What's the deal with pesticides?

Agricultural pesticides, including insecticides, herbicides, and fungicides are used in **conventional** and **organic** agriculture to protect crops from insects, weeds, and diseases.

Let's learn more about how they help farmers grow safe, healthy and affordable food, and how they are regulated to ensure consumer health and safety is a priority.

Using pesticides helps:

Reduce crop loss **by up to 50%**

Improve the quality of food grown, **reducing waste**

Keep food costs down for consumers

Aren't there other pest control options?

Yes! Pesticides are only one tool in a system farmers use called integrated pest management.

Sometimes, pesticides are the best option for controlling pests that would otherwise threaten to destroy an entire crop. However, growers monitor their crops closely and consider all of the tools available to them, which may also include:

- **Biological controls** (introducing another insect or bacteria)
- **Habitat change** (changing irrigation or watering practices)
- **Mechanical controls** (using nets or traps)

Canadians save up to $4,500/yr. because farmers can use pesticides and biotech crops to grow stronger and healthier plants more efficiently, reducing food loss and waste.

Pesticides are highly regulated

Health Canada's Pest Management Regulatory Agency (PMRA) leads the rigorous process to ensure the safety of any pesticide that makes it to market.

This process considers short- and long-term health impacts for people at all stages of life, as well as potential environmental impacts.

Because of the rigorous safety testing, it takes around 12 years and $400M before a pesticide makes it to market.

Did you know?

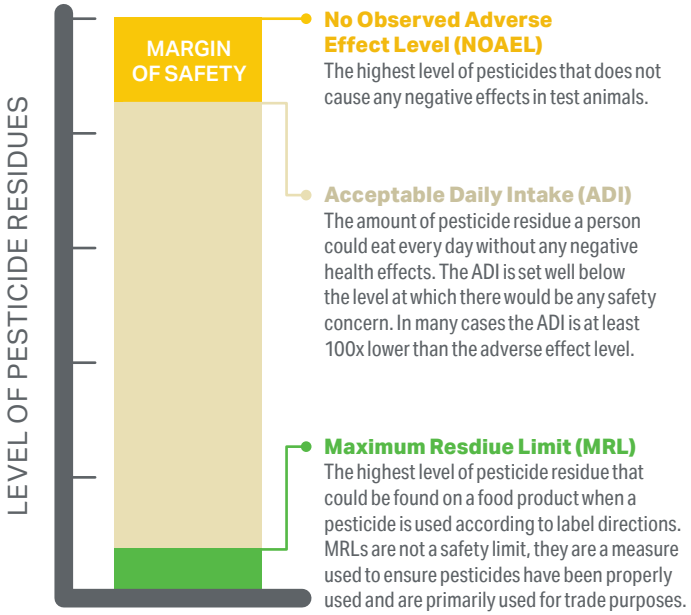
Without pesticides to control late blight, the disease responsible for the Irish potato famine that killed almost a million people, today's farmers would lose approximately 60% of their potato crops.

Are there pesticide residues on food?

Health Canada sets the acceptable amount of pesticide residues allowed to remain on food, which are called Maximum Residue Limits (MRLs).

MRLs are set at very conservative levels, far below the amount of residue we know has ***no impact on health***.

Many like-minded countries work together to align MRLs, ensuring the free-flowing trade of food around the world. They are set at very conservative levels, far below the amount of residue we know has ***no impact on health***.



How are residues on food monitored?

The Canadian Food Inspection Agency (CFIA) monitors and enforces residue limits.

over 99%
of Canadian grown produce
and 99%
of imported fruits and vegetables
test well below the MRLs

Any food found with pesticide residue levels above the MRL undergoes an investigation by the CFIA. Importantly, due to generous safety margins, in instances where residues are found to be above MRLs, they are still well below the safety threshold.

Shouldn't we avoid pesticides at any level?

Testing sensitivity has become more sophisticated as technology evolves. Claims about residues found in infinitely small amounts have been making big headlines. Importantly, just because a residue is detectable, does not mean it has an impact on health.

Did you know?

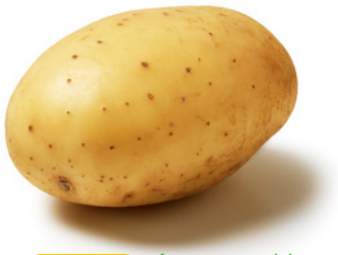
Pears naturally contain formaldehyde, a potentially harmful chemical to humans. No need to fear, it is present in amounts far below a level that could cause harm.

