Phosphorus Required by All Living Things

Phosphorus has long been recognized as the "sparkplug" in the fertilizer mixture. Without it, crop yields will be limited although levels of nitrogen and potash may be high.

Phosphorus is present in all living tissue. It is particularly concentrated in the younger parts of the plant and in the flowers and the seed.

However, phosphorus is one of the least understood and most complex of the elements used as fertilizer, despite the fact that it is so necessary.

This is because phosphorus will not "stand alone" in the soil as nitrogen, potassium or calcium do. It tends to form a compound and remain in the soil until extracted by the plant root.

PHOSPHATES DO not move readily in the soil, and accumulations are usually in the first foot of soil Some soils that have been in production long enough to deplete the total phosphorus supply will have a phosphorus layer considerably deeper.

Most of the total supply is tied up in a form that is not usable by the crop in a single growing season—it is not available to the growing plant. The available soil phosphorus originates from the breakdown of soil minerals, from soil organic matter or from the previous addition of phosphate fertilizer The available soil phosphorus usually is only about one per cent of the total soil phosphorus.

IT IS THE PROBLEM of getting fertilizer available to the plant that is greatest concern to most farmers Traditionally the use of superphosphate, containing 20 pounds of phosphate per 100 pounds of material, has been recommended

Recently, however, the use of a new material, rock phoshate has come into the picture Many farmers still are not quite clear on its use and what they can expect from it in return

In work at Penn State done some years ago by Dr Merkle, it was found that rock phosphate worked very well in Pennsylvania soils The only objection was in price

The Penn State work also reflected findings at Beltsville and other experiment stations in suggesting that the best use for rock phosphate was in deep rooted legumes and on forage crops.

THE LONGER the rotation, the better the rock phosphate will be utilized. It takes eight to 10 years to wear out, although the bulk of the phosphorus will be released in the first few years.

Soil acidity or pH is also a factor to be considered when using rock phosphate. The best results with rock phosphate have occurred in the acid soils of the corn belt states. Experimental work has shown that a mildly acid condition will help in the breakdown of rock phosphate into a soluable form that the plant can use.

The crop to be grown also must be considered when deciding to use rock phosphate. Species of plants differ markedly in their capacity to absorb phosphorus.

AT BELTSVILLE phosphorus from phosphate rock was found to be most available to buckwheat. Legumes (alfalfa, crotalarie and Ladino clover) extracted more phosphorus from rock phosphate grasses (orchard grass, bromegrass, perennial ryegrass, milet and oats.)

Crops with a low capacity to absorb the relatively insoluale calcium phosphates should benefit if they follow a crop with a high capacity. Planting pasture mixtures that combine these two types of crops may make it possible for the species with a low capacity to absorb these phosphates.

At the Massachusetts agricultural experiment station it was found that oats grown in association with red clover gained 32 per cent in yield and 62 per cent in total phosphorus uptake compared to oats alone.

GEORGE BERGGREN, agronomy specialist at Penn State, points out that fineness of rock phosphate is very important. The material is relatively insoluable and therfore should be capable of pasing through a 200 mesh screen.

Berggren also pointed out the danger of using rock phosphate on cash crops such as corn where yields must be kept high. While the phosphorus content of the soil wil be high, most will be unavailable to the plant.

Therefore a normal, or near normal, application of superphosphate should be made. Another reason for the application of superphosphate at planting time is the way the plant uses phosphorus.

ABOUT HALF the total phosphorus used in the plant is absorbed when only 20 per cent of the total growth has occurred. The smaller root system during the period of early growth and competition for available phosphorus by micro-organisms explain the need for large supplies of available phosphorus in the early stages of growth.

Mentioned earlier was the fact that Penn State research found that rock phosphate was too expensive to use. Dr. Merkle and his asociates believed that rock phosphate could be purchased economically when the price of one ton of 20 per cent superphosphate was equal to that of two tons of rock phosphate

THE PRICE FOR 20 per cent superphosphate this week was quoted at $33.50 a ton in bulk, delivered and spread. The price for the rock form was $24.50, delivered and spread. This gives a ratio of about 1 4 to one, somewhat less than the two to one ratio recommended.

More recent ersearch, especially in Illinois and Missouri, has found that the returns are somewhat greater on rock that was believed formerly. Therefore the price spread may closer as far as value is concerned.

Rock phosphate is a long term investment, just about the same as ground limestone.

About three per cent of the phosphorus will be available each year, or about 60 pounds per ton.