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# Weed control in rhubarb

This factsheet collates recent research and current knowledge to provide growers with practical information on weed control in rhubarb plantations. Weed control in rhubarb and other perennial crops is becoming increasingly difficult with the current limited range of herbicide approvals (Figure 1). As a result of AHDB Horticulture-funded trials some new approaches have been developed, and new Extensions of Authorisation for Minor Use (EAMUs) for Sencorex Flow and Callisto have been obtained.



Figure 1. Weed control in rhubarb is becoming increasingly difficult

## Action points

- Choose planting sites carefully, free from perennial weeds
- Do not bring in weeds on sets
- Apply residual herbicides prior to harvest, selected according to weed spectrum
- Clean up plantations post-harvest by topping and applying contact herbicides such as inter-row diquat. Once dormant apply glyphosate
- There is a short window for application of glyphosate during full rhubarb dormancy
- Alternate or tank-mix active ingredients from different chemical groups where possible to guard against development of herbicide resistance.

## Background

Efficient and cost effective weed control is important in rhubarb, as with other crops, to prevent yield loss caused by competition for water, space and nutrients. The presence of weeds also impedes the harvest operation, leading to increased labour costs. Competition from weeds, and in particular perennial weeds, has increased in recent years with the loss of key herbicides such as dichlobenil and simazine. In addition, where weeds have developed resistance to currently approved herbicides, growers believe that their presence has led to a decrease in rhubarb crown size and yield in both forced and green pull crops.

The harvesting regime for green pull crops has changed in recent years, with two to three harvests being taken from a crop through the season to give nearly year round supply to meet retail demands. This means that opportunities to apply effective post-harvest herbicides have been lost or delayed until later in the season, by which time weeds have increased in size and become more difficult to control. Furthermore, the cost of labour is increasing and cultural controls, such as hand pulling weeds and spot treatment with knapsack sprayers is becoming prohibitively expensive when margins are tight.

Therefore, effective weed management in rhubarb is important to allow growers to maximise the yield potential of the crop by reducing competition and reducing the likelihood of resistance developing to currently approved herbicides.

## Summary of recent research

Two projects (SF 129 and SF 161) have recently been funded by AHDB Horticulture to tackle the problem of weed control and guard against the development of resistance, by screening a number of herbicides with a likelihood of approval in the crop. The majority of rhubarb herbicide programmes are currently based on pendimethalin (Stomp Aqua) and propyzamide (Kerb Flo), and the future of these approvals remains uncertain. Therefore, alternative approvals were needed.

High priorities for investigation in the projects were solutions for the control of 'problem weeds' such as Himalayan balsam (*Impatiens glandulifera* – Figure 2) and perennials such as docks (*Rumex* spp.) and thistles (*Cirsium arvense*). Although there is an EAMU approval for glyphosate in rhubarb, the short dormant season of the crop provides a limited window for treatment. The loss of dichlobenil has also created new difficulties as perennial weed infestations are now increasing.



Figure 2. Himalayan balsam has become a problem weed for some rhubarb growers

Both projects evaluated a selection of newer herbicides for crop safety and efficacy against a range of problem weeds in rhubarb plantations, compared to industry standards.

During the first project (SF 129), clomazone (Gamit 36CS) was approved for use on rhubarb (EAMU). Compared to standard programmes, it was found to provide additional control of cleavers and groundsel plus suppression of Himalayan balsam. The work also showed the product to be safe for use on rhubarb at bud break.

As part of SF 161, further approvals were gained for metribuzin (Sencorex Flow) for use on newly planted crops, and mesotrione (Callisto) for pre and post-harvest use in established plantations. Metribuzin and mesotrione applied as residual herbicides gave good control of Himalayan balsam and, overall, reduced weeds to levels below or equivalent to the current approved grower standard tank mix treatment of pendimethalin + clomazone.

## Crop safety of metribuzin and mesotrione

Crop growth will be checked if metribuzin is applied when leaf is present. Mesotrione was not tested in a post-harvest situation but it is likely to cause yellowing, scorch and to check growth if applied when leaf is present.

