



WeedWiper

Technical Guide

WeedWiper is a unique non-drop weed wiper with supply-on-demand chemical feed.

It is highly versatile and suitable for use in a wide range of situations which include:

Arable:

- weed beet and bolters in sugar beet
- volunteer oilseed rape in strawberries
- fathen in salad and vegetable crops
- volunteer potatoes in carrots, parsnips, leeks, onions and other vegetables

Grassland:

- ragwort, thistles, nettles, docks and other weeds

Marshland:

- hard and soft rush (juncus)

Moorland:

- bracken, gorse, bramble, etc.
- tree re-growth e.g. silver birch

Conservation Schemes:

- ESA's, SSSI's, ELS, HLS, etc.

Waterways:

- rushes, reeds, etc. in and around water

Micron Group

Bromyard Industrial Estate
Bromyard
Herefordshire, HR7 4HS, U.K.
Tel: +44 (0)1885 482397
Fax: +44 (0)1885 483043
Email: micron@micron.co.uk

Goizper Group

Antigua 4, 20577 Antzuola
PO Box 211, 20570 Bergara,
Gipuzkoa SPAIN
T +34 943 786 000
F +34 943 766 008 / 943 787 095
E Goizper@goizper.com

Unique features of the WeedWiper include:

- **SUPPLY-ON-DEMAND.** Automatic control of fluid flow to the contact pads via the patented sensors and control system
- Contact pads manufactured from R12, a strong, tufted material that holds fluid until a target plant is swiped
- Pad material with extremely good fluid retention properties
- 150mm (6") deep pads provide a large fluid transfer area ensuring adequate dose of active ingredient (a.i.)
- All units can be folded and operated at narrower widths than their overall working width, and have simple boom end break-back return system
- Pad height can be altered on all units to suit the terrain, weed height, etc.

Fluid control to the contact pads:

- The unique controller has variable settings to control the pump output to the pads, replacing fluid only when it has been swiped onto the target plant
- Control settings of 0-9 reflect the dilution rate of the a.i.
- Sensors in the pad material constantly measure pad wetness and, via the control system, replace fluid only as it is required
- The pad cannot receive more fluid than the chosen Control setting allows hence preventing a.i. from reaching non-target plants
- Control settings can be altered 'on the move' if required

Tanks:

- Every WeedWiper is supplied with 2 tanks, one for the a.i. mixture, the other for clean water

The clean water tank is used to:

1. Wet the pads to near saturation point **PRIOR** to any work being carried out
2. Rinse the WeedWiper through **AFTER** work. Detergent and brushing may also be required to clear any plant wax and soil from the pads



NB. ALWAYS pre-mix the a.i. solution **BEFORE** putting it into the tank

Micron Group

Bromyard Industrial Estate
Bromyard
Herefordshire, HR7 4HS, U.K.
Tel: +44 (0)1885 482397
Fax: +44 (0)1885 483043
Email: micron@micron.co.uk

Goizper Group

Antigua 4, 20577 Antzuola
PO Box 211, 20570 Bergara,
Gipuzkoa SPAIN
T +34 943 786 000
F +34 943 766 008 / 943 787 095
E Goizper@goizper.com

WeedWiper Target Plants

The WeedWiper can control weeds growing at least 150mm (6") above the desired plant species. Weeds in arable, grassland, forestry, vineyards and amenity situations can be controlled.

EXAMPLES OF TARGET WEEDS INCLUDE: ragwort, thistles, nettles, docks, bracken, gorse, heather, broom, bramble, weed beet, wild chrysanthemum, fathen, wild oats, reed, bulrush, sedge, soft rush, ground elder, Japanese knotweed, giant hogweed, rosebay willow herb, silver birch re-growth, hazel, rhododendron plus volunteer arable crops e.g. potatoes, oilseed rape, etc.

WeedWiper Control of Weed Beet in Sugar Beet

A serious problem where sugar beet is grown. Control is aimed at reducing the seed return whenever possible within the rotation.

