

## Early Season Onion Weed Control through Chemigation

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Weed control can be problematic being a major yield limiting factor in onions (*Allium cepa*) as they are poor competitors for sunlight, water, and nutrients. Weeds can germinate unnoticed until the first true leaf resulting in competitive environments that severely reduced onion yields; so, early season weed control is critical. Crop injury is also more likely when these herbicides are applied to very small onions. Recent registrations of selective herbicides for use on onions prior to the first true leaf have become available. This paper summarizes a series of onion weed control studies in southern and northern California desert environments where 33 different herbicide treatments were evaluated for efficacy over a 3-year period. The use of traditional herbicide programs like, Dacthal 75W (DCPA) applied at planting controls a wide range of weed species. Prefar 4E (Bensulide) is registered for use on onions prior to the second true leaf; however in sandy soils it can cause significant vigor loss and weed control is sporadic. Prowl H2O (Pendimethalin) is registered at two true leaves. In other states the traditional Prowl 3.3 EC was registered for use at the onion loop stage. (Prowl H2O just received a California SNL registration for application at the loop stage)

In sandy desert soils environments with little organic matter (OM) and heavier desert soils, particularly with higher OM levels selecting the correct herbicide product, application method, timing and rate to provide effective weed control without crop injury is challenging at best.

In Lancaster Prowl H2O was applied at planting at rates ranging from 2 oz. to 2 pts per acre. Spotty vigor loss was noted at rates of 8 oz. in 2005 in very sandy with and low OM. However, the effect on yield was not documented and may have been minimal. However, for three years Prowl H2O was applied at rates of 1 pt to 2 pts at the onion loop stage without noticeable vigor loss. In 2006 this treatment was made through chemigation and controlled mustards (*Brassica* spp.) and foxtail (*Setaria* spp.) by 88% in weed counts compared to the untreated check (Table 1).

The Prowl H2O treatment applied at 1.5 pts at the onion loop stage yielded the greatest overall weed control. The GoalTender 4F (Oxyfluorfen) application of 4 oz. following the Prowl application helped to suppress the weeds. It should be pointed out that GoalTender applied by it self is very weak on weeds and needs to be applied at the earliest stage as possible, at the first true leaf, to enhance weed control. The Goal 2XL (Oxyfluorfen) applied at 8 oz. at the first true leaf caused significant onion damage initially, but the onions seemed to recover over time. This

application seemed to suppress weeds. The 6 oz. rate of GoalTender without the Prowl H2O loop application did not control weeds at all. Weed populations suppressed by the Prowl H2O onion loop treatment included foxtail, mustard, lambsquarters (*Chenopodium album*) and redroot pigweed (*Amaranthus retroflexus*). The Prowl H2O loop treatment will be registered in the 2007 season under a 24c exemption label.

