

# Control of volunteer potatoes in vegetable crops

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**Volunteer potatoes are a serious weed of field vegetables, especially on arable farms with potatoes in the rotation, as they can have an adverse effect on crop yield, quality and storage. In the light of many herbicides used for their suppression being lost, this factsheet summarises the causes of the problem and draws upon both commercial experience and HDC funded research to offer strategies for both general and crop specific control.**

## Introduction

Volunteer potatoes are an increasingly challenging weed problem in many field scale vegetable crops, as they compete with the crop, causing yield reduction, uneven size grades and on occasions complete crop failure. Other impacts can be on harvesting (slower work rate and higher costs) and storage. Potato volunteers can be especially troublesome in slow growing vegetable crops such as leeks and onions, as the volunteers

emerge early in the year and are very competitive. In some situations, appreciable extra costs can be incurred by using herbicide or hand weeding control measures.

Volunteer potatoes act like any other weed, competing for the resources of light, nutrients and water, thereby reducing crop yields. They can also be a source for potato blight and act as a reservoir or host for other potato pest and disease problems, especially potato cyst nematode (PCN). In addition, potato berries can

contaminate vining peas for processing. As a result of the EU review of pesticides, some commonly used active ingredients which suppress potato foliage or prevent potato berry formation will not be available after 31st December 2007. In particular atrazine, cyanazine, fomesafen, metoxuron, sodium monochloroacetate and terbutryn will no longer be available. Both pre-emergence and post-emergence alternatives are currently being sought in HDC herbicide screening trials.



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## Sources of volunteer potatoes

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Volunteer potatoes may arise from:

- Tubers or tuber pieces (often called ‘groundkeepers’) remaining in the field after harvest – the main source of volunteers.
- True potato seed (TPS) derived from the potato fruit, often referred to as ‘apples’ or ‘berries’. Once shed TPS can remain viable in the ground for up to 9 years.

It is not clear how important TPS is as a primary source of volunteers, as plants that initially emerge from TPS are small, with little in the way of food reserves. This makes them much easier to kill than plants emerging from tubers or tuber pieces, which are vigorous and have large reserves.

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## Reasons for increase in volunteer potatoes in vegetable crops

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Volunteer potatoes are becoming an increasing problem for vegetable growers because of:

- Increased intensity of production, with a trend towards shorter rotations between potato crops.
- Greater use of rented land both by potato growers and vegetable growers.
- A succession of mild winters resulting in less periods of penetrating frost to destroy tubers.
- Continuing legacy from the many unharvested potato crops during the wet autumn/winter of 2000–01.

- Inappropriate cultivation practices following potato crops which lead to tubers being buried in the topsoil at depths at which they are protected from harsh winter temperatures.
- Tuber loss during harvesting not improving over the years.
- Experience strongly suggesting that much higher volunteer populations emerge as a problem on lighter soils (widely used for vegetable production), rather than heavier soils.

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## Control Strategy

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The most effective control strategy is to use an integrated approach which includes informed field selection, appropriate cultural and husbandry techniques and careful potato harvesting.

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## Rotational considerations

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- When selecting potential fields for vegetable production, especially rented fields, it is advisable to examine them for evidence of volunteers in the year(s) immediately prior to growing vegetables. In this way, fields with high volunteer populations can be avoided and action taken (eg glyphosate application pre-harvest or in stubbles or set-aside) in fields where volunteer populations are lower. Glyphosate can be expected to give useful reductions in numbers of volunteers, but not complete control. Remember glyphosate cannot kill volunteers which have not emerged at the time of application!
- Where possible, follow potatoes with a series of vigorous, high density crops.
- Grass for silage is ideal in terms of quickly exhausting the reserves

of volunteer tubers. Where possible, this should be included in the rotation.

- Use of competitive crops in the rotation such as winter barley and oilseed rape will restrict volunteer numbers but these crops are normally drilled too early to follow potatoes. Winter wheat and spring rape are the next most competitive, which can significantly suppress the growth of volunteers in the year following potatoes. However,

oilseed rape in a potato rotation can encourage slugs, except on the lightest of soils.

