

## COMBINED TWO YEAR SUMMARY OF WATERHEMP CONTROL FROM CONVENTIONAL VARIABLE RATE TANK MIX COMBINATIONS OF SOIL RESIDUAL HERBICIDES

Andrew Lueck<sup>1</sup>

<sup>1</sup>Research Lead and Owner, Next Gen AG LLC: Independent Agricultural Contract Research

**FOCUS** of this conventional variable rate tank mix (CVRTM) study was to determine a “one program for all genetics” approach in addition to increasing modes of action applied to the soil to kill waterhemp at the most vulnerable biological state, emergence, and reduce the likelihood of new resistance development. For example, if theoretical odds are 1/1,000,000 (1 million) that waterhemp develops resistance to 1 MOA then the odds, in theory, it develops resistance to 3 or 4 or 5 MOA simultaneously are 1/1,000,000,000,000,000,000 (1 quintillion), 1/1,000,000,000,000,000,000,000,000 (1 septillion), and 1/1,000,000,000,000,000,000,000,000,000 (1 nonillion), respectfully, which is significant in combating weed resistance.

**ENVIRONMENTAL** impact of rainfall of greater than 0.40 inches within 30 days of pre-emergent (PRE) application is required for effective (>85% waterhemp control) activation of most soil residual herbicides. A single rainfall event of 1.0 inches is likely to achieve that goal. A single, effective rainfall event can increase residual herbicide activity on small emerged or emerging waterhemp.

**ONE-PASS V. TWO-PASS** systems suggest one-pass PRE only treatments were 3.2% more, 6.4% more, 1.5% less, and 2.8% less effective on waterhemp at A+14, A+28, A+42, and A+56 evaluation timings, respectfully, compared to the two-pass system of same products, same rates. Control during delayed rain events in the PRE only treatments was better when Flexstar was included in the tank mix.

**PRE-EMERGENCE** data suggests growers should consider applying any combination of three of these four residual products and rates onto black soil prior to crop emergence: Zidua SC at 4 fl oz (pyroxasulfone 0.13 lbai/Aequ), Valor SX at 2 oz (Flumioxazin 1.02 lbai/Aequ), Warrant at 40 fl oz (acetachlor 0.94 lbai/Aequ; encapsulated), and Blanket at 8 fl oz (sulfentrazone 0.25 lbai/Aequ). Growers should consider adding Flexstar at 7.5 fl oz (fomesafen 0.11 lbai/Aequ) to the PRE tank mix if sufficient rainfall is not in the 7-day forecast. In severe situations or a large operation with many acres to manage OR if a grower would like try to control waterhemp in a one-pass, PRE only system, data suggests there is evidence that supports applying all five products PRE may achieve 97-100% season long waterhemp control in moderate to light weed pressure situations keeping in mind excessive rainfall or lack thereof from a typical year may impact the level of success.

**EPOST** data suggests growers should apply Flexstar, if focusing on conventional options only, alone at 10-12 fluid ounces per acre with crop oil concentrate adjuvant at 1 pint per acre assuming the PRE program was used as prescribed in the paragraph above. However, if the grower elects to only use two of the four products prescribed in the PRE program, then the grower should consider adding a residual of Zidua or Warrant EPOST tank mixed with Flexstar to achieve 95%+ waterhemp control. Flexstar applied EPOST with tank mix partners of either Zidua SC or Warrant were similar to treatments with Flexstar alone EPOST, however, EPOST applications with both Warrant and Zidua tank mixed with Flexstar were statistically less effective. Growers may also elect to fore-go utilizing Flexstar EPOST and substitute a traited herbicide from their system instead, however, with a strong PRE program comes a more expensive investment up front and the cost of post-emergence traited products plus adjuvants may no longer economically compete. Investing heavily in your PRE program is much more effective in combating resistance compared to relying on POST products to achieve the same outcome.

**CROP SAFETY** of CVRTM PRE combinations will continue to be evaluated, however, at the reduced product rates the program should logically be considered safe in soybean. Crop safety of the most affordable 0.75 rate ratio treatment has the products being applied at 50% (Blanket at 6), 50% (Valor SX at \*1.5), 47% (Warrant at 30), and 47% (Flexstar at 7.5) of max single application rates for a fine textured soil (clay loam) with greater than 3% organic matter (4.5%). One label restriction related to these treatments is that Valor SX can only be applied with Warrant up to 2 ounces per acre, however, a synergistic phenomenon between the two may also be the reason for increased waterhemp control at the reduced rates in these studies.

**IN SUMMARY**, growers could consider applying the residual CVRTM approach PRE as a potential cost and time saving one-time application in years with average early rainfall. However, in years with below average early rainfall the grower must be prepared to utilize a two-pass approach that includes a contact or systemic product. Data suggests the reduced rates of PRE products when combined with more modes of action can achieve 95%+ waterhemp control in moderate to severe infestation environments. Adding a low rate of Flexstar PRE when there is a low chance of 0.5-1.0 inches of rainfall in the 7-day forecast is encouraged. This conventional program is universal across all soybean genetics minimizing tank cleanout events for operations that grow multiple herbicide tolerant soybean genetics. Next Gen Ag LLC is responsible for conducting and summarizing information, but is not liable for any decisions made on the basis of this study or publication.

