

CONTROL OF YELLOW NUTSEDGE AND LATE EMERGING WEEDS IN ONIONS

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Introduction

Effective weed control is essential for the production of marketable onions. Perennial weeds like yellow nutsedge, and annual weeds that emerge late in the season continue to reduce yields in commercial onion production. Trials were conducted to identify herbicides and weed control programs that will provide effective weed control in onions. Onion yield reduction caused by yellow nutsedge was measured in growers' fields.

Procedures

Trials were conducted at the Malheur Experiment Station and on cooperators' fields to evaluate new and registered herbicides for weed control and onion tolerance. Herbicides were evaluated for control of late emerging weeds and for control of yellow nutsedge. Other trials were conducted to evaluate a new herbicide, BAS 656 07 H for annual weed control in onions and to determine if preemergence applications of Prowl could injure onions under high moisture conditions. All herbicide treatments were applied with a CO₂-pressurized backpack sprayer calibrated to deliver 20 gpa at 30 psi.

Data were analyzed using analysis of variance, and means were separated using a protected least significant difference at the 5 percent level, LSD (0.05).

On Station Trials

On April 13, onions (cv. Viper, Asgrow) were planted at a 4-in spacing in double rows on 22-in beds. Plots were 4-rows wide and 30-ft long and arranged in a randomized block design with three replications. Lorsban was applied as a 6-in band over each row at 3.7 oz/1000 ft of row. Onions were sidedressed with 166 lb N/acre as Urea on June 5. A severe hail storm on July 4 defoliated all the onions. Insecticides and fungicides were applied for thrip and powdery mildew control.

Late Emerging Weed Trial. Sequential applications of Buctril and Buctril plus Goal were applied as a standard weed control program, and Prowl was added at various application times to provide residual weed control. Early applications of Prowl were compared to later applications and to a split application, where half of the Prowl was applied during the first herbicide application and the rest was applied at Lay-by. Prowl

was also compared to other herbicides for residual weed control. Herbicide applications were made May 8 (1 leaf), May 18 (2 leaf), June 22 (5 leaf), and July 27 (lay-by). The hail storm delayed the lay-by applications, and all plots were hand-weeded before the application of the lay-by treatments. At lay-by, Prowl, Treflan, Dual II Magnum, BAS 656 07 H, Nortron, Dual II Magnum plus Prowl, and Prowl plus Treflan were applied. Weed control was evaluated throughout the season, and onions were harvested on September 28.

Weed Control with BAS 656 07 H. BAS 656 07 H was evaluated for weed control in onions. Combinations with BAS 656 07 H were made May 28 when onions had two true leaves. Buctril was applied to all plots except the untreated as a sequential treatment on May 8, May 18, and June 22. At the time the BAS 656 07 H and Frontier treatments were applied, most of the broadleaf weeds had been controlled while barnyardgrass was not. Weed control and onion injury were evaluated throughout the season.

Onion Tolerance to Preemergence Prowl Applications. For this trial, onions (cv. Vision, Petoseed) were planted at a 4-in spacing in double rows on 22-in beds on April 20. Plots were 4-rows wide and 30-ft long and arranged in a randomized block design with four replications. So that any possible negative effects of Prowl on onions could be isolated from weed control effects, all plots were maintained weed-free by applications of Buctril and Poast and by handweeding. Prowl was applied at three rates (0.5, 0.75, and 1.0 lb ai/acre) and at four different timings. Applications were made immediately after planting (preemergence), after the onions had germinated but had not yet emerged (delayed preemergence), at the loop stage, and to 2-leaf onions. Applications were made April 22, May 1, May 11, and May 28. After each Prowl application, 0.5 in of water was applied with overhead sprinklers. At this site the soil is a silt loam with 2.3 percent organic matter and pH 7.1. Onion injury and stand were evaluated, and onions were harvested and graded to determine yields.

