UNIVERSITY OF MARYLAND EXTENSION | HOME & GARDEN INFORMATION CENTER

HG 110
2013

Selecting and Using a Soil Testing Laboratory

Reducing the flow of nutrients into Maryland waterways is a principal mission of University of Maryland Extension (UME). The Home and Garden Information Center and Maryland Master Gardeners teach residents how to fertilize plants responsibly, improve and conserve garden soil, and recycle nutrients through composting and grasscycling. Soil testing gives gardeners important information they need to make good decisions regarding soils and fertilizers.

The University of Maryland no longer has a soil testing lab. On the last page of this publication you will find a list of regional private and public soil testing labs for you to contact for information on soil testing. The University of Maryland does not endorse particular businesses and the inclusion or exclusion of specific labs does not reflect a bias. All of the listed labs can competently test soils and provide an understandable report that will include liming and fertilizing recommendations.

Please contact the Home and Garden Information Center if you have any questions about taking a soil sample or about the results and recommendations you receive from any of the labs. Go to our website, extension.umd.edu/hgic , click on "Get Help", then "Ask MD's Garden Experts".

Taking a Soil Sample

Follow the specific instructions provided by the soil testing lab you select. The following guidelines will help ensure that a good sample is taken:

Separate samples should be taken for distinct areas- front yard, back yard, vegetable garden, etc. The sample should represent the soil in which the plants are or will be growing. Use a spade or trowel to take 10-12 random samples across the area of concern. The samples are thin slices taken to a depth that contains or will contain the bulk of the plant's roots- 3 inches for turf; 6-8 inches for garden and landscape beds. Mix together all of the slices in a clean bucket removing all rocks, debris, and plant material.

Mailing in a Soil Sample

Don't send wet soil; you should not be able to squeeze water from the sample. Send a minimum of 1 cup and a maximum of 2 cups of soil per sample. If no kit is provided, seal the soil in a zip lock bag or use the special soil sample bag provided by the Maryland Department of Agriculture and University of Maryland Extension. Forms for most of the labs can be downloaded from their websites. Be sure that all of your contact information is on the form and mail it back to the lab with the sample, check for the correct amount, and sufficient postage.

Interpreting Test Results

Soil test reports from all of the labs will provide a graphical representation of results - the level of various nutrients from your soil (low medium, high, excessive). "Optimal" and "excessive" levels mean that the nutrient concentration in the soil is more than adequate for optimum plant growth. Adding more of that nutrient will not improve plant growth and may have undesirable effects on the environment.

Be aware that the specific turfgrass fertilizer recommendations you receive will not be identical to Maryland's. This is due to differences in soils, climate, and and state water quality policies. Always follow University of Maryland recommendations for applying the right amount of nitrogen for healthy lawns. Go to the 'Publications' section of our website to download the following fact sheets:

- HG 112 Turfgrass Maintenance Calendars;
- HG 63 IPM Turf (has a section on lawn fertilizers, fertilizer timing and UME turf fertilizer schedule); and
- HG 42, "Soil Amendments and Fertilizers" (contains broad fertilizer guidelines for many garden and landscape plants).

Abbreviations and Terms Found in Soil Test Reports

The labs listed provide definitions and explanations of soil sampling terms and concepts. The list below will help you better understand the soil test reports you receive.

pH- soil pH is a measure of a soil's hydrogen ion concentration. The greater the number of hydrogen ions the more acidic the soil. The pH scale is 1-14. Soils with pH levels below 7.0 are considered acidic and soils with pH levels above 7.0 are considered alkaline. Soil pH is a critical measurement for gardeners because it affects the availability of nutrients for uptake by plant roots. Most garden and landscape plants grow best in soils with a pH of 5.5–7.0. Certain plant nutrients can become unavailable or excessively available outside this range, leading to plant growth problems. But there are exceptions: for example, plants in the azalea and blueberry family grow best at pH 4.0-5.0.

Macronutrients: these are required in the greatest quantity by plants. Sulfur (**S**) is rarely tested because soils in Maryland are rarely deficient. Nitrogen (**N**) is not usually tested because it is constantly changing.

P- phosphorous
K- potassium
Mg- magnesium
Ca- calcium

Micronutrients: These important nutrients are required in relatively small quantities. Deficiencies are rarely a problem in Maryland soils, especially in the Central and Western regions. Eastern Shore gardeners may want to be sure that boron is included in the test they select.

Fe- iron
Zn- zinc
Cu- copper
Mn- manganese
B- boron

Heavy metals: excessive levels are a concern, especially in soils where food crops are grown and children play. These elements can be a health hazard when 1)tracked into the house via shoes and tools, 2)ingested by young children, or 3)ingested from food crops grown in contaminated soil. For more information on lead, refer to University of Maryland Extension fact sheet HG #18, "Lead in Garden Soil."

