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# 2012 Onion Weed Control in Tulelake

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**Introduction:** From 2009-2011, multiple small-plot weed control trials at the Intermountain Research and Extension Center (IREC) evaluated preemergence and postemergence herbicides applied at several rates and application times. In 2012, Tulelake onion growers requested a University study to evaluate promising herbicides applied on a large scale on multiple soil types using conventional application equipment. Multiple herbicide programs were tested in 2012 using commercial application equipment at IREC and in Tulelake grower fields. ***Some herbicides listed in this report may not be labeled for use in onions. Please consult herbicide labels for use instructions.***

**IREC Trial Site and Herbicide Application Information**

**Location:** Tulelake, CA
**Irrigation:** Solid-set sprinklers
**Plot Size:** 6 X 30 ft (IREC site);
**Row Spacing:** 36 inches; 4 seed-lines spaced 6 inches apart per bed
**Trt Replication:** 3 replications
**Soil Type:** Tulebasin mucky silty clay loam
**Planting Date:** 4/28/12
**Harvest Date:** 10/3/12

| | IREC Site Herbicide Application Times | | | | |
|---|---|---|---|---|---|
| **Onion Growth Stage** | **Post-Plant** | **Loop** | **1.5 Leaf** | **2.5 Leaf** | **5-6 Leaf (Starane)** |
| **Application Date** | **5/2/12** | **5/16/12** | **5/29/12** | **6/9/12** | **6/29/12** |
| **Weed Size at Application** | Pre | Pre- to seedling | 0.5-3" | 1-5" | 3-10” |

**Grower Trials Site and Herbicide Application Information (Sandy Loam Site and Clay Loam Site)**

**Location:** Tulelake, CA
**Irrigation:** Solid-set sprinklers
**Plot Size:** 50 X 60 ft (chemigation treatments were applied over a larger area)
**Row Spacing:** 36 inches; 4 seed-lines spaced 6 inches apart per bed
**Trt Replication:** 3 replications
**Soil Type:** Sandy Loam Site- Zanbur sandy loam;
Clay Loam Site- Tulebasin mucky silty clay loam
**Planting Date:** Sandy Loam Site- 5/2/12; Clay Loam Site- 4/26/12
**Harvest Date:** Sandy Loam Site- 10/8/12; Clay Loam Site- 10/5/12

| | Grower Sites Herbicide Application Times | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Post Plant | | Loop | | 1.5 Leaf | | 2.5 Leaf | |
| Onion Growth Stage | Sandy Loam Site | Clay Loam Site | Sandy Loam Site | Clay Loam Site | Sandy Loam Site | Clay Loam Site | Sandy Loam Site | Clay Loam Site |
| Application Date | 5/4/12 | 4/27/12 | 5/18/12 | 5/14/12 | 5/30/12 | 5/29/12 | 6/12/12 | 6/8/12 |
| Weed Size | Pre | Pre | Seedling to 1" | | 1-2" | | 2-5" | |

**Herbicide Application Methods**:
Herbicides applied post-plant and at loop stage were broadcast at 20 GPA and then incorporated via irrigation within 24 hours after application. Herbicides applied after the 1-leaf stage were chemigated using solid-set sprinklers. Herbicide chemigation consisted of applying 0.32 inches water before injection, 0.16 inches water during herbicide injection (1hour set), and 0.32 inches water after injection. At the IREC site, Starane at 5.6 fl oz/A was broadcast applied at 30 GPA at the 5-leaf stage over the entire trial area to control numerous kochia that escaped earlier herbicide treatments.

**Weed Density Counts and % Control Rating**:
Weed density was calculated by counting the number of live weeds growing on the bed top and furrow of the middle two beds in each plot. Percent weed control was visually estimated over the entire plot area.

**Hand Weeding:**
All plots at the grower sites were hand-weeded between the 5- to 8-leaf stage by IREC staff or a commercial weeding crew. Plots were weeded to prevent weed escapes from producing seed and excessive weed competition.

**Onion Stand, Onion Injury, and Yield:**
Onion stand was measured on the two center beds in each plot. Onion injury (stunting, curling, and chlorosis) was visually evaluated in each plot using a 0 -10 scale with 10 = highest injury (plant death). Onion yield was estimated by harvesting onions from the two center beds in each plot for the entire plot length.

