Introduction
Argentine stem weevil (ASW) (*Listronotus bonariensis*) is an exotic weevil of South American origin. It is a major pest of seedling perennial ryegrass (*Lolium perenne*) and short rotation (*Lolium multiflorum*) grasses as well as emerging stands of cereal crops including maize. ASW can also cause severe damage to established pastures. This pest is distributed throughout the country and is considered to be New Zealand’s worst insect pest of pasture. Uncontrolled, the weevil has been estimated to cost the country up to $280m per annum. The successful introduction of a biocontrol agent (*Microctonus hyperodae*) in the 1990s and the development of endophyte infected ryegrasses at about the same time reduced the impact of ASW.

Key characteristics and biology
Adult weevils are hard bodied and compact; usually less than 3.5 mm long and 1.5 mm wide. They are grey-brown with three pale longitudinal stripes on their thorax. This colour and size, combined with the fact that soil particles adhere to their bodies, make adult weevils very difficult to detect visually. ASW can be active during the day, but feeding and egg laying usually occur at night.

Adult weevils commence egg laying in spring. Females lay up to four black elongated eggs in the leaf sheath of grasses or cereals. On hatching, the white legless larvae tunnel into the leaf stem where they usually remain until they are ready to pupate. The larvae pass through four stages, each stage increasing in size. Larvae in the final stage may live outside the plant in the thatch, particularly if the tillers are small. Pupation occurs in the litter layer. New adults are able to commence laying eggs almost immediately after emergence from pupae, but egg laying is controlled by day-length and stops in early March. The adult weevils can occasionally fly; and mass dispersal flights can occur on calm, sunny days in summer and autumn.

The number of generations ASW can achieve in a year is driven by temperature. Pest status is reached when two or more generations occur, as happens from Canterbury northwards. In Otago and Southland, historically only one generation has generally occurred each year, but anecdotal evidence suggests this may have changed and ASW’s pest status may be increasing in significance.

Impacts and damage
Adult ASW do cause seedling plant damage, but their larvae are far more costly to New Zealand agriculture. Larvae mining the stem do the greatest damage to vegetative tillers, which wilt and yellow from the centre outwards. Damaged tillers contain larval frass and may show small, circular larval exit holes near the base. If tillers are attacked during flowering, they will whiten and may snap off due to mechanical weakening. In a heavy ASW infestation, swards can be severely damaged, particularly in dry conditions when pasture growth is retarded and there is poor autumnal recovery. Developing larvae can destroy up to eight ryegrass tillers and can move to new plants when required.

Adult feeding by Argentine stem weevil is characterised by ‘windowing’ of the leaves. Windows are typically rectangular and appear as clear areas, the ‘pane’ comprising the lower leaf cuticle, which remains intact. Leaf veins encountered while the adults feed are cut and often appear as coiled pigtail-like threads attached at the upper edge of the window.

Adult feeding damage is not normally significant except in summer-sown pasture, where ASW can nip off emerging seedlings. The result damage may look like poor seed strike.

Key points
- Argentine stem weevil is a common and serious pest of grasses, maize and cereal crops throughout New Zealand.
- Adult feeding is generally insignificant and most damage is caused by larval feeding inside plant tillers.
- Argentine stem weevil is difficult to control with insecticides, but endophytes are effective in some grass species.
- A biocontrol agent is present throughout New Zealand, but it appears to be less effective now than it was in the first 5-10 years after its release in the early 1990s.
Cereals are also affected by the Argentine stem weevil and there are also cases of the weevils feeding on non-graminaceous plants e.g. brassica seedlings. This may be driven by shortage of grasses for food or because the weevils are seeking moisture.

Control

Insecticide

Argentine stem weevil is difficult to control with insecticides. Several products are available that will kill adult weevils, but paddocks can be rapidly re-infested from populations nearby. The larvae generally live within the plant stems on which they feed, and are therefore protected from most insecticides.

When establishing new pastures and cereal crops there are some options that can mitigate seedling damage by this pest. Cultivation can destroy larval populations but will not protect against adults which may survive cultivation or re-invade the paddock. An insecticide can be used if necessary in this situation. Foliar sprays, and seed coatings are available.

If very high numbers of adults are present, insecticide seed coating may not offer sufficient protection to avoid loss of seedlings. Even endophyte-infected seedlings (see below) may be vulnerable to attack during establishment.

Be aware that larvae are able to survive in dying vegetation and migrate to new plants after sowing, so if you plan to re-establish pastures or sow crops via direct-drilling, assess the probability of damage and select the appropriate cultural or chemical control option.

Biocontrol and plant resistance

A small wasp, Microctonus hyperodae, was introduced to New Zealand in 1990 as a biological control agent and was released throughout the country. It is now well established in most areas and, in combination with endophyte infected ryegrasses, has reduced the impact this weevil formerly had on New Zealand pastures. This wasp is a parasite and lays its eggs inside the adult weevil, sterilising and eventually killing the weevil.

Unfortunately, recent studies have shown that the effectiveness of the parasitoid biological control agent of ASW has become greatly diminished. This has probably occurred through evolved resistance by the weevil to the natural enemy.

Pasture

In nil endophyte pastures the stem-mining larvae kill the grass tillers and the adults chew off seedlings after emergence. In general, endophytes can usefully protect established perennial pasture and insecticidal seed treatments can protect seedlings. However, in short-rotation Italian (L. multiflorum-based) grasses, ASW has been found to build up to particularly high and damaging densities.

Cereals

During the same study it became apparent that some cereals, particularly rye and wheat are also affected by ASW feeding and oviposition at the seedling stage. However, the significance of this remains uncertain. There has been a long held general view that cereals probably ‘grow away’ from ASW damage. However, it has been an enormous amount of cereal breeding since the early scientific references to ASW impact on cereals and the insect-plant interactions may have changed. Further, just because a plant can ‘grow away’ from ASW damage rather than be killed outright, does not necessarily mean that earlier damage would not translate into production losses. These uncertainties require research-based answers.

Endophyte

Endophyte is a term used to describe an organism that lives inside another. In this case the Epichloë endophyte (a fungus) that lives within ryegrass plants. Toxins produced by this fungus protect the plant from grazing. A ‘common toxic’ endophyte that can occur naturally in ryegrass, and used to be prevalent in pasture cultivars, protected the plants from ASW feeding damage, but also induced stock health problems such as heat stress and ryegrass staggers. Research and selection by plant breeders and mycologists has improved the availability and combination of endophytes and ryegrass cultivars and several companies now offer annual and perennial ryegrass cultivars containing endophytes that protect ryegrass from the weevil while minimising the effects on stock caused by ‘common toxic’ endophyte. Some endophytes will also protect against other insect pests, so talk to your seed provider to ensure you are sowing the most appropriate cultivar for your property.

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