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## Common Pokeweed Management in Corn and Soybean with a Conservation Tillage Cultivator and Herbicides

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### Introduction

Common pokeweed (*Phytolacca americana* L.) is a warm-season perennial that grows well in nondisturbed areas such as fence rows and woodland borders. In recent years it has begun spreading to corn and soybean fields where no-tillage practices are used. The deep taproot that is characteristic of common pokeweed, makes this weed difficult to manage, particularly in no-till plantings. The green leaves, fleshy stems, and purple berries of common pokeweed can inhibit the harvesting process and lead to discounts at the elevator for high moisture and stained seed.

The equipment industry has developed cultivators with large sweeps capable of operating in no-till plantings with minimal disturbance to stubble and plant residue at the soil surface. These cultivators are called "conservation tillage cultivators" and are intended to operate at shallow depths to cut plants below the soil surface.

The fact that plants with deep taproots generally do not tolerate tillage may make the conservation tillage cultivator a valuable tool for managing common pokeweed in no-till plantings. The objective of this research was to evaluate the effectiveness of a conservation-till cultivator with and without herbicide treatments for common pokeweed control in corn and soybean.

### Materials and Methods

Experiments were conducted in Kentucky corn and soybean fields where common pokeweed had become well established after several years of continuous no-till crop production. In-crop cultivation and postemergence herbicide applications were evaluated at each location, resulting in treatments arranged in a split-plot design. The main plots consisted of postemergence herbicide treatments applied four to five weeks after crop planting and a nontreated check. Each main plot was divided into two sub-plots that consisted of cultivation or no cultivation. Cultivation was conducted approximately one week following herbicide application and was performed with a John Deere 886 Conservation Tillage cultivator set to a soil depth of 2 inches. The width of the sweeps between the row varied depending on the crop row spacing.

Percent visual control of pokeweed, heights of individual common pokeweed plants, and grain yield were collected. Plant height measurements were made throughout the season on the same five plants per plot.

### Corn Studies:

Four studies were conducted on farms near Versailles, Glendale, and at the University of Kentucky Woodford Research Farm during 1996 and 1997. At each site individual sub-plots were 4 rows wide and varied from 60 feet to 200 feet in length depending on the common pokeweed population. Specific information for each site is given in Table 1.

Table 1. Experimental Methods for No-Till Corn Studies.

	Versailles 1996	Glendale 1996	Woodford 1996	Woodford 1997
Plot Size:	12' x 75' (38" rows)	10' x 200' (30" rows)	10' x 150' (30" rows)	10' x 60' (30" rows)
Replications:	4	3	4	4
Date Planted:	April 20	May 6	April 17	May 2
Variety:	Pioneer 3163	Lynk's 2807	Pioneer 3273	Pioneer 3273
Herbicide:				
Burndown:	Gramoxone Extra	Gramoxone Extra	Gramoxone Extra	Roundup
Residual:	Princep + Atrazine	TopNotch+Atrazine	Guardsman	Bicep II
Postemergence: (20 GPA)	Exceed (1 oz)	Exceed (1 oz) Banvel (0.5 pt)	Exceed (1 oz) Banvel (0.5 pt)	Exceed (1 oz) Banvel (0.5 pt)
Date:	May 23	June 10	May 23	June 10
Corn Height:	12"	15"	12"	12"
Pokeweed Height:	16"	20"	15"	18"
Cultivation:				
Date:	June 1	June 19	May 31	June 16
Corn Height:	18"	35"	18"	15"
Pokeweed Height:	24"	22"	24"	24"

Table 2. Experimental Methods for No-Till Soybean Studies.