The WeedWiper can be used in the sugar beet crop and must target those weed beet which are at least 150mm (6") above the crop canopy, hence providing a clear target for the WeedWiper contact pads.

This treatment can be carried out from the time the weed beet are first visible, usually June – early July, until early August, although best results will be achieved from treatments applied to freshly bolted stems. When this is done effectively the weed beet will collapse and decompose by September. Treatments will be timed to treat each new flush of plants at they reach the critical minimum height above the crop. Two or more treatments may be required to achieve best results with each treatment being carried out in the opposite direction to the previous one.

Swiping in late July to early August is usually treating plants that are showing signs of seed formation. Where plant density is high the treatment should be carried out using a suitable control setting and swiped in both directions on the same day where possible

(NB. Ensure sufficient time has lapsed between treatments to ensure the product from the first treatment has dried). At this stage the target plants are unlikely to collapse and decay but seed viability will be greatly reduced. It is still, therefore, worth undertaking but may not have the optimum effect.



Weed beet can be most effectively controlled using the a.i. glyphosate.

The standard glyphosate 360 g/l formulation at the following dilution rates have been used: 1 in 1 part water (50%), 1 in 2 parts water (33%), 1 in 3 parts water (25%). The stronger mixes have been used during the later stages of growth of the weed beet. Glyphosate formulated products have clearance for use through weed wipers as listed in the BCPC UK Pesticide Guide. Roundup Gold at 50% dilution rate is reported to have given excellent results.

Micron Group

Bromyard Industrial Estate
Bromyard
Herefordshire, HR7 4HS, U.K.
Tel: +44 (0)1885 482397
Fax: +44 (0)1885 483043
Email: micron@micron.co.uk

Goizper Group

Antigua 4, 20577 Antzuola
PO Box 211, 20570 Bergara,
Gipuzkoa SPAIN
T +34 943 786 000
F +34 943 766 008 / 943 787 095
E Goizper@goizper.com

WeedWiper Control of Weeds in Grassland

These weeds can be found in grassland, upland, hill or marsh grazing, forestry plantations, amenity situations, heath and common land, orchards, vineyards, etc. The list includes those injurious plants listed in the Weed Act 1959 as; spear thistle, creeping or field thistle, curled and broad leaved dock and common ragwort. DEFRA can take action where there is a risk of injurious weeds spreading from neighbouring land. The list also includes Japanese knotweed, regarded as the most invasive plant in Britain, scheduled under the Wildlife and Countryside Act 1981 and the Environment Protection Act 1990. It is classified as controlled waste, spread by rhizomes and from cut stems which can regenerate. Some of these plants are poisonous:

RAGWORT: as listed in the Weed Act 1959. Poisonous to horses and cattle, occasionally sheep. Very unpalatable when green and growing. Dangerous when cut in hay or when wilting or decomposing after treatment. Contains alkaloids that accumulate in the liver and are not excreted over time. Stock **MUST** be kept out of treated areas for **AT LEAST** four weeks. Horses should be found alternative grazing for longer periods. Treated plants can be removed and burnt. Translocation of any a.i. should be complete within two weeks of treatment although complete collapse may take longer.

BRACKEN: Some one million acres affected in the UK alone. The rhizome and green areas of this fern are poisonous. Cattle, sheep, horses and pigs can be affected. Both spores and rhizomes spread bracken. Spores released in September are carcinogenic when ripe and should be avoided. The WeedWiper should be used on fully extended fronds in July and August. Herbicide will translocate to the root rhizomes and reduce the vigour or kill the frond rhizome, hence reducing the vigour of the bracken area. This could take between two and five treatments to control. Glyphosate mixtures of between one part glyphosate in five parts water to one part glyphosate in twenty parts water have been effective.

ANIMALS must be KEPT AWAY from wilting bracken and SHOULD NOT be returned until after the bracken has disintegrated.



BROOM: Alkaloid poisons are present in this plant.

