

USE OF ACTIVATED CHARCOAL TO DETOXYFY DUAL MAGNUM[®] AND OUTLOOK[®] APPLIED PRE-EMERGENCE ON DIRECT-SEEDED ONIONS

Joel Felix and Joey Ishida
Malheur Experiment Station
Oregon State University
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Introduction

Herbicides s-Metolachlor (Dual Magnum[®]) and dimethenamid-p (Outlook[®]) are registered for use on direct-seeded onions, but only after the onions have reached the 2-leaf stage. Depending on planting date and soil temperatures, approximately 5 to 7 weeks are needed for direct-seeded onions to reach the 2-leaf stage, at which time most yellow nutsedge has emerged. In order to provide adequate yellow nutsedge control, both Dual Magnum and Outlook have to be applied pre-emergence to weeds, including yellow nutsedge. The objective of this study was to evaluate the potential use of activated carbon to detoxify Dual Magnum and Outlook when applied pre-emergence (PRE) on direct-seeded onions.

Materials and Methods

A field study was conducted at the Malheur Experiment Station, Ontario, Oregon in 2009 to evaluate the potential use of activated carbon to detoxify Dual Magnum and Outlook applied PRE on direct-seeded onions. The field was harrowed and planted to onion variety 'Vaquero' on March 19, 2009. The study followed a split-plot design with charcoal rates forming the main plots to which herbicide rates were superimposed as subplots. The study had four replications and the plot size was 4 rows of 22-inch by 30-ft bed. Herbicide treatments were applied on March 27 using a tractor to deliver 20 gal/acre of spray solution. Chlorpyrifos (Lorsban[®] 15G) insecticide was banded at 0.125 lb ai/acre (3.7 oz/1,000 ft) of row on March 31.

The activated charcoal brand used was GRO-SAFE[®] (Norit Americas Inc., Atlanta, GA). Activated charcoal was applied at onion planting using a modified planter fitted with a 25-gal Rear's NIFTY Tank Series (Rear's Manufacturing Co., Eugene, OR) to spray a 1-inch band of charcoal slurry directly over the onion row (Fig. 1). The charcoal was applied at 12.5 and 25 lb/acre in 50 gal of water and banded either directly on the ground behind the press wheel and drag chain or in-furrow directly behind the planter shoe. Dual Magnum was applied at 0.95 or 1.27 lb ai/acre (1 or 1.33 pt/acre) and Outlook at 0.98 lb ai/acre (21 fl oz/acre) or 0.47 lb ai/acre (10 fl oz/acre) followed by another 10 fl oz/acre when onions were at the 2-leaf stage. The study also included the two herbicides applied without charcoal and an untreated control.

Sethoxydim at 0.287 lb ai/acre (Poast[®], 1.5 pt/acre) was applied on April 22 to control volunteer wheat. On April 27, the onions were sprayed with 1 lb ai/acre of pendimethalin

(2.1 pt/acre of Prowl[®] H₂O) in 20 gal of spray solution. Bromoxynil at 0.25 lb ai/acre (Buctril[®], 16 oz/acre) plus oxyfluorfen at 0.25 lb ai/acre (Goal[®], 8 oz/acre) were applied on May 13. Onions were fertilized with a compound fertilizer on June 10 to supply 175 and 2 lb/acre nitrogen and sulfur, respectively. Onions were sprayed for aphid control beginning on June 11 using spinosad 0.125 lb ai/acre + Azadirachtin 0.0123 lb ai/acre (Success[®], 8 oz/acre + Aza-Direct[®], 16 oz/acre + Ad-wet, 1 qt/acre). Onions were sprayed again for thrips control on June 19. Methomyl 0.9 lb ai/acre (Lannate[®], 3 pt/acre) was applied for thrips control on July 10 and August 4. Furrow irrigation was scheduled to maintain enough moisture in the top 12 inches of the soil profile. Onions were lifted on September 11 and 20ft the 2 center rows were harvested from each plot on September 15. Dry bulb onions were graded following USDA standards on September 17, 2009. The data were subjected to analysis of variance and means compared using LSD at P = 0.05.

Results and Discussion

Note: Dual Magnum and Outlook herbicides are currently not registered for PRE application on direct-seeded dry bulb onions.

Onion stand was reduced when Dual Magnum and Outlook were applied PRE on dry bulb onions without activated charcoal. There was a 43 and 35 percent reduction in plant stand with Dual Magnum and Outlook, respectively (data not shown). Onion stand without activated charcoal was 70,000 and 79,950 plants/acre with Dual Magnum and Outlook, respectively. Banding of activated charcoal directly over the onion row provided complete protection of emerging onion seedling from PRE-applied Dual Magnum and Outlook. Marketable dry bulb onion yield ranged from 560 to 1,106 cwt/acre, with the lowest yield obtained when Dual Magnum and Outlook were applied PRE without activated charcoal protection. Activated charcoal placement did not seem to make any difference. However, applying charcoal in the furrow proved to be a challenge as most of the onion seeds were left uncovered. We later had to cover the seeds manually using a hand hoe. Future studies will evaluate the charcoal slurry banded directly over the row on the surface. Also, future studies will include irrigation/no irrigation to simulate the effect of rain after planting and application of PRE herbicides to direct-seeded dry bulb onions.

