



# Response to Canada's Arguments Against Mexico's GM Corn Restrictions

The Government of Canada is a third Party to a trade challenge launched by the Government of the United States, under the Canada-US-Mexico Trade Agreement (CUSMA), that aims to stop the Government of Mexico from restricting some food uses of genetically engineered (genetically modified or GM) corn.

On April 5, 2024, the CUSMA Secretariat published the Government of Canada's submission to the trade dispute panel, which argues against Mexico's restrictions.<sup>1</sup>

## Background

On February 13, 2023 Mexico published a [Presidential Decree](#) that disallows the use of GM corn for human consumption, specifically in the minimally processed white corn flour intended for use in traditional foods such as tortilla. It also states the intention to eventually replace GM corn in processed food. Mexico's decree additionally phases out the use of the herbicide glyphosate, but this action is not being challenged by the US and Canada.

Canada and the US are using the Canada-US-Mexico trade agreement (CUSMA) to challenge Mexico's restrictions on the use of genetically engineered (genetically modified or GM) corn. Canada does not export any corn to Mexico.

Mexico's restrictions seek to safeguard the integrity of native corn from GM contamination and protect human health from the risks of eating GM corn.

Corn is a staple food in Mexico and is central to Mexican culture and agriculture, history and national identity. Corn is sacred to Indigenous peoples and essential to their cultural and spiritual practices.

In its submission to the trade dispute panel, the Government of Canada says that it shares many of Mexico's stated goals:

*"Canada emphasizes at the outset that it shares many of the policy objectives Mexico claims to be advancing through these measures. For example, Canada agrees that protecting human, animal, and plant life and health, as well as the environment and biodiversity, are vitally important. So too are preserving and promoting cultural heritage, and respecting the rights of Indigenous Peoples." (para 2)*

Yet Canada objects Mexico's measures, saying that they create unnecessary barriers to trade. The Canadian government argues that, "Canada is concerned about Mexico's measures because they are not supported by science and have the potential to unnecessarily disrupt North American trade in a manner inconsistent with Mexico's CUSMA obligations."(para 3) However, the Mexican government has detailed the science that supports their restrictions, and Canada does not export corn to Mexico:

- Mexico's measures do not impact trade: Canada does not export any corn to Mexico. Additionally, the measures allow for non-GM corn imports, from the US and other countries.
- Mexico's actions are supported by the science: The Mexican government has detailed the science that supports their restrictions on GM corn.<sup>2</sup> (See the following pages for some discussion of this science.)
- Mexico's restrictions are necessary to protect the rights of Indigenous Peoples in Mexico: The CUSMA trade agreement allows Mexico to take measures it deems necessary to fulfill its legal obligations to Indigenous Peoples.

## **The Government of Canada is incorrect in its argumentation on the safety of GM corn**

### **Government pre-market assessments do not ensure safety.**

To support its argument that genetically modified crops pose no more risk to human health than non-GM crops, the submission of the Canadian government notes that, "GM products that are currently on the international market have all passed pre-market safety assessments conducted by national authorities."(para 6) However, these assessments all rely on the same science which is largely generated by the product developers themselves and not published in the peer-reviewed scientific literature. In Canada, the science submitted to regulators by product developers, as well as the government safety assessments themselves, is classified as confidential business information and cannot therefore be accessed by the public nor independent scientists.

Furthermore, the system of pre-market safety assessments in the United States does actually meet CUSMA's definition of regulation because government GM food safety assessments are voluntary, not mandatory.<sup>3</sup> In the case of the United States, Canada is wrong when it states that, "At the conclusion of such assessments, if the GM product is determined to be as safe as its conventional counterpart, the product is authorized,"(para 6) because, [as discussed in the submission to the dispute panel from the Center for Food Safety in the US](#), the US Food and Drug Administration does not officially approve GM crops as safe for human or animal consumption but issues a memo summarizing the product developer's findings.<sup>4</sup>

In addition, the Canadian government's approach to assessing the safety of GMOs is contested because it overlooks the many potential unexpected effects that can be created by the process of genetic engineering: "Canada is of the view that it is not the process through which a plant with novel traits is developed that determines potential risks, but rather the characteristics of the final plant variety, the environment in which the plant is released, and how the plant is used."(para 7)

### **There is no scientific consensus that GM foods are safe.**

Canada also argues that, "Internationally, scientists have concluded that GM crops pose no more risk to human health than non-GM crops".(para 6) However, scientists around the world have self-organized to contradict such claims of consensus.<sup>5</sup> Mexico's submission to the trade dispute panel outlines the volume of science that corrects Canada's statement.<sup>6</sup> Mexico's submission is further supported by the submissions from the [Center for Food Safety](#) in the US and [Friends of the Earth US](#). As discussed in the following pages, Mexico's actions are supported by the science which continues to find indicators

of potential harm to humans from eating GM insect-resistant corn, and continues to warn of health impacts from exposure to the herbicide glyphosate which is used in GM corn production.