### Clay/medium soils

No adverse effects were seen from either product when applied at bud break on the two-year-old established crop of Stockbridge Arrow planted on a clay loam soil in Yorkshire.

### Sand/light soils

However, both herbicides gave rise to phytotoxic symptoms in three treatments on the newly planted crop of Stockbridge Arrow in Nottinghamshire. This crop was planted into a sandy loam soil, and a higher sensitivity to herbicides is often expected to occur on light soil types such as these. This indicates that extra care needs to be taken when selecting residual herbicides and rates of use on rhubarb in sand textured soils.

The greatest effects were caused by metribuzin applied as Sencorex Flow at 1.45L/ha (Figures 3 and 4). The effect of metribuzin was exhibited as chlorosis along the veins of the leaves, and symptoms first occurred on 6 May, seven weeks after the sprays were applied. This was two weeks after 30mm of irrigation had been applied (on 23 April), and the interval between symptom occurrence and the treatment application demonstrates the persistence of the product and its ability to reactivate in the presence of moisture.



Figure 3. Metribuzin induced veinal chlorosis on rhubarb leaves – 7 weeks after treatment

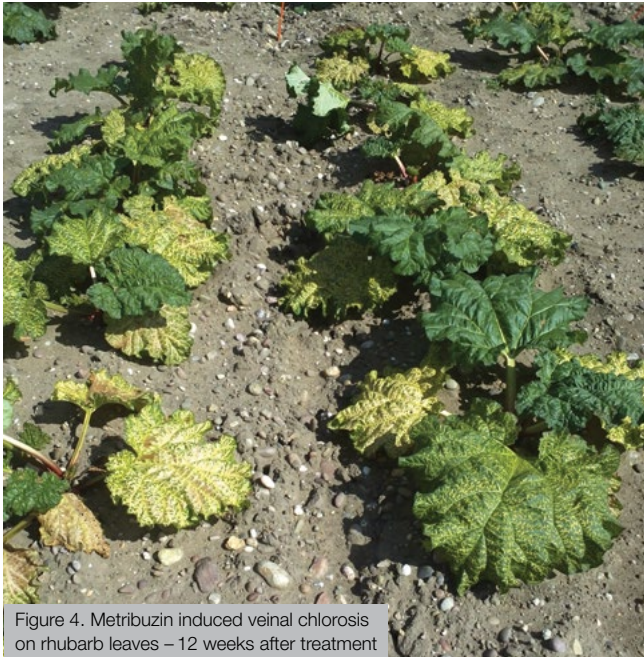


Figure 4. Metribuzin induced veinal chlorosis on rhubarb leaves – 12 weeks after treatment

The effects of metribuzin were transient and the stronger sets had recovered 12 weeks after application. By this point new leaves were no longer showing any chlorotic effects, but it should be noted that weaker plants were lost. An EAMU approval was gained for metribuzin (Sencorex Flow) use on newly planted rhubarb during the life of the project. The risk of phytotoxicity on lighter soils should be taken into account when using the product. The use of lower rates may be safer in higher risk situations, especially when planting new crops on light soil types.

Mesotrione showed a less severe phytotoxic effect with an occasional early leaf showing scorch at seven weeks after treatment (Figure 5), but the sets recovered quickly and had grown through well by 12 weeks after treatment, with no symptoms seen at this point.



Figure 5. Mesotrione induced leaf scorch on rhubarb leaves – 7 weeks after treatment

## Methods of cultural control and effective integration

In combination with the use of herbicides, cultural controls can play a part in weed control with careful selection of the planting site being a key consideration when planning a new crop. Ensure that the intended site is free of perennial weeds such as creeping thistle, bindweeds, docks and couch grass. In addition, avoid importing weeds on the propagation stock. Ensure that the nursery beds or source that the new sets are coming from are as free from weed as possible, particularly perennial weeds and Himalayan balsam.

When planting the sets, take into account the ability to hoe. Inter-row cultivate the crop once it has established.

In project SF 161, the approach of topping to remove leaf, then spraying the subsequently exposed weeds with contact herbicides, was found to be effective.

