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

Joel Felix, Kevin V. Osborne, and Joey Ishida, Malheur Experiment Station, Oregon State University, Ontario, OR, 2011

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. However, the application timing of Dual Magnum and Outlook (starting when onions are at the two-leaf stage) makes these herbicides less effective, because Dual Magnum and Outlook are more effective in controlling yellow nutsedge and other weeds when applied prior to their emergence. The potential to use activated carbon to neutralize Dual Magnum and Outlook within the onion row was demonstrated in previous studies (Felix and Ishida 2009, Felix et al. 2010). Determination of the most effective rate for activated carbon to provide adequate crop protection is required in order to determine the cost effectiveness of the practice in direct-seeded onion productions. The objective of this study was to determine the optimum rate of activated carbon to neutralize the herbicides Dual Magnum and Outlook over the onion row when the herbicides are applied prior to onion emergence. **Dual Magnum and Outlook herbicides are not currently registered for preemergence 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 2011 at the Malheur Experiment Station, Ontario, Oregon to determine the dose response of activated charcoal to detoxify Dual Magnum and Outlook applied prior to the emergence of direct-seeded onion. The wheat stubble was flailed and the field plowed during fall 2010. Enough fertilizer to provide 44, 210, 210, 5, 8, and 5 lb/acre of nitrogen, phosphate, sulfur, zinc, and manganese was applied during fall 2010. The field was later groundhogged and 22-inch-wide beds formed. The beds were harrowed and reshaped on April 5, 2011. On April 12, onion variety 'Vaquero' was planted and charcoal applied in a single pass. The study followed a split-plot design with simulated rain (with and without) forming the main blocks into which herbicides and charcoal rates were imposed as subplots. The study had three replications and the plots were 7.33 ft wide (4 beds) by 25-ft length. Lorsban® 15G insecticide was applied at 3.7 oz/1,000 ft of row (chlorpyrifos at 0.101 lb ai/acre) on April 18 as a preventive measure against onion maggot.

The activated charcoal 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 each row. Activated charcoal was applied at the rates of 5, 10, 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 (*S*-metolachlor at 1.27 lb ai/acre) and Outlook at 21 fl oz/acre (dimethenamid-p at 0.98 lb ai/acre). The study also included a grower standard, which was treated with Prowl® H2O at 2 pt/acre (pendimethalin at1 lb ai/acre) before onion emergence on May 3. Sprinkler irrigation was applied to half of the plots on May 2, simulating 0.5 inches of rainfall in one hour. The complete list of herbicides and charcoal rates evaluated in 2011 is presented in Table 1.

Onion plants were counted in the center two rows of each plot on May 22 to determine the plant population density in response to herbicide treatments. Poast® at 1.5 pt/acre (sethoxydim at 0.287 lb ai/acre) tank-mixed with crop oil at 2 pt/acre was applied on May 25 to control grassy weeds. Fertilizer was side dressed on June 21 to provide 225 lb nitrogen/acre.

The plants were sprayed four times with different insecticides during the season to control onion thrips. Movento® at 5 fl oz/acre (spirotetramat at 0.078 lb ai/acre) tank-mixed with Pierce (crop oil concentrate) at 1.57 lb ai/acre was applied on June 13. Onions were sprayed again for thrips control on June 22 and July 5 using Radiant® at 10 fl oz/acre (spinetoram at 0.078 lb ai/acre) tank-mixed with crop oil at 1 qt/100 gal of water. The final spray for thrips control was on July 24 using Lannate® at 3 pt/acre (methomyl atl 0.9 lb ai/acre). Furrow irrigation began on May 9 and was regularly applied to maintain proper moisture levels in the top 12 inches of soil profile.

Plant tops were flailed on September 8 and onions were lifted on September 12 and left on the ground to cure. Bulbs were handpicked from 15 ft of the center 2 rows on September 15 and stored in the barn until they were graded. Dry bulb onions were graded on September 25 using USDA standard categories. The data collected were subjected to analysis of variance and means were compared using LSD at $P = 0.05$.