**IREC Weed Control Results:** Plots were seeded with kochia, redroot pigweed, and lambsquarter before planting. The predominant weed at IREC was kochia; redroot pigweed, lambsquarter, and hairy nightshade were found in all plots at lower densities. Dacthal and Nortron applied post-plant and Prowl applied at loop reduced kochia density compared to the untreated control, but these preemergence

treatments did not reduce kochia density low enough for control to be considered effective (Table 1). Zeus (not registered for use in onions) at both rates applied post-plant reduced kochia density more than 95% compared to the untreated control; Zeus was the most effective preemergence herbicide for kochia control (Table 1). Numerically Goal + Buctril chemigated at 2.5 leaf stage provided better kochia control compared to Goal + Outlook or Goal alone, although control did not exceed 90% (Table 1). Starane provided excellent control of kochia as evident by the reduction in kochia density in all treatments from the 6-leaf to 9-leaf evaluation (Table 1). Nortron, Prowl, and Dacthal at rates ≥ 5 pt/A gave effective control of lambsquarter, hairy nightshade, and redroot pigweed when combined with postemergence herbicides.

**IREC Onion Stand, Injury and Yield Results**: Nortron, Dacthal, and Prowl did not cause unacceptable onion injury or onion stand reduction (Table 2). Dacthal at 2.5 pt/A applied post-plant plus Goal, Zeus applied post-plant plus Goal, and the untreated control had lower onion stand and onion yield than most herbicide treatments (Table 2). Onion stand reduction in Zeus plots was related to herbicide injury. Onion stand reduction in the Dacthal at 2.5 pt/A plus Goal treatment and untreated control was related to poor weed control that resulted in excessive weed competition. Zeus at 6 fl oz/A (not registered in onions) caused unacceptable onion stand and yield loss.

**Grower Sites Weed Control Results**: At the silty clay loam site, the predominant weeds were kochia, lambsquarter, mustard, and volunteer horseradish. All weed species were found at low densities throughout the trial site. Goal + Buctril treatments gave good weed control regardless of herbicides applied post-plant and at the loop stage (Table 3). Goal + Outlook treatments provided similar weed control to Goal + Buctril when combined with Dacthal applied post-plant and Prowl at loop (Table 3). None of the treatments controlled perennial horseradish (data not shown).

At the sandy loam site, the predominant weeds were redroot pigweed and common lambsquarter. Weed pressure was much higher at the sandy loam site compared to the clay loam site. Dacthal at 5 pt/A applied post-plant and Dacthal at 2.5 pt/A applied post-plant plus Prowl at loop had very low total weed density for both postemergence programs (Table 4). Applying Prowl at the loop stage reduced total weed density compared to using postemergence herbicides alone.

**Gower Onion Stand, Injury, and Yield**: None of herbicide programs negatively influenced onion stand at both sites (Tables 5 & 6). At the clay loam site, Goal + Buctril at the 2.5-leaf stage caused more visual injury across post-plant and loop treatments compared to Goal + Outlook, although onions quickly outgrew the injury (Table 5). Goal + Outlook numerically had higher onion yield compared Goal + Buctril across preemergence treatments at the clay loam site, but statistical analysis was not possible due to experimental design limitations (Table 5). Herbicides had a positive influence on onion yield at the sandy loam site (Table 6). Herbicide treatments with the highest onion yield where those treatments with low weed densities regardless if Goal + Outlook or Goal + Buctril were used postemergence (Table 6).

