

ROUNDUP READY CORN WEED CONTROL PROGRAMS

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ABSTRACT: A study was initiated on a Catalpa silty clay loam soil in 2004 to evaluate weed management systems for Roundup Ready corn. The study was conducted as a randomized complete block with 4 replications. Soil moisture conditions in 2004 were excellent for good herbicide activity on sicklepod (*Senna obtusifolia*) and barnyardgrass (*Echinochloa crusgalli*) control. At 49 days after planting (DAP) all preemergence (PRE) + early postemergence over the top (EPOT) and late postemergence over the top (LPOT) treatments showed 81 to 99% barnyardgrass control. All treatments at 108 DAP, except the untreated check, showed good to excellent (86 to 95%) barnyardgrass control and good to excellent sicklepod control (85 to 94%). Corn yields ranged from 86.9 bu/ac for the untreated check to 143.5 bu/ac. All herbicide treatments had similar yields and were higher than the untreated check. These preliminary results with Roundup Ready corn indicated that under excellent growing conditions, sicklepod and barnyardgrass control can be accomplished with the standard all PRE herbicide program of Bicep II Magnum (metolachlor + atrazine at 1.0 + 1.4 lb ai/ac) + atrazine at 1.8 qt + 0.6 qt/ac (0.6 lb ai/ac) alone or followed by (Fb) Accent at EPOT; Bicep II Magnum + atrazine at 2/3 (1.33 lb ai/ac) or the 1/2 (1.0 lb ai/ac) standard rate applied PRE Fb Roundup WeatherMAX (RWM) at 21.4 oz/ac; one EPOT RWM at 21.4 oz/ac application; RWM + 1/4 standard rate of atrazine applied EPOT; and EPOT RWM at 21.4 oz/ac with a LPOT repeat application at 16 oz/ac. Combination mixtures of Steadfast (24% rimsulfuron + 50% nicosulfuron) with atrazine, Cinch ATZ (metolachlor + atrazine) or Calisto (mesotrione) and crop oil, applied EPOT caused erratic early season crop injury (yellow leaves and stunted plants) but with no effect on yield. All treatments, except the untreated check, provided good to excellent late season sicklepod and barnyardgrass control with no crop injury. However, under more adverse growing conditions (drought stress) herbicide efficacy may result in differences in weed control and yield among these treatments.

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KEYWORDS: Corn, barnyardgrass, sicklepod, weed control.

MATERIALS AND METHODS: A study was initiated on a Catalpa silty clay loam soil in 2004 to evaluate weed management systems for Roundup Ready corn. The Roundup Ready corn weed management systems were compared to a conventional hybrid (Pioneer 31B13) in a standard weed management program of Bicep II Magnum + atrazine at 1.8 qt +0.6 qt/ac applied PRE Fb Accent (nicosulfuron) applied EPOT. The study was conducted as a randomized complete block with 4 replications. Plot size was 4 rows X 50 ft for the Roundup Ready corn and 8 rows X 50 ft for the conventional hybrid.

P and K fertilizer were applied based on soil test recommendations. Potash (0-0-60) and phosphorus (0-46-0) + zinc sulfate (31% zinc) at 200 + 100 + 10 lb/ac were applied broadcast on 10/07/03. A side-dress application of 180 lb N/ac (32% UAN solution) was applied 6 inches from the row and 2 inches deep with a coulter knife applicator on 04/28/04.

Corn hybrids Dekalb C69-71 (glyphosate tolerant) and Pioneer 31B13 (non-glyphosate tolerant) were planted on 04/05/04 in 30 inch rows with a seeding rate of 28,000 seed/ac. The conventional hybrid Pioneer 31B13 was only planted in treatment 2. Dekalb C69-71 hybrid was planted in treatments 1 and 3 through 19.

A burndown application of RWM + Clarity (dicamba) at 21.4 oz + 8 oz/ac was applied to the entire study area on 03/26/04. Herbicide treatment application timings were PRE, EPOT made 35 DAP, and LPOT made 60 DAP (Table 1). All treatments were applied with a tractor mounted CO₂ sprayer system at 15 gpa using 8002VS nozzles. At the time of application, corn stage of growth was 4 to 8 inches for the EPOT and 18 to 24 inches for the LPOT. The predominant weed species in the study were sicklepod and barnyardgrass. At EPOT, sicklepod was 1 to 4 inches tall and barnyardgrass was 1 to 6 inches tall. At LPOT sicklepod was in the cotyledon to 1 trifoliolate leaf stage and barnyardgrass was 1 to 2 inches.

