

## Phosphorus Fertilizer Use

Phosphorus can be supplied by a number of sources in fertilizers, biosolids, or as an integral by-product of other soil amendments, natural organic fertilizers, or bio-stimulants.

### Rock Phosphate

Rock phosphate can be used as a P fertilizer on soils with a pH of 6 or less. It is not soluble in water. The mineralization of P is a slow process, typically over a period of years depending on soil properties. If used, it should be finely ground and incorporated into the soil. If a soil test indicates a severe deficiency, others sources may be best for the short term. However, rock phosphate could be used as a long term source.

### Single and Triple Superphosphates

Single superphosphate (SSP) has 16 to 22%  $P_2O_5$  (7 to 9.5%P). The fertilizer is 90% water soluble and is all plant available P. SSP also contains 12% sulfur (S).

Triple superphosphate has 44 to 52%  $P_2O_5$  (17 to 23%P). The fertilizer has a very high water soluble fraction. It is only available in granular form.

### Ammonium Phosphates

Studies suggest that there is increased plant uptake of the P in ammonium phosphate fertilizers due to the presence of ammonium ( $NH_4^+$ ). Monoammonium phosphate (MAP) and diammonium phosphate (DAP) are water-soluble. MAP and DAP are granular products (REF).

Monoammonium, diammonium, and ammonium polyphosphate are typically used for foliar P applications.

### Biosolids

Another source of P comes from the use of biosolids as an organic fertilizer. Milorganite is a popular example containing 6% nitrogen and 4 %  $P_2O_5$ . Release of the N and P fractions is by microbial mineralization.

### Other P Sources

Phosphorus may be an integral by-product of other soil amendments, natural organic fertilizers, and bio-stimulants. The most notable additions come from the use of composts as soil amendments or nitrogen sources and the use of recycled water.

- Manure & Composts: Fertilizers that are produced as by-products of the livestock or poultry industry can be classified as composts or manure. Phosphorus in these products exceeds the 0.67% limit stated in the Dishwater Detergent and Nutrient Runoff law, but have been exempted. Manure and composts are often used to improve soil structure or as sources of nitrogen fertilization. Applying dairy composts incorporated into the top 6 inches of soil at rates of 600 to

1,200 lbs per 1,000 sq ft introduces 5 to 10 lbs P per 1,000 sq ft. Dairy compost, at approximately the same rates, introduces 4 to 8 lbs P per 1,000 sq ft. The use of compost as a soil amendment has been shown to greatly increase the stratification of P in the upper soil profile and the risks of runoff contamination.

- Recycled Water: Recycled water used for irrigation has been reported to contain a range of 3 to 10 mg/L of inorganic  $\text{PO}_4\text{-P}$  and 10 to 15 mg/L of  $\text{NO}_3\text{-N}$  and  $\text{NH}_4\text{-N}$  each. The nutrients can be used for plant growth.