- The use of set-aside in the rotation provides an opportunity for volunteer control using glyphosate. However, set-aside does have a tendency to encourage wireworms.
- Watch out for volunteers in shaded crops like winter oilseed rape and maize.



2 Several aspects of rotation need to be considered to avoid volunteer potatoes in subsequent crops



- Outdoor pigs will quickly clear up a volunteer problem if they are in the field for long enough at a sufficient stocking density.

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## In the potato crop

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- The obvious first step in reducing volunteer potatoes is to minimise the number of unharvested potatoes by using the narrowest web possible on the harvester.
- Optimise tuber size distribution for the intended market so as to minimise undersizes.
- Potato crops correctly treated with maleic hydrazide (MH) tend to produce fewer volunteers. The use of MH should be seen as part of a programme to control volunteers.

***After potato harvesting there may be as many tubers left in the ground as were originally planted!***

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## Cultivations

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- Defra funded research showed excellent volunteer control is often achieved by not ploughing for **two winters** after a potato crop. Where the rotation includes a sequence of potatoes/wheat/spring break crop, it may well be possible to do this.
- Keep returned tubers and ‘berries’ near the soil surface. Shallow cultivation with tines is more likely to leave tubers near the soil surface, where they can be killed by exposure to frost or eaten by vermin (probably more effective than frost in recent years).
- Let cold winter temperatures freeze potatoes remaining in the field after harvest. Tubers need prolonged exposure (up to 50 hours) at -2°C to be reliably killed.
- However, this may be ineffective in a mild winter and even a moderately hard winter is unlikely to eradicate the entire volunteer population.

***After potato crop harvest, over ten times as many tubers can survive***

***following ploughing compared with shallower cultivations!***

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## Strategy for vegetable crops – considerations

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- Any fields likely to be used for vegetables in the future should be monitored for the presence of volunteers. Avoid fields with high volunteer populations.
- Use glyphosate in fallows, set-aside, stubbles and pre-harvest in combinable crops at a rate sufficient to kill all emerged volunteers.
- Cultivation – where possible establish the vegetable crop without ploughing first.
- No herbicides used to control volunteer potatoes will provide 100% kill. Therefore a combination of herbicides and/or cultivations may be necessary for effective control.
- Because food reserves in the tuber are too large, residual herbicides are rarely effective, but they may be effective against volunteers emerging from true potato seed.
- A long period of potato emergence may require repeated applications of herbicides.

- A vigorously growing vegetable crop can hinder spray coverage of volunteer potato foliage and reduce control.
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## Hoeing

There may be a need to turn to mechanical weeding as a back-up (or perhaps even replacement) for herbicides. Brush hoes, finger hoes, precision steerage hoes and gas burners can be effective. The choice depends on factors such as soil type, moisture levels and crop growth stage, with some high density bed crops being difficult or impossible to hoe. However remember that most mechanical systems are only practical soon after volunteer emergence. By the time potatoes are 120 mm high, it is often too late.

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## Weed wiping

Recent developments in weed wiping machinery offer a new chance of employing this approach in commercial practice. Properly regulated flows and machine design features have largely eliminated the danger of dripping onto non-target plants. Therefore, in some low growing crops, a wiper application impregnated with glyphosate is a viable alternative control measure, making use of the differential in height between crop and weed. This technique has been used successfully in carrots. However too many volunteer potatoes, particularly



3 Avoid fields with high volunteer potato populations

those from true seed, often remain small and below the crop canopy, for treatment to be completely successful.

- Weeds must be at least 150 mm taller than the crop canopy to avoid the risk of damage to the growing crop.

- Treat weeds as they become tall enough to be wiped – more than once if necessary. Successive treatments should be carried out in the opposite direction to the previous one, particularly where volunteer potatoes are dense.