TABLE 1. Evaluation of chemigation of Prowl H2O, GoalTender, and Goal 2XL at different rates and onion growth stages.									
Location: Lancaster				Plot Size: 24 ft wide by 120 ft long (2 to 4 replications)					
Treatment Dates: 4/21/2006 and 5/9/2006				Irrigation type: Solid set sprinklers with injection pump.					
Injection time: 25 minutes per treatment.									
Soil Type: Sand with loam				Number of Sprinklers per treatment: 4					
Treatment	Rates/Acre	Onion Growth Stage	lbs. a.i. per acre	Onion Phyto <sup>1</sup> 5/12/06	Onion Phyto 5/18/06	Onion Phyto 5/23/06	Foxtail Populations <sup>2</sup> (per acre) 5/26/06	Weed Count <sup>3</sup> (per acre) 6/7/06	Percent Weed Control <sup>4</sup> 6/7/06
1. Prowl H2O (loop) + Goal 2XL (1st leaf)	1.5 pts. 8 oz.	Onion loop 1st true leaf	1.2 0.12	6.0	5.5	2.8	56	492	87%
2. Prowl H2O (loop) + GoalTender (1st leaf)	1.5 pts. 4 oz.	Onion loop 1st true leaf	1.2 0.12	3.3	1.9	1.7	959	1,268	67%
3. GoalTender (1st leaf)	6 oz.	1st true leaf	0.19	4.8	4.3	3.0	2,061	5,484	0%
4. Prowl H2O (loop)	1.5 pts.	Onion loop	1.20	0.0	0.0	0.0	221	485	88%
5. Untreated check				0.0	0.0	0.0	2,474	3,894	0%
LSD (p = 0.05)				2.7	2.7	8.2	2,112	----	----
<u>Rating:</u>	<u>Description:</u>								
1. Onion phytotoxicity rating	Ratings taken on a scale of 0 to 10: 0 = No evidence of onion injury; 5 = deformity and some stunted growth; 6-8 = Not acceptable for production; 10 = dead plants.								
2. Foxtail populations	Numbers represent the number of green foxtail ( <i>Setaria</i> ) per acre calculated from weed counts per 30 foot plot.								
3. Weed count per acre	Numbers represent the number of weeds per acre calculated from weed counts per 30 foot plot. Weed population made up of foxtail ( <i>Setaria</i> ), mustard, lambsquarters, and redroot pigweed.								
4. Percent Weed Control	Numbers represent the percent control compared to weed populations of the untreated check.								

Another trial was conducted with a CO2 backpack sprayer within the untreated check of the chemigation trial to determine the effect of GoalTender on common weed species. Field results (Table 2) with GoalTender have shown a lack of control of lambsquarter at 3 to 4 oz. per acre. This trial was applied at the first true leaf to evaluate the effectiveness of early applications of GoalTender on lambsquarters, mallow, shepherds purse, tumble mustard, and redroot pigweed. Mallow (*Malva parviflora*) and redroot pigweed were effectively controlled by these early applications of GoalTender. Although there was initial injury of all the weeds, by the end of the trial there was less than 25% control of shepherds purse (*Capsella bursa-pastoris*), tumble mustard, and lambsquarters. From these results GoalTender should be used with caution and supplemented with Goal 2XL. It may be best to apply Prowl H2O as a standard treatment in every field at the loop stage, as it is a cheap and effective treatment.

TABLE 2. Effect of GoalTender on common weed species						
Location: Lancaster			Plot Size: 36" bed x 30' long (4 replications)			
Treatment Date: 5/22/06			Nozzle: 8004 EVS @ 25 psi			
Soil Type: Sand with loam			GPA: 52.4			
Treatment	Rate/Acre	Timing	lbs. a.i. / acre	Onion Phyto <sup>1</sup> 5/23/06	Weed Species Controlled	% Weed Control <sup>2</sup> 5/18/06
1. GoalTender	4 oz	1st true leaf	0.12	1	Malva (Mallow)	85
2. GoalTender	4 oz	1st true leaf	0.12	1	Shepherds purse	25
3. GoalTender	6 oz	1st true leaf	0.19	2	Redroot pigweed	90
4. GoalTender	6 oz	1st true leaf	0.19	2	Tumble mustard	20
5. GoalTender	6 oz	1st true leaf	0.19	2	Lambsquarters	17
LSD (p = 0.05)	----	----	----	0.9	----	2.1
<u>Rating:</u>		<u>Description:</u>				
1. Onion phytotoxicity rating		Ratings taken on a scale of 0 to 10: 0 = No evidence of onion injury; 5 = slight deformity and some stunted growth; 7-8 = Not acceptable for production; 10 = dead plants.				
2. % Weed Control Rating		Ratings taken on a scale of 0 to 100: 0 = no control; 100 = Complete control				

A trial was conducted to compare Dacthal 75W and Prowl H2O applied at planting and the loop stage. The full rate of Dacthal (10 lbs) controlled weeds (Figure 1)) by 100%, whereas the half rate application (5 lbs) controlled weeds by 90%. Prowl H2O applied at the loop stage controlled weeds by 96%, whereas when it was applied at planting at 8 oz. /ac. it controlled weeds by 91%. All of these treatments were favorable, but Prowl H2O at 1.5 pts at the loop is probably the cheapest and most logical application to consider.

