HOW TO USE YOUR SOIL TEST KIT

Results of another *Weeds Trees and Turf* field research project.

SOIL TESTING is a useful technique that can be used by contract applicators in much the same way a doctor takes a patient's temperature. Interpretation of the results of a soil test will indicate various things, such as how an operator can make his weed control, turf, and soil sterilization jobs more effective.

Soil tests are of two basic types. The first is an acidity-alkalinity test (pH). Reaction of soils with chemicals or chemically treated papers determines the concentration of positively charged hydrogen ions (H+) or negatively charged hydroxyl ions (OH−). A high concentration of hydrogen ions means the soil is acid; concentrations of hydroxyl ions means the soil is alkaline.

In addition to chemicals and treated papers, pH values may be determined by use of an instrument which measures electrical resistance between two electrodes and interprets it into pH readings.

Second type is a soil analysis test which indicates, by mixing soils with certain chemical solutions, just what chemical elements are present in the soil.

Results of either or both of these tests can be important when one is to determine how to improve "ailing" turf.

Balance Changes Affect Growth

How does pH enter into turf problems? Soil is a physical-chemical relationship of organic material, water, air, and inorganic minerals. Each of these contributes to the growth of green plants. Optimum growth occurs when all these materials are in balance. When changes occur, caused by such things as excessive rainfall or watering and consequent leaching, and over-harvesting (mowing and removing clippings), soil conditions may become unbalanced and need correction.

Applicators can make a soil reaction test to see if it is acid (sour, low pH) or alkaline (sweet, high pH) and by considering the reaction, along with the physical condition of the unhealthy turf, make a fairly accurate recommendation for corrective measures.

Acid-alkaline reactions in a pH test run a scale from 0 to 14. Seven is neutral; acids and alkalies counteract or balance each other. Below 7 is the acid range; above 7 is the alkaline range.

Consider a homeowner in Pennsylvania whose lawn is beginning to brown out in spots in spite of sufficient water. He calls a contract applicator to find out what is wrong. It could be grubs, chinch bugs, fungus disease, or drying (already disproved). The turf specialist makes a soil reaction test with chemical solutions. Soil chemicals cause the test solution to change color. Comparing the resulting color with a color chart in the kit, the operator judges the pH to be 5.

A reaction of 5, then, shows that the soil is acid. The turf manager examines the grass roots and finds that they are shallow and very weak. Considering that the homeowner watered his lawn every day, the

applicator concludes, after making a soil analysis, that the soil is deficient in calcium and magnesium because the excessive water has leached these water-soluble alkaline minerals out of the soil. This left an abundance of nonsoluble acid materials in the soil. In this instance, annual bluegrass had invaded the weakened turf. The operator suggests 100 pounds of ground limestone be applied for every 1,000 square feet of lawn, which should raise the soil reaction to 6 and supply some of the needed minerals. He also advises the homeowner to water the lawn thoroughly only once a week to promote deep and strong root growth of the desired lawngrasses.

If the soil reaction in the previously mentioned test had been favorable, between 6 and 7, the turf manager could then have looked for other causes, such as grubs and chinch bugs.

To illustrate the usefulness of a pH test in the alkaline scale, we can move to the sandy porous soils of the Southwest. Here water-soluble alkaline materials, instead of draining off, are pulled to the surface by capillary action through very porous soil. Water evaporates, leaving the alkaline minerals as a residue. If grasses grown on these soils begin to indicate weakening by a sickly light-green coloration (chlorosis), and a soil reaction of about 8 is observed, an operator should readily guess that the alkaline materials have combined with iron trace elements in the soil and made iron unavailable to the plants. Iron, an essential part of the chlorophyll molecule which makes plants green, becomes less water soluble in "sweet" soils. To lower the pH reaction one can water heavily to leach the mineral residues, or apply an acid-forming fertilizer, such as urea, to lower the pH. Again, a pH soil reaction test showed part of the cause of trouble. These examples are just two of many ways soil reaction can help.

Soil Analysis More Exacting

Soil analysis is a more exacting procedure. Samples of soil are taken and reacted with chemicals. Reactions are indicated on a color scale which tells the operator whether an element is present or not and how much is needed to correct deficiencies. Soil analysis tests and pH reaction tests generally go together and complement each other. In the case of the alkaline soil mentioned above, a soil analysis would have shown that iron was in the soil. But a pH test showed that the soil was alkaline. Researchers have discovered that iron has low water solubility in alkaline soils and plants are unable to remove it from the soil. Therefore, the tester made the correct recommendation, that of lowering the pH to make more iron soluble.

There are many soil analysis tests for almost all of the major plant nutrients.