Remember, the dose makes the poison!

The harmful effect of any substance depends on the amount consumed.

When it comes to pesticide residues, check out how many servings would need to be consumed per day before there is potential of a negative impact.

A woman would have to consume **4,166 servings of lettuce**



A teen would have to consume **2,937 servings of potatoes**

A child would have to eat **1,448 strawberries**

Understanding GMOs
and other plant breeding tools!

The evolution of plant breeding

Humans have been using plant breeding to improve their crops for thousands of years. Corn is just one of the foods we eat today that is unrecognizable from its wild ancestors thanks to improvements through traditional plant breeding.

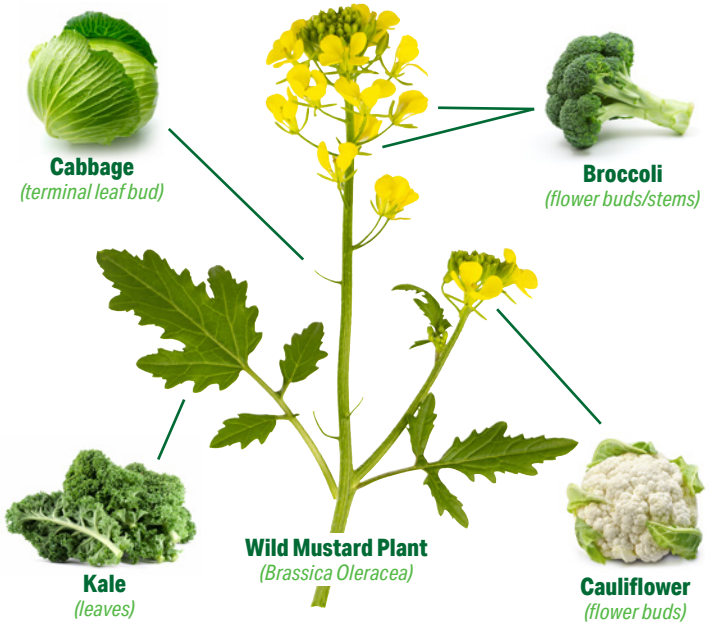
Plant breeding methods

Thousands of years ago the best method was visually selecting the best seeds from the best plants.

This evolved into deliberate cross pollination, which raised the chances of gaining the best traits from two different plants.

Jumping forward to modern times, plant breeders have access to a wide range of tools to develop improved crop varieties. For example, genetic engineering has been used for about 30 years to develop better crops more efficiently, and includes:

- **Genetically modified organisms (GMOs)**, which are typically the result of moving favourable genes from one organism to another.
- **Gene editing**, a more recent technology which focuses on making precise, targeted changes within a plant's own DNA. These changes mirror what could occur in nature or through traditional plant breeding, but more efficiently.



Over thousands of years, people in different parts of Europe and Asia transformed wild mustard by replanting the seeds from the plants which had the largest expression of their favourite parts to eat. This early plant breeding of wild mustard created some of our most recognizable grocery store staples.

Plant breeding today

Plant breeders today have access to a more advanced toolbox, providing many ways to access new beneficial traits.

Modern plant breeding is producing stronger, healthier, and more pest resistant crops as farmers face increased instances of flooding, drought, and new insects, weeds and diseases that threaten to destroy their crops.

Plant breeding is also helping to produce more nutritious, affordable, and sustainable food that consumers are looking for.

Benefits of GMOs

Here are just some examples of crop improvements through genetic engineering:

Crops that are insect and disease resistant, resulting in less crops lost in the field. This means more land can be left in its natural state to support biodiversity.

Herbicide-tolerant crops that allow farmers to more effectively control weeds without having to mechanically remove them. This has helped advance sustainable agriculture by improving soil health, retaining moisture, and reducing greenhouse gas emissions.

Crops that are better adapted to climate change and resistant to environmental stresses like drought and flooding.

Food with enhanced nutrition content including vitamin A-enhanced golden rice and omega-3 soybeans.

Crops with increased durability and non-browning traits that can significantly reduce food waste from bruising during harvesting and handling.

