

Soil pH and Fertilizers



The pH of a soil refers to how acid or alkaline the soil is. The letters “pH” mean “potential hydrogen.” The availability of nutrients is directly affected by soil pH. If the soil’s pH is too high or too low, some nutrients become insoluble, limiting the availability of these nutrients to the plant root system.

The acidity-alkalinity scale ranges from 0 to 14. Soils are referred to as being acid, neutral, or alkaline, depending on their pH levels. A pH of 7 is neutral, while a pH lower than 7 is acid, and a pH higher than 7 is alkaline (basic).

A logarithmic scale is used to measure a soil’s pH. That is, a change of one unit in the pH scale represents a 10-fold change in acidity or alkalinity. A soil with a pH of 5.0 is 10 times more acidic than a soil with a pH of 6.0 and 100 times more acidic than a soil with a pH of 7.0. This is one good reason to be very careful in trying to increase or lower soil

pH. Some factors, including soil type and organic matter, affect the amount of materials needed to change soil pH.

Fertilizers and rain affect soil pH. Organic matter and soil microorganisms are a few other factors that affect soil pH. Agricultural limestone normally is used to increase the soil’s pH. Sulfur is normally used to lower the soil pH. But fertilizer and water normally change the soil pH more rapidly.

Plants have specific pH requirements for normal growth. Most ornamental plants grow well in a pH range of 6.0 to 7.0. But azaleas, gardenias, camellias, and related plants require a soil pH level between 4.5 to 5.5.

It is important to know the pH levels and nutrient requirements of your ornamental plants to ensure normal growth and success. The following table lists some woody and herbaceous landscape plants and their desired soil pH ranges.

Common Landscape Plants and Their Preferred Soil pH Ranges

Shrubs	Preferred pH	Trees	Preferred pH		
Azalea	4.5–6.0	Apple, Peach, Pear, Cherry	6.5–7.0	Daffodil	6.0–7.5
Barberry	6.0–7.5	Dogwood	5.0–7.0	Dahlia	6.5–7.0
Buddleia (Butterfly Bush)	6.0–7.5	Elm	6.0–7.5	Day Lily	6.0–8.0
Camellia	4.5–5.5	Flowering Crab Apple	5.0–6.5	Easter Lily	6.0–7.5
Crapemyrtle	5.0–6.0	Holly	5.0–6.0	Four-O’Clock	6.0–7.5
Deutzia	6.0–7.5	Magnolia	5.0–6.0	Foxglove	6.5–7.0
Euonymus	6.5–7.0	Maple	6.0–7.5	Geranium	6.0–8.0
Flowering Almond	6.0–7.0	Oak Group		Gladiolus	6.5–7.0
Gardenia	5.0–6.0	Pin Oak	5.0–6.5	Hollyhock	6.0–8.0
Hibiscus	6.0–8.0	Scarlet Oak	6.0–7.0	Iris	6.5–7.0
Holly	5.0–6.0	Red Oak	5.0–7.5	Larkspur	6.5–7.0
Huckleberry	5.0–5.5	Pine	5.0–6.0	Lupine	6.5–7.0
Hydrangea (blue)	4.5–5.0	Redbud	5.5–6.5	Marigold	6.0–7.5
Hydrangea (pink)	6.0–7.0	Vitex	6.0–7.0	Nasturtium	6.5–7.0
Japanese Quince (flowering quince)	6.0–7.0	Weeping Willow	5.0–6.0	Narcissus	6.0–7.5
Ligustrum	6.0–7.0	Garden Flowers	Preferred pH	Pansy	5.0–6.0
Lilac	6.0–7.5	Amaryllis	5.5–6.5	Periwinkle	6.5–7.0
Oleander	5.0–7.5	Baby’s Breath	6.5–7.0	Petunia	6.5–7.0
Philadelphus (English Dogwood)	6.0–8.0	Balsam (Touch-Me-Not)	6.5–7.0	Phlox	5.0–6.0
Pyracantha (Firethorn)	6.0–7.0	Begonia	5.5–7.5	Poppy	6.5–7.0
Spiraea spp.	6.0–7.0	Caladium	6.0–7.0	Salvia	6.0–7.0
Tea Roses	5.5–7.0	Candytuft	6.5–7.0	Shasta Daisy	6.0–8.0
Viburnum	6.5–7.5	Canna	6.0–7.0	Snapdragon	6.0–7.5
Weigela	6.0–7.0	Carnation	6.5–7.0	Sweet Alyssum	6.5–7.0
		Chrysanthemum	6.0–8.0	Sweetpea	6.5–7.0
		Cockscomb (Celosia)	6.0–7.5	Sweet William	6.5–7.0
		Coleus	6.0–7.0	Tuberose	6.0–7.0
		Cornflower	6.0–7.5	Tulip	6.0–7.0
		Cosmos	6.5–7.0	Verbena	6.0–8.0
				Zinnia	5.5–7.5