Though physical composition of soil can be seen and touched, chemical contents (mineral elements, acids, alkalies) must be discovered by chemical means. Testing outfits, as this article shows, are useful to anyone who sprays, plants, or maintains soil. Scientific tests eliminate guesswork; formerly unknown variables are taken into account when soils are treated. First-run success is more certain.

pH Hint to Sterilant Efficacy

For those applicators who offer soil sterilization, a soil reaction test may indicate how long a certain sterilant will be effective under soil environmental conditions. If one wants to apply a water-soluble soil sterilant and finds that the soil is highly acid, he may want to reconsider his formulation or form of application. An acid soil is one which has had the alkaline materials leached out. This indicates that there is a lot of rainfall or water coming from some source. A water-soluble soil sterilant would be leached away as quickly as the alkaline soil components, and the weed control period would not last as long as anticipated. A less water-soluble formulation may be the key to longer control.

A highly alkaline soil is known to be very porous. When working with alkaline soils, one should consider a water-soluble emulsion which would break out of solution soon after application so that it would not be carried too deeply by its own water through the porous soil.

Once a corrective material has been applied to turf, the soil reaction may change. This change may have an effect on chemicals, insecticides, herbicides, or fungicides applied later. Thus soil testing leads one to the subject of incompatibilities.

Chemical Incompatibility Adversely Affects Results

When an operator is treating a phosphorous-deficient lawn for annual bluegrass *(Poa annua)*, he will replenish phosphorus by applying a fertilizer high in this element. Then he will treat the annual bluegrass weeds with a suitable herbicide. A good chemical for annual bluegrass control is calcium arsenate. But in this case, calcium arsenate should not be applied, because researchers have found that a high amount of available phosphates will deactivate calcium arsenate weed control treatments; they are incompatible. A different herbicide should be used.

Unfortunately, little is known about this kind of incompatibility, since research on this problem has been scant. Many operators whose control treatments have failed may have been victims of this kind of incompatibility.

Incompatibilities of tank mixtures are better known. Nonmiscible chemicals are subject to the same pH rules which apply to soils. Chemicals which are decomposed or changed by acids or alkalies should not be mixed

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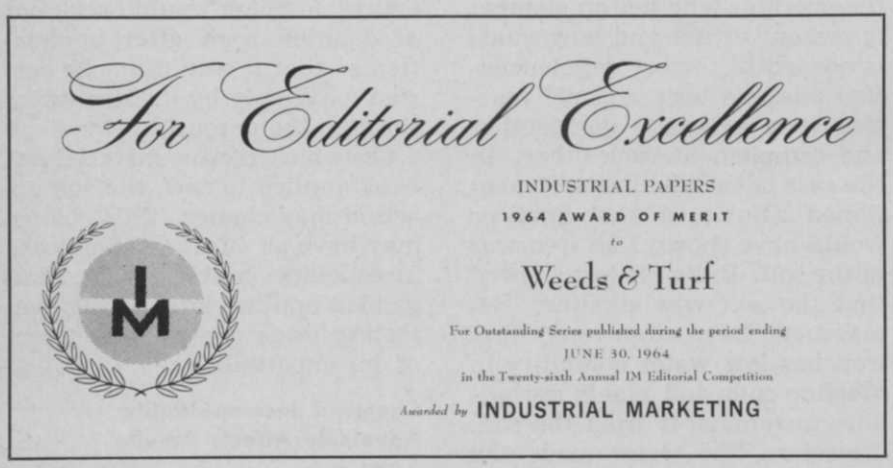

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with other chemicals which are essentially acid or alkali in content. Elaborations of noncompatible mixtures can be found in texts* dealing exclusively with chemistry and chemical descriptions of pesticides.

Soil reaction kits and soil analysis kits, available from several manufacturers, should be a part of the diagnostic materials used by the knowledgeable, progressive contract applicator. These kits are not cure-alls, just as pesticides and cultural practices are not cure-alls in themselves. But, professional use of these handy aids will help operators cite trouble, and recommend corrective measures readily when faulty soil conditions are the cause of turf problems.

* Shepard, Harold H., The Chemistry and Action of Insecticides, McGraw-Hill Book Co., Inc., New York, N.Y., 1961, p. 481. Entoma, 14th edition, E. H. Fisher, ed., Entomological Society of America, Madison, Wisconsin, 1961-1962.

St. Louis May Have Weed Law

A proposal for a weed control ordinance was recently taken under advisement by the St. Louis County Council after Counselor Norman C. Parker revealed there was no measure in the law books for the control of weeds in vacant lots, and unincorporated areas of the county.

Parker further said weed cutting can be enforced by prosecuting property owners only after the health department has determined that the weed area is a breeding ground for mosquitoes and is a health nuisance.

Elm Beetle Leaflet Out

An illustrated 4-page leaflet describing the life history and habits of the elm leaf beetle, means of natural control, and control with insecticides, is now available.

Titled "The Elm Leaf Beetle" (Catalog No. A 1.35:184/4), copies may be obtained by writing the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402. Price of the item is 5 cents, payable in coin, money order, or check. Stamps are not acceptable.