How many GMO foods are there today?

Currently, the following GMO crops are grown in Canada:

Corn

Canola

Potatoes

Soybeans

Sugar Beets

Alfafa

Other GMO crops grown in other parts of the world include:

Apple

Cotton

Eggplant

Papaya

Pink Pineapple

Purple Tomato

Rice

Squash

Sugarcane

GMO FAQs

Are GMOs safe?

GMOs have been evaluated by Health Canada and international governments and scientists for over 30 years. The scientific consensus is clear: GM foods pose no more risk to human health than non-GM foods. Globally, there have been trillions of meals consumed containing GMOs without any evidence of negative health impacts.

What are the environmental impacts of GMOs?

GMO crops can improve environmental sustainability in agriculture by increasing yield, reducing soil erosion, conserving water, reducing greenhouse gas emissions, and improving the efficiency of pesticides and fertilizers.

What about non-GMO labels?

In Canada, mandatory food labelling is reserved for things that could impact the nutrition or safety of a food product. Since GMOs do not pose a health or safety risk, they do not require labelling. Many non-GMO products are labelled advertising their GMO free status, however this can be a bit misleading as many foods labelled in this way do not contain ingredients that have a GM counterpart. For example, labelling orange juice as non-GMO is unecessary since there are no GM oranges.

What is glyphosate?

Glyphosate is an herbicide used to control weeds in agriculture, forestry, residential and commercial environments. First introduced in the 1970s, glyphosate helped revolutionize food production, making farming more productive and sustainable.

Globally, farmers lose between 30 and 40% of their crops to weeds, insects and disease. Without herbicides and other crop protection tools, these losses could double.

Did you know?

Globally, farmers have to compete with

30,000

different species of weeds.

An herbicide is a pesticide used to control unwanted plants, or weeds that would otherwise out-compete crops for vital nutrients, space, water and sunlight.

Benefits of glyphosate in agriculture:

Glyphosate helps farmers effectively and efficiently control weeds and reduce crop losses. Preventing crop losses is critically important to keeping food available and affordable.

Glyphosate has also helped farmers adopt conservation tillage practices, which means that rather than removing weeds mechanically, they do so with a herbicide.

This has resulted in significant improvements to soil health and has reduced the greenhouse gas emissions from plowing their fields, which makes it a valuable tool in support of sustainable agriculture.

How does it work?

Glyphosate works by inhibiting a specific enzyme pathway, preventing plants from making proteins needed for growth. This pathway can only be found in certain plants and microbes, it is not found in humans or animals.

Glyphosate has become a popular tool for farmers because it can be used to control a broad range of weeds while having an excellent safety profile and low toxicity.

Is glyphosate safe?

Glyphosate is one of the most thoroughly studied pesticides in the world. Health Canada's Pest Management Regulatory Agency (PMRA) leads the rigorous process to ensure the safety of any pesticide that makes it to market, including glyphosate.

Health Canada has confirmed that glyphosate does not pose any unacceptable health risks.

Regulatory agencies like Health Canada evaluate whether something poses an unacceptable risk by looking at hazard and exposure. In the case of glyphosate, its low level of toxicity coupled with the low levels at which consumers are exposed to it means it can be safely used by farmers to help grow food.

Hazard

Naturally-occurring arsenic in apple seeds has the potential to cause harm.

+

Exposure

The quantity of arsenic in an apple seed is not such that it would negatively impact health. Apple seeds are not usually consumed.

=

Risk

The risk of harm is low. Arsenic in apple seeds has the potential to cause harm, but they are not consumed at high enough levels for this to occur.

Glyphosate and cancer

Health Canada and every major regulatory agency in the world, including the European Food Safety Agency, has concluded that glyphosate does not cause cancer. These evaluations assess **risk**, meaning they consider hazard and potential exposure.

The International Agency for Research on Cancer (IARC) has assessed glyphosate to be a "probable carcinogen" using a **hazard-based** assessment. This means they evaluate the potential to cause cancer **without** considering exposure.

Since the distinction between risk and hazard is often misunderstood, IARC classifications can be used to falsely portray relatively safe products as dangerous.

According to the IARC other probable carcinogens include working night shifts, being a hairdresser, and drinking hot beverages.

What about residues on food?

