Weed management in container-grown soft fruit

Figure 1a. Hairy bittercress is a typical weed found in container-grown raspberry

Figure 1b. Prevention and control is important to allow optimum spawn growth

With a very high proportion of UK soft fruit now produced in container-grown systems, the approach required to maintain weed control has changed. This factsheet provides information on the commonly occurring weed species found in container-grown soft fruit (Figure 1) and offers guidance on control strategies.

Action points

- **Prepare a clean site when establishing a new container-grown soft fruit crop**
- **Start with weed-free plant material and clean containers and substrate**
- **Develop and maintain a consistent weed control strategy, which is followed every year**
- **Assess weed threats nearby such as older infested crops and fallow ground**
- **Always apply residual or contact-acting herbicides at the optimum time and well ahead of weed flowering. Such herbicides are, typically, approved for use around substrate crops rather than over the top of them**
- **Consider using woven polypropylene in tunnel leg rows and areas inaccessible to sprayers. It offers an excellent and durable ground cover for weed suppression**
- **Grass swards offer a cheaper alternative to artificial mulches. Maintain regular mowing to avoid weed flower or seed production**
- **Avoid cluttered growing surfaces that are difficult to keep free from plant or weed debris**
- **At the end of cropping, clean out and remove all crop and substrate debris to prevent weed development in subsequent crops**

Introduction

Soilless substrates like coir and peat are nearly always weed-free when they arrive on a production site but they immediately become vulnerable to weed contamination when placed in their new crop surroundings.

Prevention is always easier than cure for weeds. Early and consistent control greatly reduces the higher labour bill that can follow should control regimes not be implemented. Weed control is most effective when clean substrate and plant material are used right from the start and background weed control is maintained.

Weed growth generally begins with a low background level of germination but, once established within a container-grown crop, weeds are much harder to kill and usually need costly hand removal.

Sources of weeds in container-grown soft fruit production

Weed species are fertile and however well a site is cleared of weeds before establishment, the nature of their dispersal usually results in rapid movement and spread back into the cropping area. Weeds can be found around field margins, adjacent crops and floors and pathways of existing crops. Seeds and root fragments can also be brought in on field/container-grown plant propagation material.

Most growers rely on the use of residual herbicides, ground cover membrane materials (Figure 2) or a combination of these with grass-sown inter-row strips to prevent weed growth around their crops.

However, residual herbicides and ground membranes will always have weak spots. Herbicides have an active life of only a few months at best and not all weed species are controlled. Membranes have gaps and holes that weeds can grow through. In addition, the crop border areas are invariably untreated. Therefore, there is ample opportunity for weed seedlings to re-establish both within and around container-grown plants.

Figure 2. Woven polypropylene is an excellent and durable ground cover for weed suppression, which is especially useful for tunnel leg rows and inaccessible areas

Weeds use three basic methods of dispersal which allow them to spread into soft fruit crops:

1. Airborne – typical examples include groundsel (Figure 3), dandelion (Figure 4), willowherb and creeping sowthistle. At the end of flowering, the seeds are dispersed to new locations by air currents.
2. Drop/flick dispersal – typical examples include hairy bittercress (Figure 5) and chickweed. Bittercress seeds are formed in seed pods and, when ripe, the pods spring open allowing seeds to either drop or be ejected some distance to a new location.
3. Root fragments – typical examples include horsetail (Figure 6), couch grass and creeping yellow cress. Fragments of root are often spread by farm machinery within the farm or they can be introduced to the site within new propagation material.

Assess the weed control strategy with weed dispersal in mind. Do not underestimate the importance of flowering or large weed roots.

Flowering always precedes seed production. Timing control to prevent flower formation greatly reduces their rate of spread.

Perennial root spread in species such as creeping yellow cress or horsetail is particularly difficult to contain. When established, their roots constantly spread below the soil surface and they can be hard to kill without harming the crop.

Figure 3. Groundsel seeds being dispersed by wind and air currents

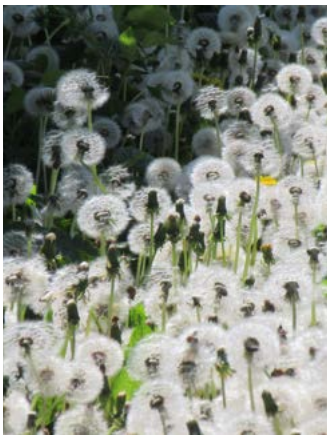

Figure 4. Dandelion seeds following petal fall and ready for wind dispersal

Figure 5. Hairy bittercress seed pods ready to ripen before pods explode

Figure 6. Established horsetail growing in a raspberry crop

Commonly occurring weeds in container-grown soft fruit

Weed growth in container-grown soft fruit crops tends to be dominated by a small number of weed species, details of which are listed below.

