

What's in a bag of fertilizer?

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Man made fertilizer can be traced back thousands of years, to when the Chinese used lime treated bones and the farmers in England treated their soil with marl. Fertilizer is used to supplement some the 13 natural occurring elements in the soil. The end result should be an improved growth of the plant. The plants also depend on three other elements Carbon (C), Hydrogen (H) and Oxygen (O) which are derived from the water and carbon dioxide.

The first three numbers on a bag represent the percent by weight of N (nitrogen), P (Phosphorus) and K (Potassium). These are the three nutrients a plant uses in the largest amounts and are called the major or macro nutrients.

Nitrogen (N)

- Considered to be the number one element needed by the plants
- There is lots of nitrogen in the air but this unavailable to the plant, nitrogen needs to be in other forms such organic, nitrate or ammonia in order for the plant to use it
- Promotes foliage growth
- Nitrogen comes in slow release and quick release forms
- Deficiencies from lack of this element is over all yellowing of the plants and stunted growth
- Unless manufactured in a stable form this element can be easily lost from the soil

Phosphorus (P)

- Considered to be the second most important element plants need
- Promotes seedling development, cell building, seeds, fruits, flowers and root growth
- Most phosphorus is used in the form of Phosphoric acid which is very stable in the soil
- Signs of phosphorus deficiencies are first found in the lower leaves having a lack of chlorophyll, a deepening of the green color and many times a reddish color in the leaves

Potassium (K)

- Considered to be the third most important ingredient a plant needs
- Promotes over all health of the plant
- Comes in potassium sulfate or potassium chloride (muriate of potash)
- Can be come tied up in the soil or leached away

Secondary nutrients are used in lesser amounts and may or may not be in the fertilizer formulation. These nutrients are:

Sulfur (S)

- Sulfur is added to the soil to decrease the pH or make the soil more acid

Magnesium (Mg)

- Magnesium is added to the soil in the form of Dolomite Limestone which also adds Calcium

Calcium (Ca)

- The addition of lime adds calcium to the soil
- Lime also raises the soil pH
- Doesn't seem to be needed much in Wisconsin soils

Our soils in Southeastern Wisconsin are limestone based and the main elements in limestone is calcium and magnesium

The last set of elements are called minor or trace and are used in very small amounts. Even though these are used in very small amounts (a few ounces per acre), and their deficiencies only show up a few times, they are still vital to the overall health of the plants. These elements are:

Iron (Fe)

- Iron deficiency can be found in southeastern Wisconsin. Many times we try to grow plants that require an acid soil. Our soils are basic and the iron gets tied up and plants may become chlorotic. Plants such as Red Maple, River Birch, Pin Oak, Winterberry (Ilex), Blueberry, etc. all suffer from chlorosis in our area

Chlorine (Cl)

Molybdenum (Mo)

Boron (Bo)

Zinc (Zn)

Copper (Cu)

Manganese (Mn)

The "Weakest Link in the Chain" theory can be applied to micronutrients. If iron is one of the links of the chain and this link can hold 100 lbs and all of the rest of the links can hold 1000 lbs. The chain can hold no more than 100 pounds since that is its weakest link. If iron is deficient in the soil no matter how much N, P, K, Ca, S, etc. you apply to the soil the plants will only grow as much as the iron will allow.

FYI

- Plants don't care if they get their nutrients organically or inorganically they all end up as the same element available to the plant.
- If you are a farmer and grow many acres of the same plant you will custom blend fertilizers to best improve production. For the gardener who is growing many different types of plants a good general fertilizer or one or two specialty fertilizers will suffice. No need trying to custom fertilizer for 12 different types of plants.
- An exception to the above statement is when the plants need an acid fertilizer to promote a lower ph or vegetable verses flowering plant fertilizer mixes.
- It is best to apply the fertilizer at the time of planting.
- Almost all of the 13 elements can be obtained from organic sources
- Organic based fertilizer tend to be safer to use

Personal experience

As a landscaper I plant trees, shrubs, annuals, perennials, ground covers, etc. I use Milorganite for all of these with good results and never any problems. Milorganite is an organic fertilizer made for sewage.

Amount of elements

A 50 pound bag of 10-15-5 would have:

- 10% nitrogen or 5 lbs
- 15% phosphorus or 7.5 lbs
- 5% potassium or 2.5 lbs.