HOW DOES SOIL pH AFFECT FERTILIZERS AND FERTILITY

How does an acid soil pH affect nutrient uptake?

- If soils are below pH 5, then availability of boron, molybdenum and sulfur is reduced, and nutrient uptake and foliage production are lowered by a third or more, regardless of N fertilization.
- If soils are near a pH of 4, then aluminum becomes toxic to grass roots.
- If soils are less than pH of 5, then grass is predisposed to yellowing and soil borne insect damage.
- If the pH is 4.5, about 75% of applied fertilizer may be unavailable to plants.
- If the pH is 5, about 54% of applied fertilizer may be unavailable to plants.
- If the pH is 5.5, about 33% of applied fertilizer may be unavailable to plants.
- If the pH is 6.0, about 20% of applied fertilizer may be unavailable to plants.
- If the pH is 7.0, about 0% of applied fertilizer should be unavailable to plants.

How does an alkaline soil pH affect nutrient uptake?

If soil pH is greater than 7, then the availability of iron, manganese, zinc, copper, and cobalt is reduced, resulting in reduction of nutrient uptake and foliage production.

What fertilizers and/or their carriers raise soil pH?

Calcium nitrate, potassium nitrate, and sodium nitrate can push the soil pH up because these sources persist in the soil.

Do phosphorous (P) and potassium (K) directly affect soil pH?

P and K nutrient sources will not have a persistent effect on soil pH unless they also contain N.

Can fertilizers and/or carriers decrease the soil pH?

Yes. Any fertilizer that contains ammonium or produces ammonium can reduce the pH.
- Ammonium sulfate and ammonium phosphate are the most acidifying because ALL of the nitrogen is in the ammonium form.
- Sulfur coated urea has a greater surface acidifying effect than many other fertilizers.
- Repeated use of sulfur coated urea, ammonium nitrate or ammonium sulfate can cause a major decline in soil pH and cause early spring yellowing.
- Ammonium salts can acidify soils.

Do most turfgrass fertilizers have an effect on soil pH?

Yes, most turfgrass fertilizers decrease the soil pH.
What is the worst case scenario for fertilizer to reduce the soil pH?

Acid soils treated with high rates of ammonium forming carriers are most likely to reduce the pH.

Why are some soils very acid?

Usually it has a lot to do with the composition of the parent rock from which the soils were formed. Certain fertilizers can also push the soil pH down. Uptake and subsequent removal through removal of plant materials such as pulling out annuals each year can have an acidifying effect on soils.

What acid pH levels are a cause for concern?

A soil with a pH of 5.0 is 10 times as acid than one with a pH of 6.0 and 100 times more acid than one with pH 7.0 because the pH scale is based on logarithms. So just “a little” change in your pH from year to year can mean a lot to your plants. Usually if your soil is at 6 or somewhere above, you DO NOT need to add any lime. If your pH is below 6 then you need to think about making lime applications.

What does soil buffering capacity mean?

Buffering capacity is resistance to change in pH. Buffering capacity of a soil is directly related to clay, organic matter content, and amounts of aluminum and iron compounds. When calcium and magnesium carbonates from lime applications neutralize the acidity you measured in the soil, more acidity is released into solution from the reserve account in clay, organic matter content, and aluminum and iron compounds and the pH does not rise. This is why soils with more clay or more organic matter require more lime to raise their pH: they have a larger supply of reserve acidity that must be neutralized. You will see this buffering capacity reported on a soil test as a “Lime Index”.

Does soil acidity promote magnesium deficiency in turf?

Yes, magnesium deficiency is relatively common in turfgrass grown on acid soil because under increasingly acid conditions, base cations are replaced by aluminum, hydrogen or manganese. Other scenarios where magnesium deficiency is likely include soils to which high rates of calcium have been applied, or on soils that are both acid and saline such as those subjected to saltwater overspray or intrusion. Use dolomitic limestone, or magnesium sulfate or magnesium oxide.

How do I know if my acid soil has caused a magnesium deficiency?

You should provide a foliar application of magnesium sulfate in a test area at 0.10lb magnesium/1000 square feet in 1 to 2 gallons of water. If magnesium is really the issue, a rapid and dramatic green up should occur. If a true magnesium deficiency is NOT corrected, the chlorosis will worsen, photosynthesis will decline, sugar transport to roots will become limited and the root system will decline.