MSU Weed Science

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Economics of Commercial Weed Control Programs in Soybean
3-Year Summary (2004, 2005, & 2006)

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Field trials in soybean were conducted in 2004, 2005, and 2006 at the MSU Research Farm in E. Lansing to compare weed control, soybean injury, soybean yield, and economic returns of dominant weed control programs being marketed to Michigan growers. Each major herbicide company was asked to submit up to four weed control programs for the studies based on soil type and weed infestation history. Site characteristics and herbicide application timings are described in Table 1. Tables 2, 3, and 4 describe the herbicide programs selected by each company for the 2004, 2005, and 2006 seasons. Herbicide programs are sorted by application timing and the need for Roundup Ready seed. Yield loss due to weeds was extremely high. In 2004, the maximum soybean yield was 67.7 bu/A and the weedy (untreated) yield was 21.3 bu/A, resulting in a yield loss of 46.4 bu/A (68.5%). In 2005, the maximum soybean yield was 62.7 bu/A and the weedy (untreated) yield was 20.8 bu/A, resulting in a yield loss of 41.9 bu/A (66%). In 2006, the maximum soybean yield was 64.4 bu/A and the weedy (untreated) yield was 19.8 bu/A, resulting in a yield loss of 46.4 bu/A (69.3%).

In 2004, immediately after planting and application of the preemergence herbicides the site received 0.53 inch of rainfall. In 2006, within 2 days of the preemergence application there was 1.92 inches of rain and within 10 day rainfall was 3.96 inches. High rainfall immediately after application in 2004 and 2006 may have contributed to the persistent injury that was observed from some of the soil-applied herbicides.

Table 1. Site descriptions.

	2004	2005	2006
Crop	Soybean	Soybean	Soybean
Variety	Asgrow 2107	Asgrow 2107	Pioneer 91M91
Soil Texture	Sandy Loam	Sandy Clay Loam	Sandy Loam
Soil pH	7.6[a]	6.3	6.9
Soil Organic Matter	3.8	1.8-2.2	2.8
Dominant Weeds	SETFA, CHEAL, AMARE, AMBEL, ABUTH, BRAKA, SOLPT	SETFA, CHEAL, AMARE, AMBEL, ABUTH, POLPY, BRAKA, SOLPT	SETFA, CHEAL, AMARE, AMBEL, ABUTH
Planting Date	May 29	May 4	May 8
Application Timings:			
PRE	May 29	May 4	May 9
Early POST (EPOS)	June 25	June 3	June 5
Mid-POST (MPOS)	July 1	June 8	June 12
POST	July 6	June 18	June 14
Late-POST (LPOS)	July 23	June 29	July 6
Evaluation Times	45 d (soybean injury) 65 d (weed control)	50 d (soybean injury) 75 d (weed control)	49 d (soybean injury) 79 d (weed control)

Abbreviations: SETFA = giant foxtail, CHEAL = c. lambsquarters, AMARE = pigweed, AMBEL = c. ragweed, ABUTH = velvetleaf, POLPY = Pennsylvania smartweed, BRAKA = wild mustard, SOLPT = e. black nightshade.

[a] Due to the high soil pH in 2004 some of the programs listed in the 2004 trial would be restrictive to rotational crops the following season (i.e., programs containing chlorimuron). Additionally, there are restrictions for applications of metribuzin containing products when pH levels approach 7.5.

Table 2. Commercial soybean herbicide programs selected by companies in 2004.

