

The CABI Podcast: Himalayan Balsam

Audio Transcript



Donna

If you live in the UK, France, Germany, Belgium or even North America, you may well have walked past this plant with its beautiful bright pink flowers.

Particularly along waterways or damp areas.

But this plant is highly invasive causing a number of negative effects...

Sonal

Himalayan balsam or *impatiens glandulifera* which is the latin name is a non-native invasive weed which is originally from the Himalayan region of India and Pakistan. It grows in the foothills of that region.

Donna

So how did it arrive in Western Europe?

Sonal

It was first introduced to Europe in the 19th century by Victorian plant hunters as an ornamental plant because it has a really beautiful flower. It's a close relative of the busy lizzie which is popular plant in horticultural industry.

Donna

Welcome to another episode of the CABI podcast. This series we're focusing on invasive species.

I'm Donna

On this episode we're focusing on the invasive plant, Himalayan balsam, with expert guests Sonal and Kate...

Sonal

My name is Sonal Varia and I'm a weed biocontrol scientist. I've worked at CABI for 12 years and I actually started working on the Himalayan balsam when I first started as an intern.

Kate

I'm Kate Pollard and I'm a research scientist and I work within the weeds biocontrol group at CABI in Egham. I'm a plant pathologist by training so I work on using fungal agents for the classical biological control of invasive weeds.

I've been at CABI for eight years and like Sonal I started on the Himalayan balsam project when I first started here

Donna

Brought over by plant hunters in the 19th century, Himalayan balsam is widespread in the United Kingdom.

It can grow up to 2 metres tall with rough, reddish stems and shiny oval-shaped leaves, and notably beautiful bright pink-purple flowers from June to September.

Sonal

And in the UK, it's found in damp woodlands and along in riverined habitats. This can be a problem because if you control it in one part of the system, it can always be reinvaded from further up in the catchment.

Donna

And Himalayan balsam does cause all sorts of problems

Sonal

Himalayan balsam can cause – can have many negative impacts on biodiversity because where it's invading it can grow in very dense monocultures where not many other plant species can grow. So, because Himalayan balsam competes with native plant species for light and space, and also pollinators, so Himalayan balsam has a really high nectar content which pollinators such as bees really like. And they'll often go to those flowers rather than native species so the native species are losing out on being pollinated in some cases.

And there's evidence to prove this. Where Himalayan balsam is present the biodiversity of other plants is often reduced as well and that can have effects on invertebrates that are present there, and also have impacts on the microorganisms that are present in the soil where Himalayan balsam grows.

Donna

Plus, due to its high seed count, it can spread prolifically

Sonal

Each plant can produce actually hundreds of seeds and therefore it makes it really hard to control and it grows in such dense patches and monocultures that it can completely take over the habitat and have negative impacts on biodiversity. And when the seeds are ripe and they're projected from the pods really explosively and they can – each seed can spread up to seven metres from the parent plant so you can imagine that each plant has a high capacity to produce lots of seeds and spread them very far as well.

And when you think about that this plant is present on rivers, banks of rivers, you can understand how the plant, the seeds can spread really far by going through the water system, the river system.

Donna

Due to its adverse impacts on biodiversity, there are efforts to control it but that isn't so easy.

As Sonal said, it grows in damp areas and along waterways and if there's a bad infestation further upstream, controlling one downstream is a bit of a lost cause.

But how do you control it?

Sonal

Where it grows along riversides and you can't use chemicals, so it's very – it's recommended not to use chemicals near water. However, it has a very shallow root system so the most commonly used method is to hand pull it, because yes, even a child could probably pull out a mature plant.

Donna

But pulling it up takes a lot of time and effort, usually from local volunteer groups.

Kate explains what CABI have been doing...

Kate

So, we are looking to control Himalayan balsam using classical biological control, and that's the use of the rust fungus from the Himalayas and introducing that into the introduce range, so into the UK for control of Himalayan balsam.

So, the aim is that it will reduce populations of Himalayan balsam so that the native vegetation can re-establish and recolonise and so that some of the negative effects of the plant that were mentioned earlier are no longer present.

Donna

This method of classical biological control doesn't eradicate Himalayan balsam but means the plant becomes part of the flora instead of growing in dense monocultures.

Giving native species a fighting chance!

This means the project needed a biological control agent and the team conducted surveys in the plant's native range, and as the name suggests, that meant the Himalayas.

Kate

So, surveys were conducted in the Himalayas and in India and in Pakistan. So, in 2010, a range of insects were brought back to the UK in addition to the rust fungus and these were imported brought into our CABI quarantine facility at Egham. Many of these insects, well, most of – all of these insects were ruled out because they were found to be generalists.

Donna

The CABI team found that the insects fed on other species which ruled them out of initial testing. They prioritised the rust fungus.

Kate

Rust pathogens have a good history of use in biological control and this is because they're highly host-specific, they co-evolve with their host over thousands and thousands of years. They're highly damaging, they often affect the leaves, drawing nutrients away from the plant, reducing overall vigour and seed production. And they're dispersed by the wind, so the spores that are on the lower leaf surface spread in the wind to new populations so they can readily establish themselves.

Donna

Before they could release the rust fungus, the team tested it against 74 species which included several varieties of popular ornamentals, economically important species, and plants which grow in the same environment as Himalayan balsam.