Off Station Trials

Yellow Nutsedge Control Trials. Yellow nutsedge control in onions was studied at two locations, one in Nyssa and the other in Owyhee Junction. At each location, ten treatments were evaluated in plots replicated four times. Treatments included Dual II Magnum, BAS 656 07 H, and Basagran alone and in various combinations. Treatments were applied June 18 and 30 at both locations. At Owyhee Junction, yellow nutsedge was so prolific that Basagran was applied over the entire trial on July 27. Because of a poor onion stand at this location and heavy yellow nutsedge pressure, onion yields were not taken. At Nyssa, the yellow nutsedge stand was too variable, and plots were not harvested.

Yield Reductions from Yellow Nutsedge in Commercial Onion Production. Onions were harvested from five commercial fields to document yield losses from yellow

nutsedge competition. Onion varieties and management practices were variable among all five locations. At each location, paired samples were replicated six times throughout each field. Onions were harvested from 5 ft of row within a yellow nutsedge patch and in adjacent areas outside of the patch. At each sample area the number of yellow nutsedge shoots per square meter were counted. Onions were graded before determining the percentage of yield reduction.

Results and Discussion

On Station Trials

Late Emerging Weed Trial. Early or late applications of Prowl and lay-by applications of the other soil-active herbicides improved redroot pigweed control (Table 1). All lay-by applications increased common lambsquarters control. Prowl applied at the second application did not increase common lambsquarters control compared to no lay-by. Prowl and Nortron applied at lay-by did not improve barnyardgrass control compared to no lay-by. Onion yields were very low following severe hail July 4. Untreated onions yielded only 2 cwt/acre under high weed pressure. Plots receiving treatments containing Dual II Magnum as a lay-by had among the lowest total onion yields of the herbicide treatments. Timely application of lay-by herbicides will allow comparison of the various strengths of the different herbicides in future years.

Weed Control with BAS 656 07 H. BAS 656 07 H provided better control of redroot pigweed, common lambsquarters, and barnyardgrass than Frontier on August 28 (Table 2). The addition of Poast to BAS 656 07 H combinations increased barnyardgrass control early in the season, but differences were less apparent at the last evaluation date. The tank mixture including BAS 656 07 H with Buctril, Prowl, and Poast provided the most consistent control of all weeds present. The tank mixture of BAS 656 07 H and Goal also provided good control of broadleaf weeds, but was less effective on barnyardgrass. Since BAS 656 07 H will not control weeds that have emerged, if it becomes available for use in onions it will need to be applied in herbicide combinations that will control the weeds that are present at the time of application. BAS 656 07 H may contribute to lay-by weed control.

Onion Tolerance to Preemergence Prowl Applications. In this trial, onions were unaffected by Prowl applications regardless of Prowl rate or application timing (Table 3). No visual injury or stand loss were observed. Onion yields and grade were reduced by severe hail but were not different among treatments. It appears that in a silt loam soil, Prowl could be applied preemergence without causing significant crop injury. However, the current label does not allow Prowl to be applied to onions with less than two true leaves.

Off Station Trials

Yellow Nutsedge Control Trials. At Nyssa, tank mixtures of Basagran with Dual II Magnum or BAS 656 07 H caused 50 and 41 percent injury to onions 12 days after application (Table 4). The initial injury was still apparent when evaluated on August 4. Evaluations of yellow nutsedge control were too variable at this site because of the low yellow nutsedge population. While most of the combinations provided similar yellow nutsedge control (68 to 79 percent), a single application of Basagran was insufficient (31 percent). At Owyhee Junction, onion injury was not discernable. Dual II Magnum plus BAS 656 07 H applied once, and Dual II Magnum, BAS 656 07 H, and Basagran applied at the first application followed by Basagran 10 days later provided the greatest yellow nutsedge control. Applications of Basagran with Dual II Magnum or BAS 656 07 H in a tank mixture were not as effective as when Dual II Magnum and BAS 656 07 H were applied initially and followed by an application of Basagran a week later.

