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JOHN'S CORNER

ORGANIC FERTILIZERS AND NUTRIENTS 24: COMPOST

by John Ferguson

One of the earliest fertilizers mankind used is still the single best and most valuable organic fertilizer is called compost. We have talked about the benefits of compost as a soil amendment and as a mulch, today we are going to focus on the nutrient aspects of a good compost.

Have you ever wondered why experienced gardeners and professional horticulturalists call a good quality compost "Black Gold"?

Compost is like any other product we buy and use, there is a huge variation in price, quality and value. So how does one determine the value of compost? How does compost compare to other products like fertilizers, seaweed, fish emulsion, humates, beneficial microbes, etc?

About ten years ago I was talking with a group of Master Gardeners whom had stopped by and they asked me to explain "Why" compost works so well in the garden as a fertilizer. As a result I went to the USDA website and looked up values for different items that contribute to soil health and fertility for an AVERAGE compost.

To start, a cubic yard of finished compost weighs between 1,200-1,400 pounds depending on the moisture content and maturity. If we remove all the moisture we have about 700 pounds of solid material left over (minerals). The next step is to look at what is in these 700 pounds of material.

First using the USDA test data a cubic yard (cy) of good compost will contain the same amount of nitrogen, phosphorous and potassium (N-P-K) as $150 worth of a good fertilizer. Or to put it another way, a gardener would have to purchase at least $150.00 worth of organic fertilizer to get the same amount of these major nutrients in just one cubic yard of compost.

Second let's look at the minor nutrients. Similar to the above, to get the iron, calcium, sulfur, magnesium, zinc, copper, boron, manganese and molybdenum in a cubic yard of compost it would require another $7.00 worth of minor nutrient fertilizer.

Next we want to look at trace elements. Compost will easily contain over 65 trace elements that are naturally found in plants. If we look at a common source of trace elements like fish emulsion, it would require over $50.00 worth of fish emulsion to get the same amount of trace minerals in just one cubic yard of compost.

As we learn more and more about the importance of soil biology we recognize that all the life forms in the soil require energy. For the life in the soil (bacteria, fungus, earthworms, etc.) the energy comes from the carbon it contains. If dry molasses is used as a carbon source to provide the energy found in one cubic yard of compost it would require over $150.00 worth of dry molasses.

As gardeners we know the importance of organic matter in the form of humus which is critical for healthy fertile soil. Compost has a lot of humus compounds in it. If Humates are used as the source of organic matter to provide the same amount of humus (organic matter) in a cubic yard of compost it would cost at least $100.00

To grow healthy plants we must have healthy soil and healthy soil is full of good microbes. Compost is teeming with beneficial microbes. It would require over $100.00 worth of microbial inoculants to provide the same amount of beneficial microbes and would not even be close to providing the same value or diversity.

In horticulture we have known for years that certain hormones (like auxins and others) help plants grow stronger and faster. Compost naturally contains many plant growth promoting hormones. It would require at least $5.00 of commercial hormones to provide a similar benefit as found in one cubic yard of compost.

When one adds it all up: One cubic yard of average compost provides over the same benefits as $562.00 worth of other products combined! This is why a good compost is called "BLACK GOLD". Remember that this was ten years ago and prices have increased a lot, hence in today's dollars the value is even more.

However, the story does not end there as other factors come into play. Over time the microbes in the compost will collect nitrogen (N) from the atmosphere and fix it into the soil and provided it to the plants as needed. This is additional and free nitrogen. Also the nitrogen release from compost does not pollute our waterways or create toxic nitrate in our foods (fruits and vegetables).

If we look at the energy aspect a little closer we find that dry molasses is an excellent energy source as it contains many types of complex sugars that provide fuel for soil life. The energy in dry molasses is available immediately but is quickly used up versus compost where the energy takes a few days to be available but lasts for months to even a couple years.

