

# YELLOW NUTSEDGE CONTROL IN ONION AFTER THREE YEARS OF CORN HERBICIDES

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## Introduction

Yellow nutsedge has become a major weed threat in some agricultural fields in the Treasure Valley of eastern Oregon and southwestern Idaho. Onions are especially affected by yellow nutsedge because of their slow growth and lack of complete canopy cover. Field surveys have indicated an average of 42% onion yield reduction in fields heavily infested with yellow nutsedge (Ransom et al. 2003). Control of yellow nutsedge presents a challenge because of its ability to reproduce by rhizomes and tubers that are able to survive in the soil for 3 to 4 years. Farming activities and weed control throughout an entire crop rotation cycle preceding onion play a significant role in yellow nutsedge distribution in infested fields. The objective of this study was to evaluate yellow nutsedge control in onion after 3 years of growing corn using herbicides with proven efficacy on yellow nutsedge.

## Material and Methods

A study was conducted in a field infested with yellow nutsedge near Ontario, Oregon from 2010 to 2013. The field was previously planted to wheat. The wheat stubble was flailed and the field was plowed during fall 2010. The soil was Greenleaf silt loam with a pH of 6.9 and 1.75% organic matter. The field was then plowed and disked during fall and again during spring of 2010 to 2012 and was bedded on 22-inch spacing. Corn was grown following recommended local practices including fertilizers and insect control. Wooden stakes were used to mark the plots for easy identification during the duration of the study.

The study was a randomized complete block design with four replications. Individual plots measured 16 ft wide and 30 ft long. Preemergence herbicides included Dual II Magnum<sup>®</sup> at 2.5 pt/acre (s-metolachlor at 2.39 lb ai/acre) and Outlook<sup>®</sup> at 21 fl oz/acre (dimethenamid-p at 0.98 lb ai/acre). Postemergence herbicides included Halex GT<sup>®</sup> at 3.6 pt/acre (s-metolachlor at 2.09 + glyphosate at 2.09 + mesotrione at 0.209 lb ai/acre), Yukon<sup>®</sup> at 8 fl oz/acre (halosulfuron at 0.338 lb ai/acre) or twice at 4 fl oz/acre each, and GWN-3404 at 0.75 oz/acre. All postemergence treatments included glyphosate at either 22 or 32 fl oz/acre (0.77 or 1.13 lb ae/acre) and either ammonium sulfate (AMS) or Array<sup>®</sup>, Zenith<sup>™</sup>, and a non-ionic surfactant (NIS). The complete herbicide rates and application timings are listed on Tables 1 and 2. Herbicide treatments were applied using a CO<sub>2</sub>-pressurized backpack sprayer fitted with a boom equipped with four EVS8002 flat-fan nozzles to deliver a spray volume of 20 gal/acre.

Based on a soil test, 150 lb phosphate/acre, 100 lb sulfur/acre, 2 lb zinc/acre, and 1 lb boron/acre were broadcast in the fall of 2012 and the field was plowed and groundhogged. After fall

fertilization the field was fumigated with Telone<sup>®</sup> II (1,3 dichloropropene) at 18 gal/acre and simultaneously bedded on a 22-inch row spacing. On March 27, 2013, the beds were harrowed and flattened to create a smooth seedbed for planting onion.

Onion variety ‘Vaquero’ was planted on March 27 in double rows spaced 3 inches apart and 4-inch seed spacing within each row on beds spaced 22 inches apart. Immediately after planting, Lorsban<sup>®</sup> 15G (chlorpyrifos) at 3.7 oz/1,000 ft of row (0.101 lb ai/acre) was banded over the top of the onion rows and the soil surface was rolled. Onion emergence was observed on April 17, 2013.

The entire study area was sprayed with Prowl<sup>®</sup> H<sub>2</sub>O at 2 pt/acre (pendimethalin at 0.95 lb ai/acre) on May 1. On May 9, the field was sprayed with Buctril<sup>®</sup> at 16 fl oz/acre (bromoxynil at 0.25 lb ai/acre) plus Goal Tender<sup>®</sup> at 4 oz/acre (oxyfluorfen 0.125 lb ai/acre). Except for the untreated control, the plots were sprayed with Outlook at 21 fl oz/acre on May 12, 2013 to control yellow nutsedge when onions were at the 2-leaf stage. Plots were hand-weeded to remove weeds other than yellow nutsedge on June 17.

