Northern NY Agricultural Development Program
2004 Project Report

Breeding Alfalfa Snout Beetle Resistant/Tolerant Alfalfa Varieties

Project Leader(s):
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Background:
Alfalfa snout beetle (ASB), *Otiorhychus ligustica*, is the most destructive insect pest of alfalfa in Northern New York (NNY), and is continuing to spread. Alfalfa snout beetle is currently infesting nine NNY counties and has invaded Canada across the St. Lawrence River. Otherwise, there is no other known infestation of this insect in North America.

Alfalfa snout beetle was introduced from Europe into the Port of Oswego during the middle to late 1800's in a sailing ship ballast. Alfalfa snout beetle was first discovered as a problem around 1930 after alfalfa was introduced into Oswego County.

This pest causes severe yield and stand losses on alfalfa by larval feeding on alfalfa roots. New infestations are often mistaken for winter injury since the majority of plants die after the last harvest and before spring growth.

To date, there are no effective methods of controlling this destructive insect pest. With other introduced insect pests, two strategies have been effectively used to reduce the insect populations to manageable levels. These strategies are:

1) identify and incorporate resistant genes into acceptable alfalfa varieties (breeding for resistance) and
2) identify and establish in NNY biological control organisms from the native home of ASB.

None of the alfalfa varieties grown in northern USA during the 1990s appeared to be resistant when grown on a field heavily infested with ASB. In 1998 at Watertown, NY, the perennial *Medicago* core collection and other germplasms were evaluated for resistance/tolerance to ASB. The 173 plant populations ranged from 3.7 to 4.8 (1 = no root damage, 5 = dead plant). This variability suggests that resistance genes may exist at a low level in a few populations. Therefore, we initiated recurrent selection to increase the level of resistance in the most resistant populations. In addition, alfalfa varieties grown in Hungary in association with native ASB populations were obtained through contacts within Hungary. Therefore, we were interested in selecting within these Hungarian varieties since ASB populations exist in Hungary and other parts of Europe, but are less destructive there than in NNY.

Breeding for ASB resistance/tolerance by screening plants in infested fields is time-consuming (2 years/screening), and not reliable because the insect pressure in fields is not uniform. In a field screening, susceptible plants may be selected because they escaped injury.

In order to screen thousands of alfalfa plants for resistance to ASB, a reliable greenhouse screening method was needed. A greenhouse screening method has recently been developed by E. J. Shields and A. Testa with funding from the NNY Agricultural Development Project. With this greenhouse screening method, the ASB population pressure can be controlled by the number of eggs applied uniformly to each flat and by the length of time the larvae are allowed to feed on the alfalfa roots. Thus, plants with a low level of resistance can be selected and over several cycles of selection, the frequency of resistance genes can be increased in several alfalfa populations.

During 2003, the first screening and plant selection was completed in several alfalfa populations with the ultimate goal of developing alfalfa varieties that are resistant to ASB, and thus more persistent and productive in areas infested with ASB. Therefore, production of high quality forage for the dairy and other livestock industries would be achievable more economically in the North Country.

Methods:

Since 2003, 15 plant populations have been evaluated for level of root damage from the ASB larvae from egg infestation on plants in the greenhouse (Figure 1). Plants with the least injury were selected and seed produced for the next cycle of selection. Plant populations consisted of the most elite in the Cornell Forage Breeding Program, varieties from ASB-infested areas of Hungary, and plant introductions that we earlier identified with least injury on John Peck's farm in the North Country. We completed the second cycle of selection on seven of these populations.

Results:

Breeding experience leads us to believe that it will take at least three cycles of selection before significant progress will be detectable. Therefore, it is too early to conduct experiments to document progress. However, observations of the variability among progenies within a single plant growth container suggest that genetic variability exists for resistance or non-preference.

Conclusions/Impacts:

Observations of the variability among progenies in our selection experiments provide hope that we can develop alfalfa varieties with resistance/tolerance to ASB. Development of resistant varieties in combination with other control measures will provide protection of the alfalfa crop from ASB injury. Therefore, alfalfa production on land that is infested with ASB will be enhanced, thus making production more economical.

Progress on this research was reported to extension educators and seed company representatives during a field day presentation last summer. It also was reported to seed sales people and growers during a presentation in January.

Next steps if results suggest continued work is needed.

We anticipate that one or two more cycles of selection will be needed to significantly improve the resistance level of the alfalfa populations. We plan to do another cycle of selection during 2005. In 2006, we will do an additional cycle and conduct a replicated experiment in the greenhouse to determine progress from selection. This experiment will guide our plans for future research and release of varieties.

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Cooperating Farmers: John Peck, Jefferson County

CCC Educators: Mike Hunter, Jefferson County CCE

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Northern New York Agricultural Development Program:

The Northern New York Agricultural Development Program provided funding for this alfalfa snout beetle research project. The Northern New York Agricultural Development Program is a farmer-driven research and education program specific to New York state's six northernmost counties: Jefferson, Lewis, St. Lawrence, Franklin, Clinton and Essex.

Thirty-three farmers serve on the Program board led by Co-Chairs Jon Greenwood of Canton (315-386-3231) and Joe Giroux of Plattsburgh (518) 563-7523. For more information, contact Jon, Joe or R. David Smith at 607-255-7286 or visit www.nnyagdev.org # # #