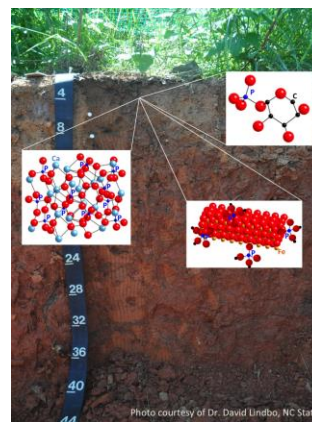


ENHANCING CROP NUTRIENT AVAILABILITY

POLYMER-PROMOTED SOIL PHOSPHATE UPTAKE

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Meeting worldwide food demands of a growing population is a global challenge. One way to increase food production while conserving natural resources is to enhance the plant availability of soil-applied nutrients. Of the three major crop nutrients applied to soils (nitrogen, phosphate, and potassium), phosphate is the most strongly bound to soil particles. Consequently, most of the phosphate in applied fertilizers is not readily available to the intended crop, resulting in a costly loss of nutrient use efficiency.

Various cost-effective additives to fertilizer systems have been developed to decrease the loss of precious nutrients and enhance their uptake by crops. One such product is a polycarboxylic acid polymer that is designed to increase the plant availability of phosphate. However, the effectiveness of this polymer varies across soils with different chemical and mineralogical properties. Because the mode of action of polycarboxylic acid is poorly understood, the degree of enhanced phosphate availability for a given soil is unpredictable.

Our goal is to use molecular-level chemical insights to increase the effectiveness of polycarboxylic acids as a phosphate fertilizer enhancer across a wide range of soils. Our research couples laboratory binding experiments and advanced spectroscopic analyses of minerals and soils to determine how polycarboxylic acid and phosphate interact. We seek an undergraduate researcher to conduct greenhouse and laboratory experiments to directly measure the effectiveness of the polycarboxylic acid on soils having different properties. The research will help bridge ongoing mechanistic research to more efficient and cost effective field applications of this fertilizer enhancer in food production.