

When and What Herbicides to Apply for Layby Weed Control in Sugarbeets during the 2008 Growing Season.

Robert Wilson

Objective: Determine the most effective herbicides, rates, and application timing for late season weed control in sugarbeets.

Background: Most of the herbicides applied postemergence to sugarbeets have a short life span and once they reach the soil they provide very little residual weed control. Weeds that germinate shortly after postemergence herbicides are applied escape treatment and go on to compete with the crop later in the growing season. To overcome this problem, growers have applied herbicides such as Eptam, Dual Magnum, or Outlook at early stages of crop growth in hopes that the herbicide will provide soil residual to control weeds that germinate later in the season. The effectiveness of layby herbicides is often affected by timing, rate, method of incorporation, uniform soil coverage, and selecting the right herbicide to control the weed problem. Experiments conducted by researchers in Europe suggest that one method of improving the performance of layby herbicides is to apply small amounts of the layby herbicide with each application of the postemergence herbicide program. This program has been called the FAR technique. The postemergence herbicide program has three components: F = foundation herbicide, Betamix; A = activator herbicide, Nortron; and R = residual herbicide, Goltix or Pyramin.

Procedure: The study was designed to measure sugarbeet injury and mid to late season weed control. Sugarbeet 'BTS-66RR50' were planted on April 22. Nortron was applied preemergence to selected plots on April 23. The study area was irrigated with an overhead sprinkler on April 25 to enhance sugarbeet seed germination and seedling establishment. Postemergence herbicide application was initiated on May 19 when sugarbeets were in the cotyledon growth stage (Table 1). Herbicides were applied with a tractor-mounted sprayer calibrated to deliver 20 gallons per acre at 32-psi pressure with Spraying Systems 11002 VS nozzles. Environmental conditions and weed growth stages at each of the herbicide application timings are given in Table 1. When sugarbeets were in the 4 true-leaf growth stage, they were cultivated. The

entire plot was treated with Roundup WeatherMax at 0.75 on June 9 and again on June 30 to kill any weeds that had emerged with the crop. Therefore, weed control measured in July would measure the residual benefit from the herbicides applied from April 27 to June 20. The sugarbeet stand in the plot area averaged 19,500 plants per acre which could be considered 60% of an optimum stand of approximately 32,000 plants/acre. The reduced stand allowed more sunlight to reach the soil surface and stimulate weed growth. Weed density in each plot was recorded on July 22. Weed counts were followed with a postemergence treatment of Roundup WeatherMax at 1.12 lb/acre on August 1 to kill emerged weeds. This allowed for a second evaluation of late season weed density on August 29.

Results: Outlook and Dual Magnum applied postemergence at the 2 true-leaf growth stage with and without Nortron preemergence at planting caused early season injury to sugarbeets (Table 2). Nortron applied preemergence followed postemergence with Outlook or Dual Magnum at the 4 true-leaf growth stage also caused early season sugarbeet injury. The Micro-Rate in combination with Outlook or Dual Magnum doubled crop injury compared to that observed when only Outlook and Dual Magnum were applied at the 2 true-leaf growth stage.

Common lambsquarters, redroot pigweed, hairy nightshade, wild proso millet, toothed spurge, kochia, Canada thistle, common purslane, and velvetleaf emerged in the plot area following Roundup application on June 30 (Table 2). Several broad comparisons can be derived from the data collected on July 22. The average total weed density for the four Outlook treatments (2, 4, 6, or 8 true-leaf) was 52 plants/247 sq ft and was greater than the 36 plants/247 sq ft observed in plots treated with Dual Magnum. Nortron applied at planting followed postemergence by Outlook or Dual Magnum (2, 4, 6, or 8 true-leaf) further reduced weed density approximately 60%. The greatest reduction in late season weed development occurred where Nortron was applied at planting followed postemergence with Outlook at the 2 or 6 true-leaf growth stage or with Dual Magnum at the 2, 6, or 8 true-leaf growth stage.

Outlook and Dual Magnum were applied at 0.55 or 0.99 lb/acre respectively, as single treatments (Table 2). Combining Outlook or Dual Magnum with the Micro-Rate resulted in an Outlook rate of 0.22 lb/acre or

Dual Magnum rate of 0.33 lb/acre applied with Betamix plus Upbeet plus Stinger plus methylated seed oil at the 2, 4, and 6 true-leaf growth stages and represented the European FAR program. Outlook provided 93% late season weed control when combined with the Micro-Rate with or without Nortron applied at planting. Applying Outlook in combination with the Micro-Rate provided weed control similar to a single application of Outlook applied postemergence at the 2 or 6 true-leaf growth stage in combination with Nortron applied at planting. Combining Dual Magnum with the Micro-Rate provide weed control similar to Dual Magnum applied postemergence in combination with Nortron at planting.