The first furrow irrigation was on April 11 and lasted 24 hours to supply about 4 inches of water (including runoff). All subsequent irrigations (11 times from May 2 to August 20, 2013) lasted the same duration and delivered the same amount of water.

Plants were sidedressed with urea on May 30 to supply nitrogen at 150 lb/acre. Onions were sprayed with Movento<sup>®</sup> at 5 oz/acre (spirotetramat at 0.078 lb ai/acre) tank-mixed with Pierce<sup>®</sup> at 1 pt/acre (methylated seed oil) on June 4 to control thrips. The onions were aerially sprayed for thrips control on June 13 using Radiant<sup>®</sup> (spinetoram) at 10 oz/acre (1.25 oz ai/acre) tank-mixed with Aza-Direct<sup>®</sup> at 16 oz/acre (azadirachtin at 0.197 lb ai/acre) plus a crop oil concentrate at 1 qt/100 gal of water. Subsequent aerial sprays for thrips control were on July 26 and July 14 using Radiant at 1.25 oz ai/acre and July 21 and 31 using Lannate<sup>®</sup> at 0.9 lb ai/acre each. Onions were visually evaluated for crop injury on April 26 and May 12, while yellow nutsedge control was evaluated on June 29 and July 30. Evaluations were based on 0 to 100%; where 0% = no weed control or crop injury and 100% = complete weed control or complete crop kill.

Plant tops were flailed and onion bulbs were lifted on September 10, 2013. Bulbs were hand-harvested from the two center rows on September 13 and graded on September 17, 2013. Bulbs were graded for quality and yield based on USDA standards. The data were subjected to analysis of variance and the treatment means were compared using LSD at 0.05% level of confidence.

## Results and Discussion

Evaluations on April 26 and May 12 indicated no apparent injury to onion seedlings from herbicides used to control yellow nutsedge in corn from 2010 to 2012 (data not shown). Plant stand on May 16 was similar across all treatments and ranged from 134,739 to 147,708 plants/acre (Table 1). Yellow nutsedge control on June 29 ranged from 74 to 89% across treatments (Table 1). Evaluation on July 30 indicated yellow nutsedge control ranged from 55 to 84% across all treatments compared to the untreated control.

Onion yield reflected the level of yellow nutsedge control (Table 2; Fig. 1). Small-size onion yield ranged from 29.6 to 74.0 cwt/acre across herbicide treatments compared to 92.6 cwt/acre

for the untreated control. The total marketable yield across herbicide treatments ranged from 298.7 to 511.1 cwt/acre compared to 202.6 cwt/acre for the untreated control.

These results indicated that 3 years of yellow nutsedge control in corn helped substantially to reduce yellow nutsedge, but may not be enough to reduce yellow nutsedge sufficiently to allow high onion yield. Yellow nutsedge exerts great competitive pressure on onion, resulting in greatly reduced yields. It is highly recommended that growers practice crop rotation, grow crops with full canopy cover, use registered herbicides to control yellow nutsedge in each crop, and use long crop rotations in fields severely infested with yellow nutsedge.

## **Reference**

Ransom, C. V., C. A. Rice, and J. K. Ishida. 2003. Yellow nutsedge competition in dry bulb onion production. Malheur Experiment Station Annual Report, 2004 Oregon State University Special Report 1055:97-101.

