SUGAR BEET RESPONSE TO DUAL MAGNUM® APPLICATION TIMING FOR YELLOW NUTSEDGE CONTROL

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Introduction

Irrigation and prevailing warm growing conditions provide ideal conditions for yellow nutsedge and other weeds to flourish in the Treasure Valley of eastern Oregon and southwestern Idaho. Weed control is an essential component of sugar beet production. Yellow nutsedge continues to be one of the most problematic weeds in some Treasure Valley fields; it presents a crop production challenge if not effectively managed in all crops grown in a rotation.

Yellow nutsedge populations can expand and contract in individual fields based on a variety of environmental and management factors. Given its perennial nature, yellow nutsedge remains a problem once it produces mature tubers in a field. Production of tubers makes control of yellow nutsedge difficult because tubers can persist in the soil for 3-5 years. Therefore, timely application of effective herbicides for each successive crop in a rotation is critical in the management of yellow nutsedge.

Because of early crop sensitivity, the current Dual Magnum® label only allows for its postemergence application after the sugar beet plants are at the first true leaf stage. At this stage, yellow nutsedge may have already emerged, and Dual Magnum does not control weeds already emerged, including yellow nutsedge. Therefore, the use of Dual Magnum and Outlook® as postemergence herbicides tank-mixed with glyphosate has largely failed to reduce yellow nutsedge in sugar beet fields.

Onion growers secured an indemnified label for Dual Magnum application to control yellow nutsedge the summer-fall preceding onion. The objective of this study was to evaluate a similar approach in which Dual Magnum would be applied and incorporated in the soil during mid-August to early September of the year preceding sugar beet.

Materials and Methods

A field study was initiated during fall 2016 in a growers' field near Ontario, Oregon previously planted to wheat. The predominant soil was a Greenleaf silt loam with a pH of 7.2 and 1.79% organic matter. The wheat stubble was flailed and the field was irrigated, disked, ripped, and rototilled in August 2016. The study had a randomized complete block design with four replications. Individual plots were 14 ft wide (8 rows) by 35 ft long. Plow-down herbicide treatments were applied on September 1, 2016 and the field was immediately moldboard plowed and disked to incorporate the herbicides in the soil. Post-plowing treatments were applied on September 14 and immediately disked into the soil. Fall fertilizer was broadcast on September 12, 2016 based on soil analysis. On October 18, 2016, the field was fumigated with Telone®C-17

at 18 gal/acre (1,3 dichloropropene 81.2% plus chloropicrin 16.5%) and simultaneously bedded on a 22-inch bed centers.

Seed of sugar beet hybrid 27RR20 was planted on April 21, 2017. The insecticide terbufos was applied on April 25 at 1.11 lb ai/acre (Counter® 15G at 7.4 lb/acre). Dual Magnum at the pre-emergence timing was applied on April 28. All plots (except the untreated check) were sprayed with glyphosate at 32 fl oz/acre plus Outlook at 21 fl oz/acre on May 19, 2017. Fertilizer was applied according the soil test results. Preventative sprays for diseases and insects were applied aerially by a commercial contractor. Otherwise all production practices including irrigation followed local production practices. Weed control and sugar beet injury were evaluated subjectively on May 4 based on 0 to 100% scale; where 0% = no weed control or crop injury and 100% = complete weed control or complete crop kill.

Plant tops were flailed and sugar beets were hand-harvested on September 20, 2017 from the two center rows of each plot. Sugar beet root weight from each plot was corrected for tare to estimate yield. Analysis for percent sucrose content and other sugar beet quality variables were conducted on September 25 at the Amalgamated Sugar Factory in Paul, Idaho. Data were subjected to analysis of variance using SAS and means compared using protected LSD at $P = 0.05\%$ level of confidence.

