J&L Garden Center

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Gypsum

Home owners are typically inundated with many sources of information on how to improve soils in the landscape. The claims of some products are almost miraculous in their ability to improve the quality and workability of soils. Other products are firmly entrenched in the minds of gardeners and landscape professionals alike, for their supposed ability to improve soils. Gypsum is one of these products. Advertisements for gypsum often claim the addition of gypsum will help loosen heavy, clay soils, and improve soil drainage. It is also generally thought that gypsum will improve the physical structure of soils. While these claims are not necessarily false in all cases, many homeowners may not see any positive soil improvements from just one application of gypsum.

Gypsum will help improve soil conditions, and change the soil structure, but it takes many years. It requires tons - not pounds - of gypsum per acre to change the soil. However, Gypsum does provide many beneficial results in home gardening, and gypsum does have a place in your soil's overall care and health program.

Gypsum is the common name for calcium sulfate ($CaSO_4$), a very water-soluble form of calcium and sulphur. This makes it an excellent source for both *plant-available* calcium and sulfur.

In most soils, calcium is primarily responsible for helping to hold clay soil particles together in clumps, or clods. The size and quantity of these clumps determine the actual soil structure. In most Utah soils, the concentration of calcium in the soil is already high, so an application of gypsum will not significantly improve soil structure in this regard.

The most practical use of gypsum, in most Utah soils, is to encourage the removal of sodium from the soil. Many soils are sodium-based, especially in West Bountiful, Woods Cross, and the west part of North Salt Lake. High levels of sodium make the small clay soil particles stick together very tightly, and make the soil feel slippery. In sodium-based soils, the calcium will replace sodium, and then water can leach the sodium away. Calcium helps keep the soil particles further apart, but still in clumps. Thus, you will get some loosening action of the soil by adding gypsum. However, you can get even a more dramatic, and long lasting 'loosening effect', by core-aerating, or by roto-tilling either **Utelite** or **Compost** into the soil.

In lawns, aerating with large, half-inch hollow tines, and punching about 10 to 15 holes per square foot, will produce good results. The deeper you can make the holes, the better results you will receive. Very compacted soil can benefit from several corings each year (a common occurrence with sport fields).

Gardening Tip. After making the coring holes, spread an inch of compost, or a half inch of Utelite, over the area and rake it into the holes. The results will be worth the extra effort.

How Gypsum Works In More Technical Terms: In arid parts of the country, sodium occupies many of the cation exchange sites in the soil. And since it is only a +1 charge, soil colloids tend to disperse and can be easily compacted together causing a poor soil structure. Adding gypsum ($CaSO_4$) allows the Ca^{++} to release and replace the soil-bound Na^{+}. The released Na^{+} is leached out as Na_2SO_4, and the soil tends to granulate due to flocculation (fluffing up and colloidally glued together on the microscopic level) with more Ca^{++} on the exchange sites. This granulated condition improves soil structure, and soil is then less prone to compaction.

The addition of *'sulfate sulfur'* — a good source of plant-available sulfur — will not significantly change the pH of the soil because of the combination with the calcium in gypsum. Gypsum will help bring a soil pH close to neutral (pH 7) but it will not change the soil to either an acid or alkaline condition. ***Gypsum is a great way to add calcium to the soil without changing the soil pH.***

If you need to lower the soil pH, it is better to add soil sulphur. If you need to raise the soil pH, is better to add Lime (calcium carbonate). See the section about ***Gypsum vs Lime vs Sulphur*** for more information about the pH effects of gypsum.

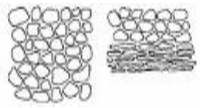
Research shows that gypsum can cause other elements, in addition to sodium, to leach faster as well. Gypsum makes Aluminum leach away faster; if you're trying to grow the

blue hydrangeas, that's not what you want. It also can cause leaching of iron and manganese, two other elements we really would rather have stick around in the soil.

Gypsum's Advertised Benefits

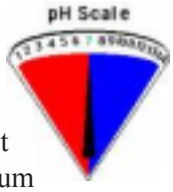
Improves Soil Structure Gypsum provides calcium, which is needed to flocculate clays in soil. Flocculation is the process in which many individual small clay particles are bound together in fewer, but larger particles. This allows root growth and air and water movement in the larger air spaces.

