Biological pest control

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Biological and non-chemical plant protection is important worldwide as an alternative to the use of conventional chemical pesticides. Biological pest control is the use of natural organisms as an alternative to, or in conjunction with, pesticides. It has become well established within protected crops and some field crops around the world.

The biological control of pests relies on predation, parasitism or other natural mechanisms. It can be an important component of integrated pest management (IPM) programs. The use of biological control methods can reduce spraying costs and lead to a reduction in the potential for pesticide resistance. Many pesticides kill beneficial insects as well as pests.

There is an enormous number of beneficial insects, including hover flies, lacewings, parasitic wasps, predatory wasps, ladybirds, predatory mites, spiders and ground beetles. Flowers are a source of food for many pest controlling insects, particularly in their adult form. Plants in the daisy, mint and carrot families are particularly attractive to these beneficial insects.

Fungi that infect insects have received considerable attention from scientists for their potential for biological control of pests. Much research has focused on the selection of virulent strains for target pests and their development as biological control agents.

Pests and diseases are almost always the result of plant stress. These include: nutrient deficiency, water stress, temperature extremes and chemical damage. Pest infestations often coincide with climatic changes such as irregular rainfall, increased humidity or drought. Pest outbreaks may have a devastating impact in a given year, but cause only marginal losses in other years.

**Scale**

The main pest of commercial olives is black scale (Saissetia oleae). Black scale infestations can result in yield loss, increased fruit washing and higher spraying costs. The scale is actually a hard shell which protects the female insect and eggs. The insects themselves are soft-bodied and feed by sucking sap from the plant. Adults do not move around the plant once they are established and form the scale covering. Young scale insects, or “crawlers”, lack the hardened shell and are more mobile. Excessive nitrogen fertiliser can make plants more susceptible to damage from insects such as scale that feed with piercing-sucking mouthparts, because nitrogen is a critical nutrient for them. By fertilising too frequently, you may actually be creating a situation that favours the scale. At least 15 species of parasitoid wasp have been recorded in association with black scale in Australia. These wasps lay their eggs inside scale insects. The wasp larva hatches and feeds on the host as it grows. Beneficial parasitic wasps and predators (e.g., lacewings and lady beetles) that control scale are available from commercial sources.

**Ants**

Ants play a role in soil development through their underground nesting activity. Ants are general predators of insects and a few species can interfere with the biological control of scale and other olive pests. Orchards with a history of sooty mould and considerable ant activity may require specific ant control measures. Honeydew attracts ants onto olive trees, and while they forage for honeydew they disturb and attack beneficial insects, disrupting the biological control. High levels of ant activity on trees often indicate significant populations of honeydew-producing insects. Ant activity can therefore be a useful indicator of which trees to check more closely for these and other pests. An exception is that ant activity may be high during flowering when the ants are attracted to nectar. Ants can be deterred from climbing the trees with the use of a sticky band traps.

**Olive Lace Bug**

Olive Lace Bug (Frogattia olivinia) is the second most common pest of olives and is found in most olive growing areas in Australia. This simple sucking insect can reduce the vigour of olive trees. Female lace bugs can lay three to four generations of eggs per year which are laid along the leaf mid-vein, then protected by a cover of black excreta. Trees suffering from stress will be more affected by lace bug. Natural enemies are important in controlling some species of lace bugs. Predators of lace bugs include lacewing larvae, lady beetles, jumping spiders, predatory thrips, and predaceous mites.
Entomopathogenic fungus

Entomopathogenic fungi are widespread in agroecosystems. *Beauveria bassiana* is a fungus which causes a disease known as the white muscadine disease in insects. When spores of this fungus come in contact with the cuticle (skin) of susceptible insects, they germinate and grow directly through the cuticle to the inner body of their host. The fungus then proliferates throughout the insect, eventually killing it. Unlike bacterial and viral pathogens, *Beauveria* infects the insect via contact, and does not need to be ingested. Once the fungus has killed its host, it grows back out through the softer portions of the cuticle, covering the insect with a layer of white mould. This downy mould then produces millions of new infective spores that are released to the environment. Commercial development of this fungus for biological control has primarily been targeted against foliar feeding pests as soil borne pests tend to be tolerant to the fungus.

Green Vegetable Bug (GVB)

The Green Vegetable Bug (*Nezara viridula*) or stink bug, is widespread across Australia and can cause trouble for olive growers. It generally pierces the fruiting parts of plants and sucks out the juices. Stink bug populations can be suppressed by predators and parasitic wasps. A parasitoid wasp *Trissolcus basalis* has proved an effective parasite of GVB. This tiny wasp (1–1.3mm in length) also attacks the eggs of other species of stink bugs. *T. basalis* females parasitise stink bug eggs by inserting one of their own eggs inside the host’s egg. They grow and pupate inside the egg where the adults emerge 9 to 12 days later. *T. basalis* is also known to parasitise adult stink bugs, laying its eggs directly on the stink bug. Once the young exit the egg, they bore a hole inside the adult stink bug and feed on them until they are completely developed, killing the bug. While it is unlikely that biological control will completely replace chemical pesticides in the foreseeable future, the use of biological control agents could be used as one component of an integrated management program to achieve the best possible results. Biological control is the key for up-to-date and environmentally respectful integrated crop protection.

You can view images and read more about beneficial insects at Vera’s website, www.olivediseases.com