ONION RESPONSE TO HERBICIDES APPLIED LATE FALL OF THE PRECEDING YEAR TO CONTROL FIELD BINDWEED

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Introduction

Field bindweed (*Convolvulus arvensis*) is widely distributed in the Pacific Northwest and is considered one of the most difficult weeds to control. It is a perennial species with creeping roots and slender green leaves on vining stems that may grow to a length of 6 ft. The climbing tendency results in entangling of crop plants and shading them from light. Crop yields often are reduced 50% or more where field bindweed infestations are dense. Field bindweed has a deep root system that competes with crop plants for water and soil nutrients. Vines complicate harvesting by clogging machinery and entangling plants (Morishita et al. 2015).

The current safe bet for field bindweed control is to spray glyphosate + 2,4D during summer or the fall preceding onion. This combination works, but not all the time, especially when not applied as suggested on the label. There are more effective herbicides for field bindweed control, but they carry a warning of possible carryover of injury to rotational crops.

The objective of this study was to evaluate onion response to quinclorac (Paramount®), diflufenzopyr (Distinct®), and 3,6-dichloro-o-anisic acid (Clarity®) herbicides applied in the late fall to simulate field bindweed control the year preceding onion.

Materials and Methods

A field study was conducted at the Malheur Experiment Station near Ontario, Oregon in 2015-2016 to evaluate onion response to various herbicides applied the previous fall to simulate the management of field bindweed. Treatments (Tables 1-3) were applied on October 7, 2015 and the field was later disked to incorporate the herbicides in the soil. The soil was fumigated with Telone® C-17 at 15 gal/acre and simultaneously bedded on a 22-inch centers. Beds were harrowed and flattened on March 9, 2016 and onion variety ‘Vaquero’ was seeded on March 18.

The study had a randomized complete block design with 4 replications of all herbicide treatments and individual plots were 7.3 ft wide (4 beds) by 27 ft long. The study was sprayed with pendimethalin 0.95 lb ai/acre (Prowl® H_2O at 2 pt/acre) followed by Buctril® at 8 fl oz/acre (bromoxynil 0.125lb ai/acre) plus GoalTender® at 4 fl oz/acre (oxyfluorfen 0.125 lb/ ai acre) when the onions were at the 2- and 4-leaf stages. All other production operations followed recommended local production practices. Plant tops were flailed September 6 and onion bulbs were lifted on September 8, 2016. Bulbs were hand-harvested from the two center beds on

September 12 and graded on September 22. The bulbs were graded according to diameter: small (<2¼ inches), medium (2¼-3 inches), jumbo (3-4 inches), colossal (4-4¼ inches), and supercolossal (>4¼ inches). Marketable yield is composed of medium, jumbo, colossal, and supercolossal grades.

Results

Onion emergence was observed on April 12, 2016. Onion plant stand on June 6 varied slightly across herbicide treatments and ranged from 102,080 to 108,240 plants/acre (Table 1). Plant heights were similar among herbicide treatments and ranged from 11.7 to 12.8 inches/plant across herbicide treatments compared to 13.2 inches/plant for the untreated control.

Onion yield was similar across treatments for all bulb grades (Table 2). The number of onion bulbs varied among treatments for the small and No. 2 categories, but was similar for medium, jumbo, colossal, and supercolossal grades (Table 3). The total number of marketable onion bulbs varied among herbicide treatments, with Paramount at 8 fl oz/acre (0.39 lb ai/acre) producing the lowest number of bulbs.

The results suggested no negative effects when Paramount was applied at 5.3 fl oz/acre, Distinct at 6 oz/acre, or Clarity at 16 fl oz/acre when applied the fall preceding onion planting.

References

Morishita, D.W., R.H. Callihan, C.V. Eberlein, J.P. McCaffrey, and D.C. Thill. 2005. Field bindweed. University of Idaho, PNW 580:1-12.

Table 1. Onion plant stand and plant height on June 6, 2016 in response to various herbicides applied the previous fall to simulate field bindweed control at Malheur Experiment Station, Ontario, OR, 2016.

			Plant stand	Plant height
Treatment[a]	Rate	Product rate	no./acre	Inches
Untreated	lb ai/acre		106,920 ab[b]	13.2 a
Paramount 75	0.26	5.3 fl oz/acre	106,333 ab	12.7 a
Paramount 75	0.39	8.0 fl oz/acre	102,080 b	11.7 a
Distinct	0.28	6 oz/acre	108,240 a	12.7 a
Clarity	0.5	16 fl oz/acre	107,360 ab	12.8 a
LSD (*P* = 0.05)			5,776	NS

[a]Paramount = quinclorac; Distinct = diflufenzopyr; Clarity = 3,6-dichloro-o-anisic acid.
[b]Means within a column followed by the same letter do not significantly differ (P = 0.05, LSD)

<u>Note that herbicides were applied the previous fall, NOT on onions.</u>

Table 2. Onion yield in plots treated with various herbicides applied the preceding fall to simulate field bindweed control at the Malheur Experiment Station, Ontario, OR, 2016.