American willowherb *(Epilobium ciliatum)*

Dispersal, biology and control:

- Produces airborne seeds of high viability, which can establish dense colonies of seedlings
- Germinates from February to June and August to November. Autumn germinating seedlings successfully overwinter and flower from May to August
- The fluffy seeds stick to berries and can contaminate punnets
- Overwintering seedlings act as a host to aphids
- Its waxy leaves make it difficult for some contact-acting herbicides. There are no effective selective contact-acting herbicides for this weed in soft fruit crops

Groundsel *(Senecio vulgaris)*

Dispersal, biology and control:

- Produces airborne seeds of high viability, which can establish dense colonies of seedlings
- Germinates all year round though the rate of germination significantly slows by winter. Autumn germinating seedlings successfully overwinter and flower throughout the year under tunnels
- The fluffy seeds stick to berries and can contaminate punnets
- Closed flower heads on overwintering weeds support western flower thrips and aphids
- Overwintered seedlings are toughened and harder to kill with selective contact-acting herbicides. Dow Shield 400 (clopyralid) is the only effective selective contact-acting herbicide available for this weed (approved for strawberry and bush fruit only)

Common chickweed *(Stellaria media)*

Dispersal, biology and control:

- Seeds are dropped to the ground rather than blown. The weed expands rapidly from patches. A frequent form of spread is through weed root fragments arriving on site in propagated plants. It is also possible that its seeds reside within dormant strawberry runners
- Germinates from February to June and August to November. Autumn germinating seedlings successfully overwinter and flower throughout the year
- The dense canopy smothers strawberry plants
- The weed can support high numbers of overwintering aphids
- There are no effective selective contact-acting herbicides for this weed in soft fruit crops

Annual sowthistle *(Sonchus oleraceus)*

Dispersal, biology and control:

- Produces airborne seeds of high viability which can establish dense colonies of seedlings
- Germinates prolifically from March to November and flowers from June to August
- Autumn germinating seedlings develop tap roots that, if large enough, allow survival and regrowth following the use of non-translocated contact-acting herbicides in spring
- The fluffy seeds stick to berries and can contaminate punnets. Overwintering closed flower heads support western flower thrips and aphids
- There are no effective selective contact-acting herbicides for the larger seedlings in soft fruit crops

Creeping thistle *(Cirsium arvense)*

Dispersal, biology and control:

- A perennial weed which disperses through airborne seeds, although it also has the capability to spread significantly through root growth
- It flowers from June to September
- Creeping thistle is mostly a threat to longer-lived potted crops such as raspberries, blackberries and blueberries
- There are no selective contact-acting herbicides approved for these crops. A partial kill of larger thistles is possible with Dow Shield 400 (clopyralid) but this is approved for use on strawberry and some bush fruit as a directed spray only

Shepherd's-purse *(Capsella bursa-pastoris)*

Dispersal, biology and control:

- Seeds are dropped to the ground rather than blown. The weed expands from patches. It does not spread by its roots
- Germinates from March to October
- Autumn germinating seedlings develop tap roots that, if large enough, allow survival and regrowth following the use of non-translocated contact-acting herbicides in spring
- There are few selective contact-acting herbicides available for use against Shepherd's-purse

Hairy Bittercress *(Cardamine hirsuta)*

Dispersal, biology and control:

- A very invasive weed capable of rapid development and colonisation. The seeds are contained in seed pods, which, when springing open, flick or eject the seeds as far as 30cm into the surrounding compost and ground
- Germinates from March to November
- Flowers from May to September
- It overwinters successfully, but has no significant tap root
- Goltix 70 SC might kill small seedlings

Strategies to maintain a weed free site

It is not easy to control weeds after they have emerged in container-grown plants. Your strategy should aim to make it easier by preventing weed establishment.

It is best to start with a clean site. Once certain weed species become established, it is extremely difficult to eradicate them (sometimes impossible) and takes considerable time to work them out of the system.

The two key components of a good weed control strategy are:

1. to implement control measures at the correct time
2. to maintain a consistent approach throughout

Never wait until weeds emerge before applying control measures – by then it can be too late.