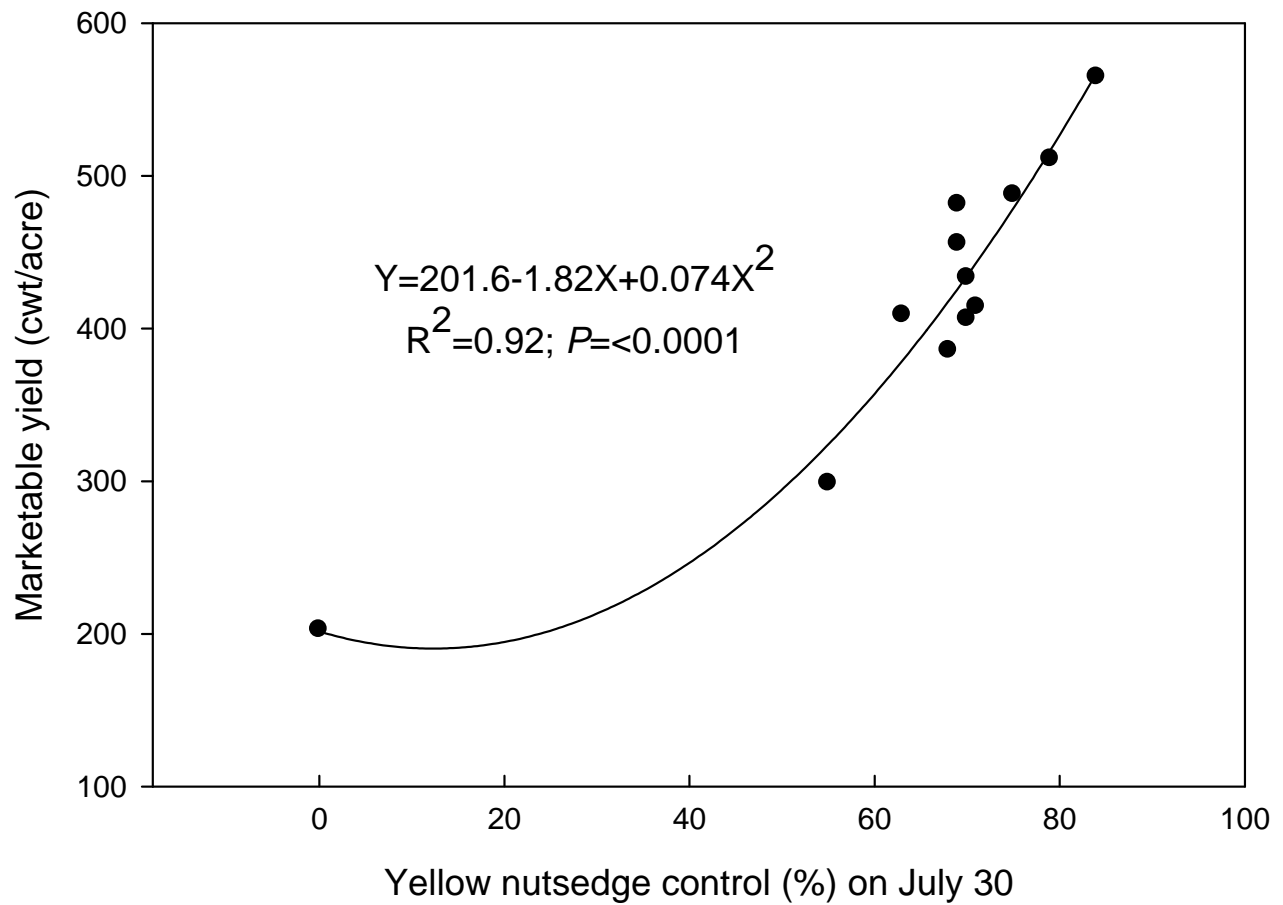


Figure 1. Onion yield as affected by yellow nutsedge control in a heavily infested field, Oregon State University, Malheur Experiment Station, Ontario, OR 2013.

Table 1. Yellow nutsedge control in onion planted after three years of corn herbicides to reduce yellow nutsedge pressure at the Malheur Experiment Station, Ontario, OR, 2013. Continued on next page.

