

WEED CONTROL AND CROP RESPONSE WITH OPTION® HERBICIDE APPLIED IN FIELD CORN

Corey V. Ransom, Charles A. Rice and Joey K. Ishida
Malheur Experiment Station
Oregon State University
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Introduction

Weed control is important in field corn production to reduce competition with the current crop and to prevent the production of weed seed for future crops. Field trials were conducted to evaluate Option (foramsulfuron) herbicide applied alone and in various combinations for weed control and crop tolerance in furrow-irrigated field corn. Option is a new postemergence sulfonylurea herbicide that controls annual and perennial grass and broadleaf weeds in field corn. Option contains a safener that is intended to enhance the ability of corn to recover from any yellowing or stunting, which may be associated with the application of sulfonylurea herbicides.

Materials and Methods

Roundup UltraMax was applied preplant at 0.56 lb ae/acre to control volunteer wheat on May 21. Pioneer variety 'P-36N18' Roundup Ready (103-day relative maturity) field corn was planted with a John Deere model 71 Flexi Planter on May 22, 2003. Seed spacing was one seed every 7 inches on 30-inch rows. Plots were 10 by 30 ft and herbicide treatments were arranged in a randomized complete block with four replicates. Plots were sidedressed with 121 lbs N, 48 lbs phosphate, 62 lbs potash, 22 lbs sulfates, 1 lb Zn and B, 2 lbs Mn, and 30 lbs elemental S/acre on May 14. Herbicide treatments were applied with a CO₂-pressurized backpack sprayer calibrated to deliver 20 gal/acre at 30 psi. Crop response and weed control were evaluated throughout the growing season. Crop height measurements were taken to evaluate herbicide injury. Height values were determined by measuring the distance from the ground to the first collar for 10 plants from the center two rows in each plot. Corn yields were determined by harvesting ears from 15-ft sections of the center two rows in each four-row plot on October 7. The harvested ears were shelled and grain weight and percent moisture content were recorded. Grain yields were adjusted to 12 percent moisture content. Data were analyzed using analysis of variance (ANOVA) and treatment means were separated using Fisher's protected least significant difference (LSD) at the 5 percent level ($P = 0.05$) for weed control and injury data and at the 10 percent level ($P = 0.10$) for corn yield data.

Option herbicide was applied early postemergence (EP) to corn at the V2 growth stage at rates of 0.0328 and 0.0382 lb ai/acre. The label rate for Option is 0.0328 lb ai/acre when susceptible weeds are at or below the maximum size as stipulated by the label. The higher rate of 0.0382 lb ai/acre is intended for use as a rescue treatment on weeds that are above labeled size. Option (0.0328 lb ai/acre) was also evaluated in EP

combinations with Distinct (dicamba + diflufenzopyr), Callisto (mesotrione), Aatrex (atrazine), or Outlook (dimethenamid-P) herbicides. In addition, Option was applied EP following a preemergence (PRE) application of Topnotch (acetochlor). Comparison treatments included EP combinations of Clarion (nicosulfuron + rimsulfuron) plus Distinct, Accent (nicosulfuron) plus Distinct, Roundup UltraMax (glyphosate) applied EP followed by a second application at a late postemergence (LP) timing, and finally Topnotch applied PRE followed by an EP application of Roundup UltraMax. All postemergence Option applications included a methylated seed oil (MSO) at 1.0 percent v/v and 32 percent nitrogen at 2.5 percent v/v. In treatments where Distinct was applied postemergence without Option, a non-ionic surfactant (NIS) at 0.5 percent v/v and 32 percent nitrogen at 2.5 percent v/v were included.