	Shelby (#1) 1996	Shelby (#2) 1996	Woodford 1998
Plot Size:	12' x 150' (36" rows)	12' x 150' (36" rows)	10' x 60' (30" rows)
Replications:	4	4	4
Date Planted:	May 23	May 23	May 28
Variety: <sup>1</sup>	HT-381 (STS)	HT-381 (STS)	AG 4701
Herbicide:			
Burndown:	Roundup Ultra (2 qt)	Gramoxone Extra (3 pt)	Gramoxone Extra (3 pt)
Residual:	Turbo	Turbo	Squadron
Postemergence: (20 GPA)	Synchrony "STS" (0.85 oz)	Synchrony "STS" (0.85 oz)	Synchrony "STS" (0.85 oz) Roundup Ultra (3 pt)
Date:	June 25	June 25	July 8
Soybean Growth Stage:	8" (V3-V4)	8" (V3-V4)	9" (V3-V4)
Pokeweed Height:	10 to 40"	10 to 40"	6 to 30"
Cultivation:			
Date:	July 2	July 2	July 13
Soybean Growth Stage:	12" (V5-V6)	12" (V5-V6)	15" (V5-V6)
Pokeweed Height:	20 to 45" (nontreated)	20 to 45" (nontreated)	9 to 36" (nontreated)

<sup>1</sup>Soybean variety HT-381 (STS) is a Sulfonyleurea Tolerant Soybean. AG4701 contains the Roundup Ready gene for herbicide resistance.

### **Soybean Studies:**

One field site was located in Shelby county in 1996. Two studies were conducted by dividing the site into two main areas for evaluation of the impact of the "burndown" treatments to control the existing vegetation, including common pokeweed, before crop planting as well as in-season treatment affects. One study area at this site was treated with Roundup Ultra and the adjacent study area with Gramoxone Extra. (i.e. designated Shelby #1 and Shelby #2). Since common pokeweed plants were hand removed from all plots at mid-season, the impacts on soybean grain yield could not be determined at this site. Another experiment was conducted in 1998 at the University of Kentucky Woodford Research Farm. At each site individual subplots were 4 rows wide and varied in length depending on the common pokeweed population. Specific information for each site is given in Table 2.

## **Results and Discussion**

### **Corn Studies:**

Common pokeweed growth was suppressed by cultivation when used without a postemergence herbicide. Cultivation treatments without a herbicide 12 WAT (weeks after treatment) provided over 60% control at two locations and approximately 40 to 50% control at the other two locations (Table 3). In general, acceptable control was observed between the corn rows where cultivation occurred, but overall visual ratings per plot were less since no control was obtained in or near the crop row. Average common pokeweed height 12 WAT in the nontreated check plots without cultivation ranged from 66 to 79 inches (Table 3). Whereas, the average height of common pokeweed plants was reduced by at least 60% with cultivation at three locations and about 50% at one location.

Exceed without cultivation was also effective in suppressing common pokeweed growth. Exceed provided 75 to 86% control 12 WAT at three sites; whereas, at the Glendale location, control was 43 percent. The control ratings 4 WAT did not indicate a benefit from cultivation following an Exceed application compared to Exceed alone, except at the Woodford 1997 site (data not shown). However, later evaluations 12 WAT indicated that cultivation did improve control by 14 to 33% compared with Exceed alone at three locations. Common pokeweed heights were greatly reduced either with a postemergence application of Exceed or with

Exceed followed by cultivation. At the Versailles 1996 and Woodford 1997 sites, Exceed followed by cultivation significantly decreased average pokeweed height compared with Exceed alone 12 WAT. Exceed alone and Exceed followed by cultivation were highly effective in suppressing common pokeweed growth.

Banvel treatments were applied at three locations. Banvel without cultivation provided 60 to 86% control 12 WAT. Banvel followed by cultivation did enhance common pokeweed control 4 WAT (data not shown), but was not improved 12 WAT compared to Banvel alone at two of three sites. Average pokeweed heights between Banvel alone and Banvel followed by cultivation did not differ, except at Woodford 1997, and were equal to those observed with Exceed treatments.

Corn grain yield was significantly greater for Exceed without cultivation compared with yield for the nontreated check at the Woodford 1996 site (Table 3). A similar trend was observed for all other treatments across all studies indicating a potential for common pokeweed to reduce yield when control measures are not implemented. The use of herbicides alone had a greater tendency to increase corn yield compared with cultivation alone.