Bicep II Magnum + atrazine at 1.8 qt + 0.6 qt/ac applied PRE Fb Accent + crop oil concentrate (COC) at 0.66 oz/ac + 1% v/v was the standard herbicide program used with P31B13 (treatment 2) and DK C69-71 (treatment 3) hybrids for comparison. The standard program was compared to Bicep II Magnum + atrazine at 1.8 qt + 0.6 qt/ac applied PRE alone; Bicep II Magnum + atrazine at 1.2 qt + 0.4 qt/ac (2/3 standard rate) applied PRE Fb EPOT of RWM at 21.4 oz/ac; Bicep II Magnum + atrazine at 0.9 qt + 0.3 qt/ac (1/2 standard rate) Fb EPOT application of RWM at either 21.4 or 16 oz/ac; RWM + atrazine at 21.4 oz/ac + 1.5 qt/ac applied EPOT or Fb RWM at 16 oz/ac applied LPOT; RWM at 21.4 oz/ac applied EPOT; RWM at 21.4 oz/ac applied EPOT Fb RWM at 16 oz/ac applied LPOT; Lexar (metolachlor + mesotrione + atrazine at 1.3 + 0.17 + 1.3 lb ai/ac) at 3 qt/ac applied PRE; Steadfast + atrazine + ammonium sulfate (AMS) + COC applied at 0.75 oz + 2.0 qt + 2 lb/ac + 1% v/v applied EPOT following Cinch PRE at 0.8 pt/ac and Cinch ATZ PRE at 1.3 pt/ac; Steadfast + Calisto + COC at 0.75 oz + 3 oz/ac + 1% v/v applied EPOT; Steadfast + Calisto + atrazine + AMS + COC at 0.75 oz + 2.0 oz + 3 pt + 2 lb/ac + 1% v/v at EPOT; Steadfast + atrazine + AMS + COC at 0.75 oz + 2 qt + 2 lb/ac + 1% v/v applied EPOT; Atrazine PRE at 2.5 pt/ac Fb Steadfast + Cinch ATZ + AMS + COC at 0.75 oz + 2 pt + 2 lb/ac + 1% v/v applied EPOT; and atrazine at 2.5 pt/ac applied PRE Fb Steadfast + atrazine + AMS + COC at 0.75 oz + 2.5 pt + 2 lb ac + 1% v/v applied EPOT.

Weed control and crop injury ratings were made at 35, 49, 59 and 108 DAP. The center 2 rows of each plot were harvested with a plot combine equipped with a cornhead. Harvested samples were weighed and seed moisture was measured with a Dickey John® 2000 grain analysis computer. Yields were converted to bu/ac at 15% moisture. All data were subjected to Analysis of Variance and means were separated using Fisher's Protected LSD calculated at 5% significance level.

RESULTS AND DISCUSSION: Soil moisture conditions in 2004 were excellent for good herbicide activity on sicklepod and barnyardgrass control.

Crop Injury: Crop injury was only noted in treatments that included Steadfast in the mixture and applied EPOT (data not shown). All treatments (10 through 14, and 17 and 18) that had Steadfast in the tank mixture with an EPOT application caused erratic crop injury ranging from 4 to 16%, 13 days after EPOT application (49 DAP). The injury symptoms were yellowish streaked leaves and stunted crop growth. However, at 24 days after application (59 DAP) crop injury ranged from none to 6%. No crop injury was observed at 108 DAP. The early season injury did not result in any yield losses.

Barnyardgrass control: Barnyardgrass control 35 DAP ranged from 0 to 95% (Table 1). All treatments (2, 3, 4, 5, 10, 11, 12, 13, 15, 16 and 19) with PRE herbicides showed 84 to 95% grass control at 35 DAP. The no PRE + EPOT (36 DAP) treatments showed no barnyardgrass control 35 DAP. However, 13 days after EPOT application (49 DAP) all PRE and PRE + EPOT treatments, except the untreated check, showed 81 to 99% barnyardgrass control. EPOT applications of Steadfast + Callisto + AMS + atrazine + COC at 0.75 oz + 2 oz + 2 lb + 3 pt/ac + 1% v/v; and Steadfast + Calisto + COC at 0.66 oz + 3 oz/ac + 1% v/v; and Steadfast + atrazine + AMS + COC at 0.75 oz + 2 qt + 2 lb/ac + 1% v/v showed 81 to 85% barnyardgrass control which was lower than all other herbicide treatments. At 59 DAP (12 days after LPOT application), all treatments except the untreated check, showed 69 to 95% control. RWM at 21.4 oz/ac applied EPOT; Steadfast + Calisto + COC at 0.66 oz + 3 oz/ac + 1% v/v applied EPOT; Steadfast + atrazine + AMS + COC at 0.75 + 2 qt + 2 lb/ac + 1% v/v applied EPOT; and Steadfast + Calisto + atrazine + AMS + COC at 0.75 oz + 2 oz + 3 pt + 2 lb/ac + 1% v/v applied EPOT showed 69 to 79% control and were lower than all other treatments. All other treatments showed 89 to 95% control. All treatments at 108 DAP, except the untreated check showed good to excellent (86 to 95%) barnyardgrass control.

