

Prowl and Prefar for Onion Weed Control

K. Umeda, D. MacNeil, N. Lund, and D. Roberts

Abstract

Pendimethalin (Prowl7) applied preemergence (PREE) at 0.25 to 0.50 lb AI/A caused no observable injury and did not affect yields of onions that were furrow irrigated. Prowl applied PREE at 0.50 lb AI/A caused significant crop stand and yield reduction compared to lower rates or the untreated check under sprinkler irrigation. Prowl applied preplant incorporated (PPI) at rates ranging from 0.25 to 0.75 lb AI/A did not significantly injure onions or cause a significant yield reduction. Combination treatments of Prowl plus bensulide (Prefar7) applied PREE did not cause any measurable crop height or stand reduction compared to the standard treatment or untreated check. Prowl at 0.25 lb AI/A plus Prefar at 4.0 lb AI/A adequately controlled cheeseweed, yellow sweetclover, sowthistle, and London rocket.

Introduction

Prowl herbicide is currently labeled for use in onions when applied at layby or postemergence when the crop has at least two true leaves. Soil-applied applications in the low organic matter content soils of the Southwest U.S. have generally resulted in causing varying degrees of onion injury at conventional labeled use rates. Preliminary investigations have indicated that low use rates of Prowl applied in combination with Prefar herbicide offer very good broadspectrum weed control compared to when either is applied alone at higher rates. Field experiments were conducted to determine the efficacy and safety of the two herbicides combined on onions when applied at planting time. Weed control in onion production is at a critical period because of the anticipated loss of DCPA (Dacthal 7) herbicide which has been the effective standard to allow the crop to establish a stand in the fall planting season.

Materials and Methods

Three small plot field tests were conducted in Central Arizona: 1) University of Arizona Maricopa Agricultural Center (MAC), Maricopa, AZ, under furrow irrigation, 2) Tolleson, AZ, under sprinkler irrigation, and 3) Waddell, AZ, under furrow irrigation. Each of the experiments was set up as randomized complete block design with three or four replicates. Onions were planted on conventional 40-inch beds with 2 seedlines of cv. Desex per bed at MAC, nine seedlines of cv. Granex 33 at Tolleson, and eight seedlines of cv. Rafiki at Waddell. All treatment plots consisted of two beds and measured 25 or 40 ft in length. Herbicide treatments were applied using a hand-held boom with four flat fan 8002 nozzle tips spaced 20 in apart. The sprays were applied in 20 or 25 gpa water pressurized with a CO₂ backpack sprayer at 35 psi. At MAC, the preplant incorporated (PPI) herbicide treatments were applied on 29 October 1998 and mechanically incorporated with a *Asidewinder*® power mulcher-bed shaper immediately after applications. The weather conditions were clear and air temperature at 60°F during applications. Onions were planted on 30 Oct and preemergence (PREE) applications were made immediately after and then furrow irrigated within 24 hr. The air temperature was 80°F with few scattered clouds and the soil temperature was 72°F. At Tolleson, PPI treatments were applied on 02 Nov when it was clear and 66°F with soil temperature at 62°F and then treatments were immediately mechanically incorporated with a power mulcher for the first time. Subsequently, three more passes with the power mulcher were made to loosen and dry the soil after prior rains. Onions were planted on 06 Nov and PREE treatments were applied after planting when it was clear and 80°F. Solid set

This is a part of the University of Arizona College of Agriculture 1999 Vegetable Report, index at <http://ag.arizona.edu/pubs/crops/az1143/>

sprinklers were used to germinate and establish the crop stand. At Waddell, onions were planted on 28 Oct and PREE herbicide treatments were applied immediately after planting and then furrow irrigated within 48 hr. The weather was clear and 78°F with the soil slightly moist at 76°F.

Onion injury was observed and crop stand establishment and height were measured at intervals during the growing season. Weed control evaluations were made at Waddell. Onions were harvested at Tolleson and MAC to determine effect of herbicide treatments on onion yield.

Results and Discussion

Prowl applied PPI at rates ranging from 0.25 to 0.75 lb AI/A did not significantly injure onions or cause a significant yield reduction (Table 1 and 2). Prowl at 0.75 lb AI/A showed a slight numerical reduction in onion height and stand compared to the untreated check while the lower rates did not cause such injury or reduction. No differences could be observed between furrow irrigated and sprinkler irrigated onions for Prowl applied PPI. At the sprinkler irrigated site, the beds were mechanically mulched four times after the soil-surface application due to excessive soil moisture from prior rains. The mulching was done to enhance more rapid drying of the soil to enable planting. The unusually excessive number of mulching may have diluted the Prowl in the soil to reduce crop injury severity.