### **Soybean Studies:**

The "burndown" treatment at time of planting had little impact on the common pokeweed control observed in Shelby county during the 1996 crop season. Observations made in mid-season (5 WAT) indicated that significant regrowth of pokeweed had occurred regardless of whether Roundup Ultra or Gramoxone Extra was used as the "burndown" herbicide (Table 4). Common pokeweed control 5 WAT was approximately 45% when cultivation was used without a postemergence herbicide treatment. As noted with the corn studies, acceptable control was observed between the rows where cultivation occurred, but no control was obtained in or near the soybean row. Average common pokeweed height 5 WAT with cultivation was reduced nearly 80% (8 and 11 inches) compared with the nontreated plots without cultivation (38 and 44 inches).

Treatments with Synchrony "STS", with or without a cultivation, provided better pokeweed control than the cultivation only treatment. Synchrony "STS" with cultivation gave nearly 90% control 5 WAT compared with 72% with

Synchrony "STS" alone. Average common pokeweed height was reduced to 2 inches or less with Synchrony "STS" followed by cultivation. Pokeweed heights were similar between Synchrony "STS" without cultivation and cultivation alone without a herbicide treatment.

Common pokeweed control 4 WAT at the Woodford 1998 site was 30% and at 12 WAT decreased to less than 20% when cultivation was used without a postemergence herbicide (Table 5). The control observed was between the crop rows. Average common pokeweed height 4 WAT was reduced more than 50% with cultivation (28 inches) compared with the nontreated plots without cultivation (63 inches). Observations 12 WAT indicated that common pokeweed height was reduced by cultivation, but to a lesser extent compared with observations made at 4 WAT.

Treatments with Synchrony "STS" with or without a cultivation provided greater common pokeweed control than the cultivation only treatment. Synchrony "STS" with cultivation gave 72% control 12 WAT compared to 52% with Synchrony "STS" without cultivation. Average common pokeweed height was reduced when Synchrony "STS" was followed by cultivation compared with Synchrony "STS" alone 4 WAT and 12 WAT. Plant heights 12 WAT were lower with Synchrony "STS" without cultivation compared with cultivation alone without herbicide treatment.

Roundup Ultra with or without cultivation provided more than 95% control throughout the season. These results were also evident in average pokeweed heights which were significantly lower, except when compared with Synchrony "STS" followed by cultivation 4WAT. Soybean grain yield was also greater with Roundup Ultra compared with the nontreated and Synchrony "STS" without cultivation.

## Summary

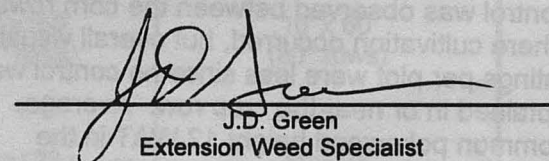
The use of the conservation-tillage cultivator alone or postemergence herbicides alone helped suppress common pokeweed growth in no-till corn and soybeans. Operating the cultivator at a depth of 2 inches clipped off the deep taproot that is characteristic of common pokeweed with minimal disturbance of the residue at the soil surface. This process helped curtail the growth of pokeweed plants located between the crop rows, but did not impact

plants within the crop rows. The combination of using Exceed or Banvel in corn and Roundup Ultra or Synchrony "STS" in soybean followed by cultivation generally provided greater control of common pokeweed than cultivation alone.

As a general observation, cultivation tended to be more of a benefit for pokeweed control in crops planted in wider row spacings (>30 inches) since a wider area could be cultivated with wider sweeps. Additional research is needed to evaluate the depth and timing of the operation to achieve the maximum benefit from cultivation. Also, since herbicides tended to have a greater impact on common pokeweed control than cultivation, further research is warranted to determine the rates and timing of herbicide applications for optimum control.

