ANALYSIS OF HERBICIDE INTERACTIONS USING FLUORESCENCE MEASUREMENTS. Rachel K. Bethke, Donald Penner, William T. Molin. Department of Crop and Soil Sciences, Michigan State University, East Lansing, MI, USDA-ARS, Stoneville, MS.

Tank-mixing of herbicides with different chemistries provides the opportunity to control herbicide resistant weeds. Specifically, the opportunity may exist to control glyphosate and sulfonylurea resistant weeds with glufosinate. The combination of glyphosate or glufosinate and chlorimuron and of glyphosate and glufosinate in a tank mix has the potential to cause unexpected interactions. Interactions between glyphosate, glufosinate and chlorimuron have been observed in the greenhouse and the field. The objective of this study was to evaluate the combinations of glyphosate, glufosinate and chlorimuron on three annual weeds; giant foxtail, common lambsquarters, velvetleaf and the perennial weed, Canada thistle using fluorescence. Fast acting herbicides like glufosinate cause rapid inhibition of photosynthesis which is observable through fluorescence measurements before injury may be visible. When applied alone or in combination with these herbicides, glufosinate caused a rapid decrease in Fm, Fv and Fv/Fm, due to the rapid quenching of chlorophyll fluorescence. Changes in the maximum capacity for photochemical quenching (Fv) are observable within 4 HAT when glufosinate is applied alone or in combination, indicative of the rapid breakdown of the plants protective non-photochemical photosynthetic systems. With glyphosate alone and in combination with chlorimuron, changes in Fv are observable within 24 HAT whereas chlorimuron alone shows no observable changes until 72 HAT. The fast action of glufosinate on the photosynthetic system may limit translocation and expression of the activity of glyphosate and chlorimuron and results indicate that the combinations of glufosinate with glyphosate and chlorimuron may be antagonistic.

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