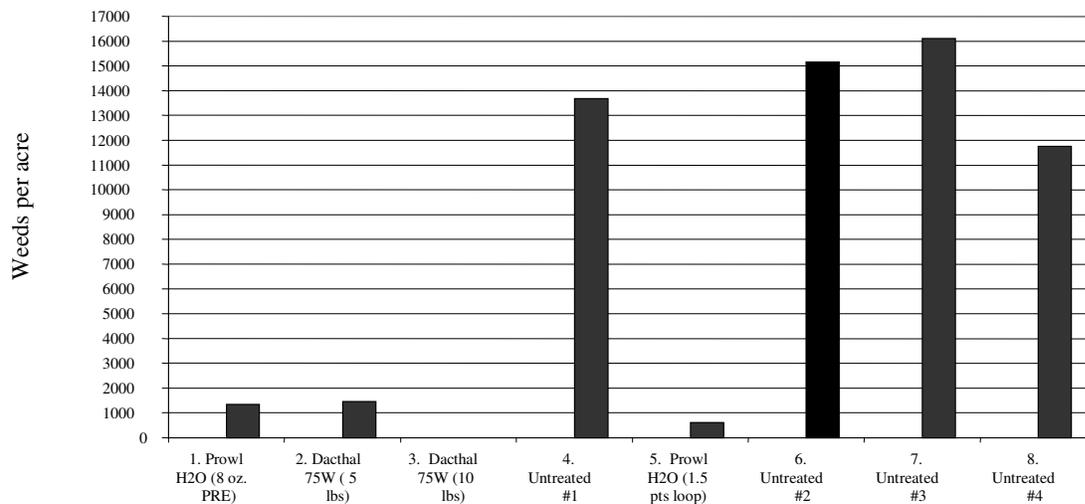


FIGURE 1. Weeds per acre of Dacthal 75W applied at two rates (5 and 10 lbs) at planting and Prowl H2O applied at planting (8oz.) and the loop stage (1.5 pts).

Some of most difficult weeds to control in onions are yellow nutsedge (*Cyperus esculentus*) and volunteer potatoes (*Solanum tuberosum*). Outlook (Dimethenamid) has proven to suppress yellow nutsedge in the field. Nortron (Ethofumesate) is another herbicide in a similar chemical family as Outlook and has shown some effectiveness in controlling yellow nutsedge. A trial was conducted in sandy soils to compare Nortron and Outlook for onion tolerance and yellow nutsedge control.

Outlook should not be applied to onions prior to the second true leaf. These treatments were made at the second true leaf into an emerging patch of yellow nutsedge. Although the onion phytotoxicity ratings (Table 3) for the Nortron treatments were low, later in the season these treatments showed significant stunting that was not acceptable for production. It is not recommended that Nortron be registered for onions in sandy soils.

It was discovered as the season progressed that onions showed 'looping' symptoms in the Outlook treatment. Symptoms of 'looping' were that the third leaf actually grew through the 4th and 5th leaves, of which both were on the same side of the plant (onion leaves should be alternating from opposite sides). This was confirmed by others as being phytotoxicity from herbicides and is common among herbicides similar to Outlook. In earlier carrot (*Daucus carota*) trials Outlook has shown nutsedge suppression at 7 oz./ac. This rate should be used in sandy soils in onions. Outlook registration is currently pending, but is scheduled to be registered in California for use in 2007.

