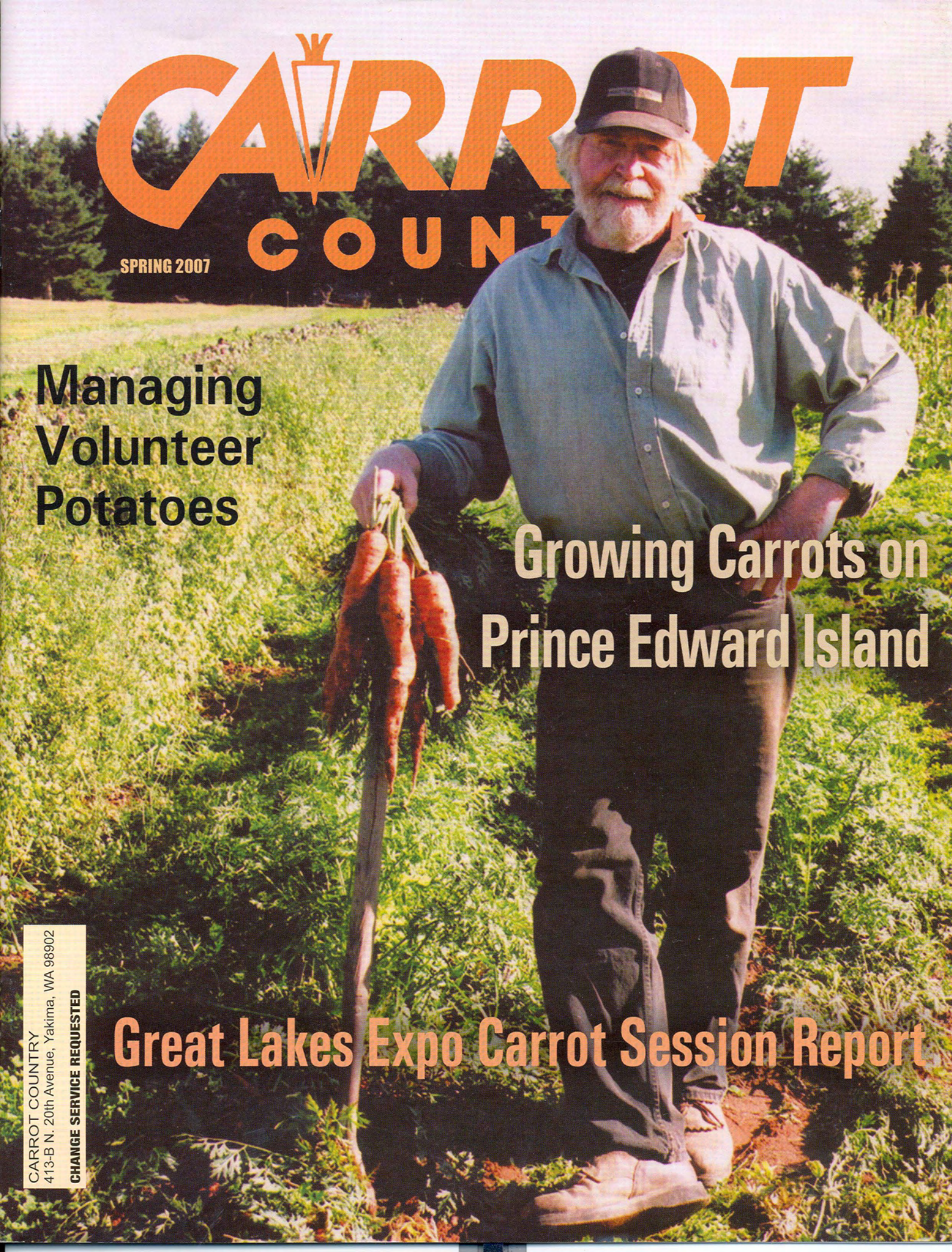
CARROT COUNTRY

SPRING 2007



Managing Volunteer Potatoes

Growing Carrots on Prince Edward Island

Great Lakes Expo Carrot Session Report

CARROT COUNTRY
413-B N. 20th Avenue, Yakima, WA 98902
CHANGE SERVICE REQUESTED

New Tools for Managing Volunteer

By Rick Boydston and Martin Williams, II
USDA-ARS , Prosser, Wash., and Urbana, Ill.

