

Volunteer potato management with herbicides and tillage. Timothy W. Miller and Carl R. Libbey. Washington State University, Mount Vernon, WA 98273. Volunteer potatoes are a major weed species in many regions where potatoes are produced. Two studies were conducted in 1998 at the WSU Mount Vernon Research and Extension Unit to test herbicide efficacy and combinations of glyphosate and tillage to control volunteer potatoes.

Herbicide study. This study compared volunteer potato control by various herbicides and herbicide combinations available for rotational crops grown in northwestern Washington. ‘Russet Burbank’ potatoes were planted in 10 by 20-ft plots April 24. Preplant incorporated and preemergence herbicides were applied May 8, and postemergence herbicides were applied June 2. All herbicide treatments were applied using a tractor-mounted sprayer delivering 29.7 gpa at 15 psi. Volunteer potato control was visually estimated on May 28 and June 15. The experimental design was a randomized complete block with four replicates. A general linear models procedure was used to analyze the data. Means were separated using Fisher’s Protected LSD. Application data is listed in Table 1 and volunteer potato control is listed in Table 3.

Table 1. Application data, herbicide study.

Date:	6:20 a.m., May 8, 1998	6:00 a.m., May 29, 1998
Type:	Broadcast, preplant incorporated preemergence	Broadcast, postemergence
Potato stage:	---	4 to 6 in.
Cloud cover:	100%	0%, clear
Winds:	2 to 7 mph from SW	0 to 3 mph from N
Air temp.:	9 C	17 C
Soil temp (4"):	8 C	6 C
Relative humidity:	92%	66%
Comments:	No dew; soil surface dry	Dew present; soil surface damp

Glyphosate/tillage study. This study tested tillage with and without glyphosate to control volunteer potato in three rotational crops common in northwestern Washington: sweet corn, green peas, and pickling cucumbers. ‘Russet Burbank’ potatoes were planted into 20 by 30-ft plots May 7. Two treatments were applied to control volunteer potatoes prior to seeding the rotational crop: (1) tillage used when volunteer potatoes were 4 to 8 in. or 8 to 12 in. tall and followed by crop seeding, and (2) application of glyphosate + 32-0-0 (at 1.5 lb/A + 1.5% v/v, respectively) to volunteer potatoes at 4 to 8 in. or 8 to 12 in. tall and followed by tillage and crop seeding. Glyphosate treatments were applied on June 12 or 22 using a CO₂-pressurized backpack sprayer delivering 31.3 gpa at 43 psi (application data in Table 2; tillage, spray, and seeding dates in Table 4). No herbicides were applied to the rotational crops. Emerged potato plants were counted in each crop July 24 and August 18, and a general “establishment” rating of the crop and weeds other than volunteer potatoes was estimated August 25 (rating from 1 to 10, where 1 = very poor crop or few weeds, and 10 = full crop or heavy weed population). The experimental design was a split-plot, randomized complete block with three replicates. A general linear models procedure was used to analyze the data. Means were separated using Fisher’s Protected LSD.

Table 2. Application data, glyphosate/tillage study.

Date:	10:00 p.m., June 12, 1998	8:00 a.m., June 22, 1998
Type:	Broadcast, postemergence	Broadcast, postemergence
Potato stage:	4 to 8 in.	8 to 12 in.
Cloud cover:	0%	25%
Winds:	5 to 7 mph from NW	1 to 4 mph from SW
Air temp.:	16 C	17 C
Soil temp (6"):	13 C	13 C
Relative humidity:	89%	88%
Comments:	No dew; soil surface dry	Dew present; soil surface damp

Herbicide study. Clomazone at either rate gave 100% control of volunteer potato 20 days after treatment (DAT); the sequential treatments with bentazon or bentazon + MCPA were largely ineffectual, however, because there was no potato regrowth at the time of postemergence application. Primisulfuron + dicamba and fluroxypyr + MCPA provided 94 and 91% volunteer potato control, respectively, at 17 DAT; no other treatments exceeded 90% control.

Table 3. Volunteer potato control from various herbicides and herbicide combinations.

Treatment ^a	Rate	Timing ^b	Volunteer potato control	
			5/28 ^c	6/15
	lb/A		----- % -----	
Triasulfuron + bromoxynil + NIS	0.016 + 0.5	POST	--	76
Thifensulfuron + tribenuron + NIS	0.028 + 0.5	POST	--	80
+ bromoxynil	0.5	--	--	--
Bromoxynil + MCPA	0.5 + 0.5	POST	--	39
Clopyralid + MCPA	0.122 + 0.69	POST	--	55
Fluroxypyr + MCPA	0.25 + 0.5	POST	--	91
Imazamethabenz + NIS	0.47	POST	--	41
Dicamba + pyridate + COC	0.063 + 0.71	POST	--	78
Primisulfuron + dicamba + NIS	0.031 + 0.063	POST	--	94
Halosulfuron + dicamba + NIS	0.063 + 0.063	POST	--	89
Imazamox + NIS	0.04	POST	--	81
Clomazone	0.5	PPI	100	78
+ bentazon + MCPA	0.5 + 0.25	POST	--	--
Sulfentrazone	0.25	PRE	15	10
Cycloate	3.0	PPI	85	25
Ethofumesate	1.5	PRE	25	6
Pyrazon	2.75	PRE	35	14
Phen. + des. + etho.	0.5	POST	--	36
+ endothall	0.075	POST	--	--
Triflurosulfuron + des. + NIS	0.016 + 0.5	POST	--	70
Simazine	0.8	PRE	25	83
+ clopyralid	0.25	POST	--	--
Clomazone	0.17	PPI	100	49
+ bentazon	0.5	POST	--	--
Rimsulfuron + metribuzin + NIS	0.023 + 0.5	POST	--	18

^aPhen. + des. + etho. = phenmedipham + desmedipham + ethofumesate in pre-packaged tank mixture; des. = desmedipham; COC = crop oil concentrate applied at 1.0% v/v; NIS = nonionic surfactant applied at 0.25% v/v.