The second flush of late-season weeds was measured on August 29 and weed density was less than the first flush (Table 2). The weed control trends observed with the second flush of weeds were similar to those observed on July 22.

The results from the past three years of this study suggest that applying Nortron broadcast at planting provides both early and late season weed control. If sugarbeet stands are poor and late season weed growth is expected a postemergence application of Dual Magnum at the 4 or 8 true-leaf growth stage or Outlook at the 8 true-leaf growth stage would reduce late season weed density 55 to 60%.

Table 1. Environmental Conditions at the Time of Herbicide Application.

Date	Air temperature (F)	Humidity (%)	Wind speed & direction (mph)	Time of day	Crop growth stage	No weeds present
April 23	48	31	6 SE	9:00 am	Preemergence	
May 19	70	39	7 W	9:00 am	Cotyledon	
May 29	54	80	9 SE	9:00 am	2 true-leaves	
June 9	57	50	1 SW	8:30 am	4 true-leaves	
June 17	58	92	4 SE	10:00 am	6 true-leaves	
June 20	79	34	1 N	3:00 pm	8 true-leaves	

Rainfall before and after herbicide application:

Date	Amount - (inches) -	Date	Amount - (inches) -	Date	Amount - (inches) -
April 24	0.06	May 14	0.10	June 5	0.13
April 30	0.61	May 22	0.27	June 7	0.01
May 1	0.10	May 23	0.33	June 15	0.08
May 7	0.29	May 24	0.08	June 16	0.17
May 9	0.05	May 26	0.15	June 20	0.47
May 10	0.03	June 1	0.06	June 26	0.02
May 12	0.08	June 4	0.52	June 28	0.02

Table 2. When and What Herbicides to Apply for Layby Weed Control in Sugarbeets.

Herbicide treatment	Rate (lb/acre)	Time of application	Sugarbeet						Weed Density 7/22 ¹										Weed Density 8/29						
			Visual injury		Stand	Root Yield																			
			6/18	7/9	7/22	10/16	Sucrose	SLM	Colq	Rrpw	Hans	Wipr	Tosp	Kocz	Cath	Copu	Vele	Total	Colq	Tosp	Kocz	Rrpw	Cath	Copu	Total
--- (%) ---		(plants/acre)	(tons/acre)	(%)	(%)	(plants/247.5 sq ft)																			
Nontreated	—	—	0	0	17820	26.0	14.9	1.7	21	0	13	0	17	1	3	4	2	60	3	4	0	2	0	2	11
Handweed Roundup Ultramax II + AMS	0.75	8 TL	0	0	18150	27.3	15.5	1.7	1	0	1	0	2	0	0	1	0	4	1	0	0	1	0	2	4
Outlook	0.66	2 TL	7	0	19404	29.9	15.0	1.7	19	0	11	0	15	0	1	0	1	47	4	4	0	1	0	0	8
Outlook	0.66	4 TL	0	0	24156	35.5	15.3	1.7	40	3	4	0	13	1	0	0	10	71	1	2	0	0	0	1	3
Outlook	0.66	6 TL	0	0	16764	26.9	14.3	1.9	26	0	25	0	5	0	1	3	0	61	6	3	0	0	2	1	11
Outlook	0.66	8 TL	0	0	20526	31.9	15.6	1.6	13	0	9	0	3	1	0	1	2	27	1	1	0	1	0	0	3
Nortron Outlook	1.0 0.66	Pre 2 TL	8	0	18612	30.5	15.9	1.6	2	0	0	0	4	0	1	0	3	9	0	1	0	1	0	0	1
Nortron Outlook	1.0 0.66	Pre 4 TL	7	0	22770	31.8	15.6	1.6	7	1	1	0	10	1	10	0	0	28	1	3	0	1	2	0	7
Nortron Outlook	1.0 0.66	Pre 6 TL	3	0	17094	28.6	15.8	1.5	4	0	1	0	4	0	0	0	0	9	1	1	0	2	0	0	4
Nortron Outlook	1.0 0.66	Pre 8 TL	2	0	21120	33.8	15.7	1.5	6	0	0	0	10	0	24	0	4	44	0	1	0	2	2	1	5
Betamix + Upbeet + Stinger + MSO	0.08 + 0.004 + 0.02	Cot	14	0	17226	26.8	15.8	1.6	0	0	0	0	2	0	0	0	2	4	0	0	0	2	0	1	3
Betamix + Upbeet + Stinger + Outlook + MSO	0.08 + 0.004 + 0.02 + 0.22	2 TL																							
Betamix + Upbeet + Stinger + Outlook + MSO	0.08 + 0.004 + 0.02 + 0.22	4 TL																							
Betamix + Upbeet + Stinger + Outlook + MSO	0.08 + 0.004 + 0.02 + 0.22	6 TL																							
Nortron Betamix + Upbeet + Stinger + MSO	1.0 0.08 + 0.004 + 0.02	Pre Cot	16	0	17358	26.8	15.0	1.7	1	0	0	1	2	0	0	0	0	4	0	0	0	1	0	0	2
Betamix + Upbeet + Stinger + Outlook + MSO	0.08 + 0.004 + 0.02 + 0.22	2 TL																							
Betamix + Upbeet + Stinger + Outlook + MSO	0.08 + 0.004 + 0.02 + 0.22	4 TL																							
Betamix + Upbeet + Stinger + Outlook + MSO	0.08 + 0.004 + 0.02 + 0.22	6 TL																							
Dual Magnum	0.99	2 TL	7	0	21780	34.0	15.6	1.6	15	1	3	0	1	1	6	11	0	38	0	0	0	1	1	0	2
Dual Magnum	0.99	4 TL	1	0	17820	31.1	14.5	1.7	6	0	1	0	2	0	14	0	1	24	0	1	0	2	1	0	3
Dual Magnum	0.99	6 TL	0	0	19998	32.3	16.8	1.4	25	2	13	1	12	1	0	3	0	55	3	1	0	1	0	0	5
Dual Magnum	0.99	8 TL	0	0	18150	29.1	15.1	1.5	15	1	7	0	4	0	0	1	0	26	1	0	0	0	0	0	1