## Herbicides approved for use on rhubarb

A limited range of herbicides is currently approved for use on rhubarb. The approvals and selectivity of each are listed in Tables 1 and 2 (pages 5–7).

## Suggested herbicide approaches

Pendimethalin + clomazone remains a good standard for residual control in plantations where Himalayan balsam is not a problem as shown in Figure 6 (overleaf). Where Himalayan balsam is a problem, metribuzin now has an approval to help growers control the weed in new plantations. It should also be noted that mesotrione reduced the Himalayan balsam weed population by 50% (Figure 6 – overleaf), when applied pre-harvest at bud break.

The following herbicide approaches can be taken throughout the year in the following situations:

### Newly planted crops

- Select the planting site carefully and remove/control any perennial weeds pre-planting through appropriate use of cultivation, glyphosate or carfentrazone-ethyl (Shark) application
- At planting, where Himalayan balsam is present, apply metribuzin + clomazone; where it is not present, pendimethalin + clomazone gives adequate control of most weeds
- On sandy soils, reduce the rate of metribuzin to half the approved rate (eg 0.6L/ha of Sencorex Flow)
- During crop establishment and when the canopy is present, inter-row diquat application and cultivation can be used
- Post-senescence of the crop canopy, apply propyzamide in November/December
- Once the crop is totally dormant, apply glyphosate if possible. **Take note that the crop MUST be completely dormant with no leaf otherwise glyphosate may kill the sets.**

