

Breeding for Resistance to Alfalfa Snout Beetle

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Alfalfa snout beetle (ASB), *Otiorhynchus ligustici* L. (Coleoptera: Curculionidae), is the most destructive insect pest of alfalfa in Northern New York, causing severe yield and stand losses on alfalfa by larval feeding on alfalfa roots. A replicated spaced-plant trial was established in 1998 to evaluate the winter hardy *Medicago* PIs from the core collection. Variability in root damage scores suggested 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 2002, E. J. Shields and A. Testa developed a greenhouse screening method that gives control over the selection intensity in each test, allowing the selection of plants with low levels of resistance. 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 populations each year.

An experiment was completed in the fall of 2006 under controlled greenhouse conditions to determine progress from selection. Significant progress was realized through three cycles of recurrent phenotypic selection. Averaged across alfalfa populations, root damage visually scored on a 1 (no root damage) to 5 (severe root damage) basis was 3.46 for the unselected populations (Cycle 0), 3.35 for Cycle 1, 3.23 for Cycle 2, and 3.09 for Cycle 3. This trend was significant and suggested that more improvements could be made by further selection.

Replicated field trials were established in ASB-infested fields in the spring of 2008, 2009, and 2011. This field research will allow comparison of Cycles 0 and 4 in three alfalfa populations to determine if the breeding efforts translate into differences in forage yield, plant stand, and root damage ratings in farmers' fields where ASB populations exist. The 2008 trial had poor establishment and was abandoned.

In the 2009 trial, one of the three Cycle 4 populations yielded significantly higher than its corresponding Cycle 0 population in 2010 (Cycle 4 - 7.86 vs. Cycle 0 - 7.04 tons/acre) and two of the Cycle 4 populations yielded significantly higher in 2011 (Cycle 4 - 4.39 vs. Cycle 0 - 3.98 tons/acre averaged). Between the second and third harvests in 2011, some color differences were noted among the plots, possibly indicating more severe nodule and root feeding in the unselected populations. The 2011 trial had good establishment and is being harvested for yield in 2012.

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 tolerance or resistance to ASB root feeding damage.