Yield Reductions from Yellow Nutsedge in Commercial Onion Production. Yellow nutsedge densities at the different locations ranged from 17 to 42 shoots per square foot (Table 5). Those densities would be equal to 750,000 and 1,800,000 shoots per acre. Total onion yields were reduced by 32 to 77 percent depending on the location, with the largest reductions in jumbo (20-93 percent) and colossal onions (36-100 percent). Location 5 had the highest population of yellow nutsedge, and the yellow nutsedge had been present all season. Losses at this location were 77 percent for total onion yield and 93 and 100 percent for jumbo and colossal onions respectively. Yellow nutsedge density and the duration of competition both have an important affect on onion yields. Averaged across all five locations, yellow nutsedge competition increased the production of small onions, did not affect medium onion yields, and decreased jumbo and colossal onion yields.

Table 1. Weed control and onion yield in response to various lay-by treatments following severe hail, Malheur Experiment Station, Oregon State University, Ontario, OR, 1998.

Treatment [†]	Rate lb ai/acre	Timing	Weed control					Total onion yield cwt/acre
			Redroot pigweed	Common lambsquarters	Hairy nightshade	Barnyard- grass	Annual sowthistle	
No Lay-by	-	-	80	85	92	81	80	374
Prowl	1.5	1 Leaf	97	94	94	96	76	394
Prowl	1.5	2 Leaf	89	92	98	96	95	382
Prowl	1.5	Lay-by	96	98	95	84	98	428
Prowl + Prowl	0.75 + 0.75	1 Leaf + Lay-by	96	98	98	95	92	348
Treflan	0.75	Lay-by	94	98	98	98	95	358
Dual II Magnum + Prowl	1.9 + 1.5	Lay-by	96	99	94	97	100	267
Dual II Magnum	1.9	Lay-by	98	98	94	92	94	263
BAS 656 07 H	0.64	Lay-by	98	98	94	95	92	433
Nortron	0.75	Lay-by	95	96	92	81	93	361
Prowl + Treflan	0.75 + 0.75	Lay-by	98	98	96	90	89	339
Untreated	-	-	0	0	0	0	0	2
LSD (0.05)			9	8	6	9	11	86

[†]All plots except the untreated received Buctril May 8 (1 Leaf), Buctril plus Goal on May 18 (2 Leaf), and Buctril on June 22. All plots were also handweeded before application of lay-by treatments on July 27.

Table 2. Weed control with BAS 656 07 H combinations, Malheur Experiment Station, Oregon State University, Ontario, OR, 1998.

Treatment†	Rate	Timing‡	Weed control										
			Onion injury		Redroot pigweed		Common lambsquarters		Hairy nightshade		Barnyardgrass		Annual sowthistle
			6-23	8-28	6-23	8-28	6-23	8-28	6-23	8-28	6-23	8-28	8-28
lb ai/acre	-----%-----		-----%-----										
Frontier	1.17	2 Leaf	0	0	95	62	83	67	94	60	23	55	89
BAS 656 07 H	0.65	2 Leaf	0	0	98	88	98	98	95	63	30	81	87
BAS 656 07 H + Poast	0.65 + 0.38	2 Leaf	0	0	95	77	98	78	95	68	97	81	98
BAS 656 07 H + Buctril	0.65 + 0.25	2 Leaf	0	0	98	98	98	95	98	84	40	67	98
BAS 656 07 H + Prowl + Buctril + Poast	0.65 + 1.0 + 0.25 + 0.38	2 Leaf	3	0	98	98	98	98	98	92	97	98	98
BAS 656 07 H + Goal	0.65 + 0.15	2 Leaf	0	0	98	86	98	98	98	95	60	75	98
Untreated	-	-	0	0	0	0	0	0	0	0	0	0	0
LSD (0.05)			2	NS	4	20	13	23	6	22	18	23	17

†All plots except the untreated received Buctril (0.15 lb ai/ac) on May 8, May 18, and June 22.

‡Application to 2-leaf onions was on May 28.

Table 3. Onion injury, density, yield, and grade in response to Prowl rates and timing, Onions suffered severe hail damage on July 4, Malheur Experiment Station, Oregon State University, Ontario, OR, 1998.