RUSH: Hard and blue rush can be poisonous.

HEMLOCK, HEMLOCK WATER DROPWORT and **COWBANE** are also toxic plants.

PLEASE NOTE: As the WeedWiper is designed as a non-drip, supply on demand weed wiper then various dilution rates of glyphosate e.g. Roundup are normally the product of choice where there is a height difference between the plant to be preserved compared to the plant to be removed of at least 150mm (6").

Selective products may also be used through the WeedWiper.

Micron Group

Bromyard Industrial Estate
Bromyard
Herefordshire, HR7 4HS, U.K.
Tel: +44 (0)1885 482397
Fax: +44 (0)1885 483043
Email: micron@micron.co.uk

Goizper Group

Antigua 4, 20577 Antzuola
PO Box 211, 20570 Bergara,
Gipuzkoa SPAIN
T +34 943 786 000
F +34 943 766 008 / 943 787 095
E Goizper@goizper.com

WeedWiper Control of Weeds in Grassland (continued)

Most grassland weed plants will be controlled using glyphosate. Plants will be most sensitive to control, and present the best target, when approaching or during the early flowering stage. By the late flowering / early seed set stage, sensitivity and translocation will be reduced and the plants may not collapse and decompose. Seed viability can still be significantly reduced which, in turn, will help in reducing regeneration of that species.

Intensive grazing, just before treatment with the WeedWiper, will allow improved contact for the contact pads with the target weeds, therefore reducing any damage to the desired grassland species.



Dense weeds may require a further treatment.

The following products have clearance for use through weed wipers:

GLYPHOSATE 360 g/l

Test clearance. Marketed as Roundup from Monsanto, plus numerous other branded products from various manufacturers.

Note: Glyphosate 360 g/l formulations, at the following dilution rates, have been used: 1 to 1 part water (50%) through to 1 to 3 parts water (25%). Dilution rates may be 1 to 10 parts water through to 1 to 20 parts water when the weeds are lush and green. Where glyphosate 360 g/l is being used at 1 part glyphosate to 2 parts water the control setting should be set somewhere around number 7 or 8 on the control box.

CHLORPYRALID 200 g/l

Text clearance. Marketed as Dow Shield from Dow Agchem. NFU SOLA No. 0662/92. Maximum dose 1 l/ha per year. Target – thistles in established grassland.

CHLORPYRALID & TRICLOPYR – 60:240 g/l

Text clearance. Marketed as Grazon 90 from Dow Agchem. NFU SOLA No. 692/95. Target – woody weeds.

2 4-D + DICAMBA + TRICLOPYR – 200:85:65 g/l

Text clearance. Marketed as Nufarm Nu-shot from Nufarm Whyte Ltd., or Broadsword from United Phosphorous.

Note: All precautions regarding toxic plants and return of stock to treated areas apply, as do all label precautions, recommendations and maximum dose restrictions.

Micron Group

Bromyard Industrial Estate
Bromyard
Herefordshire, HR7 4HS, U.K.
Tel: +44 (0)1885 482397
Fax: +44 (0)1885 483043
Email: micron@micron.co.uk

Goizper Group

Antigua 4, 20577 Antzuola
PO Box 211, 20570 Bergara,
Gipuzkoa SPAIN
T +34 943 786 000
F +34 943 766 008 / 943 787 095
E Goizper@goizper.com

