



JOHN'S CORNER

ORGANIC FERTILIZERS AND NUTRIENTS 23: GREEN SAND

by John Ferguson

Over a year ago we talked about greensand as a soil amendment however it is much more than that since it is loaded with nutrients.

Greensand has been used for over 100 years as a natural source of a slow release fertilizer and soil conditioner. The slow release of potash and phosphate does not burn plants and the minerals improve the moisture holding properties of soil.

For years many gardening books and horticultural publications talked about the importance and value of New Jersey greensand. However shipping it into Houston was extremely expensive as it can weigh over 3,000 pounds per cubic yard. About 15 years ago several deposits of greensand were discovered in Texas and now it is only pennies per pound! It is the most economical way of adding a huge range of nutrients to your soil.

Origin of Greensand

Greensand was formed in anoxic (without oxygen) marine environments that are rich in organic detritus and low in sedimentary inputs. As in fish emulsion, seaweed and other products from the ocean it has all the nutrients (elements) found in seawater (see chart below). The geological formation is a sedimentary rock known as "Glauconite". It is often an olive-green colored sandstone like rock found in layers in many sedimentary rock formations of marine origin. It is called a sand due to its crumbly and grainy nature, but in reality the minerals are very similar to clay minerals.



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Element	Atomic weight	ppm	Element	Atomic weight	ppm
Hydrogen H ₂ O	1.0079	110,000	Molybdenum Mo	0.09594	0.01
Oxygen H ₂ O	15.999	883,000	Ruthenium Ru	101.07	0.0000007
Sodium NaCl	22.989	10,800	Rhodium Rh	102.905	.
Chlorine NaCl	35.453	19,400	Palladium Pd	106.4	.
Magnesium Mg	24.312	1,290	Argentum (silver) Ag	107.870	0.00028
Sulfur S	32.064	904	Cadmium Cd	112.4	0.00011
Potassium K	39.102	392	Indium In	114.82	.
Calcium Ca	10.080	411	Stannum (tin) Sn	118.69	0.00081
Bromine Br	79.909	67.3	Antimony Sb	121.75	0.00033
Helium He	4.0026	0.0000072	Tellurium Te	127.6	.
Lithium Li	6.94	0.170	Iodine I	166.904	0.064
Beryllium Be	9.0133	0.0000006	Xenon Xe	131.30	0.000047
Boron B	10.811	4,450	Cesium Cs	132.905	0.0003
Carbon C	12.011	28.0	Barium Ba	137.34	0.021
Nitrogen ion	14.007	15.5	Lanthanum La	138.91	0.000029
Fluorine F	18.998	13	Cerium Ce	140.12	0.0000012
Neon Ne	20.183	0.00012	Praesodymium Pr	140.907	0.00000064
Aluminium Al	26.982	0.001	Neodymium Nd	144.24	0.0000028
Silicon Si	28.086	2.9	Samarium Sm	150.35	0.00000045
Phosphorus P	30.974	0.088	Europium Eu	151.96	0.0000013
Argon Ar	39.948	0.450	Gadolinium Gd	157.25	0.0000007
Scandium Sc	44.956	<0.000004	Terbium Tb	158.924	0.00000014
Titanium Ti	47.900	0.001	Dysprosium Dy	162.50	0.00000091
Vanadium V	50.942	0.0019	Holmium Ho	164.930	0.00000022
Chromium Cr	51.996	0.0002	Erbium Er	167.26	0.00000087
Manganese Mn	54.938	0.0004	Thulium Tm	168.934	0.00000017
Ferrum (Iron) Fe	55.847	0.0034	Ytterbium Yb	173.04	0.00000082
Cobalt Co	58.933	0.00039	Lutetium Lu	174.97	0.00000015
Nickel Ni	58.710	0.0066	Hafnium Hf	178.49	<0.000008
Copper Cu	63.54	0.0009	Tantalum Ta	180.948	<0.0000025
Zinc Zn	65.37	0.005	Tungsten W	183.85	<0.000001
Gallium Ga	69.72	0.00003	Rhenium Re	186.2	0.0000084
Germanium Ge	72.59	0.00006	Osmium Os	190.2	.
Arsenic As	74.922	0.0026	Iridium Ir	192.2	.
Selenium Se	78.96	0.0009	Platinum Pt	195.09	.
Krypton Kr	83.80	0.00021	Aurum (gold) Au	196.967	0.000011
Rubidium Rb	85.47	0.120	Mercury Hg	200.59	0.00015
Strontium Sr	87.62	8.1	Thallium Tl	204.37	.
Yttrium Y	88.905	0.000013	Lead Pb	207.19	0.00003
Zirconium Zr	91.22	0.000026	Bismuth Bi	208.980	0.00002
Niobium Nb	92.906	0.000015	Thorium Th	232.04	0.0000004
			Uranium U	238.03	0.0033
			Plutonium Pu	(244)	.

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Since greensand was formed under pressure in deep oceans and without oxygen the mineral complex's become unstable after being mined and exposed to oxygen at atmospheric pressure, hence these nutrients are released into the soil.

Greensand in our area is a dark greenish gray color when dry and turns almost black when wet when it is first mined. Greensand is a very heavy mineral with a density of approximately 90-120 pounds per cubic foot (2,500-3,000 pounds per cubic yard) depending on moisture content.

The minerals are normally released slowly over time but occur much faster in organic rich soils full of beneficial microbes (microbes produce organic acids as they break down organic matter which facilitates the release of the minerals for plant absorption). The pH of greensand varies from slightly acidic to slightly alkaline depending on the source and has little effect on the pH of soils. Some greensands can contain up to 12% iron (Fe). As greensand weathers (starts to breakdown and oxidize) the iron combines with oxygen (O) and the color becomes rusty looking.