Sicklepod Control: At 35 DAP, all treatments showed less than 64% sicklepod control (Table 2). Treatments which contained atrazine applied PRE also showed poor sicklepod control (33 to 63%). However, at 49 DAP (13 days after EPOT applications), all treatments showed good to excellent sicklepod control (80 to 95%). At 59 DAP (12 days after LPOT), all treatments except Bicep II Magnum + atrazine at 1.8 qt + 0.6 qt/ac applied PRE; Bicep II Magnum + atrazine PRE at 1.8 qt + 0.6 qt/ac Fb Accent + COC EPOT at 0.66 oz/ac + 1% v/v with both Pioneer 31B13 and Dehakb C69-71 hybrids; Bicep II Magnum + atrazine PRE at 0.9 qt + 0.3 qt/ac PRE Fb RWM at 16 oz/ac EPOT; RWM at 21.4 oz/ac applied EPOT; Lexar at 3 qt/ac applied PRE; and Steadfast + Calisto + atrazine + AMS + COC at 0.75 oz + 2.0 oz + 3 pt + 2 lb/ac + 1% v/v provided 75 to 81% sicklepod control. These treatments, however, provided lower sicklepod control than Cinch PRE at 0.8 pt Fb Steadfast + atrazine + AMS + COC at 0.75 oz + 2 qt + 2 lb/ac + 1% v/v applied EPOT; atrazine PRE at 2.5 pt/ac Fb Steadfast + Cinch ATZ + AMS + COC at 0.75 oz + 2 pt + 2 lb/ac + 1% v/v applied EPOT; Cinch ATZ at 1.3 pt/ac PRE Fb Steadfast + atrazine + AMS + COC at 0.75 oz + 2 qt + 2 lb/ac + 1% v/v at EPOT; RWM at 21.4 oz/ac applied EPOT Fb 16 oz/ ac at LPOT; and RWM + atrazine at 21.4 oz + 1.5 qt/ac applied EPOT Fb RWM at 16 oz/ac LPOT. These treatments provided 89 to 90% sicklepod control. At 108 DAP all treatments showed good to excellent sicklepod control (85 to 94%).

Yield: Corn yields ranged from 87 bu/ac for the untreated check to 144 bu/ac (Table 2). All herbicide treatments had similar yields and were higher than the untreated check.

These preliminary results with Roundup Ready corn indicate that under excellent growing conditions, sicklepod and barnyardgrass control can be accomplished with the standard all PRE program of Bicep II Magnum + atrazine at 1.8 qt + 0.6 qt/ac alone or Fb Accent at EPOT or Bicep II Magnum + atrazine at 2/3 standard rate (1.33 lb ai/ac) or 1/2 standard rate (1.0 lb ai/ac) Fb RWM at 21.4 oz/ac; RWM application EPOT; RWM at 21.4 oz/ac+ 0.75X rate of atrazine (1.5 lb ai/ac) applied EPOT Fb RWM at 16 oz/ac LPOT; and EPOT RWM at 21.4 oz/ac with a repeat LPOT application at 16 oz/ac. All of these treatments provided good to excellent sicklepod and barnyardgrass control with no crop injury. Steadfast treatments caused some early erratic crop injury but had no effect on yield. However, under more adverse growing conditions (drought stress) herbicide efficacy may be different from this year's excellent growing conditions. This could possibly result in weed control differences among these treatments.

COOPERATORS: None

PUBLICATIONS: None

Table 1. Barnyardgrass control in Roundup Ready and conventional corn hybrids as influenced by preemergence and postemergence herbicides and time of application in 2004, Verona, MS.