TABLE 3. Onion tolerance of Nortron and Outlook for yellow nutsedge control.					
Location: Lancaster			Plot Size: 36" bed x 30' long (3 replications)		
Soil Type: Sandy			Nozzle: 8004 EVS @ 25 psi GPA: 52.4		
Treatment	Rate/Acre	Timing	lbs. a.i.	Onion Phyto <sup>1</sup> 6/7/06	Onion Looping <sup>2</sup> (per acre) 6/7/06
1. Nortron SC	1 pt	2 true leaves	0.50	3.7	0.0
2. Nortron SC	2 pts.	2 true leaves	1.00	4.0	1,618 (1% population)
3. Outlook	14 oz	2 true leaves	0.66	5.7	4,530 (3% population)
4. Untreated Check	0.6 pts.	2 true leaves	0.12	0.0	----
LSD (p = 0.05)	----	----	----	1.2	1,067
<u>Rating:</u>	<u>Description:</u>				
1. Onion phytotoxicity rating	Ratings taken on a scale of 0 to 10: 0 = No evidence of onion injury; 5 = deformity and some stunted growth; 7-8 = Not acceptable for production; 10 = dead plants				
2. Onion looping per Acre	The number of onion plants with looping symptoms from herbicide toxicity on a per acre basis. Estimations were made from individual plant counts per plot.				
Onion Nutsedge Control	Nutsedge control ratings were not taken in this trial as the plot was hand weeded before ratings could be made. However, in other trials, nutsedge control for one application of Outlook at 14 oz per acre has been around 60% at the end of the season.				

A post-emergence herbicide weed control experiment was conducted at the Intermountain Research and Extension Center (IREC) in an attempt to identify treatments that produce satisfactory weed control with little or no crop injury. The primary herbicides evaluated were Goal and Buctril, applied post-emergence, at various rates, alone and in combination. Sequential applications of low rates were also applied in a strategy that has been successfully tried in onions and other crops. This strategy is designed to slow early weed growth, making weeds susceptible to control with repeat applications later in the season. The strategy is designed to avoid serious crop loss to early weed competition or herbicide injury.

In the post emergence studies broadleaf weeds; mostly redroot pigweed, hairy nightshade (*Solanum sarrachoides*) and lambsquarters began germinating shortly after planting. The experimental treatments evaluated on Table 4 indicate treatments produced acceptable commercial control (>70%). Split applications of Goal XL provided excellent control without apparent yield loss. Perfect weed control was archived with the early combination treatment of Prowl H20, a half rate of Outlook and split Goal applications. Applications with the full rate of Outlook at the 1 to 1.5 leaf stage appeared to reduce onion yields.

TABLE 4. Application date and onion growth stage for post emergence studies						
	6/1/06	6/6/06	6/9/06	6/13/06	6/26/06	
Herbicides	Flag leaf to 1 true leaf	1.5 leaf	2 leaf	3 leaf	Weed Control Rating (10=complete control)	Onion Yield (cwt/A)
Goal XL	Goal XL @ 2oz/A	Goal XL @ 2oz/A		Goal @ 4 oz	9.8	323
Goal XL		Goal XL @ 4oz/A	Goal @ 4oz/A	Goal @ 6 oz	8.7	318
Goal + Buctril		Goal XL @ 4oz/A + Buctril @ 4 oz/A	Goal @ 4oz/A	Goal @ 6 oz	8.5	328
Outlook + Goal	Outlook @ 21 oz/A + Goal XL @ 2oz/A	Goal XL @ 2oz/A		Goal @ 4 oz	9.5	307
Outlook + Goal		Goal XL @ 4oz/A + Outlook @ 21 oz/A	Goal @ 4oz/A	Goal @ 6 oz	9.6	317
Outlook + Goal + Buctril		Goal XL @ 4oz/A + Buctril @ 4 oz/A + Outlook @ 21 oz/A	Goal @ 4oz/A	Goal @ 6 oz	8.6	296
Prowl + Goal	Prowl @ 4 pts/A + Goal XL @ 2oz/A	Goal XL @ 2oz/A		Goal @ 4 oz	8.9	324
Prowl + Goal + Outlook	Prowl @ 4 pts/A + Goal XL @ 2oz/A + Outlook @ 10.5 oz/A	Goal XL @ 2oz/A		Goal @ 4 oz + Outlook @ 10.5 oz/A	10.0	322
UTC (hand weeded weekly)					10.0	313
UTC					1.0	0