Himalayan balsam biological control agent – *Puccinia komarovii* var. *glanduliferae*

What does the rust look like?

Spring

The first visible signs of rust infection can be seen during spring (**March – May**) when the stems of small Himalayan balsam seedlings are targeted. Small yellow /orange cups, called aecia, erupt from the surface of the stem below the first leaves (the hypocotyl), causing the stem to elongate, bend and become distorted. The area of infection may also become red. Stems of infected plants are usually longer than seedlings that are not infected.

Symptoms seen on the stems of Himalayan balsam seedlings during spring
Left: bending and distortion of the stem
Right: yellow/orange cups erupting from the stem

Summer

The most noticeable symptoms can be observed from the end of spring and throughout the summer (**May – September**). During this time, small yellow spots or whitening (known as chlorosis) on the upper leaf surface develops. About a week later, on the lower leaf surface, but associated with these yellow spots, small light brown pustules (uredinia) form.

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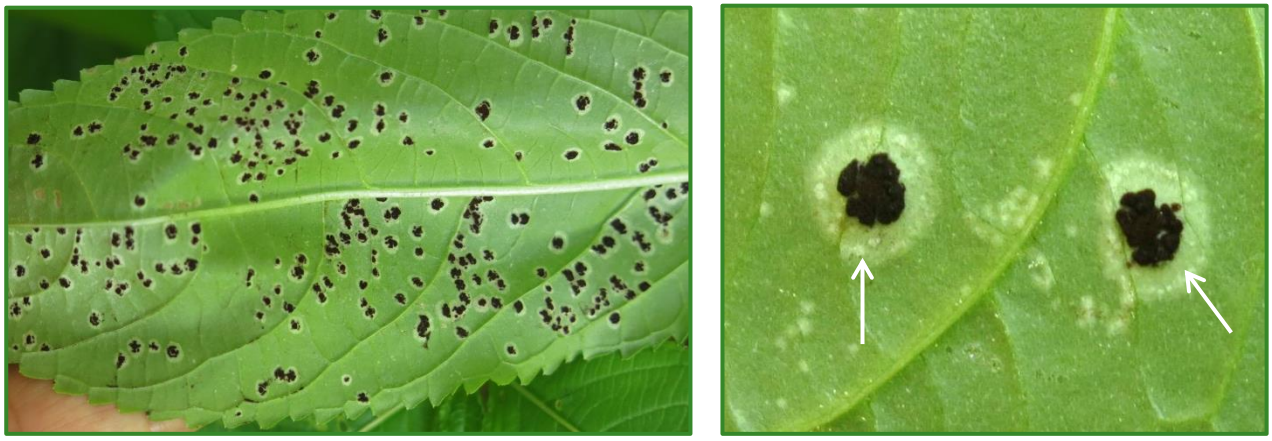
This process repeats itself so patches of chlorosis and the formation of these brown pustules on the leaves will continue throughout the summer. At the beginning of the season, initial signs of infection may be low with only a few pustules forming. However, these spores are readily dispersed by the wind enabling the infection to spread causing symptoms to become more prevalent.

Symptoms seen on infected leaves of Himalayan balsam during the summer months
Left: yellow/white lesions, chlorosis, seen on the upper leaf surface
Right: light brown pustules, uredinia on the lower leaf surface

Autumn

Towards the end of the summer (**August – September**) the light brown pustules on the lower leaf surface, become darker in colour and form dark brown/black pustules (telia). This stage represents the over-wintering stage. To begin with, both the light brown and dark brown pustules may be seen together on the same leaf, and are difficult to tell apart with the naked eye. Infected leaves will naturally fall to the ground where they will remain along with the biocontrol agent over winter and infect the stem again the next spring.



Symptoms seen on infected leaves of Himalayan balsam towards the end of summer/ autumn following a drop in temperature
Left: dark brown/black pustules, telia, on the lower leaf surface
Right: close-up of telia, 'satellite' teliospores (arrows) are starting to develop around the primary telia

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