



The Biological control of Paterson's curse

Flea beetle

Longitarsus echii

Biological control aims to limit the dominance of Paterson's curse to a point that makes it economically insignificant to farmers; biocontrol is not an eradication program. It will take many years for the insects to reach their full potential although at some sites insects are killing plants and have spread kilometres 8 years after release. Biocontrol typically requires more than one agent to control the target, for Paterson's curse there is a suite of four insects and each attacks a different life stage of the plant. Once all four insects have large widespread field populations, significant reductions in Paterson's curse seed production are most likely to occur. From this time it will take several years for the seed bank to reach a level that will limit Paterson's curse populations; however this process may be hastened through the establishment of competitive pastures.

Biology

The flea beetle (*Longitarsus echii*) is a small shiny black beetle (3-4mm long) and is so named because it has large hind legs that are adapted for jumping. The flea beetle has one generation each year. Adult beetles become active from late autumn (May) to late winter (August) after heavy rain stimulates Paterson's curse germination. After feeding for 1-2 weeks, females become sexually mature and lay eggs directly on the taproot of the rosettes. Egg production can last from May to November with females producing 250 eggs on average. The eggs hatch after 2-4 weeks. Larvae feed and mine into the taproot and secondary roots where they are protected from grazing livestock and reduce plant growth. If attack is high, 30-40

larvae will destroy the root and continue feeding into the crown (the growth point of the weed) killing rosettes, 15-20cm in diameter. Once feeding is complete, larvae leave the root to pupate in the soil up to 20cm below the ground surface. Over summer the pupae turn into adults and remain below ground until winter rain stimulates them to emerge and start a new generation. The ability of the flea beetle to remain dormant below ground until winter makes it ideally suited to regions with hot dry summers and late autumn breaks. Once established, flea beetles are proving to be the most successful insects in heavily grazed pastures because the insect spends most of its life below ground protected from hungry mouths and trampling hooves.

Life Cycle of the Paterson's curse flea beetle



Release and establishment of the flea beetle

Winter is the only time to release flea beetles, after heavy rain stimulates the adults to emerge from the ground and Paterson's curse to germinate. At this time females are reproductive and the weed is available for egg lay. Releases of 300-500+ adult beetles into "nursery sites" are recommended to ensure a good level of attack in the first season. A nursery site is an area kept free of grazing, cultivation and chemicals for at least 3-4 years to allow the beetles to breed rapidly and become self-sustaining. Nursery sites protect adults and prevent them from being trampled by livestock. The nursery site needs only be 0.5 hectare in size (though bigger is better) and is easily created by fencing off a corner of a paddock thick with Paterson's curse, particularly non-arable land where weed is difficult to control. Nursery sites are best located next to paddocks of permanent or long pasture rotations and should have a free draining soil. Soil that regularly becomes water logged can result in larvae drowning while they are feeding in the root.

Once a pasture is locked up, perennial grasses can quickly dominate and exclude annuals like Paterson's curse. If this starts to occur in your nursery site, grazing livestock can be introduced to the nursery site from summer to autumn (or an application of herbicide if you are in a summer rainfall zone) to open up the pasture and promote Paterson's curse germination in the following year. Grazing or herbicide use at this time of year will have minimal impact on the beetles, as they are dormant, up to 20cm below ground.

Managing the flea beetle in pasture

Once a good level of flea beetle activity has been observed in the nursery site (many adults feeding in winter or roots damaged by larvae in spring), any reduction in grazing pressure in the adjacent curse infested pastures in winter will encourage wider impact of the beetles as they are less likely to be trampled. A simple guide for a suitable grazing pressure is when the crown of Paterson's curse is being grazed; reducing the grazing pressure will benefit the insects (and desirable pasture species). In paddocks that are entering a cropping phase, minimum tillage in autumn will offer the best protection for adult insects still dormant below ground.

Targeting an area on your property usually next to your nursery site for biological control gives you the flexibility to continue controlling the weed in other infested paddocks. Managing Paterson's curse on the rest of the property must continue, as the insects will take many years to have a significant impact. While the use of herbicides have no direct effect on beetle activity, killing a rosette will cause under-developed larvae to starve. The use of insecticides can significantly depress the numbers of flea beetles and should be used with caution on the paddock you are managing for flea beetle activity. If insecticide or herbicide must be sprayed in an area where insects are active contact your State officer for advice.

Managing Paterson's curse in pasture

For more information on controlling Paterson's curse with herbicides, grazing and pasture improvement, go to 'Tips and Tools' at the Meat and Livestock Australia; www.mla.com.au or phone **1800 675 717**. For more detailed information the book 'Pasture management for weed control' is available through MLA or NSW DPI phone **1800 028 374**.

Contacts for collaborating organisations

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