Conclusion

Yellow nutsedge is a serious weed in direct-seeded onion production systems. The weed cannot be effectively and safely removed by hand or cultivation and has the potential to devastate dry bulb onion yields. Even though both Dual Magnum and Outlook are registered for use on dry bulb onions after the 2-leaf stage, they do not provide postemergence control of weeds, including yellow nutsedge. Application of activated charcoal at the time of onion planting effectively neutralized Dual Magnum and Outlook and no injury to direct-seeded onions was observed. More studies will be conducted to generate data to support future registration for pre-emergence application of Dual Magnum and Outlook on direct-seeded onions using activated charcoal.



Figure 1. Modified onion planter fitted with a 25-gal Rear's Nifty Tank Series to apply a 1-inch band of charcoal slurry directly over the onion row, Malheur Experiment Station, Ontario, OR, 2009.

Table 1. Response of direct-seeded dry bulb onions to pre-emergence application of Dual Magnum and Outlook with banded activated charcoal at the Malheur Experiment Station, Ontario, OR 2009.

Treatment	Rate	Unit	Timing	Onion yield [†]					
				Small	Medium	Jumbo	Colossal	Super colossal	Marketable
				----- cwt/acre -----					
Activated carbon slurry applied on the surface									
Activate charcoal Untreated				77 a	39 bc	17 h	0 g	0 g	56 d
Activated carbon [‡]	12.5 lb/a			10 c	46 bc	686 a-e	190 f	36 b-f	957 c
Outlook	21 fl oz/a		PRE						
Activated carbon	25 lb/a			10 c	38 bc	776 ab	219 ef	24 d-g	1056 abc
Outlook	21 fl oz/a		PRE						
Activated carbon	12.5 lb/a			8 c	37 bc	716 abc	268 b-f	34 b-g	1054 abc
Outlook	10.5 fl oz/a		PRE						
Outlook	10.5 fl oz/a		2-Leaf						
Activated carbon	25 lb/a			25 b	95 a	706 a-d	190 f	15 fg	1006 abc
Outlook	10.5 fl oz/a		PRE						
Outlook	10.5 fl oz/a		2-LF						
Activated carbon	12.5 lb/a			8 c	39 bc	767 ab	188 f	13 fg	1008 abc
Dual Magnum	1.33 pt/a		PRE						
Activated carbon	25 lb/a			12 bc	55 b	709 a-d	235 def	21 efg	1021 abc
Dual Magnum	1.33 pt/a		PRE						
Activated carbon	12.5 lb/a			3 c	43 bc	685 a-e	241 cf	30 c-g	999 abc
Dual Magnum	1 pt/a		PRE						
Activated carbon	25 lb/a			9 c	45 bc	763 ab	277 cf	21 efg	1106 a
Dual Magnum	1 pt/a		PRE						
Dual Magnum	1.33 pt/a		PRE	77 a	101a	322 g	45 g	15 fg	560 c
Prowl H ₂ O	2 pt/a		Loop						
Prowl H ₂ O	2 pt/a		Loop	3 c	33 bc	688 a-e	307 a-e	32 c-g	1059 abc
Buctril	0.5 pt/a		2-leaf						
Goal 2XL	0.5 pt/a		2-leaf						
Outlook	21 fl oz/a		PRE	4 c	30 bc	441 g	223 def	54 a-e	752 c
Prowl H ₂ O	2 pt/a		Loop						
Handweeded				6 c	27 bc	602 d-g	347 a-d	62 abc	1039 abc
Activated carbon slurry applied in the furrow									
Activated carbon-furrow	12.5 lb/a			7 c	27 bc	573 fg	389 a	77 a	1066 ab
Outlook	21 fl oz/a		PRE						
Activated carbon-furrow	25 lb/a			4 c	24 bc	610 c-g	373 ab	75 a	1082 ab
Outlook	21 fl oz/a		PRE						
Activated carbon-furrow	12.5 lb/a			4 c	30 bc	541 g	323 a-e	58 a-e	952 bc
Outlook	10.5 fl oz/a		PRE						
Outlook	10.5 fl oz/a		2-LF						
Activated carbon-furrow	25 lb/a			2 c	15 c	583 efg	346 a-d	53 a-e	997 bc
Outlook	10.5 fl oz/a		PRE						
Outlook	10.5 fl oz/a		2-LF						
Activated carbon-furrow	12.5 lb/a			6 c	28 bc	665 b-f	352 abc	38 b-f	1083 ab
Dual Magnum	1.33 pt/a		PRE						
Activated carbon-furrow	25 lb/a			4 c	31 bc	618 c-g	373 ab	53 a-e	1076 ab
Dual Magnum	1.33 pt/a		PRE						
Activated carbon-furrow	12.5 lb/a			8 c	24 bc	552 g	353 abc	68 ab	997 bc
Dual Magnum	1 pt/a		PRE						
Activated carbon-furrow	25 lb/a			5 c	32 bc	596 g	350 abc	46 a-f	1024 ab
Dual Magnum	1 pt/a		PRE						

[†]Means within a column followed by the same letter are not significantly different (LSD, P = 0.05)

[‡]Activated carbon was applied in 50 gal of water/acre directly over the onion row or in furrow.