Operators Guide to Successful Use of the WeedWiper

1. Weeds must be at least 150mm (6") taller than the crop canopy to ensure no risk of damage to the desired plant species.
2. Treat weeds as they become tall enough to be swiped, more than once if necessary, with successive treatments carried out in the opposite direction to the previous one.
3. ALWAYS use one tank for a.i. mix and the other tank for clean water. Having decided which tank is for what purpose thereafter NEVER change its use.
4. NEVER operate the pump with the tank outlet tap closed.
5. AVOID excessive forward speeds (above 10 kph).
6. Use water only to thoroughly wet the pad material PRIOR to any treatments.
7. Where water from the clean water tank has been used to wet the pads remember to CLOSE the tap on the clean water tank and OPEN the tap on the a.i. mixture tank BEFORE continuing.
8. PRE-MIX the chosen product PRIOR to putting into the tank and avoid mixing more a.i. mixture than is required for the task. Dilution rates will vary depending upon weed maturity.
9. Start work with only half a tank of mixture to evaluate product use compared to weed density. This will help to avoid the need to dispose of excess product mix.
10. ALWAYS endeavour to prevent the pads from dripping a.i. mixture into the crop canopy by choosing the correct control setting for the a.i. mixture.
11. IMPORTANT. When working on hillsides that are too steep to travel up and down it is advisable, where possible, to work these areas in runs of no more than 200 metres long across the hill to ensure the product does not concentrate at one end of the pads.
12. Site the WeedWiper in a designated area to avoid pollution. Set the control to 'constant pump' until the pad material drips across the entire width. Reduce the control setting until the pump stops. On the first few runs keep nudging the control setting up until the pump comes on, then reduce it until the pump stops. Repeat this process until you have determined the 'drip point' of the a.i. mixture. When this point has been reached reduce the control setting by a fraction to ensure it is set just below the drip point of the a.i. mix being used. The buzzer will stop at this point.
13. Swipe the first two runs again to ensure weeds are adequately treated as, initially, product takes a little time to reach the pads. IMPORTANT. Always ensure sufficient product mix has run through the pads to be certain the a.i. mixture has reached the pre-mixed dilution rate.
14. ALWAYS wash off and clear the pads of any plant wax or soil which may build up during work.
15. At the end of each task rinse the system through thoroughly with clean water from the rinsing tank. Use the 'constant pump' setting on the control box for this purpose.
16. Boom covers are supplied for use when the WeedWiper is being transported to:
 - a. Prevent damage occurring to the pads, and
 - b. Protect the environment from unintentional contact with contaminated pads.

Micron Group

Bromyard Industrial Estate
Bromyard
Herefordshire, HR7 4HS, U.K.
Tel: +44 (0)1885 482397
Fax: +44 (0)1885 483043
Email: micron@micron.co.uk

Goizper Group

Antigua 4, 20577 Antzuola
PO Box 211, 20570 Bergara,
Gipuzkoa SPAIN
T +34 943 786 000
F +34 943 766 008 / 943 787 095
E Goizper@goizper.com

Examples of WeedWiper Treatments



Weed beet in sugar beet, swiped after flowering.



Docks swiped early June, photo taken late June.



Fathen in Chicory, swiped late August, photo taken mid September.



Soft rush (*juncus efficus*) often called sedge grass or other local names. This is one of several *juncus* species found in the U.K.



Oilseed rape in strawberries, swiped end March, photo taken end May.



18 month old Silver Birch re-growth. Swiped early May, photo taken late May.

Micron Group

Bromyard Industrial Estate
Bromyard
Herefordshire, HR7 4HS, U.K.
Tel: +44 (0)1885 482397
Fax: +44 (0)1885 483043
Email: micron@micron.co.uk

Goizper Group

Antigua 4, 20577 Antzuola
PO Box 211, 20570 Bergara,
Gipuzkoa SPAIN
T +34 943 786 000
F +34 943 766 008 / 943 787 095
E Goizper@goizper.com

Acknowledgements

The following volumes of the **British Sugar Beet Review** give the economic and technical background to the whole problem of weed beet:

Volume 68 no.2 summer 2000 – page 53

Volume 68 no.4 winter 2000 – page 15** (Copy of this article attached)

Volume 69 no.2 summer 2001 – page 38

Volume 70 no.2 summer 2002 – page 38

Thanks must go to Broom's Barn and British Sugar plc for their assistance and encouragement in the WeedWiper project, and for the use of copyright.