Results and Discussion

Sugar beet emergence was observed on May 2, 2017. Evaluation on May 4 indicated yellow nutsedge control ranging from 13 to 97% (Table 1). Plots treated with Dual Magnum at 1 or 1.33 pt/acre followed by moldboard plowing and disking had the lowest control. Application of Dual Magnum at 0.5 or 1 pt/acre after moldboard plowing and disking provided the best yellow nutsedge control at 95 and 97%, respectively. Evaluation during mid-season following glyphosate application when sugar beet plants were at the 2-leaf stage indicated 50 to 90% yellow nutsedge control across herbicide treatments (data not shown).

Dual Magnum treatments did not cause visible sugar beet foliar injury and did not reduce root yield or harvested root yield (Table 1). Similarly, there were no effects on percent sucrose content, nitrate (ppm), root conductivity, or the estimated recoverable sugar (ERS). Sucrose content ranged from 13.7 to 14.7% across treatments. Root conductivity ranged from 0.83 to 1 mmhos across treatments while nitrate content was 383 to 539%. Root yield ranged from 53.5 to 58.2 tons/acre across treatments. The estimated recoverable sugar ranged from 12,299 to 14,160 lb/acre.

It is not clear if the lack of sugar beet injury was influenced by the uncharacteristically high snow during winter 2016 and early spring precipitation. The increased moisture may have helped to move the herbicides below the top soil layer and mitigated the injury to emerging sugar beet seedlings. A follow-up study to confirm these results will be conducted in 2018 following the same procedures. If these results are confirmed, the data will be used to petition the EPA for a Dual Magnum label for application the fall preceding sugar beet.

Disclaimer: products used in this study are for experimental purpose only and NOT labeled for application the fall preceding sugar beet production.

Table 1. Yellow nutsedge control and sugar beet yield in response to Dual Magnum applied at different timeings at the Malheur Experiment Station, Oregon State University, Ontario, OR, 2016-2017.

Treatment [z]	Rate/acre	Timing [y]	Y. nutsedge control	Sucrose	Clean root yield [x]		ERS [w]	
			%	(%)	(ton/acre) [v]		(lb/acre) [v]	
Fumigation			2.5 e	14.53	26.8	b	6539	b
Dual Magnum	1 pt	Fall/plow	12.5 de	14.44	57.5	a	13805	a
Dual Magnum	1.33 pt	Fall/plow	30.0 b	14.34	59.2	a	14160	a
Dual Magnum + EPTAM	1 pt 7 pt	Fall/plow	27.5 bc	14.72	55.5	a	13507	a
Dual Magnum + EPTAM	1.33 pt 7 pt	Fall/plow	21.3 bcd	14.20	56.6	a	13269	a
Dual Magnum + EPTAM fb Dual Magnum	0.5 pt +7 pt 0.5 pt	Fall/surface POST	94.5 a	14.46	55.6	a	13097	a
Dual Magnum + EPTAM	1 pt 7 pt	Fall/surface	97.3 a	14.64	58.2	a	13930	a
Dual Magnum fb Dual Magnum	0.5 pt 0.5 pt	Fall/plow POST	21.3 b	13.65	57.5	a	12955	a
Dual Magnum	0.75 pt	PRE	31.3 b	14.27	53.5	a	12299	a
Roundup + Outlook	22 fl oz 21 fl oz	POST	15.0 cde	14.35	56.4	a	13276	a
LSD (0.05)			14.1	NS	11.2		3021	
***P* > F**			0.0001	0.6743	0.0001		0.0013	

[z] fb = followed by

[y] Fall/plow = Treatments applied fall of 2016 preceding sugar beet; Fall/surface = treatments applied after soil tillage and disked in the soil twice during fall of 2016; PRE = herbicide applied immediately after sugar beet planting. POST = herbicide applied in season to sugar beet at the 2-leaf stage.

[x] Root yield was tared.

[w] ERS = Estimated recoverable sucrose.

[v] Means within a column followed by the same letter are not significantly different according to Fisher's protected least significant difference (LSD) $P \leq 0.05$.