



Horticultural
Development
Company

Grower summary

SF 91

Strawberry: Evaluation of
herbicides for use in bed
systems

Annual Report 2009

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Before using all pesticides check the approval status and conditions of use.

Read the label before use: use pesticides safely.

Further information

If you would like a copy of the full report, please email the HDC office (hdc@hdc.org.uk), quoting your HDC number, alternatively contact the HDC at the address below.

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Headline

A range of herbicide products have been assessed for use in strawberry bed systems and the most successful have been identified.

Background and expected deliverables

The majority of strawberries produced in the UK are grown in plastic-mulched raised beds. The alleyways between beds can be difficult to keep weed-free, because of the lack of crop competition. Where the alleyway is treated rather than the crop, there is the potential for using less selective herbicides that would not be safe when used over the crop. This project aims to investigate the safety and efficacy of a range of herbicides for total weed control in the alleyway.

The increasingly common practices of both bed replanting and thinning of high density plantings results in gaps in the plastic-mulched beds and consequent weed control problems. The problems have been exacerbated by the loss of soil sterilants. The use of chemical weed control over plastic-mulched beds has the potential for significant cost saving compared with hand-weeding. This project investigates the safety of existing approved strawberry herbicides and novel products when used over beds and will check for residues in the fruit.

The recent loss of the contact herbicide paraquat from the UK market has reduced the options available for runner and weed control between strawberry beds. The introduction of the contact herbicide Shark (carfentrazone-ethyl) offers another alternative for contact weed and runner control. This project evaluates the efficacy of Shark for runner and weed control in strawberry bed alleyways compared with industry standards.

Summary of the project and main conclusions

A range of herbicides (Table 1) were applied on 2 May 2008 to the alleyways between plastic-mulched strawberry beds that were not currently planted, but had previously been used for strawberries.

Table 1. Residual herbicide treatments applied to strawberry alleyways

No.	Product	Active ingredient	Product rate	Approval status (strawberries)
1.	Untreated			
2.	Stomp 400SC + Flexidor 125	pendimethalin (400 g/L) + isoxaben (125 g/L)	3.3 L/ha + 2.0 L/ha	Label
3.	Ally SX	metasulfuron methyl (20% w/w)	0.03 kg/ha	Not approved
4.	Artist	flufenacet (24 % w/w)+ metribuzin (17.5 % w/w)	2.5 kg/ha	Not approved
5.	Calaris	terbuthylazine (330 g/L) + mesotrione (70 g/L)	1.5 L/ha	Not approved

6.	Chikara	flazasufuron (25% w/w)	0.2 kg/ha	Not approved
7.	Goal 2E	oxyfluorfen (2 g/L)	2.0 L/ha	Not approved
8.	Ronstar Liquid	oxadiazon (250 g/L)	4.0 L/ha	Not approved
9.	Sencorex WG	metribuzin (70% w/w)	1.0 kg/ha	Not approved
10.	Skirmish	terbuthylazine (420 g/L) + isoxaben (75 g/L)	1.0 L/ha	Not approved
11.	Sumimax	flumioxazin (300 g/L)	0.1 L/ha	Not approved

- No damage was noted in the crop planted subsequently into the beds.
- Chikara (flazasufuron), Sencorex WG (metribuzin) and Goal 2E (oxyfluorfen) gave the best control of the predominant weeds groundsel, American willowherb and sow-thistle.

A further range of herbicides were assessed for crop safety, chemical residues and weed control when applied to strawberries post-planting over the plastic-mulched beds. Residual herbicides (Table 2) were applied on 27 May 2009 to a waiting bed crop of cold stored Elsanta runners in full leaf but before flowering.

Table 2. Residual herbicide treatments applied to strawberry beds

No.	Product	Active ingredient	Product rate	Approval status (strawberries)
1.	Untreated			
2.	Devrinol	napropamide 450 g/L	5.0 L/ha	Label
3.	Dual Gold	s-metolachlor 960 g/L	1.6 L/ha	Not approved
4.	Goltix Flowable	metamitron 700 g/L	5.0 L/ha	Not approved pre-harvest
5.	Teridox	dimethachlor 500 g/L	3.0 L/ha	Not approved

- No phytotoxicity symptoms were seen but the vigour of Teridox (dimethachlor) -treated plants was slightly reduced and the yield was also slightly reduced.
- Goltix Flowable (metamitron) appeared to give the best weed control.

Contact herbicides (Table 3) were applied on 1 June 2008 to a waiting bed crop of cold stored Elsanta runners in full leaf but before flowering.