Results and Discussion

Control of pigweed species (i.e., Powell amaranth and redroot pigweed) from herbicide treatments ranged from 95 to 100 percent on July 8 and was similar among herbicide treatments (Table 1). Option applied alone at either 0.0328 or 0.0382 lb ai/acre and when applied with Outlook provided 86 percent or less common lambsquarters control, which was significantly less than all other treatments on July 8. Option applied postemergence with Distinct, Callisto, or Aatrex or following a preemergence application of Topnotch gave 98 percent or greater common lambsquarters control when evaluated on July 8. Common lambsquarters control with postemergence Option was improved when preceded by a preemergence application of Topnotch. Hairy nightshade control was 94 percent or greater with all herbicide treatments. The only differences were with postemergence combinations of Clarion and Distinct or Accent and Distinct, which gave less hairy nightshade control than treatments with preemergence Topnotch applications, two postemergence applications of Roundup UltraMax, or when Option was applied with Callisto. Option applied postemergence with Distinct, Callisto, or Aatrex provided greater kochia control than when Option was applied alone or with Outlook. The postemergence combination of Option plus Distinct provided 11 percent greater barnyardgrass control than did the treatment of Accent plus Distinct. Barnyardgrass control with postemergence Option was improved when preceded by a preemergence application of Topnotch. The combination of Clarion and Distinct provided broadleaf weed control similar to Option and Distinct. Weed control was similar with Option alone regardless of rate. Both treatments incorporating Roundup UltraMax provided greater than 98 percent control of all weeds.

Weed control results from this trial suggest that Option should be applied postemergence in combination with or following a preemergence application of another herbicide in order to provide broad spectrum weed control in field corn. In terms of broad spectrum weed control, applying Option postemergence with Distinct or Aatrex or following preemergence Topnotch were some of the better combinations with Option.

Corn injury on June 14, 7 days after the EP applications, ranged from 0 to 10 percent (Table 2). No injury, as compared to the untreated control, was observed with the postemergence combination of Accent plus Distinct, or treatments including Roundup UltraMax, for which only the EP and PRE applications had been applied by June 14.

Injury was greatest with treatments containing Option. Injury with these treatments was characterized by slight stunting due to shortened internodes and slight yellowing of the foliage compared to the untreated control. Plant height data collected on June 16 showed measurable corn stunting associated with postemergence combinations of Option plus Distinct and Option plus Outlook when compared to the untreated control. Injury on June 21, 14 days after EP applications, was greatest with the treatment of Option plus Outlook. Injury with this treatment was greater than from all other treatments except for those where Option was combined with Distinct or Callisto. The yellowing that was observed previously was no longer visible on June 21. However, stunting was still visible in certain plots where Option had been applied. Corn injury was no longer detectable by June 30 and no further injury evaluations were taken.

Corn yields ranged from a low of 66 bu/acre with the untreated control to a high of 85 bu/acre with two applications of Roundup UltraMax (Table 2). Corn yields in this trial were significantly less than those typically obtained at the Malheur Experiment Station. This trial was established approximately 2-3 weeks later than what is typical for corn trials on station. Optimum conditions were not present during pollination and the ears did not fully fill. Reduced yield may be attributed to extremely hot daytime temperatures (>100°F) and low relative humidity during pollen shed and silking, resulting in poor kernel set. The only treatments to yield significantly ($P = 0.10$) greater than the untreated control were those including Roundup UltraMax, combinations of Clarion plus Distinct, or Accent plus Distinct.

Table 1. Weed control with Option® herbicide applied in field corn, Malheur Experiment Station, Oregon State University, Ontario, OR, 2003.

