Biocontrol of purple loosestrife by two host-specific European leaf feeding beetles in Iowa wetlands

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Abstract
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Keywords
Entomology, Agronomy, Biocontrol and Integrated Pest Management, Conservation practices, Weed control alternatives (not GMOs)

Disciplines
Agricultural Science | Agriculture | Agronomy and Crop Sciences | Entomology

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Abstract: Can the persistent purple loosestrife plant be kept in check by environmentally safe methods? This project tested the use of two kinds of Galeruclla insects as biocontrol agents to combat the spread of purple loosestrife in Iowa wetlands.

Background

Purple loosestrife is an exotic perennial plant species that invades habitats with poorly drained soils. Once established, it overruns native plant species to produce dense monocultures. Large stands of purple loosestrife pose a threat to indigenous wildlife species that depend on native wetland habitats for food and shelter. Broad-spectrum herbicides must be used to achieve chemical control on large stands of purple loosestrife and use of such chemicals also can be economically prohibitive. Biological control offers an alternative method for long-term suppression that is environmentally safe.

Galeruclla calmariensis and G. pusilla are two European insect species approved for release in Iowa for biological control of purple loosestrife. Both species are small beetles that feed on the leaves and stems of purple loosestrife plants, reducing their competitiveness with native plant species. Large numbers of Galeruclla calmariensis and G. pusilla can cause significant damage to purple loosestrife stands.

This project was designed to increase Galeruclla populations in Iowa wetlands infested with purple loosestrife. Starting in 1994, these beetles had been released at several Iowa locations in Buena Vista, Pocahontas, and Sac counties. The objective of this project was to increase the density of beetles at each release site through continued mass rearing and field releases.

Approach and methods

In 1994, Galeruclla calmariensis and G. pusilla were purchased by the Iowa Department of Natural Resources from Cornell University, Ithaca, New York. These adults formed
the basis for a mass rearing and release program. Beetles were grown year-round in a greenhouse and outdoors from May to August. Both *Galerucella* species were released directly onto purple loosestrife plants in the field.

From 1997 to 1999, observations were conducted at all *Galerucella* release sites to determine if the adults had successfully overwintered. Surveys were conducted in the release areas in May of each year to count the eggs, larvae, and adults that had survived.

**Results and discussion**

Between 1997 and 1999, nearly 760,000 adult *Galerucella calmariensis* and *G. pusilla* beetles were released at 12 sites in Iowa. Both species successfully overwintered and continued to disperse in the release areas, increasing the size of their populations.

In 1998, numbers of *Galerucella* in various life stages at Sunken Grove (Pocahontas County) and Black Hawk (Sac County) marshes were similar to those found in 1994 and 1995 samples taken at the same sites. Shade’s Pond had the highest density of larvae and egg masses observed, and this site also showed the most visible defoliation. Additionally, percentage bloom estimates for loosestrife plants in August 1998 showed that Shade’s Pond had only 5 to 10 percent bloom, whereas 85 to 90 percent of the plants at the other 11 sites produced flowers.

**Conclusions**

With the release of more than 700,000 *Galerucella* adults in Iowa wetlands, these beetles have shown promise for reducing loosestrife growth at several sites, notably at Shade’s Pond. With additional fine-tuning, biological control may be one long-term solution to the purple loosestrife problem.
Impact of results

Populations of beetles have been established at numerous wetlands in Iowa. It is important to monitor the density and survival of loosestrife where Galerucella have been released. This monitoring will help determine if populations of loosestrife are reduced by increases in the beetle populations, with resulting restoration of native plants and animals to Iowa wetlands.

Further research that involves the ecology of Galerucella beetles could enhance biological control and provide better understanding of this insect herbivore-plant interaction. Trophic-level interactions with native predatory species may influence control of purple loosestrife by Galerucella. With more information about these interactions, releases of the beetles could be synchronized with periods of lower predator abundance and thereby enhance biological control of loosestrife.

Education and outreach

Presentations about the project have been made on many occasions. Among the groups receiving information about the beetles and purple loosestrife were the Iowa Department of Natural Resources; Izaak Walton League; Lake Preservation Association of Storm Lake, Iowa; Iowa County Weed Commissioners; National Wetlands Conservation Council; Iowa State Fair; North Central Regional Weed Science Society of America; Entomological Society of America (Midwestern branch); and the Natural Resources Conservation Service. Articles about the project have appeared in numerous scholarly and popular publications.

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