### **There is no long history of the safe use of GM corn for the Mexican diet.**

Canada argues that there is a long history of safe use of GM crops and GM corn. Canada states that “GM crop varieties have been grown around the world for use in food and livestock feed since the mid-1990s”.(para 6) However, even now, GM crop varieties – mostly corn, canola and soy – are grown in just a few countries. The information source that the US government uses in their submission shows that ten countries account for 98% of total GM acreage around the world.<sup>7</sup> In fact, 91% of global GM acres are planted in five countries: the US, Brazil, Argentina, Canada and India and the US alone accounts for almost 40% of global GM acres (37.5%). Of the 29 countries growing GM crops, many devote only a fraction of their agricultural land to cultivating GM crops: globally, GM crops are grown on less than 4% of agricultural land.<sup>8</sup>

“Canada considers that Mexico has not considered the long history of safe use of GM corn when adopting its measures.”(para 60) However, there is no long history of the safe use of GM corn for the Mexican diet which is unique:

- The history of GM corn consumption globally is dominated by highly processed food ingredients and use for animal feed (yellow corn) whereas in Mexico corn is consumed largely through the daily use of minimally processed (white) corn flour to make tortilla and other traditional foods.
- As discussed in the [submission to the trade dispute panel from Friends of the Earth US](#) and in the following pages, while insect resistant and herbicide tolerant traits have dominated the GM seed market for two decades, the stacking of these traits continues to mount and change in both Canada and the US. These stacked products have not been assessed for safety by government regulators.

For further discussion of the trade dispute see CBAN's briefing “Canada & US vs. Mexico's Ban on GM Corn” January 29, 2024 [www.cban.ca/tradedispute](http://www.cban.ca/tradedispute).

For information and updates see also [www.cban.ca/trade](http://www.cban.ca/trade).



**The Canadian Biotechnology Action Network (CBAN)** brings together 16 groups 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 of MakeWay's shared platform.

[www.cban.ca/corn](http://www.cban.ca/corn)

# GM Corn Risks: Factsheet #1

## Herbicide use has increased with GM crops

*The term “pesticide” includes herbicides, insecticides and fungicides.*

**The use of genetically engineered (genetically modified or GM) crops has driven up the use of herbicides, especially glyphosate.**

**Five GM crops are grown in Canada:** corn, canola, soy, white sugar beet, and a small amount of GM alfalfa. **All have herbicide-tolerant traits**, which means that they are genetically engineered to withstand being sprayed by one or more herbicides. Some have additional GM traits (insect resistance in the case of corn, and low lignin in the case of alfalfa). The first GM plant approved in Canada, in 1995, was a glyphosate-tolerant canola.

In the United States, 91% of corn acres were planted with GM herbicide-tolerant seeds in 2023 - and 95% of soy and 94% of cotton acres.<sup>9</sup>

**100% of the GM crops grown in Canada are herbicide-tolerant.**

### Herbicide use on GM crops has created “superweeds”.

Intensified use of glyphosate has led to the emergence and spread of many glyphosate-resistant weeds.<sup>10</sup> Glyphosate-resistant weeds emerged in GM glyphosate-tolerant crops in the US just four years (2000)<sup>11</sup> after their introduction,<sup>12</sup> and most of the documented cases of glyphosate-resistant weeds in the early 2000s were in fields of GM glyphosate-tolerant crops.<sup>13</sup> Since 1996, 59 weed species across the world have developed resistance: 18 of them are found in the US, and eight in Canada.<sup>14</sup> Glyphosate-resistant weeds are now found in five Canadian provinces.

### Companies are stacking herbicide-tolerant traits to combat superweeds.

This emergence of glyphosate-resistant weeds has led seed companies to “stack” multiple GM herbicide-tolerant traits together in the one seed so that other herbicides can also be sprayed to control weeds.

Canada approved the first GM corn tolerant to the herbicide 2,4-D in 2012; the first GM corn tolerant to dicamba in 2016; and then, in 2020, a GM corn tolerant to both 2,4-D and dicamba.

