

YELLOW NUTSEDGE CONTROL IN LIBERTY®- AND ROUNDUP®-RESISTANT SUGAR BEETS

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Introduction

Yellow nutsedge continues to be an increasing weed problem in the Treasure Valley in several crops, including sugar beets. New technology has been developed that allows the use of nonselective herbicides for weed control in herbicide-resistant sugar beet varieties. Trials were conducted to evaluate yellow nutsedge control in Liberty- and Roundup-resistant sugar beets.

Methods

A site was established with a heavy infestation of yellow nutsedge. Soil type was Feltham loamy fine sand with pH 8.2 and 1.4 percent organic matter. The field was bedded, and two separate trials were initiated adjacent to each other. For certain treatments, Ro-Neet or Nortron was applied preplant and immediately incorporated into the soil using a spike-toothed bed-harrow. On April 27, Hillehog variety 'Pillar RR' (Roundup-ready) was planted in one trial and Betaseed '8757 LL' (Liberty Link) was planted in the other. Beets were planted in 22-inch rows. Plots were four rows wide and 30 ft long and arranged in a randomized complete block design. Trials were sidedressed on June 5 with 120 lb N/acre as urea. Herbicide treatments were applied with a CO₂-pressurized backpack sprayer calibrated to deliver 20 gal/acre at 30 psi. Postemergence treatments were applied three times approximately 2 weeks apart. Applications were made on May 26, June 13, and June 26. Sugar beet injury and nutsedge control were evaluated throughout the growing season. Because of problems with rhizoctonia root rot, sugar beet yields were determined by harvesting 10 ft of healthy row from each plot on September 22.

The production of yellow nutsedge tubers was evaluated for each treatment. Two core samples measuring 4.25-inches in diameter by 10 inches deep were taken from each plot. The soil from each core was washed through a screen with 5/64-inch holes. All viable nutlets were counted and weighed.

Liberty-resistant Sugar Beets

Three applications of Liberty (0.357 lb ai/acre) were compared to the standard combination of Betamix Progress, Upbeet, and Stinger. Both the Liberty and standard treatments were applied with and without Ro-Neet as a preplant incorporated treatment. Each treatment previously mentioned was also evaluated with the addition of Dual

Magnum or Outlook. All treatments of Liberty included ammonium sulfate (AMS) at 2.5 lb/acre.

Roundup-resistant Sugar Beets

Treatments with Roundup alone included Roundup applied two or three times at 0.75 lb ae/acre. Preplant applications of Ro-Neet or Nortron followed by post treatments of Roundup also were evaluated. Combinations of Roundup and Dual Magnum or Outlook were evaluated with and without a preplant application of Ro-Neet. Standard combinations of Progress, Upbeet, and Stinger were applied with Dual Magnum or Outlook both with and without a preplant application of Ro-Neet. All Roundup treatments included AMS at 2.5 lb/acre.

Results and Discussion

Liberty-resistant Sugar Beets

On June 24, 11 days after the second application, the treatments containing Progress, Upbeet, and Stinger following preplant Ro-Neet and combined with Dual Magnum or Outlook showed significantly greater injury than Roundup plus Dual Magnum or Outlook following Ro-Neet (Table 1). By July 24, no significant injury was apparent. On June 24 and July 3, Liberty with the addition of preplant Ro-Neet or combined with Outlook or Dual Magnum at the second postemergence application, or the combination of Ro-Neet followed by Liberty plus Dual Magnum or Outlook improved yellow nutsedge control compared to Liberty alone. Liberty following Ro-Neet or Liberty plus Dual Magnum or Outlook provided greater yellow nutsedge suppression than the same combinations with the standard treatment of Progress, Upbeet, and Stinger. Differences in yellow nutsedge control were more variable at later evaluation dates, with the combination of Liberty and Dual Magnum providing some of the greatest control. Liberty applied three times alone and in combination with Outlook following preplant Ro-Neet produced some of the highest sugar beet yields. Yellow nutsedge tuber numbers and yields were variable and differences among treatments were not detected.

Roundup-resistant Sugar Beets

On June 24, treatments receiving the standard herbicides generally had some of the highest sugar beet injury while those treated with Roundup had some of the lowest injury (Table 2). Yellow nutsedge control, with few exceptions, was greater with Roundup treatments than with standard treatments. Possibly because of increased sugar beet injury and poorer yellow nutsedge control, sugar beet yields were generally lower with the standard herbicide treatments compared to those with Roundup. Yields ranged from 20 to 23.2 ton/acre with the standard treatments and 27.1 to 30.5 ton/acre with the Roundup treatments. All treatments reduced yellow nutsedge tuber numbers and weight compared to the untreated plots, but there were few differences among herbicide treatments.

Table 1. Sugar beet injury, root yields, and yellow nutsedge control and tuber production in Liberty-resistant sugar beets, Malheur Experiment Station, Oregon State University, Ontario, OR, 2000.