Treatment number	Herbicide treatment ¹	Rate	Application timing	Percent barnyardgrass control			
				35 DAP	49 DAP	59 DAP	108 DAP
1	Untreated			0.0	0.0	0.0	0.0
2	Bicep II Magnum Atrazine Accent COC	1.8 QT/A 0.6 QT/A 0.66 OZ WT/A 1% V/V	PRE PRE 36 DAP-EPOT 36 DAP-EPOT	96	96	94	94
3	Bicep II Magnum Atrazine Accent COC	1.8QT/A 0.6 QT/A 0.66OZ WT/A 1% V/V	PRE PRE 36 DAP-EPOT 36 DAP-EPOT	94	97	93	95
4	Bicep II Magnum Atrazine	1.8 QT/A 0.6 QT/A	PRE PRE	95	95	91	95
5	Bicep II Magnum Atrazine Roundup WMAX	0.9 QT/A 0.3 QT/A 16 OZ/A	PRE PRE 36 DAP-EPOT	95	97	91	93
6	Roundup WMAX Atrazine	21.4 OZ/A 1.5 QT/A	36 DAP-EPOT 36 DAP-EPOT	0	94	89	95
7	Roundup WMAX Atrazine Roundup WMAX	21.4 OZ/A 1.5 QT/A 16 OZ/A	36 DAP-EPOT 36 DAP-EPOT 47 DAP-LPOT	0	98	94	94
8	Roundup WMAX	21.4OZ/A	36 DAP-EPOT	0	89	69	88
9	Roundup WMAX Roundup WMAX	21.4OZ/A 16OZ/A	36 DAP-EPOT 47 DAP-LPOT	0	99	89	94
10	Cinch ATZ Steadfast Atrazine AMS COC	1.3 PT/A 0.75OZ WT/A 2.0 QT/A 2 LB/A 1% V/V	PRE 36 DAP-EPOT 36 DAP-EPOT 36 DAP-EPOT 36 DAP-EPOT	95	99	95	95
11	Atazine Steadfast Atrazine AMS COC	2.5 PT/A 0.75 OZ WT/A 2.5 PT/A 2 LB/A 1% V/V	PRE 36 DAP-EPOT 36 DAP-EPOT 36 DAP-EPOT 36 DAP-EPOT	85	93	89	94
12	Atazine Steadfast Cinch ATZ AMS COC	2.5 PT/A 0.75 OZ WT/A 2 PT/A 2 LB/A 1% V/V	PRE 36 DAP-EPOT 36 DAP-EPOT 36 DAP-EPOT 36 DAP-EPOT	84	98	93	95
13	Cinch Steadfast Atrazine AMS COC	0.8 PT/A 0.75 OZ WT/A 2.0 QT/A 2 LB/A 1% V/V	PRE 36 DAP-EPOT 36 DAP-EPOT 36 DAP-EPOT 36 DAP-EPOT	88	98	93	95
14	Steadfast Atrazine AMS COC	0.75 OZ WT/A 2 QT/A 2 LB/A 1% V/V	36 DAP-EPOT 36 DAP-EPOT 36 DAP-EPOT 36 DAP-EPOT	0	85	79	90
15	Bicep II Magnum Atrazine Roundup WMAX	1.2 QT/A 0.4 QT/A 21.4 OZ/A	PRE PRE 36 DAP-EPOT	94	98	93	94
16	Bicep II Magnum Atrazine Roundup WMAX	0.9 QT/A 0.3 QT/A 21.4 OZ/A	PRE PRE 36 DAP-EPOT	93	98	90	94
17	Steadfast Calisto COC	0.66 OZ WT/A 3 OZ/A 1% V/V	36 DAP-EPOT 36 DAP-EPOT 36 DAP-EPOT	0	81	73	86
18	Steadfast Calisto Atazine AMS COC	0.75 OZ/A 2 OZ/A 3 PT/A 2 LB/A 1% V/V	36 DAP-EPOT 36 DAP-EPOT 36 DAP-EPOT 36 DAP-EPOT 36 DAP-EPOT	0	81	71	86
19	Lexar	3 QT/A	PRE	96	97	95	95
	LSD ₍₀₅₎			5	5	7	5

¹Corn hybrid DKC69-71 was planted in treatments 1and 3 through 19. Conventional corn hybrid Pioneer 31B13 was planted in treatment 2.

Table 2. Sicklepod control and yield in Roundup Ready and conventional corn hybrids as influenced by preemergence and postemergence herbicides and time application in 2004, Verona, MS.