- All of the GM corn seeds commercially available in Canada are herbicide-tolerant.<sup>15</sup>
- Of the GM corn products on the market that are insect-resistant (the vast majority), approximately 80% are tolerant to more than one herbicide.<sup>16</sup>
- in 2023, three GM corn brands were marketed in Canada that had tolerance to glyphosate, glufosinate, 2-4,D, and FOPS which a family of herbicides that contains seven distinct active ingredients.<sup>17</sup>

### Herbicide use has increased with the cultivation of GM crops.

The use of GM herbicide-tolerant crops is clearly associated with increased herbicide use.<sup>18</sup> Cultivation of GM crops has led to herbicides being applied more frequently in a growing season, at higher rates, and in new combinations.

Most GM herbicide-tolerant crops are tolerant to the herbicide glyphosate; and many are tolerant to the herbicide glufosinate ammonium. The top two agricultural herbicides sold in Canada are glyphosate and glufosinate ammonium.<sup>19</sup>

## In Canada, herbicide sales increased by 244% between 1994 and 2021.<sup>20</sup>

A 2023 study by US weed scientists found that the spread of glyphosate-resistant weeds has driven up the use of herbicides on GM crops in North America. The scientists found that herbicide application has doubled or tripled, and that the number of different herbicides applied to GM corn fields in North America has risen by more than 50% since the 1990s.<sup>21</sup>

Globally, by 2014, glyphosate use rose almost 15-fold, from 51 million kg in 1995 to 747 million kg in 2014.<sup>22</sup>

### **GM corn cultivation is associated with the increased use of other pesticides.**

All of the GM corn grown in Canada is herbicide-tolerant and most is also insect-resistant which means that **the corn plant itself functions as an insecticide**. The Canadian Food Inspection Agency lists 61 corn products with stacked GM traits (Bt insect resistance and/or herbicide tolerance) that could be on the market.<sup>23</sup>

The total number of pesticides (herbicides, insecticides and fungicides) applied to corn fields has increased from approximately 4 per hectare in 1996 when GM crops were introduced, to over 13 in 2023.<sup>24</sup> This includes the widespread use of seed coatings called neonicotinoids.<sup>25</sup>

### **Exposure to glyphosate and 2,4-D is linked to human health risks.**

Research links glyphosate to health problems including cancer,<sup>26</sup> neurological diseases,<sup>27</sup> endocrine disruption and birth defects.<sup>28</sup> The human health risks from glyphosate exposure are also discussed in the comments submitted to the trade dispute panel by [Friends of the Earth US](#).<sup>29</sup> The International Agency for Cancer Research of the World Health Organization classifies glyphosate as a “probable human carcinogen.”

Research has also shown 2,4-D to be an endocrine disruptor that is persuasively linked to cancers, neurological impairment and reproductive problems, and may affect the immune system.<sup>30</sup> The International Agency for Cancer Research of the World Health Organization classifies 2,4-D as a “possible human carcinogen.”

The use of tank mixes of multiple herbicides to control resistant weeds also poses risks.<sup>31</sup>

The UN Codex guideline for GM food safety assessment notes that some GM traits such as herbicide tolerance “may indirectly result in the potential for accumulation of pesticide residues” and recommends that safety assessments take this into account.<sup>32</sup> However, the question of harm relating to increased pesticide use, and the potential synergism among multiple pesticides (as would be used on GM crops with stacked herbicide tolerant traits), is not considered in Canadian risk assessments.

### **Profits from seeds and pesticides are tied together by GM crops**

After a wave of mergers, the markets for GM seeds are now controlled by just four companies: Bayer bought Monsanto, Dow and Dupont merged and rebranded as Corteva, ChemChina bought Syngenta, and some of Bayer's and Monsanto's business was sold to BASF. Sales of pesticides and GM seeds are closely tied together for these companies. Together Bayer, Corteva, Syngenta and BASF control 51% of the global commercial seed market and these same four companies also control 62% of the global pesticide market.

## GM Corn Risks: Factsheet #2

# Bt insect-resistant corn poses human health risks

While all GM corn plants are herbicide tolerant, most are also genetically modified to kill insect pests. Research continues to find indicators of potential harm to humans from eating GM insect-resistant corn.

### **Bt in GM crops is not equivalent to natural Bt.**

Insect resistant corn plants are genetically engineered to express a toxin from the soil bacteria *Bacillus thuringiensis* (Bt) which is known to harm the guts of particular types (orders) of insects but supposedly not others. The Bt (Cry) proteins bind to specific receptors on the membranes of mid-gut cells in certain pests, resulting in their rupture. Other insects, animals, and humans do not have those receptors and it is assumed that the Bt proteins are degraded in the gut and are not harmful to them. For example, in its most recent Bt corn approval summary (in 2021, for MON95379 from Bayer), Health Canada states that, “There are no known equivalent receptor sites for Cry proteins in mammalian species and the more acidic environment of the mammalian gut leads to degradation of Cry proteins; therefore, this toxic mode of action is not considered relevant to humans.”<sup>33</sup> However, studies continue to undermine this assumption (see below).