Ref: BCPC Publications, The UK Pesticide Guide
Monsanto Product Information Guide, Roundup Biactive 2002
Monsanto Roundup booklet 1990
DEFRA UK Weed Act pages 1-5, 1959
HMSO British Poisonous Plants, A A Forsyth. Ref. Book 161

Micron Sprayers Ltd. Reserves the right to alter specification and prices without prior notice.

Tractor mounted and trailed models are available, as are various boom widths. The WeedWiper technology can also be added onto existing suitable equipment, e.g. crop sprayer booms, SPV's, excavators, etc.

An optional bolt-on LGP trailer is available to enable towing behind: ATV's, Landrovers, pick-up trucks, etc.

Enquiries for bespoke units to exactly suit the customers' needs are always welcome.

As this application technology is constantly evolving, please feel free to discuss any proposals to treat a weed species, or to use a chemical product, not mentioned within these guidance notes. We strongly advise adhering to these guidelines.

Due to the extensive variability of field circumstances, weather conditions, etc., Micron Sprayers Ltd. can offer no warranty whatsoever on these procedures.

For further information regarding the WeedWiper range of equipment or its uses please contact us at the details below.

Micron Group

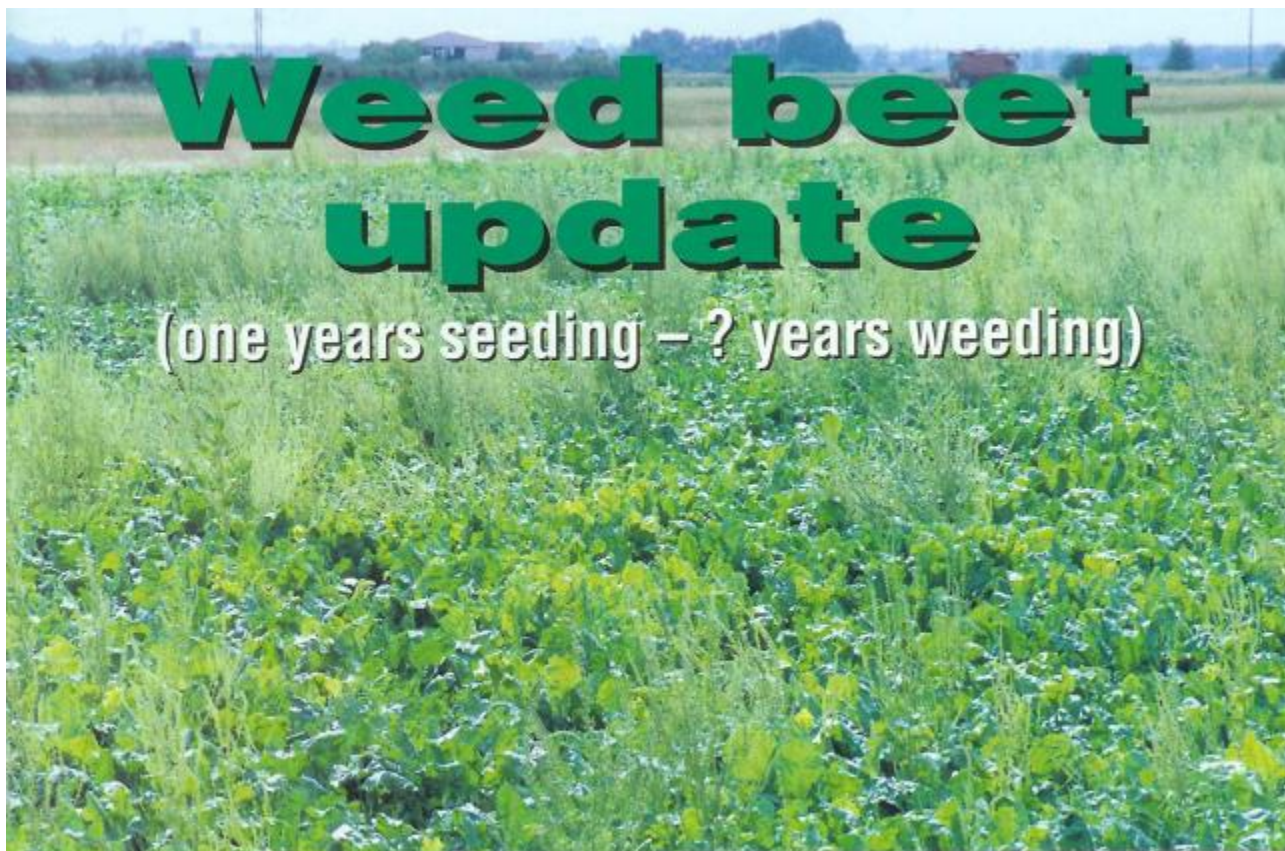
Bromyard Industrial Estate
Bromyard
Herefordshire, HR7 4HS, U.K.
Tel: +44 (0)1885 482397
Fax: +44 (0)1885 483043
Email: micron@micron.co.uk