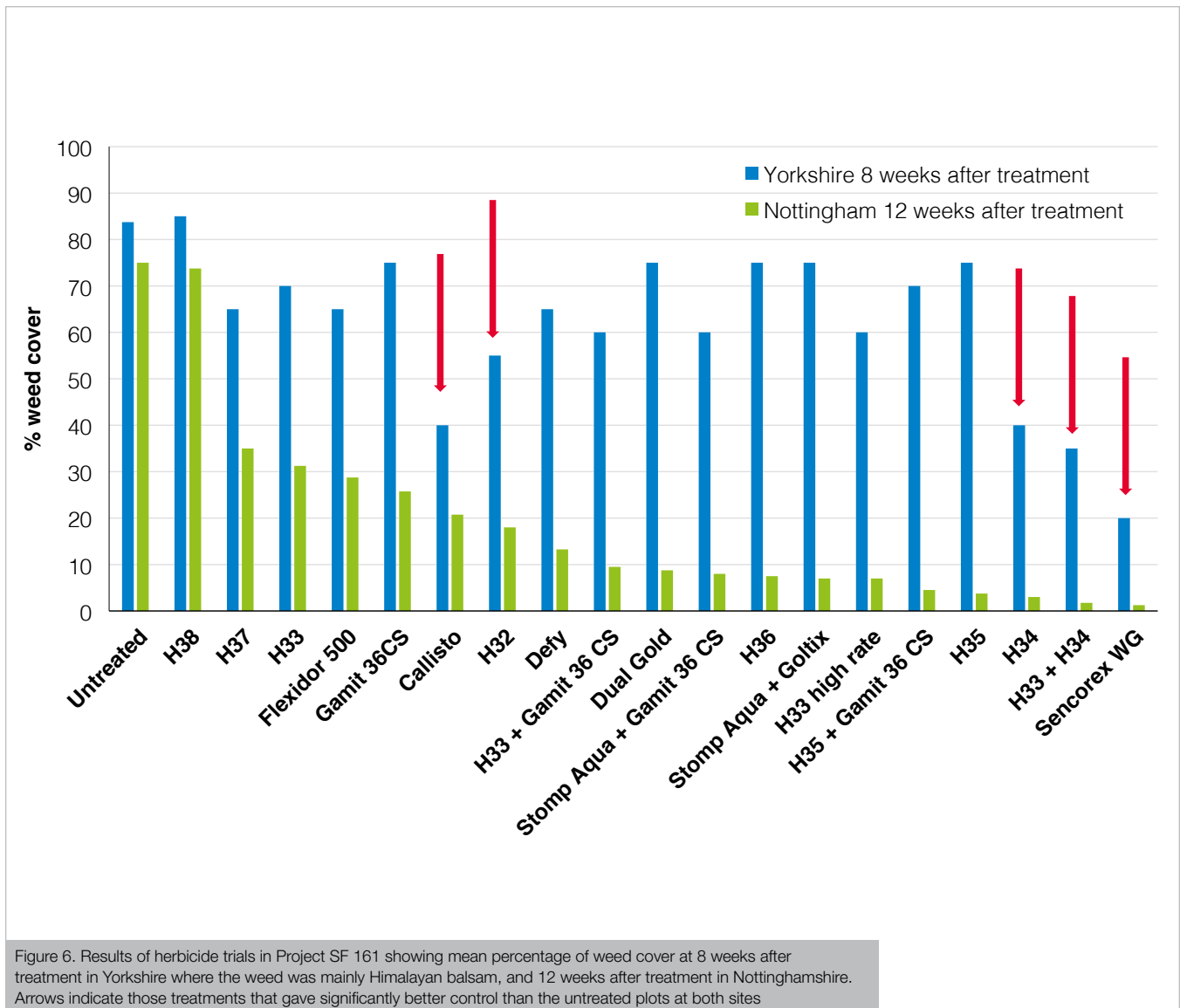


Figure 6. Results of herbicide trials in Project SF 161 showing mean percentage of weed cover at 8 weeks after treatment in Yorkshire where the weed was mainly Himalayan balsam, and 12 weeks after treatment in Nottinghamshire. Arrows indicate those treatments that gave significantly better control than the untreated plots at both sites

### Established plantations

- Before or at bud break apply pendimethalin + clomazone, mesotrione + pendimethalin or mesotrione + clomazone to provide weed control early in the season. Use the latter mix if Himalayan balsam is present
  - If a high weed population is anticipated post-harvest or Himalayan balsam returns, mesotrione can be applied again at this timing but do not exceed the maximum total dose for Callisto of 1.5L/ha if it has already been used pre-harvest
  - For situations with a history of Himalayan balsam, an alternative approach would be to apply mesotrione (eg Callisto at 0.75L/ha) + clomazone pre-harvest, and then apply mesotrione (Callisto) post-harvest at 0.75L/ha + pendimethalin. Note: residual herbicides such as pendimethalin need soil moisture to work effectively
- If mesotrione is used post-harvest it will scorch and cause yellowing in the crop, but will give a good clean up if needed

- During canopy expansion and when the canopy is present, inter-row diquat application and cultivation can be used if needed
- Post-senescence of the crop canopy, apply propyzamide in November/December
- Once the crop is totally dormant, apply glyphosate if possible. **Take note that the crop MUST be completely dormant with no leaf otherwise glyphosate may kill the sets.**

### Propagation stock or nursery beds

- Follow a programme for established crops, but endeavours to apply glyphosate over the winter where possible to ensure propagation stock is as free from weeds as possible. **Take note that glyphosate may kill the sets if the rhubarb is not completely dormant.**

**Table 1. Currently approved herbicides in rhubarb**

Active ingredient	Product	Approval type	Harvest interval	Maximum application rate	Maximum number of applications/ total dose	Other information
Carfentrazone-ethyl	Various	Full	None stated	0.33L/ha	1	Application should be made before planting or production. Outdoor and protected crops
Clomazone	Gamit 36 CS, Cleancrop Covert	EAMU	Pre-emergence or prior to bud break in the following year	0.25L/ha	Max total dose: 0.25L/ha/year	Outdoor crops only
Diquat	Various	Full	None stated	Varies with product	2L/ha	Inter-row application. Outdoor and protected crops
Glyphosate	Asteroid Roundup Biactive Roundup Powermax	EAMU	Post-harvest but prior to bud break in the following year	4L/ha 4L/ha 2kg/ha	10L/ha/year 10L/ha/year 5kg/ha/year	Outdoor crops only when using these products
Mesotrione	Callisto	EAMU	42 days	1.5L/ha	Max total dose: 1.5L/ha/year	Apply February–April (bud burst) OR June–September (post-harvest). Outdoor crops only
Metribuzin	Sencorex Flow	EAMU	At least 12 months before harvest	1.15L/ha	1	Pre-crop emergence in year of establishment
Pendimethalin	Aquarius Cinder Stomp 400 SC Stomp Aqua	EAMU	Pre-emergence of the crop in the year of harvest/after final harvest of crop	3.75L/ha 3.75L/ha 3.75L/ha 3.3L/ha	Max total dose: 3.75L/ha/year (Aquarius, Cinder, Stomp 400 SC) 3.3L/ha/year (Stomp Aqua)	Outdoor crops only
Propyzamide	Various	Full	42 days	Varies with product	1	1 October–31 December before year of harvest. Outdoor and protected crops