Conventional	***Treatments (Rate/A)***	***Abbreviated Form***	***Years[a]***
PRE	Outlook (18 fl oz) + Lorox (1.5 lb) + Sencor (4 oz)	Outlook + Lorox + Sencor	2004
	Axiom (13 oz) + Pursuit (1.44 oz)	Axiom + Pursuit	2004
	Python (0.8 oz) + FirstRate (0.3 oz) + Pendimax (3 pt)	Python + FRate + Pendimax	2004
	Boundary (2 pt) + Canopy XL (3.8 oz)	Boundary + Canopy XL	2004
	Gangster (3 oz) + Pendimax (2.4 pt)	Gangster(L) + Pendimax	2004, 2005, 2006
	Gangster (3.6 oz) + Pendimax (2.4 pt)	Gangster(H) + Pendimax	2004
PRE/POST	Prowl H_2O (2.5 pt) fb. Pursuit (1.44 oz) + Cobra (2 fl oz) + MSO (1%) + AMS (2.5 lb)	Prowl fb. Pursuit + Cobra	2004
	Prowl H_2O (2.5 pt) fb. Raptor (4 fl oz) + Cobra (2 fl oz) + MSO (1%) + AMS (2.5 lb)	Prowl fb. Raptor + Cobra	2004
	Python (1 oz) fb. FirstRate (0.3 oz) + Select (6 fl oz) + COC (1%) + 28% N (2.5%)	Python fb. FRate + Select	2004
	Canopy XL (3.5 oz) fb. Flexstar (1.5 pt) + Assure II (8 fl oz) + COC (1%)	Canopy XL fb. Flex + Assure	2004
	Boundary (1.75 pt) fb. Flexstar (16 fl oz) + COC (1 qt/100 gal) + AMS (10 lb/100 gal)	Boundary fb. Flexstar	2004, 2005
	Gangster (3 oz) fb. Select (6 fl oz) + COC (1 qt)	Gangster fb. Select	2004
Roundup Ready			
PRE/POST	Prowl H_2O (2.5 pt) fb. Extreme (3 pt) + Activator 90 (0.25%) + AMS (2.5 lb)	Prowl fb. Extreme	2004
	Sencor (5.3 oz) fb. Roundup WeatherMax (22 fl oz) + AMS (17 lb/100 gal)	Sencor fb. RoundupWM	2004, 2005, 2006
	Domain (10 oz) fb. Roundup WeatherMax (22 fl oz) + AMS (17 lb/100 gal)	Domain fb. RoundupWM	2004
	Python (0.8 oz) fb. Glyphomax Plus (32 fl oz) + AMS (2 lb)	Python fb. GlyphoPlus	2004
	Canopy XL (3.5 oz) fb. Roundup WeatherMax (22 fl oz) + AMS (17 lb/100 gal)	Canopy XL fb. RoundupWM	2004
	IntRRo (1 qt) fb. Roundup WeatherMax (22 fl oz) + AMS (2%)	IntRRo(L) fb. RoundupWM	2004, 2005
	IntRRo (2 qt) fb. Roundup WeatherMax (22 fl oz) + AMS (2%)	IntRRo(H) fb. RoundupWM	2004
	Boundary (1.75 pt) fb. Touchdown Total (24 fl oz) + AMS (17 lb/100 gal)	Boundary fb. Touchdown	2004, 2005, 2006
	Valor (2 oz) - PRE fb. Roundup WeatherMax (22 fl oz) + AMS (17 lb/100 gal)	Valor fb. RoundupWM	2004
POST (1-pass)	Glyphomax Plus (32 fl oz) + FirstRate (0.3 oz) + AMS (2 lb) - MPOS	GlyphoPlus + FRate	2004
POST (2-pass)	Extreme (3 pt) + Activator 90 (0.25%) + AMS (2.5 lb) fb. Roundup WeatherMax (22 fl oz) + AMS (2.5 lb) - EPOS fb. LPOS	Extreme fb. RoundupWM	2004
	Roundup OriginalMax (22 fl oz) + AMS (2%) - MPOS fb. LPOS	RoundupOM fb. RoundupOM	2004
	Roundup WeatherMax (22 fl oz) + AMS (2%) - MPOS fb. LPOS	RoundupWM fb. RoundupWM	2004, 2005, 2006
	Touchdown Total (24 fl oz) + AMS (17 lb/100 gal) - MPOS fb. LPOS	Touchdown fb. Touchdown	2004, 2005

[a] Herbicide programs that were common in 2004, 2005, and 2006.

Table 3. Commercial soybean herbicide programs selected by companies in 2005.

