

Breeding for Resistance to Alfalfa Snout Beetle

Alfalfa snout beetle (ASB), *Otiorhynchus ligustici* L. (Coleoptera: Curculionidae), is the most destructive insect pest of alfalfa in Northern New York and Southern Ontario Canada, causing severe yield and stand losses on alfalfa by larval feeding on alfalfa roots. In 2002, E. J. Shields and A. Testa, entomologists at Cornell University, developed a greenhouse screening method that provides control over the larval root feeding intensity in each test, allowing the selection of plants with resistance or tolerance to ASB. The first cycles of selection were completed in 2003 and selection has continued at the rate of one cycle per year, screening on average 18,000 seedlings from seven alfalfa populations each year.

Replicated field trials were established in ASB-infested fields in the spring of 2009 and 2011. The goal of this field research was to compare alfalfa populations selected for resistance to ASB with the unselected, base populations for forage yield, plant stand, and root damage ratings in farmers' fields where ASB populations naturally exist.

In the 2009 trial that was harvested for three production years, the 9558 Cycle 4 population yielded 114% of the base population. In the 2011 trial that was harvested for two production years, the 9558 Cycle 7 population yielded 108% of the base population.

In the fall of 2013, all the plants in an area of 1.5 feet x 1 foot at each end of plots in two replicates of the 2011 trial were dug. Plants were rated from 1 to 5 where 1 was little to no root feeding damage and 5 was severe root feeding damage. Percent resistance was calculated as the percentage of plants with root ratings of 1 or 2.

The alfalfa populations selected for 7 or 8 cycles ranged from 26% to 38% resistance, whereas the original unselected populations ranged from 13% to 17% resistance. Similarly, the average severity index for 7 or 8 cycles of selection ranged from 2.9 to 3.3, while the average severity index for the original unselected populations ranged from 3.4 to 3.7. Thus, selection for resistance to ASB in the greenhouse resulted in alfalfa populations that have some resistance or tolerance in fields with high populations of ASB.

Both greenhouse and field evaluations show that the selection program is successful and can be used to find alfalfa seedlings that have some level of resistance or tolerance to ASB root feeding damage. The first cultivar released from this breeding program is Seedway 9558 SBR (7 cycles of selection) and this cultivar has moderate resistance to ASB. This level of resistance, in combination with the entomopathogenic nematodes that have been released by Dr. Elson Shields' research project, should provide some control against this insect (<http://www.alfalfasnoutbeetle.org/>). However, our goal is to continue development of resistant cultivars that have higher levels of resistance to ASB.

J. Crawford, J. Hansen, E. Shields, A. Testa, and D. Viands