

# 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 allowing the use of non-selective herbicides for weed control in herbicide resistant sugar beet varieties. Trials were conducted to evaluate yellow nutsedge control with Liberty and Roundup in Liberty and Roundup resistant sugar beets.

## Procedures

A site was established with a heavy, even infestation of yellow nutsedge. Soil type was sandy loam with pH 8.1 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 soil incorporated using a bed-harrow. Hilleshog variety 'Pillar RR (Roundup Ready)' was planted in one trial, and Betaseed 8757 LL (Liberty Link) was planted in the other on May 5. Beets were planted in 22-in rows. Plots were four rows wide and 30 ft long and arranged in a randomized complete block design. Trials were sidedressed on June 15 with 210 lb N/acre as urea. Herbicide treatments were applied with a CO<sub>2</sub>-pressurized backpack sprayer calibrated to deliver 20 gpa at 30 psi. Sugar beet injury and nutsedge control were evaluated throughout the growing season. Redroot pigweed, common lambsquarter, and hairy nightshade control was evaluated on August 25. Sugar beet yields were determined by harvesting the center two rows of each plot on August 26. Due to late planting, early harvest, and narrow plant spacing, yields should not be compared to commercial beet production.

The production of yellow nutsedge tubers was evaluated for each treatment. Two core samples measuring 4.25 in in diameter by 10 in deep were taken from each plot. The soil from each core was sifted through a screen with 5/64-in 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 with and without Ro-neet as a preplant incorporated treatment. Dual Magnum or BAS 656 07 H also was added to each treatment previously mentioned. First applications were made to cotyledon beets on May 27. Beets in the 2-true-leaf stage were sprayed on June 7, and 4-leaf beets were sprayed on June 16. All treatments of Liberty included AMS at 2.5 lb/acre.

Crop injury, recorded as a percent of injured beets, and nutsedge control were evaluated on June 22, July 1, 7, 15, and August 25.

#### *Roundup Resistant Sugar Beets*

Treatments with Roundup alone included Roundup applied twice or three times at 0.75 lb ae/acre, and Roundup applied twice at 1.5 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 BAS 656 07 H were evaluated with and without a preplant application of Ro-neet. Standard combinations of Progress, Upbeet, and Stinger were applied with Dual Magnum or BAS 656 07 H both with and without a preplant application of Ro-neet. All treatments of Roundup included AMS at 2.5 lb/acre. First post applications were made to cotyledon beets on May 27. Second applications were made on June 7 to 2-leaf beets. The 4-leaf spray timing was June 16. Crop injury and nutsedge control were evaluated throughout the growing season.

### **Results and Discussion**

#### *Liberty Resistant Sugar Beets*

On June 22, 6 days after the last application, the treatments of Progress, Upbeet, Stinger, and Dual Magnum or BAS 656 07 H both with and without Ro-neet showed significantly greater injury (16 to 23 percent) than all other treatments (Table 1). By the July 15 evaluation, only the Progress, Upbeet, Stinger, and BAS 656 07 H combination had an injury rating (3 percent) significantly higher than the check. No signs of crop injury were apparent at harvest. On June 22, 6 days after the final postemergence application, nutsedge control for all treatments ranged from 78 to 95 percent. On the August 25 rating, all treatments recorded 100 percent nutsedge control. This indicates that between herbicidal control and beet competition, no nutsedge plants were able to emerge through the beet canopy. All treatments gave 100 percent control of redroot pigweed, common lambsquarters, and hairy nightshade (data not shown). All treatments yielded statistically more than the untreated check. Treatment yields ranged from 22.4 to 25.4 ton/acre, with the untreated check yielding 4.1 ton/acre.

For all treatments, the number and weight of viable yellow nutsedge tubers was significantly less than the untreated check. Combinations of Progress, Upbeet, Stinger, and BAS 656 07 H with and without Ro-neet preplant were among the best at reducing the number of viable tubers. There were no significant differences between herbicide treatments for viable nutsedge tuber weight reduction.