The following table lists fertilizer materials that supply certain nutrients and change the soil pH. Use this table as a reference. It does not take the place of a soil test.

Material	Analysis N-P-K	Rate of application per 100 square feet		Speed of Reaction	Effect on pH
		Dry	Liquid		
Ammonium Sulfate	20-0-0	½–1 lb	1 oz per 2–3 gal	Rapid	Very acid
Sodium Nitrate	15-0-0	¾–1¼ lb	1 oz per 2 gal	Rapid	Basic
Calcium Nitrate	15-0-0	¾–1½ lb	1 oz per 2 gal	Rapid	Basic
Potassium Nitrate	13-0-44	½–1 lb	1 oz per 3 gal	Rapid	Neutral
Ammonium Nitrate	34-0-0	¼–½ lb	1 oz per 5 gal	Rapid	Acid
Urea	45-0-0	¼–½ lb	1 oz per 5–7 gal	Rapid	Slightly acid
Mono-ammonium Phosphate	11-48-0	1 lb	1 oz per 3 gal	Rapid	Acid
Di-ammonium Phosphate	18-46-0	½–¾ lb	1 oz per 4–5 gal	Rapid	Acid
Triple Superphosphate	0-46-0	1–2½ lb	Insoluble	Medium	Neutral
Superphosphate	0-20-0	3–5 lb	Insoluble	Medium	Neutral
Potassium Chloride	0-0-60	½–¾ lb	1 oz per 4–5 gal	Rapid	Neutral
Potassium Sulfate	0-0-50	½–1 lb	Not advisable	Rapid	Neutral
Complete Soluble (mixtures)	20-20-20 20-5-30 12-12-12	Not advisable	1 oz per 3–5 gal	Rapid	Various
Complete Dry (mixtures)	10-10-10 5-10-10	2 lb 2–3 lb	Relatively insoluble	Various Various	Various Various
Limestone	None	5–20 lb	Insoluble	Slow	Basic
Hydrated Lime	None	2 lb	Relatively insoluble	Rapid	Basic
Gypsum (calcium sulfate)	None	2–5 lb	Insoluble	Medium	Neutral
Sulfur	None	1–2 lb	Insoluble	Slow	Acid
Epsom Salts (magnesium sulfate)	None	8–12 oz	1 oz per 5 gal	Rapid	Neutral
Aluminum Sulfate	None	Not advisable	1 oz per 5 gal	Rapid	Very acid
Urea Formaldehyde	38-0-0	3–5 lb	—	Slow	Slightly acid
Magnesium Ammonium Phosphate	7-40-6	Variable	—	Slow	Neutral
Dried Blood	12-0-0	2–3 lb	—	Medium	Acid
Steamed Bone Meal	Usually	5 lb	—	Slow	Basic
Castor Pumice	5-1-1	3–5 lb	—	Slow	—
Cottonseed Meal	7-2-2	3–4 lb	—	Slow	Acid
Hardwood Ashes	0-1-5	3–10 lb	—	Medium	Basic
Hoof and Horn Meal	13-0-0	2–3 lb	—	Slow	—
Seaweed (Kelp)	Usually	2–3 lb	—	Slow	—
Linseed Meal	5-1-1	3–5 lb	—	Slow	Acid
Soybean Meal	6-0-0	3–5 lb	—	Slow	—
Trace Elements	—	3–6 oz	—	0	—
Iron Sulfate	—	8–12 oz	1 oz per gal	—	—
Chelated Iron	—	1–2 oz	1 oz per 25 gal	—	—
Borax	—	½ oz	—	—	—
Copper Sulfate	—	1–2 oz	—	—	—

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