Prowl applied PREE at 0.25 to 0.50 lb AI/A on onions that were furrow irrigated exhibited no observable injury and did not affect yields (Table 1). Under sprinkler irrigation, significant injury was observed when Prowl was applied PREE at 0.50 lb AI/A compared to 0.25 lb AI/A or the untreated check (Table 2). Onion height, the crop stand, and yield were all reduced significantly.

Prowl or Prefar applied alone PREE on onions that were furrow irrigated did not reduce height or crop stand (Table 3). Combination treatments of Prowl plus Prefar applied PREE also did not cause any measurable crop height or stand reduction compared to the standard, Dacthal treatment, or untreated check. Visual observations on one rating date indicated some minimal crop injury but no height reduction was measurable at about the same time interval. The combination treatments provided very good weed control at 10 weeks after treatment (Table 4). Prowl at 0.25 lb AI/A plus Prefar at 4.0 lb AI/A adequately controlled cheeseweed (*Malva parviflora*), yellow sweetclover (*Melilotus officinalis*), sowthistle (*Sonchus oleraceus*), and London rocket (*Sisymbrium irio*). Increasing Prowl rate to 0.50 lb AI/A or Prefar to 6.0 lb AI/A did not enhance weed control performance of the combination treatment. The combination of Prowl and Prefar gave improved weed control of all weeds compared to when either was applied alone.

Prowl applied PPI did not appear to cause significant visible or measurable onion crop injury under sprinkler or furrow irrigation. Prowl applied PREE at 0.50 lb AI/A caused significant crop stand reduction, injury, and yield compared to lower rates or the untreated check under sprinkler irrigation. No such injury was observed or measured for Prowl at 0.50 lb AI/A or less on onions grown with furrow irrigation. Combination treatments of Prowl plus Prefar provided improved weed control compared to less acceptable weed control observed for either herbicide applied alone. Rates of Prowl and Prefar were combined at rates lower than typically used rates and effective weed control was achieved. Prowl provided very good weed control and crop safety on onions that were furrow irrigated. The use of sprinkler irrigation caused substantial crop injury and stand reduction. Sprinkler irrigation on onions treated with Prowl applied PPI did not exhibit significant crop injury. The site where Prowl PREE caused significant crop injury and stand reduction, onions were planted very shallow at 0.25 in or less with some seed exposed at the soil surface. The sprinkler irrigation may have moved the surface-applied Prowl to the zone of onion seed germination and resulted in the crop injury. Prowl applied PPI with sprinkler irrigation was diluted in the soil sufficiently to minimize crop injury. Prowl applied PREE and followed with furrow irrigation maintained the herbicide at the soil surface and emerging seedlings escaped phytotoxic levels of herbicide.

Acknowledgments

The cooperation of Rousseau Farming Company and G Farms is gratefully acknowledged for allowing small plot field experiments to be conducted within their commercial onion fields during the growing season.

Table 1. Prowl herbicide weed control in onions, MAC. (Umeda, et al)

| Treatment | Rate (lb AI/A) | Timing | Onion Injury | | |
|-----------------|-------------------|--------|--------------|--------|------------------|
| | | | Height (in.) | | Yield lb/plot |
| | | | 19 Jan | 15 Mar | |
| Untreated check | | | 2.8 | 12.7 | 18.9 |
| Prowl | 0.25 | PPI | 2.8 | 13.1 | 25.5 |
| Prowl | 0.38 | PPI | 2.7 | 12.6 | 25.3 |
| Prowl | 0.50 | PPI | 2.7 | 11.7 | 25.2 |
| Prowl | 0.75 | PPI | 2.6 | 11.8 | 27.3 |
| Prowl | 0.25 | PREE | 2.8 | 12.4 | 21.7 |
| Prowl | 0.38 | PREE | 2.8 | 13.9 | 28.6 |
| Prowl | 0.50 | PREE | 2.7 | 12.3 | 31.7 |
| LSD (p=0.05) | | | 0.5 | 1.8 | 5.3 |

Onions planted 29 October 1998, harvested 20 May 1999.

PPI = preplant incorporated applied 29 Oct

PREE = preemergence applied 30 Oct

Height = average of 10 or 20 plants/plot, harvested 5 ft row of 2 rows/plot

Table 2. Prowl herbicide weed control in onions, Tolleson. (Umeda, et al)

| Treatment | Rate (lb AI/A) | Timing | Onion Injury | | | | Yield 10 May lb/plot | |
|-----------------|-------------------|--------|--------------|-----------|--------|---------------------|----------------------------|---------|
| | | | 28 Jan | | No./ft | 25 Mar Ht. (in.) | | |
| | | | CSI (%) | Ht. (in.) | | | | CSR (%) |
| Untreated check | | | 0 | 6.4 | 0 | 46.3 | 25.3 | 103 |
| Prowl | 0.25 | PPI | 0 | 6.6 | 0 | 41.0 | 25.3 | 106 |
| Prowl | 0.50 | PPI | 5 | 6.3 | 0 | 46.3 | 25.4 | 107 |
| Prowl | 0.75 | PPI | 7 | 6.2 | 0 | 36.3 | 25.2 | 98 |
| Prowl | 0.25 | PREE | 13 | 6.4 | 0 | 39.0 | 26.1 | 102 |
| Prowl | 0.50 | PREE | 47 | 5.3 | 38 | 25.3 | 24.2 | 83 |
| LSD (p=0.05) | | | 16.7 | 0.9 | 23.6 | 13.3 | 1.6 | 13.5 |