#### *Roundup Resistant Sugar Beets*

On June 22, there was no crop injury for any of the treatment combinations containing Roundup (Table 2). All treatments including Progress, Upbeet, and Stinger, along with Ro-neet, Nortron, Dual Magnum, or BAS 656 07 H had significant amounts of crop injury (20 to 24 percent). On August 25, the only treatment showing a significant amount of injury was Progress, Upbeet, Stinger, and BAS 656 07 H (13 percent).

Similar to the Liberty trial, all treatments showed excellent nutsedge control. On the July 1 rating, nutsedge control ranged from 79 to 95 percent. Among the weaker treatments were Progress, Upbeet, and Stinger with Dual Magnum, BAS 656 07 H, or Nortron (79 to 84 percent). By the harvest date, only the treatment of Progress, Upbeet, Stinger, and BAS 656 07 H had below a 90-percent nutsedge control rating. All treatments provided 100 percent control of common lambsquarters and hairy nightshade except the Progress, Upbeet, Stinger, and BAS 656 07 H treatment at 96 percent (data not shown). Beet yields for all treatments were significantly higher than the untreated check.

All treatments significantly reduced the number of viable nutsedge tubers compared to the untreated check, except the combination of Progress, Upbeet, Stinger, and BAS 656 07 H. All other treatments appeared to be equal at reducing outlet numbers. All herbicide treatments significantly reduced the weight of nutsedge tubers compared to the untreated check. All herbicide treatments were equal at reducing the weight of viable tubers per plot.

Table 1. Sugar beet injury and root yields and yellow nutsedge control and tuber production in Liberty resistant sugar beets, Malheur Experiment Station, Oregon State University, Ontario, OR, 1999.

Treatment <sup>†</sup>	Rate lb ai/acre	Timing <sup>‡</sup>	Crop injury		Sugar beet root yield <sup>§</sup> ton/acre	Nutsedge control				Nutlet production	
			6-22	7-15		6-22	7-1	7-15	8-25	Number 1,000/acre	Weight ton/acre
			-----%-----		-----%-----						
Liberty	0.357	cot, 2-lf, 4-lf	0	0	23.5	78	87	98	100	10,114	0.27
Ro-neet	3.0	PPI	0	0	22.9	90	93	76	100	5,914	0.17
Liberty	0.357	cot, 2-lf, 4-lf									
Ro-neet	3.0	PPI	10	0	22.4	94	97	98	100	5,859	0.14
Progress + Upbeet + Stinger	0.5 + 0.031 + 0.094	cot, 2-lf, 4-lf									
Ro-neet	3.0	PPI	5	0	24.2	90	95	98	100	4,698	0.16
Liberty	0.357	cot, 2-lf, 4-lf									
Dual Magnum	1.6	2-lf									
Ro-neet	3.0	PPI	3	0	25.4	88	96	98	100	5,251	0.26
Liberty	0.357	cot, 2-lf, 4-lf									
BAS 656 07 H	0.64	2-lf									
Liberty	0.357	cot, 2-lf, 4-lf	1	0	23.4	85	92	98	100	6,080	0.16
Dual Magnum	1.6	2-lf									
Liberty	0.357	cot, 2-lf, 4-lf	0	1	23.4	82	93	98	100	10,170	0.36
BAS 656 07 H	0.64	2-lf									
Ro-neet	3.0	PPI	16	0	23.0	90	91	96	100	4,809	0.11
Progress+Upbeet	0.5 + 0.031	cot, 2-lf, 4-lf									
Stinger	+ 0.094										
Dual Magnum	1.6	2-lf									
Ro-neet	3.0	PPI	23	1	23.4	95	96	98	100	3,316	0.13
Progress+Upbeet	0.5 + 0.031	cot, 2-lf, 4-lf									
Stinger	+ 0.094										
BAS 656 07 H	0.64	2-lf									
Progress+Upbeet	0.5 + 0.031	cot, 2-lf, 4-lf	21	1	22.8	83	90	97	100	6,632	0.21
Stinger	+ 0.094										
Dual Magnum	1.6	2-lf									
Progress+Upbeet	0.5 + 0.031	cot, 2-lf, 4-lf	23	3	23.4	84	90	97	100	2,432	0.05
Stinger	+ 0.094										
BAS 656 07 H	0.64	2-lf									
Untreated			0	0	4.1	0	0	0	0	25,259	1.12
LSD (0.05)			5	2	2.1	10	5	19	-	7,625	0.33

<sup>†</sup>All Liberty treatments included AMS at 2.5 lb/acre.

