



## ORGANIC FERTILIZERS - The Nutrient Story

Over the last few years there has been a lot of exciting new research on fertilizers. We have learned that organic fertilizers work better, are cheaper to use, do not pollute, and do not create pest and insect problems. Also organic fertilizers by law are not allowed to contain hazardous waste.

Texas A&M tested several organic fertilizers and synthetic fertilizers. They found the worst organic fertilizer did a better job than the best synthetic (artificial) fertilizer. Ohio State University released a multi-year study where they found that artificial fertilizers significantly increased the amount of insect and disease problems in plants. Oregon State University and the USDA found that only 5-10% of the synthetic fertilizers reached the plant with the rest polluting the streams. Hence the organic fertilizers were 70-80% less costly to use and better results.

In October of 2002 the EPA allowed manufacturers of artificial fertilizers to dispose of hazardous waste containing lead, cadmium, arsenic, mercury, etc. in the fertilizer and they do not have to tell you. Organic fertilizers are tightly regulated hence they are safer to use (an easy way to protect your children and pets), work better and at lower cost!

- Organic fertilizers contain trace minerals which are often critical to plant health and growth
- Organic fertilizers do not leach out of the soils as compared to commercial chemical fertilizers
- Organic fertilizers do not contain harmful salts that contaminate soil and create hardpan as commercial artificial chemical fertilizers
- Organic fertilizers last longer in the soil hence are cheaper in the long term
- Organic fertilizers do not burn the roots of plants
- Organic fertilizers do not destroy beneficial microorganisms and earthworms. Many synthetic fertilizers kill off microbes in the soil that prevent disease. Brown Patch in turf



grass is a good example. The bacteria that prevents brown patch is killed off by synthetic fertilizer hence the fungus that causes brown patch grows out of control.

- Organic fertilizers increase a plants resistance to disease! (Chemical fertilizers do the opposite which works out nicely for the manufacturers since they sell more insecticide, fungicides, etc.
- Blood meal contains about 15% Nitrogen, Bonemeal contains about 21% Phosphorus, and wood ashes contain about 7% Potassium. Mix one part blood meal, one part bonemeal and 2 parts wood ashes and you get an organic fertilizer supplying nitrogen, phosphorus and potassium in the ratio 5-6-4.
- Compost is a excellent slow release fertilizer containing nitrogen, phosphorus, potassium, trace minerals, humic and fulmic acids, vitamins, enzymes, and other needed nutrients. Good compost also contains carbon and huge amounts of beneficial microbes.
- Studies at the Alabama Polytechnic University have shown that as much as 50% of the synthetic derived nitrogen applied to the soil will be leached out and lost anyway and the half that does reach the plants may in fact be harmful.
- Nitrogen in organic fertilizers is found in proteins and other complex molecules
- "Every pound of excess Nitrogen applied to the soil destroys 100 pounds of humus.. ." The Carbon Connection, L. Ridzon and C. Walters
- In reference to organic fertilizers, "...they are much less labor over the long run, and the soil improves rather than degrades.... In general, for vegetables, ornamental's, and berries, organic fertilizers are vastly preferable." Year Round Vegetables, Fruits, and Flowers for Metro Houston, Bob Randall, Ph.D.
- "Plants grown with ammonia- based synthetic fertilizers actually attract pest insects." Earth Kind Gardening, 1993. For example an USDA test on corn fields found that even a teaspoon of ammonium nitrate fertilizer on one corn plant in thousands would allow a released corn borer moth to find that one plant in only a couple minutes.
- Evidence is accumulating that synthetic chelates (fertilizers) are ineffective and have harmful



side effects. Synthetic chelates are alien molecules, and plants can absorb them slowly. Also, after the chelating molecule releases its payload it may latch on to other nutrients in the plants, thus making them unavailable. For example: synthetic iron chelates cause a manganese

deficiency and lower zinc and copper levels; EDTA grabs calcium ions and thus upsets the calcium-potassium balance. September 1981, Acres U.S.A., p. 32-33

- Plant growth is often limited by the amount of CO<sub>2</sub> available to the plant. C.H. Wadleigh, 1957 USDA Yearbook of Agriculture, "Soils", (p.41). Agronomists and farmers are increasing yields by adding carbon dioxide (CO<sub>2</sub>) to their bag of practices...Carbon dioxide is a basic requirement for plant growth. October 1968, World Farming (p.31). We have evidence that CO<sub>2</sub> produced by the respiration of microorganisms in the soil is an important factor in the supply of the gas to photosynthesizing plants. A soil rich in decomposing organic matter provides a much higher level of CO<sub>2</sub> in the air just above the soil than a barren, infertile soil. Use organic fertilizers and compost!
- Seaweed based organic fertilizers in addition to primary nutrients generally contain 60 trace minerals and several important growth stimulators (includes auxins, hormones, gibberellins, indoles, and cytokinins). Seaweed fertilizers work best when applied directly on the foliage. People using seaweed fertilizers *regularly* report increased cold hardiness in their plants and increased resistance to powdery mildew and black spot. If transplants are soaked in a seaweed solution it makes an excellent stimulator and starter solution. Texas Gardener, September/October 1993.
- Why not use manures (horse, cow, etc.) directly on plants instead of compost? USDA studies indicate that raw manure lost 50-75% of its nitrogen in storage and application. A study by Iowa State University indicated that 65% of the nitrogen, 75% of the phosphorus, and 49% of the potassium is lost when manures are spread directly on farm acres. It has been suggested that 1 ton of pre-digested (composted) manure can replace 20 tons of raw manure when applied to imbalanced soils.
- Using compost as an organic fertilizer stimulates microorganisms to take nitrogen from the air and fix it in the soil where plants can use it. Up to 120 pounds of nitrogen can be fixed per acre per year under ideal eco-conditions. An Acres U.S.A. Primer



