ACIDIC AMS REPLACEMENT ADJUVANTS: PART II. Rich Zollinger*; North Dakota State University, Fargo, ND (215)

ABSTRACT

Studies were conducted in 2009 through 2011 in North Dakota, Nebraska, Kansas, and Illinois to evaluate phytotoxicity from glyphosate (no adjuvant formulation) applied with commercial acidic ammonium sulfate (AMS) replacement (AAR) adjuvants in distilled water and water with 1000 ppm hardness. Commercial AAR adjuvants were compared to AMS plus nonionic surfactant (NIS). Most AAR adjuvants contain 1-aminomethanamide dihydrogen tetraoxosulfate (AMADS) but the active ingredient is listed on adjuvant labels as monocarbamide dihydrogen sulfate (MCDS) which is a compound of sulfuric acid complexed with urea and will reduce spray water pH to approximately 2.0. The low pH is below the pKa of most herbicides and causes herbicides to have a neutral charge which reduces binding with antagonistic cations in hard water. AMADS at not less than 1% v/v provided similar herbicide enhancement as AMS plus NIS in distilled and hard water. In the absence of hard water, some commercial AAR adjuvants enhanced glyphosate phytotoxicity similar to AMS plus NIS; however, in hard water glyphosate phytotoxicity was less. Generally, the rate of 1% v/v was required for commercial AAR adjuvants to equal the same herbicide enhancement as AMS plus NIS. The AMADS concentration in commercial AAR adjuvants may be diluted with other ingredients in the formulations. Lowering spray solution pH did not increase glyphosate activity in hard water. Sulfate in AMS and AMADS can condition hard water which may then allow the ammonium to enhance herbicide activity. AMADS applied at no less than 1% v/v or AMADS contained in some commercial AAR adjuvants provide the minimum water conditioning from $SO_4^=$ similar to AMS. Hard water that is sufficiently conditioned with $SO_4^=$ may allow urea in AMADS to enhance and optimize herbicide phytotoxicity similar to AMS.