The Canadian Food Inspection Agency (CFIA) says that glyphosate residues on food do not pose a health risk to Canadians. Residue testing done by the CFIA shows no trace of pesticide residue on 89.9% of Canadian fruit and vegetables and 99.97% compliance with maximum residue limits (MRLs).

In instances where there are trace amounts of pesticide residues that remain on food they are at levels well below those that would pose any safety concern. Just because a chemical is detectable, does not mean it will have an impact on health.

Maximum Residue Limits (MRLs): The maximum amount of pesticide residues that are allowed to remain on a crop when the product is used according to label directions. They are generally set 100 times or more below a level that would pose any safety concern.

Organic and conventional food production: facts and myths

The facts

When it comes to growing food, there is no 'one size fits all' approach. Farmers have a choice of production methods, and regardless of whether they choose organic or conventional production practices, they share the desire to grow safe, healthy food while ensuring the health of the land for future generations.

Conventional food production involves farming practices that may include using genetically modified organisms (GMOs), synthetic fertilizers, and pesticides.

In Canada, the organic industry has set specific standards for organic food production. These standards are made up of two parts:

1. Defines the general principles and standards of organic farming.
2. List of 'permitted substances', which includes crop production aids like pesticides and fertilizers.

Criteria for organic food production includes:

Avoiding the use of synthetic products for production, growth, and crop protection, which includes fertilizers and pesticides.

Prohibiting the use of genetically modified seeds.

While organic production must meet a specific set of criteria, these criteria do not speak to the quality, safety, or nutrient content of food produced.

As stated in the Organic Standards:

"Neither this standard nor organic products produced in accordance with this standard represent specific claims about the healthiness, safety and nutrition of such organic products[1]."

The myths

Myth: organic production does not use pesticides

Pesticides are used as a tool to manage diseases, insects and weeds. While other tools are also used to prevent pests, both organic and conventional farmers use pesticides. Organic growers are only permitted to use a restricted list of pesticides, most of which are derived from natural sources.

Myth: organic pesticides are natural and therefore safer

A naturally-derived pesticide is not an indication of safety. Many bacteria, fungi, and plants naturally produce chemicals that are not safe for human consumption.

All pesticides, whether they are organic or conventional, must go through the same regulatory process and be approved for use by Canada's Pest Management Regulatory Agency (PMRA).

Regardless of whether food is grown using synthetic or organic pesticides, it is completely safe to eat.

Myth: organic food is more nutritious

Studies have shown that the variance in nutritional composition between organic and conventional foods is minimal, and any small differences would not have an impact on health[2]. The nutritional profile of food is mainly influenced by the quality of the soil in which it is cultivated.

Myth: organic production is better for the environment

Organic production methods do not necessarily guarantee superior environmental sustainability.

Since organic farming prohibits the use of synthetic pesticides and fertilizers, it often requires more land to produce equivalent yields, which can potentially drive deforestation and habitat loss. Additionally, organic farming may rely more heavily on tillage (the mechanical removal of weeds), which can contribute to soil erosion and carbon emissions.

Conventional production tools like genetically engineered crops can significantly improve sustainability in agriculture by increasing yield, reducing soil erosion, conserving water, reducing greenhouse gas emissions, and improving the efficiency of input use.

The bottom line:

Both conventionally and organically grown food in Canada is safe and nutritious. No two farms are exactly alike, and each farm's unique needs, as well as market considerations, may lead a farmer to choose one approach versus another.

1 *Page III https://publications.gc.ca/collections/collection_2020/ongc-cgsb/P29-32-310-2020-eng.pdf*

2 *https://www.acpjournals.org/doi/10.7326/0003-4819-157-5-201209040-00007?articleid=135568)*

The dose makes the poison:
understanding chemicals in everyday life

Inaccurate claims about the dangers of chemicals are prevalent in the media. Allegations that our cereals are contaminated with pesticides, the Dirty Dozen list instilling fear about eating fruits and vegetables, and the myth that glyphosate is responsible for a long list of ailments are just a few examples. Claims like these are exacerbating a phenomenon known as chemophobia, a fear of chemicals at any level.

What are chemicals?

A chemical is any material substance with a unique chemical composition and characteristic properties. From the soil we walk on, to the food we eat, the air we breathe, and even our own bodies, our entire universe is made up of chemicals. Life wouldn't exist without chemistry!