Carrot was most sensitive to weed interference of 25 crops reviewed by Van Heemst (1985). Weeds in carrot reduce yields, impede proper root formation and interfere with harvest operations. Volunteer potato is difficult to manage as a weed in many areas where potatoes are grown in rotation. In regions with mild winters, potato tubers left in the soil after harvest often escape exposure to lethal cold temperatures and become a weed in the following crop. Densities of volunteer potato emerging in the spring in Washington are as high as 93 plants per 100 square feet (Thornton et al. 2001).

Herbicides registered for use in carrot production are limited, and until recently, none suppressed volunteer potato. Costly hand-weeding and limited cultivation are the primary methods of controlling volunteer potato in carrot. High crop seeding rates and narrow rows restrict mechanical cultivation to furrows between beds. Growers also utilize soil fumigation to suppress volunteer potato, especially if nematode presence warrants fumigant use. Fumigation with as low as 38 lb ai/a of 1,3-dichloropropene or 86 lb ai/a of metham sodium (about half the labeled rate of each product) significantly reduced potato tuber viability in lab and field studies (Boydston and Williams 2003).

One aspect of volunteer potato management should include reducing or eliminating daughter tuber production. Surviving tubers can overwinter and cause losses in yield or quality of rotational crops including field corn, green peas, onion, snap beans, and sweet corn. Moreover, volunteer potato is a host to serious pest of potato including insects, nematodes, and diseases.

Researchers at USDA-ARS and Washington State University conducted field trials near Prosser, WA to: (1) quantify the effect of volunteer potato density on carrot yield, (2) determine the critical time for volunteer potato removal in carrot, and (3) determine the response of volunteer potato and carrot to various treatments of Nortron and Caparol. Results of these studies have recently been published (Williams and Boydston 2005, 2006)

Volunteer Potato Density Study

Carrot yield was nearly eliminated by volunteer potato at relatively low weed densities (Figure 1). A 5 percent carrot yield loss was observed with as few as 0.6 volunteer potato plants per 100 square feet. A density of 74 plants per 100 square feet reduced carrot yield by greater than 80 percent. Volunteer potato produced many daughter tubers even at low densities. For instance, a volunteer potato density of 0.6 plants per 100 square feet produced from nine to 13 tubers. Control measures that allow survival of even very few volunteer potato plants can result in daughter tubers capable of causing substantial losses in subsequent crops.

Time of Volunteer Potato Removal Study

Increasing the length of time for volunteer potato to compete with carrot before removing them resulted in sharply lower carrot yields. Carrot tolerated volunteer potato well for only a week or two after crop emergence, and yield dropped rapidly beyond about four weeks. Five percent yield loss occurred when carrot had 4.5 leaves and 10 percent yield loss was estimated for 6-leaf carrot. Consequently, volunteer potato should be removed early in carrot to prevent yield loss. Volunteer potato height at the time of removal was a good predictor of carrot yield loss (Figure 2). If volunteer potato was removed before reaching 12 inches tall, yield loss was minimal. In addition, early removal of volunteer potato reduces the number of daughter tubers produced, which prevents problems in subsequent crops.

Nortron potato injury pre and post.
Rick Boydston photo.