***Many of these treatments only reduce the problem temporarily and need to be considered as part of a programme of control.***



4 Precision weeding using vision-guided hoe



5 Weed wipers offer useful control where there is a height differential between the crop and the volunteer potatoes

## Checklist of control measures in vegetable crops

### For all vegetables

- With the reduction in number of herbicides available there is a need for more emphasis on cultural control.
- Use specific broad-leaved herbicides that reduce volunteer haulm growth in other crops in the rotation.
- Consider using mechanical hoeing, including precision techniques now available eg Robocrop Precision Guided Hoe System, but note that the currently available systems will not remove potatoes within the crop row.
- Selective applications of glyphosate with a weed wiper, when there is adequate height differential between crop and weed, can be effective but there are many situations when the height difference is not sufficient

and/or the contact between the wiper and the weed not adequate to give good herbicide transfer and adequate weed control.

- Hand pulling of potato volunteers is always an option but may not be practical and can be too expensive.

## Herbicide strategy for specific vegetable crops

### Carrots

Currently the only available strategy is weed wiping. Volunteer potatoes provide a satisfactory differential between crop and weed for several weeks from shortly after drilling to the



6 Timing of herbicides via a weed wiper is crucial to successful control of potato volunteers



3 – 4 true leaf stage of growth. This gives a window of opportunity of a few weeks to tackle the emerged volunteers before they are enveloped by the crop.

Alternative herbicide treatments are actively being sought in HDC trials but to date no replacement has been found.

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#### **Bulb onions**

In HDC trials the safest (yet most effective) programme proved to be two applications of ioxynil at 0.7 then 1.4 l/ha, followed by fluroxypyr. Effective volunteer potato control was also achieved using a single application of clopyralid in programmes with ioxynil or ioxynil and fluroxypyr (Starane 2). Linuron can also suppress haulm growth.

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#### **Red beet**

Clopyralid significantly suppresses potato foliage and reduces numbers and viability of daughter tubers, especially when tank-mixed with other beet herbicides ethofumesate, phenmedipham and triflurosulfuron-methyl (Debut). It is best applied when the most advanced volunteers are 100 – 120 mm tall and repeated about ten days later.

Salt (sodium chloride), in a concentrated solution, can be used in warm, humid conditions on beet with eight leaves or more. It will only burn off the volunteer foliage and a split application should be used. This gives about 70% control of potato haulm, and thus reduces tuber production.

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#### **Vining peas**

Crops contaminated with potato berries will be automatically rejected,

as the poisonous berries, which when immature are the same size and colour as peas, cannot be effectively separated at the factory. There are not expected to be any herbicide options available for 2008, though HDC and PGRO work has assessed alternatives.

Emphasis will have to be on using the best cultural practices after potato harvest and before drilling so that vining peas are grown in fields posing the lowest possible threat of contamination. The BPC potato variety seed database should be consulted as it comments on the likelihood of varieties to produce berries.

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#### **Leeks**

A similar strategy to that for bulb onions should be followed.

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#### **Sweetcorn**

Fluroxypyr can be used as one application at a maximum rate of 1 l/ha up to 6 true leaves, to suppress potato haulm. Mesotrione (Callisto) can give control of volunteers up to 125 mm tall.



7 Volunteer potato berries are particularly troublesome in vining peas causing crop rejection

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## **Agrochemicals**

Always read the product labels before applying pesticides. Use pesticides safely.

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#### **Products:**

Mention of products does not constitute an endorsement, nor does failure to mention products imply criticism

Off-label use is at the grower's own risk. The conditions relating to off-label use are statutory and must be complied with. The conditions of use

are listed on the SOLA document, a copy of which must be obtained before the product is used.

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#### **Recommendations:**

Information in this Factsheet is intended to provide guidance, but cannot constitute a recommendation. You are strongly advised to contact your agronomist when more detailed information is needed.