Herbicide treatment	Rate (lb/acre)	Time of application	Sugarbeet						Weed Density 7/22 ¹										Weed Density 8/29						
			Visual injury		Stand	Root Yield																			
			6/18	7/9	7/22	10/16	Sucrose	SLM	Colq	Rrpw	Hans	Wipr	Tosp	Kocz	Cath	Copu	Vele	Total	Colq	Tosp	Kocz	Rrpw	Cath	Copu	Total
--- (%) ---		(plants/acre)	(tons/acre)	(%)	(%)	----- (plants/247.5 sq ft) -----																			
Nortron Dual Magnum	1.0 0.99	Pre 2 TL	6	0	21846	33.9	14.4	1.8	5	0	1	0	3	0	0	0	9	0	0	0	0	0	1		
Nortron Dual Magnum	1.0 0.99	Pre 4 TL	6	0	20724	33.4	15.3	1.6	12	0	0	0	7	3	9	0	9	39	0	0	0	1	3	0	4
Nortron Dual Magnum	1.0 0.99	Pre 6 TL	2	0	18876	30.5	15.8	1.6	5	0	2	0	3	0	1	0	10	0	0	0	0	0	1	2	
Nortron Dual Magnum	1.0 0.99	Pre 8 TL	2	0	19074	32.0	15.5	1.5	8	0	1	0	1	1	1	0	11	0	0	0	0	0	0	0	
Betamix + Upbeet + Stinger + MSO	0.08 + 0.004 + 0.02	Cot	14	0	20658	28.9	15.6	1.7	5	0	0	0	1	0	1	0	6	0	0	0	1	0	0	1	
Betamix + Upbeet + Stinger + Dual Magnum + MSO	0.08 + 0.004 + 0.02 + 0.33	2 TL																							
Betamix + Upbeet + Stinger + Dual Magnum + MSO	0.08 + 0.004 + 0.02 + 0.33	4 TL																							
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Nortron Betamix + Upbeet + Stinger + MSO	1.0 0.08 + 0.004 + 0.02	Pre Cot	16	0	18414	29.7	14.9	1.5	0	0	0	0	1	1	15	0	17	0	0	0	1	2	0	4	
Betamix + Upbeet + Stinger + Dual Magnum + MSO	0.08 + 0.004 + 0.02 + 0.33	2 TL																							
Betamix + Upbeet + Stinger + Dual Magnum + MSO	0.08 + 0.004 + 0.02 + 0.33	4 TL																							
Betamix + Upbeet + Stinger + Dual Magnum + MSO	0.08 + 0.004 + 0.02 + 0.33	6 TL																							
LSD at 5%	—	—	3	0	5044	6.2	1.4	0.3	21	2	9	1	10	2	16	6	7	43	3	4	0	2	2	7	

¹ Weed density was measured on July 22 and then weeds were removed with Roundup, a second flush of weeds was measured on August 29. Weed abbreviations were as follows: common lambsquarters (Colq), redroot pigweed (Rrpw), hairy nightshade (Hans), wild proso millet (Wipr), toothed spurge (Tosp), kochia (Kocz), Canada thistle (Cath), common purslane (Copu), and velvetleaf (Vele).