UTILIZATION OF SEQUENTIAL HERBICIDE APPLICATIONS AND HERBICIDE TANKMIX COMPONENTS TO IMPROVE GLYPHOSATE EFFICACY. Lisa M. Behnken*, Ryan P. Miller, Fritz R. Breitenbach, and Jeffery L. Gunsolus, Extension Professor, University of Minnesota, Rochester Regional Center, Rochester, MN 55904-4915, Assistant Extension Professor, University of Minnesota, Rochester Regional Center, Rochester, MN 55904-4915, Extension Professor, University of Minnesota, Rochester Regional Center, Rochester, MN 55904-4915, Associate Extension Professor, University of Minnesota, Rochester Regional Center, Rochester, MN 55904-4915, and Professor, Department of Agronomy and Plant Genetics, University of Minnesota, St. Paul, MN 55108-6026.

Field research was conducted at Rochester, MN in 2007, 2008 and 2009 to determine which tank mix components and sequential applications improved glyphosate efficacy. A randomized complete block design with four replications was used. Soybean variety 'Dairyland DSR 199' was planted on May 17, 2007, soybean variety 'Dairyland DSR 1302' was planted on May 23, 2008 and soybean variety 'Asgrow 2108' was planted on May 19, 2009. Soybeans were planted at 3.8 cm deep in 76 cm rows at a rate of 370,500 seeds ha^{-1}. All herbicide applications were made with a tractor-mounted sprayer delivering 187 l ha^{-1} at 221 kpa using 11002 flat fan nozzles. Treatments were made according to label instructions and adequate rainfall was received after each treatment date. A reduced rate of 420 g ae glyphosate ha^{-1} was used to better determine the effect of corresponding tank mix and sequential treatments.

In 2007 preemergence treatments included: flumioxazin + cloransulam-methyl at 89 + 29.4 g ai ha^{-1} (Gangster); flumioxazin at 89 g ai ha^{-1} (Valor); sulfentrazone + cloransulam-methyl at 130 + 16.6 g ai ha^{-1} (Sonic); s-metolachlor + fomesafen at 1065 + 233 g ai ha^{-1} (Prefix), and sulfentrazone + metribuzin at 126 + 189 g ai ha^{-1} (Authority MTZ). In 2008, several preemergence treatments were added: sulfentrazone + imazethapyr at 346.6 + 70.4 g ai ha^{-1} (Authority Assist), and chlorimuron-ethyl + flumioxazin + thifensulfuron-methyl at 5.6, 71, and 17.25 g ai ha^{-1} (Enlite). Pendimethalin at 1600 g ai ha^{-1} (Prowl H_2O) was applied preplant incorporated.

Postemergence treatments were 420 g ae glyphosate ha^{-1} alone or tank mixed with one of the following components: fomesafen at 197 g ai ha^{-1} (Flexstar); lactofen at 105 g ai ha^{-1} (Cobra); flumiclorac-pentyl-ester at 30 g ai ha^{-1} (Resource); cloransulam-methyl at 19.4 g ai ha^{-1} (FirstRate); chlorimuron-ethyl at 4.37 g ai ha^{-1} (Classic); chlorimuron-ethyl at 6.63 g ai ha^{-1} (Classic); chlorimuron-ethyl + thifensulfuron-methyl at 5.7 + 1.8 g ai ha^{-1} (Synchrony XP), thifensulfuron-methyl at 17.4 g ai ha^{-1} (Harmony GT), imazethapyr at 70 g ai ha^{-1} (Pursuit). In 2008, fluthiacet-methyl at 3.2 g ai ha^{-1} (Cadet) was added as a tank mix treatment.

In 2009, preemergence treatment modifications included: saflufenacil + imazethapyr at 25 + 70 g ai ha^{-1} (Optill), sulfentrazone + cloransulam-methyl at 195 & 25 g ai ha^{-1} (Sonic), s-metolachlor + fomesafen at 1218 + 267 g ai ha^{-1} (Prefix), and s-metolachlor + metribuzin at 1326 + 316 g ai ha^{-1} (Boundary). Modifications to postemergence treatments were 420 g ae glyphosate ha^{-1} tank mixed with the following: fomesafen at 197 g ai ha^{-1} (Flexstar) + thifensulfron-methyl at 4.38 g ai ha^{-1} (Harmony GT), chlorimuron-ethyl at 5.8 g ai ha^{-1} (Classic), thifensulfron-methyl at 4.38 g ai ha^{-1} (Harmony GT), pendimethalin at 1600 g ai ha^{-1} (Prowl H_2O) applied preplant incorporated followed by postemergence application of glyphosate + fomesafen at 197 g ai ha^{-1}. All preemergence treatments were followed by a postemergence treatment of glyphosate.

Weeds were visually rated for percent control, soybean was evaluated for injury and plots were machine harvested with yields calculated and adjusted to 13.0% moisture. Sequential treatments that included a preemergence application tended to have greater grain yields and better weed control than glyphosate with the various tank mix treatments. In 2009, all of the tank mix partners caused soybean injury with several resulting in substantial injury to soybean, 13-54%.

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