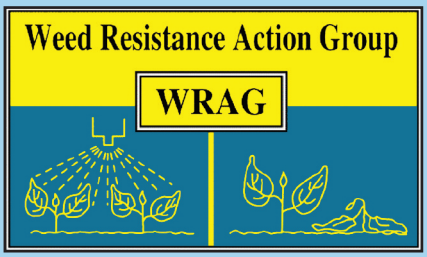
Minimising the risk of glyphosate resistance

AHDB Information Sheet 03
Autumn 2017



Always read product labels, consider your local conditions and consult a professional agronomist, if necessary.

Latest information

- Increased risk is linked to repeated use and over-reliance on glyphosate.
- Retain the value and efficacy of glyphosate by minimising resistance risk.
- Currently, there are no known cases of glyphosate resistance in the UK.

Action

- Prevent survivors
- Maximise efficacy
- Use alternatives
- Monitor success

The risk of glyphosate resistance

The herbicide glyphosate has been commercially available for 40 years. It is one of the most frequently used herbicides in the UK in all crop production systems, including annual and perennial crops and non-cropped areas.

There are currently **no known cases of glyphosate resistance in the UK**; however, globally, resistance to glyphosate has evolved as a result of repeated use and over-reliance.

Current changes in usage patterns in the UK are potentially increasing the risk of glyphosate resistance development.

An over-reliance on a limited group of herbicide modes of action has accelerated the development of herbicide-resistant grass weeds, particularly black-grass. This has been mainly due to a lack of new herbicides, regulatory policy changes, a limited crop rotation and the under-exploitation of cultural control practices.

The main threats of resistance to glyphosate in the UK are in:

- **annual arable crops**, especially where it is used to control grass weeds that exhibit resistance to many selective herbicides
- **perennial crops and amenity use**, where it is used on annual and perennial weeds where few alternative modes of action are available.

To reduce the risk of glyphosate resistance

Prevent survivors

- Avoid repeat applications of glyphosate to the same (surviving) plants

Maximise efficacy

- Use the right dose rate for the target weed on actively growing plants
- Reduced dose rates increase the risk of reduced efficacy

Use alternatives

- Use cultivation or other non-chemical control options when practical
- Use other herbicides in sequence (or in mixture, only if recommended)

Monitor success

- Consult your agronomist or supplier
- Remove survivors to prevent spread
- Test seed samples of survivors

Factors affecting the risk of glyphosate resistance

Agronomic factor	Higher risk	Lower risk
Cropping system	Continuous monoculture or perennial crops	Varied rotation – winter and spring cropping
Cultivation	None or insufficient to kill weeds	Thorough disturbance to kill weeds
Weed infestation level	High	Low
Control method	Glyphosate only	Mixed use of glyphosate with effective use of other modes of action and cultural control
Number of glyphosate applications pre-drilling	More than two applications and no cultivation	Fewer than two applications and sufficient cultivation
Target weed size for glyphosate rate	Weeds too large for dose rate; reduced or less effective dose rates used	Weeds at correct growth stage; full and effective dose rates used

Maximising the efficacy of glyphosate

To maximise efficacy, spray at the **right dose rate**, the **right growth stage** and in the **right conditions**.

Dose rate

Get the dose rate right for the weed and growth stage. Annual grasses typically require 540 g.a.i./ha for seedlings up to 6 tillers and 1,080 g.a.i./ha when flowering.

Growth stage

Ideally, spray when plants are at least 5 cm but before the start of rapid stem extension. Apply prior to 'shading' from other plants.

Conditions

Apply to actively growing plants in warm conditions (15–25°C), with at least 6 hours before any rainfall.

Choice of nozzles, water volume and the addition of water conditioner can also be influential.

Managing the risk of glyphosate resistance development

Annual weeds in annual crops

Key species at risk: black-grass and Italian rye-grass

Glyphosate applied prior to drilling a crop is an effective weed control option but it needs to be used sensibly:

- Maximise efficacy of glyphosate to reduce the number of survivors
- Use the manufacturer's recommended dose rate for the weed sizes present
- Avoid repeat applications of glyphosate to the same (surviving) weeds
- Supplement glyphosate use with sufficient cultivation to kill survivors and effective subsequent herbicides (pre- and post-emergence)
- Monitor the success of control strategies carefully and frequently
- Remove survivors to reduce seed spread
- Report suspected survivors to your crop protection adviser and/or the product manufacturer

Based on current understanding, two applications of glyphosate (with sufficient cultivation to kill survivors and effective subsequent herbicide use) is likely to be a manageable risk. Multiple applications in the absence of sufficient cultivation should be avoided.

Application of glyphosate within crops, such as between crop rows through shrouded sprayers, presents an increased risk of resistance developing in survivors that will need careful management.

Adjuvant use is often associated with use of reduced rates of glyphosate products. Unless specifically recommended on glyphosate product labels, extreme caution should be taken – any reduction in efficacy could increase the risk of resistance development.

A single pre-harvest application of glyphosate per crop should not increase the risk of resistance developing unless there are survivors present from prior glyphosate applications.

Perennial crops and amenity areas

- Avoid over-reliance on a single herbicide (eg glyphosate); use mixtures of herbicides whenever possible
- Consider non-chemical control measures (eg hand weeding, cutting, flaming, steam treatments) as a supplement or alternative to herbicide treatment
- Monitor and assess herbicide efficacy after spraying to detect any loss of control
- If resistance is suspected, act quickly to prevent it spreading: use a strategy involving alternative herbicides and non-chemical methods and continue to monitor
- Consider collecting and testing seed samples to confirm resistance
- Good record-keeping and assessment after spraying is essential in the early detection of herbicide resistance

This two-page summary is supported by more detailed guidance, produced by the Weed Resistance Action Group (WRAG), to help minimise the risk of weeds evolving resistance to glyphosate in the UK and to promote best practice to better manage emerging risks to prolong the effective activity of glyphosate.

Further information

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Guidelines for minimising the risk of glyphosate resistance in the UK (WRAG, 2015)
cereals.ahdb.org.uk/wrag

Herbicide resistance in amenity weed control situations
cereals.ahdb.org.uk/media/1219028/Herbicide-resistance-in-amenity-weed-control-situations-2009-.pdf

Development of zero and minimal herbicide regimes for controlling weeds on hard surfaces and determining their emissions (Defra project PS2802)
sciencesearch.defra.gov.uk
Search for "PS2802"

Publications orders
0845 245 0009
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