Treatment number	Herbicide treatment ¹	Rate	Application timing	Percent sicklepod control				Yield bu/ac
				35 DAP	49 DAP	59 DAP	108 DAP	
1	Untreated			0.0	0.0	0.0	0.0	87
2	Bicep II Magnum Atrazine Accent COC	1.8 QT/A 0.6 QT/A 0.66 OZ WT/A 1% V/V	PRE PRE 36 DAP-EPOT 36 DAP-EPOT	53	85	79	94	130
3	Bicep II Magnum Atrazine Accent COC	1.8QT/A 0.6 QT/A 0.66OZ WT/A 1% V/V	PRE PRE 36 DAP-EPOT 36 DAP-EPOT	43	85	80	89	141
4	Bicep II Magnum Atrazine	1.8 QT/A 0.6 QT/A	PRE PRE	38	84	75	87	128
5	Bicep II Magnum Atrazine Roundup WMAX	0.9 QT/A 0.3 QT/A 16 OZ/A	PRE PRE 36 DAP-EPOT	38	88	81	89	135
6	Roundup WMAX Atrazine	21.4 OZ/A 1.5 QT/A	36 DAP-EPOT 36 DAP-EPOT	0	93	85	93	129
7	Roundup WMAX Atrazine Roundup WMAX	21.4 OZ/A 1.5 QT/A 16 OZ/A	36 DAP-EPOT 36 DAP-EPOT 47 DAP-LPOT	0	94	90	94	137
8	Roundup WMAX	21.4OZ/A	36 DAP-EPOT	0	88	80	86	128
9	Roundup WMAX Roundup WMAX	21.4OZ/A 16OZ/A	36 DAP-EPOT 47 DAP-LPOT	0	95	89	93	122
10	Cinch ATZ Steadfast Atrazine AMS COC	1.3 PT/A 0.75OZ WT/A 2.0 QT/A 2 LB/A 1% V/V	PRE 36 DAP-EPOT 36 DAP-EPOT 36 DAP-EPOT 36 DAP-EPOT	33	95	88	91	125
11	Atazine Steadfast Atrazine AMS COC	2.5 PT/A 0.75 OZ WT/A 2.5 PT/A 2 LB/A 1% V/V	PRE 36 DAP-EPOT 36 DAP-EPOT 36 DAP-EPOT 36 DAP-EPOT	63	91	84	93	133
12	Atazine Steadfast Cinch ATZ AMS COC	2.5 PT/A 0.75 OZ WT/A 2 PT/A 2 LB/A 1 % V/V	PRE 36 DAP-EPOT 36 DAP-EPOT 36 DAP-EPOT 36 DAP-EPOT	40	94	89	89	121
13	Cinch Steadfast Atrazine AMS COC	0.8 PT/A 0.75 OZ WT/A 2.0 QT/A 2 LB/A 1% V/V	PRE 36 DAP-EPOT 36 DAP-EPOT 36 DAP-EPOT 36 DAP-EPOT	0	95	89	93	144
14	Steadfast Atrazine AMS COC	0.75 OZ WT/A 2 QT/A 2 LB/A 1% V/V	36 DAP-EPOT 36 DAP-EPOT 36 DAP-EPOT 36 DAP-EPOT	0	91	85	90	122
15	Bicep II Magnum Atrazine Roundup WMAX	1.2 QT/A 0.4 QT/A 21.4 OZ/A	PRE PRE 36 DAP-EPOT	56	91	86	91	134
16	Bicep II Magnum Atrazine Roundup WMAX	0.9 QT/A 0.3 QT/A 21.4 OZ/A	PRE PRE 36 DAP-EPOT	39	89	86	90	133
17	Steadfast Calisto COC	0.66 OZ WT/A 3 OZ/A 1% V/V	36 DAP-EPOT 36 DAP-EPOT 36 DAP-EPOT	0	90	83	88	130
18	Steadfast Calisto Atazine AMS COC	0.75 OZ/A 2 OZ/A 3 PT/A 2 LB/A 1% V/V	36 DAP-EPOT 36 DAP-EPOT 36 DAP-EPOT 36 DAP-EPOT 36 DAP-EPOT	0	90	81	90	119
19	Lexar (A14224A)	3 QT/A	PRE	96	80	78	85	117
	LSD _(.05)			37	6	6	5	32

¹Corn hybrid DKC69-71 was planted in treatments 1 and 3 through 19. Conventional corn hybrid Pioneer 31B13 was planted in treatment 2.