The dose makes the poison

The fundamental principle of toxicology, "the dose makes the poison," underscores that any substance can be toxic if consumed in a large enough quantity.

In science, toxicity refers to an exposure that might cause harm to an organism. Chemicals have varying levels of toxicity – meaning, some chemicals are toxic at very low doses while others would require a much larger dose to cause harm. Whether a chemical is naturally occurring or synthetically produced does not impact its level of toxicity.

Many items we consume everyday such as salt, baking soda and coffee are perfectly safe at the levels we eat but at a high enough dose they can be lethal.

Substance	Toxic Category	Lethal Dose* LD50 (mg/kg)**
Botulin	Super Toxic	0.00001
Vitamin D	Extremely Toxic	10
Caffeine	Very Toxic	192
Copper Sulphate pesticide used in organic production	Very Toxic	481
Acetaminophen pain killer	Moderately Toxic	1,944
Sodium Chloride table salt	Moderately Toxic	3,000
Glyphosate weed killer	Slightly Toxic	5,600
Ethanol alcohol	Slightly Toxic	7,000
Sucrose sugar	Practically Non-Toxic	30,000

* *Acute toxicity/one time dose. Smaller numbers = greater toxicity*

** *Dose that is lethal to 50% of test animals*

Pesticide residues debunked

Pesticides are a tool farmers use to grow healthy, abundant crops by protecting them against insects, weeds and diseases. Both organic and conventional farmers rely on pesticides, all of which are stringently regulated in Canada.

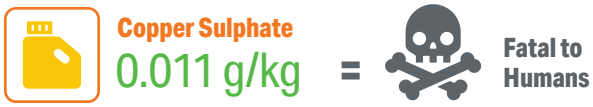
Health Canada's Pesticide Management Regulatory Agency (PMRA) determines the maximum concentration of pesticide residues legally permitted on food products, called Maximum Residue Limits (MRLs). MRLs are set far below the levels that could cause harm to human health.

Simply being able to detect a residue on a food item does not mean there is cause for concern. Regulatory agencies take into account how much potential exposure a person could have to a pesticide to accurately assess the risk. To put this into context, an adult woman could eat 850 servings of apples a day without any negative impact from pesticide residues.

The appeal to nature fallacy

It is a common misconception that natural chemicals are safer than synthetic ones. Substances sourced from nature or created in the lab are both made up of chemicals, and each have the potential to be toxic.

Take copper sulfate, for example. This pesticide, used in organic farming to control fungi and bacteria, is naturally occurring in minerals. Ingesting just 0.011 grams per kilogram can be fatal to humans, which equates to 0.77 grams for a 70 kg adult. For comparison, a quarter teaspoon of granulated sugar is about 1 gram.



Chemicals in our food supply

Everything we eat is made up of a variety of chemicals, even foods marketed as "natural" or "organic". Even an "all natural" strawberry contains a variety of chemical compounds that contribute to their flavor, aroma, and nutritional profile.

Chemical makeup of a strawberry:

pelargonidin 3-glucoside, cyanidin 3-glucoside, cyanidin 3-rutinoside, pelargonidin 3-galactoside, pelargonidin 3-rutinoside, pelargonidin 3-arabinoside, pelargonidin 3-malylglucoside Quercetin, kaempferol, fisetin, their glucuronides, glycosides, catechin, proanthocyanidin B1, proanthocyanidin trimer, proanthocyanidin B3 Sanguiin H-6, ellagitannin, ellagic acid, lambertianin C, galloylbis-hexahydroxydiphenoyl-glucose, sanguiin H-6, ellagitannin, ellagic acid, lambertianin C, galloylbis-hexahydroxydiphenoyl-glucose 4-coumaric acid, p-hydroxybenzoic acid, ferulic acid, vanillic acid, sinapic acid, vitamin C, vitamin B9, 4-coumaric acid, p-hydroxybenzoic acid, ferulic acid, vanillic acid, sinapic acid, vitamin K, manganese, magnesium, phosphorus, calcium, glucose, fructose, and sucrose, fibers.

In an age where fear of chemicals is often amplified by misinformation, it's crucial to understand that everything around us, including the food we eat, is made up of chemicals. Understanding the science behind chemicals and their role in our daily lives helps dispel myths and promotes a more informed perspective on food safety.