PPI applied 02 Nov 1998, PREE applied 06 Nov.

CSI = crop stand injury, CSR = crop stand reduction

Ht.= average of 10 or 20 plants/plot, No. = plants per seedline, harvested 5 ft row of 2 rows/plot

Table 3. Prowl and Prefar herbicide weed control in onions, Waddell. (Umeda, et al)

| Treatment | Rate (lb AI/A) | Onion Injury | | | | |
|-----------------|-------------------|--------------|--------|--------|----------|----------|
| | | 20 Nov | 06 Jan | 28 Jan | | 10 Apr |
| | | % | | No./ft | Ht.(in.) | Ht (in.) |
| Untreated check | | 0 | 0 | 35.0 | 9.2 | 22.5 |
| Dacthal | 9.0 | 0 | 0 | 37.0 | 10.2 | 21.6 |
| Prefar | 4.0 | 0 | 0 | 37.0 | 9.4 | 21.8 |
| Prefar | 6.0 | 0 | 0 | 36.0 | 10.0 | 22.6 |
| Prowl | 0.25 | 0 | 0 | 35.8 | 10.6 | 21.4 |
| Prowl | 0.50 | 0 | 0 | 36.8 | 9.8 | 22.6 |
| Prowl | 0.75 | 0 | 2 | 35.5 | 10.7 | 22.0 |
| Prowl + Prefar | 0.25 + 4.0 | 0 | 2 | 37.0 | 9.9 | 22.2 |
| Prowl + Prefar | 0.25 + 6.0 | 0 | 9 | 35.3 | 10.5 | 22.8 |
| Prowl + Prefar | 0.50 + 6.0 | 0 | 9 | 39.0 | 10.7 | 23.4 |
| LSD (p=0.05) | | 0 | 2.4 | 7.7 | 2.2 | 2.3 |

Herbicides applied on 28 October 1998

No./ft = number of plants/1 ft of row on 8 lines per bed

Ht. = onion plant height, average of 5 plants/plot

Table 4. Prowl and Prefar herbicide weed control in onions, Waddell. (Umeda, et al)

| Treatment | Rate (lb AI/A) | Weed Control (%) | | | | | | | |
|-----------------|-------------------|------------------|--------|--------|--------|--------|--------|--------|--------|
| | | MALPA | | MEUOF | | SONOL | | SSYIR | |
| | | 20 Nov | 06 Jan | 20 Nov | 06 Jan | 20 Nov | 06 Jan | 20 Nov | 06 Jan |
| Untreated check | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dacthal | 9.0 | 91 | 13 | 55 | 13 | 99 | 85 | 99 | 85 |
| Prefar | 4.0 | 94 | 0 | 55 | 0 | 94 | 79 | 97 | 73 |
| Prefar | 6.0 | 89 | 0 | 63 | 0 | 95 | 78 | 99 | 75 |
| Prowl | 0.25 | 96 | 84 | 74 | 83 | 96 | 86 | 98 | 89 |
| Prowl | 0.50 | 94 | 90 | 78 | 88 | 98 | 95 | 99 | 94 |
| Prowl | 0.75 | 95 | 96 | 84 | 93 | 99 | 97 | 99 | 98 |
| Prowl + Prefar | 0.25 + 4.0 | 95 | 90 | 84 | 88 | 99 | 96 | 98 | 94 |
| Prowl + Prefar | 0.25 + 6.0 | 96 | 95 | 90 | 94 | 97 | 97 | 99 | 97 |
| Prowl + Prefar | 0.50 + 6.0 | 98 | 96 | 90 | 93 | 99 | 97 | 99 | 98 |
| LSD (p=0.05) | | 7.2 | 13.5 | 10.8 | 13.3 | 3.4 | 9.4 | 1.6 | 10.3 |

Onions planted and treated 28 October 1998

MALPA = *Malva parviflora* (cheeseweed), MEUOF = *Melilotus officinalis* (yellow sweetclover)

SONOL = *Sonchus oleraceus* (sowthistle), SSYIR = *Sisymbrium irio* (London rocket)