

Effects of Common Synthetic Fertilizers

Nitrates are salts, dehydrating their surroundings. They are also very strong oxidizers, literally burning up the organic matter in the soil. These attributes are not a problem in natural ecosystems where nitrates are made available only as quickly as they can be consumed, but become a serious detriment when excess nitrates are applied. To slow down this expensive loss of synthetic nitrogen, various forms of nitrogen are then coated, or combined with, various substances, creating so-called "slow release" fertilizers.

The effect of some common synthetic nitrogen fertilizers on the soil

Supposedly these various coatings make nitrogen available at a rate plants can absorb. What all these advertisements don't tell us is that these products undergo chemical reactions in the soil, with serious "side effects" on the soil and soil life. Here are just some examples of the most common nitrogen fertilizers:

Ammonium sulfate $(\text{NH}_4)_2\text{SO}_4$ 21-0-0 + 24% sulfur

1. In the soil, reacts with water to produce sulfuric acid (H_2SO_4).
2. Sulfuric acid has a pH of less than 1. It is extremely toxic and kills organisms and is a component of acid rain.
3. Hydrogen ions released from the acid replace alkaline elements on the cation exchange sites, depleting the soil of nutrients.
4. The free oxygen created in this reaction oxidizes the organic matter of the soil (causes a low level "combustion" (burning) of the organic matter). This is a purely chemical reaction which depletes the organic matter.
5. In calcareous soils (soil with excess calcium) the sulfuric acid reacts with calcium carbonate (CaCO_3) to form gypsum (CaSO_4 = calcium sulfate).
6. Gypsum is a salt and attracts water to itself and away from soil organisms and plant roots
7. In anaerobic conditions gypsum and water form hydrogen sulfide (H_2S), which is a toxic gas (thus gypsum is banned from landfills).

Ammonium nitrate NH_4NO_3 34-0-0

1. In the soil, breaks down into ammonium (NH_4^+) and nitrate (NO_3^-).
2. The ammonium is consumed by plants and fungi, or by denitrifying bacteria which eventually convert it to nitrate.
3. The nitrates are consumed by soil organisms, leached, or converted to nitrogen gas and volatilized.
4. The free oxygen created through these processes oxidizes the organic matter of the soil (causes a low level "combustion" (burning) of the organic matter). This is a purely chemical reaction which depletes the organic matter.
5. Some biological soil scientists advocate the use of small amounts of ammonium nitrate under specific circumstances even though it is prohibited for use under organic standards.

Source: http://www.organiclandcare.org/files/education/pesticides_and_fertilizers/Effects%20of%20some%20synthetic%20fertilizers.pdf



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