Lifecycle of clover root weevil and its natural enemy, the parasitoid Microctonus aethiopoides

Early instar CRW larva on root of white clover

Larvae feed of nodules and roots of white clover

CRW eggs

CRW female feeds on white clover

Eggs fall to the ground

Adult clover root weevil (CRW)

Parasitoid lays a single egg inside the adult weevil (females become infertile)

Parasitoid cocoon

Adult M. aethiopoides emerges

The weevil dies when parasitoid grub emerges

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A Weevil Pest of White Clover

**Common name:** Clover root weevil (CRW)  
**Scientific name:** *Sitona lepidus*

CRW attacks clovers, especially white clover. A recent invader to New Zealand, both adults and larvae feed on clovers year round, causing significant declines in clover content and pasture quality. While adults kill clover seedlings, it is the larval stage that is the most damaging, with the early stages of the larvae feeding almost exclusively on the nitrogen-fixing root nodules and the older larvae attacking the roots and stolons of white clover.

**Why is white clover important to New Zealand**

White clover is the best quality component of grazed ryegrass/white clover pastures. White clover fixes nitrogen from the air, helps improve soil fertility and pasture quality. It is highly nutritive and palatable and as a consequence provides higher milk yields, wool production and animal live weight gains. The annual financial contribution of white clover through fixed nitrogen, pasture yield, seed production and honey production is estimated at just over $3 billion.

**Damage caused by CRW**

CRW adults feed on the foliage, causing a scalloping on the edges of the leaves. A single CRW female can lay hundreds of eggs, which are laid as the weevil feeds. The eggs fall to the ground from where the first-instar larvae hatch. These burrow down to attack the nodules and roots of white clover. Recent results from a pasture impact trial have shown that modest populations of 300 larvae/m² reduce spring clover dry matter production by 56%. Therefore, instead of relying on this free, natural source of nitrogen, most farmers in infested regions must apply high levels of nitrogen fertiliser (> 200kg N/ha) to maintain soil fertility and farm profitability. However, if used incorrectly, these high levels of fertiliser can pollute our waterways having undesirable effects on the habitats for our native and introduce freshwater aquatic life.

**The parasitoid *Microctonus aethiopoides***

This parasitoid wasp is the natural enemy of CRW. In quarantine tests it was found that a parasitoid wasp from Ireland was very effective against the weevil. *Microctonus aethiopoides* is the size of a sandfly and reddish brown. There are only females. The parasitoid was first released in the North Island in 2006.

**Parasitism of CRW**

The parasitoid uses her sharp ovipositor to pierce the adult weevil in the soft parts of the body and deposits a single egg inside. She can lay up to 70 eggs in her life time. Parasitism makes female weevils sterile and they stop laying eggs. The weevil keeps feeding while the parasitoid grub develops inside the weevil, but when the grub emerges, the weevil dies. The grub forms a cocoon from which a new adult parasitoid emerges. The time it takes for the parasitoid to go through its life cycle is dependent on temperature.

**Host range testing**

It was important to know if the parasitoid was host specific to CRW. Detailed research in quarantine found that a small number of native weevils are potential targets for attack by the parasitoid, but that CRW was always the preferred host. The tests were rigorous, and results with a similar parasitoid has shown that despite laboratory test results, in the field, impacts on native species are minor.

**Cost/benefit of the parasitoid**

CRW is having a significant impact on the productivity and survival of white clover in New Zealand and is increasing farmer reliance on N fertilisers. The parasitoid *M. aethiopoides* appears the only option for controlling this pest. While the parasitoid may attack native weevils in the wild, the impact on these weevils is expected to be negligible.