Community collaboration supports pilot release of a biocontrol agent for flaxleaf fleabane across the Riverina

Community groups and researchers have joined forces to tackle one of Australia's most invasive crop weeds — flaxleaf fleabane (*Conyza bonariensis*). Researchers have identified a rust fungus that can reduce the reproductive viability of flaxleaf fleabane and lessen the reliance on chemicals to control this invasive weed. But it is the community level collaboration across stakeholder groups, which is enabling holistic management of flaxleaf fleabane at a regional scale, that is a standout success of this project.

Flaxleaf fleabane, an annual native herb from South America, is one of the most difficult-to-control weeds in Australian cropping systems. The total area impacted by this weed is around three million hectares, with an estimated revenue loss of more than $43 million per year for Australian grain growers.

Flaxleaf fleabane is a prolific seeder, capable of producing more than 100,000 seeds per plant, which can spread long distances in wind and water. More recently, the weed has developed resistance to commonly used herbicides, making it even more difficult to control.

AT A GLANCE

- Community collaboration underpins area wide control of invasive weeds in Australian cropping systems.
- Researchers have been working with cross-sector community groups to pilot the release of a rust fungus that may offer a complementary control option in the fight against flaxleaf fleabane.
- Engaging community stakeholders at the outset of any weed management project offers the greatest potential for long-term area wide weed control.

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Flaxleaf fleabane infestations are particularly problematic in fallows, along roadsides, fencelines, irrigation channels and around farm infrastructure. The combination of abundant seed production and highly mobile seed means populations proliferate and spread to neighbouring crop paddocks. The key to effective management is landscape-scale collaboration using an arsenal of control strategies to diminish the reproductive viability of these populations and reduce the invasive pressure on adjacent crop paddocks.

Biocontrol agent – another 'tool' in the toolkit

A research team led by Dr Ben Gooden from CSIRO, Australia's national science agency, went in search of potential biocontrol agents to complement existing management tools for controlling flaxleaf fleabane in cropping systems. The team found a rust fungus (*Puccinia cnici-oleracei*) on fleabane in Colombia, South America, which infects the leaves and green flower parts of flaxleaf fleabane, diverting nutrients from the plant's cells, reducing photosynthesis, plant growth and reproduction. If the fungus becomes established widely across flaxleaf fleabane populations in Australia, it may cause severe disease, decreasing the reproductive output of the weed and reducing its potential to reinvade neighbouring cropping areas.

Fast forward to September 2022, following a rigorous impact and risk assessment process that saw the fungus brought into Australia, the CSIRO team has been working collaboratively with community-based groups, including the Irrigation Research and Extension Committee (IREC) in the Murrumbidgee Irrigation area of New South Wales to release the fungus in flaxleaf fleabane-infested areas.

"This is the first time a biocontrol agent has been developed and released in Australia for flaxleaf fleabane," Ben said.

"With the increased rates of herbicide resistance among flaxleaf fleabane populations and the increased spread of the weed, the time was right to investigate and add another tool in the management toolkit for this problematic weed.

"Biocontrol agents, such as the rust fungus, complement but do not replace more traditional control options, including chemical herbicide application, to give a multifaceted control strategy."

Community engagement critical to long-term success

Dr Gooden is excited to be working with the IREC to coordinate community-based releases of the fungus as part of a small pilot program through to March 2023.

He emphasised the importance of working with communities of growers and other land managers to create area wide impact with biocontrol agents such as the rust fungus.

"Community collaboration is helping us to optimise a biocontrol agent release program that best fits with the aspirations of local growers," Dr Gooden said.

He stressed that involving the community as research partners from the outset is critical to the success of any weed management project.

RIGHT: Including biocontrol agents such as the rust fungus, adds another tool to the management toolkit for flaxleaf fleabane, giving a mulitifacted control strategy.

"When the community is actively engaged, has input into the project and can see the benefits of the research through their involvement we can achieve broadscale, long-term impact," he said.

"If we were to only engage and consider community members as the end-users of the research, we would not have the uptake and level of enthusiasm and engagement we currently have.

"We are building connections between researchers and growers on the ground, working together to develop a shared program of interest to manage a really complex weed."

IREC is playing a key facilitative role linking researchers with networks of community members, growers, agricultural businesses and weed anagers.

Executive Officer, Iva Quarisa agrees that while the rust fungus is a potentially valuable addition to the flaxleaf fleabane control toolbox, what is really exciting is the networks of stakeholders brought together under an area wide framework to enable holistic management of weeds at a regional scale.

IREC is also a partner in the area wide management (AWM) project bringing together stakeholders to tackle highly mobile weeds, and the fleabane rust fungus release has offered a unique area wide option to be added to the range of other tools aimed at improving weed control across the region.

ABOVE: Community collaboration is helping create area wide impact with biocontrol agents such as rust fungus.

BELOW LEFT: Flaxleaf fleabane infestations are particularly problematic along roadsides, fencelines, irrigation channels, and in fallows.

Biocontrol offers a sustainable long-term solution

Until March 2023, when the pilot program closes, the CSIRO team will monitor for signs of fungal infection at the release sites and determine overall infection rates. This information will assist in determining the regions and conditions under which the fungus is most likely to infect flaxleaf fleabane in the future.

At this pilot stage of research, the CSIRO team has no expectations the fungus will become widely established or reduce the impacts of flaxleaf fleabane straight away.

Dr Gooden predicts it will take several years to see significant declines in the population size of flaxleaf fleabane, even after the rust fungus has successfully established in the field. While spread of the fungus between plants will initially be slow, the rate of spread will accelerate as levels of the rust fungus increase in the weed population.

"Biocontrol is safe and sustainable, but it is important to understand it is not a 'silver bullet' for completely removing a target weed from the landscape altogether over short periods of time. It will not remove the need for other management techniques, including cultural and chemical control.

"We want to see a slow and steady decline in the flaxleaf fleabane population, but most importantly a reduction in the ability of the weed to set seed."

Area wide management
of weeds in cropping systems

A ground-breaking project is exploring the potential for cross-sector collaboration to make inroads into the ever-evolving challenge of weed control across private and public land. The project is investigating and demonstrating the agronomic, economic and social benefits of tackling the problem of mobile weeds on a cross-industry scale.

The project looks to increase understanding of the mobility of key weeds in cropping systems, their herbicide resistance status, the costs of managing herbicide-resistant weeds and the attitudes of a range of stakeholders to collaborative weed management approaches, such as AWM.

Researchers focussed on three main regions with diverse land-use types and distinct social dynamics: the Darling Downs, Queensland, Riverina, New South Wales and Sunraysia, Victoria.

Local stakeholders were engaged across the project to better understand the impacts of weeds and weed dispersal and the collective motivation to minimise weed seeds at a landscape scale. This will have a larger impact then individuals working independently.

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