

DIRECT-SEEDED ONION RESPONSE TO DUAL MAGNUM[®] HERBICIDE BANDED BETWEEN BEDS BEFORE HARROWING

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Introduction

Yellow nutsedge continues to present challenges in onion production in Malheur County, Oregon, and southwestern Idaho. Poor control is associated with application timings for Dual Magnum[®] (S-metolachlor) and Outlook[®] (dimethenamid-P), both of which have current labels that allow application after onions have attained the 2-leaf growth stage. However, at that stage, yellow nutsedge has already emerged. Because Dual Magnum and Outlook (WSSA/HRAC group 15) herbicides lack the ability to control emerged weeds, yellow nutsedge flourishes all season long. The objective of this experiment was to evaluate onion cultivar ‘Vaquero’ response and yellow nutsedge control when Dual Magnum was banded between mound beds before harrowing in spring.

Materials and Methods

A field experiment was established at the Malheur Experiment Station during spring 2020.

The field was prepared the previous fall by flailing wheat stubble. The field was then irrigated, disked, ripped, plowed, and groundhogged. Based on soil analysis, fertilizer was broadcast applied during fall 2019 at 100 lb nitrogen (N)/acre, 50 lb phosphorus/acre, 100 lb potassium/acre, 2 lb zinc/acre, and 2 lb boron/acre. The field was fumigated with Telone[®] C-35 at 13 gal/acre and beds were formed at 22-inch spacing on October 18, 2019.

In the spring, Dual Magnum was applied at 4 different rates (Table 1) in a band to the area between mounded beds (14-inch band in the furrow of two beds), leaving the top 7 inches of each bed unsprayed. The beds were harrowed down, and onion seed of cultivar Vaquero was planted on March 24, 2020, in double rows spaced 3 inches apart with 4-inch seed spacing within each row. Each pair of rows was planted on beds spaced 22 inches apart. Immediately after planting, each onion bed received a 7-inch band of Lorsban[®] 15G at 3.7 oz/1000 ft of row (chlorpyrifos 0.101 lb ai/acre) and the soil surface was rolled.

The study had a randomized complete-block design with four replicates. Individual plots were 7.33 ft wide (4 beds) by 27 ft long. Herbicide treatments were applied using a CO₂-pressurized backpack sprayer fitted with a boom equipped with 8002EVS TeeJet nozzles calibrated to deliver 20 gal/acre. Plots (except the untreated and hand-weeded checks) were sprayed with a delayed pre-emergence combination of Prowl[®] H₂O at 2 pt/acre (pendimethalin 0.95 lb ai/acre) and glyphosate herbicides on April 7, 2020. A tank-mixture of Brox[®] 2EC at 12 fl oz/acre plus

GoalTender at 4 fl oz/acre was applied on May 15, 2020, to control broadleaf weeds. Poast[®] herbicide was later applied to control grassy weeds. The study was furrow irrigated.

In-season fertilizer was applied according to soil and tissue test results. Fertilizer was side dressed on May 27 to supply 225 lb N/acre.

The following insecticide combinations were used on the indicated dates to control onion thrips:

- May 29 and June 5, 2020 — Movento[®] 5 fl oz/acre (spirotetramat 0.078 lb ai/acre) + Aza-Direct[®] 12 fl oz/acre (azadirachtin 0.0093 lb ai/acre) + Persist[®] Ultra 1% v/v (methyl esters of canola oil 85% + alkyl phenol ethoxylate 12%).
- June 18 and June 26, 2020 — Exirel[®] 20.5 fl oz/acre (cyantraniliprole 0.13 lb ai/acre) + Persist Ultra 1% v/v (methyl esters of canola oil 85% + alkyl phenol ethoxylate 12%).
- July 4 and 14, 2020 — Radiant[®] 10 fl oz/acre (spinetoram 0.078 lb ai/acre) + Dyne-Amic[®] adjuvant 0.25% v/v (methyl esters of C16-C18 fatty acids, polyalkyleneoxide modified polydimethylsiloxane, alkylphenol ethoxylate 99%).