Treatment [†]	Rate	Timing [‡]	Onion injury	Onion density		Onion yield [§]				
				5-20	6-8	Small	Medium	Jumbo	Colossal	Total
	lb ai/acre		--%--	----no./m----	-----cwt/acre-----					
Prowl	0.5	PRE	0	15	15	10	55	419	14	496
Prowl	0.75	PRE	0	14	15	8	31	450	28	517
Prowl	1.0	PRE	0	14	15	9	40	406	21	476
Prowl	0.5	DPRE	0	15	15	8	46	399	22	475
Prowl	0.75	DPRE	0	15	15	6	40	484	25	555
Prowl	1.0	DPRE	0	13	15	8	41	439	23	512
Prowl	0.5	LOOP	0	15	14	9	37	435	19	500
Prowl	0.75	LOOP	0	14	15	9	35	457	28	528
Prowl	1.0	LOOP	0	14	15	10	44	464	13	530
Prowl	0.5	2 Leaf	0	14	15	8	41	446	12	506
Prowl	0.75	2 Leaf	0	14	15	7	39	429	25	500
Prowl	1.0	2 Leaf	0	13	14	8	37	437	20	502
Untreated	-	-	0	13	15	8	34	466	25	532
LSD (0.05)			NS	NS	NS	NS	NS	NS	NS	NS

[†]Plots were maintained weed free with applications of Buctril, Poast, and handweeding.

[‡]PRE= immediately after planting; DPRE=delayed preemergence, after germination but before emergence; Loop=loop stage onions; 2 Leaf=onions with two true leaves. Approximately 0.5 inches of overhead irrigation were applied immediately after each application.

[§]Onions suffered severe hail damage on July 4.

Table 4. Onion injury and yellow nutsedge control in onions. Malheur Experiment Station, Oregon State University, Ontario, OR, 1998.

Treatment [†]	Rate	Timing [‡]	Onion injury				Yellow nutsedge control			
			Nyssa			Owyhee Jct	Nyssa		Owyhee Jct	
			6-30	7-13	8-4	6-30	7-13	7-22	8-6	8-21
	lb ai/acre		-----%							
Dual II Magnum	1.25	POST	0	0	3	0	71	32	48	53
BAS 656 07 H	0.64	POST	1	0	5	0	68	30	50	45
Basagran	1.0	POST	9	0	3	0	31	10	32	25
Dual II Magnum + BAS 656 07 H	1.25 + 0.64	POST	4	0	8	0	68	52	73	77
Dual II Magnum + Basagran	1.25 + 1.0	POST	50	30	35	0	81	55	58	58
BAS 656 07 H + Basagran	0.64 + 1.0	POST	41	25	18	0	79	38	55	55
Dual II Magnum + Basagran	1.25 + 1.0	POST + 12 DL	0	13	5	0	80	80	83	87
BAS 656 07 H + Basagran	0.64 + 1.0	POST + 12 DL	0	4	0	0	81	65	83	82
Basagran + Basagran	1.0 + 1.0	POST + 12 DL	1	10	8	0	78	65	78	77
Untreated	-	-	0	0	0	0	0	0	18	15
LSD (0.05)			6	6	14	NS	19	21	14	15

[†]Initial treatments were applied May 19 and two weeks later on May 30. At Owyhee Junction the entire study area was treated with basagran at 2.0 lb ai/acre on June 24.

[‡]POST= initial application; 12 DL =12 days after initial application.

Table 5. Onion yields in response to yellow nutsedge competition in 5 commercial production fields, Malheur Experiment Station, Oregon State University, Ontario, OR, 1998.

Location	Yellow nutsedge density --no/ft ² --	Onion yields [*]									
		Small		Medium		Jumbo		Colossal		Total	
		None	Yellow nutsedge	None	Yellow nutsedge	None	Yellow nutsedge	None	Yellow nutsedge	None	Yellow nutsedge
		-----cwt/acre-----									
1	21	13	13	45	44	549	381*	40	0	647	438*
2	32	17	31	87	68	315	136*	24	15	443	250*
3	17	9	14	31	31	644	512	202	17*	886	574*
4	30	8	17	53	68	495	328*	66	8	622	421*
5	42	25	60	83	76	617	42*	46	0*	771	178*
Ave	28	14	27*	60	57	524	280*	76	8*	674	372*

^{*}Values marked with a asterisk represent significant differences at the 0.05 level.