

WEEDS

Herbicide Adjuvant Information

Chris Boerboom, Ext. Weed Scientist

Have you ever heard an adjuvant name, but didn't know if it was a surfactant or a crop oil or exactly what? If so, the 8th Edition of the Compendium of Herbicide Adjuvants is a great reference to answer this and many other adjuvant questions. This compendium contains 523 entries from 39 companies and has been compiled by Bryan Young at Southern Illinois University. The products are organized by type of adjuvant such as nonionic surfactants, crop oil concentrates, buffering agents, nitrogen sources, etc. Product name, principal functioning agent (when provided), use rate, comments in some instances, and manufacturer and/or distributor are provided.

There are two ways to get the compendium. It is available on-line at <http://www.herbicide-adjuvants.com> and this web site allows convenient searching and sorting through the adjuvants by product name, by category, by manufacturer, or through the crop-based adjuvant products. It also contains a glossary.

If you want a conveniently-sized, booklet version, you can clip out the form below and mail to:

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Please send me _____ copy(s) of
Compendium of Herbicide Adjuvants, 8th Edition.
Enclosed is full payment of \$ _____ (\$3.00 per copy)
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Can Proactive Herbicide Resistance Management Pay?

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Additional cases of glyphosate-resistant weeds in the Midwest should have Wisconsin growers thinking about management options to delay or prevent resistance. However, most growers probably think the options will cost more money compared to using low cost glyphosate in Roundup Ready crops. They might be right. But on the other hand, a glyphosate-resistant weed might be expensive to control in the future too. So in regards to resistance management, the question is: **Is it more profitable to pay now or to pay later?**

Another way to consider this question is to ask if a grower wants to wait until a resistant weed problem develops and react at that time by adding another herbicide or switching to a different herbicide. Reactive management is like "using a tool until it breaks, then finding a new tool". It is reasonable to assume that the cost of weed control will increase after resistance develops because an additional herbicide will be needed or weed control may not be as good. In addition, yield losses may occur during the year or two when glyphosate fails to control the weed and other herbicide options are applied too late to achieve adequate control.

Alternatively, a grower could be proactive and use options to delay resistance. This would be like "using a tool carefully so it doesn't break". Proactive management likely increases the current cost of management if the tactics used to delay resistance include herbicide tank mixtures or preemergence herbicides. Even herbicide rotations may increase short-term costs depending on the herbicide programs used. However, this increased short-term cost comes with the benefit of lower costs in the long run because resistance does not develop.

The economic choice between these two strategies depends on the number of years that it takes for resistance to develop, the cost of the options, the cost of controlling the resistant weed after it develops, and the interest rate. With this information, the most profitable choice can be calculated. Reactive management is most profitable if resistance is not likely to occur for a long time into the future. However, investing in proactive management makes sense if the cost of controlling a herbicide resistant weed is high.

Examples of these economic choices are summarized in the following table based on a paper by Mueller and others (2005). Consider these examples.

1. If it costs \$10/a for a more expensive herbicide rotation to be proactive and it only costs an extra \$2.50/a to add a tank mix partner to control a glyphosate-resistant weed, proactive management would never pay.
2. If the proactive option only costs an extra \$2/a and the extra cost to control the glyphosate-resistant weed is only \$2.50/a, the resistance would have to happen very soon (within 3 years) for the proactive management to pay.
3. If the proactive option only costs an extra \$2/a, but the extra cost to control the glyphosate-resistant weed is very expensive (\$20/a), the extra \$2/a would be money well spent even if the glyphosate-resistant weed didn't develop for 29 years.

Proactive management pays if resistance occurs before the number of years listed in the table.

Additional annual cost to control the glyphosate-resistant weed	Additional annual cost for proactive management				
	\$2/a	\$4/a	\$6/a	\$8/a	\$10/a
\$2.50/a	3 yr	-	-	-	-
\$5/a	11 yr	3 yr	-	-	-
\$10/a	20 yr	11 yr	6 yr	3 yr	-
\$20/a	29 yr	20 yr	15 yr	11 yr	9 yr

This example assumes a discount rate of 8%.

This suggests that weeds that are currently difficult or expensive to control without glyphosate, such as waterhemp, giant ragweed, and perhaps common lambsquarters, may be the best targets for proactive management.

Perhaps a more realistic way to consider these options and costs is to use an example with glyphosate-resistant waterhemp. In the next table, we outlined weed management programs with four levels of resistance management that ranged from none to quite high. These examples suggest that glyphosate-resistant waterhemp may be one of those weeds that could be very expensive to control. Plus, we think it suggests that there are cost effective, proactive options that can be used such as using preemergence herbicides or rotating glyphosate with other herbicide modes of action. (Note that no additional costs are included to control volunteer RR corn in the soybeans if required.)

Cost of weed management programs considering potential glyphosate-resistant waterhemp.

	Cost/a
<i>Low cost program that has high risks for selecting glyphosate-resistant weeds and high risk of yield loss because of poorly timed applications; not recommended</i>	
RR corn/glyphosate/application	\$20
RR soybean/glyphosate/application	\$12
Average across rotation	\$16
<i>Program that reduces risks of resistance and yield loss by adding a pre herbicide in corn</i>	
RR corn/Harness/glyphosate/2 applications	\$42
RR soybean/glyphosate/application	\$12
Average across rotation	\$27
<i>Program that further reduces risk of resistance by rotating herbicide modes of action in the corn year</i>	
Conv. corn/Lumax/application	\$45
RR soybean/glyphosate/application	\$12
Average across rotation	\$28.50
<i>Program with the most proactive management; herbicide rotation plus a pre herbicide before glyphosate in soybean</i>	
Conv. corn/Lumax/application	\$45
RR soybean/Valor/glyphosate/2 applications	\$29
Average across rotation	\$37
<i>Program that may be required to control glyphosate-resistant waterhemp in Roundup Ready crops</i>	
RR corn/Harness/glyphosate+Clarity/2 applications	\$52
RR soybean/Valor/glyphosate+Cobra/2 applications	\$37
Average across rotation	\$44.50

Prices assumed. The herbicides and prices are just used as an example. You can adjust the prices and herbicides based on your situation to make more accurate comparisons.

Roundup Ready corn (extra \$20/bag)	\$8/a
Roundup Ready soybean (used in all examples)	\$0/a
custom application	\$7/a
preemergence Valor at 2 oz/a	\$10/a
preemergence Harness at 1.5 pt/a	\$15/a
preemergence Lumax at 3 qt/a	\$38/a
postemergence glyphosate at 32 oz/a	\$5/a
postemergence Clarity at 1 pt/a	\$10/a
postemergence Cobra at 8 oz/a	\$8/a

Source: Mueller, T. C., P. D. Mitchell, B. G. Young, and A. S. Culpepper. 2005. Proactive versus reactive management of glyphosate-resistant or -tolerant weeds. Weed Technol. 19:924-933.