<sup>‡</sup>PPI treatments were applied on May 5. Cotyledon, 2-leaf, and 4-leaf treatments were applied on May 27, June 7, and June 16.

<sup>§</sup>Sugar beets were harvested on August 26.

Table 2. Sugar beet injury and root yields and yellow nutsedge control and tuber production in Roundup resistant sugar beets, Malheur Experiment Station, Oregon State University, Ontario, OR, 1999.

Treatment <sup>†</sup>	Rate lb ai/acre	Timing <sup>‡</sup>	Crop injury		Sugar beet root yield <sup>§</sup> ton/acre	Nutsedge control				Nutlet production	
			6-22	8-25		6-22	7-1	7-15	8-25	Number	Weight
			-----%-----		-----%-----				1,000/acre	ton/acre	
Roundup	0.75	cot, 2-lf, 4-lf	0	3	22.4	82	95	95	93	9,175	0.44
Roundup	0.75	cot, 2-lf	0	3	20.3	80	91	90	88	16,968	0.69
Roundup	1.5	cot, 2-lf	0	0	22.6	89	93	88	90	13,486	0.69
Ro-neet	3.0	PPI	0	3	22.6	88	93	93	98	11,883	0.46
Roundup	0.75	cot, 2-lf, 4-lf									
Ro-neet	3.0	PPI	20	3	19.0	79	85	84	89	11,054	0.40
Progress + Upbeet + Stinger	0.5 + 0.031 + 0.094	cot, 2-lf, 4-lf									
Ro-neet	3.0	PPI	0	3	23.3	86	94	97	96	9,285	0.38
Roundup	0.75	cot, 2-lf, 4-lf									
Dual Magnum	1.6	2-lf									
Ro-neet	3.0	PPI	0	4	22.8	86	93	96	95	12,712	0.52
Roundup	0.75	cot, 2-lf, 4-lf									
BAS 656 07 H	0.64	2-lf									
Ro-neet	3.0	PPI	23	4	17.6	82	90	88	93	14,702	0.62
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	24	3	21.2	86	89	90	94	13,044	0.47
Progress + Upbeet + Stinger	0.5 + 0.031 + 0.094	cot, 2-lf, 4-lf									
BAS 656 07 H	0.64	2-lf									
Nortron	1.5	PPI	0	0	24.7	88	95	97	99	16,249	0.81
Roundup	0.75	cot, 2-lf, 4-lf									
Nortron	1.5	PPI	20	4	19.6	78	84	85	91	18,516	0.64
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	21	4	19.0	73	83	88	95	15,918	0.42
Dual Magnum	1.6	2-lf									
Progress + Upbeet + Stinger	0.5 + 0.031 + 0.094	cot, 2-lf, 4-lf	24	13	17.3	65	79	83	85	28,243	0.80
BAS 656 07 H	0.64	2-lf									
Dual Magnum	1.6	2-lf	0	4	22.6	85	94	97	100	10,888	0.48
Roundup	0.75	cot, 2-lf, 4-lf									
BAS 656 07 H	0.64	2-lf	0	0	23.2	84	95	98	100	16,415	0.72
Roundup	0.75	cot, 2-lf, 4-lf									
Untreated			0	0	3.4	0	0	0	0	34,599	1.58
LSD (0.05)			3	6	3.9	8	7	7	12	9,303	0.45

<sup>†</sup>All Roundup treatments included AMS at 2.5 lb/acre.

<sup>‡</sup>PPI treatments were applied May 5. Cotyledon, 2-leaf, and 4-leaf treatments were applied on May 27, June 7, and June 16.

<sup>§</sup>Sugar beets were harvested on August 26.