Flea beetles are the most economically-damaging pest of canola. Researchers at Agriculture and Agri-Food Canada initiated a project to develop canola lines with superior resistance to the crucifer flea beetle by enhancing a natural insect control system. The project examined nearly 1000 natural Brassica accessions for trichome (hairs) abundance and physical features on leaves and stems and developed and advanced new lines with combinations trichome regulatory genes required for dense trichome coverage, flea beetle resistance and healthy plant growth. Seed and genetic tools are available from Agriculture and Agri-Food Canada for the plant breeding community to transfer the trichome trait into their own elite B. napus (canola) germplasm.

Flea beetles are the most economically damaging pest of canola since they feed voraciously on young seedlings as they emerge from the soil in spring. At the start of the project, there were no useful Brassica napus (canola) lines available to breed for flea beetle resistance, and de-registration had restricted the use of several major insecticides. Approximately, $30M per year in insecticides is used to control flea beetles, but they still generate crop losses of $200M to $300M even with annual insecticide applications.

Researchers at Agriculture and Agri-Food Canada (AAFC) initiated a project to develop canola lines with superior resistance to the crucifer flea beetle by enhancing a natural insect control system. Some plants produce hairs (trichomes) on their leaves which are a barrier to insects, reduce water loss in seedlings during drought and increase tolerance to freezing by providing a warmer microclimate around trichome-bearing tissues. Project researchers had previously developed a ‘hairy’ canola by introducing a gene from a trichome-bearing distant relative of canola.

The objective of the project was to develop superior Brassica napus (canola) breeding germplasm with resistance to the crucifer flea beetle by developing new hairy canola lines with the most optimal combinations of trichome (plant hair) coverage genes, and make them available to the canola breeding community. A few of these lines had already been developed with funding provided earlier by the canola industry or by AAFC, but the remaining combinations needed to be developed to find the most superior canola lines with dense trichome coverage, flea beetle resistance, and healthy growth characteristics. In addition, the project examined the gene expression patterns in hairy lines of Brassica
*Brassica napus, Brassica rapa* and *Brassica villosa* to identify genes/alleles associated with trichome production.

Researchers conducted laboratory, greenhouse and field trials to develop and test several new transgenic lines. The project successfully developed and advanced new lines with combinations of 5 trichome regulatory genes required for dense trichome coverage, flea beetle resistance and healthy plant growth. The first offerings of hairy canola germplasm were made available to the plant breeding community in 2012.

Another big focus was the phenotyping of nearly 1000 natural Brassica accessions for trichome abundance and physical features. The project identified natural accessions of *B. napus* and *B. rapa* with moderate levels of trichomes and an extremely hairy line of *B. villosa* (related to the vegetable Brassicas) as a valuable resource to access trichome-related traits. This material will likely be of most interest to breeders and in the future should be tested in the greenhouse and field for flea beetle resistance and other agronomic characteristics. Seed and genetic tools are also available from AAFC for others to transfer the trichome trait into their own elite *B. napus* germplasm. These plants and their genetic information are road maps that can be used in future breeding efforts to create non-transgenic host resistance to insect pests.

**Video: Hairy Canola Meets the Crucifer Flea Beetle**

**Scientific publications.**


