

TIMELY INFORMATION

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Lowering Soil pH

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Some plants need a low pH.

Most plants grow best where the soil is slightly acid in the range of pH 5.8 to 7.0. However, a few plants such as azaleas, gardenias, and blueberries grow best at lower pH levels. Others such as centipede turf, camellias, and potatoes grow well in a wide range of pH conditions, but seem to prefer more acid soils. Centipede turf is prone to iron chlorosis (iron deficiency) when the soil pH is high (above 6) and the soil has excessive phosphorus..

New growth on azaleas show typical iron deficiency on plants where crushed limestone from a driveway washed over the roots. This situation could be corrected by lowering the soil pH.

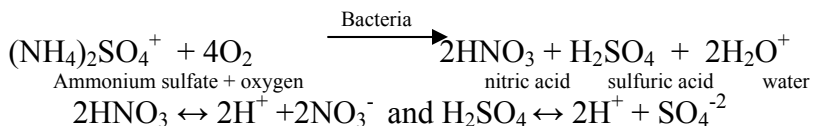
"Why is my soil pH so high?"

Sometimes gardeners may inadvertently over lime their soil. They may not have tested the soil but lime just because "... granddaddy always did and he had a beautiful garden." Others rationalize that ". Sure I limed according to soil test, but I also used basic slag." Others figured, ". Wood ashes make great mulch." Mistakes may be made during construction and builders lime (calcium hydroxide) from mortar mix or concrete could be spilled on the soil. And there may be a few whose neighbor works for company XYZ. Company XYZ has a huge pile of free lime from the mill so ". . I just had a few dump-truck loads piled in the garden." Any of these situations could create a very high soil pH - so high that some plants have a difficult time surviving.

If the soil pH is above 7.0 anywhere in Alabama, one needs to find out "Why?". Of course, some soils from the Black Belt prairie region (central Alabama) are naturally calcareous. They are formed from the soft limestone known as Selma chalk. Some soils could be as much as 50% calcium carbonate lime and have a pH as high as 8.3. There's not much one can do about this. Just grow plants tolerant of calcareous soils - not azaleas, camellias, gardenias, and blueberries. However, soils that have an artificially high pH may also have a high salt content. Some waste products such as wood ashes (not agricultural lime) applied to the soil could be high in salts (salts of sodium, potassium, etc.). High salts probably caused the initial damaging effects to the plants. With time, rainfall will leach the salts out of the rooting zone. A high pH (up to about pH 8.0) would probably create severe micronutrient deficiencies (iron, zinc, manganese) and result in a general yellowing and poor growth. High salts may kill sensitive plants.

Use fertilizers to lower soil pH.

In most cases, soil pH can be lowered simply by using fertilizers containing ammonium-N (Table 1). Ammonium sulfate and sulfur-coated urea are two of the best choices for acidifying soils. Fertilizers sold as “34-0-0” and “33-0-0” at garden centers are actually a blend of ammonium sulfate and urea and are quite acid forming. Most specialty fertilizers for "acid-loving" plants contain ammonium sulfate or sulfur-coated urea. These are popular sources of nitrogen for azaleas and blueberries. An illustration for ammonium sulfate reaction is:



These highly reactive acids will yield 4H⁺ ions that are responsible for lowering soil pH.

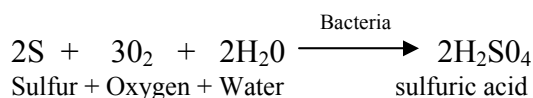
Table 1. Acidifying effect of some common fertilizers and soil amendments	
Material	Pure CaCO ₃ needed to neutralize acidity in 100 pounds of material
	-----pounds-----
Ammonium nitrate (34-0-0)	60
Ammonium sulfate (21-0-0)	110
32% liquid urea-ammonium nitrate (32-0-0)	55
Urea (46-0-0)	81
Sulfur-coated urea (38-0-0)	118
Diammonium phosphate (18-46-0)	70
Flowers of sulfur (elemental S)	312
Aluminum sulfate (alum)	45
Iron sulfate	35
Pine bark mulch*	20+
Peat*	30+
Compost*	0 to 10+
Poultry litter*	0
Other animal manures*	0 to 10+
*Organic materials can be highly variable.	

If you are desperate, try sulfur or aluminum sulfate.

In rare cases, it may be desirable to lower the pH by adding an acidifying agent such as elemental sulfur (flowers of sulfur) or aluminum sulfate (alum). This can be done successfully on soils that do not contain large amounts of free lime. It will not work on calcareous Black Belt soils. Amounts of sulfur needed to lower the pH of a silt loam soil to a 6-inch depth are given in Table 2. Sandy soils would require less and clayey soils would require more.

Elemental sulfur is converted to sulfuric acid by soil bacteria. Therefore, in order for sulfur to work the following must be satisfied:

- 1) Sulfur must be mixed with the soil to provide contact.
- 2) The soil must be moist.
- 3) The soil must be aerated (bacteria need oxygen).
- 4) The soil must be warm for rapid bacterial growth.
- 5) Time is required for the reaction to go to completion.



for large scale growers, and caution them about over-applying sulfur. Don't confuse elemental sulfur as a soil acidifying agent with sulfate-sulfur recommendations as a plant nutrient. Sulfate-S won't acidify the soil.