DOSE RESPONSE OF ACTIVATED CHARCOAL TO DETOXIFY DUAL MAGNUM® AND OUTLOOK® APPLIED PRE-EMERGENCE ON DIRECT-SEEDED ONIONS

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Introduction

Yellow nutsedge is a problem in onion fields in the Treasure Valley of eastern Oregon and southwestern Idaho. Dual Magnum® (*s*-metolachlor) and Outlook® (dimethenamid-p) are registered for yellow nutsedge control in onions. The application timing of Dual Magnum and Outlook (starting when onions are at 2-leaf stage) makes these herbicides less effective. This is because Dual Magnum and Outlook are more effective in controlling yellow nutsedge when applied prior to yellow nutsedge emergence. The potential to use activated carbon to neutralize the two herbicides within the onion row was demonstrated in previous studies (Felix and Ishida 2009). However, determination of the most effective rate for activated charcoal to provide adequate crop protection will suggest the cost effectiveness of the practice in direct-seeded onion productions. The objective of this study was to determine the optimum rate of activated charcoal to be applied to neutralize the herbicides Dual Magnum and Outlook over the onion row when the herbicides are applied prior to onion emergence (PRE). **Dual Magnum and Outlook herbicides are not currently registered for pre-emergence application on direct-seeded dry bulb onions. Always read herbicide labels to ensure that the product is registered for the intended use.**

Materials and Methods

A field study was conducted in 2010 at the Malheur Experiment Station, Ontario, Oregon to determine the dose response of activated charcoal to detoxify Dual Magnum and Outlook applied PRE on direct-seeded onions. The field was harrowed and planted to onion variety 'Vaquero' on March 24, 2010. The study followed a split-plot design with charcoal rates forming the main plots to which herbicide rates were imposed as subplots. The study had 4 replications and the plots were 4 rows on 22-inch beds by 30 ft long. Activated charcoal was applied at the time of planting and herbicide treatments were applied on March 29, 2010.

The activated charcoal brand used was GRO-SAFE® (Norit Americas Inc., Atlanta, GA) and was applied using a modified planter fitted with a 25-gal Rear's NIFTY Tank Series (Rear's Manufacturing Co., Eugene, OR) with a 1-inch band of activated charcoal slurry sprayed directly over the onion row. Activated charcoal was applied at the rates of 5, 10, 15, 20, and 25 lb/acre in

50 gal of water on the soil surface directly behind the press wheel of the onion planter. Dual Magnum was applied at a rate of 1.33 pt/acre (1.27 lb ai/acre) and Outlook at 21 fl oz/acre (0.98 lb ai/acre). The study also included a grower standard, which was treated with Prowl® H_2O at 2 pt/acre (pendimethalin at 1 lb ai/acre) before onion emergence, followed by Buctril® and Goal® 2XL herbicides at 0.5 pt/acre (bromoxynil and oxyfluorfen at 0.125 lb ai/acre) with and without charcoal. An untreated control treatment was also included.

Lorsban® 15G was applied at a rate of 3.7 oz/1,000 ft of row over the entire field on March 29 as a preventive measure against onion maggots. Plants were counted in the center 2 rows of the plot by 15 ft length on May 12 to evaluate onion plant population density in response to herbicide treatments. A tankmix of Buctril at 16 oz/acre plus Goal at 8 oz/acre (bromoxynil at 0.25 lb ai/acre plus oxyfluorfen at 0.25 lb ai/acre) and Poast at 1.5 pt/acre (sethoxydim at 0.287 lb ai/acre) was applied on May 25 to control weeds. Fertilizer was applied on June 8 to supply 250 lb/acre of nitrogen, 180 lb/acre of phosphorus, 90 lb/acre of potassium, 5 lb/acre of zinc, 4 lb/acre of manganese, and 1 lb/acre of boron.

Movento® insecticide was applied on June 23 at a rate of 4 fl oz/acre plus Ad-Wet® non-ionic surfactant at 8 fl oz/100 gal of water for onion thrips control. Onions were sprayed for thrips control again on June 30 using Success® at 8 oz/acre plus Aza-Direct® at 16 oz/acre (spinosad at 0.125 lb ai/acre plus azadirachtin at 0.0123 lb ai/acre). Lannate® at 3 pt/acre (methomyl at 0.9 lb ai/acre) was applied on July 15, July 27, and August 26 for onion thrips control. Irrigation was scheduled to maintain proper moisture levels in the top 12 inches of soil profile.