Goizper Group

Antigua 4, 20577 Antzuola
PO Box 211, 20570 Bergara,
Gipuzkoa SPAIN
T +34 943 786 000
F +34 943 766 008 / 943 787 095
E Goizper@goizper.com

Weed beet update

(one years seeding – ? years weeding)



By Mike May,
IACR-Broom's Barn.



Weed beet have become a serious problem in many fields but they have not just suddenly appeared. They built up during the late 1970s and early 1980s and, as a consequence, the SBREF funded a series of projects aimed at improving the understanding of their biology and control. The results of that work, which are still relevant today, were put to good use and the problem reduced by the early 1990s. However, since then, weed beet have gradually built up to an all-time high with over 60% of fields infested in this season (Fig. 1). We believe that the recent increases in fields affected, irrespective of infection source, are a direct result of reduced or no control measures against the problem during the 1990s and the ability of the weed seeds to survive for long periods in the soil. In addition, early March drilling exacerbates the problem. Table 1 shows how a few weed beet left in the last beet crop in 1996 will have developed to create the current problem. Bolters should be considered in a similar way as weed beet because a proportion of these will give rise to some plants which will bolt in their first season of growth.

Table 1. Effect of allowing 100 weed beet to shed seed in beet on numbers of weed beet in subsequent crops

1996

- Assume 100 weed beet plants/ha in beet crop (i.e. 0.01/m²)
- No control was applied in beet crop
- These produced 150,000 viable seeds
- 50% of these eaten by birds and mice or died, 50% buried by late ploughing.

1997

- Winter wheat – 75,000 weed beet seeds/ha in soil
- 1% germinated (most were too deep in soil to germinate) and were killed
- 50% reduction of viable seed in the soil (natural mortality, eaten, germinated but did not emerge)
- 10% germinated in autumn and were killed before drilling next crop (winter beans) in October.

Micron Group

Bromyard Industrial Estate
Bromyard
Herefordshire, HR7 4HS, U.K.
Tel: +44 (0)1885 482397
Fax: +44 (0)1885 483043
Email: micron@micron.co.uk

Goizper Group

Antigua 4, 20577 Antzuola
PO Box 211, 20570 Bergara,
Gipuzkoa SPAIN
T +34 943 786 000
F +34 943 766 008 / 943 787 095
E Goizper@goizper.com

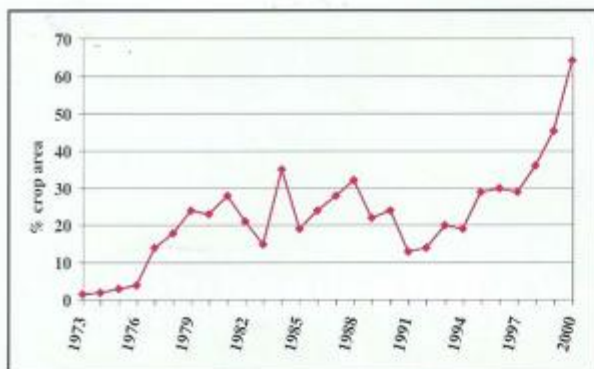


Fig. 1 - Incidence of weed beet in UK (1973-2000).



