



## GIVING DYER'S WOAD THE BLUES

**Locations** United States

**Dates** 01/01/2004 - Ongoing

### Summary

Dyer's woad is an ancient source of blue dye and was grown as a textile dye crop in Europe and Asia for centuries. It was introduced to North America by early colonists, but escaped cultivation. Today, it is recognized as a serious weed in the western USA. One reason for its impact is the absence of the natural enemies that keep it in check in its area of origin. CABI is searching for specialist natural enemies in Europe that could potentially be introduced for its biological control.

### The problem

Dyer's woad (*Isatis tinctoria*) is a plant of Eurasian origin in the mustard family. It was introduced to North America by early colonists as a textile dye crop and then accidentally spread as a contaminant of crop seed. Today, it is officially recognized as a serious weed in 10 western US states. Unlike most other invasive plants, dyer's woad can invade undisturbed sites. This makes it a particular problem in well-vegetated sites, such as rangelands, because it can readily invade and dominate them.

Control is difficult. Chemical control is limited in rangeland and forests by often inaccessible terrain, the risk of undesirable environmental impacts and questionable economic returns. Cultivation can be effective against the weed in crop areas, but it must be repeated 2–3 times a year for several years to be successful.

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#### What we are doing

In 2004, Mark Schwarzländer (University of Idaho, USA) and Jim Hull (Weed Superintendent, Idaho) invited CABI to participate in an initiative to investigate the potential for biological control of dyer's woad. We identified several potential biological control agents, which we subsequently studied to varying degrees. The aim was to identify species that are both specific to the target plant and cause sufficient damage to limit the weed's impact and spread in the USA.

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#### Results so far

Current work concentrates on two weevils: the seed feeder *Ceutorhynchus peyerimhoffi* and the root-crown miner *C. rusticus*. We tested them on over one hundred plant species, two-thirds of which are native to North America and include species of conservation concern.

The host range testing with *C. peyerimhoffi* is coming to an end and we plan to submit a petition for field release to the USDA-APHIS (Animal and Plant Health Inspection Service) Technical Advisory Group (TAG) in 2023. The host range of this weevil is narrow. Full larval development only occurred in five non-target species in no-choice tests (i.e. when weevils were confirmed to one plant species). One of them, *Boechera hoffmannii*, is a federally listed endangered species. However, additional tests suggest a very limited risk of non-target attack on *B. hoffmannii* and other test species in the field.

*C. rusticus* developed to adult on 17 species native to North America. But Dyer's woad was highly preferred for egg-laying in field tests, so we believe *C. rusticus* will not have a significant impact on non-target species.

In impact experiments, up to 97% of seeds were destroyed by *C. peyerimhoffi*, while *C. rusticus* reduced seed production by up to 72% and plant biomass by 46%. We believe that a combination of both agents would be ideal to control dyer's woad in North America.

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#### Donors

United States Department of the Interior Bureau of Land Management (USDI BLM), Idaho, USDA-APHIS-CPHST, Wyoming Biological Control Steering Committee, USA

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#### Partners

Biotechnology and Biological Control Agency (BBCA), Rome, Italy, University of Idaho, USA

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