^bPPI = preplant incorporated, applied 5/8/98; PRE = preemergence, applied 5/8/98; POST = postemergence, applied 6/2/98.

^cOn this date, postemergence treatments had not yet been applied.

Glyphosate/Tillage study. There was a significant three-way interaction between (1) the volunteer potato management program employed, (2) the rotational crop being produced, and (3) the size of the volunteer potatoes when management was applied on crop establishment (Table 4). Crop establishment was generally best in the glyphosate-treated plots when potatoes were 8 to 12 in. in height. The three-way interaction was not significant for volunteer potato control or weed establishment. There was, however, a significant interaction between the management program employed and the rotational crop being produced, indicating that potato height at the time of tillage or spraying did not affect either volunteer potato control or weed establishment (three-way data in Table 4, two-way data in Table 5).

The glyphosate/tillage program was more effective for suppression of volunteer potatoes than tillage alone. Glyphosate application reduced volunteer potato counts 84, 79, and 68% in sweet corn, cucumbers, and green peas by July 24 (respectively), and 87, 84, and 77% by August 24. In all cases, green peas were more competitive with volunteer potatoes than either sweet corn or cucumbers (as based on volunteer potato counts), although the magnitude of the difference was more apparent in the non-sprayed plots than in the glyphosate-treated plots. The weed establishment data displayed similar results, with peas being more likely to form stands dense enough to suppress general weed establishment than either cucumbers or sweet corn.

Table 4. Influence of tillage and herbicide combinations at two volunteer potato growth timings in three rotational crops.

Treatment ^a	Spray date ^b	Tillage date(s)	Seeding date	Volunteer potato control		Establishment ^c	
				7/24	8/18	Crop	Weed
-- plants/plot --							
<u>Till and seed;</u> <u>potatoes at 4 to 8"</u>							
Peas	----	6/18, 6/22	6/23	9.0	13.0	6.3	6.0
Sweet Corn	----	6/18, 6/22	6/23	18.3	25.0	2.7	7.0
Cucumbers	----	6/18, 6/22, 6/29	6/30	22.7	24.3	4.7	8.3
<u>Spray, till, and seed;</u> <u>potatoes at 4 to 8"</u>							
Peas	6/12	6/18, 6/22	6/23	4.7	5.3	6.3	2.3
Sweet Corn	6/12	6/18, 6/22	6/23	5.0	5.7	4.3	8.7
Cucumbers	6/12	6/18, 6/22, 6/29	6/30	9.7	5.7	6.3	6.7
<u>Till and seed;</u> <u>potatoes at 8 to 12"</u>							
Peas	----	6/22	6/23	8.0	11.0	5.3	6.0
Sweet Corn	----	6/22	6/23	19.7	29.0	5.3	7.7
Cucumbers	----	6/22, 6/29	6/30	32.0	31.3	6.7	8.7
<u>Spray, till, and seed;</u> <u>potatoes at 8 to 12"</u>							
Peas	6/22	7/1, 7/9	7/10	0.7	0.3	10.0	1.0
Sweet Corn	6/22	7/1, 7/9	7/10	1.0	1.3	5.7	7.3
Cucumbers	6/22	7/1, 7/9	7/10	2.0	3.3	7.7	5.3

^aFirst herbicide/tillage treatment applied when volunteer potatoes were at either 4 to 8" or 8 to 12"; plots were then seeded to peas, sweet corn, or cucumbers.

^bGlyphosate + 32-0-0 at 1.5 lbs ai/A + 1.5% v/v.

^cEstablishment ratings from 1 to 10 (1 = very poor crop or few weeds; 10 = full crop or heavy weed population) on 8/25/98.

Table 5. Influence of tillage and herbicide combinations on volunteer potato growth and crop and weed establishment in three rotational crops.

Treatment ^a	Volunteer <u>potato control</u>		<u>Establishment^b</u>	
	7/24	8/18	Crop	Weed
	-- plants/plot --			
<u>Spray, till, and seed</u>				
Sweet corn	3.0	3.5	5.0	8.0
Cucumbers	5.8	4.5	7.0	6.0
Green peas	2.7	2.8	8.2	1.7
<u>Till and seed</u>				
Sweet corn	19.0	27.0	4.0	7.3
Cucumbers	27.3	27.8	5.7	8.5
Green peas	8.5	12.0	5.8	6.0

^aFirst herbicide/tillage treatment applied at the time volunteer potatoes were at either 4 to 8" or 8 to 12"; plots were then seeded to peas, sweet corn, or cucumbers.

Glyphosate + 32-0-0 was applied at 1.5 lbs ai/A + 1.5% v/v.

^bEstablishment ratings from 1 to 10 (1 = very poor crop or few weeds; 10 = full crop or heavy weed population) on 8/25/98.