- 1998**
- Winter beans - 30,071 weed beet seeds/ha in soil
 - 5% germinated in crop and were killed (some ploughed back up into top layer of soil)
 - 50% reduction of viable seed in soil
 - Field ploughed and next winter wheat crop drilled.

- 1999**
- Winter wheat - 14,284 weed beet seeds/ha in soil
 - 5% germinated in crop and were killed
 - 50% reduction of viable seed in soil.

- 2000**
- Sugar beet late drilled following stale seedbed
 - 30% weed beet emerge and are controlled before sugar beet emerge, 4,999 weed beet plants/ha (0.5/m²) emerge in sugar beet crop
 - This is a population that requires tractor hoeing and weed wiping
 - If the rotation was repeated again, the number in the next beet crop would be nearly 250,000/ha or 25/m² (three times the number of commercial beet) - i.e. it would not be feasible to grow sugar beet.

The scenario in the table above is an example of what might happen and clearly indicates how a few annual

beet (bolters or weed beet) that are allowed to set viable seed can cause economically damaging effects in the next beet crop.

Effect on yield

Weed beet is particularly competitive in beet crops, as many emerge at the same time as sown beet. In addition, it has a similar nutrient and water requirement to normal sugar beet plants. They will also grow tall enough to shade the crop. Each weed beet plant/m² reduces crop yields by approximately 12% - i.e. on average £150/ha lost revenue (Ref. 1). Considering the financial return from controlling weed beet populations within the infested crop, most weed beet populations appear uneconomic to control. However, from the figures above, leaving as few as 1,000 bolters/ha (i.e. 0.1/m²) unchecked will result in such high numbers within the next and subsequent beet crops that these crops become uneconomic to grow.

Biology

The main points that are relevant to control of weed beet are listed below:

- The average weed beet plant produces around 1,500 seeds, early emerging ones produce more, later emerging ones less.
 - Preventing seed return to soil from any bolter is important.
- Weed beet seed become dormant when buried in the soil.
 - Delaying cultivation and ploughing of infested fields for as long as possible after harvest will reduce seed return. Birds and mice will eat seeds left on the surface.

- Weed beet are generally spring germinating and will not emerge when dense crop canopies are present. Therefore, few weed beet will germinate in winter cereals (generally between 1% and 5%). A proportion of buried weed beet seed can persist in soil for 10 to 15 years with, on average, a 50% year on year decline under an autumn sown crop.

- Extend the rotation as far as possible between sugar beet or other spring sown crops, where control is difficult.

- Weed beet will not emerge from depths greater than 10 cm.

- Plough deep after an infested beet crop and then leave deep buried seeds undisturbed by using shallow ploughing in subsequent seasons. However, burying deep and not disturbing will reduce the annual decline to around 30-40%.

- Keep the weed beet in the upper layers when growing other spring crops, then plough deep before the sugar beet.

- The greatest proportion of weed beet seed will germinate in open (i.e. little early canopy present in March/April) spring sown crops such as sugar beet.

- Use spring sown crops for fastest reduction in weed beet populations.

- Where possible, use a stale seedbed to stimulate weed beet to germinate so that it can be killed before the crop emerges. This will often

reduce the weed beet population in a subsequent sugar beet crop by 30%.

- Spring linseed sown into a fine seedbed in March will encourage many weed beet seeds to germinate in the top 10 cm of soil. These can then be controlled with a sulphonyl urea herbicide, such as Ally, later in the season.