**Highlights:**

- 1) Applying Conventional Variable Rate Tank Mixes as a single PRE or two-pass is effective.
- 2) PRE only CVRTM control at A+56 ranged from 87-97% and averaged 92%.
- 3) PRE fb Layby CVRTM control at A+56 ranged from 79-98 and averaged 92%.
- 4) Best end of season treatments were a result of ONLY Flexstar POST. Flexstar applied alone POST vs. part of PRE tank mix increased control by 3-5%.
- 5) Treatments are on label, but there are specific guidelines surrounding Valor SX and Warrant tank mixes. This study does not violate those guidelines, but growers should read both product labels to understand the potential risk.
- 6) After 5 years of evaluating these products across 26 different soybean varieties and four seed companies I have witnessed injury once and crop recovered within a week.
- 7) Grower's farming soils higher in sand (>33%) and/or lower in %OM (<4.5%) should consider experimenting on the lower end of tank mix rates.

**Waterhemp Control: Conventional Variable Rate Tank Mixes in Soybean, Renville, MN 2022 & Combined**

Treatment <sup>a</sup>	Rate	Waterhemp Control								App. Code
		A+14 <sup>b</sup>		A+28		A+42		A+56		
		'22	2YR	'22	2YR	'22	2YR	'22	2YR	
	oz/A* or fl oz/A	-----%-----								
		--								
Val + War + Zid + Flx <sup>c</sup>	*1.5 + 30 + 3.25 + 7.5	100	100	99	79	88	83	85	87	A
Val + War + Zid / Flx	*1.5 + 30 + 3.25 / 7.5	98	93	100	86	96	91	96	90	A/B
Val + War / Zid + Flx	*1.5 + 30 / 3.25 + 7.5	98	96	100	85	91	93	90	91	A/B
Val + Zid / War + Flx	*1.5 + 3.25 / 30 + 7.5	94	94	99	76	97	92	97	89	A/B
Val / War + Zid + Flx	*1.5 / 30 + 3.25 + 7.5	95	94	90	60	92	90	92	79	A/B
Val + War + Zid + Flx	*2 + 40 + 4 + 10	100	100	99	94	95	96	95	95	A
Val + War + Zid / Flx	*2 + 40 + 4 / 10	98	99	100	83	99	99	98	98	A/B
Val + War / Zid + Flx	*2 + 40 / 4 + 10	93	96	99	74	91	93	89	91	A/B
Val + Zid / War + Flx	*2 + 4 / 40 + 10	96	95	100	76	94	93	93	94	A/B
Val / War + Zid + Flx	*2 / 40 + 4 + 10	93	96	89	66	90	89	89	89	A/B
Blkt + Val + War + Flx	6 + *1.5 + 30 + 7.5	100	100	99	86	89	93	84	89	A
Blkt + Val + War / Flx	6 + *1.5 + 30 / 7.5	98	99	99	74	95	94	93	93	A/B
Blkt + Val / War + Flx	6 + *1.5 / 30 + 7.5	100	94	93	68	93	89	91	89	A/B
Blkt + Val + War + Flx	8 + *2 + 40 + 10	100	100	100	88	91	92	91	92	A
Blkt + Val + War / Flx	8 + *2 + 40 / 10	100	100	100	91	100	99	99	97	A/B
Blkt + Val / War + Flx	8 + *2 / 40 + 10	99	99	100	85	95	95	95	94	A/B
Blkt + Val + War + Flx	10 + *2 + 48 + 12	100	100	98	80	88	92	93	94	A
Blkt + Val + War / Flx	10 + *2 + 48 / 12	100	100	100	95	99	99	99	98	A/B
Blkt + Val / War + Flx	10 + *2 / 48 + 12	100	100	100	89	98	96	97	94	A/B
Blkt+Val+War+Flx+Zid	8 + *2 + 40 + 10 + 3.25	100	100	100	86	100	99	100	97	A
LSD (0.1) (90% confident)		6	6	6	17	7	7	9	9	

<sup>a</sup>PRE treatment applications contained no additional adjuvants; MSO at 0.5% v/v POST.

<sup>b</sup>A+[number]=Days after "A" application.

<sup>c</sup>Flx=Flexstar; War=Warrant; Val=Valor SX; Blkt=Blanket; Zid= Zidua SC equivalent.

**COST RANK: Trt 1 thru 5=\$\$; 6 thru 10=\$\$\$\$; 11 thru 13=\$; 14 thru 16=\$\$\$; 17 thru 19=\$\$\$\$; 20=\$\$\$\$\$.**