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IMPACT OF CHEMICAL FERTILIZERS -BLUE BABY SYNDROME

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What Is Fertilizer?

Fertilizer is any substance used to add nutrients to the soil to promote soil fertility and increase plant growth. Notice how nothing in there mentions the actual soil health; that's because not all fertilizers are made the same and not all are healthy for the soil.Soil health relies on a balance of macronutrients and micronutrients, as well as microbial health. It's vastly more complicated then simply adding nitrogen, phosphorus and potassium (NPK) to the ground and calling it a day.Because science doesn't always get it right. In the past scientists once thought food only consisted of macronutrients, but have since discovered micornutrients, antioxidants and so on. The same goes for soil health: scientists have focused almost exclusively on NPK since their "discovery" in the mid-1800s. It's this reductionist science that has us assuming we understand the chemisty of Nature and soil and thinking we can solve it with a quick application of chemical fertilizers. Unfortunately, as unsustainable farming and gardening practices continue our soil is stripped of its health and we depend on amendments even greater. This leads to some pretty negative effects of chemical fertilizers.

Negative Effects of Chemical Fertilizers

The effects of chemical fertilizers are not widely spoken about. This is partially because they are largely untested. We understand there is a risk of groundwater contamination and the environmental issues that brings, but we're still not entirely sure what it means for our own health. To really understand this issue, we need to understand what chemical fertilizes actually do. The biggest issue facing the use of chemical fertilizers is groundwater contamination. Nitorgen fertilizers break down into nitrates and travel easily through the soil. Because it is water-soluble and can remain in groundwater for decades, the addition of more nitrogen over the years has an accumulative effect.

One of the Negative Effects of Chemical Fertilizers Blue baby syndrome also called methemoglobinemia. The most common cause of blue baby syndrome, and the one which was the subject of the classic "blue baby operation" developed at Johns Hopkins in the 1940s, is tetralogy of Fallot. In the normal heart, there are four separate chambers; the two top chambers, or atria, pump blood simultaneously into the two bottom chambers, or ventricles. Blood first enters the heart at the right atrium, which then empties blood into the right ventricle, which pumps the blood into the lungs through the pulmonary artery to get oxygen. From the lungs, the blood enters the left atrium through the pulmonary vein; the left atrium empties into the left ventricle, which pumps the blood into the aorta and from there reaches the rest of the body. Because the left ventricle is responsible for getting blood to the entire body through the aorta, it is usually the biggest and strongest chamber of the heart.

This syndrome occurs when newborn babies have cyanotic heart defects, such as:

- Persistent truncus arteriosus
- Transposition of the great vessels
- Tricuspid atresia
- Tetralogy of Fallot[1]
- Total anomalous pulmonary venous connection

Other causes

A sort of "blue baby syndrome" can also be caused by methemoglobinemia It is believed to be caused by nitrate contamination in groundwater resulting in decreased oxygen carrying capacity of hemoglobin in babies leading to death. The groundwater can be contaminated by leaching of nitrate generated from fertilizer used in agricultural lands, waste dumps or pit latrines. Cases of blue baby syndrome have for example been reported in villages in Romania and Bulgaria where the groundwater has been polluted with nitrate leaching from pit latrines.

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The disease and how it affects people

Methaemoglobinemia is characterized by reduced ability of the blood to carry oxygen because of reduced levels of normal haemoglobin. It is uncommon. Infants are most often affected, and may seem healthy, but show signs of blueness around the mouth, hands, and feet, hence the common name “blue baby syndrome”. These children may also have trouble breathing as well as vomiting and diarrhoea. In extreme cases, there is marked lethargy, an increase in the production of saliva, loss of consciousness and seizures. Some cases may be fatal.

In the body nitrates are converted to nitrites. The nitrites react with haemoglobin in the red blood cells to form methaemoglobin, affecting the blood's ability to carry enough oxygen to the cells of the body. Bottle-fed infants less than three months of age are particularly at risk. The heamoglobin of infants is more susceptible and the condition is made worse by gastrointestinal infection. Older people may also be at risk because of decreased gastric acid secretion.