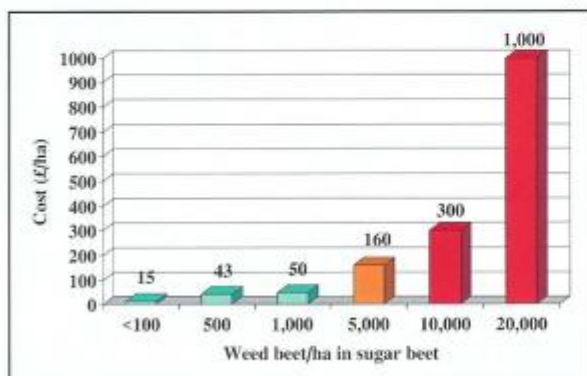


Fig. 2 – Cost of weed beet control in sugar beet.

Control in sugar beet

Control methods should be adjusted to the number of weed beet plants or bolters that are present. The costs of the various options are given in Fig. 2.

Less than 100/ha

Use hand pulling. Whilst the flowers are still present and seed not set (often before July), the plants can be pulled and left on the field. This can reduce the cost of control by half, compared to removal off the field, although in some seasons a later 'flush' of bolters might mean a second pass.

100 to 1,000/ha

If weed beet are present between rows, start with a tractor hoe. Pull remaining bolted stems growing within the rows as above. At these lower levels of infestation, the weed beet are likely to be patchy in distribution if they have arisen from one or two bolters in the previous beet crop.

1,000 to 10,000/ha

Control weed beet growing between the rows with repeated tractor hoeing, start when weed beet have four true leaves and repeat at two week intervals (three passes may be required). Control bolted plants using a weed wiper. Where dense patches are present, wipe twice,

once in each direction. Glyphosate will kill weed beet seed that is developing on the bolter. However, care must be taken to treat early to avoid the presence of the rotted roots of bolters at harvest.

More than 10,000/ha

Control weed beet growing between the rows with repeated tractor hoeing, start when weed beet have four true leaves and repeat at two week intervals (three passes may be required). At these densities, it may be necessary to use a

guided system (e.g. rib wheel following groove set up by tine at drilling). Control bolted plants in less dense patches using two passes (once in each direction) of a weed wiper each time. Where patches are dense, use a cutter. Repeat as necessary – usually two or more passes required.

Try to harvest first any field where weed beet may shed some seed (i.e. where dense populations were treated with a weed wiper). However, account must be taken of the risk of rotting roots of bolters contaminating harvested produce, especially if there are large numbers and/or the crop is to be clamped. Early harvest will reduce the time for seed to mature. Ideally, this should be in September to early October; the later the harvest, the more seeds will reach maturity. After harvest, leave the soil uncultivated or ploughed for as long as possible. If feasible, direct drill the following cereal crop three or four weeks after beet harvest.

Where an infested sugar beet field is followed by cereals, control any groundkeepers and any seedling weed beet with a sulphonyl urea or other herbicide which will give good control of weed beet. Do not let volunteer beet set seed in set-aside, this may be achieved by cutting in May, or glyphosate application by permission from MAFF.

Seriously infested fields

As can be seen from above, there is a range of options to reduce or prevent weed beet problems. However, many fields are now becoming so seriously infested that they will not be able to

grow beet again for possibly eight years or more, by which time the population of viable seed should be manageable again. Once a field is seriously infested and beet has to be grown, consider the inclusion of a spring crop in the rotation, such as linseed, to encourage weed beet seeds to germinate so that they can be controlled later. However, subsequent ploughing will then turn the soil so that the previously buried fraction will germinate and be a problem.

The message for 2001

- Prevent seed return – poor bolter/weed beet control in beet crops is the major cause of seed return increase. Seed set in set-aside can also be a problem on some farms.
- Increase rotation length where possible. The annual mortality of weed beet seeds in the soil is around 50% per year.
- Plan a strategy to reduce the risks of weed beet building up.

As for most weeds, increased numbers of weed beet lead to greater reductions in crop yield. **However**, unlike most other weeds, the more weed beet present the greater the cost of control. ■

Reference

1. Effects of increasing weed-beet density on sugar-beet yield and quality. Longden, P.C. *Annals of Applied Biology* (1989), **114**, 527-532.



A single weed beet or bolter can set 1,500 or more viable seeds.