

BIOLOGICAL CONTROL OF GORSE: GORSE SPIDER MITE

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 spider mite, *Tetranychus lintearius*, is one of a guild of agents being used for the biological control of gorse in Australia and was first released in Tasmania and Victoria in December 1998, following tests that showed it feeds only on gorse. It is now widespread in Tasmania and Victoria and has become well established in South Australia, Western Australia the ACT and NSW.

Description

Adult mites are red in colour with eight legs and are smaller than a pin head (Fig. 1). Females are oval in shape and 0.6 mm long while males are smaller (0.4 mm long) and more triangular in shape. Eggs are translucent, spherical, about 0.1 mm in diameter and turn bright orange when ready to hatch (Fig. 1). The newly hatched juveniles (larvae) are similar to adults but smaller and have only six legs. Two later active juvenile stages (protonymph and deutonymph) both have eight legs. Immature mites have dark green abdomens with orange mouthparts and legs. The body reddens as they mature.

Life cycle and biology

Gorse spider mites live in webbed colonies on gorse bushes (Fig. 2) and move around the host plant en masse feeding and web spinning as they go. These colonies feed on mature gorse foliage. The life cycle is temperature dependent. The period for egg to adult development takes *ca.* 46 days at 15°C, *ca.* 32 days at 20°C and 20 days at 23°C. As it is able to pass through several generations in a relatively short time at warmer temperatures populations can increase rapidly.

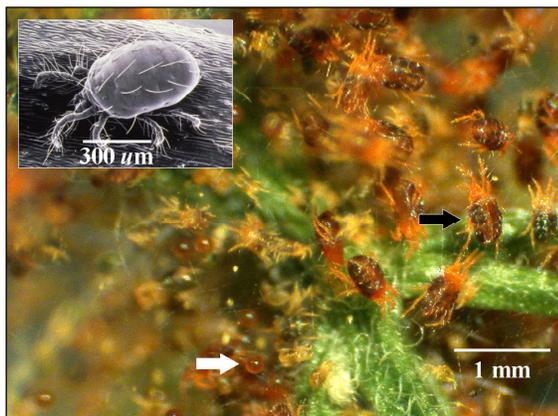


Figure 1. Colony of gorse spider mite, showing egg (white arrow) to adult stages (black arrow) (Photo: W. Chatterton, TIAR) and adult gorse spider mite under high magnification (insert) (Photo courtesy of Landcare Research New Zealand Ltd.).

Adults may feed from 1-2 weeks before the female starts egg-laying. Eggs are scattered through the silk webbing of the colony and hatch in 1-2 weeks under warm conditions. In summer, each female lays *ca.* 40-50 eggs at the rate of 1-4 eggs per day, depending on temperature. The mites pass through three active juvenile stages before the adult stage is reached. The sex ratio is 1 male for every 20 females, although this can vary considerably. Climatic conditions, particularly rainfall, have a significant impact on the establishment and population growth of the mites. On warm days they can be seen moving actively through their webbing. However, on cold or wet days they protect themselves by clustering at the centre of the web, often on the leeward side of the gorse stems where they are protected from the wind and rain which can destroy the fine webbing.



Figure 2. Gorse spider mite webbing on gorse (Photo: R. Holloway, TIAR).

Damage to gorse

Gorse spider mites have sucking mouthparts that pierce the plant cell wall and extract the cell contents. This gives the foliage a bleached or bronzed appearance. Mite feeding can kill individual shoots and reduce plant growth and flower production. Tasmanian studies showed that mites can reduce shoot growth of gorse by around 36%. Although colonies can expand rapidly causing severe damage to individual bushes, populations can decline suddenly. Factors that contribute to population decline are heavy predation of the less mobile juvenile stages by the Chilean predatory mite, *Phytoseiulus persimilis* (Fig. 3), and species of mite eating ladybirds, *Stethorus* spp., coupled with mass migration. The migration could be triggered by a range of factors including the presence of predators, colony size and a decline in plant quality. When a colony is about to migrate, large numbers congregate from the tips of branches often in an icicle-like formation. The mites are then blown by the wind to land on gorse further away and form new colonies.



Figure 3. The Chilean predatory mite is an effective predator of gorse spider mite (Photo: W. Chatterton, TIAR).

Prospects for control

The gorse spider mite 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 thrips, *Sericothrips staphylinus*, was first released in Tasmania and Victoria in 2001 and has since been released in South Australia and NSW. The gorse thrips prefer to feed on young shoots and seedlings. A glasshouse study in Tasmania 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.

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.

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