Volunteer potato was able to produce many small tubers relatively quickly while

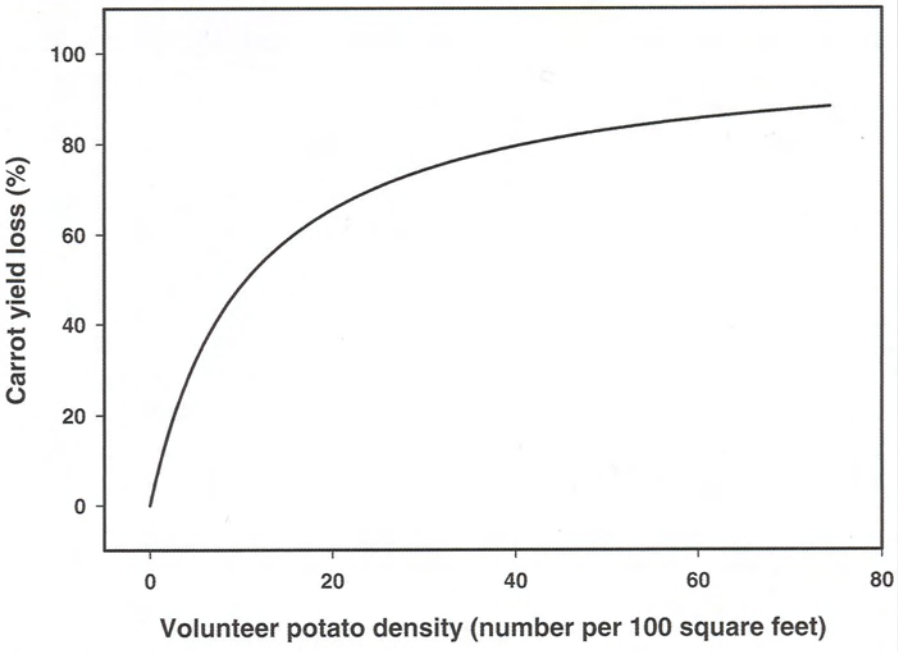


Figure 1. Effect of volunteer potato density on carrot yield loss.

Potatoes in Carrot Production

Table 1. Volunteer potato control and number and mass of tubers at carrot harvest after treatment with Nortron in 2003 near Prosser, WA.

Treatment	Timing[a,b]	Rate	Potato control[c]	Number of tubers	Mass of tubers
		lb ai/a	%	% of nontreated check[d]	
Nortron	PRE + EPOST	1.5 + 2	82 a	45 a	21 a
Nortron	EPOST + LPOST	2 + 2	80 a	65 a	54 a

[a]Abbreviations: PRE, preemergence; EPOST, early-postemergence; LPOST, late-postemergence.
[b]PRE applied 11 days after planting; EPOST applied when carrots had 2 leaves; and LPOST applied when carrots had 6 leaves.
[c]Potato control was visually estimated 2 wks after LPOST applications.
[d]Nontreated checks contained 2.8 tubers/ft^2 weighing 2.2 pounds.

growing in carrot. Each volunteer potato plant produced about five daughter tubers by approximately four weeks, exemplifying the need to deploying management tactics early in the season.

Additional factors come into play when deciding when to remove volunteer potato. Not all potatoes emerge simultaneously and if growers remove them too early, another weeding may be necessary to remove later emerging plants. Removing plants too early also increases the chance of leaving the maternal tuber in the ground, which could give rise to new shoots.

Suppression of Volunteer Potato with Nortron

Nortron, active ingredient ethofumesate, was labeled for use in carrot grown in Oregon and Washington in late 2006. Nortron is also registered for use in sugarbeet and grass seed production for control of annual grass and broadleaf weeds. Nortron may be applied preemergence (PRE) at or soon after carrot planting and may also be applied early postemergence (POST) when carrot has two to four leaves.

Our research demonstrated that Nortron applied PRE at 1.5 lb ai/a or more can delay emergence and growth of volunteer potato and often results in deformed and stunted growth of volunteer potato plants. Nortron applied POST at 2 lb ai/a causes crinkled, epinastic growth of potato leaves and shoots. Nortron applied PRE followed by POST or two sequential POST applications has consistently suppressed volunteer potato growth and reduced potato tuber mass (Table 1). Nortron treated potato may still produce a fair amount of small daughter tubers. The maximum allowed Nortron rate for a single application in carrot is 2 lb ai/a, and rates should be adjusted for soil type and for plants under stress as injury to carrot is possible. Nortron also controls a number of annual grass and broadleaf weed species.

