

## **NEW CANADIAN SCARE: GENES FROM GENETICALLY-ENGINEERED CROPS CREATING HERBICIDE-RESISTANT WEEDS<sup>1</sup>**

**Gillian Steward**©

Calgary -- Tony Huether's family has been farming for four generations. So two years ago, when he spotted stray canola plants in a field on his northern Alberta farm that he wanted to seed with wheat, he thought a thorough spraying with herbicide would easily get rid of them. But after a thorough drenching in Roundup, an all-purpose weed killer developed by the agricultural-chemical giant Monsanto Inc., the canola was still standing tall.

The year before, Mr. Huether had sown Quest canola -- a genetically modified variety, also developed by Monsanto, that was resistant to Roundup. This meant he could plant the seed, and as it and other plants and weeds started to sprout, he could spray with Roundup and only the canola would be left standing. In a field across the road he planted 20 acres of Innovator, a genetically modified canola engineered to tolerate Aventi's Liberty herbicide. In a third field 400 metres away, he planted a third variety bred for resistance to Cynamid's Pursuit and Odyssey herbicides. As he prepared to seed fields with wheat in the spring of 1998, he realized that the stray canola didn't die because it was likely the Roundup-resistant type he had planted the year before. So he applied a second chemical mix, but the stray canola was left unscathed. "I knew I had a real problem," Mr. Huether said from his farm near Sexsmith, about 400 kilometres west of Edmonton. "I just couldn't figure out how to get rid of the stuff."

Eventually he called in the crop specialists from Alberta Agriculture. They took plant and seed samples. In a report released earlier this year, provincial oil-seed specialist Phil Thomas confirmed that Mr. Huether's stray canola was a new variety resistant to two common herbicides. Seed from his fields produced canola that was resistant to three commonly used herbicides -- Roundup, Liberty and Pursuit. In three years, Mr. Huether had unwittingly produced a super-herbicide-resistant breed, the first documented case of gene stacking in canola occurring without deliberate human intervention.

It was soon determined that 2,4-D -- a common herbicide in use since 1946 -- would kill off the super canola that had become a super weed. But Mr. Huether's super weeds served as a warning that while man can successfully tinker with nature in the lab, nature cannot be disregarded all together. Genetically modified canola, which is now a major cash crop in Canada, can easily outcross between varieties (rather than crossing between two organisms of the same variety), whether they are genetically modified through DNA manipulation or induced-mutation hybrids produced through controlled breeding. Bees and other insects will carry the sticky, heavy pollen from one plant to another. Wind also transports the pollen and all the genetic modification it contains from one field to another. Seeds from the new outcrossed varieties can be carried by wind, animals, birds, humans and truck and tractor tires to other fields where they can sprout, and their pollen can migrate to yet another type of canola.

"This was anticipated," Mr. Thomas says. He has been studying canola (a yellow-flowered edible oilseed once known as rapeseed) for 30 years at Alberta Agriculture's Field Crop Development

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<sup>1</sup> The Globe and Mail, June 15, 2000

Centre in Lacombe. "But if farmers manage their crops properly it won't become a problem." Since there are now six different canola systems, farmers need a lot of management skills. Some varieties have been developed to produce a canola low in fatty acid designed to appeal to health-conscious consumers. Mutogenesis (controlled breeding) was used to develop certain herbicide-resistant canola varieties. The latest is genetically modified canola also designed to stand up to certain herbicides.

"Pollen from any of the above canola systems can outcross to any nearby canola plants, whether or not they are the same or of a different system. In other words, the pollen of novel-trait herbicide-tolerant canola plants can outcross to nearby non-herbicide-tolerant canola or canola with other herbicide tolerances," Mr. Thomas says. To avoid this, farmers must plant different varieties at least 175 metres away from each other, know what their neighbours are planting and rotate crops and herbicides. Mr. Thomas also points out that technically, canola is not a weed, and since even the outcrossed GMO (genetically modified organism) varieties can be easily eliminated with 2,4-D, there is no danger of it becoming an uncontrollable nuisance.

