

Economics of Commercial Weed Control Programs in Roundup Ready 2 Xtend Soybean, 2019

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A field trial was conducted in 2019 at the MSU Agronomy Research Farm in E. Lansing to compare weed control, soybean injury, yield, and economic returns of commercial weed control programs that could be used in Roundup Ready 2 Xtend soybean. Each major herbicide company was asked to submit up to four weed control programs based on soil type and weed infestation history. Site characteristics and herbicide application timings are described in Table 1. Table 2 describes the herbicide programs selected by each company for 2019. Of the 23 treatments examined, three were applied at an early POST (EPOS) application time (V2 soybean; 1-2 inch weeds), 18 were PRE followed by POST applications, one was applied only POST (weeds 4 inches tall), and one treatment was the untreated control. Yield loss due to weeds was extremely high. The maximum soybean yield was 58.1 bu/A and the weedy (untreated) yield was 21.6 bu/A, resulting in a yield loss of 36.5 bu/A (63%).

Within 14 days of planting and application of the preemergence herbicides the site received 1.5-inches of rain. This resulted in significant incorporation of the PRE herbicides and 11 treatments exhibited signs of soybean injury 21 DAP, six of these treatments exhibited injury >10% all these treatments contained the active ingredient flumioxazin (Valor) (Table 3). Within the two weeks following this application soybean outgrew most of this injury. The EPOS treatments that contained Pursuit or the active ingredient fomesafen (in Warrant Ultra) also caused some soybean injury. Overall all treatments, except for the untreated control, controlled all weeds >90%.

There was a wide range in herbicide program costs \$29.20 to \$93.21 and soybean yield for the different herbicide programs ranged from 47.4 and 58.9 bu/A (Table 3). Only one herbicide program yielded less than highest yielding treatment. Soybean injury and weed control from this treatment did not explain the lower soybean yield. All but three herbicide programs were amongst the highest economic return. These treatments were on the lower end of soybean yield and were toward the higher end of the program costs, even though one of the more expensive programs were amongst the highest economic returns. Overall several of the treatments that we examined were effective and resulted in high economic returns.

Table 1. Site description.

Crop	Soybean
Variety	P24A80X
Soil Texture	Loam
Soil pH	7.3
Soil Organic Matter	3.5
Dominant Weeds	ANGR, CHEAL, AMBEL ¹ , ABUTH, SINAR
Planting Date	May 14
Application Timings:	
PRE	May 14
EPOS	June 12
POST	June 26
Evaluation Times	Soybean injury –21 d after planting 14, & 28 d after POST Weed control prior to harvest (56 d after POST)

Abbreviations: ANGR = giant foxtail, CHEAL = c. lambsquarters, AMAPO = Powell amaranth, AMBEL = c. ragweed, ABUTH = velvetleaf. ¹ALS-resistant (Group 2).

Table 2. Commercial soybean herbicide programs selected by companies in 2019.