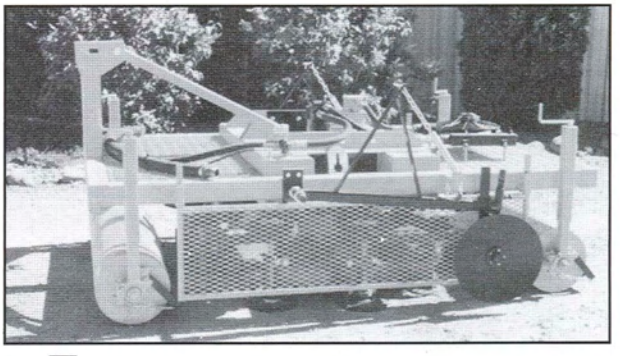
Suppression of Volunteer Potato with Caparol

Caparol, active ingredient prometryn, also suppresses volunteer potato selectively in carrot. Caparol is registered for use in cotton, celery, pigeon peas and carrot grown for seed. Caparol registration in carrot is expected in 2008. In studies conducted by researchers at Washington State University and USDA-ARS near Prosser, Wash., single or sequential POST applications of Caparol at 2 lb ai/a, were safe on carrot and frequently controlled volunteer potato similar

(continued on page 14)

American Wholesale Co.
USED WALK-IN-COOLER-FREEZER BOXES
REFRIGERATION SYSTEMS - EQUIPMENT
Large Inventory, All Sizes
■ Buy ■ Sell - Nationwide ■
Wholesale Prices ■ www.awrco.com
Phone: (216)426-8882 ■ Fax: (216)426-8883

CROWN IT.



The **KPR Crowner** can be used on all varieties of carrots where crown or shoulder removal is desired. Unique, high-speed cutting discs allow for virtually no shattering of carrots. For successful crowning... crown it with KPR.

KPR INCORPORATED
P.O. Box 608 • 375 Avenue D West • Wendell, ID 83355-0608
Telephone (208) 536-6601 • Fax (208) 536-6695
www.kprincorp.com

NOW hydraulically powered with its own pump and reservoir.

Hand weeding a carrot field.

to the hand-weeded treatment. Caparol applied POST initially caused chlorosis to potato leaf margins followed by necrotic lesions and stunted growth within one week of application. In 2002, the most effective treatments were the sequential applications of Caparol and Caparol plus an adjuvant (Table 2). All Caparol treatments reduced volunteer potato tuber production. Caparol reduced the size (mass) of daughter tubers to a greater extent than the number of tubers.

Carrot tolerance to Caparol has been similar to that of Lorox and only minor and transient injury symptoms have been observed. Carrot yields were similar to hand-weeded controls when Caparol was applied POST twice at 1 lb ai/a or POST once at 2 lb ai/a plus adjuvant. Follow up studies conducted by Syngenta in 2006 demonstrated that an early POST application of Caparol at 1 lb ai/a plus crop oil concentrate followed by another POST application at 1 lb ai/a with crop oil concentrate or a single application of Caparol at 2 lb ai/a was safe on carrots. Caparol also controls numerous annual broadleaf weeds.

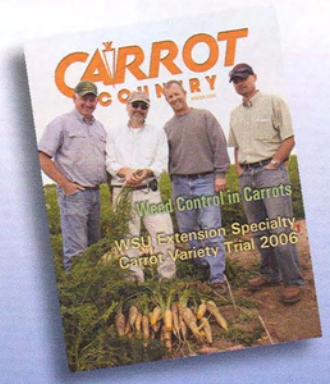
Both Nortron and Caparol offer benefits to integrated weed management systems in carrot, particularly where volunteer potato is problematic and may help reduce or eliminate hand-weeding costs. Prowl H20, active ingredient pendimethalin, was also recently labeled for weed control in carrot, but does not have activity on volunteer potato.

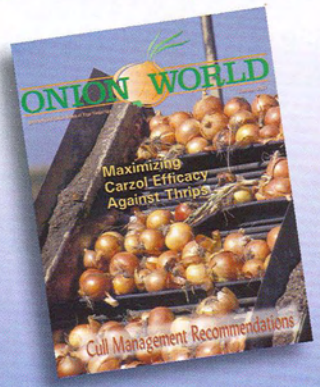
Integrated Management of Volunteer Potato in Carrot Rotations

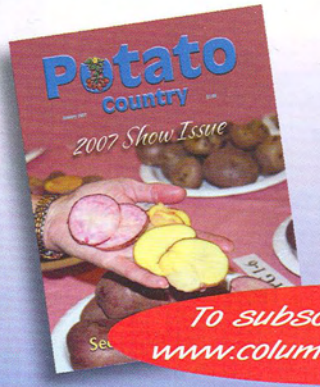
- Where allowed, treat potato crop with maleic hydrazide prior to harvest to reduce sprouting of tubers left in the field.
- Limit the tubers left in the field after potato harvest through use of proper chain size, proper blade depth, digging speed, field conditions, etc.

