

GM ALFALFA CONTAMINATION in the US and CANADA

Alalfa is the most widely grown forage crop in Canada. It is grown on almost 30% of Canada's cropland.¹ Alfalfa is used to produce high-quality hay or haylage for dairy and beef cattle, and grown as pasture. It is also included in crop rotations to help build nitrogen levels and maintain soil fertility. These latter uses are particularly important for organic farms, which do not use nitrogen fertilizers. Canada also produces and exports several alfalfa products, including hay, alfalfa seed, and processed products such as pellets, meal and cubes.

THE STATUS OF GM ALFALFA IN CANADA

A small amount of genetically modified (GM or genetically engineered) alfalfa seed was sold in Eastern Canada in 2016, and some seed is on the market in 2017. The GM alfalfa is stacked with GM Roundup Ready (herbicide-resistant) and low-lignin traits, and is being sold by Forage Genetics International.

THE IMPOSSIBILITY OF PREVENTING GM ALFALFA CONTAMINATION

Since alfalfa is a perennial plant that is pollinated by bees, GM contamination of non-GM alfalfa is unavoidable. The role of human error/behaviour in handling GM alfalfa seed and hay is also a known risk. There are several ways in which gene flow from GM to non-GM alfalfa can occur. These may be broadly divided into three categories: seed escape, pollinator-mediated gene flow, and gene flow through volunteer and feral alfalfa.

Seed escape

There are a number of ways in which seeds of GM and non-GM alfalfa can mix, resulting in contamination. These include seed spillage during planting, harvest and transport, and seed being left behind when storage, seeding or harvesting equipment is being cleaned out. Alfalfa seed often has some amount of "hard seed", which can stay dormant for years and then germinate at a later time, possibly in fields of non-GM crops.

Pollinator-mediated gene flow

Alfalfa is an out-crossing perennial crop that needs insects to pollinate it. In Ontario, it may be pollinated by a number of native pollinators, as well as by the better-known leafcutter bee and honeybee. Foraging distances for native

The unintended presence of genetically modified alfalfa will have widespread and negative impacts on family farms across Canada. Past experiences with GM flax and GM canola in Canada further warn of the inevitability of gene flow and consequences of GM contamination, including the risk of contamination in certified seed. The only way to prevent contamination from GM alfalfa is to stop any further market release.

pollinators are not well understood, but many travel great distances. Leafcutter bees forage up to one kilometre from their nests, and may travel even further over time.² Honeybees – especially juvenile honeybees, who have not learnt to avoid alfalfa's "tripping" mechanism – also forage in alfalfa stands. The risk of pollinator-mediated contamination is heightened when harvest is delayed due to weather conditions, or farm management decisions. It is impossible to fully control the forage patterns of pollinators, or the bloom timings of a forage stand.

Feral and volunteer alfalfa

Alfalfa produces persistent and hardy feral populations. These can act as "bridges" that facilitate gene flow from GM alfalfa, both through cross-pollination, as well as by producing seeds that may then germinate.³ Volunteer alfalfa can also grow in other non-GM fields, further increasing the risk of contamination.

REPORTED CONTAMINATION INCIDENTS

There have been two documented cases of contamination from genetically modified (GM) alfalfa in the US and one reported incident in Canada.

GM alfalfa contamination in Washington State (2013)

In August 2013, a farmer in Washington state reported that his non-GM alfalfa shipments were rejected for export when they were tested by their export company buyer and

found to be contaminated with Monsanto's GM herbicide-tolerant Roundup Ready trait.⁴ The farmer complained to state agricultural officials, who then tested samples and confirmed the contamination. The USDA's investigation into the event concluded that the contamination incident was a "commercial issue" and did not call for any government action.⁵ The statement from the USDA said, "The agriculture industry has approaches to minimize their occurrence and manage them when they occur."⁶ The seed that was used to grow the alfalfa crop that was rejected was purchased in 2010, before alfalfa was deregulated in the US.⁷

China rejects GM alfalfa from the US (2014)

In summer 2014, China began testing US alfalfa imports after it found GM traits in US alfalfa shipments from three companies.⁸ Those companies were blacklisted from exporting to China, and several other shipments of alfalfa from the US were rejected when they were found to have Roundup Ready alfalfa in them.⁹ Overall US exports of alfalfa to China declined sharply. Between August and October 2014, shipments of alfalfa to China declined by 22% by weight from the year before.¹⁰

