

Best practice to minimise risks to water from the agricultural use of glyphosate

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European Glyphosate Environmental Information Source

Important Notes to users:

This document is part of a toolbox which provides independent information on the sustainable use of glyphosate. It cannot however be definitive and users must ensure that they assess local factors and particularly take account of any national or regional legislative requirements. At the end of the document reference sources used in its preparation and links to other relevant documents are provided.

Summary

Glyphosate is a widely used total herbicide applied as a spray to control annual and perennial weeds in arable crops. As for any pesticide, label instructions must be followed closely. Although glyphosate is strongly adsorbed to soil particles and subsequently broken down by microorganisms there is a risk of losses to water occurring from field run-off after heavy rainfall and from direct overspray or drift. These risks can be mitigated by appropriate soil management, grass buffer strips, correct timing of application and good application practice.

Detailed information

Minimum advice on safe and correct use, including measures to protect the environment is provided on the pesticide label. This must be followed.

In many circumstances use of glyphosate will also follow the specific recommendation of a professional adviser and this is the preferred situation. However, because of its widespread and longstanding use some farmers familiar with the product may not always feel the need to seek professional advice on its correct use.

All operators applying pesticides, including glyphosate, should be properly trained, have read the label and take account of any adviser's additional recommendations before use.

In practice most agricultural usage of glyphosate takes place during spring, mid-late summer and early autumn when weeds are growing actively, soils are not saturated and rainfall is less persistent and micro-organisms will act more quickly to break the chemical down. The risks of pollution will therefore be lower. Nevertheless, risks still remain and the pathway of glyphosate to water from field use will vary depending on site and circumstance. Potential pathways to water from the field are:

- Surface run-off
- Drainage through macro-pores (large deep cracks)
- Drainage through micro-pores
- Drift or overspray onto a water course

In addition, poor general handling and disposal practice can also be important ways in which a pesticide can reach water.

All pathways can be significant, but in practice the most likely routes will be from surface run-off following heavy rainfall 2-3 days after application and from drainage through macro-pores that may extend directly to field drains. The potentially rapid loss via these routes can result in little or no time for glyphosate to become adsorbed to soil particles or degraded by soil micro-organisms.

Research has shown that glyphosate is most strongly adsorbed to iron and aluminium oxides that are typically present at the surface of clay minerals. Glyphosate bound to clay particles may move down the soil profile and this may be more problematic where soils are heavily cracked and under-drained. The potential for glyphosate to move to deeper soil layers is greater in this situation, particularly if applied in the early autumn to stale seedbeds or stubbles after a hot dry summer when soils may be more fissured,

though there is little evidence of this occurring.

Mitigation Measures for general agricultural use

The advice to minimise soil erosion and protect water during application applies to all pesticides and is not unique to glyphosate. There are three main areas to consider:

1) Minimising soil erosion and surface run-off

Well managed soils reduce risks of soil erosion and pesticide losses from surface run-off. Soils should be managed to retain organic matter and protect structure. Measures such as grass buffer strips, cultivation and other good field management practice should be adopted to ensure that water cannot run off from the treated area onto adjacent fields, roads or tracks from where it may directly enter a watercourse. Where available follow any published national or regional Good Agricultural Practice as well as any specific local requirements to reduce risks of erosion.

- Do not overwork the soil as this may lead to loss in structure;
- "Tramlines" produced by tractors should run across slopes where practical NOT down the slopes since this increases the potential for pesticide loss to a watercourse;
- Drill tramlines where possible;
- Maintaining significant trash cover and rapid establishment of crop can reduce the impact of raindrops which break down soil crumbs and can trigger soil erosion;
- Establish 6m grass buffers trips adjacent to any watercourse.

As far as possible avoid or minimise cropping practices and cultivations on soils and slopes which are at risk of erosion. The risk of erosion can be reduced further by specific crop rotations that minimise the level of cultivation. Where there are slopes of over 5% (*A 5% gradient is 1 metre in 20 metres*) running for more than 200m, establish at least 5-6m wide grass strips across the entire slope or equivalent buffer strips designed to create enhanced wildlife habitats. Buffer strips up to 20m wide may be needed in steep fields. Ideally this break should be located where the slope changes. Also consider grassing down the bottoms of valleys which lead to any watercourse.

2) Use on dry, cracked or saturated Soils

Dry Cracked Soils – Take care if applying glyphosate in situations where the soil is dry and cracked and there is little weed (or pre-harvest crop) cover as water carrying glyphosate and soil particles can move into the drains. Cultivations will help to break up the large cracks and reduce the direct passage of water carrying pesticides into drains. If soils are cracked wait until they have re-hydrated and cracks have sealed before applying pesticides.

Dry Soils – Risk of glyphosate movement through soils that are dry but not cracked is lower. If soils are very light and heavy rain is imminent delay applications until the heavy rain has passed.

Saturated Soils – Saturated soils are more likely to result in run-off problems, especially along tractor wheel tracks, potentially resulting in the movement of glyphosate off the field. Wait until drains have stopped flowing before application. If heavy rainfall is forecast in the following 3-5 days, delay application.

3) Careful application and handling to protect water

- Establish a 6m grass buffer strip or an appropriate no-spray buffer-zone adjacent to any watercourse;
- Do not spray if ground is waterlogged, frozen or if heavy rain is forecast in the following 5 days;
- Avoid conditions where spray drift can occur - use nozzles and a spray equipment which reduce drift;

Before spraying consider if field drains are flowing or is predicted to flow in the next 7 days as this will increase the risk of glyphosate reaching water, risks are also greater if the field is bordered by a watercourse. Consider if run-off could reach the watercourse. A field slope of less than 5% *and/or* a well established grass strip (at least 5m wide) adjacent to the watercourse will reduce risk significantly.

- Do not overspray buffer zones & watercourses, field edges and adjacent tracks or roads
- Spray headlands last to avoid driving over sprayed area and picking up mud and pesticides on tyres
- Spray tank washings on to previously treated areas. Take care where washings are sprayed as they may contain sufficient glyphosate to temporarily damage growing plants.
- Wash the outside of the sprayer before leaving the field
- Clean mud from tyres before leaving the field, keep tyres as mud-free as possible; mud on tyres can carry pesticides out of the field
- Ensure all cleaning activities take place away from watercourses.

Use in horticulture and forestry

In horticulture and forestry, glyphosate is used to control annual and perennial weeds. In most cases applications are made during the early and mid-parts of the growing season when weeds are growing and soils are moist but not deeply fissured. Thus risks of glyphosate losses are low. However in nurseries there are risks during filling and handling, application to hard surfaces or treatment of row crops running up and down slopes as this could increase losses through surface run-off. In forestry slopes are often steep, resulting in an increased risk of surface run-off. However most applications of glyphosate, if needed, are only made during the first two years of crop establishment, often as a spot, band or tree base only application.

Reference for further detailed information:

1. Soil management advice -UK ([Click here](#))
2. General application advice: UK Crop Protection Association/ The Voluntary Initiative ([Click here](#))
3. French best practice advice ([Click here](#))

See also:

- Best practice for general handling of herbicides to minimise risks of point source pollution
- Environmental fate and behaviour of glyphosate and its main metabolite

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