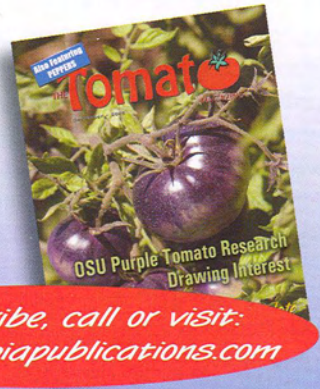
At Columbia Publishing

Our focus is on...









To subscribe, call or visit:
www.columbiapublications.com

Carrot Country
1 Year (4 issues)
U.S. $10.00
Canada $15.00
Foreign $20.00
www.carrotcountry.com

Onion World
1 Year (8 issues)
U.S. $16.00
Canada $27.00
Foreign $45.00
www.onionworld.net

Potato Country
1 Year (9 issues)
U.S. $18.00
Canada $30.00
Foreign $45.00
www.potatocountry.com

Tomato Magazine
1 Year (6 issues)
U.S. $12.00
Canada $18.00
Foreign $29.00
www.tomatomagazine.com

509-248-2452 or 800-900-2452

Editorial EXT. 105 dbrent@columbiapublications.com | Advertising EXT. 106 jmike@columbiapublications.com | Circulation EXT. 110 ckieffer@columbiapublications.com

413-B N. 20th Avenue, Yakima, WA 98902

- Do not perform tillage operations that bury tubers deeper where they are more likely to escape killing temperatures.
- Utilize rotation crops that are competitive with volunteer potato and which include numerous cultivation and effective herbicide options (i.e. field corn).
- Fumigate with metham or 1,3-dichloropropene if nematode and disease problems warrant.
- Delay planting of carrot in fields where volunteer potato is expected to be a problem and control early emerging potatoes with cultivation or herbicides.
- Utilize new herbicide options of Nortron and/or Caparol (not yet labeled) to suppress volunteer potato in the carrot crop.
- Hand-weed and/or cultivate volunteer potato escapes to prevent daughter tuber production.

Table 2. Volunteer potato control and number and size (mass) of tubers at carrot harvest after postemergence applications of Caparol in 2003 near Prosser, WA.

Treatment	Timing[a,b]	Rate	Potato control[c]	Number of tubers	Mass of tubers
		lb ai/a	%	-- % of nontreated check --	
Caparol	MPOST + LPOST	1+ 1	69 c	34 a	8 a
Caparol	MPOST	2	86 b	14 a	3 a
Caparol + NIS[d]	MPOST	2	90 ab	26 a	6 a
Handweeded			100 a	5 b	6 a

[a] Abbreviations: MPOST, mid-postemergence; LPOST, late-postemergence.
[b] MPOST applied when carrots had 4 leaves and LPOST when carrots had 6 leaves
[c] Volunteer potato control was visually estimated 1 wk after LPOST applications.
[d] X-77® nonionic surfactant applied at 0.5% v/v.
[e] Nontreated checks contained 1.2 tubers/ft^2 weighing 2.5 pounds.

Literature Cited

Boydston, R. A. and M.M. Williams II. Effect of fumigation on volunteer potato (Solanum tuberosum) tuber viability. Weed Technol. 17:352-357. 2003.

Thornton, R. E., g. d. Newberry, D. Joy, G. Hyde, and T. Schotzko. 2001. Potato volunteer project. Pages 189-239 in Progress Reports 2001. Moses Lake, WA: Washington State Potato Commission.

Van Heemst, H.D.J. 1985. The influence of weed competition on crop yield. Agric. Syst. 18:81-93.

Williams, M. M. II and R. A. Boydston. Alternatives to handweeding volunteer potato (Solanum tuberosum) in carrot (Daucus carota). Weed Technol. 19:1050-1055. 2005.

Williams, M. M. II and R. A. Boydston. Volunteer potato (Solanum tuberosum L.) interference in carrot. Weed Science 54:94-99. 2006.