- Using lava or granite sand is an excellent organic fertilizer. It contains almost all trace minerals which helps stimulate microbes to fix nitrogen from the air. It also helps the soil become better balanced chemically which means healthier plants and fewer problems. Often used in making compost to increase mineral content also helps prevent odors from forming.
- The University of California at Berkeley has found that broccoli and other vegetables fertilized with organic fertilizers attracted less pests (aphids and flea beetles) than those with chemical fertilizers. Additionally, the organic fertilized plots out yielded the commercial plots.
- Azomite is a naturally occurring organic fertilizer. It is a pinkish powdery clay found only in Utah and is chemically a hydrated sodium calcium aluminosilicate that contains 67 major minerals including many trace elements. Increases growth rates, diseases and pest resistance of most plants.
- Grass clippings contain 4% nitrogen, 0.5% phosphorous, 2% potassium and many essential minor elements. (Texas A & M University)
- Animal feed such as Corn gluten meal is 9% Nitrogen, often used as an organic weed & feed in late February at 20 pounds/1,000 sq. ft. A natural and safe pre-emergent herbicide, Iowa State University.
- If a soil contains 4% organic matter...then up to 55Kg (120lbs) of ammonium could be released each year per acre. USDA.
- Wood Ash - hardwoods produce 3X as much ash as softwoods and contain 5X the amount of nutrients. Wood Ash typically contains: 10-25% Calcium, 1-4% Magnesium, 5-15% Potassium, 1-3% Phosphorous, If listed as a chemical fertilizer it would read 0-2-10. Note: Tends to be very alkaline so do not use to much or compost first.
- Labeling laws are misleading. For example they require that nitrogen numbers refer to total N while those for phosphate and potash only tell the amount that will be released in the first



year...not the total amount. Hence when one buys an organic fertilizer they are getting a lot more nutrients than shows up on the bag! Organic fertilizers work for a long time.

- Greensand – An excellent source of nutrients. Contains potassium, iron calcium, and other major and minor nutrients and trace elements. One of the easiest and best ways to improve soil fertility for all plants. Greensand comes from rock deposits formed from evaporated sea water.

Recommend using about 40 pounds per 2,500 square feet every couple years to prevent minor and trace element deficiencies. Extremely important for soils along the Gulf Coast that are heavily leached by our high rainfall that are deficient. Trace elements are to plants as vitamins are to humans, you do not need a lot but if they are missing increased disease and pest problems result.

## WHAT REALLY HAPPENS WHEN YOU USE CHEMICAL FERTILIZERS

- High nitrogen fertilizers can increase yields in some cases (temporarily) of certain grains, however the amino acid content of the protein is actually adversely affected. For example in wheat and barley grown with synthetic fertilizers are less nutritious even though the total protein weight may be higher since critical amino acids are missing or reduced in quantity as compared to organically grown. USDA Researcher
- Synthetic nitrogen fertilizers increase the amounts of toxic nitrates in dietary intake. According to the National Research Council, 6 of the top 7 and 9 of the top 15, foods with oncogenic (cancer causing) risk are produce items with high nitrate content from pesticides or nitrogen fertilizers. A 12 year study comparing organically grown versus chemically grown showed that chemically grown foods had 16 times more nitrate (a carcinogen).
- Vitamin C content decreases in crops as the use of synthetic nitrogen fertilizers increase. Soil Scientist, USDA
- Excess synthetic nitrogen (fertilizers) can also reduce carbohydrate synthesis which results in lower glucose content which affects taste. Soil Scientist, USDA



