TILLAGE AND OTHER PRACTICES FOR VOLUNTEER SUPPRESSION

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Volunteer potatoes are a serious weed problem. Not only do they compete with other crops in the rotation, they can also harbor a number of serious potato diseases, including late blight, early blight, leaf roll and virus Y. Volunteer potatoes are most common in regions where soil temperatures are not low enough to freeze tubers left in the ground after harvest. Fall tillage operations can further increase the problem by burying tubers at depths where killing temperatures are not reached. Volunteer control practices employ two general strategies; 1) reduce viable tubers that over winter, and 2) reduce competition with the following crop. Examples of the first strategy include utilizing post-harvest tillage practices that keep tubers near the soil surface, application of sprout inhibitors and fumigation. The second strategy involves use of herbicides and multiple cultivation's in rotational crops. Effective volunteer control generally requires employing a combination of several of these practices (2). This article looks at the role that tillage practices and sprout inhibitors can play in reducing volunteer potato populations.

Volunteer Survey

Fourteen fields in southwest Idaho that had been cropped to potatoes in 1995 were surveyed during June of 1996 to determine the severity of the volunteer potato problem in various rotation crops. Most of the fields surveyed had been planted with the Shepody variety the previous season. Volunteer potatoes in an area of one meter square were counted at twenty random sites per field. Information on fall and spring tillage practices was collected from the farm operator.

Volunteer populations ranged from 0 to approximately 22,000 plants per acre (Figure 1). A previous study in Washington by Boydston and Seymore (1) found that about 95,000 tubers per acre are left in fields following harvest. If that figure is accurate for southwest Idaho, it would indicate that in the worst fields 29% of tubers survived the winter and produced volunteer plants. Fall tillage practices seemed to be the primary determinant of the incidence of volunteer populations. The seven fields that were plowed in the fall had average volunteer populations of almost 10,000 plants per acre, compared to 2,500 plants per acre for the fields that were not plowed (Figure 2). Two of the three fields that were disced in the fall had no volunteer potatoes in the following crop. The results of the survey support the recommendation that fields not be plowed directly after potato harvest. Even under the relatively mild winter conditions in southwest Idaho, enough of the tubers appear to freeze when left undisturbed by tillage to significantly reduce populations of volunteer potatoes.

This Presentation is part of the 1998 Proceedings of the Washington State Potato Conference and Trade Show.

Sprout Inhibitors

Maleic hydrazide (MH) is a plant growth regulator applied to potato plants during the growing season to inhibit sprouting of tubers during storage. In addition to sprout control in stored potatoes, MH has been reported to control 70-80% of volunteer potatoes. Sprout inhibition activity depends largely on the level of MH residue in the tubers at harvest, which in turn is dependent on absorption and translocation of MH by the leaf. Therefore, environmental conditions and application timing are very important in ensuring sprout control (5). Much of the previous research on sprout inhibition activity of MH has been conducted on the Russet Burbank variety (3, 4, 5).

A study was initiated at the University of Idaho Parma Research and Extension Center in 1995 to investigate how MH influences volunteer populations of Shepody, one of the predominant processing potato varieties in the region. Three rates of MH-30 XTRA (0.5, 1.0 and 1.3 gal/acre) were compared to an untreated check. Applications were made with a tractor mounted sprayer to replicated plots in mid to late July when plants were still in the rapid phase of tuber bulking. After harvest, 70 lbs of tubers from each plot were spread back on a field in November in a 6' x 6' area. These plots were disced twice and moldboard plowed. In June, the total weight of the above ground portion of the volunteer plants was recorded for each plot. Additionally, a sample of tubers from each plot was held in storage at 52^{0}F during the winter. In April, 25 seed pieces in the 2.0-2.5 oz range were cut from the bud end of each tuber and planted in replicated plots. Emerged potato plants were counted in May and June.

Treatment with MH did not significantly influence total or marketable yield, or any processing characteristics such as solids, dark ends, sugar ends, dextrose, sucrose, greening, internal discoloration, hollow heart, jelly ends or fry color (data not shown). Emergence of bud-end seed pieces from the MH treatments was less than 10%, compared to 80% for the control (Figure 3). When tubers from the same treatments were disced and plowed in the fall, volunteer control was not as good as observed in the plant back trial, but still approached 70% (Figure 4). There was a trend for higher rates of MH to increase the level of volunteer control.

Summary

Both tillage and chemical sprout inhibitors can play a role in reducing volunteer potato populations. Growers that practiced fall plowing as a primary tillage practices had four times more volunteer potatoes in their following crop than growers that disced and planted, or waited until spring to plow. Maleic hydrazide was also very effective in reducing emergence and growth of volunteer potato plants. The level of control was often better than the 70 to 80% that had been previously reported.

Literature Cited

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Acknowledgments

Funding for this project was provided by the University of Idaho, Idaho Potato Commission and Uniroyal Chemical Co. Post-harvest tuber analysis for processing quality were conducted by the J.R. Simplot Co.

