BIOLOGICAL CONTROL OF RAGWORT: RAGWORT FLEA BEETLE

Background

Ragwort, *Senecio jacobaea*, is a serious weed in Tasmania and is poisonous to stock. It infests 16,000 ha of cattle grazed pasture and up to 270,000 ha of pasture are considered vulnerable to invasion. In Tasmania, the most serious infestations occur in the high rainfall dairy pastures in the north of the State. Losses to the dairy and beef industries from ragwort, due to a reduction in pasture production, have been conservatively estimated to be at least $1 million annually in some years.

The ragwort flea beetle, *Longitarsus flavicornis* (Fig. 1), was introduced to Tasmania in the autumn of 1979 as a possible biological control agent for ragwort. During an intensive mass rearing program, adult beetles were released from November 1979 at sites throughout the State. This resulted in the successful establishment of field populations. A successful redistribution program during the 1990's involving the collection of beetles from established sites, followed by their release at new sites, accelerated the spread of the beetle. It is now established throughout most of Tasmania's ragwort infestations and has reduced the severity of the weed in many localities.

Description

The adult stage is a beetle about 3 mm long. Newly emerged beetles are a light brown colour, becoming darker as they mature. The eggs are elongated, about 0.2 mm in diameter and 0.6 mm long and light brown in colour. Larvae are whitish in colour and pass through three moults or instars. Newly hatched larvae are about 1.5 mm in length and have dark head capsules. Mature larvae are about 5 mm in length and have reddish-brown head capsules. The pupae from which adults emerge are white and just over 3 mm in length.

Life cycle

One generation of the ragwort flea beetle is produced each year. In Tasmania, adults are most active on the ground surface in summer and autumn. The beetles start to emerge from pupae in the soil about mid-December (sometimes earlier) and eggs are laid, usually in the surface soil around the plants, three to four weeks after mating. Hatching is temperature dependent and occurs in about 17 days at 20°C. The newly hatched larvae feed by mining into the leaf petioles, roots and plant crown. Larvae also feed externally on the roots and crown. Feeding occurs from late summer until the end of the following spring when they pupate in the soil around the plants.

Damage to ragwort

The larvae burrowing into roots and crowns, giving them a furrowed or scarred appearance (Fig. 2), cause the most significant damage to ragwort. As many as 400 larvae may feed on a single plant, severely weakening the plant and ultimately causing its death.

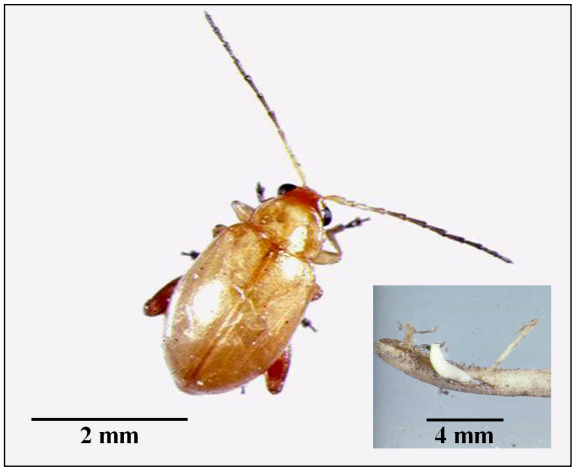

Figure 1. *Ragwort flea beetle and larvae (insert) feeding on ragwort root.*

Much of the beetles' life cycle takes place below ground and their presence is often not evident to the casual observer. However, during summer and autumn, the adults (beetles) are active and can be observed feeding on the rosettes, particularly on warm, still and overcast days. Although adult feeding is not regarded as having a significant detrimental effect on the plants, large numbers of beetles can cause extensive leaf damage at some sites. Adult feeding on the leaves is characterised by the appearance of small 'shot-holes'. High densities of adults can cause extensive damage on some plants, with only ragged portions of the leaves remaining.

Figure 2. *Section of ragwort crown showing larval damage (Photo: R. Holloway, TIA).*

How effective is the beetle?

