

A NOVEL WATER CONDITIONER FOR USE WITH GLYPHOSATE. Mark L. Bernards, Richard K. Zollinger, Bryan G. Young, R. Scott Tann, and Howard Stridde, Assistant Professor, Department of Agronomy and Horticulture, University of Nebraska-Lincoln, Lincoln, NE 68583-0915, Professor, Department of Plant Sciences, North Dakota State University, Fargo, ND 58108, Professor, Department of Plant, Soil, and Agricultural Systems, Southern Illinois University-Carbondale, Carbondale, IL 62901, Business Manager-Agrochemicals Americas and Research Chemist, Huntsman, The Woodlands, TX 77380.

The hard-water cations calcium ( $\text{Ca}^{2+}$ ), magnesium ( $\text{Mg}^{2+}$ ), and iron ( $\text{Fe}^{3+}$ ) reduce glyphosate efficacy by complexing with glyphosate to form salts that are not readily absorbed by plants. The antagonism caused by hard-water cations may be overcome by increasing the glyphosate concentration relative to the cation content, or by adding a water conditioner to the spray solution. Granular ammonium sulfate (AMS) is the product most commonly recommended as a water conditioner because it is highly effective and relatively inexpensive. However, many pesticide applicators choose to use liquid AMS replacement products instead of granular AMS because liquid products are more convenient to load into the tank. Most of these replacement products contain some AMS, but when used at the marketed use rates (0.25-1.0%) do not provide the same level of water conditioning as granular AMS at its recommended use rate (1-2% w/v). The chemical U8784 was identified as a potential water conditioner. The objective of this research was to compare U8784 to AMS for efficacy in overcoming the  $\text{Ca}^{2+}$  antagonism of glyphosate. In an initial screening study, U8784 increased glyphosate activity in 500 mg  $\text{Ca}^{2+}$ /L water similarly to AMS (2% w/v) on sunflower, and increased activity more than AMS on wheat. Formulating U8784 with a surfactant further enhanced glyphosate's activity on wheat, but reduced activity on sunflower. In a second study, U8784 overcame a 1000 mg  $\text{Ca}^{2+}$ /L water antagonism on sunflower and wheat, but not on green foxtail. Dose response studies were conducted to compare the rate of U8784 to rate of AMS. The formulation of U8784 had a low concentration of the active molecule, hence, use rates ranged from 0 to 32% (v/v). AMS rates ranged from 0 to 2% (w/v). Glyphosate activity increased on sunflower, velvetleaf and green foxtail in 1000 mg  $\text{Ca}^{2+}$ /L water as U8784 and AMS rates increased, and the curves were similar for both products. We believe that U8784 has the potential to be developed as a novel water conditioner for glyphosate.