Herbicide programs	Abbreviated Form
EPOS Engenia (12.8 fl oz) + Zidua SC (3 fl oz) + Roundup PowerMax (32 fl oz) + Induce (0.25%)	Engenia + Zidua + RupPM
Warrant Ultra (50 fl oz) + XtendiMax (22 fl oz) + Roundup PowerMax (32 fl oz) + Intact (0.5%)	Warrant Ultra + Xtend + RupPM
Engenia (12.8 fl oz) + Pursuit (3 fl oz) + Zidua SC (3 fl oz) + Roundup PowerMax (32 fl oz) + Induce (0.25%)	Engenia + Pursuit + Zidua + RupPM
PRE/POST Valor XLT (4 oz) fb. XtendiMax (22 fl oz) + Roundup PowerMax (32 fl oz) + Intact (0.5%)	Valor XLT fb. Xtend + RupPM
Authority MTZ (16 oz) fb. XtendiMax (22 fl oz) + Roundup PowerMax (32 fl oz) + Intact (0.5%)	Auth MTZ fb. Xtend + RupPM
Fierce EZ (6 fl oz) fb. XtendiMax (22 fl oz) + Roundup PowerMax (32 fl oz) + Intact (0.5%)	Fierce EZ fb. Xtend + RupPM
Zidua PRO (4.5 fl oz) fb. Engenia (13 fl oz) + Roundup PowerMax (32 fl oz) + Induce (0.3%)	Zidua PRO fb. Engenia + RupPM
Valor (2 oz) + Mauler (6 fl oz) + Prowl H ₂ O (1.5 pt) fb. XtendiMax (22 fl oz) + Roundup PowerMax (32 fl oz) + Intact (0.5%)	Valor + Mauler + Prowl fb. Xtend + RupPM
Fierce MTZ (16 fl oz) fb. XtendiMax (22 fl oz) + Roundup PowerMax (32 fl oz) + Intact (0.5%)	Fierce MTZ fb. Xtend + RupPM
Warrant (3 pt) + Metribuzin (5 oz) fb. XtendiMax (22 fl oz) + Roundup PowerMax (32 fl oz) + Intact (0.5%)	Warrant + Metri fb. Xtend + RupPM
Warrant Ultra (50 fl oz) fb. XtendiMax (22 fl oz) + Roundup PowerMax (32 fl oz) + Intact (0.5%)	Warrant Ultra fb. Xtend + RupPM
Boundary (1.8 pt) fb. Tavium (57 fl oz) + Roundup PowerMax (28 fl oz) + Class Act Ridion (1%) + Intact (0.5%)	Boundary fb. Tavium + RupPM
Prefix (2 pt) fb. Tavium (57 fl oz) + Roundup PowerMax (28 fl oz) + Class Act Ridion (1%) + Intact (0.5%)	Prefix fb. Tavium + RupPM
BroadAxe SC (25 fl oz) fb. Tavium (57 fl oz) + Roundup PM (28 fl oz) + Class Act Ridion (1%) + Intact (0.5%)	BroadAxe fb. Tavium + RupPM
Zidua PRO (6 fl oz) fb. Engenia (12.8 fl oz) + Zidua SC (3 fl oz) + Roundup PM (32 fl oz) + Induce (0.25%)	Zidua PRO fb. + Engenia + Zidua + RupPM
Engenia (12.8 fl oz) + Zidua SC (3 fl oz) + Metribuzin (5 oz) fb. Engenia (12.8 fl oz) + Zidua SC (3 fl oz) + Roundup PowerMax (32 fl oz) + Induce (0.25%)	Eng + Zidua + Metri. fb. Eng + Zidua + RupPM
Engenia (12.8 fl oz) + Pursuit (3 fl oz) + Zidua SC (3 fl oz) fb. Engenia (12.8 fl oz) + Zidua SC (3 fl oz) + Roundup PowerMax (32 fl oz) + Induce (0.25%)	Eng + Pursuit + Zidua fb. Eng + Zidua + RupPM
Authority Supreme (6.5 fl oz) + Metribuzin (6 oz) fb. Anthem MAXX (2.5 fl oz) + XtendiMax (22 fl oz) + Roundup PowerMax (32 fl oz) + Intact (0.5%)	Auth Supr + Metri fb. Anth MX + Xtend + RupPM
Authority MTZ (16 oz) fb. Anthem MAXX (3 fl oz) + XtendiMax (22 fl oz) + Roundup PowerMax (32 fl oz) + Intact (0.5%)	Auth MTZ fb. Anth MX + Xtend + RupPM
Valor (2 oz) + Metribuzin (5 oz) fb. Warrant (3 pt) + XtendiMax (22 fl oz) + Roundup PowerMax (32 fl oz) + Intact (0.5%)	Valor + Metri fb. Warrant + Xtend + RupPM
Fierce (3 oz) fb. Warrant (3 pt) + XtendiMax (22 fl oz) + Roundup PowerMax (32 fl oz) + Intact (0.5%)	Fierce fb. Warrant + Xtend + RupPM
POST XtendiMax (22 fl oz) + Roundup PowerMax (32 fl oz) + Intact (0.5%)	XtendiMax + RupPM

Table 3. Soybean injury, weed control, program costs, soybean yield, and economic returns for herbicide programs in RR 2 Xtend soybean, 2019.

