

Checkoff-Funded Project: Glyphosate resistant waterhemp control through cost effective combinations of pre-emergent and early post-emergent residual herbicide applications in soybean.

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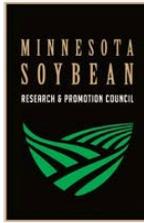
Soybean growers continue to look for ways to decrease input costs. Herbicide resistant weeds continue to affect yield, while new resistant biotypes continue to evolve due to limited post-emergent herbicide options.

Continued grower investment in “new” soybean herbicide tolerance genetics, which require increased technology fees per unit of soybean, are potentially unnecessary if conventional herbicides are able to economically compete. Modern soybean genetics, such as glyphosate (i.e. Roundup), dicamba (i.e. Xtendimax), glufosinate (i.e. Liberty), 2, 4-D, and HPPD (i.e. Callisto) tolerant soybeans, provide herbicide tolerance to increase post-emergence weed control options.

However, misapplication and overuse of post-emergent herbicides has led to selection pressure in waterhemp populations. Soil applied residuals are effective as the herbicide is absorbed into the weed at the most vulnerable stage of growth, emergence. Soil applied residual herbicide programs can be cost effective while providing effective waterhemp control. Increased soil residual herbicide use will decrease selection pressure in waterhemp, and likely other troublesome weeds such as giant and common ragweed or palmer amaranth.

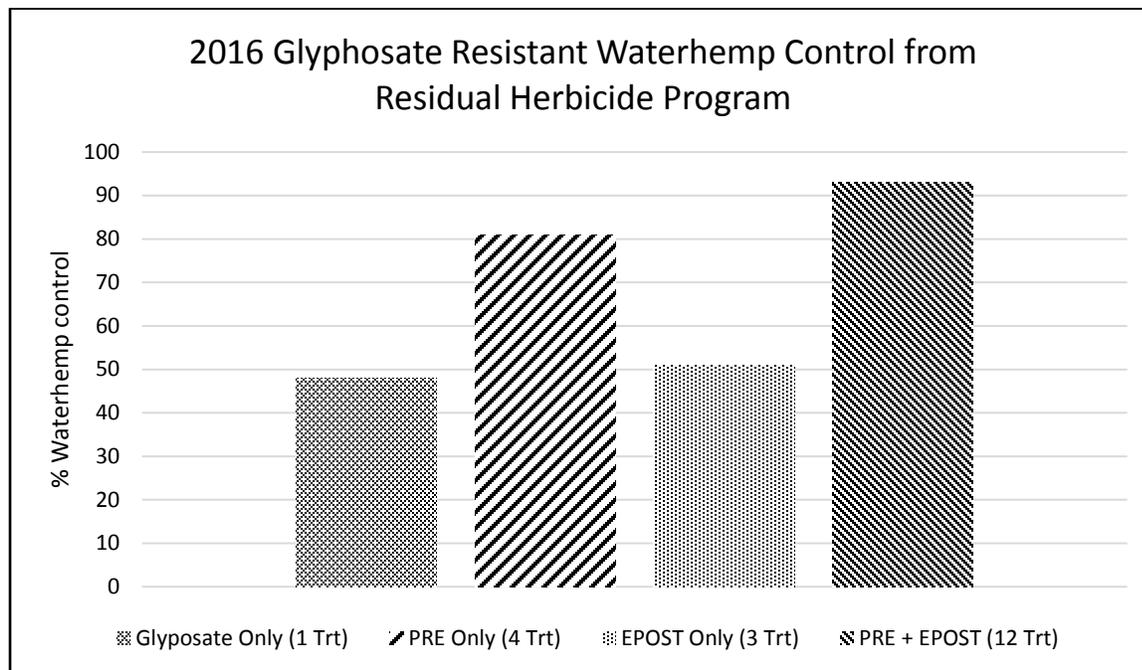
Objectives are to evaluate combinations of soil residual herbicides, target economical treatments that compete with current recommended herbicide programs, and exceed 90% glyphosate resistant waterhemp control 90 days after treatment (DAT) – or late August – in glyphosate tolerant soybeans.

Glyphosate resistant waterhemp populations are common across Minnesota crop production regions. Eighty percent of Minnesota sugarbeet growers representing 13 counties reported waterhemp as the most troublesome weed in a 2015 survey (Lueck et al. 2015). Only seven percent of growers indicated excellent control from glyphosate. Redwood and Renville counties, where the research will be conducted, ranked 2nd and 3rd in soybean production in 2016 and were inclusive of the 13 counties represented in the survey.

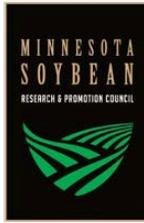


Herbicide resistant waterhemp populations are difficult to control. Known glyphosate resistant bio-types in the Redwood and Renville county areas continue to prevail through post-emergence herbicide programs. A single active ingredient residual application followed by a single glyphosate post-emergence program did not provide adequate waterhemp control on glyphosate resistant populations (Lueck and Peters 2016). Lueck and Peters (2016) conducted a study that determined a pre-emergence residual followed by a second, first trifoliate timing, residual herbicide program in combination with glyphosate provided at least 85 and up to 98% waterhemp control 90 DAT.

However, the input cost (~\$90/A) related to the combination that provided 98% waterhemp control 90 DAT was not economical. The input cost (~\$30/A) related to the combination that provided 85% waterhemp control 90 DAT was more economical than most recommended multiple post-emergence programs.



When incorporating 3 different residual herbicide active ingredients, approximately 520 different combinations exist. Growers have been faced with low commodity prices lately, so economical applications will provide the greatest value added to the grower. Based on research done by Lueck and Peters (2016) 90% waterhemp control 90 DAT is attainable while maintaining a competitive cost per acre value and reduces selection pressure on rapidly adaptive weed populations, specifically waterhemp. Other rapidly adaptive weed populations



include common ragweed, giant ragweed and palmer amaranth, which has already been positively identified in 2016 by university extension agents in Yellow Medicine County, Minn., although eradicated. Waterhemp and Palmer amaranth belong to the same biological family, and similar herbicide programs may be considered to control both species.