Conventional	***Treatments (Rate/A)***	***Abbreviated Form***
PRE	Define (14.4 fl oz) + Pursuit (1 oz) + Sencor (6.4 oz)	Define + Pursuit + Sencor
	Synchrony XP (1.25 oz) + Linex (1 pt) + Cinch (1 pt)	Synchrony + Linex + Cinch
	Gangster (3 oz) + Pendimax (2 pt)	Gangster + Pendimax
	FirstRate (0.6 oz) + Dual Magnum (1.33 pt) – WeedSOFT	FRate + Dual Magnum
PRE/POST	Prowl H_2O (2.5 pt) fb. Raptor (4 fl oz) + Flexstar (12 fl oz) + MSO (1%) + AMS (2.5 lb)	Prowl fb. Raptor + Flexstar
	Linex (1.5 pt) fb. Assure II (8 fl oz) + COC (1%)	Linex fb. Assure
	Synchrony XP (1.5 oz) fb. Flexstar (1.5 pt) + Assure II (8 fl oz) + COC (1%) + AMS (2 lb)	Synchrony fb. Flexstar + Assure
	Boundary (1.75 pt) fb. Flexstar (16 fl oz) + COC (1%)	Boundary fb. Flexstar
	Domain (10 oz) fb. Flexstar (1 pt) + Assure II (8 fl oz) + COC (0.8 qt) + AMS (17 lb/100 gal) - WeedSOFT	Domain fb. Flex + Assure
Roundup Ready		
PRE/POST	Sencor (5.3 oz) fb. Roundup WeatherMax (22 fl oz) + AMS (17 lb/100 gal)	Sencor fb. RoundupWM
	IntRRo (1 qt) fb. Roundup WeatherMax (22 fl oz) + AMS (2%)	IntRRo(L) fb. RoundupWM
	Boundary (1.75 pt) fb. Touchdown Total (24 fl oz) + AMS (17 lb/100 gal)	Boundary fb. Touchdown
	Domain (10 oz) fb. Glyphosate (32 fl oz) + AMS (17 lb/100 gal) - WeedSOFT	Domain fb. Glyphosate
POST (1-pass)	Glyphosate (32 fl oz) + AMS (17 lb/100 gal) – MPOS - WeedSOFT	Glyphosate
POST (2-pass)	Roundup WeatherMax (22 fl oz) + AMS (17 lb/100 gal) - MPOS fb. LPOS	RoundupWM fb. RoundupWM
	Touchdown Total (24 fl oz) + AMS (17 lb/100 gal) - EPOS fb. LPOS	Touchdown fb. Touchdown
	Sequence (2.5 pt) + AMS (MP) fb. Touchdown Total (24 fl oz) + AMS (17 lb/100 gal) (LP)	Sequence fb. Touchdown

Table 4. Commercial soybean herbicide programs selected by companies in 2006.

Conventional	***Treatments (Rate/A)***	***Abbreviated Form***
PRE	Define (14 fl oz) + Pursuit (1 oz) + Sencor (6.4 oz)	Define + Pursuit + Sencor
	Sencor (5.3 oz) + Define (15 fl oz) + Linex (1 pt)	Sencor + Define + Linex
	Gangster (3.0 oz) + Pendimax (2.4 pt)	Gangster (L) + Pendimax (H)
	Canopy (2.25 oz) + Linex (1 pt) + Cinch (1 pt)	Canopy + Linex + Cinch
	Gangster (3.6 oz) + Pendimax (2 pt)	Gangster (H) + Pendimax (L)
	Valor (3 oz) + Sencor (6 oz) + Pendimax (2 pt)	Valor + Sencor + Pendimax
	Boundary (2 pt) + FirstRate (0.6 oz)	Boundary + FRate
PRE/POST	Prowl H_2O (2.5 pt) fb. Raptor (4 fl oz) + Flexstar (12 fl oz) + MSO (1%) + AMS (2.5 lb)	Prowl fb. Raptor + Flexstar
	Canopy (3 oz) fb. Flexstar (1.5 pt) + Assure II (8 fl oz) + COC (1%)	Canopy fb. Flexstar + Assure
	Boundary (2.25 pt) fb. Flexstar (16 fl oz) + Harmony GT (0.08 oz) + COC (1%)	Boundary fb. Flexstar + Harmony
	Boundary (2 pt) fb. Cobra (8 fl oz) + COC (1%) + AMS (2.5 lb)	Boundary fb. Cobra
POST	Raptor (4 fl oz) + Cobra (4 fl oz) + COC (1%) + AMS (2.5 lb)	Raptor + Cobra
Roundup Ready		
PRE/POST	Sencor (6.4 oz) fb. Roundup WeatherMax (22 fl oz) + AMS (17 lb/100 gal)	Sencor fb. RoundupWM
	Domain (10 oz) fb. Roundup WeatherMax (22 fl oz) + AMS (17 lb/100 gal)	Domain fb. RoundupWM
	IntRRo (2 qt) fb. Roundup WeatherMax (22 fl oz) + AMS (17 lb/100 gal)	IntRRo fb. RoundupWM
	Boundary (1.75 pt) fb. Touchdown Total (24 fl oz) + AMS (8.5 lb/100 gal)	Boundary fb. Touchdown
	Prefix CP (1 qt) fb. Touchdown Total (24 fl oz) + AMS (8.5 lb/100 gal)	Prefix fb. Touchdown
	Boundary (2 pt) fb. Glyphosate (32 fl oz) + AMS (17 lb/100 gal)	Boundary fb. Glyphosate
POST (1-pass)	Roundup WeatherMax (22 fl oz) + AMS (17 lb/100 gal) – POST	RoundupWM
POST (2-pass)	Extreme (3 pt) + NIS + AMS (EP) fb. Roundup OriginalMax (22 fl oz) + NIS (0.25%) + AMS (2.5 lb) (LP)	Extreme fb. RoundupOM
	Roundup WeatherMax (22 fl oz) + AMS (17 lb/100 gal) - EPOS fb. LPOS	RoundupWM fb. RoundupWM
	Roundup OriginalMax (22 fl oz) + AMS (17 lb/100 gal) - EPOS fb. LPOS	RoundupOM fb. RoundupOM
	Sequence (3.5 pt) + AMS (EP) fb. Touchdown Total (24 fl oz) + AMS (8.5 lb/100 gal) (LP)	Sequence fb. Touchdown