Herbicide Programs	Soybean injury		Weed control (56 d after POST)					All Weeds (≥90%)	Costs ¹ (\$/A)	Yield ³ (bu/A)	Economic Returns ^{2,3} (\$/A)
	21 DAP	14 DAT	ANGR	CHEAL	AMAPO	AMBEL	ABUTH				
	(%)	(%)	% control								
Engenia + Zidua + RupPM (<i>EPOS</i>)	0	7	90	100	100	100	100	YES	\$43.94	57.6*	\$491.74**
Warrant Ultra + Xtend + RupPM (<i>EPOS</i>)	0	21	96	100	100	100	100	YES	\$49.27	58.1*	\$491.06*
Engenia + Pursuit + Zidua + RupPM (<i>EPOS</i>)	0	18	99	100	100	100	100	YES	\$53.76	55.6*	\$463.32*
Valor XLT fb. Xtend + RupPM	16	12	95	100	100	100	100	YES	\$58.35	52.3*	\$428.04*
Auth MTZ fb. Xtend + RupPM	2	0	95	100	100	100	100	YES	\$75.28	53.9*	\$425.99*
Fierce EZ fb. Xtend + RupPM	21	5	94	100	100	100	100	YES	\$59.80	53.9*	\$441.47*
Zidua PRO fb. Engenia + RupPM	7	0	96	100	100	100	100	YES	\$52.31	48.6*	\$399.67*
Valor + Mauler + Prowl fb. Xtend + RupPM	19	5	96	100	100	100	100	YES	\$61.53	55.8*	\$457.41*
Fierce MTZ fb. Xtend + RupPM	23	5	98	100	100	100	100	YES	\$63.56	58.9**	\$484.21*
Warrant + Metri fb. Xtend + RupPM	1	1	98	100	100	100	100	YES	\$56.80	52.7*	\$433.31*
Warrant Ultra fb. Xtend + RupPM	1	0	99	100	100	100	100	YES	\$57.27	51.2*	\$418.89*
Boundary fb. Tavium + RupPM	3	4	100	100	100	100	100	YES	\$73.19	56.5*	\$452.26*
Prefix fb. Tavium + RupPM	5	2	100	100	100	100	100	YES	\$66.67	52.9*	\$425.30*
BroadAxe fb. Tavium + RupPM	9	4	100	100	100	100	100	YES	\$79.10	57.4*	\$454.72*
Zidua PRO fb. + Engenia + Zidua + RupPM	6	3	100	100	100	100	100	YES	\$74.60	58.0*	\$464.80*
Eng + Zidua + Metri. fb. Eng + Zidua + RupPM	0	0	99	100	100	100	100	YES	\$87.26	47.4	\$353.56
Eng + Pursuit + Zidua fb. Eng + Zidua + RupPM	0	0	100	100	100	100	100	YES	\$90.67	52.4*	\$396.65*
Auth Supr + Metri fb. Anth MX + Xtd + RupPM	1	0	100	100	100	100	100	YES	\$83.64	50.5*	\$386.01
Auth MTZ fb. Anth MX + Xtend + RupPM	0	0	99	100	100	100	100	YES	\$93.21	52.2*	\$392.25
Valor + Metri fb. Warrant + Xtend + RupPM	24	5	99	100	100	100	100	YES	\$66.01	53.6*	\$432.47*
Fierce fb. Warrant + Xtend + RupPM	23	7	100	100	100	100	100	YES	\$72.47	53.9*	\$428.80*
XtendiMax + RupPM (<i>POST</i>)	0	0	90	100	100	100	100	YES	\$29.20	54.7*	\$479.51*
Untreated	0	0	0	0	0	0	0	NO	--	21.6	\$200.88

Abbreviations: ANGR = giant foxtail, CHEAL = c. lambsquarters, AMAPO = Powell amaranth, AMBEL = c. ragweed, ABUTH = velvetleaf, fb. = followed by.

¹Herbicide costs = avg. of price lists; App. cost = \$8.00/A; seeding rate = 155,000 seeds/A. Weed control costs = Herbicide \$ + Additive \$ + Application \$.

²Crop selling price = \$9.30/bu (January 2020). Economic return = (Yield x Price) – Weed Control Costs.

*** = Highest yield and economic return; * = yield and economic returns for these treatments were not significantly different from the treatment with highest yield or economic return. Consult the Table 12 in the MSU Weed Control Guide for Field Crops (E-434) or the herbicide label for crop rotation restrictions.