Reclaims Sodic (Sodium) Soils Gypsum is the most economical way to reclaim sodic soils. The calcium replaces the sodium held on the clay-binding sites. The sodium can then be leached from the soil as sodium sulfate. The sulfate is provided by the gypsum.



Improves Compacted Soil Soil compaction can be prevented by not plowing or driving machinery on soil when it's too wet. The compaction in many soils can be decreased with gypsum, especially when combined with deep tillage. Combination with organic amendments also helps, especially in preventing return of the compaction.

Stops Water Runoff and Erosion Gypsum improves water infiltration rates into soils and the hydraulic conductivity of the soil. It is protection against excess water runoff from especially large storms that accompany erosion.



Decreases pH of Sodic Salts Gypsum immediately decreases the pH of sodic soils, and near sodic soils, from values over 8 to 9, to values of 7.5 to 7.8. These values are in the range of acceptability for growth of most crop plants. The level of exchangeable sodium is decreased, which lessens the hydrolysis of clay to form hydroxides. Also, there is release of the acid ions.

Improves Swelling Clays Gypsum can decrease the swelling and cracking associated with high levels of exchangeable sodium on certain types of clays. As sodium is replaced by calcium on these clay soils, they swell less and therefore do not easily clog the pore spaces through which air, water and roots move.

Prevents Waterlogging of Soil Gypsum improves the ability of soil to drain and not become waterlogged due to a combination of high sodium, swelling clay and excess water. Improvements of infiltration rate and hydraulic conductivity with the use of gypsum adds to the ability of soils to have adequate drainage.

Binds Organic Matter To Clay Gypsum is a source of calcium which is a major mechanism that binds organic matter to clay in soil. This gives stability to soil aggregates. The value of organic matter is increased when it is applied with gypsum.

Helps Plants Absorb Nutrients Calcium, which is supplied in gypsum, is essential to the mechanisms by which most plant nutrients are absorbed by roots.

Prevents Heavy Metal Toxicity Calcium acts as a regulator of the balance of micro nutrients, such as iron, zinc, manganese and copper in plants. It also regulates non-essential trace elements. Calcium prevents excess uptake of many of them, and, once they are in the plant, calcium keeps them from having adverse effects when their levels get high.

Increases Value Of Organics Gypsum adds to the value of organic amendments. Blends of gypsum and organics increase the value of each other as a soil amendment. Gypsum decreases burn out of soil organic matter when soils are cultivated.

Improves Fruit Quality; Prevents Some Diseases Good fruit quality requires an adequate amount of calcium. Calcium moves very slowly in the soil, if at all, and fruits at the end of the transport system get too little. Calcium must be constantly available to the roots. This is especially true in very high pH soils. Gypsum helps prevent blossom-end rot of tomatoes and bitter pit in apples. Gypsum is preferred over lime for potatoes grown in acid soils so that scab may be controlled.

Provides A Source of Sulfur Gypsum contains sulfate, a natural form of sulfur which is readily available for soil needs and plant up-take. This replenishes the sulfur which is no longer being added to the soil due to the use of high-analysis fertilizers, which contain very little, if any, sulfur.

Keeps Clay Off Roots Gypsum can help keep clay particles from adhering to the roots of crops like potatoes, carrots, garlic and beets. This is a time and cost-saver, especially at harvest time.

Decreases Loss of Nitrogen to the Air Calcium from gypsum can help decrease volatilization loss of ammonium nitrogen from applications of ammonia, ammonium nitrate, urea, ammonium sulfate, or any of the ammonium phosphate fertilizers.

Increases Crop Yields Gypsum-for various combinations of the above effects-can substantially increase crop yields. A 10 to 50 percent increase is very common. Gypsum can be a gardener's friend.

Recyle Drywall - Gypsum Board

Gypsum is the main component of drywall. Drywall is the primary material used for interior walls in all types of construction. When it comes to dealing with drywall waste, the best route to go is to recycle. Many recycling facilities accept drywall scraps. Before you try to drop off your truckload of drywall, or use it in your garden, here are a few important considerations:

It needs to be clear of any foreign objects such as screws, nails, joint tape, and wires.

