PHOSPHORUS MANAGEMENT

? FIXATION

SOILS CONTAIN 1000 - 2000 lb P/acre, BUT MOST OF THIS IS “FIXED”:

THE FIXATION MECHANISM IS A CHEMICAL COMPLEXING BY IRON AND ALUMINUM AT LOW pH AND CALCIUM AT HIGH pH. THE COMPOUNDS FORMED ARE VERY INSOLUBLE IN WATER

MUCH OF ADDED PHOSPHORUS IS ALSO FIXED, HOWEVER THERE IS SOME RELEASE THAT OCCURS. REMEMBER THE BUFFERING FACTOR OF 18:1

AVAILABLE P IN A SOIL IS IN AN ANIONIC FORM (NEGATIVELY CHARGED), BUT DOES NOT LEACH BECAUSE OF THIS FIXATION

RECENT RESEARCH HAS SHOWN SOME MOVEMENT OF P IN SOILS, POSSIBLY AS ORGANIC FORMS

? FUNCTION IN PLANTS

P IS AN IMPORTANT COMPONENT OF GENETIC MATERIAL IN CELLS. IT ALSO IS IMPORTANT FOR ENERGY TRANSFER FOR PROCESSES LIKE ACTIVE NUTRIENT UPTAKE

IT IS A MOBILE NUTRIENT WITH DEFICIENCIES OBSERVED AS A DARKENING OR PURPLING OF THE LOWER LEAVES

YOUNG CROPS GROWING ON COLD WET SOILS MAY SHOW P DEFICIENCY IF NOT FERTILIZED BECAUSE OF THE SLOW MINERALIZATION FROM ORGANIC MATTER

? PHOSPHORUS FERTILIZATION

PHOSPHATE FERTILIZER ORE IS MINED FROM SHALLOW MARINE DEPOSITS IN FLORIDA AND NORTH CAROLINA IN THE US

IF THE ORE IS TREATED WITH SULFURIC ACID, OSP IS MADE
IF THE ORE IS TREATED WITH PHOSPHORIC ACID, TSP IS MADE

DAP AND MAP ARE MADE BY BUBBLING AMMONIA THROUGH THE PHOSPHORIC ACID

AMMONIUM POLY PHOSPHATES MADE BY HEATING PHOSPHORIC ACID (DRIVING OFF WATER) AND BUBBLING AMMONIA THROUGH THE MIX

COMMON SOURCES OF P FERTILIZER (TABLE 9.4)

<table>
<thead>
<tr>
<th>FERTILIZER</th>
<th>TYPICAL ANALYSIS</th>
</tr>
</thead>
<tbody>
<tr>
<td>TRIPLE SUPER PHOSPHATE (TSP)</td>
<td>0-46-0</td>
</tr>
<tr>
<td>DI-AMMONIUM PHOSPHATE (DAP)</td>
<td>18-46-0</td>
</tr>
<tr>
<td>MONOAMMONIUM PHOSPHATE (MAP)</td>
<td>11-48-0</td>
</tr>
<tr>
<td>ORDINARY SUPERPHOSPHATE (OSP)</td>
<td>0-20-0</td>
</tr>
<tr>
<td>AMMONIUM POLY PHOSPHATE (APP)</td>
<td>10-34-0</td>
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</tbody>
</table>

WATER SOLUBILITY IS SOMETIMES SUGGESTED AS A CONCERN. TSP AND OSP ARE NOT 100% SOLUBLE IN WATER, BUT DO DISSOLVE ADEQUATELY IN THE SOIL SOLUTION

? PLACEMENT

BANDING: BECAUSE OF FIXATION, BANDING OF FERTILIZER IS OFTEN SHOWN TO HAVE AN ADVANTAGE BECAUSE OF MINIMAL SOIL CONTACT

STARTER FERTILIZER IS A ROW-PLACED BAND. TYPICALLY PLACEMENT IS “2 x 2”. TWO INCHES TO THE SIDE AND TWO INCHES BELOW THE SEED

SEED-PLACED FERTILIZER (POP-UP) IS CURRENTLY POPULAR. RATE IS LIMITED BECAUSE OF SALT INJURY (10 lb N+K₂O/a LIMIT)
PURDUE RESEARCH IN THE 70's SUPPORTED SURFACE BANDING. SIMILAR STUDIES IN WISCONSIN WERE NOT ABLE TO REPEAT THOSE RESULTS

BROADCAST: UNIFORM APPLICATION OVER THE SURFACE WHICH IS USUALLY INCORPORATED BY TILLAGE (PLOWDOWN)

GREATER POTENTIAL FOR FIXATION, BUT NECESSARY TO UNIFORMLY RAISE SOIL TEST

TOPDRESSING: BROADCAST APPLICATION OVER A GROWING CROP SUCH AS ALFALFA.

ONLY WAY TO APPLY ESSENTIAL NUTRIENTS TO A GROWING CROP OF ALFALFA

? TIMING

BECAUSE SIGNIFICANT P LEACHING IS RARE, LOSS IS MINIMAL UNLESS SOIL ERODES.

ADD INCREMENTS OF FERTILIZER WHERE THERE IS A LARGE RECOMMENDATION. MIXED BY TILLAGE AND MINIMAL FIXATION

“FRESH” P FERTILIZER BETTER BECAUSE OF LOWER FIXATION

INCORPORATE TO BUILD SOIL TEST, ESPECIALLY BEFORE ADOPTING NO-TILL