**Table 1. Influence of Herbicides on Weed Control in Onions at IREC in 2012[1]**

| | Herbicide Application Time | | | | Kochia Density | | | Lambsquarter Density | | | Hairy Nightshade Density | | | Redroot Pigweed Density | | | Total Weed Density[8] | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| trt # | Post-Plant Product/A | | Loop stage Product | 1.5 leaf stage Product | 2.5 leaf stage Product | 3-leaf plants/plot | 5-leaf plants/plot | 9-leaf plants/plot | 3-leaf plants/plot | 5-leaf plants/plot | 9-leaf plants/plot | 3-leaf plants/plot | 5-leaf plants/plot | 9-leaf plants/plot | 3-leaf plants/plot | 5-leaf plants/plot | 9-leaf plants/plot | 3-leaf plants/plot | 5-leaf plants/plot | 9-leaf plants/plot |
| **Goal Tender and Goal 2XL applied via chemigation** | | | | | | | | | | | | | | | | | | | | |
| 1 | Untreated Control- no herbicide until 3-4 leaf stage | | | | | 562 | 364 | 4 | 2 | 1 | 21 | 8 | 5 | 5 | 8 | 2 | 32 | 588 | 383 | 64 |
| 2 | Dacthal | 2.5 pt/A | | Goal Tender[3] | Goal[4] | 297 | 132 | 8 | 1 | 0 | 15 | 0 | 0 | 0 | 0 | 0 | 13 | 299 | 133 | 32 |
| 3 | Dacthal | 5 pt/A | | Goal Tender[3] | Goal[4] | 469 | 205 | 5 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 1 | 470 | 206 | 5 |
| 4 | Dacthal | 10 pt/A | | Goal Tender[3] | Goal[4] | 362 | 119 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 363 | 120 | 3 |
| 5 | Nortron SC | 16 fl oz/A | | Goal Tender[3] | Goal[4] | 298 | 145 | 8 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 298 | 145 | 3 |
| 6 | Nortron SC | 32 fl oz/A | | Goal Tender[3] | Goal[4] | 283 | 150 | 7 | 1 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 2 | 283 | 150 | 8 |
| 7 | Dacthal + Nortron SC | 2.5 pt/A + 16 fl oz/A | | Goal Tender[3] | Goal[4] | 438 | 293 | 2 | 1 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 1 | 438 | 293 | 6 |
| 8 | No Herbicide | | Prowl $H_20$[2] | Goal Tender[3] | Goal[4] | 434 | 208 | 5 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 6 | 439 | 214 | 8 |
| 9 | Dacthal | 2.5 pt/A | Prowl $H_20$[2] | Goal Tender[3] | Goal[4] | 452 | 216 | 1 | 0 | 0 | 5 | 0 | 0 | 0 | 0 | 0 | 4 | 453 | 218 | 13 |
| 10 | Dacthal | 5 pt/A | Prowl $H_20$[2] | Goal Tender[3] | Goal[4] | 287 | 121 | 3 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 3 | 288 | 121 | 6 |
| 11 | Nortron SC | 16 fl oz/A | Prowl $H_20$[2] | Goal Tender[3] | Goal[4] | 276 | 140 | 10 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 277 | 140 | 3 |
| 12 | Zeus | 3 fl oz/A | | Goal Tender[3] | Goal[4] | 22 | 20 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 2 | 25 | 24 | 3 |
| 13 | Zeus | 6 fl oz/A | | Goal Tender[3] | Goal[4] | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 4 | 0 |
| 95% Confidence Interval (NS = No Signficant Differences) | | | | | | 196 | 109 | NS | 1 | NS | 13 | 4 | 2 | 2 | 3 | 1 | 7 | 192 | 105 | 16 |
| **Goal Tender and Goal 2XL + Buctril applied via chemigation** | | | | | | | | | | | | | | | | | | | | |
| 14 | No Herbicide | | Prowl $H_20$[2] | Goal Tender[3] | Goal + Buctril[5] | 162 | 71 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 164 | 72 | 2 |
| 15 | Dacthal | 2.5 pt/A | Prowl $H_20$[2] | Goal Tender[3] | Goal + Buctril[5] | 224 | 88 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 3 | 228 | 90 | 5 |
| 16 | Nortron SC | 16 fl oz/A | Prowl $H_20$[2] | Goal Tender[3] | Goal + Buctril[5] | 208 | 85 | 5 | 1 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 1 | 209 | 86 | 5 |
| 95% Confidence Interval (NS = No Signficant Differences) | | | | | | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS |
| **Goal Tender and Goal 2XL + Outlook applied via chemigation** | | | | | | | | | | | | | | | | | | | | |
| 17 | No Herbicide | | Prowl $H_20$[2] | Goal Tender[3] | Goal + Outlook[5] | 298 | 161 | 4 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 2 | 302 | 164 | 6 |
| 18 | Dacthal | 2.5 pt/A | Prowl $H_20$[2] | Goal Tender[3] | Goal + Outlook[5] | 386 | 158 | 6 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 3 | 391 | 160 | 8 |
| 19 | Nortron SC | 16 fl oz/A | Prowl $H_20$[2] | Goal Tender[3] | Goal + Outlook[5] | 385 | 144 | 1 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 2 | 385 | 144 | 5 |
| 95% Confidence Interval (NS = No Signficant Differences) | | | | | | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS |
| **Postemergence treatments broadcast applied at 70 GPA** | | | | | | | | | | | | | | | | | | | | |
| 20 | No Herbicide | | Prowl $H_20$[2] | Goal Tender[3] | Goal 2XL[6] | 374 | 194 | 2 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 5 | 376 | 197 | 10 |
| 21 | No Herbicide | | Prowl $H_20$[2] | Goal Tender[3] | Goal + Buctril[7] | 267 | 75 | 4 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 7 | 270 | 78 | 10 |
| 22 | No Herbicide | | Prowl $H_20$[2] | Goal Tender[3] | Goal + Outlook[7] | 332 | 214 | 9 | 0 | 0 | 3 | 0 | 0 | 2 | 0 | 0 | 3 | 335 | 218 | 10 |
| 23 | No Herbicide | | Prowl $H_20$[2] | Goal Tender[3] | Goal+Buctril+Outlook[7] | 86 | 44 | 4 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 4 | 87 | 46 | 7 |
| 24 | No Herbicide | | Prowl $H_20$[2] | Goal Tender[3] | Zeus at 3 fl oz/A | 381 | 131 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 390 | 137 | 4 |
| 95% Confidence Interval (NS = No Signficant Differences) | | | | | | 181 | 101 | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | 179 | 100 | NS |