Results and Discussion

There was no significant reduction in plant stand in response to the various rates of activated charcoal when Dual Magnum and Outlook were applied prior to onion emergence (Table 1). Generally, the onion yield results did not indicate significant differences among treatments for the colossal and super colossal onion grades (Table 1). The analysis indicated differences among treatments for the small, medium, and jumbo categories, which in turn affected the results for marketable category. The results, however, did not clearly distinguish the effects of charcoal, irrigation, and the herbicide treatments. We suspect the weather conditions in 2011 may have contributed to these results. Because of the cooler conditions earlier in the season, the herbicides may not have been active to negatively affect the emerging onion seedlings. Importantly, the relatively heavy soil texture (silt loam) may have masked the effect of Dual Magnum and Outlook on emerging seedlings when applied prior to onion emergence.

The application of sprinkler irrigation to simulate rain after herbicide application before onion emergence, did not significantly impact stand or yield (Table 2). However, it should be noted that windy conditions at or around the time of planting delayed both the intended application dates of herbicide and sprinkler irrigation. Preemergent herbicides were not applied until 10 days

after planting and the sprinkler application was applied another 10 days after the herbicides were applied, which may have impacted the spread and activity of herbicides on the emerging seedlings.

The dose response study will be repeated in 2012 to further evaluate onion response to simulated rain after preemergence application of herbicides. This study is important in order to determine the most efficacious rate. If favorable crop response is demonstrated, we will work with the manufacturers to pursue future registration of Dual Magnum and Outlook preemergence use on direct-seeded onions.

References

Felix, J., and J. Ishida. 2009. Use of activated charcoal to detoxify Dual Magnum® and Outlook® applied preemergence on direct-seeded onions. Oregon State University Malheur Agricultural Station Annual Report, Ext/CrS 131:115-118.

Felix, J., K. V. Osborne, and J. Ishida. 2010. Evaluation of Dual Magnum® and Outlook® used preemergence on direct-seeded dry bulb onions with activated charcoal. Oregon State University Malheur Agricultural Station Annual Report, Ext/CrS 132:120-125.

Table 1. Onion stand and yield in response to herbicides and activated charcoal rate at Malheur Experiment Station, Ontario, OR, 2011.

