

How GMOs and Glyphosate Impact Soil Biology

- Glyphosate shuts down amino acid synthesis, followed by inhibition of protein synthesis necessary for plant growth. When that happens, it makes the plant more susceptible to pathogens in the soil
- Glyphosate also acts as a mineral chelator, and minerals such as zinc, copper, and manganese act as cofactors in many enzymes. This mineral suppression opens the plant up to disease
- **When minerals are bound to glyphosate in the plant, they will not be available to your body when you eat it.** Instead, those minerals will be excreted or stored in your body along with the glyphosate

How Glyphosate Disrupts Plant Growth

As described by Kremer, glyphosate's primary mode of action is that it shuts down amino acid synthesis, followed by inhibition of protein synthesis necessary for plant growth.

A complementary mode of action is that when this happens, it causes the plant to be more susceptible to the microbes (and any pathogens) in the soil.

The reason for this is because the amino acids are also building blocks for other compounds that have defensive functions against soil pathogens — such as *Fusarium*. As a result, the plant becomes more susceptible to attack and infection by many microorganisms in the soil.

Glyphosate also acts as a mineral chelator, and minerals such as zinc, copper, and manganese which are essential cofactors in many plant and human enzymes.

Chelating or removing these minerals from the plants is largely responsible for impairing their protein synthesis as the enzymes involved in syntheses require the minerals to function. This then opens the plant up to attack.

Glyphosate Is Systemic, and That's Part of the Problem

We often think of glyphosate as just another herbicide being applied topically, but it's important to realize that one of the properties of

glyphosate is that when it enters a plant, it becomes systemic, and cannot be washed off like many other herbicides.¹

When glyphosate is released there... it will contact nutrients that are in the soil solution and chelate or immobilize them, tying them up, and making them unavailable to the plant.

The nutrients also become unavailable to beneficial microorganisms that are in the rhizosphere. They are not able to acquire those micronutrients at all. You have a two-way effect here.

You have an effect on the plant where it can't take up these essential nutrients to mediate the reactions by the enzymes, where those micronutrients are needed.

Also, the microorganisms that have enzymes to those of plants, cannot accomplish their metabolism either."

Once Bound by Glyphosate, Micronutrients Are Also Made Unavailable to Your Body

Interestingly, if you do a tissue analysis of a GE plant looking for micronutrients, the test may reveal that there are sufficient amounts of manganese and other minerals present. **However, the tissue analysis will not tell you how much of this manganese is tied up and therefore made unavailable by the glyphosate in the plant...**

Moreover, if the minerals are bound to glyphosate in the plant, there's no way for your body to dissociate that bond to make the nutrients available when you eat it. Instead, those minerals will simply be excreted back out, or worse, stored in your body right along with the glyphosate.

Making matters even worse, [glyphosate formulations](#) such as [Roundup](#) are synergistically even more toxic than glyphosate itself. For example, surfactant chemicals disrupt the cellular membranes in the plant, making uptake of other chemicals like glyphosate a lot easier, and hence riskier.

"With some of the microorganisms we found, [the surfactants] will interfere with cellular membrane lipids. For example, in some of these microorganisms, it will interfere with soil enzyme activities that have beneficial effects in some biological processes. There's a lot more that we need to learn about this, because there are many additives in the formulation of Roundup, surfactants being just one of those compounds."

GMOs Have Led to Increase in Herbicides and Other Agricultural Chemicals

One justification the chemical technology industry used to promote and support the use of GE crops is that they would decrease the need for **pesticides**. In reality, weed resistance to the chemical has led to a steady increase in use. An estimated 60 million acres of farmland are now overrun with glyphosate resistant superweeds.

To Regenerate Soil, We Need a New Agricultural System

According to Kremer, after years of growing GE corn and soybeans, many farmers are now noticing a decline in productivity — which again is the exact converse of Monsanto's promises. And the reason for this decline is directly linked with declining soil health. As noted by Kremer:

*"What has happened, primarily with industrial agriculture, is that using glyphosate and transgenic [plant] varieties, and all the chemical fertilizers that we're putting out there, we've **decreased soil organic matter, which is the key to soil health, because it affects all the properties of the soil.**"*

As you would expect, many nutrients, especially the micronutrient levels, have also decreased in our food. As a result of these adverse ramifications, increasing numbers of farmers are ready for change, and many now want to revert back to non-GMO crops. This is certainly part of the answer, but it's not the whole solution. Soil must be actively regenerated with appropriate processes. It's not enough to just switch to non-GMO seeds.