Year	Treatment	Rate	Application timing <sup>a</sup>	Onion stand 5/16/2013 No./acre	Control Yellow nutsedge	
					6/29/2013	7/30/2013
					----- % -----	
2010-12	Untreated			144,738	0	0
2010	Yukon Herbicide + Roundup PowerMax + AMS + NIS	4 oz/a 20 fl oz/a 8 pt/a 0.4 pt/a	EPOST	134,739	78	70
	Yukon Herbicide + Roundup PowerMax + AMS + NIS	4 oz/a 20 fl oz/a 8 pt/a 0.4 pt/a	POST			
2011	Dual II Magnum Roundup PowerMax + AMS	2.5 pt/a 22 fl oz/a 8 pt/a	PPI POST			
2012	Dual II Magnum	2.5 pt/a	PPI			
2010	Yukon Herbicide + Roundup PowerMax + AMS + NIS	8 oz/a 20 fl oz/a 8 pt/a 0.4 pt/a	EPOST	139,293	79	75
2011	Dual II Magnum Roundup PowerMax + AMS	2.5 pt/a 22 fl oz/a 8 pt/a	PPI POST			
2012	Dual II Magnum	2.5 pt/a	PPI			
2010	Yukon Herbicide + Roundup PowerMax + AMS + NIS	8 oz/a 20 fl oz/a 8 pt/a 0.4 pt/a	POST	143,649	79	70
2011	Dual II Magnum Roundup PowerMax + AMS	2.5 pt/a 22 fl oz/a 8 pt/a	PPI POST			
2012	Dual II Magnum	2.5 pt/a	PPI			
2010	Yukon Herbicide + Roundup PowerMax + AMS + NIS + WETCIT	8 oz/a 20 fl oz/a 8 pt/a 0.4 pt/a 100 fl oz/100gal	POST	141,669	78	71
2011	Outlook Roundup PowerMax + AMS	21 oz/a 22 fl oz/a 8 pt/a	PPI POST			
2012	Dual II Magnum	2.5 pt/a	PPI			

<sup>a</sup>EPOST = Early postemergence; POST = postemergence; PPI = preplant incorporated.

Table 1. Yellow nutsedge control in onion planted after three years of corn herbicides to reduce yellow nutsedge pressure at the Malheur Experiment Station, Ontario, OR, 2013. Continued on next page.

Year	Treatment	Rate	Application timing <sup>a</sup>	Onion stand 5/16/2013 No./acre	Control Yellow nutsedge	
					6/29/2013	7/30/2013
					-----	% -----
2010	Halex GT + AMS + NIS	3.6 pt/a 5 gal/100gal 0.8 pt/a	POST	146,817	88	84
2011	Halex GT + AMS + NIS + Roundup PowerMax + AMS	3.6 pt/a 5 gal/100gal 0.8 pt/a 22 fl oz/a 8 pt/a	POST			
2012	Dual II Magnum	2.5 pt/a	PPI			
2010	Sequence + AMS	3 pt/a 5 gal/100gal	POST	140,877	75	69
2011	Yukon Herbicide + Roundup PowerMax + AMS + NIS	8 oz/a 20 fl oz/a 8 pt/a 0.4 pt/a	EPOST			
2012	Dual II Magnum	2.5 pt/a	PPI			
2010	Roundup PowerMax + AMS Roundup PowerMax + AMS	22 fl oz/a 8 pt/a 22 fl oz/a 8 pt/a	POST	138,006	74	55
2011	Roundup PowerMax + AMS Roundup PowerMax + AMS	22 fl oz/a 8 pt/a 22 fl oz/a 8 pt/a	POST			
2012	Dual II Magnum	2.5 pt/a	PPI			
2010	Roundup PowerMax + AMS Roundup PowerMax + AMS	32 fl oz/a 8 pt/a 32 fl oz/a 8 pt/a	POST	140,778	85	79
2011	GWN-3404 + Roundup PowerMax + AMS + NIS	0.75 oz/a 20 fl oz/a 4 pt/a 0.4 pt/a	POST			
2012	Dual II Magnum	2.5 pt/a	PPI			

<sup>a</sup>EPOST = Early postemergence; POST = postemergence; PPI = preplant incorporated.

Table 1. Continued. Yellow nutsedge control in onion planted after three years of corn herbicides to reduce yellow nutsedge pressure at the Malheur Experiment Station, Ontario, OR, 2013.