Table 5. Soybean injury, weed control, program costs, soybean yield, and economic returns for 26 herbicide programs in 2004.

Herbicide Programs	Soybean Injury *(%)*	SETFA, CHEAL, AMARE, BRAKA, SOLPT *(≥90%)*	AMBEL *(%)*	ABUTH *(%)*	All Weeds *(≥90%)*	Costs[1] *($/A)*	Yield *(bu/A)*	Economic Returns[2] *($/A)*
PRE*(Conventional)*								
Outlook + Lorox + Sencor	0	+	74	87	NO	$50.28	60.4	$251.72
Axiom + Pursuit	0	+	78	**99**	NO	$35.67	57.1	$249.83
Python + FRate + Pendimax	4	+	79	**99**	NO	$26.90	52.9	$237.60
Boundary + Canopy XL	**23†**	+	**98**	**99**	**YES**	$28.23	51.3	$228.27
Gangster(L) + Pendimax	**8†**	+	**99**	**99**	**YES**	$28.30	54.2	$242.70
Gangster(H) + Pendimax	5	+	**96**	**99**	**YES**	$31.68	59.7	**$266.82***
PRE fb. POST (Conventional)								
Prowl fb. Pursuit + Cobra	3	+	71	**99**	NO	$41.46	53.4	$225.54
Prowl fb. Raptor + Cobra	**13†**	+	73	**99**	NO	$41.62	55.7	$236.88
Python fb. FRate + Select	1	+	**93**	**99**	**YES**	$38.32	**66.0***	**$291.68***
Canopy XL fb. Flex + Assure	**20†**	+	**99**	**99**	**YES**	$48.40	56.3	$233.10
Boundary fb. Flexstar	3	+	**99**	**99**	**YES**	$38.50	**62.7***	**$275.00***
Gangster fb. Select	3	+	**99**	**99**	**YES**	$39.20	**62.8***	**$274.80***
PRE fb. POST (Roundup Ready)								
Prowl fb. Extreme	4	+	**99**	**99**	**YES**	$42.49	**60.9***	**$262.01***
Sencor fb. RoundupWM	0	+	**98**	**96**	**YES**	$37.68	**65.2***	**$288.32***
Domain fb. RoundupWM	0	+	**98**	**97**	**YES**	$38.61	**63.0***	**$276.39***
Python fb. GlyphoPlus	0	+	**98**	**99**	**YES**	$37.29	**63.9***	**$282.21***
Canopy XL fb. RoundupWM	**9†**	+	**98**	**99**	**YES**	$37.31	57.6	$250.69
IntRRo(L) fb. RoundupWM	0	+	**97**	**97**	**YES**	$35.72	**63.5***	**$281.78***
IntRRo(H) fb. RoundupWM	0	+	**99**	**97**	**YES**	$40.22	60.1	**$260.28***
Boundary fb. Touchdown	0	+	**99**	**96**	**YES**	$45.00	**67.7***	**$293.50***
Valor fb. RoundupWM	0	+	**99**	**99**	**YES**	$39.13	**65.2***	**$286.87***
POST 1-pass (Roundup Ready)								
GlyphoPlus + FRate	0	+	**99**	**99**	**YES**	$31.68	**63.1***	**$283.82***
POST 2-pass (Roundup Ready)								
Extreme fb. RoundupWM	0	+	**97**	**99**	**YES**	$43.49	**62.4***	**$268.51***
RoundupOM fb. RoundupOM	0	+	**98**	**99**	**YES**	$37.57	60.0	**$262.43***
RoundupWM fb. RoundupWM	0	+	**99**	**99**	**YES**	$41.21	**67.4***	**$295.79***
Touchdown fb. Touchdown	0	+	**99**	**99**	**YES**	$41.41	**62.2***	**$269.59***
Untreated	0	0	0	0	NO	0	21.3	$106.25