[1] All treatments were chemigated with Goal2XL at 4 fl oz/A + Buctril 2EC at 8 fl oz/A at 3-4 leaf stage. Starane Ultra at 5.6 fl oz/A was applied at 5-6 leaf stage to control kochia escapes.

[2] Prowl $H_20$ applied at 1.5 pt/A

[3] GoalTender at 4 fl oz/A

[4] Goal 2XL at 6 fl oz/A

[5] Goal 2XL at 4 fl oz/A ; Buctril 2EC at 8 fl oz/A ; Outlook at 12 fl oz/A

[6] Goal 2XL at 7.5 fl oz/A

[7] Goal 2XL at 5 fl oz/A ; Buctril 2EC at 10 fl oz/A ; Outlook at 15 fl oz/A

[8] Total weed density includes all miscellaneous weeds along with weed species listed in the Table 1.

**Table 2. Influence of Herbicides on Onion Stand, Onion Growth, and Onion Yield at IREC in 2012 [1]**

| trt # | Post-Plant Product/A | Herbicide Application Time: Loop stage Product | 1.5 leaf stage Product | 2.5 leaf stage Product | Onion Injury Rating @ 3-leaf 1-10 scale | Onion Injury Rating @ 4-leaf 1-10 scale | Onion Stand 4-leaf stage plants/plot | Onion Yield 10/20/2012 tons/acre |
|---|---|---|---|---|---|---|---|---|
| | **Goal Tender and Goal 2XL applied via chemigation** | | | | | | | |
| 1 | Untreated Control- no herbicide until 3-4 leaf stage | | | | 0.0 | 0.0 | 790 | 17.90 |
| 2 | Dacthal 2.5 pt/A | | Goal Tender[3] | Goal[4] | 1.3 | 0.0 | 737 | 18.66 |
| 3 | Dacthal 5 pt/A | | Goal Tender[3] | Goal[4] | 1.0 | 0.0 | 967 | 25.66 |
| 4 | Dacthal 10 pt/A | | Goal Tender[3] | Goal[4] | 1.0 | 0.0 | 904 | 23.01 |
| 5 | Nortron SC 16 fl oz/A | | Goal Tender[3] | Goal[4] | 1.2 | 0.0 | 857 | 21.94 |
| 6 | Nortron SC 32 fl oz/A | | Goal Tender[3] | Goal[4] | 1.3 | 0.0 | 903 | 23.48 |
| 7 | Dacthal 2.5 pt/A + Nortron SC 16 fl oz/A | | Goal Tender[3] | Goal[4] | 1.2 | 0.0 | 871 | 20.47 |
| 8 | No Herbicide | Prowl $H_20$[2] | Goal Tender[3] | Goal[4] | 1.0 | 0.0 | 941 | 20.83 |
| 9 | Dacthal 2.5 pt/A | Prowl $H_20$[2] | Goal Tender[3] | Goal[4] | 1.0 | 0.0 | 859 | 23.68 |
| 10 | Dacthal 5 pt/A | Prowl $H_20$[2] | Goal Tender[3] | Goal[4] | 1.3 | 0.0 | 895 | 25.48 |
| 11 | Nortron SC 16 fl oz/A | Prowl $H_20$[2] | Goal Tender[3] | Goal[4] | 1.2 | 0.0 | 879 | 25.39 |
| 12 | Zeus 3 fl oz/A | | Goal Tender[3] | Goal[4] | 2.0 | 0.3 | 763 | 21.61 |
| 13 | Zeus 6 fl oz/A | | Goal Tender[3] | Goal[4] | 9.0 | 8.7 | 81 | 4.99 |
| | **95% Confidence Interval (NS = No Signficant Differences)** | | | | 3.0 | 4.0 | 101 | 3.01 |
| | **Goal Tender and Goal 2XL + Buctril applied via chemigation** | | | | | | | |
| 14 | No Herbicide | Prowl $H_20$[2] | Goal Tender[3] | Goal + Buctril[5] | 1.2 | 0.0 | 883 | 23.27 |
| 15 | Dacthal 2.5 pt/A | Prowl $H_20$[2] | Goal Tender[3] | Goal + Buctril[5] | 1.2 | 0.0 | 939 | 23.51 |
| 16 | Nortron SC 16 fl oz/A | Prowl $H_20$[2] | Goal Tender[3] | Goal + Buctril[5] | 1.2 | 0.0 | 904 | 24.69 |
| | **95% Confidence Interval (NS = No Signficant Differences)** | | | | NS | NS | NS | NS |
| | **Goal Tender and Goal 2XL + Outlook applied via chemigation** | | | | | | | |
| 17 | No Herbicide | Prowl $H_20$[2] | Goal Tender[3] | Goal + Outlook[5] | 1.0 | 0.0 | 911 | 23.39 |
| 18 | Dacthal 2.5 pt/A | Prowl $H_20$[2] | Goal Tender[3] | Goal + Outlook[5] | 1.0 | 0.0 | 914 | 24.10 |
| 19 | Nortron SC 16 fl oz/A | Prowl $H_20$[2] | Goal Tender[3] | Goal + Outlook[5] | 1.2 | 0.0 | 927 | 23.41 |
| | **95% Confidence Interval (NS = No Signficant Differences)** | | | | NS | NS | NS | NS |
| | **Postemergence treatments broadcast applied at 70 GPA** | | | | | | | |
| 20 | No Herbicide | Prowl $H_20$[2] | Goal Tender[3] | Goal 2XL[6] | 1.5 | 0.0 | 900 | 23.63 |
| 21 | No Herbicide | Prowl $H_20$[2] | Goal Tender[3] | Goal + Buctril[7] | 2.2 | 0.0 | 861 | 20.44 |
| 22 | No Herbicide | Prowl $H_20$[2] | Goal Tender[3] | Goal + Outlook[7] | 2.0 | 0.0 | 894 | 22.73 |
| 23 | No Herbicide | Prowl $H_20$[2] | Goal Tender[3] | Goal+Buctril+Outlook[7] | 3.2 | 0.7 | 904 | 23.49 |
| 24 | No Herbicide | Prowl $H_20$[2] | Goal Tender[3] | Zeus at 3 fl oz/A | 3.2 | 0.7 | 891 | 21.53 |
| | **95% Confidence Interval (NS = No Signficant Differences)** | | | | 0.4 | 0.5 | NS | NS |

