VOLUNTEER POTATO CONTROL IN ROTATIONAL CROPS

by
Rick Boydston and Marc Seymour
Weed Scientist and Research Technician
USDA-Agricultural Research Service
Prosser, Washington

Field surveys conducted in 1993 indicated approximately 95,000 potato tubers per acre were left in the field following potato harvest. Volunteer potatoes are a weed problem in rotational crops when winter soil temperatures do not drop low enough to kill potato tubers left in the field. Volunteer potatoes in rotational crops can defeat the purpose of rotating out of potatoes. Volunteer potato plants harbor insects, diseases, and nematodes which can re-infect neighboring potato fields or keep pest levels high in the rotational crop. Volunteer potatoes can compete for light, nutrients, and water with the rotational crop and lower yields.

Placement depth influences the exposure of volunteer potato tubers to freezing soil temperatures. In order to kill tubers, soil temperatures must reach -2 C for 25 hours, -4 C for 12.5 hours, or -6.4 C for 2.5 hours. In one study 50 hours at 1 C did not kill tubers. Surveys of five fields in 1993 indicated that 66% of the tubers left in the field were 0 to 2 inches deep and are not likely to survive freezing winter temperatures. Twenty-eight percent of the tubers were 2 to 4 inches deep and 6% were 4 to 6 inches deep. These tubers at 4 to 6 inches deep that likely escape freezing temperatures represent 28% of a normal planting rate.

Analysis of soil temperature data from Othello, Wa. from 1989 to 1993 indicated that tubers buried over four to six inches deep were only exposed to temperatures required to kill them in 1 of 4 years. Tubers buried 8 inches deep after potato harvest in 1993 were intact when samples were dug in December 1993 and January of 1994 and will likely regrow in the spring. However, tubers buried 2 inches deep had become soft and were beginning to rot in December and were completely rotted by mid January.

Plowing after potato harvest may bury tubers deep in the soil where winter soil temperatures seldom drop below freezing. However, light discing, subsoiling, and paraplowing did not alter the tuber depth in fields sampled in 1993 (Table 2). Cultivation is effective in removing the topgrowth of volunteer potatoes, but must be done numerous times in rotational crops during the growing season as new shoots continue to emerge from the tuber.

This Presentation is part of the Proceedings of the 1994 Washington State Potato Conference & Trade Fair

Volunteer potatoes are difficult to control with herbicides because of the large food reserve in the tuber and the deep depth from which many plants emerge. The narrow window of application for many translocated herbicides that move in the phloem is often not synchronized with the movement of sugars from the potato leaves to the roots and developing tubers and as a result, control with many postemergence herbicides is poor.

The choice of rotational crops can drastically influence the control of volunteer potatoes. Onions and carrots are poor competitors with volunteer potatoes and have fewer effective herbicides available than corn. Alfalfa can compete fairly well with volunteer potatoes and numerous harvests help reduce volunteer potatoes. Winter wheat competes well with volunteer potatoes and has reduced total tuber number and weight more than corn when no herbicides were used (Table 2). However, there are more herbicide and cultivation options available for controlling volunteer potatoes in corn than in winter wheat. Glyphosate labels have been expanded for use in wheat past the hard dough stage (less than 30% moisture) and at least seven days prior to harvest and may effectively translocate to volunteer potato tubers when applied during this period.

In corn, atrazine and cyanazine applied preemergence effectively reduces volunteer potato tuber number and weight, but can limit crop rotation options. 2,4-D, dicamba, nicosulfuron, and primisulfuron applied postemergence in corn can suppress volunteer potatoes, but are not totally effective. Fluroxypyr reduced potato tuber number and weight better than other postemergence treatments tested in corn in 1993, but is not labeled for use in the United States (Table 2).

Several strategies that can help reduce volunteer potatoes in crop rotations are:

1. Minimize the number of tubers left in the field (physical removal, alter chain size, etc.).

2. Keep tubers near the soil surface (above 2 inches).

3. Rotate to a competitive crop such as winter small grains.

4. Multiple cultivations and herbicides in rotational crops such as corn, onions, carrots, etc.

Table 1. Percent of total volunteer potato tubers found at each depth under five different fall tillage practices.

Fall Tillage After Harvest	Percent at Each Depth		
	0-1 inch	2-4 inch	4-6 inch
Post harvest, no tillage	67	26	7
Disc and plant wheat	61	29	10
Paraplow and fumigate	67	26	7
Subsoil and pack	63	31	6
Disc and pack	70	28	2

Data are the means of four 8 ft^2 samples from each field.

Table 2. Volunteer potato tuber production in corn treated with six herbicides and in winter wheat.

Crop/Herbicide treatment		Number of Tubers Per 10 ft of Row			
		0-2 oz	2-4 oz	>4 oz	Total
None	None	136	39	44	219
Corn	None	104	21	26	151
Corn	2,4D + Banvel	139	28	6	173
Corn	Banvel + Accent	106	26	15	147
Corn	2,4D + Stinger	57	18	13	88
Corn	Fluroxypyr	47	4	0	51
Corn	Bladex	15	7	5	27
Corn	Bladex/2,4D + Banvel	8	1	3	12
Wheat	None	20	7	5	32