[1] Herbicide and additive costs = avg. of price lists (April 2004); Application cost = $6.00/A; Roundup Ready seed premium = $9.25/A; seeding rate = 155,000 seeds/A. Weed control costs = Herbicide $ + Additive $ + Application $ + seed premium $ (where applicable).

[2] Crop selling price = $5.00/bu (December 2004). Economic return = (Yield x Price) – Weed Control Costs.

+ All treatments provided ≥90% control of weeds listed; ***** Values are not significantly different from the highest value within that column; † Indicates significant soybean injury.

Table 6. Soybean injury, weed control, program costs, soybean yield, and economic returns for 17 herbicide programs in 2005.

Herbicide Programs	Soybean Injury *(%)*	SETFA *(%)*	CHEAL *(%)*	AMARE *(%)*	AMBEL *(%)*	ABUTH *(%)*	POLPY *(%)*	BRAKA, SOLPT *(≥90%)*	All Weeds *(≥90%)*	Costs[1] *($/A)*	Yield *(bu/A)*	Economic Returns[2] *($/A)*
PRE*(Conventional)*												
Define + Pursuit + Sencor	0	**99**	**99**	**99**	**97**	**99**	**99**	+	**YES**	$38.72	**59.1***	**$256.78***
Synchrony + Linex + Cinch	0	**99**	**99**	**99**	72	**91**	**99**	+	NO	$32.11	51.2	$223.90
Gangster + Pendimax	0	82	**99**	**94**	**99**	**94**	**99**	+	NO	$26.98	**62.7***	**$286.36***
FRate + Dual Magnum	0	79	67	**99**	81	**99**	**99**	+	NO	$32.99	**56.2***	**$247.89***
PRE fb. POST (Conventional)												
Prowl fb. Raptor + Flexstar	**17†**	**99**	**99**	**99**	**99**	**99**	**99**	+	**YES**	$48.31	52.6	$214.82
Linex fb. Assure	**5†**	**99**	73	**91**	49	78	76	+	NO	$30.83	44.8	$193.30
Synchrony fb. Flexstar + Assure	**19†**	84	**94**	**99**	**99**	**99**	**99**	+	NO	$48.02	54.4	$223.98
Boundary fb. Flexstar	**16†**	**99**	**97**	**99**	**99**	**98**	**99**	+	**YES**	$37.88	**60.9***	**$266.45***
Domain fb. Flex + Assure	**5†**	**99**	**99**	**99**	**99**	**96**	**99**	+	**YES**	$41.42	**56.6***	$241.58
PRE fb. POST (Roundup Ready)												
Sencor fb. RoundupWM	0	**99**	**99**	**99**	**99**	**99**	**99**	+	**YES**	$44.19	**58.6***	**$248.94***
IntRRo(L) fb. RoundupWM	0	**99**	**99**	**99**	**96**	**99**	**99**	+	**YES**	$41.97	**57.6***	**$246.03***
Boundary fb. Touchdown	1	**99**	**99**	**99**	**99**	**99**	**99**	+	**YES**	$46.84	**60.7***	**$256.49***
Domain fb. Glyphosate	0	**98**	**99**	**99**	**98**	**99**	**99**	+	**YES**	$40.02	**58.0***	**$250.37***
POST 1-pass (Roundup Ready)												
Glyphosate	0	83	**96**	86	**95**	**98**	**99**	+	NO	$26.56	**58.3***	**$265.07***
POST 2-pass (Roundup Ready)												
RoundupWM fb. RoundupWM	**6†**	**98**	**99**	**99**	**99**	**99**	**99**	+	**YES**	$47.46	**56.0***	$232.29
Touchdown fb. Touchdown	0	**98**	**99**	**99**	**99**	**99**	**99**	+	**YES**	$40.79	**58.5***	**$251.59***
Sequence fb. Touchdown	**4†**	**99**	**99**	**99**	**99**	**99**	**99**	+	**YES**	$49.17	**58.2***	$241.71
Untreated	0	0	0	0	0	0	0	0	NO	0	20.8	$103.88