Year	Treatment	Rate	Application timing <sup>a</sup>	Onion stand 5/16/2013 No./acre	Control Yellow nutsedge		
					6/29/2013	7/30/2013	
					-----	%	-----
2010	Roundup PowerMax +	22 fl oz/a	POST	138,600	74	63	
	AMS +	8 pt/a					
	WETCIT	50 fl oz/100gal					
	Roundup PowerMax +	22 fl oz/a					
	AMS +	8 pt/a					
	WETCIT	50 fl oz/100gal					
2011	Roundup PowerMax +	22 fl oz/a	POST				
	AMS +	8 pt/a					
	WETCIT	100 fl oz/100gal					
	Roundup PowerMax +	22 fl oz/a					
	AMS +	8 pt/a					
	WETCIT	100 fl oz/100gal					
2012	Dual II Magnum	2.5 pt/a	PPI				
2010	Roundup PowerMax +	22 fl oz/a	POST	147,708	85	69	
	AMS +	8 pt/a					
	WETCIT	100 fl oz/100gal					
	Roundup PowerMax +	22 fl oz/a					
	AMS +	8 pt/a					
	WETCIT	100 fl oz/100gal					
2011	Roundup PowerMax +	22 fl oz/a	POST				
	ARRAY	9 lb/100gal					
	Roundup PowerMax +	22 fl oz/a					
	ARRAY	9 lb/100gal					
2012	Dual II Magnum	2.5 pt/a	PPI				
2010	Roundup PowerMax +	32 fl oz/a	POST	138,501	78	68	
	AMS +	8 pt/a					
	WETCIT	100 fl oz/100gal					
	Roundup PowerMax +	32 fl oz/a					
	AMS +	8 pt/a					
	WETCIT	100 fl oz/100gal					
2011	Roundup PowerMax +	22 fl oz/a	POST				
	ZENITH	2.25 lb/a					
	Roundup PowerMax +	22 fl oz/a					
	ZENITH	2.25 lb/a					
2012	Dual II Magnum	2.5 pt/a	PPI				
LSD ( $P = 0.05$ )				8,892.0	14.7	23.1	

<sup>a</sup>EPOST = Early postemergence; POST = postemergence; PPI = preplant incorporated.

Table 2. Onion yield in response to three years of corn herbicides to reduce yellow nutsedge pressure at the Malheur Experiment Station, Oregon State University, Ontario, OR, 2013. Continued on next page.

Year	Treatment	Rate	Application timing <sup>a</sup>	Marketable yield by grade			Total
				Small <2¼ inch	medium 2¼-3 inch	jumbo 3-4 inch	
				----- cwt/acre -----			
2010-12	Untreated			92.6	161.8	40.8	202.6
2010	Yukon Herbicide + Roundup PowerMax + AMS + NIS	4 oz/a 20 fl oz/a 8 pt/a 0.4 pt/a	EPOST	50.4	212.6	193.8	406.4
	Yukon Herbicide + Roundup PowerMax + AMS + NIS	4 oz/a 20 fl oz/a 8 pt/a 0.4 pt/a	POST				
2011	Dual II Magnum	2.5 pt/a	PPI				
	Roundup PowerMax + AMS	22 fl oz/a 8 pt/a	POST				
2012	Dual II Magnum	2.5 pt/a	PPI				
2010	Yukon Herbicide + Roundup PowerMax + AMS + NIS	8 oz/a 20 fl oz/a 8 pt/a 0.4 pt/a	EPOST	39.4	225.3	262.2	487.6
2011	Dual II Magnum	2.5 pt/a	PPI				
	Roundup PowerMax + AMS	22 fl oz/a 8 pt/a	POST				
2012	Dual II Magnum	2.5 pt/a	PPI				
2010	Yukon Herbicide + Roundup PowerMax + AMS + NIS	8 oz/a 20 fl oz/a 8 pt/a 0.4 pt/a	POST	61.1	235.6	197.7	433.3
2011	Dual II Magnum	2.5 pt/a	PPI				
	Roundup PowerMax + AMS	22 fl oz/a 8 pt/a	POST				
2012	Dual II Magnum	2.5 pt/a	PPI				
2010	Yukon Herbicide + Roundup PowerMax + AMS + NIS + WETCIT	8 oz/a 20 fl oz/a 8 pt/a 0.4 pt/a 100 fl oz/100gal	POST	53.9	223.7	190.5	414.2
2011	Outlook	21 oz/a	PPI				
	Roundup PowerMax + AMS	22 fl oz/a 8 pt/a	POST				
2012	Dual II Magnum	2.5 pt/a	PPI				

<sup>a</sup>EPOST = Early postemergence; POST = postemergence; PPI = preplant incorporated.



Table 2. Onion yield in response to three years of corn herbicides to reduce yellow nutsedge pressure at the Malheur Experiment Station, Oregon State University, Ontario, OR, 2013. Continued on next page.