Let's look at the organic matter aspects a little closer. Organic matter affects everything from water retention, soil structure and tilth, to aeration and much more. Without organic matter in the soil all plants suffer and have many problems. Humates are often used as a source of organic matter. The family of molecules called humates is composed of many types of organic molecules from short and simple to long and complex, with each type providing different benefits. Mined Humates commonly sold by the bag provide organic matter, nutrition, food for microbes; increase the water holding capacity of soils, and many other benefits and are a great tool for gardeners as we have discussed. They are quick acting but due to the short chain (small) humus molecules they do not last long, hence they must be applied frequently and they are relatively expensive. Studies have shown that a good mature compost will contain up to 70% humic substances that are both short and long chain molecules! These humic substances are composed of three types of humus:

1) An active fraction that will last 1-5 years

2) A slow fraction that will slowly degrade over 20-40 years

3) A passive fraction which is resistant to microbial decay with a life of 200-1500 years (real long term benefits and provides sequestering of carbon). These humic substances are a mix of humins, fulvic acid, humic acid and other beneficial components. *A cubic yard of compost can easily contain over 300 pounds of humic substances!*

Let's look at the microbial aspects in more detail. In recent years we have begun to understand that all life on Earth is dependent on microbes. For plants it is the microbes that live in the soil and live on the roots, leaves

and stems. Research has shown that microbial inoculants can have a tremendous benefit on plant growth and health. The best inoculants on the market have only 100-200 species of bacteria and 20-30 species of fungi and very few protozoa, nematodes, arthropods or other beneficial life forms. By comparison good compost will easily have 25,000 species of bacteria, 10,000 species of fungus, many species of protozoa and beneficial nematodes to cycle nutrients, prevent disease, fix nitrogen and create soil structure. The microbes found in compost provide disease suppression (competition, inhibit, consume), they improve nutrient retention in soil, they mineralize nutrients and make them available to plants, they improve soil structure allowing water and oxygen to move into the soil, they decompose toxic materials (phenols, tannins, pesticides), they produce plant growth promoting compounds, and they improve crop quality (flavor, nutrients, yield). In addition, the good microbes in compost prevent diseases which save additional value throughcost avoidance of purchasing expensive toxic fungicides and pesticides.

We mentioned growth hormones above. Research is just beginning to identify and understand the many substances in good compost that promote plant growth. These range from enzymes and hormones to vitamin like substances. Numerous studies have shown that compost helps all plants grow better (faster, stronger and healthier).

Other Value Added Benefits of Compost:

- Compost holds water in the soil and helps create soil structure so that rain fall and irrigation water soaks into the soil
- Plants use far less water when compost is used, and with some turfgrass, 50-70% less water is required.
- Compost stimulates disease and insect resistance in plants so expensive toxic chemicals are no longer required and eliminates this expense
- Compost enriched soil holds in nutrients from fertilizer better. This means less fertilizer runs off to pollute our waterways.
- Compost buffers the soil, neutralizing both acid and alkaline soils, bringing the pH levels to the optimum range for plants.
- Compost helps sandy soil retain water and nutrients

- Compost loosens tightly bound particles in clay or silt soil so roots can spread, excess water can drain out, and air can penetrate the soil
- Compost alters soil structure, making it less likely to erode, and prevent soil spattering on plants reducing the spread of disease.
- Compost can hold nutrients tight enough to prevent them from washing out but loose enough that plants can easily take them up as needed.
- Compost makes any soil easier to work
- Compost enriched soils have a lot of beneficial insects, earthworms and other organisms that burrow through the soil keeping it aerated (no need to rent expensive aerators wasting time and money).
- Compost encourages healthy root systems which decreases runoff (less flooding)
- Only a 5% increase in organic material in the soil from compost quadruples its water holding capacity.

Every time we use a good compost it is like making a deposit in a bank account called "soil fertility"!

SUMMARY:

Compost is like any other product we can purchase, there are huge swings in quality and value, mis-labeling and outright deceit since we do not have labeling laws. Just like in buying a car, one can get a Yugo for $10,000 or a Lexus or Mercedes for $60,000, they are both cars but is there a difference? The old gardening proverb is one tool a gardener can use to help tell the difference: "I have no quarrel with a man whom has a lower price, whom better knows what his product is really worth". A good compost is really black gold for a gardener.

PROS:

- good source of major nutrients
- contains minor and trace elements
- contains and feeds soil microbes
- contains plant growth hormones
- buffers soil acidity or alkalinity
- aerates heavy tight clay soils
- helps light sandy soils hold moisture

- increases soil organic matter
- contains and encourages microbes that fix nitrogen from the air into the soil
- adds organic matter to the soil

CONS:

- there are no labeling laws in Texas hence many products sold are not a true compost
- many compost products are made from cow manure which is high in salts, antibiotics, and other chemicals from the feedlots
- many compost products contain poultry manure which is high in salts and arsenic

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