GM Bt crops are also promoted as safe to non-target organisms on the basis that organic and conventional farmers have long used Bt as an insecticide spray that it is benign to organisms other than the target pests. However, the Bt toxins in GM crops are different from natural Bt in structure, function, and biological effects.<sup>34</sup>

### **Bt is shown to harm non-target insects.**

Bt toxin proteins in GM plants have been shown to impact insects that are not the intended targets. For example, spiders, wasps, ladybugs, and lacewings, which are predators that eat Bt-targeted insects, were negatively affected by ingesting prey that had consumed GM Bt toxins.<sup>35</sup> Additionally, a study published in 2023, funded by the French government, found that Bt Cry1A toxins disrupt normal growth and functioning of gut cells in fruit flies.<sup>36</sup> The editor’s evaluation published with that study is that these findings raise the possibility of Bt toxins altering the intestinal lining of non-targeted animal species.

### **Bt is shown in animal feeding tests to harm mammals.**

GM Bt toxins and GM Bt crops have also been found to have toxic effects on mammals in controlled animal feeding studies. Toxic effects and indications of toxicity have variously been observed in the blood, stomach, small intestine, liver, kidney, spleen, and pancreas, as well as immune responses, though the mechanism is not clear from these studies.<sup>37</sup> At least one study on mice shows Bt toxins binding to the guts.<sup>38</sup>

Health Canada does not undertake or require animal feeding studies in order to assess the safety of GM foods. Some companies may choose to conduct such tests, however, without this requirement it appears that very few animal feeding trials have been provided to Health Canada for GM food safety assessments.<sup>39</sup> In at least four cases, long-term peer-reviewed animal safety tests on GM products were conducted years after Health Canada had approved these products as safe.<sup>40</sup>

In particular, Monsanto’s corn NK603 was approved by Canadian regulators in 2001, four years before Monsanto published its own peer-reviewed 90-day animal feeding trial.<sup>41</sup> Health Canada’s

2001 decision summary on NK603 does not indicate the use of data from any animal feeding trials<sup>42</sup> and when asked if regulators had access to feeding tests for their assessment, an official from Health Canada responded to CBAN, "Regarding your specific request on NK603, I cannot provide you with information beyond what is presented in our decision document."<sup>43</sup> Health Canada's approval of NK603 was granted a full decade before the first-ever independent, long-term feeding study.<sup>44</sup> That study authors (Seralini et al) observed mammary tumours, and kidney and liver damage, leading to premature death.

Interpreting the results of animal feeding studies is often controversial, with contested results. Many industry funded studies have observed statistically significant effects in GM-fed animals that the authors have, however, dismissed as not biologically relevant or not adverse.<sup>45</sup> In 2007, scientists analyzed the data from Monsanto's 90-day animal feeding test on the GM corn MON863 (data that was released as a result of a court case) and published their argument that the data could not lead to a conclusion of safety.<sup>46</sup> In 2009, some of these same scientists examined data from tests on the three commercialized GM corn - NK603, MON810, and MON863 – that they argue reveal new side-effects.<sup>47</sup>

### **Bt has allergenicity potential.**

In their submission to the trade dispute panel, the [Center for Food Safety in the US](#) discusses allergenicity and argues that the Cry1Ab endotoxin, which is expressed in the most widely planted Bt corn varieties, exhibits three properties of food allergens: resistance to digestion in simulated gastric fluid, heat stability, and amino acid homology to a known allergen.<sup>48</sup>

### **Stacking Bt corn traits is not assessed for safety.**

Most GM corn varieties on the market in Canada and the US are "stacked" with more than one Bt protein. 24 of the 26 varieties of Bt corn on the market in Canada in 2023 had more than one Bt protein, and all of them also had one or more herbicide-tolerant traits.<sup>49</sup> However, Health Canada does not assess the food safety of plants with stacked GM traits: if each of the individual GM traits (events or lines) has been approved, companies are free to stack these traits together without a government risk assessment. For example, in 2010, Monsanto commercialized its first "Smartstax" corn that had eight different GM traits – six insect-resistant traits and two herbicide-tolerance traits – but this product was not assessed for safety by Canadian regulators.<sup>50</sup>