Abbreviations: SETFA = giant foxtail, CHEAL = common lambsquarters, AMARE = redroot pigweed, AMBEL = common ragweed, ABUTH = velvetleaf, POLPY = Pennsylvania smartweed, BRAKA = wild mustard, SOLPT = eastern black nightshade, fb. = followed by.

[1] Herbicide and additive costs = avg. of price lists (April 2005); Application cost = $6.00/A; Roundup Ready seed premium = $15.23/A; seeding rate = 155,000 seeds/A. Weed control costs = Herbicide $ + Additive $ + Application $ + seed premium $ (where applicable).

[2] Crop selling price = $5.00/bu (December 2005). Economic return = (Yield x Price) – Weed Control Costs.

+ All treatments provided ≥90% control of weeds listed.

***** Values are not significantly different from the highest value within that column.

† Indicates significant soybean injury 50 days after soybean planting.

Table 7. Soybean injury, weed control, program costs, soybean yield, and economic return for 23 herbicide programs in 2006.

Herbicide Programs	Soybean Injury *(%)*	SETFA *(%)*	CHEAL *(%)*	AMARE *(%)*	AMBEL *(%)*	ABUTH *(%)*	All Weeds *(≥90%)*	Costs[1] *($/A)*	Yield *(bu/A)*	Economic Returns[2] *($/A)*
PRE*(Conventional)*										
Define + Pursuit + Sencor	4	**97**	**96**	**99**	48	**96**	NO	36.31	50.9	269.09
Sencor + Define + Linex	4	**96**	**97**	88	89	76	NO	32.32	**60.1***	**328.28***
Gangster (L) + Pendimax (H)	**14†**	72	**99**	**97**	**99**	**99**	NO	28.31	53.8	294.49
Canopy + Linex + Cinch	**24†**	**99**	**98**	**99**	**94**	**97**	**YES**	31.66	54.5	295.34
Gangster (H) + Pendimax (L)	**19†**	83	**99**	**99**	**99**	**99**	NO	30.85	52.4	283.55
Valor + Sencor + Pendimax	**9†**	88	**99**	**98**	**99**	88	NO	28.27	52.7	287.93
Boundary + FRate	**25†**	**99**	**96**	85	70	**97**	NO	36.80	45.9	238.60
PRE fb. POST (Conventional)										
Prowl fb. Raptor + Flexstar	**28†**	**97**	**99**	**99**	89	**99**	NO	48.48	46.2	228.72
Canopy fb. Flexstar + Assure	**24†**	**99**	**98**	**98**	**99**	**98**	**YES**	47.71	56.7	292.49
Boundary fb. Flexstar + Harmony	**21†**	**99**	**99**	**99**	**99**	**92**	**YES**	43.37	**57.7***	**302.83***
Boundary fb. Cobra	**27†**	**99**	**96**	**98**	**99**	**91**	**YES**	37.24	52.1	275.36
POST (Conventional)										
Raptor + Cobra	**17†**	40	35	**95**	43	86	NO	28.30	47.0	253.70
PRE fb. POST (Roundup Ready)										
Sencor fb. RoundupWM	1	**91**	**96**	**96**	**99**	**96**	**YES**	40.07	**62.2***	**333.13***
Domain fb. RoundupWM	1	**93**	**96**	**93**	**98**	**94**	**YES**	41.88	**62.2***	**331.32***
IntRRo fb. RoundupWM	5	**93**	83	85	**93**	**96**	NO	43.91	**63.1***	**334.69***
Boundary fb. Touchdown	**10†**	**99**	**93**	**90**	**98**	**96**	**YES**	46.39	**58.0***	301.61
Prefix fb. Touchdown	**7†**	**99**	**98**	**97**	**99**	**99**	**YES**	44.29	**59.8***	**314.51***
Boundary fb. Glyphosate	**11†**	**99**	**93**	82	**96**	**97**	NO	45.84	56.0	290.16
POST 1-pass (Roundup Ready)										
RoundupWM	**8†**	80	79	85	**93**	**97**	NO	28.27	57.2	**314.93***
POST 2-pass (Roundup Ready)										
Extreme fb. RoundupOM	**12†**	**99**	**99**	**99**	**99**	**99**	**YES**	45.99	**60.2***	**315.21***
RoundupWM fb. RoundupWM	1	**99**	**99**	**99**	**99**	**99**	**YES**	41.56	**64.4***	**344.84***
RoundupOM fb. RoundupOM	3	**98**	**99**	**99**	**99**	**99**	**YES**	38.30	**60.2***	**322.90***
Sequence fb. Touchdown	0	**99**	**99**	**99**	**99**	**99**	**YES**	54.20	**64.4***	**332.20***
Untreated	0	0	0	0	0	0	NO	--	19.8	118.80