Note: This oxidizing process of iron is what gives many of the iron rich soils in East Texas their reddish color.

Most of the soils around Houston and along the Gulf Coast tend to be very nutrient deficient. We are located far from any areas where the weathering of igneous rocks would release the required minerals and allow them to be deposited in our soil for plants to use. Historically, we also receive a lot of rainfall. The slight acidity of rain tends to make these minerals soluble and allows them to be leached out of the soil. The result is our area soils tend to be very low in the minor and trace elements. This is why it is so important that we have lots of organic matter in our soils to feed the microorganisms. These guys will absorb the nutrients into their bodies and prevent them from leaching. As they eat each other the nutrients are released into the soil and the plant roots can get them. For example fungus will form calcium oxalate crystals on their hyphae and store it into the soil till it is needed. Blossom end rot on tomatoes is an example of a calcium deficiency and some weeds like Dandelions require soils low in available calcium.

Traditionally, we were taught that plants can grow with only 16 elements. However recent research has shown that plants grown with a much wider assortment of nutrients have less disease and insect problems, use less water, taste better, have larger and more fragrant flowers, etc. The human body has 90 elements in it and if



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they are not in the soil then plants cannot absorb them and we do not get them when we eat the plants and fruits, nuts, etc. and many health problems are the result.

There is an excellent lecture available on CD on the importance of trace elements. It is called "Dead Doctors Don't Lie", By Joel Wallach, DVM, N.D, (available at many health food stores or online). It explains why we have so many health problems associated with the lack of nutrients in our food supply. Almost all of Dr. Wallach's statements have been confirmed by other researchers since this lecture was recorded many years ago. This is a fun lecture to listen to, as Dr. Wallach has quite a sense of humor as he explains the importance of trace elements for both animal and human health.

In December I was able to attend a multi-day workshop on advanced soil science. During the seminars several of the speakers talked about the role of these micro and pico-nutrients working as co-factors in enzyme reactions for both plants and animals including humans. The research showed that a lack of these elements prevented the enzymes systems from working properly and led to more insect and disease problems in plants and health problems in animals and humans.

Additionally I was given a copy of the newest edition of a book on diagnosing plant health and nutrition problems that goes well beyond the obsolete 16 nutrient model of plant health.

Plant Analysis Handbook III - A Guide to Sampling, Preparation, Analysis, and Interpretation for Agronomic and Horticultural Crops, Multiple Authors, Micro-Macro Publishing, Inc., 2014, ISBN: 978-1-878148-01-8 .

Uses of Greensand

Greensand often has the consistency of sand but is able to absorb 10 times more moisture which makes it a good amendment for use in agriculture and horticulture for many soils types. Greensand does not burn plants and helps the beneficial microbes to grow in the soil. It also has been found to be a good conditioner to help loosen heavy and tight soils and help bind loose soils.

Recommended application is 2-4 pounds of greensand per 100 square feet, 40 pounds per 1,000 square feet or 1 ton per acre. For potting soils 5-20 pounds per cubic yard can be beneficial. It is a good idea to repeat this every few years to replace the nutrients that have been used up or leached from the soil.

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Many gardeners add a few cups of greensand to their compost bins to increase the nutrient density. I like to sprinkle a little greensand in my worm bin (vermi-composting) to add some mineral roughage that helps the worms eat the feedstock and it increases the nutrient content of the castings.

A field test by Rutgers University in a sandy loam soil with greensand applied in the row at the time of planting, found that the application of greensand increased the yield of potatoes by 16%.

The benefits of greensand, largely unexplained by scientific research are far more than a laboratory analysis would indicate. However numerous greenhouse and field studies have shown significant improvement in the growth of plants. Other studies have shown that the use of greensand improves the taste, color, nutritional value, the health of plants and the health of soils.

Note: The crushing process of the glauconite ore produces both greensand and rock. The rock can be screened to different sizes and used as a landscape rock. It gives a very different look than commonly used gravels, crushed granite or basalt. The green rock portion when used on pathways packs well, is black when wet and greenish grey when dry. The greenish grey color makes yellow flowered plants (Daylilies, Tunera, etc.) stand out and really "sizzle and pop".

SUMMARY:

Greensand is the most cost effective method of adding minor, trace, micro and pico nutrients to ones soil. Always look for screened greensand where the rock portion has been removed.

PROS:

- good source of iron phosphorous, potassium and calcium
- inexpensive
- good availability
- available in bag or bulk
- nutrients moderately available
- easy to use

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- often used in compost piles to enrich it
- almost a unlimited resource
- good for all plants

CONS:

- may be dusty when dry (wear a mask)
- not a complete fertilizer
- some lower cost brands do not screen it to remove rock portion

BOOK REVIEW:

I find one of the benefits of the winter and holiday season from Thanksgiving through January is that gardening slows down. As a result I get caught up on my reading from numerous books, research articles and other materials. Another book I read this winter was:

"TOXIN TOXOUT Getting Harmful Chemicals out of our Bodies and Our World", Bruce Lourie and Rick Smith, 2013, Knopf Publications, ISBN: 978-1-250-05133-2

This is the second book by these two authors. Their first book "Slow Death by Rubber Duck- How The Toxic Chemistry of Everyday Life Affects Our Health" became an international best seller.

This book reviews many of the toxic chemicals we come into contact with every day and the health problems they cause from allergies, autism, cancer, and many more. It also offers alternatives and ways to remove these toxic chemicals from our bodies. It strongly reinforces the concept that most experienced gardeners already knows: *healthy soil = healthy food = healthy bodies.*

This book is an easy to read overview of what has happened, the consequences and how to remove toxic chemicals and recover from the damage that has been done to our bodies.

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