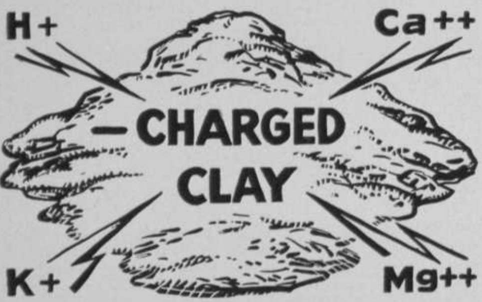
Soil Acidity — pH — Soils that show a pH value of 7.0 are said to be neutral. A pH value of 6.0 indicates a soil that is 10 times more acid than 7.0. Similarly, a pH value of 8.0 shows 10 times greater alkalinity than pH 7.0. Most good agricultural soils are maintained between pH 6.0 and 7.0 (with exceptions).

The term pH refers to the logarithm of the reciprocal of the Hydrogenion concentration. This cumbersome technical term, reduced to "pH," avoids the need to use awkward statements like: ". . . the H-ion concentration is 0.000,000,1 gram per liter."

pH refers to active soil acidity, not to total acidity. pH values **do not** represent figures that can be used to calculate the amount of lime that is needed.



Plus charged nutrients attach to clay by electric magnetism.

Acidity develops as hydrogen ions increase. Water, H^2O, can also be written H OH. Water splits into H^+ ions and OH^- ions. Hydrogen ions develop acidity as they take the place of basic (alkaline) ions (Ca^{++}, Mg^{++}, K^+) on the negatively charged soil particles. Soil is a balanced magnetic system with all the soil particles negatively charged.

When lime is applied the positively-charged Calcium (Ca^{++}) ions replace the H^+ ions on the surface of the clay minerals. This is called Base Exchange. As the plants use the Ca^{++} ions (and others such as Mg^{++}, K^+) their places are again taken by H^+ions and once again the soil acidity becomes stronger.

In 1856, Thaer developed litmus paper which changes color in the presence of acidity. Many other methods have been developed, among them the zinc sulfate-calcium chloride boiling technique where liberated hydrogen sulfide blackens a paper treated with lead acetate roughly in relation to the degree of acidity. In 1935, I used a pocket kit developed by Hellige — Truog where color changes approximately indicate pH values. Newer methods of great sensitivity now measure pH values to three decimal places.

Students of soil chemistry may read for further detail:

Yearbook of Agriculture 1957 — pp. 72-79.
Soil Fertility, C. E. Millar,
Wiley & Sons, N. Y. 1955 — pp. 64-79.

Soil Acidity and its correction deserves serious, continuing study.

Yes, the name of the Post Office is "Secretary."

NOTE: This is not a blanket endorsement of Tufcote Bermuda. This evaluation has been presented to encourage wide practical testing under continuous play. The performance of this grass merits consideration by all who use warm-season grasses on tees.

Fertilizer Framework

Q. "I am using three different nitrogen fertilizers on my course. Their analyses are 21-0-0, 5.5-4-0, and 38-0-0. I know that the first figure is the nitrogen, but why is it so low? Why can't I have 100-0-0? What is the rest of the material-filler?" (West Virginia)

A. Your question is typical of many we receive. Naturally, you want to get the most for your money.

There is no "filler" in these fertilizers. Take 21-0-0 for example. The chemical formula is $(NH_4)_2SO_4$, the well-known ammonium sulfate Based on molecular weights the N portion of the molecule is 21 per cent of the total. The hydrogen, sulfur and oxygen are essential parts of the

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and color saves many dollars in maintenance costs during the life expectancy of a good green. The advantages of using stolons are many and important in providing the desired degree of satisfaction.

Grau's Answers

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"framework" or "skeleton" that hold the nitrogen in a soluble form ready to go into solution and to feed the plant. Without the framework you would have 100-0-0 which is elemental gaseous nitrogen, almost completely useless to your turf. Efficiency would be a fraction of one per cent. Cost would be astronomical. You would have great difficulty in applying it to your turf.

Now let's look at 38-0-0, the familiar insoluble ureaform that you are using. The N content is higher but it is still a long way from the 100-0-0 you speak of. This material has no filler. It, too, must have a skeleton to carry the N in a slow-release form just as your body must have a skeleton.

Unlike the simple inorganic soluble molecule of sulfate of ammonia, ureaform is a mixture of complex molecules of various sizes. All ureaform molecules are made up of hydrogen, carbon, oxygen and nitrogen. The carbon, hydrogen and oxygen are all a part of the framework. Carbon furnishes energy to microorganisms that release N from the molecule. Oxygen is essential to the life and health of the soil microflora. Hydrogen enters into base exchange to release other nutrient elements to the plants.

Thus, you see, every part of the ureaform molecule is useful. A simple molecule might be shown thus:

$$H_2C \begin{array}{l} \diagup NH{-}CO{-}NH_2 \\ \diagdown NH{-}CO{-}NH_2 \end{array}$$

From here they become increasingly complex.

The case of the natural organic, 5.5-4-0, follows the same general pattern but is not so easily explained because it is a variable accumulated by-product of a mixture of materials that have been used before for other purposes. The nitrogen is carried in a framework of lignins, cellulose, waxes, inorganic salts, and organic colloids, all of which act more or less as a framework for the nitrogen. Many of the soluble materials have been carried away in the water processing.

Fillers sometimes are used to make up a mixed fertilizer to equal a ton. More generally these are called "conditioners" which help the physical nature of the blend. Single ingredients as we have discussed never contain fillers or conditioners. The nitrogen is carried in an essential molecular skeleton or framework.

Allen Co. Adds Distributor

Paul E. Allen Co., Palm Harbor, Fla., has added Illinois Lawn Equip. Co., Orland Park, Ill., to its list of distributors of True Organic fertilizer.