The most common cause of methaemoglobinemia is high levels of nitrates in drinking-water. High nitrate levels may be present in drinking-water due to the use of manure and fertilizers on agricultural land. The natural level of nitrites and nitrates from the environment is normally a few milligrams per litre, although high levels may occur naturally in some areas. Intense farming practice may increase this to more than 50 mg/litre (WHO 1998). Levels greater than 50mg/litre are known to have been associated with methaemoglobinaemia in bottle fed infants. Nitrate is also found in vegetables. Methaemoglobinaemia can also be a side effect of some drugs (phenacetin and sulphonamides), although this is very rare with modern drugs.

Alternatively, some chemicals can oxidize the iron in hemoglobin. The altered form, called methemoglobin, loses the ability to bind oxygen, and the pigment now changes to greenish brown or almost black. The human body contains enzymes to reverse methemoglobinemia, but only up to certain levels. After blood levels reach 15 percent, adults become visibly cyanotic. If more than half of the hemoglobin is converted, oxygen transport, particularly to the brain, is severely hampered, respiratory distress is likely, and death is possible.

Chemical Fertilizer vs Organic Fertilizer

Nitrogen fertilizers break down into nitrates upon application. Nitrates are necessary for the plants growth but an excess will leach into groundwater supplies and can contaminate sources miles away. Because nitrogen leaches through the soil more quickly, over-application is abundant. These chemical fertilizers have a hugely negative effect on plant and aquatic life, as well as human health. Numerous studies have shown the negative effects chemical fertilizers have on our environment and health. One study from Stanford University is a great example of the difference between the use of chemical and organic fertilizers.

CONCLUSION

According to its findings, soil fertilized with organic fertilizer contained naturally occurring microbes that turned any excess nitrogen into a benign gas, dinitrogen. These microbes are found less frequently and were less active in soil fertilized with chemicals. The more leaching of nitrogen, the greater application is applied, the fewer microbes and the more poisoning of land and water.

And when comparing chemical fertilizers vs organic fertilizers it's important to mention one study from the University of California, Berkeley that states sustainable farming can indeed "feed the world", despite what proponents and manufacturers of chemical fertilizers would have us believe. It produces as high harvest rates, using less inputs and virtually eliminates the pollution or contamination that leads to health and environmental issues.

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FERTILIZERS & TYPES

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Fertilizer:

Fertilizer (or **fertiliser**) is any material of natural or synthetic origin (other than liming materials) that is applied to soils or to plant tissues (usually leaves) to supply one or more plant nutrients essential to the growth of plants. Conservative estimates report 30 to 50% of crop yields are attributed to natural or synthetic commercial fertilizerGlobal market value is likely to rise to more than US$185 billion until 2019 The European fertilizer market will grow to earn revenues of approx. €15.3 billion in 2018

Mechanism

Fertilizers enhance the growth of plants. This goal is met in two broad ways, the traditional one being additives that provide nutrients. The second mode by which some fertilizers act is to enhance the effectiveness of the soil by modifying its water retention and aeration. This article, like most on fertilizers, emphasizes the nutritional aspect. Fertilizers typically provide, in varying proportions:

- three main macronutrients: nitrogen (N), phosphorus (P), potassium (K);
- three secondary macronutrients: calcium (Ca), magnesium (Mg), and sulfur (S);
- micronutrients: copper (Cu), iron (Fe), manganese (Mn), molybdenum (Mo), zinc (Zn) and nickel (Ni), and sometimes boron (B), silicon (Si), cobalt (Co), vanadium (V).

The nutrients required for healthy plant life are classified according to the elements, but the elements are not used as fertilizers. Instead compounds containing these elements are the basis of fertilizers. The macronutrients are consumed in larger quantities and are present in plant tissue in quantities from 0.15% to 6.0% on a dry matter (DM) (0% moisture) basis. Plants are made up of four main elements: hydrogen, oxygen, carbon, and nitrogen. Carbon, hydrogen and oxygen are widely available as water and carbon dioxide. Although nitrogen makes up most of the atmosphere, it is in a form that is unavailable to plants. Nitrogen is the most important fertilizer since nitrogen is present in proteins, DNA and other components (e.g., chlorophyll). To be nutritious to plants, nitrogen must be made available in a "fixed" form. Only some bacteria and their host plants (notably legumes) can fix atmospheric nitrogen (N_2) by converting it to ammonia. Phosphate is required for the production of DNA and ATP, the main energy carrier in cells, as well as certain lipids.