- Of the 26 Bt corn products on the market in Canada in 2023, 24 had more than one insect-resistant trait, and all were tolerant to one or more herbicides. Eighteen of the 26 products expressed more than two Bt toxins.
- Of the GM corn varieties sold in the United States in 2023, on average each expressed 3.6 Bt/VIP traits for insect resistance (and 2.5 herbicide tolerant traits). Fifteen expressed five to seven Bt/VIP toxins.<sup>51</sup>
- As discussed in the [Center for Food Safety's submission to the dispute panel](#), there is no government maximum residue limit in the US (nor in Canada) for Bt toxins, either individually or combined.<sup>52</sup> As noted in [the submission from Friends of the Earth US](#), the levels of these toxins exceed maximum tolerances for widely used corn insecticides.<sup>53</sup>

### **There is a lack of monitoring and study to track potential harm.**

In their submission to the trade dispute panel, the Government of Canada writes, "To date, Canada is not aware of any credible evidence of adverse health effects directly attributable to GM technology, or from GM derived foods, including corn."(para 8)<sup>54</sup> However, there is no monitoring of GM foods or active, dedicated research. There have been no post-market studies on human populations to determine if there have been adverse health effects and, without tracing or labelling of GM foods, such studies are not possible. In 2003, the US Society of Toxicology stated that, "verified records of adverse health effects are absent, although the current passive reporting system would probably not

detect minor or rare adverse effects, nor can it detect a moderate increase in common effects such as diarrhea.”<sup>55</sup>

The Canadian and US governments have not set up mechanisms to track and trace GMOs, nor to monitor possible health impacts. The US government has only recently (2019) implemented a disclosure standard that requires a form of labelling for some GM foods. In Canada, there is no mandatory labelling of GM foods and the Canadian government does not monitor which GM foods are on the market.

### **There are risks of unintended changes.**

Tracking GM foods is necessary because unintended and unpredicted changes in GMOs can remain undetected for years. There is a high level of unintended traits observed, even in highly-selected commercialized genetically engineered plants, that suggests product developers and government regulators are not fully controlling for unintended effects.<sup>56</sup> In 2003, the structure of the transgene in Monsanto's GM corn MON810 was found to be different from the description provided to regulators by Monsanto,<sup>57</sup> in a discovery that suggests a genomic rearrangement involving the transgene insertion site. Such unintended changes or mistakes can be missed. For example, in 2013, European regulators discovered a “hidden” gene present in many commercialized GM crops,<sup>58</sup> and, in 2019, foreign DNA was unexpectedly found in genome-edited hornless cows that were claimed to be free of foreign DNA.<sup>59</sup>

### **Dietary exposure is not carefully accounted for.**

Health Canada's regulators maintain that GM food safety evaluations “are based on the most conservative estimate of exposure to ensure the continued safety of these products regardless of how they are subsequently bred,” and that, “dietary exposure is calculated taking into account every use of corn that exists, which would include whole kernel consumption.”<sup>60</sup> However, Canadian's exposure to GM corn has changed significantly over time, in both volume and form. Dietary exposure has increased dramatically as more GM corn was planted, more corn ingredients have been incorporated into processed foods,<sup>61</sup> and as GM traits were introduced to sweetcorn.

For example, Health Canada's summary of its' 2001 decision to approve the GM corn NK603 mentions dietary exposure through animal feed and processed corn ingredients and explicitly stated that, “The 603 line of transgenic corn is not a sweet corn,”<sup>62</sup> and, “Consequently, the dietary exposure of Canadians to this product is anticipated to be the same as for other lines of commercially available field corn.”<sup>63</sup> Ten years later, however, Monsanto introduced NK603 into sweet corn varieties in Canada, without any new government safety assessment.<sup>64</sup>

(The Canadian government does not have information about the dietary exposure of Canadians to GM foods beyond knowing that 88% of the GM corn grown for grain in Canada is GM and 81% of soy grown is GM.<sup>65</sup> The government does not know, for example, how much GM sweet corn is grown, sold, and eaten in Canada.)

In Monsanto's response to a 2011 study (Aris et al.<sup>66</sup>), the company referred to dietary exposure to GM corn saying, “Cry1Ab is present in GM maize intended primarily for animal feed and processing to food ingredients (corn syrup, starch, etc.), and human consumption is expected to be quite low.”<sup>67</sup> However, scientists and the public have no access to the information behind Monsanto's stated expectation of low consumption. Cry1Ab is now in 15 of the 19 GM Bt corn hybrids that were on the market in Canada in 2023, including some sweet corn, and is widely used in the US.<sup>68</sup>

**In relation to its 1999 approval of Monsanto's Bt corn MON802, Health Canada's summary stated, “Although an ideal source of energy, little whole kernel or processed corn is consumed by humans worldwide when compared to corn-based food ingredients.”<sup>69</sup> This is not the case in Mexico.**

## Endnotes

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