BIOLOGICAL CONTROL OF GORSE: GORSE THRIPS

Background

Gorse, *Ulex europaeus*, is native to western Europe and was introduced to Australia in the early 1800's. Gorse has since become a significant agricultural and environmental weed and is now listed as a Weed of National Significance. Gorse occurs in Western Australia, South Australia, New South Wales and the ACT, but the heaviest infestations are in Victoria and Tasmania. Gorse is common in agricultural and urban areas, riparian environments and disturbed areas of bushland. It significantly reduces pasture and animal productivity and in forestry plantations, reduces tree establishment and growth. It also provides a habitat and shelter for vertebrate pests. The annual cost of gorse management to agricultural and forest industries across Australia has been estimated at $7 million. Because of the difficulty and expense of controlling gorse by traditional methods such as herbicides, mechanical clearing and cultivation, biological control continues to be investigated as a possible cheaper and long-term control option.

The gorse thrips, *Sericothrips staphylinus*, is one of a guild of agents being used for the biological control of gorse in Australia and was first released in Tasmania in January 2001 following tests that showed it feeds only on gorse.

Description

Adult gorse thrips (Fig. 1) range in size from about 0.7-1.2 mm in body length and appear black except for distinctive white rudimentary wing pads and a layer of shiny hairs on the abdomen. There are two larval (juvenile) stages. The first larval stage is pale and membranous and moults into a more robust, yellowish second stage larva (inset Fig. 1). The second stage larva then moults into a pre-pupal form with short antennae which then becomes an immobile pupa distinguished by the longer antennae which curve back over the body.

The eggs are only about 0.3 mm long and are white to pale yellow in colour. They are laid in the tissue of young stems but because of their small size are very difficult to locate.

Life cycle and biology

There are two generations of the gorse thrips each year. Adult thrips are present all year but numbers are highest in summer. As new gorse shoots mature and harden during summer, the adult population enters a reproductive diapause. Adults start egg-laying towards the end of winter (from mid-late August). Eggs commence hatching in spring at the time new succulent shoot growth is available as a prime food source for the developing thrips larvae. Juvenile thrips densities peak in mid-spring and again in mid-summer. The adults that develop from the juveniles produced in mid-summer are the ones that enter diapause as the new growth hardens.

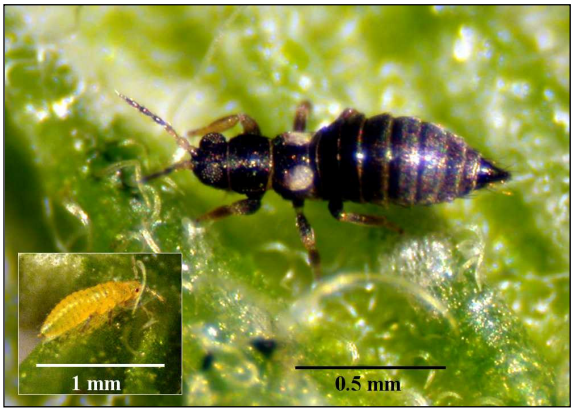

Figure 1. *Adult gorse thrips and second stage larva (inset) (Photo: W. Chatterton, TIA).*

At 20°C female thrips can lay ca. 2 eggs per day and ca. 70-80 eggs in their lifetime. The time for egg to adult development is about 32 days. Eggs take about 16 days to hatch at this temperature. Over another 16 days, the thrips pass through the two feeding larval stages before moulting into the mobile but non-feeding pre-pupa and the immobile pupa before reaching the adult stage.

Gorse thrips disperse by jumping short distances or being blown by the wind. Occasionally, winged thrips are produced enabling dispersal over longer distances.

Damage to gorse

Both adult and juvenile forms of gorse thrips feed by piercing the mesophyll tissues of gorse foliage and sucking out the cell contents. High thrips densities produce pale, stippled areas on leaves, spines and stems that give the gorse a mottled, blotchy appearance.

Feeding and egg-laying usually take place on new growth but older growth can also be attacked. Significant damage has been observed on potted gorse under glasshouse conditions (Fig. 2). A glasshouse study also showed that a combination of gorse thrips, ryegrass competition and simulated grazing caused 93% mortality of gorse seedlings, thus indicating the potential of gorse thrips in an integrated control program. However, at field sites, thrips population densities have not yet reached high enough levels to cause observable damage.

Establishment and dispersal

Since 2001, gorse thrips has been released in Tasmania, Victoria, South Australia and NSW. Although established at many sites it is spreading slowly. The release of around 250 gorse thrips on a single bush is the minimum number currently being used to achieve successful field establishment.

Figure 2. *Gorse thrips damage to potted plant (left) compared to healthy gorse (right) (Photo: W. Chatterton, TIA).*

However, studies have shown it is possible to achieve field establishment by releasing numbers as low as 10. Releases are best conducted in spring to maximise the chances of establishment.

To accelerate dispersal, releases are continuing from glasshouse cultures to establish nursery sites from which gorse thrips could either be collected and transferred to other sites or left to disperse naturally. When culturing ceases, it may be possible for community groups to assist in thrips redistribution once thrips field densities are high enough. However, due to the difficulties in distinguishing gorse thrips from other thrips species that commonly inhabit gorse, it would be vital to have personnel present trained in thrips identification to supervise community collections and releases as well as post-release monitoring. The ideal nursery site is one where the population density is high enough to enable multiple batches of around 250 thrips to be easily collected. The collection of release numbers lower than 250 at field nursery sites is an option if field densities are low.

Beating individual sections of gorse foliage for about 10 seconds, over a tray or white piece of cardboard can be used to assess numbers at a release site. Infested branches can be removed with secateurs, placed in sealed containers and transported to a new release site. Infested branches should then be lodged into gorse, preferably with soft shoots, so the thrips can transfer across.

Prospects for gorse control

The gorse thrips is one of four agents of European origin that have been released for the biological control of gorse in Australia.

The gorse seed weevil, *Exapion ulicis*, was first released in 1939 and is now widespread. The weevil larvae feed on gorse seeds within the developing pods during spring and summer. However, seeds produced during autumn and winter are not attacked so its impact is limited. The gorse spider mite, *Tetranychus lintearius*, was released in 1998 and is now widespread in Tasmania, Victoria and South Australia, the ACT and parts of NSW. The mites feed on mature gorse foliage and studies have shown they can reduce the growth of gorse by around 36%. However, predators such as the Chilean predatory mite, *Phytoseiulus persimilis*, and species of mite eating ladybirds, *Stethorus* spp., have reduced its effectiveness.

Another foliage feeding agent, the gorse soft shoot moth, *Agonopterix umbellana*, which attacks the newly developing spring growth of gorse, was released in Victoria and Tasmania in spring 2007. Further releases are planned, but it is still too early to tell whether establishment has been successful. Its impact alone or in combination with the other agents will be determined by future research. Research is also being conducted for possible host specific fungal pathogens and additional seed feeding agents.

It is important to remember that biological control is a long-term process that will not eradicate gorse. However, it is hoped that the combined impact of complementary biological control agents will reduce gorse vigour, seed output and rate of spread and make it more susceptible to grazing, weather stresses and herbicides as part of an integrated management program.

Acknowledgements

The gorse biological control program is a collaborative project between the Tasmanian Institute of Agriculture and DPI Victoria. Funding support has been provided by the Australian Government through the Natural Heritage Trust and the 'Defeating The Weeds Menace' program. This pamphlet was reviewed by Jamie Davies, DPI Victoria.

Further information

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