Table 3. Contact herbicide treatments applied to strawberry beds

No.	Product	Active ingredient	Product rate	Approval status (strawberries)
1.	Untreated			
2.	Beetup	phenmedipham 160 g/L	2.5 L/ha	Label
3.	Defy	pro sulfocarb 800 g/L	5.0 L/ha	Not approved
4.	Dow Shield	clopyralid 200 g/L	0.5 L/ha	Label but not for maidens
5.	Goltix Flowable	metamitron 700 g/L	3.0 L/ha	Not approved pre-harvest

- Defy (pro sulfocarb) caused unacceptable foliage and flower distortion and reduced yield. The plants subsequently recovered however.
- None of the other treatments caused phytotoxicity or loss of yield.

Residue samples were taken from treatments applied over the beds. The only residues found were 0.02 mg/kg metamitron from Goltix Flowable applied at the higher 5 L/ha rate. This is below the maximum residue level (MRL) for metamitron (0.1 mg/kg). Application 5 days later at 3 L/ha did not give rise to residues in the fruit. Herbicide treatments (Table 4) were applied to runner and weed growth adjacent to the beds in the autumn.

Table 4. Contact herbicide treatments applied to the alleyway between strawberry beds

No.	Product	Active ingredient	Product rate	Approval status (strawberries)
1.	Untreated			
2.	Shark	carfentrazone-ethyl 60 g/L	0.8 L/ha	Not approved
3.	Shark	carfentrazone-ethyl 60 g/L	1.6 L/ha	Not approved
4.	Harvest	glufosinate-ammonium 150 g/L	5.0 L/ha	Label
5.	Reglone	diquat	2.0 L/ha	Label

- Shark (carfentrazone-ethyl) was much less effective than Harvest (glufosinate-ammonium) at controlling runners and left some weeds uncontrolled, particularly annual meadow grass.
- Because no runner translocation damage resulted from any of the treatments, it is not possible to say if Shark is safer for autumn use on non-cut runners than Harvest.

- For control of cleavers and nettles, Shark does have some advantages over Harvest, so tank mixtures with Harvest will be considered in the experiments to be carried out in 2009.

Financial benefits

Some of the most effective treatments tested, Dual Gold (s-metolachlor), Chikara (on soil grown crops) and Shark, require SOLAs before they can be adopted by growers. Therefore there is no financial benefit from these treatments at present. A SOLA would be required to permit the use of Chikara on pathways between strawberry crops. For these crops, the benefit in improved weed control could be around 100hr/ha or £600/ha. Chikara is relatively expensive at £300 / ha compared with a standard treatment such as Stomp 400SC 3.3 L/ha + Flexidor 2.0 L/ha (£130 / ha) but the treated pathway area is typically 50% of the field area. Sencorex WG was slightly less effective than Chikara but much cheaper at around £40/ha for 1kg/ha.

For over-bed treatments, some growers already use Dow Shield (clopyralid) or approved phenmedipham products similar to Beetup. It is reassuring that so far, no residues have been found in the fruit following these treatments. Goltix (metamitron) shows some potential for use as a bed treatment. At present the specific off-label approval (SOLA) only covers post-harvest use, but with the impending withdrawal of Ramrod (propachlor), Goltix could provide a partial replacement for groundsel control in particular.

It is estimated that hand weeding costs could be up to £1,200/ha per weeding session (i.e. 3p per plant/hole @ 40,000 plants /ha). Typically a crop may require one further weeding session at a quicker rate of £600/ha (i.e. 1.5p per plant/hole) per year. The total cost could amount to £1,800/ha or 300 hr/ha @ £6 per hr including overheads.

Action points for growers

- When available, Dual Gold appears safe for use over strawberry beds and, subject to SOLA application could provide useful residual control of a range of weeds.
- Goltix was safe applied over strawberry beds. It is currently approved for use post-harvest and could provide a useful alternative to Ramrod for residual control of groundsel. A low level of residue was detected in the fruit when tested at the full rate pre-harvest – this use is not currently approved.
- Currently approved herbicides Dow Shield and Devrinol (napropamide) did not give rise to residues when applied post-planting, pre-flowering over the plastic-mulched strawberry beds. Similarly Beetup did not give rise to residues. Beetup is

not approved on strawberries but similar formulations of phenmedipham are approved.

- Chikara was the most effective total herbicide for weed control between strawberry beds. It is approved for use on land not intended to bear vegetation. For strawberry crops a SOLA would be required to allow use between plastic-mulched beds.
- Shark was not as effective as Harvest for the control of strawberry runners between beds, but it was more effective than Reglone (diquat). No damage was seen on the mother plants in early spring even though the runners were not cut when sprayed in the autumn.