Follow these basic principles:

- Always prepare a clean site to establish a new crop in good time. Sites with long-established annual and perennial weed populations are much more likely to cause problems
- Any existing weeds should be correctly controlled and eradicated before planting a new crop
- Look after the youngest crops first as they will be with you longer than old crops
- Start with clean planting material and clean growing media, but be prepared to protect them from outside weed invasion
- Existing weeds within a crop create additional work but it is essential that you prevent these increasing in number. Initially, you will need to hand weed as there are few selective herbicide options
- Always remove weeds in nearby non-cropping ground such as paths, leg rows and areas under tabletops
- Never allow weeds to flower (Figure 7) or else seeds are produced that perpetuate the problem and will lead to increased weed populations
- Always remove weeds in nearby crops. Neglected soil-grown and potted crops can be a continuous source of weed-blown seeds

Figure 7. Kill weeds before they flower – not afterwards!

Timing

Timing is of great importance for weed control. Your strategy will depend on the time of year and weed types to control.

Spring

Many weed seeds germinate in spring. To prevent germination, residual herbicides must be applied by mid-March for outdoor crops and a month earlier on those crops being prepared for protection.

For several reasons, residual herbicides may only offer partial control of some weed species. Any seedlings emerging from ground treated with residual products will still need to be controlled. It is always best to kill emerging seedlings before they exceed 2cm in height to prevent even the remotest chance of them producing flowers (Figure 8). Hairy bittercress can flower on very small plants and is a particular threat (Figure 9).

These spring germinating weeds can flower, seed and produce second, maybe third, generation plants by the end of the year (Figure 10). It is, therefore, important.to break this sequence right at the start of the season. Clopyralid, diquat and carfentrazone-ethyl have useful contact activity in spring.

Figure 8. Kill emerging seedlings early before they have had a chance to flower

Figure 9. Flowering hairy bittercress is a particular threat

Figure 10. Chickweed can germinate and flower throughout the year so produces several generations

Autumn

Groundsel, willowherb, chickweed, shepherd's purse, sowthistle and dandelion all germinate from spring to autumn, so offer challenges to control later in the year. The last four are particularly difficult as they grow strong taproots.

During the summer harvest season, opportunities to apply herbicides are limited, so it is important to implement comprehensive control measures starting in September and October.

By November, the ground may look bare but if these seedlings have been allowed to develop a taproot of several centimetres (Figure 11), they are able to withstand subsequent applications of directed contact-acting herbicides in autumn, winter and spring.

Figure 11. Overwintered shepherd's purse in March. Its taproot will survive applications of diquat or carfentrazone-ethyl

Crop duration

A weed control management strategy will be influenced by the intended longevity of a crop.

Longer-term crops

Longer-lived crops such as bush and cane fruit need particular vigilance as they have open-topped pots, which are exposed to seed dispersion for longer. Regular attention to weed control is essential from the potting day onwards. Some blueberry growers choose to use wood chippings as a pot mulch which helps to prevent weed establishment (Figure 12).

Deep-rooted perennials such as creeping thistle, docks and bindweed are particular threats (Figures 13, 14 and 15). Should such species be allowed to establish, it may be necessary to dispose of whole pots and the crop within, to prevent continual weed spread.

Figure 12. Wood chippings are sometimes used as a mulch for container-grown blueberry

Figure 13. Horsetail will grow through ageing mulch materials and into pots

Figure 14. Bindweed will smother crops and drop seeds into pots

Figure 15. Docks can drop seed into pots and bags

Shorter-term crops

Shorter-lived crops such as 60-day strawberries should be much simpler to keep clean, especially in single-use bags. Replanting used bags with weed-carrying plant material still presents a serious threat, even if background weed control has worked successfully.

The more common species in these systems tend to be those producing airborne seeds such as groundsel and American willowherb.

Soil-raised strawberry runners commonly contain more weed as a result of earlier contamination in the propagator's field. Chickweed is a frequent problem and, to a lesser extent, other perennials spread by root fragments.

Routine practices to follow

Figure 16 outlines some routine practices which should be followed consistently to maintain good weed control.

