ma Nature has up her sleeve that some of these insect warriors are being shipped around the world. Overseas you can buy them from mail order catalogues, and fly them into your own garden, orchard, small holding or farm; ladybirds, lacewings, wasps, praying mantid egg cases – they're all in demand. A cup or two of ladybirds would be enough for the average garden, and give them a balanced diet too, as they feast on a huge variety of adult insects and larvae. Lacewing larvae have an insatiable appetite and can consume a few hundred aphids every two hours. Who needs poisons with allies like these?

Encourage the natural enemies to your garden by growing many different food crops and herbs and by keeping trees and shrubs and flowers growing around the boundaries. Apply organic fertilisers and loads of compost instead of nitrogen fertilisers. Experiment with different natural sprays and repellent crops. The important thing is that you try different techniques and find the best ones for your situation. In the end you will discover the best programme for managing any problems that arise in you garden.