[1] All treatments were chemigated with Goal2XL at 4 fl oz/A + Buctril 2EC at 8 fl oz/A at 3-4 leaf stage and Starane Ultra at 5.6 fl oz/A at 5-6 leaf stage

[2] Prowl $H_20$ applied at 1.5 pt/A

[3] GoalTender at 4 fl oz/A

[4] Goal 2XL at 6 fl oz/A

[5] Goal 2XL at 4 fl oz/A ; Buctril 2EC at 8 fl oz/A ; Outlook at 12 fl oz/A

[6] Goal 2XL at 7.5 fl oz/A

[7] Goal 2XL at 5 fl oz/A ; Buctril 2EC at 10 fl oz/A ; Outlook at 15 fl oz/A

## Table 3. Weed Control at Silty Clay Loam Soil Grower Location in 2012[1]

| | Herbicide Application Time | | | | Weed Control | Weed Control | Weed Density @ 4-leaf stage | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| trt # | Post-Plant Product/A | Loop stage Product | 1.5 leaf stage Product | 2.5 leaf stage Product | Rating @ 3-leaf % | Rating@harvest % | kochia | lambsquarter | mustard | total |
| | | | | | | | plants/ 180 ft$^2$ | | | |
| **Goal Tender and Goal 2XL + Buctril applied via chemigation** | | | | | | | | | | |
| 1a | No Herbicide | Prowl $H_20$[2] | Goal Tender[3] | Goal + Buctril[4] | 98.0 | 75.0 | 1 | 0.3 | 0.0 | 1.7 |
| 2a | Dacthal 5 pt/A | | Goal Tender[3] | Goal + Buctril[4] | 99.0 | 70.0 | 2 | 0.3 | 0.0 | 2.0 |
| 3a | Nortron SC 16 fl oz/A | | Goal Tender[3] | Goal + Buctril[4] | 99.0 | 73.3 | 1 | 0.0 | 0.0 | 1.3 |
| 4a | Dacthal 2.5 pt/A | Prowl $H_20$[2] | Goal Tender[3] | Goal + Buctril[4] | 100.0 | 68.3 | 0 | 0.0 | 0.0 | 0.7 |
| 5a | Nortron SC 16 fl oz/A | Prowl $H_20$[2] | Goal Tender[3] | Goal + Buctril[4] | 96.7 | 80.0 | 1 | 0.0 | 0.3 | 1.0 |
| 6a | No Herbicide | | Goal Tender[3] | Goal + Buctril[4] | 99.0 | 73.3 | 1 | 0.3 | 0.0 | 2.0 |
| 95% Confidence Interval (NS = No Signficant Differences) | | | | | NS | NS | NS | NS | NS | NS |
| **Goal Tender and Goal 2XL + Outlook applied via chemigation** | | | | | | | | | | |
| 1b | No Herbicide | Prowl $H_20$[2] | Goal Tender[3] | Goal + Outlook[5] | 86.7 | 78.3 | 4 | 0.7 | 1.0 | 7.3 |
| 2b | Dacthal 5 pt/A | | Goal Tender[3] | Goal + Outlook[5] | 91.7 | 78.3 | 5 | 0.0 | 0.7 | 7.7 |
| 3b | Nortron SC 16 fl oz/A | | Goal Tender[3] | Goal + Outlook[5] | 80.0 | 73.3 | 7 | 0.3 | 8.3 | 21.0 |
| 4b | Dacthal 2.5 pt/A | Prowl $H_20$[2] | Goal Tender[3] | Goal + Outlook[5] | 86.7 | 70.0 | 5 | 0.0 | 0.0 | 5.7 |
| 5b | Nortron SC 16 fl oz/A | Prowl $H_20$[2] | Goal Tender[3] | Goal + Outlook[5] | 95.0 | 80.0 | 2 | 0.3 | 0.3 | 3.0 |
| 6b | No Herbicide | | Goal Tender[3] | Goal + Outlook[5] | 70.0 | 71.7 | 12 | 0.3 | 3.3 | 16.3 |
| 95% Confidence Interval (NS = No Signficant Differences) | | | | | 14.0 | NS | 6 | NS | NS | 7.6 |

