

Polyhalite Alters the Uptake and Partitioning of Mineral Nutrients in Maize

Scott Foxhoven, University of Illinois-Urbana-Champaign, Champaign, IL and Frederick E. Below, Department of Crop Sciences, University of Illinois-Urbana-Champaign, Urbana, IL
Swf2@illinois.edu

ABSTRACT

Modern maize (*Zea mays* L.) hybrids coupled with advanced agronomic practices have led to an increased yield potential on many US corn acres. To realize these higher yields demands a better understanding of crop nutrition. The objective of this study was to document the pattern of uptake, partitioning, and remobilization of nutrients released after potassium fertilization, specifically muriate of potash (MOP; 0-0-60) and/or polyhalite fertilizers (0-0-14-6Mg-17Ca-19S). Polyhalite is a multi-nutrient fertilizer that supplies not only potassium, but also calcium, magnesium, and sulfur in the same granule. Muriate of potash supplies only potassium, which can lead to a luxury consumption of K and competition with Ca and Mg for plant uptake. Field studies were conducted in 2017 and 2018 comparing pre-plant applications of 75 lbs ac⁻¹ of K₂O as MOP, 75 lbs ac⁻¹ of K₂O as polyhalite, and 75 lbs ac⁻¹ of K₂O as a 25/75 blend of MOP/polyhalite to an untreated control. At the V6, V10, V14, R2, R4, & R6 growth stages, plants were sampled and separated into four fractions for nutrient determination, with grain yield also measured at physiological maturity. Season-long plant accumulations of potassium, calcium, magnesium, and sulfur were greater in response to all treatments containing polyhalite. The greatest accumulations of plant biomass and grain yield resulted from supplying the blend of MOP/polyhalite, suggesting a synergistic effect of the two sources. The untreated control yielded 253 bu ac⁻¹. Fertilization with polyhalite led to 3 bu ac⁻¹ greater yield than with MOP, and using the blend of MOP/polyhalite resulted in the greatest yield of 264 bu ac⁻¹, 13 bu ac⁻¹ more than MOP. Nutrient uptake curves generated from this experiment indicate a physiological benefit to supplying calcium and magnesium when fertilizing maize with potassium. Polyhalite may have the unique elemental composition necessary to maximize potassium fertilizer-based yield responses.