

# Biological control of invasive plants



Biological control of invasive plants (weeds) involves the use of naturally occurring, co-evolved insects, mites or pathogens (diseases) collected from the target weed in its native range. These organisms affect the health of invasive plants with the aim to reduce the vigour, size and competitiveness of invasive plant infestations down to a level where the weed no longer causes economic or environmental harm. However, they rarely get rid of the weed altogether.

Australia has introduced over 200 biological control agents to control over 70 weed species. About one third of the weeds (e.g. prickly pear and other cactus species, groundsel bush, noogoora burr and four species of water weeds), have been successfully controlled, with an average benefit:cost ratio of 23:1. That means for every dollar spent on invasive plant biological control, we have had a return on investment of \$23 through reduced impacts and treatment costs and increased production.

There are also significant benefits to the environment through the reduction of herbicide use and a reduced impact on biodiversity.

The Department of Agriculture and Fisheries undertakes weed biological control research in Queensland. Strict measures are in place to ensure that the introduced biological control agents do not negatively affect native plants and animals or horticultural and agricultural crops.

Before an agent is released into Australia, it is thoroughly tested in a quarantine facility against numerous plant species, closely related to the target plant, native and/or economically important, to determine if any other plant species are at risk from attack from the biological control agent.



Once researchers are confident that the host specificity testing shows the agent poses minimal risk to other plants, an application is submitted to the Australian Department of Agriculture (DoA) for assessment.

A risk analysis is undertaken within the DoA under the *Biosecurity Act 2014* (Cwth) by technical and scientific experts, in consultation with scientific specialists and other stakeholders in all states and territories of Australia.

Based on the risk analysis, DoA provides a recommendation to allow the field release of the biological control agent only if the risk is considered acceptable.

A parallel process operates for the assessment of biological control release applications within the Australian Department of Environment and Energy under the Environment Protection and Biodiversity Conservation Act 1999 (Cwth).

## Will the biological control agent attack other plants?

Biological control agents have co-evolved with their host and are not adapted to attack other plant species. Biological control involves going back to the invasive plant's country of origin and finding agents which are found only on the target plant. If during host specificity testing potential agents are observed to attack other species, then they are rejected and not released.

When populations of the weed decrease, populations of the insect also decrease. The insects rarely eat all the host plants. The moth *Cactoblastis cactorum* was released on prickly pear over 85 years ago. While we never see populations of prickly pear equal to that of the 1920s, there are still scattered plants around the countryside, and most will have a few insects present, keeping populations of prickly pear low.

## What happens once the biological control agent has eaten all the target plants?

It is rare for the biological control agent to completely kill all the target plants. Populations of the invasive plant and the insect stay in equilibrium but at very low levels. If, as occurs on occasions, the target plant is completely destroyed within a localized area, the insect in that locality also dies out, unless the adults can find other plants of the same species elsewhere. The biological control agent will not attack another plant species, if the target plant disappears, as it is not adapted to do so.

## Can the biological control agent mutate or evolve to attack other plants?

Mutations occur at the sexual reproduction stage. Individuals do not mutate nor do they evolve. Most mutations that occur in nature are deleterious and the organism dies and does not pass it on to the next generation.

For an insect to find and recognize its host plant amongst many other plants in the environment, there are numerous phases that occur. Typically, the insect will first smell its host plant, then as it gets closer, see the host plant. The insect will then land on the host plant and 'taste' using its feet. Once convinced the plant is suitable, it will take a bite. For the insect to process the host plant, it requires all the enzymes and chemicals to breakdown plant metabolites.

For a biocontrol agent to attack and survive on another plant, there has to be several simultaneous mutations in the offspring for it to find and recognize a different plant, as well as changes to their enzymes to allow them to process the new plant. For these changes to be fixed in a population, the individuals will have to find and mate with similar individuals, otherwise the mutations are lost. Therefore, the chance of a biological control agent mutating to attack another species is extremely low.

## How long does it take for control to be achieved?

Prior to releasing a biological control agent, the research to determine that the agent is suitable for release, may take several years. The time for a biological control agent or agents to work, depends on the weed, the agents and the climatic conditions. The cochineal recently released on coral cactus took 21 months from the time of release to bring the weed under control.

Some of our water weeds were controlled in 18 months in north Queensland while in South East Queensland, the weeds were controlled in 36 months. Other weeds such as parthenium or noogoora burr took many years due to the biology of the plant and the need to introduce multiple biological control agents.

## How can I get biocontrol agents?

For many of the weeds which have been previously studied, biological control agents are firmly established and widespread in the environment and the department is no longer maintaining cultures. It is possible that from time to time, new weed infestations arise in a new locality and in the early stages, biological control agents have not yet found and attacked the plant. In most situations, given time, the agents will find the weed and the plant will be attacked and hopefully controlled. However, if new infestations arise well away from existing plants, then there will be a longer time period before the agent finds the plant. In the meantime, the weed population may increase. To circumvent this happening, biological control agents could be sought from other infestations of the plant.

## Further information

Landholders wishing to source biological control agents can contact your local government office or Biosecurity Queensland on 13 25 23 or visit [biosecurity.qld.gov.au](http://biosecurity.qld.gov.au).

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Fact sheets are available from Department of Agriculture and Fisheries (DAF) service centres and our Customer Service Centre (telephone 13 25 23). Check our website at [biosecurity.qld.gov.au](http://biosecurity.qld.gov.au) to ensure you have the latest version of this fact sheet. The control methods referred to in this fact sheet should be used in accordance with the restrictions (federal and state legislation, and local government laws) directly or indirectly related to each control method. These restrictions may prevent the use of one or more of the methods referred to, depending on individual circumstances. While every care is taken to ensure the accuracy of this information, DAF does not invite reliance upon it, nor accept responsibility for any loss or damage caused by actions based on it.