[1] Herbicide and additive costs = avg. of price lists (April 2006); Application cost = $6.00/A; Roundup Ready seed premium = $14.98/A; seeding rate = 152,000 seeds/A. Weed control costs = Herbicide $ + Additive $ + Application $ + seed premium $ (where applicable).

[2] Crop selling price = $6.00/bu (December 2006). Economic return = (Yield x Price) – Weed Control Costs.

***** Values are not significantly different from the highest value within that column; † Indicates significant soybean injury 49 days after soybean planting.

Table 8. Summary of instances of soybean injury, weed control, herbicide program costs, highest yielding, and highest economic returns for the five weed control systems in 2004.

	Soybean Injury	All Weeds Controlled *(≥90%)*	5 Most Expensive	5 Least Expensive	Highest Yielding	Highest Economic Returns
Conventional						
PRE	2/6	3/6	1/6	4/6	0/6	1/6
PRE/POST	2/6	2/6	1/6	0/6	3/6	3/6
Roundup Ready						
PRE/POST	1/9	9/9	2/9	0/9	7/9	8/9
POST (1-pass)	0/1	1/1	0/1	1/1	1/1	1/1
POST (2-pass)	0/4	4/4	1/4	0/4	3/4	4/4

Information in Table 8 is based on results presented in Table 5.

Table 9. Summary of instances of soybean injury, weed control, herbicide program costs, highest yielding, and highest economic returns for the five weed control systems in 2005.

	Soybean Injury	All Weeds Controlled *(≥90%)*	5 Most Expensive	5 Least Expensive	Highest Yielding	Highest Economic Returns
Conventional						
PRE	0/4	1/4	0/4	3/4	3/4	3/4
PRE/POST	5/5	3/5	2/5	1/5	2/5	1/5
Roundup Ready						
PRE/POST	0/4	4/4	1/4	0/4	4/4	4/4
POST (1-pass)	0/1	0/1	0/1	1/1	1/1	1/1
POST (2-pass)	2/3	3/3	2/3	0/3	3/3	1/3

Information in Table 9 is based on results presented in Table 6.

Table 10. Summary of instances of soybean injury, weed control, herbicide program costs, highest yielding, and highest economic returns for the six weed control systems in 2006.

	Soybean Injury	All Weeds Controlled *(≥90%)*	5 Most Expensive	5 Least Expensive	Highest Yielding	Highest Economic Returns
Conventional						
PRE	5/7	1/7	0/7	3/7	1/7	1/7
PRE/POST	4/4	3/4	2/4	0/4	1/4	1/4
POST	1/1	0/1	0/1	1/1	0/1	0/1
Roundup Ready						
PRE/POST	3/6	4/6	1/6	0/6	5/6	4/6
POST (1-pass)	1/1	0/1	0/1	1/1	0/1	1/1
POST (2-pass)	1/4	4/4	2/4	0/4	4/4	4/4

Information in Table 10 is based on results presented in Table 7.