- Four metals that are considered harmful to humans; aluminum, cadmium, lead and mercury are lower in foods grown organically as compared to those with synthetic chemicals. Doctor's Data Analytical Laboratories.
- Chemicals not absorbed by the grass can leach into ground-water and pollute the water supply. In time local ponds, streams, and lakes become polluted. 2) salts accumulate in the soil and can "lock up" water and other nutrients making them unavailable to grass, salt buildup also reduces the soils ability to absorb water and air 3) fast release chemicals needlessly stress the grass making it more susceptible to insects, disease and injury. 4) slow-release fertilizers are coated with other materials that can further pollute the soil and environment 5) thatch greatly increase with the use of synthetic fertilizers since the soil becomes too acidic for earthworms and microorganisms (if the salts have not killed them first) hence they are not available to break down the thatch back into beneficial organic compounds. 6) Chemical burning and browning often occurs if synthetic fertilizers are over applied to grass. 7) destruction of earthworms and microorganisms leads to a reduced root zone in the soil which means more watering required and additional fertilization required to keep plants green which starts the cycle all over again.
- Excess synthetic nitrogen (fertilizers) has been found to reduce insect and disease resistance of plants. Soil Scientist, USDA
- Synthetic fertilizers use strong chemical salts used to carry nutrients that create a thatch buildup by killing both microorganisms and earthworms in the soil that eat and breakdown thatch. A thick layer of thatch (high lignin content) creates a fertile breeding ground for diseases and destructive insects (cinch bugs, webworms, fleas, fire ants, etc.) unlike mulch.
- As a rule only 30% of the nitrogen (up to 50% for anhydrous forms depending on soil types) and 10-11% of the phosphate applied as a fertilizer is actually used by plants in a best case environment.
- Excess salts used in synthetic fertilizers cause 2 problems. First, they reduce the moisture holding ability of soils and cause what moisture is present to be bound more tightly to the soil making it harder for plants to absorb. Second, also salt exposure reduces a plants roots



ability to absorb water even if the soil is fully saturated. Since most commercial fertilizers are composed of soluble salts (ammonium nitrate, potassium chloride, etc.) and as these salt build up in the soil more water (irrigation) is required, the plants are weaker and more susceptible to insects and disease hence require more pesticides, fungicides, etc.

- Synthetic artificial fertilizers:

$\text{NaNO}_3$  - "sodium nitrate or nitrate of soda", contains 16% Nitrogen, very soluble hence leaches easily and pollutes (not good for conifers or hardwoods). Kills beneficial microbes, earthworms

and other soil life required for healthy soil. Increases disease problems.

$\text{NH}_3\text{NO}_3$  ( $\text{NH}_4\text{NO}_3$ ) - Ammonium nitrate, 33.5% nitrogen (50% in nitrate form & 50% in Ammonium form), highly soluble hence leaches and pollutes. Also flammable and can explode if stored in a closed warehouse. Also absorbs water. Commonly used in nurseries, may also be used as a top dressing. Kills beneficial microbes, earthworms and other soil life required for healthy soil.

$(\text{NH}_4)_2\text{SO}_4$  - "ammonium sulfate", source of N and S, does not acidify soil, may be used as a top dressing. Kills beneficial microbes, earthworms and other soil life required for healthy soil and also increases disease problems.

$\text{CO}(\text{NH}_2)_2$  - "urea", nitrogen loss by volatilization can be a problem, dissolves rapidly and suffers leaching losses. Kills beneficial microbes, earthworms and other soil life required for healthy soil and also increases disease problems.

$\text{KNO}_3$  - "potassium Nitrate or nitrate of potash", 13% nitrogen (not good for trees as a N source, may be okay for K).

$\text{CaNO}_3$  - Calcium nitrate, 15% nitrogen

Anhydrous Ammonia - 82% nitrogen, a particularly lethal form of nitrogen, combines with soil moisture to form colloids that stay in soil, when applied to soils low in humus over 2/3 (67%) can be lost to the atmosphere. Kills beneficial microbes, earthworms and other soil life



required for healthy soil and also increases disease problems.

- Most (all) synthetic fertilizers use "fillers" to help carry the nutrients. These fillers are not listed on the label. These can be chemical salts, sand, lime, dolomite, or even (as it was recently discovered) contaminated wastes containing dangerous heavy metals and hazardous wastes. These fillers can often cause problems. For example, if your soil has high magnesium relative to calcium, then using a fertilizer with a dolomitic lime filler will make the soil imbalance worse, resulting in more weeds.
- Synthetic fertilizers kill the soil microbes that are so essential for healthy soil and healthy plants.

The residues from these fertilizers can adversely affect the soil biology for years.

- If anhydrous ammonia (synthetic fertilizer and a particularly lethal form of nitrogen) is applied to a field low in humus, over 2/3 of the material can be lost to the atmosphere, sometimes before the farmer can move from one end of a field to the other. Acres USA Primer, 1992
- Many synthetic fertilizers are dangerous to keep around as they can create a condition where spontaneous combustion can occur. They also can be used as an essential ingredient in making explosives (i.e. Oklahoma City Bombing).
- New studies have shown that nitrate from synthetic fertilizers stimulate the germination of weed seeds. In tests of 85 species of weeds it was found that nitrate could replace light requirements for germination, and increase germination under adverse temperatures. Other studies have shown that nitrate increases weed germination rates 11 times higher (3% to 34%). Acres USA February 1997, Harold Willis, Ph.D.