Never let a weed flower or even produce an unopened flower bud

Maintain close-cut grass before weed flower buds appear

Use a strimmer before weed flower buds appear to prevent seeds from developing and spreading the weed further

Clean out an old crop thoroughly and remove all crop and substrate debris or organic matter, which can harbour weed seedlings

Avoid cluttered surfaces, which are difficult to keep free from debris

Even the smallest amount of debris plus constant irrigation moisture is sufficient for weed germination and growth

Figure 16. Practical guidance for growers to maintain good control

Time and distance matters

A very weedy crop is likely to have a range of species at different points of development, so, no matter where you have success, there are more weeds to fill in later. Aim to prevent trouble before it occurs, as a well-established weed presence in a substrate crop is rarely eradicated, just eased.

- Use flazasulfuron (Chikara) and/or glyphosate outdoors on non-cropping areas (eg around tunnels) that will be planted later. This is helpful where weed seeds are blown in from non-cropping land
- Such practices will help to reduce the prevalence of airborne species, which become more thinly dispersed over distance

Control options

Table 1 (located in the wallet of the back cover) offers guidance on the optimum timing for controlling each of these commonly occurring weeds and the herbicides available to control them in soft fruit crops.

For each of the herbicide products available, Table 2 (located in the wallet of the back cover) provides information on the time of year for application and the crops on which they are approved.

Label guidance for herbicide application in substrate crops

Only Shark (carfentrazone-ethyl) has a clear recommendation (EAMU approval) for application directly over strawberry bags and troughs or raspberry pots for spawn control. Such use is not included on the label recommendations of other contact and residual-acting materials, and no crop safety data is provided on their labels. Applications over substrate grown crops always carry some level of risk of product leaching and deactivation when compared to soil-grown crops.

Chikara (flazasulfuron) is **not approved** in any soft fruit cropping areas. It is included in Tables 2 and 3 as it enhances weed control across a whole site and prevents spread of weed seeds into soft fruit cropping areas.

Roundup products (glyphosate) are only approved for use before planting or production, with the exception of an EAMU approval for use as an inter-row application in bush fruit. It can be used in conjunction with Chikara to provide weed control across the site as a whole.

Always seek guidance from a BASIS qualified consultant before applying herbicides to soft fruit crops.

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Further information

Other useful weed publications from AHDB

AHDB Horticulture Weed ID Guide

HDC Grower Guide: Practical weed control for nursery stock (Fully revised 2013)

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Table 1. Optimum timing and products for controlling commonly occurring weeds[1]

Weed species	Optimum time to control	Contact-acting Active ingredient (Typical product)	Residual-acting Active ingredient (Typical product)
American willowherb *Epilobium ciliatum*	Best killed with contact herbicides before flower buds appear, from February to November. Most residuals require dormant season application.	carfentrazone-ethyl (Shark)[2] glyphosate (Roundup Max)[4] metamitron (Goltix 70 SC)	flazasulfuron (Chikara)[3] s-metolachlor (Dual Gold)
Groundsel *Senecio vulgaris*	Best killed with contact herbicides before flower buds appear, from February to November. Most residuals require dormant season application.	clopyralid (Dow Shield 400) diquat + wetter (Mission) glyphosate (Roundup Max)[4] metamitron (Goltix 70 SC)	flazasulfuron (Chikara)[3] s-metolachlor (Dual Gold)
Common chickweed *Stellaria media*	Best killed with contact herbicides before flower buds appear, from February to November. Most residuals require dormant season application.	carfentrazone-ethyl (Shark)[2] diquat + wetter (Mission) glyphosate (Roundup Max)[4]	dimethenamid-p + pendimethalin (Wing-P) flazasulfuron (Chikara)[3] isoxaben (Flexidor)
Annual sowthistle *Sonchus oleraceus*	Best killed with contact herbicides before flower buds appear, from February to November. Most residuals require dormant season application.	clopyralid (Dow Shield 400) diquat + wetter (Mission) glyphosate (Roundup Max)[4] metamitron (Goltix 70 SC)	flazasulfuron (Chikara)[3] s-metolachlor (Dual Gold)
Creeping thistle *Cirsium arvense*	Best killed with contact herbicides before flower buds appear from April to September. Note that unopened flower heads, which are removed from the plant, continue to develop seeds.	clopyralid (Dow Shield 400) diquat + wetter (Mission) glyphosate (Roundup Max)[4]	flazasulfuron (Chikara)[3]
Shepherd's-purse *Capsella bursa-pastoris*	Best killed with contact herbicides before flower buds appear, from February to November. Never allow autumn germinated seedlings to develop above a height of 5cm, to avoid taproot development.	diquat + wetter (Mission) glyphosate (Roundup Max)[4] metamitron (Goltix 70 SC)	dimethenamid-p + pendimethalin (Wing-P) flazasulfuron (Chikara)[3] isoxaben (Flexidor)
Hairy Bittercress *Cardamine hirsuta*	Best killed with contact herbicides before flower buds appear, from February to November. Most residuals require dormant season application.	diquat + wetter (Mission) glyphosate (Roundup Max)[4] metamitron (Goltix 70 SC)	dimethenamid-p + pendimethalin (Wing-P) flazasulfuron (Chikara)[3] isoxaben (Flexidor)

