YELLOW NUTSEDGE CONTROL IN CORN AND DRY BEAN CROPS

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Introduction

Yellow nutsedge is an increasing weed problem in the Treasure Valley of eastern Oregon and southwestern Idaho. Yellow nutsedge is particularly detrimental in onion production due to the noncompetitive nature of the crop and the ability of yellow nutsedge to proliferate under the growing conditions that exist in onion production. Previous research conducted in the Treasure Valley evaluating yellow nutsedge control in onion has met with limited success, in part due to the lack of effective herbicide options and the weed's ability to germinate over long periods of time during the growing season. An integrated approach is needed to manage yellow nutsedge, including the use of effective herbicide treatments in each of the crops within a rotation. In 2003, several herbicide treatments in corn and dry bean significantly reduced the number of yellow nutsedge tubers in the soil. This research was conducted to further evaluate the effects of crop species and herbicides on growth and development of yellow nutsedge in field corn and dry bean production.

Methods

Studies were conducted in a field heavily infested with yellow nutsedge located north of Ontario on the Oregon Slope. The soil was a Owyhee silt loam with pH 8.5 and 1.7 percent organic matter. The field was disked on May 19 and ground hogged on May 20. The field was bedded for corn and dry bean on May 21 and preirrigated. Plots were 7.33 ft wide and 30 ft long and were replicated 4 times and arranged in a randomized block design. Pretreatment nutsedge tubers were sampled May 31, which consisted of taking 8 core samples measuring 4.25 inches in diameter and 7 inches deep from the center furrow within each individual plot. The samples were combined and the tubers were extracted from the soil by washing the soil through screens with 11/64-inch holes. To determine treatment effects on tuber numbers, core samples were taken again at harvest. Season-end core samples were taken from the bed tops of the center two rows in each plot. Four cores were sampled from each row. The extraction process for season-end yellow nutsedge tubers was the same as for the initial samples. In total, tuber sampling involved taking 1,280 core samples and washing tubers from approximately 3.9 tons of soil. Herbicide applications were made with a CO_2-pressurized backpack sprayer calibrated to deliver 20 gal/acre at 30 psi. Crop injury and visual evaluations of yellow nutsedge control were made throughout the growing season. Yields were taken for each crop by harvesting the center two rows of each plot.

Corn

Beds were sidedressed with 150 lbs of nitrogen (N) on May 31. The field was harrowed on June 1 and preplant incorporated (PPI) Dual ll Magnum® (s-metolachlor) treatments were applied to plots and incorporated by making two passes with the bed harrow in opposite directions. Pioneer 'P-36N69 Roundup Ready' field corn was planted on June 1 on a 7-inch seed spacing on 22-inch rows. Mid-postemergence treatments were applied June 21 and late postemergence treatments were applied on June 29. Postemergence treatments included Basagran® (bentazon), Permit® (halosulfuron), and Roundup® (glyphosate). Basagran and Roundup were applied once following PPI Dual Magnum, twice alone, or twice following PPI Dual Magnum. Permit was applied once alone and in combination with Basagran following PPI Dual Magnum. Basagran and Permit were applied in combination with a crop oil concentrate (COC) while ammonium sulfate (AMS) was added to Roundup applications. Yield was determined by harvesting ears from the center two rows of each plot on October 12. The ears were shelled, and grain moisture content and weights were recorded. Final yields were adjusted to 12 percent moisture content.

Dry Bean

On May 31, plots were sidedressed with 150 lb N/acre. On June 1, beds were harrowed, and PPI herbicide treatments were applied and incorporated by harrowing the beds twice more in opposite directions. PPI treatments included Dual Magnum® (s-metolachlor), Eptam® (EPTC), and a combination of Dual Magnum plus Eptam. Small white beans ('Aurora' variety) were planted and Prowl® (pendimethalin) was applied preemergence to help control weeds other than yellow nutsedge. On June 11, due to poor bean emergence, we decided to replant. The field was sprayed with 0.75 lb ai/acre Roundup and 2.5 lb/acre of AMS to remove the beans that had emerged. A different variety of pinto bean 'Othello' was planted on June 14. Postemergence treatments were applied July 6 and included Sandea® (halosulfuron) plus nonionic surfactant (NIS) and Basagran plus COC. The plots treated with Basagran received a second application of Basagran on July 21. On September 16, plants were pulled from the center two rows of each plot to determine dry bean yield. After the bean plants had dried, the beans were threshed by with a Hege plot combine.

Results and Discussion

Corn

The corn rotation had some of the best yellow nutsedge control and all treatments had less tuber production compared to the untreated check (Table 1). Corn was not injured by any of the herbicide treatments evaluated. Yellow nutsedge control ranged from 68 to 97 percent on July 8 and 79 to 97 percent on July 28 (Table 1). Dual II Magnum alone and Roundup applied twice provided the least control on July 8 and Dual II Magnum provided less control than all other treatments on July 28. Treatments with herbicides applied PPI and followed by multiple postemergence (POST) applications tended to have greater yellow nutsedge control than treatments with only PPI or POST treatments. Tuber numbers increased by 55 percent in the untreated plots. In herbicide-treated plots the change in yellow nutsedge tuber numbers ranged from a 68

percent decrease to a 2 percent increase. Dual II Magnum followed by Permit plus COC resulted in significantly fewer tubers than Dual II Magnum followed by one application of Basagran plus COC. Corn yields did not differ significantly among treatments and ranged from 224 to 246 bu/acre.