[1] Post-plant and Loop Stage Herbicides were broadcast applied at 20 GPA; 1.5 and 2.5 Leaf Stage Herbicides were applied via solid-set chemigation

[2] Prowl $H_20$ applied at 1.5 pt/A

[3] GoalTender at 4 fl oz/A

[4] Goal 2XL at 4 fl oz/A ; Buctril 2EC at 8 fl oz/A ; Outlook at 12 fl oz/A

## Table 4. Weed Control at Sandy Loam Soil Grower Location in 2012[1]

| | | Herbicide Application Time | | | Weed Control | Weed Control | Weed Density @ 4-leaf stage | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| trt # | Post-Plant Product/A | Loop stage Product | 1.5 leaf stage Product | 2.5 leaf stage Product | Rating @ 3-leaf % | Rating@harvest % | pigweed | lambsquarter | mustard | nightshade | total |
| | | | | | | | plants/ 180 ft$^2$ | | | | |
| **Goal Tender and Goal 2XL + Buctril applied via chemigation** | | | | | | | | | | | |
| 1a | No Herbicide | Prowl $H_20$[2] | Goal Tender[3] | Goal + Buctril[4] | 94.5 | 95.0 | 29.7 | 39.7 | 0.3 | 4.0 | 73.7 |
| 2a | Dacthal 5 pt/A | | Goal Tender[3] | Goal + Buctril[4] | 99.1 | 93.3 | 1.7 | 0.0 | 0.3 | 4.3 | 6.3 |
| 3a | Nortron SC 16 fl oz/A | | Goal Tender[3] | Goal + Buctril[4] | 89.5 | 90.0 | 3.7 | 122.0 | 0.3 | 1.7 | 128.0 |
| 4a | Dacthal 2.5 pt/A | Prowl $H_20$[2] | Goal Tender[3] | Goal + Buctril[4] | 99.8 | 93.3 | 4.7 | 1.0 | 0.0 | 2.3 | 8.3 |
| 5a | Nortron SC 16 fl oz/A | Prowl $H_20$[2] | Goal Tender[3] | Goal + Buctril[4] | 99.2 | 95.0 | 7.7 | 18.3 | 2.3 | 6.3 | 34.7 |
| 6a | No Herbicide | | Goal Tender[3] | Goal + Buctril[4] | 79.9 | 85.0 | 26.7 | 265.3 | 2.0 | 2.3 | 297.0 |
| 95% Confidence Interval (NS = No Signficant Differences) | | | | | 4.7 | 3.3 | 13.0 | 118.0 | NS | NS | 152.6 |
| **Goal Tender and Goal 2XL + Outlook applied via chemigation** | | | | | | | | | | | |
| 1b | No Herbicide | Prowl $H_20$[2] | Goal Tender[3] | Goal + Outlook[4] | 93.8 | 73.3 | 35.7 | 39.3 | 1.0 | 0.0 | 76.0 |
| 2b | Dacthal 5 pt/A | | Goal Tender[3] | Goal + Outlook[4] | 96.0 | 73.3 | 13.7 | 3.0 | 2.0 | 0.0 | 18.7 |
| 3b | Nortron SC 16 fl oz/A | | Goal Tender[3] | Goal + Outlook[4] | 86.7 | 73.3 | 37.0 | 141.0 | 1.0 | 0.0 | 179.0 |
| 4b | Dacthal 2.5 pt/A | Prowl $H_20$[2] | Goal Tender[3] | Goal + Outlook[4] | 99.7 | 85.0 | 4.7 | 1.7 | 1.0 | 0.0 | 7.3 |
| 5b | Nortron SC 16 fl oz/A | Prowl $H_20$[2] | Goal Tender[3] | Goal + Outlook[4] | 98.2 | 88.3 | 14.3 | 5.3 | 0.0 | 0.0 | 19.7 |
| 6b | No Herbicide | | Goal Tender[3] | Goal + Outlook[4] | 71.3 | 51.7 | 84.0 | 142.3 | 2.0 | 0.0 | 231.7 |
| 95% Confidence Interval (NS = No Signficant Differences) | | | | | 4.3 | 7.4 | 23.3 | 110.7 | NS | NS | 99.2 |