Nevertheless, the rapid outcrossing of GMO herbicide-resistant plants raises serious questions for those concerned about the emergence around the world of weeds that do not die no matter what herbicide is applied. Herbicide-resistant weeds ruin crops, endanger food supplies and ruin once-fertile land. According to a 1998 survey conducted by Weedsmart, a herbicide-resistance research organization funded by the Weed Science Society of America (<http://www.weedscience.com>) and two industry-related groups -- the North America Herbicide-Resistance Working Group and the Herbicide Resistance Action Committee, there are now 216 herbicide-resistant weeds in 45 countries. Most of them can be found in developed countries where the same herbicides have been used for decades. The United States tops the list with 80 types of herbicide-resistant weeds. Canada and Australia are second with 32 each, and France is next with 30.

In Manitoba, for example, herbicide-resistant wild oats have become a serious threat to crops. A recent University of Manitoba study found that one field in four has herbicide-resistant wild oats. Seed samples collected by the Manitoba Weed Supervisors' Association from suspicious-looking weed patches found that of 204 samples tested, 163 showed resistance to wild-oat herbicides designed to kill them. If a genetically modified herbicide-resistant variety of oats was introduced into Manitoba, it would soon outcross with its wild cousin and Manitoba farmers would have an even bigger problem on their hands.

According to Weedsmart director Ian Heap, some Manitoba wild mustard (a relative of canola) has developed resistance to phenoxy herbicides such as 2,4-D. But since wild mustard does not directly cross with canola, it is unlikely, he says, that canola will develop resistance to 2,4-D. "But it's very important that farmers not plant crops that can outcross with nearby herbicide-resistant weedy varieties," Dr. Heap adds. "Farmers can also choose not to use GMO herbicide-resistant seeds if there is a danger it will become an uncontrollable weed or outcross with a wild relative." Mr. Heap also believes such companies as Monsanto must provide evidence that their GMO products can be used with minimal risk of creating unmanageable problems.

Craig Evans, general manager of biotechnology for Monsanto Canada, says that "10 to 15 years" of research is conducted before GMO products are put on the market. "If farmers practice good agronomics, outcrossing of GMO canola won't be an issue," he adds. "There are 20,000 farmers in Canada using Roundup Ready Canola, and we've had only a handful of cases of unexpected canola volunteers [weeds]. That's a good record." Mr. Thomas agrees that the canola

outcrossing that occurred on Mr. Huether's farm is a rare occurrence, and doesn't signal cause for alarm. But at least two farmers remain unconvinced. "I've had my fill of being controlled by large companies," Mr. Huether says. "Monsanto led us to believe that this kind of thing wouldn't happen. There were no warnings until they were made aware of what happened on my farm."

In Bruno, Sask., about 100 kilometres east of Saskatoon, canola farmer Percy Schmeiser is going to fight it out with Monsanto in court. Two years ago, when Roundup Ready canola appeared in one of his fields, Monsanto accused him of using its patented seed without paying for it and sued. Mr. Schmeiser fought back with a \$10-million lawsuit of his own in which he accused Monsanto of libel, trespass and contamination of his fields with Roundup Ready. "I never put those plants on my land," he says. "The question is where do Monsanto's rights end and mine begin." Mr. Huether's documented experience with GMO herbicide-resistant canola will no doubt be of great interest to all as Monsanto's case against Mr. Schmeiser unfolds. The trial opened last week in Saskatoon. The dangers of cross pollination Canola, along with other plants, can be genetically modified to be resistant to specific herbicides. The farmer can then use this herbicide to eliminate all but the valuable canola. When pollination occurs between two plants, the traits of each are passed along.

### **Nature's Highways**

The majority of pollen, containing genetic codes, is transferred between plants by insects, a small percentage is carried by the wind. Seeds from new varieties are also carried by the wind as well as animals and birds.

### **Increased Resistance**

Cross-pollination can occur within the same or related species in several ways. Pollen can be passed between any combination of GMO herbicide resistant plants, naturally resistant plants and plants without resistance. The results can vary from resistance where it was not expected to super-resistant plants which become an uncontrollable nuisance.

### **Top Ten Countries**

The occurrence of herbicide-resistant weeds:

U.S	80
Australia	32
Canada	32
France	30
Spain	24
U.K	19
Israel	18
Belgium	15
Germany	15
Switzerland	14