All other operations followed recommended local production practices for furrow-irrigated onions. Visible plant injury and weed control were assessed based on a scale of 0% (no onion injury or weed control) to 100% (complete onion plant kill or total weed control). Weed control and onion response to herbicide mixtures were assessed on May 26 and June 17, 2020. The numbers of weeds in the center two rows of each plot were enumerated by species on July 2, 2020.

The field was furrow irrigated on a calendar schedule April 20 to August 28, 2020. Plant tops were flailed on September 8, and onion bulbs were lifted and left in the field to cure. Bulbs were hand harvested from the two center beds on September 11, 2020, and placed in burlap bags. Bulbs were graded for yield and quality based on USDA standards as follows: bulbs without blemishes (U.S. No. 1), split bulbs (No. 2), bulbs infected with the fungus *Botrytis allii* in the neck or side, bulbs infected with the fungus *Fusarium oxysporum* (plate rot), bulbs infected with the fungus *Aspergillus niger* (black mold), and bulbs infected with unidentified bacteria in the external scales. The U.S. No. 1 bulbs were graded according to diameter: small (<2¼ inches), medium (2¼–3 inches), jumbo (3–4 inches), colossal (4–4¼ inches), and super colossal (>4¼ inches). Marketable yield consisted of U.S. No.1 bulbs greater than 2¼ inches in diameter.

Results and Conclusions

Evaluations on May 26 and June 17 indicated 8% visible injury for plants in plots treated with Dual Magnum at 0.85 or 0.95 pt/acre compared to 11% for Dual Magnum at 1.27 pt/acre and 93% for Dual Magnum at 2.55 pt/acre (data not shown). The injury was characterized by poor unfurling of new leaves and the first true leaf appearing trapped in the sheath. As the sheath-trapped leaf pushed to come out, the plants would bend and twist, resulting in distorted growth (Figure 1). Subsequent evaluation on July 1 indicated onions had fully recovered from injury (Figure 1) but were stunted in plots treated with Dual Magnum at 2.25 pt/acre.

Injury was observed on newly emerged onion seedlings (Figure 1). However, onions were free of injury symptoms by mid-season. Total marketable yield ranged from 849.3 to 1,057.8 cwt/acre across herbicide treatments (Table 1).

These results suggest that banding Dual Magnum during spring, before harrowing the beds, may provide yellow nutsedge control in furrow-irrigated onions. We will continue to improve the methods by reducing the herbicide-banded area in order to reduce early season onion injury.

Acknowledgements

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Table 1. Onion yield in response to Dual Magnum banded between beds before harrowing at the Malheur Experiment Station, Oregon State University, Ontario, OR, 2020.

Treatment	Rate	Product rate	Growth stage	Appl code	Marketable yield by grade						
					No.2	Small	Medium	Jumbo	Colossal	Super colossal	Total marketable
					cwt/acre						
Untreated					5.2 a	5.9 a	14.2 a	544.5 a	396.7 a	64.5 a	1019.9 a
Dual Magnum	0.81	0.85	PRE harrowing	A	0.0 a	6.8 a	17.4 a	454.1 a	403.9 a	182.3 a	1057.8 a
Prowl H ₂ O	0.95	2	LPRE	B							
Dual Magnum	0.905	0.95	PRE harrowing	A	3.4 a	11.3 a	23.1 a	502.8 a	336.9 a	113.2 a	976.0 a
Prowl H ₂ O	0.95	2	LPRE	B							
Dual Magnum	1.21	1.27	PRE harrowing	A	0.0 a	9.9 a	22.8 a	426.7 a	404.8 a	145.6 a	999.9 a
Prowl H ₂ O	0.95	2	LPRE	B							
Dual Magnum	2.43	2.55	PRE harrowing	A	3.6 a	8.5 a	25.1 a	319.1 a	342.6 a	162.6 a	849.3 a
Prowl H ₂ O	0.95	2	LPRE	B							
LSD (P = 0.05)					NS	NS	NS	NS	NS	NS	NS

Note: Means within a column followed by same letter do not significantly differ (P = 0.05, LSD).