Herbicide[a]	Rate		Charcoal	Irrigation	Stand	Onion yield					
						Small	Medium	Jumbo	Colossal	Super colossal	Marketable yield
			lb/acre	0.5 in	plants/acre	cwt/acre					
Prowl H2O	2	pt/a	0	Yes	93,060	4.5	16.2	529.0	313.6	65.5	922.2
Prowl H2O	2	pt/a	0	No	102,465	4.8	55.2	479.1	274.0	86.4	853.6
Prowl H2O	2	pt/a	5	Yes	109,065	3.1	32.3	612.8	235.7	26.0	888.4
Prowl H2O	2	pt/a	5	No	81,675	6.7	16.5	419.1	231.3	59.4	723.8
Prowl H2O	2	pt/a	10	Yes	98,175	5.9	24.2	551.4	240.8	45.3	851.5
Prowl H2O	2	pt/a	10	No	92,070	2.9	20.5	514.2	280.8	59.4	868.4
Prowl H2O	2	pt/a	15	Yes	111,210	7.7	27.8	693.7	266.6	17.6	991.9
Prowl H2O	2	pt/a	15	No	104,445	4.9	15.5	611.8	341.8	79.8	1047.4
Prowl H2O	2	pt/a	20	Yes	110,550	4.2	29.1	615.1	273.4	38.4	940.9
Prowl H2O	2	pt/a	20	No	111,210	3.2	28.7	642.9	325.1	68.7	1,050.8
Prowl H2O	2	pt/a	25	Yes	107,580	6.6	27.2	588.7	263.8	29.9	896.5
Prowl H2O	2	pt/a	25	No	102,300	2.3	18.6	656.6	321.9	39.3	1,031.9
Dual Magnum	1.33	pt/a	0	Yes	86,625	3.9	19.4	443.6	267.6	82.5	807.7
Dual Magnum	1.33	pt/a	0	No	99,660	4.1	31.1	465.8	310.3	94.3	884.5
Dual Magnum	1.33	pt/a	5	Yes	100,485	5.0	15.7	529.8	281.0	52.4	877.2
Dual Magnum	1.33	pt/a	5	No	85,305	3.6	6.3	292.2	347.4	107.6	761.2
Dual Magnum	1.33	pt/a	10	Yes	107,910	6.5	29.7	667.0	201.5	17.0	899.6
Dual Magnum	1.33	pt/a	10	No	99,825	3.8	26.9	600.1	267.9	65.3	947.4
Dual Magnum	1.33	pt/a	15	Yes	95,040	5.8	19.1	541.9	270.2	26.0	852.1
Dual Magnum	1.33	pt/a	15	No	101,640	3.6	17.7	563.8	326.1	82.6	986.5
Dual Magnum	1.33	pt/a	20	Yes	110,220	3.7	25.3	652.9	250.5	39.6	956.9
Dual Magnum	1.33	pt/a	20	No	110,385	6.3	30.6	655.4	257.8	34.5	961.7
Dual Magnum	1.33	pt/a	25	Yes	98,670	8.9	32.3	580.6	291.3	34.2	920.2
Dual Magnum	1.33	pt/a	25	No	108,405	3.9	26.9	660.2	205.2	49.2	928.6
Outlook	21	fl. oz/a	0	Yes	94,545	2.4	31.7	420.7	337.3	86.2	858.3
Outlook	21	fl. oz/a	0	No	84,810	2.8	17.6	449.0	244.5	109.4	816.9
Outlook	21	fl. oz/a	5	Yes	95,370	6.5	22.4	524.0	292.0	65.8	895.8
Outlook	21	fl. oz/a	5	No	104,115	4.5	38.8	608.6	296.4	81.1	1,000.1
Outlook	21	fl. oz/a	10	Yes	70,785	7.1	20.1	353.5	197.4	45.9	610.8
Outlook	21	fl. oz/a	10	No	95,370	4.1	33.5	516.6	195.3	62.9	788.9
Outlook	21	fl. oz/a	15	Yes	93,225	6.1	24.9	489.8	273.7	30.8	808.3
Outlook	21	fl. oz/a	15	No	99,825	3.8	17.7	557.9	388.0	33.6	993.5
Outlook	21	fl. oz/a	20	Yes	108,240	3.5	22.5	667.7	246.9	28.6	957.2
Outlook	21	fl. oz/a	20	No	108,075	6.6	30.9	616.6	266.5	12.7	909.8
Outlook	21	fl. oz/a	25	Yes	97,845	3.9	31.9	553.8	286.7	35.8	890.2
Outlook	21	fl. oz/a	25	No	116,490	3.2	34.9	725.0	262.8	37.2	1,038.9
LSD (P = 0.05)					NS	5	21.3	232	NS	NS	275

[a] Prowl H2O was applied prior to onion emergence. All treatments were also sprayed with GoalTender at 0.5 pt/acre (0.25 lb ai/acre) and Buctril at 0.5 pt/acre (0.125 lb ai/acre) when onions were at the two-leaf stage.

Table 2. Onion stand and yield in response to application or no application of sprinkler irrigation to simulate rain. Malheur Experiment Station, Ontario, OR, 2011.

		Onion Yield					
Treatment	Plant stand	Small	Medium	Jumbo	Colossal	Super colossal	Marketable yield
	no./acre	---------- cwt/acre ----------					
No Irrigation	99,367	5.3	25.1	556.4	266.1	42.6	879.2
Irrigation	100,448	4.2	26.0	557.5	285.7	64.6	921.9
LSD *P* = 0.05	NS	NS	NS	NS	NS	NS	NS