Pb- lead
Ni- nickel
Cd- cadmium
Cr- chromium

OM- organic matter; includes living and decomposed plant and animal tissues (dead leaves, soil fungi, plant roots, etc. Soil organic matter drives a soil's biological and chemical processes. OM test results are given on a weight basis. Usually a sample is weighed in the lab and then ignited to burn off the carbon compounds, leaving only the mineral soil. The sample is re-weighed to determine the OM%. Gardeners who add lots of organic matter to their soils may be surprised that the OM content is less than 5%. This is because OM is lighter than mineral soil and the measurement is based on weight, not volume.

CEC- cation exchange capacity measures the capacity of a soil to hold and release nutrient ions. Soils high in clay and organic matter will have high CEC. This measurement will vary across Maryland soils. Adding organic matter is recommended where the CEC is less than 10.

Nitrogen

Plants need a relatively large amount of nitrogen for healthy growth. Plant roots take up nitrogen in the nitrate and ammonium forms. Unlike most other nturients, nitrogen does not come from mineral soil. Instead it comes "naturally" from organic matter, lightning and legumes (plants that convert nitrogen in air to nitrate nitrogen.)

Fertilizing Responsibly for a Healthy Chesapeake Bay

Nitrogen and phosphorous are the two key nutrient pollutants of waterways in Maryland that contribute to the complex problem known as eutrophication. These nutrients encourage blooms of algae that cloud the water and block sunlight causing underwater grasses to die. This has negative affects on aquatic life and birds. Huge numbers of microorganisms in the water then use up oxygen as they feed on and break down the algae once it has died. Dissolved oxygen in the water quickly declines, depriving fish, crabs and other aquatic life forms of needed oxygen.

It is estimated that up to 80% of the nitrogen entering groundwater and surface water comes from non-point sources-farms, public lands, and private landscapes. About one-half of excessive or mis-applied nitrogen fertilizer enters surface water fairly quickly as run-off from hard surfaces, lawns and gardens. The other half travels for at least 10 years through soil and underground water before it eventually enters the Chesapeake Bay (for Marylanders who live east of the Eastern Continental Divide, located in Garrett County). So mistakes in measuring and applying fertilizers today can contribute to nutrient pollution problems many years in the future.

Farmers, municipalities, corporations, AND homeowners all have a duty to reduce the flow of nitrogen and phosphorous into streams, rivers, and the Chesapeake Bay. Marylanders with lawns should fertilize according to the 2011 Fertilizer Use Act (Maryland state law) and University of Maryland Extension recommendations found on the HGIC website under 'lawns'.

10 Ways to Achieve a Healthy Home Landscape Without Harming the Chesapeake Bay

1. Take a soil test every 3 to 4 years. Fertilize according to soil test recommendations. Use less than the recommended amounts listed on fertilizer packages.

2. Leave grass clippings on your lawn (grasscycling.) They are a source of nitrogen for your lawn and will not contribute to thatch build-up in fescue or bluegrass lawns.

3. Home gardeners tend to over-fertilize flower and vegetable gardens. Reduce or eliminate fertilizer applications in well-established beds if organic matter is being added each year.

4. Don't fertilize trees and shrubs if they appear healthy and are making adequate shoot and leaf growth.

5. Compost plant residues or incorporate them directly into soil. Discard plants with serious disease problems.

6. When appropriate, substitute slow-release fertilizers for those that are highly soluble and substitute locally available organic fertilizers (well-decomposed farmyard manure, backyard compost and municipal leaf compost) for manufactured chemical fertilizers.

7. Keep fertilizers off hard surfaces. Rain water will carry fertilizer salts into storm drains and surface waters and contribute to nutrient pollution of our waterways.

Feed The Soil First!

The surest way to improve soil quality and plant growth is the regular incorporation of organic matter such as composted yard waste. Organic matter improves soil structure, slowly releases nutrients, increases beneficial microbial activity, and reduces the need for purchased fertilizers.

8. Over time, rainfall causes bare soil to erode and become compacted. Keep bare soil covered with a mulch and plant ground covers in areas where turf won't grow. Plant winter cover crops in vegetable gardens - like oats, winter rye and crimson clover.

9. Avoid excessive foot or equipment traffic to prevent soil compaction, especially when the soil is wet. Construct terraces for beds on sloped ground. Keep soil in raised beds framed with solid sides.

10. To melt winter ice, use calcium magnesium acetate (CMA), potassium chloride (KCl), or calcium chloride ($CaCl_2$). Do not use sodium chloride or chemical fertilizers such as urea, potassium nitrate, or other products containing nitrogen or phosphorous. The salts in these fertilizers may burn the foliage and roots of adjacent plants and wash into and pollute waterways.

Reviewers: Patricia Steinhilber, Ph.D., Nutrient Management Coordinator, University of Maryland Extension Associate and Judy McGowan, Nutrient Management Specialist, Maryland Department of Agriculture

12/2003; revised 9/2005; 2/2009; 4/2011; 12/2012; 9/2013

Do you have a plant or insect pest question?
Visit us at extension.umd.edu/hgic

Author: Jon Traunfeld, University of Maryland Extension Specialist, Home and Garden Information Center