Figure 1. Incidence of volunteer potatoes found in fourteen southwest ID fields - 1996

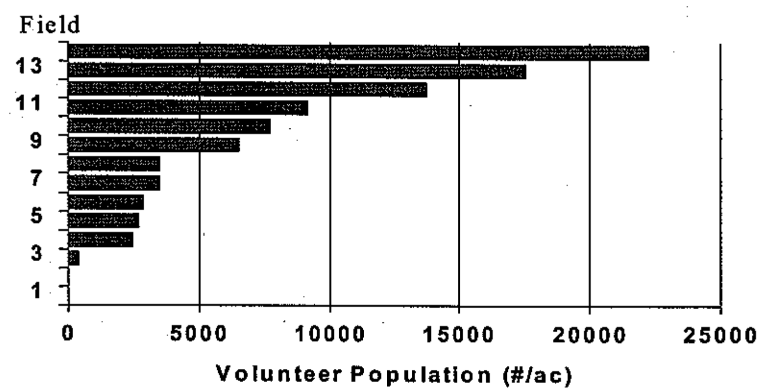


Figure 2. Association of tillage practices with incidence of volunteer potatoes in ID - 1996

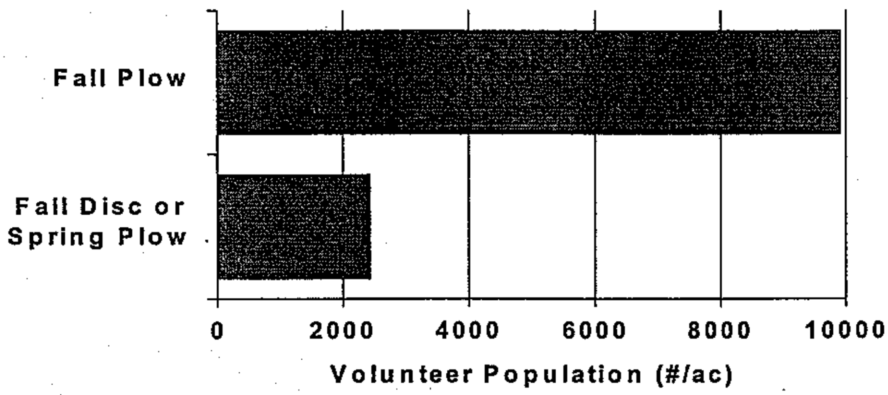
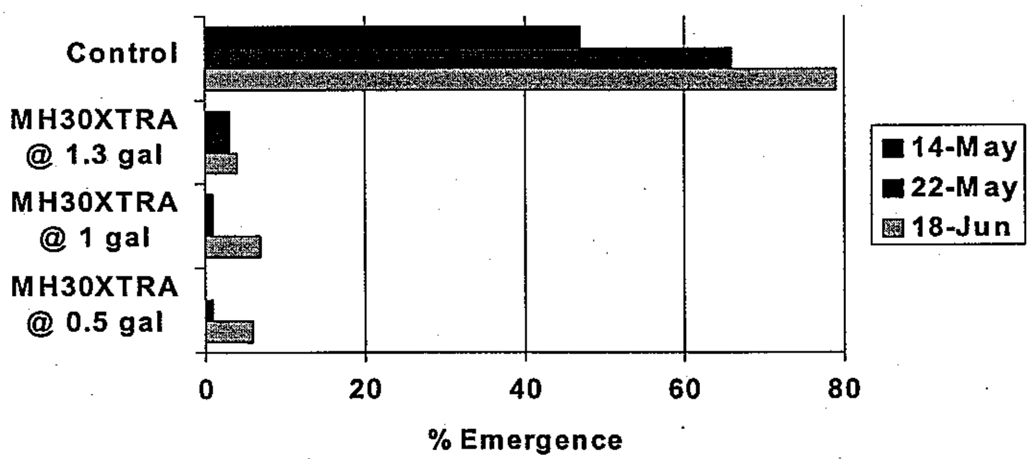
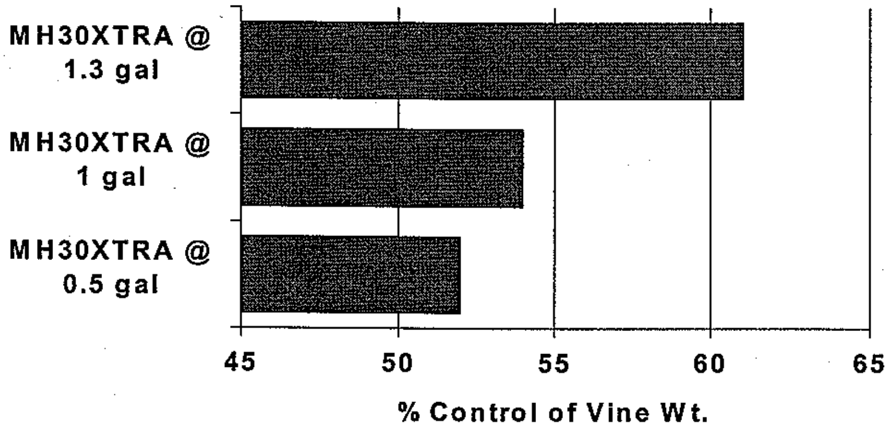


Figure 3. Effect of MH30 on emergence of volunteer Shepody plants at Parma, ID - 1997



- Bud-end seed pieces from tubers stored at 52F

Figure 4. Effect of MH30 on growth of volunteer Shepody plants at Parma, ID - 1997



- Whole tubers spread, disced and plowed in fall of 96