Micronutrients are consumed in smaller quantities and are present in plant tissue on the order of parts-per-million (ppm), ranging from 0.15 to 400 ppm DM, or less than 0.04% DM. These elements are often present at the active sites of enzymes that carry out the plant's metabolism. Because these elements enable catalysts (enzymes) their impact far exceeds their weight percentage.

Classification

Fertilizers are classified in many ways. They are classified according to whether they provide a single nutrient (say, N, P, or K), in which case they are classified as "straight fertilizers." "Multinutrient fertilizers" (or "complex fertilizers") provide two or more nutrients, for example N and P. Fertilizers are also sometimes classified as inorganic (the topic of most of this article) vs organic. Inorganic fertilizers excludes carbon-containing materials except ureas. Organic fertilizers are usually (recycled) plant- or animal-derived matter. Inorganic are sometimes called synthetic fertilizers since various chemical treatments are required for their manufacture.

Single nutrient ("straight") fertilizers

The main nitrogen-based straight fertilizer is ammonia or its solutions. Ammonium nitrate (NH_4NO_3) is also widely used. About 15M tons were produced in 1981, i.e., several kilograms per person. Urea is another popular source of nitrogen, having the advantage that it is a solid and non-explosive, unlike ammonia and ammonium nitrate, respectively. A few percent of the nitrogen fertilizer market (4% in 2007)[9] is met by calcium ammonium nitrate ($Ca(NO_3)_2 \bullet NH_4NO_3 \bullet 10H_2O$).

The main straight phosphate fertilizers are the superphosphates. "Single superphosphate" (SSP)

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consists of 14–18% P_2O_5, again in the form of $Ca(H_2PO_4)_2$, but also phosphogypsum ($CaSO_4 \cdot 2 H_2O$). Triple superphosphate (TSP) typically consists of 44-48% of P_2O_5 and no gypsum. A mixture of single superphosphate and triple superphosphate is called double superphosphate. More than 90% of a typical superphosphate fertilizer is water-soluble.

Multinutrient fertilizers

These fertilizers are the most common. They consist of more than two or more nutrient components.

Binary (NP, NK, PK) fertilizers

Major two-component fertilizers provide both nitrogen and phosphorus to the plants. These are called NP fertilizers. The main NP fertilizer are monoammonium phosphate (MAP) and diammonium phosphate (DAP). The active ingredient in MAP is $NH_4H_2PO_4$. The active ingredient in DAP is $(NH_4)_2HPO_4$. About 85% of MAP and DAP fertilizers are soluble in water.

NPK fertilizers

NPK fertilizers are three-component fertilizers providing nitrogen, phosphorus, and potassium.

NPK rating is a rating system describing the amount of nitrogen, phosphorus, and potassium in a fertilizer. NPK ratings consist of three numbers separated by dashes (e.g., 10-10-10 or 16-4-8) describing the chemical content of fertilizers.[10][11] The first number represents the percentage of nitrogen in the product; the second number, P_2O_5; the third, K_2O. Fertilizers do not actually contain P_2O_5 or K_2O, but the system is a conventional shorthand for the amount of the phosphorus (P) or potassium (K) in a fertilizer. A 50-pound bag of fertilizer labeled 16-4-8 contains 8 pounds of nitrogen (16% of the 50 pounds) an amount of phosphorus and potassium equivalent to that in 2 pounds of P_2O_5 (4% of 50 pounds) and 4 pounds of K_2O (8% of 50 pounds). Most fertilizers are labeled according to this N-P-K convention, though Australian convention, following an N-P-K-S system, adds a fourth number for sulfur .

Micronutrients

The main micronutrients include sources of iron, manganese, molybdenum, zinc, and copper. As for the macronutrients, these elements are provided as water-soluble salts. Iron presents special problems because it converts to insoluble (bio-unavailable) compounds at moderate soil pH and phosphate concentrations. For this reason, iron is often administered as a chelate complex, e.g. the EDTA derivative. The micronutrient needs depend on the plant. For example, sugar beets ap

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