Dry Bean

Dry beans also appear to have effective options for yellow nutsedge control. On the July 8 evaluation, yellow nutsedge control was significantly better with Eptam plus Dual Magnum when both were applied PPI as compared to Eptam applied PPI and Dual Magnum applied preemergence (PRE) (Table 2). On July 8, treatments with Dual Magnum applied PPI were more effective than Eptam PPI followed by Dual Magnum PRE. At this rating, POST treatments had been applied only 2 days earlier and yellow nutsedge was not exhibiting symptoms. On July 28, herbicide treatments provided 59-91 percent yellow nutsedge control. Treatments with only PPI or POST herbicides were generally less effective than combinations with a PPI application followed by one or two POST herbicide applications. Yellow nutsedge tuber numbers increased by 77 percent in the untreated plot. In the herbicide-treated plots, the change in yellow nutsedge tuber numbers ranged from a 43 percent decrease to a 7 percent increase with no significant differences between herbicide treatments. All herbicide treatments increased dry bean yield compared to the untreated check. Basagran applied twice POST had lower bean yield than Eptam plus Dual Magnum applied PPI.

Table 1. Corn yield, yellow nutsedge control, and yellow nutsedge tuber response to herbicide treatments, Malheur Experiment Station, Oregon State University, Ontario, OR, 2004.

				Nutsedge control		Average nutsedge tubers		
Treatment[a]	Rate	Timing[b]	Crop yield	7-8	7-28	Initial	Final	Change
	lb ai/acre %v/v		bu/acre	----------%----------		----------no/ft^2---------		---%---
Untreated control	--	--	224	--	--	148	220	55
Dual II Magnum	1.6	PPI	243	68	79	164	77	-32
Basagran + COC Basagran + COC	1.0 + 1.0 % 1.0 + 1.0%	MP LP	240	94	86	172	62	-57
Roundup + AMS Roundup + AMS	0.58 + 2.5 0.58 + 2.5	MP LP	235	69	88	193	75	-54
Dual II Magnum Basagran + COC	1.6 1.0 + 1.0%	PPI LP	236	84	89	123	78	2
Dual II Magnum Roundup + AMS	1.6 0.58 + 2.5	PPI MP	246	79	87	154	72	-49
Dual II Magnum Permit + COC	1.6 0.031 + 1.0%	PPI MP	231	83	95	238	64	-68
Dual II Magnum Basagran + Permit + COC	1.6 1.0 + 0.031 + 1.0%	PPI MP	229	97	97	260	69	-67
Dual II Magnum Roundup + AMS Roundup + AMS	1.6 0.58 + 2.5 0.58 + 2.5	PPI MP LP	245	83	92	248	89	-53
Dual II Magnum Basagran + COC Basagran + COC	1.6 1.0 + 1.0% 1.0 + 1.0%	PPI MP LP	242	96	97	199	73	-58
LSD (0.05)	--	--	NS	10	6	NS	33	59

[a]COC = crop oil concentrate, AMS = ammonium sulfate.
[b]Application timing abbreviations and dates: Preplant incorporated (PPI) on June 1, mid-postemergence (MP) on June 21, and late postemergence (LP) on June 29.

Table 2. Dry bean yield, yellow nutsedge control, and yellow nutsedge tuber response to herbicide treatments, Malheur Experiment Station, Oregon State University, Ontario, OR, 2004.

				Nutsedge control		Average nutsedge tubers		
Treatment[a]	Rate	Timing[b]	Crop yield	7/8	7/28	Initial	Final	Change
	lb ai/acre %v/v		cwt/acre	----------%----------		----------no/ft^2----------		---%---
Untreated control			33	--	--	236	365	77
Dual Magnum	1.6	PPI	41	76	59	198	149	3
Eptam Dual Magnum	3.9 1.6	PPI PRE	42	40	68	352	231	-14
Eptam Dual Magnum	3.9 1.3	PPI PPI	45	78	76	218	141	-28
Dual Magnum Sandea + NIS	1.6 .031+.25%	PPI POST	44	81	91	235	172	7
Dual Magnum Sandea + Basagran + NIS	1.6 .031+ 1.0+.25%	PPI POST POST	43	73	91	271	128	-43
Basagran + COC Basagran + COC	1.0+1.0% 1.0+1.0%	POST LP	40	4	70	255	177	-24
Dual Magnum Basagran + COC	1.6 1.0+1.0%	PPI POST	43	75	85	206	155	-12
Dual Magnum Basagran + COC Basagran + COC	1.6 1.0+1.0% 1.0+1.0%	PPI POST LP	42	75	90	279	158	-20
LSD (0.05)			4	20	10	156	75	65

[a]The entire trial was treated with Prowl (1.0 lb ai/acre) preemergence for control of weeds other than yellow nutsedge. NIS = non-ionic surfactant, COC = crop oil concentrate.
[b]Application timing abbreviations and dates: Preplant incorporated (PPI) on June 1, preemergence (PRE), postemergence (POST) on July 6, and late postemergence (LP) on July 21.