Year	Treatment	Rate	Application timing	Marketable yield by grade			Total
				Small <2¼ inch	medium 2¼-3 inch	jumbo 3-4 inch	
2010	Halex GT + AMS + NIS	3.6 pt/a 5 gal/100gal 0.8 pt/a	POST	29.6	232.8	332.0	564.8
2011	Halex GT + AMS + NIS + Roundup PowerMax + AMS	3.6 pt/a 5 gal/100gal 0.8 pt/a 22 fl oz/a 8 pt/a	POST				
2012	Dual II Magnum	2.5 pt/a	PPI				
2010	Sequence + AMS	3 pt/a 5 gal/100gal	POST	54.4	232.9	221.3	455.6
2011	Yukon Herbicide + Roundup PowerMax + AMS + NIS	8 oz/a 20 fl oz/a 8 pt/a 0.4 pt/a	EPOST				
2012	Dual II Magnum	2.5 pt/a	PPI				
2010	Roundup PowerMax + AMS Roundup PowerMax + AMS	22 fl oz/a 8 pt/a 22 fl oz/a 8 pt/a	POST	74.0	132.2	166.5	298.7
2011	Roundup PowerMax + AMS Roundup PowerMax + AMS	22 fl oz/a 8 pt/a 22 fl oz/a 8 pt/a	POST				
2012	Dual II Magnum	2.5 pt/a	PPI				
2010	Roundup PowerMax + AMS Roundup PowerMax + AMS	32 fl oz/a 8 pt/a 32 fl oz/a 8 pt/a	POST	33.8	221.3	287.2	511.1
2011	GWN-3404 + Roundup PowerMax + AMS + NIS	0.75 oz/a 20 fl oz/a 4 pt/a 0.4 pt/a	POST				
2012	Dual II Magnum	2.5 pt/a	PPI				

<sup>a</sup>EPOST = Early postemergence; POST = postemergence; PPI = preplant incorporated.

Table 2. Continued. Onion yield in response to three years of corn herbicides to reduce yellow nutsedge pressure at the Malheur Experiment Station, Oregon State University, Ontario, OR, 2013.

Year	Treatment	Rate	Application timing	Marketable yield by grade			Total
				Small <2¼ inch	medium 2¼-3 inch	jumbo 3-4 inch	
				----- cwt/acre -----			
2010	Roundup PowerMax +	22 fl oz/a	POST	54.4	216.3	192.6	409.0
	AMS +	8 pt/a					
	WETCIT	50 fl oz/100gal					
	Roundup PowerMax +	22 fl oz/a	POST				
	AMS +	8 pt/a					
	WETCIT	50 fl oz/100gal					
2011	Roundup PowerMax +	22 fl oz/a	POST				
	AMS +	8 pt/a					
	WETCIT	100 fl oz/100gal					
	Roundup PowerMax +	22 fl oz/a	POST				
	AMS +	8 pt/a					
	WETCIT	100 fl oz/100gal					
2012	Dual II Magnum	2.5 pt/a	PPI				
2010	Roundup PowerMax +	22 fl oz/a	POST	44.9	264.9	216.5	481.4
	AMS +	8 pt/a					
	WETCIT	100 fl oz/100gal					
	Roundup PowerMax +	22 fl oz/a	POST				
	AMS +	8 pt/a					
	WETCIT	100 fl oz/100gal					
2011	Roundup PowerMax +	22 fl oz/a	POST				
	ARRAY	9 lb/100gal					
	Roundup PowerMax +	22 fl oz/a	POST				
	ARRAY	9 lb/100gal					
2012	Dual II Magnum	2.5 pt/a	PPI				
2010	Roundup PowerMax +	32 fl oz/a	POST	60.9	213.5	172.2	385.7
	AMS +	8 pt/a					
	WETCIT	100 fl oz/100gal					
	Roundup PowerMax +	32 fl oz/a	POST				
	AMS +	8 pt/a					
	WETCIT	100 fl oz/100gal					
2011	Roundup PowerMax +	22 fl oz/a	POST				
	ZENITH	2.25 lb/a					
	Roundup PowerMax +	22 fl oz/a	POST				
	ZENITH	2.25 lb/a					
2012	Dual II Magnum	2.5 pt/a	PPI				
LSD ( <i>P</i> = 0.05)				49.6	82.6	192.9	209.5

<sup>a</sup>EPOST = Early postemergence; POST = postemergence; PPI = preplant incorporated.