[1]Post-plant and loop stage herbicides were broadcast applied at 20 GPA; 1.5 and 2.5 leaf stage herbicides were applied via solid-set chemigation; the entire trial area was chemigated with Goal 2XL at 3 fl oz/A + Buctril at 6 fl oz/A + Prowl $H_20$ at 1.5 pint/A at the 4-leaf stage to control numerous weed escapes.

[2] Prowl $H_20$ applied at 1.5 pt/A

[3] GoalTender at 4 fl oz/A

[4] Goal 2XL at 3 fl oz/A ; Buctril 2EC at 6 fl oz/A ; Outlook at 8 fl oz/A

**Table 5. Onion Stand, Onion Growth, and Onion Yield at Silty Clay Loam Soil Grower Location in 2012** [1]

| | | Herbicide Application Time | | | Onion Injury Rating @ 3-leaf 1-10 scale | Onion Injury Rating @ 6-leaf 1-10 scale | Onion Stand 4-leaf stage plants/30ft bed | Onion Yield 10/5/2012 tons/acre |
|---|---|---|---|---|---|---|---|---|
| trt # | Post-Plant Product/A | Loop stage Product | 1.5 leaf stage Product | 2.5 leaf stage Product | | | | |
| **Goal Tender and Goal 2XL + Buctril applied via chemigation** | | | | | | | | |
| 1a | No Herbicide | Prowl $H_20$[2] | Goal Tender[3] | Goal + Buctril[4] | 1.0 | 0.0 | 651 | 20.97 |
| 2a | Dacthal 5 pt/A | | Goal Tender[3] | Goal + Buctril[4] | 1.0 | 0.0 | 665 | 23.02 |
| 3a | Nortron SC 16 fl oz/A | | Goal Tender[3] | Goal + Buctril[4] | 1.0 | 0.2 | 634 | 22.49 |
| 4a | Dacthal 2.5 pt/A | Prowl $H_20$[2] | Goal Tender[3] | Goal + Buctril[4] | 1.0 | 0.2 | 622 | 22.87 |
| 5a | Nortron SC 16 fl oz/A | Prowl $H_20$[2] | Goal Tender[3] | Goal + Buctril[4] | 1.0 | 0.5 | 652 | 21.19 |
| 6a | No Herbicide | | Goal Tender[3] | Goal + Buctril[4] | 1.0 | 0.0 | 638 | 22.21 |
| 95% Confidence Interval (NS = No Signficant Differences) | | | | | NS | 0.3 | NS | NS |
| **Goal Tender and Goal 2XL + Outlook applied via chemigation** | | | | | | | | |
| 1b | No Herbicide | Prowl $H_20$[2] | Goal Tender[3] | Goal + Outlook[5] | 0.5 | 0.0 | 644 | 24.98 |
| 2b | Dacthal 5 pt/A | | Goal Tender[3] | Goal + Outlook[5] | 0.5 | 0.2 | 632 | 24.01 |
| 3b | Nortron SC 16 fl oz/A | | Goal Tender[3] | Goal + Outlook[5] | 0.5 | 0.0 | 622 | 24.68 |
| 4b | Dacthal 2.5 pt/A | Prowl $H_20$[2] | Goal Tender[3] | Goal + Outlook[5] | 0.5 | 0.3 | 624 | 23.96 |
| 5b | Nortron SC 16 fl oz/A | Prowl $H_20$[2] | Goal Tender[3] | Goal + Outlook[5] | 0.5 | 0.3 | 617 | 25.26 |
| 6b | No Herbicide | | Goal Tender[3] | Goal + Outlook[5] | 0.5 | 0.0 | 584 | 25.99 |
| 95% Confidence Interval (NS = No Signficant Differences) | | | | | NS | NS | 30 | NS |