[1] The herbicide products listed in this table offer either contact or residual control of the weed species listed. Not all of the species are included on the individual product label recommendations or manufacturer's product information, but agronomists' experience suggests they will offer some incidental control when used to control other species.

[2] Only Shark (*carfentrazone-ethyl*) has a clear recommendation (EAMU approval) for application directly over strawberry bags and troughs or cane fruit pots for spawn control. Such use is not included on the label recommendations of other contact and residual-acting materials.

[3] Chikara (*flazasulfuron*) is **not approved** in any soft fruit cropping areas, but is approved in non-cropping areas to enhance weed control across a whole site and prevent spread of weed seeds into soft fruit cropping areas.

[4] Roundup products (glyphosate) are only approved for use before planting or production, with the exception of an EAMU approval for use as an inter-row application in bush fruit.

Always seek guidance from a BASIS qualified consultant before applying herbicides to soft fruit plants.

Table 2. Products available to control commonly occurring weed species and their time of use

Active ingredient	Typical product	Approval	Time of use and other information
carfentrazone-ethyl (contact-acting)	Shark	Strawberry (EAMU 0378/17) for use over dormant crop	After harvest in the dormant season of the year of harvest. Offers control of seedlings larger than 5cm in height.
		Cane fruit (EAMU 0097/16) for use as a directed spray to the base of canes to control excess spawn	February to July Offers control of seedlings larger than 5cm in height.
		All edible crops (Full approval) for use before planting or production	Pre-planting Offers control of seedlings larger than 5cm in height.
clopyralid (contact-acting)	Dow Shield 400	Outdoor Strawberry (EAMU 1822/13) and Bush Fruit (EAMU 1629/16)	HI – Strawberry 28 days, Bush Fruit – 42 days. Do not use between the end of August and beginning of March. Use as a directed spray in bush fruit.
dimethenamid-p + pendimethalin (residual-acting)	Wing-P	Outdoor Strawberry (EAMU 0933/16)	Apply when crowns are dormant.
diquat + wetter (contact-acting)	Mission	All edible crops (Full approval) for application around base of crop and as an inter-row ground spray	None stipulated Offers control of seedlings larger than 5cm in height.
flazasulfuron (residual-acting)	Chikara	Only approved for use in non-cropping areas (Full approval) and **not in or around soft fruit crops**	Apply in the dormant period. Offers residual control of germinating perennial and annual broad-leaved and grass weeds in non-cropping areas. It can be mixed with glyphosate to offer both contact and residual control.
glyphosate (contact-acting)	Roundup brands	Outdoor Bush Fruit (EAMU 1316/14) for use as an inter-row application	28-day harvest interval.
		All edible crops (Full approval) for use before planting or production	A translocated herbicide, which is useful to control weeds and vegetation before planting. Be aware of the risk of residues collecting on polythene and other mulches that may affect subsequent plantings. Also, be aware of the risk of drift of this product when applied near to existing plantations. Never use near raspberries or blackberries, even when they are fully dormant – it is exceedingly dangerous. Any fruit harvested within 12 months of treatment must be destroyed.

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Table 2. Products available to control commonly occurring weed species and their time of use – continued

Active ingredient	Typical product	Approval	Time of use and other information
isoxaben (residual-acting)	Flexidor	Strawberry, Cane Fruit and Bush Fruit (Full approval)	Apply during the dormant season between October and April. Experience has demonstrated it is useful for controlling cruciferous weeds such as shepherd's-purse and hairy bittercress – in the case of strawberries, using the lower rate.
metamitron (contact- and residual-acting)	Goltix 70 SC	Strawberry (EAMU 2919/14)	Apply after the final harvest of the crop, between September and November. Controls a broad spectrum of small seedlings.
s-metolachlor (residual-acting)	Dual Gold	Outdoor Strawberry (EAMU 2573/13)	Apply between 1 March and 31 May. HI – Strawberry 30 days.

Always seek guidance from a BASIS qualified consultant before applying herbicides to soft fruit plants.