

Managing Nutrient Needs in Agriculture

Soil Charge Demonstration

Which ions will stay in the soil?

One of the greatest expenses for a farmer is the agronomy expense, testing soil for fertility. Fertilizers and pesticides need to stay in the soil to increase crop yield. Solid soil particles behave as ion exchange sites because they have charged surfaces. These charged surfaces can attract molecules with the opposite charge. If the charge is not adequate for nutrient holding, these nutrients will be lost to leaching and the crop yield is decreased.

Materials

6 volt battery
copper bands
alligator clips
clay-water slurry (clay & distilled water)
small beaker

Procedure

1. Cut 2 lengths of copper bands about 8 inches long.
2. Using the alligator clips, attach one copper band to the positive pole of the battery and attach the second copper band to the negative pole. Be sure that the insulation of the alligator clips is not in the slurry.
3. Place the other ends of the bands in a small beaker filled to the top with clay that has been mixed with distilled water to the consistency of glue. Make sure that you are using the stickiest clay you can find or purchase.
4. After 10 minutes check to see whether the clay particles have moved to the wire attached to the positive or negative pole. Remember that unlike charges are attracted to one another. (Organic matter has the same charge as clay).

These ions are commonly added from limestone, fertilizers or acid rain to soils.

H^+	Cl^-
NH_4^+	Ca^{+2}
NO_3^-	Mg^{+2}
K^+	SO_4^{-2}
AL^{+3}	Mn^{+2}

Which nutrient ions listed above will attach to charged sites (exchange sites) on the soil particles?

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