						Marketable[b]				
Treatment[a]	Rate	Unit	<2¼ in[c]	No. 2	Plate rot	2¼-3 in	3-4 in	4-4¼ in	>4¼ in	Total
			cwt/acre							
Untreated			12.2 a	0.0 a	0.0 a	56.6 a	583.1 a	292.4 a	28.2 a	960.3 a
Paramount	0.26 lb ai/acre	5.3 fl oz/acre	8.9 a	4.4 a	1.2 a	39.7 a	573.0 a	310.6 a	27.9 a	951.3 a
Paramount	0.39 lb ai/acre	8.0 fl oz/acre	8.5 a	14.1 a	0.0 a	46.6 a	558.5 a	275.6 a	34.2 a	914.9 a
Distinct	0.286 lb ai/acre	6 oz/acre	12.2 a	12.4 a	1.0 a	59.7 a	604.7 a	260.2 a	19.0 a	943.6 a
Clarity	0.5 lb ai/acre	16 fl oz/acre	7.6 a	9.9 a	0.0 a	55.0 a	642.0 a	226.4 a	8.3 a	931.7 a
LSD (*P* = 0.05)			NS	NS	NS	NS	NS	NS	NS	NS
Standard deviation			4.1	7.7	1.2	16.4	54.1	69.5	14.74	42.1
CV			41.0	94.2	258.4	31.8	9.1	25.4	62.67	4.5

[a]Paramount = quinclorac; Distinct = diflufenzopyr; Clarity = 3,6-dichloro-o-anisic acid.
[b]Means within a column followed by the same letter do not significantly differ (*P* = 0.05, LSD).
[c]The bulbs were graded according to diameter: small (<2¼ inches), medium (2¼-3 inches), jumbo (3-4 inches), colossal (4-4¼ inches), and supercolossal (>4¼ inches). Marketable yield is composed of medium, jumbo, colossal, and supercolossal grades. Marketable yield consists of No.1 bulbs >2¼ inches.

Note that herbicides were applied the previous fall and NOT on onions.

Table 3. Number of onion bulbs in response to various herbicides applied the preceding fall to simulate field bindweed control at the Malheur Experiment Station, Ontario, OR, 2016.

						Marketable[b]				
Treatment[a]	Rate		<2¼ in	No. 2	Plate rot	2¼-3 in	3-4 in	4-4¼ in	>4¼ in	Total
			number/acre							
Untreated			6,330 a[c]	0 b	0 a	12,265 a	63,500 a	23,738 a	1,780 a	101,284 ab
Paramount	0.26 lb ai/acre	5.3 fl oz/acre	3,956 ab	396 b	396 a	8,506 a	65,281 a	25,123 a	1,780 a	100,690 ab
Paramount 75	0.39 lb ai/acre	8.0 fl oz/acre	3,956 ab	1,583 a	0 a	10,089 a	62,907 a	21,167 a	1,978 a	96,141 b
Distinct	0.286 lb ai/acre	6 oz/acre	5,143 ab	989 ab	198 a	13,254 a	67,852 a	21,562 a	1,187 a	103,856 a
Clarity	0.5 lb ai/acre	16 fl oz/acre	2,769 b	791 ab	0 a	12,067 a	74,578 a	18,793 a	593 a	106,032 a
LSD (*P* = 0.05)			2,946	1,099	NS	NS	NS	NS	NS	7,080
Standard deviation			1,565	584	242	2,625	6,825	5,439	951	3760
CV			35	78	204	23	101	25	65	4

[a]Paramount = quinclorac; Distinct = diflufenzopyr; Clarity = 3,6-dichloro-o-anisic acid.
[b]The bulbs were graded according to diameter: small (<2¼ inches), medium (2¼-3 inches), jumbo (3-4 inches), colossal (4-4¼ inches), and supercolossal (>4¼ inches). Marketable yield is composed of medium, jumbo, colossal, and supercolossal grades. Split bulbs (No. 2s), bulbs infected with the fungus *Botrytis allii* in the neck or side, bulbs infected with the fungus *Fusarium oxysporum* (plate rot). Marketable yield consists of No.1 bulbs >2¼ inches.
[c]Means within a column followed by the same letter do not significantly differ (*P* = 0.05, LSD).

Note that herbicides were applied the previous fall, and NOT on onions.