



Northern New York Agricultural Development Program FACT SHEET

#2 in a series on Alfalfa Snout Beetle

Breeding Alfalfa Snout Beetle- Resistant Alfalfa

Principal Investigators: Don Viands, Plant Breeding and Genetics, Cornell University; Elson J. Shields, Entomology, Cornell University

Introduction: Controlling Alfalfa's Most Destructive Pest

The alfalfa snout beetle (*Otiorhynchus ligustica*) is the most destructive insect pest of alfalfa crops in Northern New York (NNY). The non-native beetle has progressively advanced across the northern region of New York State, moving east from Oswego. In 2004, the insect was found in all six NNY counties: Jefferson, Lewis, St. Lawrence, Franklin, Clinton, and Essex; in Oswego, Cayuga and Wayne counties; and in Canada at Prescott, Ontario. (To learn more about the alfalfa snout beetle itself and its history, see the first fact sheet in this series: Developing Biological Controls for Alfalfa Snout Beetle.)



Thirteen percent, some 500,000 acres, of New York's cropland is infested with alfalfa snout beetles.

New infestations often are mistaken for winter injury.

The alfalfa snout beetle causes severe yield and stand losses by larval feeding on alfalfa roots. New infestations often are mistaken for winter injury since the majority of plant death occurs after third harvest and before spring growth. Dairy farmers who lose fields to the beetles suffer an increase of production costs of up to 25 percent caused by the need to purchase protein supplement for their cows, added replanting costs and time lost to replanting. Farmers suffer income losses due to decreased milk production when alfalfa feed crops are lost to infestation.

Researchers, funded by the Northern New York Agricultural Development Program (NNYADP), are developing and evaluating two strategies that have been used to reduce alfalfa snout beetle populations.

The goal of breeding alfalfa varieties with resistance to alfalfa snout beetle is to develop alfalfa plant varieties that can persist and be productive in areas infested with the beetle.

Researchers are studying alfalfa grown in Hungary, where the alfalfa snout beetle is a native insect.

To date there are no effective methods of controlling this destructive insect. Researchers, funded by the Northern New York Agricultural Development Program (NNYADP), are developing and evaluating two strategies that have been used to reduce alfalfa snout beetle populations:

- incorporating beetle-resistance genes into acceptable alfalfa varieties, and
- establishing biological controls (see NNYADP Fact Sheet: Developing Biological Controls for Alfalfa Snout Beetle.)

This Fact Sheet looks at research that is developing alfalfa snout beetle-resistant alfalfa varieties.

Methods: 1998 to 2004

The goal of breeding alfalfa varieties with resistance to alfalfa snout beetle is to develop plants that can persist and be productive in areas infested with the beetle.

In 1998, many germplasm sources were evaluated for resistance to alfalfa snout beetle. Statistically significant variation in resistance was found, suggesting that resistance genes may exist at low frequencies in a few alfalfa populations.

Effectively screening thousands of alfalfa plants for resistance or tolerance to alfalfa snout beetle requires a reliable greenhouse screening method that controls the beetle population pressure and does not mask the presence of resistance genes that may exist at low frequencies in the plant populations. Such a method was recently developed by Dr. Elson J. Shields and Antonio Testa, working with Northern New York Agricultural Development Program funding.

In 2003-2004, one cycle of plant selection using 14 alfalfa populations and a second cycle with eight other populations were completed. Selections were made of plants showing little damage among plants with severe alfalfa snout beetle-inflicted root damage.

The breeding program also includes Hungarian-grown alfalfa varieties now at the Entomology Lab at Cornell University. The alfalfa snout beetle is present in Hungary and other parts of Europe, where it is a native species, but it is less destructive there.

Tubs of alfalfa are infested with alfalfa snout beetle eggs suspended in a dilute agar solution.



Methods: 2005-2007

The following research work is planned **for 2005**:

- In May 2005, thousands of adult alfalfa snout beetles will be collected soon after they emerge on the John Peck dairy farm near Carthage in Jefferson County, NY. The beetles will be stored in a cooler until late fall for introduction of their eggs to test plants to allow for several screenings of plant populations.
- Additional selection of Hungarian alfalfa varieties, the most promising germplasm of the Medicago core collection, and New York-adapted alfalfa populations.
- Selected plants will be grown in plastic containers in Cornell University Plant Breeding greenhouse facilities in Ithaca. After six weeks of growth, alfalfa snout beetle eggs will be placed on the plants, which will be grown under contained conditions at the Cornell Entomology greenhouses. Thirty to 40 days after infestation, the most resistant plants from each alfalfa population will be selected and seeds of the selected plants will be collected for future cycles of selection.

In 2006, researchers will replicate the above cycle to determine the success of the selection process. Several cycles of selection will be needed to increase the plants' resistance/tolerance to alfalfa snout beetle to an effective level.

If significant progress in this plant breeding program is seen in the greenhouse in 2006, field trials will be planted at several locations in Northern New York **in 2007**.

Several cycles of selection will be needed to increase the plants' resistance to alfalfa snout beetle to an effective level.

If significant progress in the plant breeding program is seen in the greenhouse in 2006, field trials will be planted at several locations in Northern New York in 2007.

To learn more about the alfalfa snout beetle itself and its history, see the first fact sheet in this series: Developing Biological Controls for Alfalfa Snout Beetle.

Alfalfa Snout Beetle Project Sponsors

Research into breeding alfalfa snout beetle-resistant varieties of alfalfa is funded by the Northern New York Agricultural Development Program Program and by Hatch Multistate Project NE-1010 funds through Cornell University and the Cornell University Agricultural Experiment Station

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The Northern New York Agricultural Development Program selects and prioritizes research the results of which can be practically applied to farms in the six-county region of northern NY: Jefferson, Lewis, St. Lawrence, Franklin, Clinton and Essex Counties.

To learn more about the Northern New York Agricultural Development Program, contact Co-Chairs Jon Greenwood, 315-386-3231, or Joe Giroux, 518-563-7523; or R. David Smith, Cornell University, 607-255-7286. ♦

4: ASB Resistance



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