[1] Post-plant and Loop Stage Herbicides were broadcast applied at 20 GPA; 1.5 and 2.5 Leaf Stage Herbicides were applied via solid-set chemigation

[2] Prowl $H_20$ applied at 1.5 pt/A

[3] GoalTender at 4 fl oz/A

[4] Goal 2XL at 4 fl oz/A ; Buctril 2EC at 8 fl oz/A ; Outlook at 12 fl oz/A

**Table 6. Onion Stand, Onion Growth, and Onion Yield at Sandy Loam Soil Grower Location in 2012 [1]**

| | | Herbicide Application Time | | | Onion Injury | Onion Injury | Onion Stand | Onion Yield |
|---|---|---|---|---|---|---|---|---|
| trt # | Post-Plant Product/A | Loop stage Product | 1.5 leaf stage Product | 2.5 leaf stage Product | Rating @ 3-leaf 1-10 scale | Rating @ 6-leaf 1-10 scale | 4-leaf stage plants/30ft bed | 10/5/2012 tons/acre |
| **Goal Tender and Goal 2XL + Buctril applied via chemigation** | | | | | | | | |
| 1a | No Herbicide | Prowl $H_20$[2] | Goal Tender[3] | Goal + Buctril[4] | 1.6 | 1.0 | 525 | 26.78 |
| 2a | Dacthal 5 pt/A | | Goal Tender[3] | Goal + Buctril[4] | 1.8 | 1.2 | 536 | 27.71 |
| 3a | Nortron SC 16 fl oz/A | | Goal Tender[3] | Goal + Buctril[4] | 2.2 | 1.5 | 484 | 26.41 |
| 4a | Dacthal 2.5 pt/A | Prowl $H_20$[2] | Goal Tender[3] | Goal + Buctril[4] | 1.8 | 1.0 | 532 | 27.47 |
| 5a | Nortron SC 16 fl oz/A | Prowl $H_20$[2] | Goal Tender[3] | Goal + Buctril[4] | 2.5 | 1.7 | 501 | 26.23 |
| 6a | No Herbicide | | Goal Tender[3] | Goal + Buctril[4] | 1.7 | 1.0 | 511 | 23.78 |
| 95% Confidence Interval (NS = No Signficant Differences) | | | | | 0.5 | 0.5 | 37 | 2.49 |
| **Goal Tender and Goal 2XL + Outlook applied via chemigation** | | | | | | | | |
| 1b | No Herbicide | Prowl $H_20$[2] | Goal Tender[3] | Goal + Outlook[4] | 1.5 | 1.0 | 558 | 25.81 |
| 2b | Dacthal 5 pt/A | | Goal Tender[3] | Goal + Outlook[4] | 1.6 | 1.0 | 578 | 26.05 |
| 3b | Nortron SC 16 fl oz/A | | Goal Tender[3] | Goal + Outlook[4] | 1.7 | 1.3 | 524 | 24.78 |
| 4b | Dacthal 2.5 pt/A | Prowl $H_20$[2] | Goal Tender[3] | Goal + Outlook[4] | 1.5 | 1.0 | 588 | 27.98 |
| 5b | Nortron SC 16 fl oz/A | Prowl $H_20$[2] | Goal Tender[3] | Goal + Outlook[4] | 1.8 | 3.0 | 544 | 24.51 |
| 6b | No Herbicide | | Goal Tender[3] | Goal + Outlook[4] | 1.5 | 0.8 | 544 | 24.79 |
| 95% Confidence Interval (NS = No Signficant Differences) | | | | | 0.2 | 0.5 | NS | 1.47 |

[1]Post-plant and loop stage herbicides were broadcast applied at 20 GPA; 1.5 and 2.5 leaf stage herbicides were applied via solid-set chemigation; the entire trial area was chemigated with Goal 2XL at 3 fl oz/A + Buctril at 6 fl oz/A + Prowl $H_20$ at 1.5 pint/A at the 4-leaf stage to control numerous weed escapes.

[2] Prowl $H_20$ applied at 1.5 pt/A

[3] GoalTender at 4 fl oz/A

[4] Goal 2XL at 3 fl oz/A ; Buctril 2EC at 6 fl oz/A ; Outlook at 8 fl oz/A