**Table 2. Susceptibility of weeds to approved herbicides (autumn 2016)**

Weeds	Established crops – approved herbicides			Approved for use one month before production or planting	Approved pre-crop emergence in establishment year	Post-harvest but prior to bud break in the following year	Inter-row application
	Clomazone (Garmit 36 CS) 360g/L 0.25L/ha	Mesotrione (Callisto) 100g/L 1.5L/ha	Pendimethalin (Stomp Aqua) 400g/L 3.3L/ha				
AM Grass	MS	MS	MS	R	S	S	MR
Black bindweed	MR	S	MS	S	S	S	S
Black nightshade	MS	S	MS	S	R	S	
Charlock	R	S	R	S	S	S	S
Cleavers	S	MS	MR	S	R	S	MR
Common chickweed	S	S	S	MR	S	S	S
Common fumitory	R	S	MS	S	S	S	MR
Common orache	MR	S	S	S	S	S	MR
Common poppy	R	R	S	S	S	S	S
Corn marigold		S	S			S	
Corn spurrey		S			S		
Crane's-bill	S	MR	MS		S	S	MS
Creeping thistle	R		R	S (from seed)	MR	MS	MR
Dandelion	R		R	MR	MR	MS	MR
Fat hen	MS	S	S	S	S	S	S
Field/hedge bindweeds	MR	MR	R	MR	MR	MS	MR
Field forget-me-not	MR	S	MS		S	S	S

Field pansy	R	S	MS		S	S	S	S
Fool's parsley	S	S					S	
Groundsel	S	S	R	R	MR	S	S	S
Hemp-nettle (Day nettle)	MR	S	S		S	S	S	MR
Henbit dead-nettle		MS	S		S	S	S	
Himalayan balsam	MR	MS	R		S (summer)	S	S	MR
Knot-grass	MS	S	S	S	S	S	S	MR
Mayweeds	MR	S	R	R	MR	S	S	S
Mugwort	R		R	R	MR	MR	MR	R
Pale persicaria	MS	S			S	S	S	MR
Parsley-piert			S		S		S	MR
Red dead-nettle	S	S	S	R	S	S	S	MS
Redshank	MS	S	MS	S	S	S	S	MR
Scarlet pimpernel		S	S	R			S	
Shepherd's-purse	S	S	R	MS	S	S	S	S
Small nettle	R	MR	S	S	S	S	MR	MR
Smooth-Sowthistle	MS		R	S	S	S	S	S
Speedwells	S	S	S	S	S	S	S	MS
Sun spurge					MS	S	S	
Volunteer oilseed rape	R	S	MS	MS	S	S	S	S
Wild radish (Runch)		S			S	S	S	

**S**  
Susceptible (good kill)

**MS**  
Moderately Susceptible (some kill, strong suppression of survivors)

**MR**  
Moderately resistant (poor kill but useful suppression)

**R**  
Resistant

**[blank]**  
no information available

## Further information

### AHDB Horticulture project reports

SF 129 – Evaluation of residual herbicides for rhubarb.

SF 161 – Rhubarb: Evaluation of herbicides for problem weeds – 2015.

### Other useful publications

AHDB Grower guide – Practical weed control for nursery stock.

AHDB Grower guide – AHDB Weed identification guide.

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