Table 11. A 3-year summary of all conventional weed control programs for soybean yield (% of maximum yield) and economic return (% of maximum economic return).

	2004	2005	2006	2004	2005	2006
PRE (Conventional)	% of max. yield			% of max. economic return		
Outlook + Lorox + Sencor	89	–	–	85	–	–
Axiom + Pursuit	84	–	–	84	–	–
Python + FRate + Pendimax	78	–	–	80	–	–
Boundary + Canopy XL	76	–	–	77	–	–
Gangster(L) + Pendimax	80	**100***	84	82	**100***	86
Gangster(H) + Pendimax	88	–	81	**90***	–	83
Define + Pursuit + Sencor	–	**94***	79	–	**90***	79
Synchrony + Linex + Cinch	–	82	–	–	78	–
FRate + Dual Magnum	–	**90***	–	–	**87***	–
Sencor + Define + Linex	–	–	**93***	–	–	**96***
Canopy + Linex + Cinch	–	–	85	–	–	87
Valor + Sencor + Pendimax	–	–	82	–	–	82
Boundary + FRate	–	–	71	–	–	70
PRE fb. POST (Conventional)						
Prowl fb. Pursuit + Cobra	79	–	–	76	–	–
Prowl fb. Raptor + Cobra	82	–	–	80	–	–
Prowl fb. Raptor + Flexstar	–	84	72	–	75	67
Python fb. FRate + Select	**98***	–	–	**99***	–	–
Canopy XL fb. Flex + Assure	83	–	–	79	–	–
Canopy fb. Flex + Assure	–	–	88	–	–	86
Boundary fb. Flexstar	**93***	**97***	–	**93***	**93***	–
Boundary fb. Flexstar+Harmony	–	–	**90***	–	–	**89***
Gangster fb. Select	**93***	–	–	**93***	–	–
Linex fb. Assure	–	72	–	–	68	–
Synchrony fb. Flexstar+Assure	–	87	–	–	78	–
Domain fb. Flex + Assure	–	**90***	–	–	84	–
Boundary fb. Cobra	–	–	81	–	–	81
POST (Conventional)						
Raptor + Cobra	–	–	73	–	–	74

* Values are not significantly different from the highest value within that column.

Table 12. A 3-year summary of all Roundup Ready weed control programs for soybean yield (% of maximum yield) and economic return (% of maximum economic return).

	2004	2005	2006	2004	2005	2006
PRE fb. POST (Roundup Ready)	% of max. yield			% of max. economic return		
Prowl fb. Extreme	**90***	—	—	**89***	—	—
Sencor fb. RoundupWM	**96***	**94***	**97***	**97***	**87***	**97***
Domain fb. RoundupWM	**93***	—	**97***	**93***	—	**97***
Domain fb. Glyphosate	—	**93***	—	—	**87***	—
Python fb. GlyphoPlus	**94***	—	—	**95***	—	—
Canopy XL fb. RoundupWM	85	—	—	85	—	—
IntRRo(L) fb. RoundupWM	**94***	**92***	—	**95***	**86***	—
IntRRo(H) fb. RoundupWM	89	—	**98***	**88***	—	**99***
Boundary fb. Touchdown	**100***	**97***	**90***	**99***	**90***	88
Valor fb. RoundupWM	**96***	—	—	**97***	—	—
Prefix fb. Touchdown	—	—	**93***	—	—	**92***
POST 1-pass (Roundup Ready)						
GlyphoPlus + FRate	**93***	—	—	**96***	—	—
Glyphosate/(RoundupWM '06)	—	**93***	89	—	**93***	**92***
POST 2-pass (Roundup Ready)						
Extreme fb. RoundupWM/OM	**92***	—	**93***	**91***	—	**92***
RoundupOM fb. RoundupOM	89	—	**93***	**89***	—	**95***
RoundupWM fb. RoundupWM	**100***	**89***	**100***	**100***	81	**100***
Touchdown fb. Touchdown	**92***	**93***	—	**91***	**88***	—
Sequence fb. Touchdown	—	**93***	**100***	—	84	**97***

* Values are not significantly different from the highest value within that column.