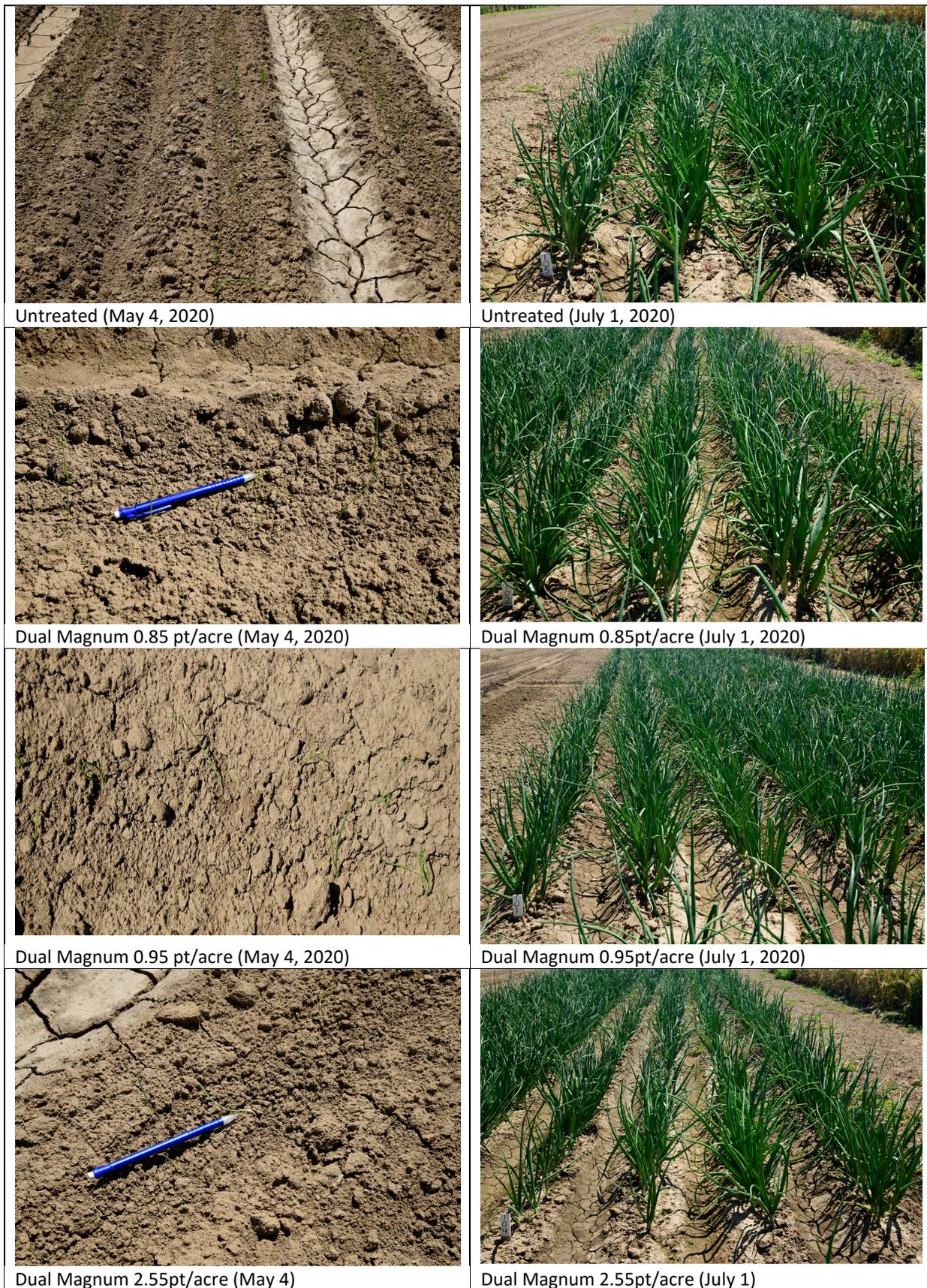


Figure 1. Plants in plots treated with Dual Magnum in furrows before bed harrowing, Malheur Experiment Station, Oregon State University, Ontario, OR, 2020.