Regular changes occur in the approval status of pesticides arising from changes in the pesticide

legislation or for other reasons. For the most up to date information, check with a professional supplier or with the:

#### **Pesticides Safety Directorate (PSD)**

Tel. (01904) 455775

information@psd.defra.gsi.gov.uk

[www.pesticides.gov.uk](http://www.pesticides.gov.uk)

**Table 1 Herbicide options for controlling volunteer potatoes in vegetable crops – Anticipated approvals as at 1st January 2008**

Crop following potatoes	Active ingredient	Product(s)	Rate & timing*	Control of volunteers/notes
Asparagus	clopyralid	Cliophar (SOLA 2622/03) Dow Shield (SOLA 0470/05) Lontrel (SOLA 2445/06)	max. 1 l/ha post final harvest and pre-em of the fern	SOLAs are for the control of thistles.
Cabbage, Kale, Brocoli, Calabrese, Cauliflower, Brussels sprouts, Collard	clopyralid	Various products	max. 1 l/ha	Haulm vigour reduction; apply when 100 mm high and repeat. Affected tubers produce distorted sprouts of reduced vigour.
Swede Turnip	clopyralid	Various products	max. 1 l/ha	Haulm vigour reduction; reduction in number and size of tubers. Affected tubers produce distorted sprouts of reduced vigour.
Carrots Parsnips	linuron glyphosate	Various products Various products	rate varies	Some check of haulm growth. Weed wiping of potato haulm.
Beetroot	clopyralid ethofumesate phenmedipham triflusalifuron-methyl sodium chloride solution	Various products Various products Various products Debut (SOLA 3629/02) Salt	max. 1 l/ha rate varies rate varies 30 g/ha rate varies	Suppresses foliage and reduces numbers and viability of daughter tubers. Improves activity of clopyralid. With clopyralid/ethofumesate to improve activity. Improves speed of kill when used with clopyralid. In warm, humid weather to desiccate potato haulm.
Bulb onions	clopyralid fluroxpyr ioxynil linuron	Various products Starane 2 (SOLA 0986/04) Totril Various products (SOLAs)	max. 1 l/ha 1 l/ha 0.7 – 2.8 l/ha rate varies	Haulm vigour reduction; reduction in number and size of tubers. Affected tubers produce distorted sprouts of reduced vigour. Control of haulm growth. Scorches haulm. Some check of haulm growth
Salad onions	clopyralid ioxynil	Various products Totril	max. 1 l/ha 0.7 – 2.8 l/ha	Haulm vigour reduction; reduction in number and size of tubers. Affected tubers produce distorted sprouts of reduced vigour. Scorches haulm.
Leeks	clopyralid linuron fluroxpyr ioxynil	Dow Shield (SOLA 2638/06) Various products (SOLAs) Starane 2 (SOLA 0987/04) Totril	max. 1 l/ha rate varies 0.5 l/ha 0.7 – 2.8 l/ha	Haulm vigour reduction; reduction in number and size of tubers. Affected tubers produce distorted sprouts of reduced vigour. Some check of haulm growth. Control of haulm growth. Scorches haulm

Table continued...

Crop following potatoes	Active ingredient	Product(s)	Rate & timing*	Control of volunteers/notes
Sweetcorn	clopyralid fluroxpyr mesotrione	Various products Starane 2 (SLOA 1696/05) Callisto (SOLA 1893/05)	max. 1 l/ha 1 l/ha max. 1.5 l/ha	Haulm vigour reduction; reduction in number and size of tubers. Affected tubers produce distorted sprouts of reduced vigour. Control of haulm growth, checks production of tubers, reduces vigour and re-growth Activity against volunteer potatoes
Herbs**	clopyralid	Cliophar (SOLA 2622/03) Dow Shield (SOLA 0473/05) Lontrel (SOLA 2442/06)	max. 1 l/ha	<b>NOT SAFE</b> on all herb species

Note: only herbicides expected to be available from 1 January 2008 have been included.

\* Refer to product label or SOLA for full details of application rate, harvest interval, etc.

\*\* Herbs: angelica, balm, bay, burnet (salad), chamomile, chives, hyssop, land cress, lovage, marjoram, mint, nettle, oregano, rosemary, rue, sage, sorrel, tarragon, thyme, lemon verbena, woodruff, basil, borage, caraway, chervil, clary, coriander, dill, fennel, fenugreek, feverfew, parsley, rocket (salad) and savory.

**Additional information:**