Be sure that the drywall is not covered in lead paint, some houses were painted with lead paint up until 1979.

Check to make sure the drywall does not contain asbestos. While this is not in use anymore, a handful of manufacturers used it in the past.

Boron is a natural element that is added to drywall as a fire retardant. Although too much boron can be toxic to plants, it is a plant nutrient, and its addition may be beneficial where the boron content in the soil is low.

These are a few checks that are vital to your health and well being.

Recycling drywall is a good green practice, and it also saves money in the long run. Many companies are now recycling gypsum board, and packaging it for gardening uses.

More information.

http://www.ciwmb.ca.gov/conDemo/Wallboard/#Reuse

Gypsum vs Lime vs Sulphur

Lime is applied to acid soils to raise the soil pH. Soil pH is an important chemical property of the soil. The pH scale runs from 0 to 14 and is used to indicate the relative acidity or alkalinity of the soil. A pH less than 7 is acid, while that above 7 is alkaline. A pH of 7 indicates a neutral soil. The pH is important because it influences the availability of essential nutrients. Most horticultural crops will grow satisfactorily in soils having a pH between 6 (slightly acid) and 7.5 (slightly alkaline). Most soil nutrients are readily available in this pH range.

Lime is seldom needed in Utah, usually only when using potting soil, or when you are making your own soilless mixes. Occasionally you may need lime in gardens exceptionally high in organic matter.

Gardeners should apply liming materials to gardens and lawns only when recommended by a soil test. A soil test will indicate the current soil pH and, if necessary, the amount of lime to apply to the area. Liming materials include ground limestone which is mainly calcium carbonate ($CaCO_3$). Dolomitic limestone is also available which contains calcium carbonate ($CaCO_3$) and magnesium carbonate ($MgCO_3$). Applying lime to neutral or alkaline soils can actually create problems. The addition of lime can raise the soil pH to excessively high levels, reducing the availability of plant nutrients and leading to poor plant growth.

If additional calcium is needed in your soil, without changing the pH, you should apply Gypsum ($CaSO_4$) instead of limestone.

To lower the pH of alkaline soils (soils above 7.0) apply sulfur, aluminum sulphate, or iron sulphate. Most sulfur products contain 90 percent elemental sulfur. The best time to apply most sulphur products is in the spring, or early summer.

If you apply sulphur in the fall, you will just start to have the correct soil pH by spring. The effect is delayed, in the fall, because soil-dwelling bacteria need time to break down the sulfur, and lower the pH. Bacteria oxidize the sulfur, and then the sulphur combines with water to form sulfuric acid, which acidifies the soil. Because this process relies upon active soil bacteria, sulfur is best applied in spring or summer, when the bacteria are most active. The colder the soil temperature is, the slower the effect of sulphur will be to the soil. Soil sulphur may be slow acting, but it is long lasting.

If you are having trouble with acid loving plants such as Rhododendrons, Azaleas, Blueberries, Japanese Maples, and even Holly, sulphur can help. Soil sulphur is easy to apply, widely available, fairly inexpensive, and safer for your plants than using aluminum sulfate, iron sulfate, or sulfuric acid. For existing plants (plants that are already in the ground) spread about 6 ounces of soil sulphur evenly, in a wide ring, around each plant you are treating. Scratch the sulphur into the surface of the soil or mulch.

Your best results when planting a new shrub, one that needs to have a low soil pH, is to dig a hole much larger than necessary, incorporate the soil sulphur, plus add acid planting mix into the soil, so you have the correct soil pH right from the start.

If you really want to know where you are with the soil pH, or fertility, it's a great idea to have a soil test so you know exactly what your soil is lacking.

More Resources

http://extension.usu.edu/files/publications/publication/AG-SO-07.pdf

http://www.westernminingandminerals.com/gypsum-use-article.pdf

http://www.basic-info-4-organic-fertilizers.com/gypsum.html

http://www.hmhgypsum.com/why.htm

http://www.ars.usda.gov/sp2UserFiles/Place/36071000/Posters/Frantz180082_2006_HealthyPlant.pdf

http://www.agr.state.nc.us/cyber/kidswrld/plant/nutrient.htm