Treatment*	Rate lb ai/acre	Timing†	Crop injury		Sugar beet root yield‡ ton/acre	Nutsedge control				Nutlet production	
			6-24	7-24		6-24	7-3	7-24	9-26	Number 1,000/acre	Weight ton/acre
			-----%-----		-----%-----						
Liberty	0.357	cot, 2-lf, 4-lf	5	0	29.6	70	80	82	76	2,653	0.17
Ro-Neet Liberty	3.0 0.357	PPI cot, 2-lf, 4-lf	11	14	26.2	87	92	83	74	1,658	0.09
Ro-Neet Progress + Upbeet + Stinger	3.0 0.5 + 0.031 + 0.094	PPI cot, 2-lf, 4-lf	15	6	22.9	70	80	75	82	2,598	0.18
Ro-Neet Liberty Dual Magnum	3.0 0.357 1.6	PPI cot, 2-lf, 4-lf 2-lf	5	5	25.7	95	95	95	88	663	0.04
Ro-Neet Liberty Outlook	3.0 0.357 0.64	PPI cot, 2-lf, 4-lf 2-lf	8	3	29.9	91	94	90	81	884	0.06
Liberty Dual Magnum	0.357 1.6	cot, 2-lf, 4-lf 2-lf	5	0	23.7	89	95	94	92	1,492	0.09
Liberty Outlook	0.357 0.64	cot, 2-lf, 4-lf 2-lf	14	6	27.4	90	94	90	78	497	0.04
Ro-Neet Progress + Upbeet Stinger Dual Magnum	3.0 0.5 + 0.031 + 0.094 1.6	PPI cot, 2-lf, 4-lf 2-lf	30	13	22.0	83	89	90	83	608	0.02
Ro-Neet Progress + Upbeet Stinger Outlook	3.0 0.5 + 0.031 + 0.094 0.64	PPI cot, 2-lf, 4-lf 2-lf	21	9	22.6	79	82	84	71	884	0.07
Progress + Upbeet Stinger Dual Magnum	0.5 + 0.031 + 0.094 1.6	cot, 2-lf, 4-lf 2-lf	16	8	21.7	65	75	83	73	3,537	0.14
Progress + Upbeet Stinger Outlook	0.5 + 0.031 + 0.094 0.64	cot, 2-lf, 4-lf 2-lf	21	13	22.6	61	71	66	64	5,693	0.25
Untreated			0	0	7.1	0	0	0	0	2,045	0.19
LSD (0.05)			12	NS	5.7	14	8	12	13	NS	NS

*All Liberty treatments included AMS at 2.5 lb/acre.

†PPI treatments were applied on May 5. Cotyledon(cot), two-leaf (2-lf), and four-leaf (4-lf) treatments were applied on May 26, June 13, and June 26.

‡Sugar beets were harvested on September 22.

Table 2. Sugar beet injury, root yields, and yellow nutsedge control and tuber production in Roundup-resistant sugar beets, Malheur Experiment Station, Oregon State University, Ontario, OR, 2000.

Treatment*	Rate lb ai/acre	Timing†	Crop injury		Sugar beet root yield‡ ton/acre	Nutsedge control				Nutlet production	
			6-24 -----%-----	7-24		6-24	7-3	7-24	9-25	Number 1,000/acre	Weight ton/acre
Roundup	0.75	cot, 2-lf, 4-lf	14	6	29.6	79	93	95	80	2,432	0.14
Roundup	0.75	cot, 2-lf	11	4	25.7	80	91	90	83	3,316	0.20
Ro-Neet	3.0	PPI	1	3	29.6	86	93	94	90	1,492	0.15
Roundup	0.75	cot, 2-lf, 4-lf									
Ro-Neet	3.0	PPI	18	16	22.0	58	74	70	65	7,351	0.34
Progress + Upbeet + Stinger	0.5 + 0.031 + 0.094	cot, 2-lf, 4-lf									
Ro-Neet	3.0	PPI	11	10	30.5	91	95	95	84	1,713	0.09
Roundup	0.75	cot, 2-lf, 4-lf									
Dual Magnum	1.6	2-lf									
Ro-Neet	3.0	PPI	8	5	29.9	92	95	94	86	1,492	0.06
Roundup	0.75	cot, 2-lf, 4-lf									
Outlook	0.64	2-lf									
Ro-Neet	3.0	PPI	25	13	23.2	85	88	89	72	1,934	0.08
Progress + Upbeet + Stinger	0.5 + 0.031 + 0.094	cot, 2-lf, 4-lf									
Dual Magnum	1.6	2-lf									
Ro-Neet	3.0	PPI	34	19	20.3	73	85	73	68	4,532	0.25
Progress + Upbeet + Stinger	0.5 + 0.031 + 0.094	cot, 2-lf, 4-lf									
Outlook	0.64	2-lf									
Nortron	1.5	PPI	1	3	27.1	83	90	91	88	2,542	0.16
Roundup	0.75	cot, 2-lf, 4-lf									
Nortron	1.5	PPI	23	25	20.0	60	74	64	55	8,622	0.42
Progress + Upbeet + Stinger	0.5 + 0.031 + 0.094	cot, 2-lf, 4-lf									
Progress + Upbeet + Stinger	0.5 + 0.031 + 0.094	cot, 2-lf, 4-lf	28	21	21.5	61	80	71	60		
Dual Magnum	1.6	2-lf								5,638	0.27
Progress + Upbeet + Stinger	0.5 + 0.031 + 0.094	cot, 2-lf, 4-lf	26	8	21.5	64	75	78	79		
Outlook	0.64	2-lf								4,753	0.21
Dual Magnum	1.6	2-lf	18	15	27.4	85	95	94	83	1,990	0.15
Roundup	0.75	cot, 2-lf, 4-lf									
Outlook	0.64	2-lf	15	5	29.1	81	95	94	85	3,371	0.15
Roundup	0.75	cot, 2-lf, 4-lf									
Untreated			0	0	7.6	0	0	0	0	14,868	1.12
LSD (0.05)			12	12	4.9	11	7	10	14	5,985	0.38

*All Roundup treatments included AMS at 2.5 lb/acre.

†PPI treatments were applied April 27. Cotyledon (cot), two-leaf (2-lf), and four-leaf (4-lf) treatments were applied on May 26, June 13, and June 26.

‡Sugar beets were harvested on September 22.