Onions were lifted on September 14 from 27 ft of the center 2 rows and bulbs were hand harvested on September 16. Dry bulb onions were graded on September 20 using USDA standard categories. The data collected were subjected to analysis of variance and means compared using LSD at $P = 0.05$.

Results and Discussion

No significant reduction in plant stand or onion yield was observed with the various rates of activated charcoal when Dual Magnum and Outlook were applied PRE. However, the Dual Magnum treatment had significantly greater plant stand on May 12 relative to plots treated with Outlook or the grower standard treatment (data not shown). Generally, the onion yield results did not indicate significant differences among treatments for the different onion grade yields and total marketable yield (Table 1). Even though Dual Magnum did not show any significant reduction in plant stand and/or yield, it is not known what the response would be under extreme moisture conditions. Therefore, a separate study was conducted to evaluate onion response to Dual Magnum and Outlook applied PRE on direct-seeded dry bulb onions with the addition of sprinkler irrigation to simulate rain immediately after herbicide application. The results for that study are reported separately.

The dose response study will be repeated in 2011 to evaluate onion response to simulated rain after PRE application of herbicides. More studies are needed to evaluate crop response to Dual magnum and Outlook applied prior to onion emergence with different rates of activated charcoal. If a favorable crop response is demonstrated, we will work with the manufacturers to pursue future registration of Dual Magnum and Outlook for pre-emergence use on direct-seeded onions.

References

Felix, J., and J. Ishida. 2009. Use of activated charcoal to detoxify Dual Magnum® and Outlook® applied pre-emergence on direct-seeded onions. Oregon State University Malheur Agricultural Station Annual Report 2010:115-118.

Table 1. Onion yield in response to herbicides and activated charcoal rate at Malheur Experiment Station, Ontario, OR 2010

				Onion yield					
Treatment	Rate	Unit	Charcoal	Small	Medium	Jumbo	Colossal	Super Colossal	Marketable Yield
				---------- cwt/acre ----------					
Grower standard[a]			0 lb/a	13.8	165.2	493.0	2.0	0.0	660.2
Dual Magnum	1.33	pt/a	0 lb/a	11.5	109.6	611.8	7.5	0.0	728.9
Dual Magnum	1.33	pt/a	5 lb/a	15.7	154.3	496.8	2.4	0.0	653.6
Dual Magnum	1.33	pt/a	10 lb/a	17.2	169.5	511.5	2.7	0.0	683.7
Dual Magnum	1.33	pt/a	15 lb/a	14.4	153.4	593.5	10.6	0.0	757.6
Dual Magnum	1.33	pt/a	20 lb/a	21.7	173.1	488.9	1.2	0.0	663.2
Dual Magnum	1.33	pt/a	25 lb/a	53.5	253.1	423.8	0.0	0.0	676.9
Outlook	21.00	fl oz/a	0 lb/a	10.8	117.8	575.0	9.9	0.0	702.7
Outlook	21.00	fl oz/a	5 lb/a	10.7	131.8	534.6	4.4	0.0	670.9
Outlook	21.00	fl oz/a	10 lb/a	15.8	157.9	470.7	2.5	0.0	631.1
Outlook	21.00	fl oz/a	15 lb/a	10.9	129	600.5	4.9	0.0	734.5
Outlook	21.00	fl oz/a	20 lb/a	23.9	217.5	452.7	0.9	0.0	671.2
Outlook	21.00	fl oz/a	25 lb/a	21.1	176.4	497.1	2.3	0.0	675.8
				NS	NS	NS	NS	--	NS

[a] The grower standard was treated with Prowl H_2O at 2 pt/acre (pendimethalin at 1 lb ai/acre) before onion emergence, followed by Buctril and Goal 2XL herbicides at 0.5pt/acre (bromoxynil and oxyfluorfen at 0.125 lb ai/acre).