Foundation alfalfa seed contamination reported in Alberta

In 2016, a farmer in Alberta anonymously reported to the *Alberta Farm Express* that foundation seed that he ordered four years earlier was contaminated with GM Roundup Ready alfalfa seed.¹¹ The farmer found the contamination when he sprayed the stand with Roundup to take it out. Approximately 100 plants survived being sprayed. The farmer called Forage Genetics International (FGI), the company that distributes GM alfalfa in Canada, to inspect his farm. The company did not make the investigation public. Four years later, when asked for comment, FGI said the contaminated seed would have come from the US due to a lack of quality control by seed companies: "If someone buys seed from the U.S., they can end up with Roundup alfalfa... Companies can be lousy companies, and not have formal, rigid quality controls and test their seed."¹²

USDA STUDY FINDS GM ALFALFA HAS SPREAD IN THE WILD

In 2016, a team of US Department of Agriculture (USDA) scientists published a study that confirmed GM alfalfa has dispersed widely into the environment in the US. The scientists studied alfalfa-seed producing areas in 2010-2011, and found that 404 sites had feral alfalfa.¹³ 20.5% of the feral populations contained the GM trait. The scientists believed that most of the GM alfalfa came from spilled GM seed, and found that "transgenic plants could spread transgenes to neighboring feral plants, and potentially to neighboring non-GE fields."¹⁴

The scientists also found evidence that the GM trait may have been spread by bees, since the GM feral alfalfa stands were within foraging distances for honeybees, leafcutter bees and alkali bees.¹⁵ The amount of GM alfalfa being planted in the US has significantly increased since 2011, when this data was collected.

REFERENCES CITED:

- 1 Calculated from: Statistics Canada. 2012. 2011 Census of Agriculture. Available at: <http://www.statcan.gc.ca/ca-ra2011/index-eng.htm>.
- 2 St. Armand P. C., D. Z. Skinner, and R. N. Peadar. 2000. Risk of alfalfa transgene dissemination and scale-dependent effects. *Theoretical and Applied Genetics*, 101:107-114.
- 3 Bagavathiannan, M. V. and Van Acker, R. C. 2009. The biology and ecology of feral alfalfa (*Medicago sativa* L.) and its implications for novel trait confinement in North America. *Critical Reviews in Plant Sciences* 28: 69-87.
- 4 Gilliam, Carey. 2013. Washington state testing alfalfa for GMO contamination. *Reuters*. September 11. <http://www.reuters.com/article/us-usa-alfalfa-gmo-idUSBRE98A16H20130911>
- 5 Gilliam, Carey. 2013. USDA will not take action in case of GMO alfalfa contamination. *Reuters*. September 17. <http://www.reuters.com/article/usa-alfalfa-gmo-idUSL2N0HD15Q20130917>
- 6 Ibid.
- 7 Center for Food Safety. 2013. Petition for Agency Action, Rulemaking, Investigation, and Otherwise Collateral Relief on Recent Genetically Engineered Alfalfa Contamination. http://www.centerforfoodsafety.org/files/cfs_petition_usda_alfalfa-contamination_9_26_2013_final_57348.pdf
- 8 Newman, Jesse. 2014. China's hard line on biotech burns US hay. *Wall Street Journal*. December 15. <https://www.wsj.com/articles/u-s-hay-exports-to-china-shrivel-up-1418598477>
- 9 MacArthur, Mary. 2014. Roundup Ready in alfalfa exports 'catastrophic'. *The Western Producer*. November 28. <http://www.producer.com/2014/11/roundup-ready-in-alfalfa-exports-catastrophic/>
- 10 Newman, Jesse. 2014. China's hard line on biotech burns US hay. *Wall Street Journal*. December 15. <https://www.wsj.com/articles/u-s-hay-exports-to-china-shrivel-up-1418598477>
- 11 Kienlen, Alexis and Glenn Cheater. 2016. GM alfalfa may already be in Alberta. *Alberta Farm Express*. February 29. <https://www.albertafarmexpress.ca/2016/02/29/exclusive-gm-alfalfa-may-already-be-in-alberta/?module=carousel&pgtype=homepage&i=1?module=carousel&pgtype=homepage&i=1>
- 12 Ibid.
- 13 Greene, Steffanie, Sandya R Kesoju, Ruth C Martin and Matthew Kramer. 2015. Occurrence of transgenic feral alfalfa (*Medicago sativa* subsp. *sativa* L.) in alfalfa seed production area in the United States. *PLOS One*. <http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0143296>
- 14 Ibid.
- 15 Ibid.

For more information, see CBAN's report, "The Inevitability of Contamination from GM Alfalfa Release in Ontario" at www.cban.ca/alfalfa.

The Canadian Biotechnology Action Network (CBAN) brings together 16 organizations to research, monitor and raise awareness about issues relating to genetic engineering in food and farming. CBAN members include farmer associations, environmental and social justice organizations, and regional coalitions of grassroots groups. CBAN is a project on Tides Canada's shared platform. www.cban.ca