Kate

We conducted host range testing. So, this involves infecting plants under optimal conditions of the rust, to ensure that the rust doesn't infect any species.

It was found to be highly host-specific to Himalayan balsam and could only complete its lifecycle on this one plant. So, we don't foresee the rust causing any problems in the field once it's been released.

Sonal

We compiled all of our research into a pest risk analysis and presented the work to the government and it was assessed by different experts including people from the government and external stakeholders and the European standing committee on plant health.

Donna

And, after being granted permission, the rust fungus has since been released in the UK.

Kate

The rust was first released into England in 2014 and then we've had subsequent releases into wales since then. And to date we have two different strains of the rust. There's one from India and one from Pakistan. And they both infect different cohorts of the Himalayan balsam population.

Donna

Working with local action groups and landowners, the rust fungus has been released in sites with dense populations of Himalayan balsam.

Kate explains how the rust fungus works.

Kate

The rust fungus has five different spore stages, and so it's termed *macrocyclic* rust fungus. And it completes all of these stages on Himalayan balsam. It has a two main-pronged attack where it causes damage to Himalayan balsam populations. So, the first is at the seedling stage. This is most visible as what they call ecious spores. So, it's orange little spores that form on the stems of the Himalayan balsam seedlings. And these cause the seedlings to become etiolated and warped. It will, it can kill seedlings – this stage can kill the seedlings and it renders them susceptible to the secondary infection via the pathogens.

These spores then will spread normally in rain and from raindrops, and these spores infect more mature Himalayan balsam plants, and they form what we call the uredinia spores and these are little brown spots that you see on the lower leaf surface. And these are an asexual spore stage that re-infect continuously and spread by the wind.

For the rust to overwinter, the rust produces an overwintering spore stage, called etiolate spores and this persists in the leaf litter. This falls on the leaves, and as the leaves fall, they persist in the leaf litter over the winter and these produce a spore stage that then initiates the ecious spore formation in the spring. So, it's a full cycle all on the Himalayan balsam.

Donna

The CABI team train local collaborators in how to release the rust and will conduct the first one alongside them and then the local groups or landowners carry out subsequent releases and help with monitoring at the field sites.

Kate

The technique we currently try is we release the rust three times over the growing season in June, July, and August just to get the population levels high enough.

Sonal

During the summer season the local action groups will be assessing and telling us what they find. But then, at the end of that, of the following year, in the spring, we will go to each site and assess if the rust has overwintered because that stage of the rusts can be more challenging to identify. So, we make sure that we go back to each site at that time.

Donna

But how exactly does one release a rust fungus?

Kate

So, we – to release the rusts at our field sites, we harvest the uredinia spores into a petri dish by tapping the leaves into – by tapping the leaves and collecting the spores in the petri dish and we mix these spores into a solution with water and something called tween which is a surfactant and this helps the spores to stick to the lower leaf surface of the plant, and also stop clumping.

When we go to a field site, we take the solution – we'll make up the solution in the field and then we use this and spray this onto the lower leaf surface of a dense stand of Himalayan balsam.

Donna

And crucially... is it working?

Kate

At some of our release sites we are seeing that the rust is establishing quite well, we're getting really good levels of infection on the leaves and the rust is overwintering at a number of sites in the UK. We are finding that the rust – the longer that the rust has been established at a site, we're find that the rust is spreading further from the initial release patch.

But biological control is not a quick fix and once established fully at a site, the impacts can take between five and 10 years before you can see them visibly in the field.

Donna

Whilst it's not a quick fix, biological control is safe and sustainable

Sonal

One of the main advantages is that once the biocontrol agent has become established, you don't need to keep putting more input as in putting – releasing more agent and putting in more money and resources. So, it's also a very reliable and cheap method of control and environmentally benign, we would say, because we would have done so much testing before to prove that it's safe, we would only release something that is safe to release and doesn't attack other plant species. So, biocontrol's got a good safety record.

Donna

CABI will continue to release the rust in its current UK sites and are also looking to try and identify additional strains.

At the moment, there are two rust strains being used, one from India and one from Pakistan but these don't infect all populations in the UK.

Through molecular work, the team have identified a region in the native range that they suspect the plants were originally introduced from.

Kate

The plan would be to try and conduct more surveys in this region to identify additional strains that would therefore be able to infect a broader range of Himalayan balsam populations in the UK.

Donna

Working with scientists on the ground in India and Pakistan, CABI's work on the biological control of Himalayan balsam continues.

You can find out more about this project by searching CABI Himalayan balsam.

But will we ever see the end of Himalayan balsam in the UK?

Sonal

It's too widespread. It will always be here and what with the rust and biocontrol you generally don't aim to eradicate the weed or the pest. You just want to reduce its vigour so that other plants can compete with it and it doesn't become such a dominant part of the landscape as it is currently.

Donna

If you've spotted Himalayan balsam in your area, the advice is to let local groups or authorities know rather than trying to tackle it yourself.

And remember, unlike the plant hunters of the 1800s, never ever bring plants back into the country!

Kate

I think the Victorians are responsible for a lot of our invasive species, and their plant hunters literally bringing back exotic and fancy things.

Donna

This podcast is a CABI production and was presented by Donna Hutchinson and Joanna Slezak, and edited by Tom Swindley.

Thank you to our guests Kate Pollard and Sonal Varia from the CABI centre in Egham in the UK.

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