## Acknowledgements

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Table 3. Common Pokeweed Control and Plant Height 12 Weeks After Treatment and Corn Grain Yields with and without Cultivation Following Herbicide Treatment in No-Tillage Corn Production (1996-1997)<sup>1</sup>

Treatment	Versailles 1996			Glendale 1996			Woodford 1996			Woodford 1997		
	Pokeweed		Corn Yield	Pokeweed		Corn Yield	Pokeweed		Corn Yield	Pokeweed		Corn Yield
	Control	Height		Control	Height		Control	Height		Control	Height	
	-- (%) --	-- (in.) --	(bu/A)	-- (%) --	-- (in.) --	(bu/A)	-- (%) --	-- (in.) --	(bu/A)	-- (%) --	-- (in.) --	(bu/A)
Nontreated	0 d	79 a	150 a	0 c	72 a	134 a	0 c	70 a	122 b	0 d	66 a	51 a
Nontreated Cultivation	62 c	11 bc	159 a	68 a	19 b	134 a	38 b	28 b	129 ab	52 c	32 b	58 a
Exceed + COC	75 b	25 b	150 a	43 b	32 b	143 a	86 a	6 c	145 a	80 b	24 b	60 a
Exceed + COC Cultivation	90 a	3 c	157 a	70 a	18 b	144 a	86 a	4 c	139 ab	94 a	6 c	66 a
Banvel (0.5 pt)	---	---	---	60 ab	17 b	148 a	86 a	4 c	134 ab	81 b	22 b	67 a
Banvel (0.5 pt) Cultivation	---	---	---	67 a	17 b	138 a	85 a	4 c	127 ab	94 a	9 c	62 a

<sup>1</sup> Means within a column followed by the same letter are not significantly different

Table 4. Common Pokeweed Control and Plant Height 5 Weeks After Treatment with and without Cultivation in No-Tillage Soybean at Shelby Co., KY 1996<sup>1</sup>

In-Season Treatments	Shelby (#1) Roundup Ultra (2 qt)		Shelby (#2) Gramoxone Extra (3 pt)	
	Pokeweed		Pokeweed	
	Control	Height	Control	Height
	--(%)--	(inches)	--(%)--	(inches)
Nontreated	0 a	38 a	0 a	44 a
Nontreated Cultivation	42 b	8 bc	45 b	11 b
Synchrony "STS"	72 c	14 b	72 c	13 b
Synchrony "STS" Cultivation	89 d	2 c	89 d	1 c

<sup>1</sup> Means within a column followed by the same letter are not significantly different

Table 5. Common Pokeweed Control with and without Cultivation in No-Tillage Soybean at UK Woodford Research Farm 1998<sup>1</sup>

In-Season Treatments	Pokeweed Control		Pokeweed Height		Soybean
	4 WAT <sup>2</sup>	12 WAT	4 WAT	12 WAT	Grain Yield
	----- (%) -----		----- (inches) -----		--(bu/A)--
Nontreated	0 e	0 e	63 a	73 a	25 b
Nontreated Cultivation	30 d	18 d	28 b	52 b	26 b
Synchrony "STS" (0.5 oz)	65 c	52 c	25 b	32 c	28 b
Synchrony "STS" (0.5 oz) Cultivation	78 b	72 b	7 c	20 d	32 ab
Roundup Ultra (3 pt)	95 a	100 a	3 c	0 e	41 a
Roundup Ultra (3 pt) Cultivation	100 a	100 a	0 c	0 e	42 a

<sup>1</sup> Means within a column followed by the same letter are not significantly different.

<sup>2</sup> WAT = Weeks After Treatment.

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Table 1. Soybean Plant Height and Grain Yield with and without Cultivation in No-Tillage Soybean at

Cultivation Treatment	Plant Height (inches)		Plant Height (inches)		Soybean Grain Yield (bu/A)
	4 WAT	12 WAT	4 WAT	12 WAT	
Control	0a	0a	53a	73a	25 b
Control	37a	50a	38b	51b	26 b
Control	58c	52c	25b	35c	20 b
Control	78b	72b	11	30d	32 ab
Control	95a	100a	0c	0a	41 a
Control	100a	100a	0c	0a	42 a

Means within a column followed by the same letter are not significantly different.