Treatment	Rate lb ai/acre % v/v	Timing*	Weed control				
			Pigweed spp [†] 7-8	C. lambs- quarters [‡] 7-8	H. night- shade [‡] 7-8	Kochia 7-8	Barnyard- grass [‡] 7-8
Option + MSO + 32% N	0.0328 + 1.0% + 2.5%	EP	95	78 c	98 ab	89	90 de
Option + MSO + 32% N	0.0382 + 1.0% + 2.5%	EP	97	81 c	98 ab	90	92 cde
Option + Distinct + MSO + 32% N	0.0328 + 0.175 + 1.0% + 2.5%	EP	98	98 ab	99 ab	100	97 a-d
Option + Callisto + MSO + 32% N	0.0328 + 0.0468 + 1.0% + 2.5%	EP	98	99 ab	100 ab	98	88 de
Option + Aatrex + MSO + 32% N	0.0328 + 0.75 + 1.0% + 2.5%	EP	98	100 a	100 a	100	94 b-e
Option + Outlook + MSO + 32% N	0.0328 + 0.56 + 1.0% + 2.5%	EP	97	86 c	98 ab	91	96 a-e
Clarion + Distinct + NIS + 32% N	0.0328 + 0.175 + 0.5% + 2.5%	EP	98	96 b	94 b	95	91 de
Accent + Distinct + NIS + 32% N	0.031 + 0.175 + 0.5% + 2.5%	EP	97	98 ab	94 b	99	86 e
Topnotch Option + MSO + 32% N	2.0 0.328 + 1.0% + 2.5%	PRE EP	100	98 ab	100 a	95	99 abc
Topnotch Roundup UltraMax	2.0 0.56	PRE LP	99	98 ab	100 a	100	100 a
Roundup UltraMax Roundup UltraMax	0.56 0.56	EP LP	100	98 ab	100 a	100	99 ab
LSD (0.05)			NS	--	--	6	--

*Application timings were preemergence (PRE) on 5-22-03, early postemergence (EP) applied to corn at the V2 growth stage on 6-7-03, and late postemergence (LP) to corn at the V3 to V4 growth stages on 6-17-03.

[†]Pigweed species were a mixture of Powell amaranth and redroot pigweed.

[‡]The ANOVA was performed on arcsine square root percent transformed data. Mean separations are applied to non-transformed data. Within-column values followed by the same letter designation are similar (P = 0.05). The untreated control was not included in the ANOVA for weed control.

Table 2. Injury and yield with Option® herbicide applied in field corn, Malheur Experiment Station, Oregon State University, Ontario, OR, 2003.

Treatment	Rate	Timing*	Field Corn			
			Injury [†]		Height [‡]	Yield [§]
			6-14	6-21	6-16	10-7
	lb ai/acre % v/v		----- % -----		inches	bu/acre
Untreated control	--	--	--	--	11.7	66
Option + MSO + 32% N	0.0328 + 1.0% + 2.5%	EP	8	5	11.2	75
Option + MSO + 32% N	0.0382 + 1.0% + 2.5%	EP	10	5	11.0	70
Option + Distinct + MSO + 32% N	0.0328 + 0.175 + 1.0% + 2.5%	EP	10	9	10.6	77
Option + Callisto + MSO + 32% N	0.0328 + 0.0468 + 1.0% + 2.5%	EP	9	6	11.2	73
Option + Aatrex + MSO + 32% N	0.0328 + 0.75 + 1.0% + 2.5%	EP	5	5	11.4	75
Option + Outlook + MSO + 32% N	0.0328 + 0.56 + 1.0% + 2.5%	EP	10	11	10.9	77
Clarion + Distinct + NIS + 32% N	0.0328 + 0.175 + 0.5% + 2.5%	EP	4	6	11.3	80
Accent + Distinct + NIS + 32% N	0.031 + 0.175 + 0.5% + 2.5%	EP	0	0	11.4	84
Topnotch Option + MSO + 32% N	2.0 0.328 + 1.0% + 2.5%	PRE EP	5	3	11.4	73
Topnotch Roundup UltraMax	2.0 0.56	PRE LP	0	1	12.0	82
Roundup UltraMax Roundup UltraMax	0.56 0.56	EP LP	0	0	11.9	85
LSD (0.05)			5	5	0.8	NS
LSD (0.10)			--	--	--	12

*Application timings were preemergence (PRE) on 5-22-03, early postemergence (EP) applied to corn at the V2 growth stage on 6-7-03, and late postemergence (LP) to corn at the V3 to V4 growth stages on 6-17-03.

†The untreated control was not included in the ANOVA for percent injury.

‡Height was determined by measuring the distance from the soil surface to the first collar.

§Corn yields were significantly less than those typically obtained at the Malheur Experiment Station. Reduced yield may be attributed to extremely hot daytime temperatures (>100°F) and low relative humidity during pollen shed and silking resulting in poor kernel set.