

Glyphosate: appropriate choice for the environment?

Pesticides notebook
by Colin Palmer



A few months back these notes considered the issues embracing various glyphosate products and the implications for the spray operator. This topic provoked requests for a similar dissection of the product in the environmental context.

Glyphosate was one of the very first products to be assessed under the then new 1991 EC pesticide regulations - and as such it is one of the first to undergo the re-appraisal process. This will be completed later this year - no doubt making some of these notes redundant!

Secondly, it would be daft to claim that glyphosate is environmentally benign - it's designed to kill vegetation for heaven's sake. The more important question is actually, is it likely to be associated with greater unintended consequences than the alternatives of hand cutting, machine swiping, Shropshire sheep or plastic mulches? In this context, I believe that the product can be considered to be a realistically viable environmentally acceptable option for vegetation control. And here's why...

As with the operator health issue, the discussion needs to be divided into two sections:

- (1) the characteristics of the glyphosate itself, and then
- (2) the implications of the various formulations of the products that we actually buy and use.

There are some 70 glyphosate formulations on the UK market, most of which have forestry

approvals. Typically, the formulation you buy will have 30 - 40 % glyphosate, and anything between 4 - 20 % formulants with the remainder made up with water.

(1) Glyphosate - the molecule

What is the effect on wildlife? Glyphosate does not bioaccumulate in the body. Any mammal, bird, fish or aquatic organism touching or eating glyphosate treated vegetation will rapidly eliminate the chemical leaving minimal, non-harmful tissue residues. If they are subsequently eaten, then there is no accumulation in the food chain.

Will it accumulate in the soil? No. Glyphosate is degraded by naturally occurring micro-organisms with a half-life of less than six weeks in the soil. Numerous studies have concluded that the products do not accumulate, even after repeated applications in the same year or over several years. Glyphosate binds tightly to the clays, silts and organic matter in the soils, and studies in the laboratory and the field have clearly demonstrated that it poses no threat by leaching into drains or groundwater, and is very unlikely to be taken up by nearby non-target vegetation.

What is the threat to aquatic life? The half-life of glyphosate is less than a week in water, and any surface run-off following heavy rain will be rapidly adsorbed onto suspended sediment. Initially it is degraded to amino-methyl-phosphonic acid prior to breaking into carbon dioxide and phosphate. The net result is a negligible risk to aquatic organisms - demonstrated by the product having a UK approval for spraying over water weeds.

Can we be sure that forest ecosystems will be unaffected? Ecosystem studies are notoriously difficult to evaluate due to the complexity of the wildlife diversity. Nevertheless, two major independent studies conducted by Oregon State

University and the Canadian Carnation Creek Study confirmed that soils, groundwater, terrestrial and aquatic life was not affected by the use of glyphosate.

(2) Glyphosate - the formulations

Not all formulations are the same, so the environmentally conscious forester does need to be rather choosy over choice of product. Formulations have additives to help to spread the herbicide over the weed surface, to aid penetration through cell wax, and to provide product stability. These additives can be as non-hazardous as the glyphosate itself, but some, such as the highly effective tallowamine, are not so pleasant.

The quickest way of making an environmentally sound choice is to look for a product label which does NOT carry the 'dead fish and tree' pictogram. If this is absent, then the product is regarded as being of low hazard in the environment. A more in-depth appraisal is also available from the product safety data sheets (MSDS) as noted in some of the more popular glyphosate products below.

In conclusion, although there will inevitably be studies which appear to show ill effects from the use of glyphosate, the overwhelming quantity of peer reviewed independent and regulatory data demonstrating the benign environmental properties of glyphosate should allow its continued use without loss of conscience.



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Confor members may contact Colin Palmer for free advice and information on pesticides. Call 01531 633500 or email to forestry@branchline.demon.co.uk

Product	Glyphosate Type	Formulants	Hazard Warning	Aquatic Hazard	Terrestrial Hazard	Soil Hazard
Roundup ProBiactive 360*	Isopropylamine	"Surfactants" 16 %	None	None***	None	None
Gallup Biograde 360	Isopropylamine	Not specified	None	None***	None	None
Roundup ProBio	Potassium salt >5 % + Nitroaryl >1 %	Alkyopolyglycoside	None	R53	None	None
Roundup Probiactive 450	Potassium salt etheralkylamine >10 %	Ethoxylate	None	R52/R53	None	None
Roundup ProVantage	Potassium salt >20 % + Nitroaryl >3 %	Alkyopolyglycoside	None	R53	None	None
Nufarm Credit**	Isopropylamine Ammonium salts	None	None	R53/H413	None	None
Clinic Ace	Isopropyl-ammonium alkyltallowamine <13 %	Ethoxylated	YES	R51/R53/H411	None	None
Gallup 360	Isopropylamine alkyltallowamine <30 %	Ethoxylated	YES	R51/53	None	None
Glyphos	Isopropylamine alkyltallowamine <10 %	Ethoxylated	YES	R50/R53	None	None

* Roundup ProBiactive 360 has been discontinued. However, Roundup Biactive 360 is identical and available. It is legal to use this in forestry providing you also have a Roundup Probiactive label to hand.
 ** Credit has no additives, allowing the use of an environmentally friendly adjuvant such as the emulsified vegetable oil, Toil.
 *** This will probably be replaced by an R53 following the review, as part of the test for an R53 is the effect on algae - and glyphosate does kill algae.

Aquatic Hazard Numbers
 R50. Very toxic to aquatic organisms
 R51. Toxic to aquatic organisms
 R52. Harmful to aquatic organisms
 R53. May cause long-term adverse effects in the aquatic environment.
 H411 Toxic to aquatic life with long lasting effects
 H413 May cause long lasting harmful effects to aquatic life.