Where ragwort flea beetle has established and increased in large numbers a substantial decline in the population of ragwort has occurred, reducing

infestations at some sites by as much as 95%. Although the beetle continues to play a major role in reducing the density and vigour of ragwort in many locations, it must be emphasised that control does not mean eradication. Furthermore, conditions vary from site to site, which may either prevent establishment of beetles, or affect the extent and rate of control. Factors responsible for reduced efficacy of the beetle include frequent pasture flooding in winter causing high larval mortality through drowning. Heavy stocking with cattle is also thought to have an adverse effect on the beetle by trampling larvae feeding externally on the roots and crowns.

In these situations additional stress on the plant will be achieved through the impact of other biological control agents such as the recently established ragwort stem and crown boring moth and the ragwort plume moth. The biological control agents can also be combined with traditional control methods in an integrated management program.

Farming with beetles (integrated management)

Observing some simple management practices can increase the efficacy of the beetle:

- **Use of herbicides**

Broad acre spraying of herbicides can cause high plant mortality and reduces beetle populations to low levels. Wick wiping or spot spraying in late spring and summer to kill flowering plants but leaving the non-flowering rosettes intact for the beetle is therefore recommended if the population of beetles and non-flowering rosettes is high.

- **Avoid excessive grazing by sheep**

Sheep are valuable in suppressing the spread of ragwort and can be used to enhance the beetle's effectiveness in release areas provided strict management practices are observed.

Beetles emerge in mid-December and are most active above ground in summer and autumn. They need leafy rosettes for food and shelter during this period. Excessive grazing by sheep in summer and autumn reduces the food and shelter available to the beetles, may remove larvae present in the leaf stalks and is therefore detrimental to the beetles' survival and rate of spread.

Release sites can be grazed heavily until about the end of November. This should allow sufficient regrowth of rosettes before adult beetles become active in mid-December. It is essential that sheep are then kept off the sites until about late February, or until just before the ragwort starts to seed. However, heavy grazing should be avoided because the beetles will still be active. Sheep can be used to remove the flower heads and lightly graze the foliage from late February until the end of April. By then the beetles' activity on the surface will have started to decline and normal grazing practices can be resumed.

- **Other grazing animals**

Cattle and horses normally avoid eating ragwort. No grazing strategy needs to be applied apart from preventing excessive trampling and pugging when stocking rates are high. This is particularly important during winter because it could cause high mortality to externally feeding larvae just below the ground surface, particularly in areas where pastures are waterlogged.

- **Cutting and mowing**

Cutting in summer and autumn to a height of 10-15 cm above the ground to remove flowering stems and keep rosettes intact may be used in place of grazing by sheep. This strategy does not prevent seeding past the green bud stage as seeds can still mature on these cut stems, but is effective in reducing wind dispersal of seed. However, cutting may need repeating several times to prevent flowering.

Additional agents

A native moth, *Patagoniodes farinaria*, commonly known as the blue stem borer because the bluish coloured larvae bore into ragwort stems, often attacks ragwort. Larvae are particularly active on flowering stems during summer. Their presence is detected by large quantities of frass (excreta) on the stem surface. This insect, where it occurs alone, does not appear to have any significant effect on the ragwort population.

Blue stem borers and ragwort flea beetles when they occur together should complement each other in controlling ragwort because the beetle larvae feed mainly below ground and those of the blue stem borer feed mainly in the stems above the ground.

Two other biological control agents of European origin, the ragwort stem and crown boring moth, *Cochylis atricapitana*, and the ragwort plume moth, *Platyptilia isodactyla*, have now become established in Tasmania and are continuing to spread (see Weed Biological Control Pamphlet Nos. 3 and 4). The feeding activities of the larvae of these insects also complement the root feeding activities of the ragwort flea beetle larvae resulting in more effective control, particularly at sites prone to water logging where the impact of the ragwort flea beetle may be restricted.

Further information

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