Keeping glyphosate going

Forward-thinking farmers

With glyphosate remaining a stalwart in crop protection programmes – despite being more than 50 years old – *CPM* seeks advice from the experts on stewardship to keep it in rotations.

By Charlotte Cunningham

For most farmers, glyphosate will be an integral part of the crop protection programme – having provided growers globally with high levels of weed control for more than 50 years.

That said, there's no denying its usage has been a topic of great controversy during recent years – a burden worsened by resistant weeds appearing in other countries including the US and Australia – highlighting the importance of good stewardship and best practice to preserve the herbicide now and in the future.

"Glyphosate is still very much a cornerstone of integrated weed management – for most people, it's still incredibly important," says Bayer's Roger Bradbury. "Therefore, maximising its efficacy short-term and protecting it in the long-term should be a key priority for everyone.

"It's a unique mode of action – there are no alternatives coming," he continues. "It's the only active in the HRAC Group 9. This year Roundup brand is celebrating 50 years of use since its launch in the UK in 1974, and in that time there hasn't been anything launched that's equivalent to glyphosate, so it's important to bear that in mind when it comes to protecting it.

"What's more, there are issues with resistance to the chemistry in other parts of the world and it's important to remember we're not immune to that happening here."

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So what can growers do practically in terms of stewardship to both maximise efficacy of applications while protecting the future of the chemistry?

Weed targets

"Thinking about the target weed spectrum is vital," explains Roger. "While glyphosate is a broad-spectrum herbicide, it's not equally effective against all species. They do all have a different inherent susceptibility to glyphosate and this comes down to a number of factors, such as the nature of the waxy leaf surface or the innate physiology of the plants, for example.

"Having a good understanding of this will enable growers to tailor their dose rates accordingly."

It's also important to consider the size of weeds, says Roger. "This is where I think we've become a little complacent," he warns. "There's a tendency to think that glyphosate will be able to deal with really big weeds. While yes, it can kill larger weeds, smaller weeds are much easier to control reliably, so timing of the application to target them while they're smaller can also help to protect the chemistry."

Conditions at the time of application also should be considered, as well as sprayer set up and nozzle choice. "Where this isn't optimal, the plants are more likely to be subject to sub-lethal doses and therefore perhaps not as good efficacy as you'd expect. This is also a risk factor for resistance development, so where there are survivors, don't be tempted to apply another dose of glyphosate; instead incorporate an alternative mechanical means of destruction."

Water source and volumes will also play into the efficacy of the herbicide, adds Roger. "Harvested rainwater is the most ideal choice, although we know this isn't something everyone has access to. However, where this is possible, it avoids all those queries around hardwater.

"If you're drawing water from the mains, it's important to understand the water hardness. For Roundup-branded products, in most situations, you don't have to use a water conditioner – but that doesn't apply for other glyphosate products and for many of these you absolutely should."

Delving deeper into how application can impact glyphosate performance and another factor which can influence it is nozzle choice and boom height – something independent application specialist Tom Robinson has been researching.

The driver behind the research was to reaffirm the theories on how application techniques can implicate glyphosate. As such, Tom has conducted trials for Bayer during the past few years which have looked at how both of these factors affect drift and ▶

Repeated applications of glyphosate is a risk factor for resistance, so it's important to deploy a range of weed control tactics, says Roger Bradbury.

Sarah Cook says good glyphosate stewardship comes down to using the right rate of the right product at the right time.

Experts say judicious use of the plough to aid herbicide performance may be wise this year, given the poor state of soils.

Independent trials carried out in 2022 have looked at the impact of four different nozzle types – Lechler ID3, Hypro Guardian Air, Hypro 3D and a 110 Fan Jet – on glyphosate application and performance.

efficacy of the herbicide. The goals were to ascertain the effects of application factors on the performance of Roundup when applied through a commercial sprayer.

Applications were carried out at a rate of 100 l/ha at 12km/h to KWS Kilburn spring wheat during late tillering. Four different nozzle types were used – Lechler ID3, Hypro Guardian Air, Hypro 3D and a 110 Fan Jet (see table) – with observations including spray coverage percentage, control percentage, distance of drift damage and area of drift damage.

Based on the research, Tom was able to make three key recommendations when it comes to the best nozzle selection when applying glyphosate – assuming a stable boom and a nozzle height of 50cm:

1. Under good spraying conditions – Hypro 3D

2. Under less stable conditions – Guardian Air

3. Where gusts are variable – Lechler ID3

"I'd also never recommend using traditional Fan Jet nozzles," adds Tom. "That was the worst for drift. As a good all-rounder, the Hypro 3D is a really good choice but it really does depend on the conditions."

But above all else, and regardless of nozzle choice, Tom stresses that maintaining a straight and stable boom with a nozzle height no greater than 50cm is imperative.

For longer-term management, Roger says it's vital that growers monitor the success of their weed control on an annual basis. "With grassweeds, this can be quite obvious – you'll be able to see them sticking out of the top of the crop. If control is poor, consider what the reasons for this are – dose rate? Timing? Poor application? The conditions? A good summary of best practice is available in published WRAG

Glyphosate guidelines

ADAS has looked in detail at best practice for managing resistance to ensure the long-term effectiveness of glyphosate in the UK, including a five-year study which concluded in 2020. ADAS' Dr Sarah Cook was one of the key researchers involved. "Glyphosate is the most frequently used herbicide in the UK and is very important to the industry," says Sarah. "As such, this research was very important to quantify how to get the best control from glyphosate and reduce the risk of resistance development by using best practice on grassweeds. This in turn helps to be able to protect it in the future."

As a brief background recap, the study was carried out to build on and improve the current evidence at the time surrounding risk management with glyphosate. Specifically, the team wanted to scientifically quantify the four key management principles: preventing survivors, maximise efficacy, use alternatives and monitor success.

Practically, the research started with a survey into how glyphosate was being currently used followed by experimental work which included both field and container-based studies.

The end goal for the project was to produce guidelines which would allow growers to minimise the risk of resistance while also optimising the efficacy of glyphosate, and as such the key take homes were:

- Optimum application timing for blackgrass and Italian ryegrass is GS12–13
- Glyphosate rate >540g is critical for optimal control
- If target weeds are tillering (from GS21), a higher glyphosate rate (>720g) is required
- Temperature at application is extremely important for both enhancing or reducing control
- Cultivation of stale seedbed at a depth of 5cm is essential to increase blackgrass control
- Maximum of two glyphosate application timings for a stale seedbed

But four years on, is the advice still relevant? Very much so, says Sarah. "It's still all about the right product, for the right situation, applied at the right time."

Something that's increased in popularity since the initial research is experimentation with alternative products that are naturally derived to try and reduce rates of glyphosate. However, ADAS' research scientist Katy Hebditch warns that the evidence is lacking on these alternatives at present as no data have been published.

"At the moment, there's not the robust experimental evidence for these additional products to justify reduced rates. So until we can see that, we're very much still pushing key messages in the guidelines to not reduce rates at all – although we're always interested in new proven solutions that'll help farmers if the scientific evidence is there."

With some evidence of increased tolerance to levels of glyphosate in ryegrass, Katy continues that it's vital to monitor resistance levels to all chemistry. "Generally, we're now seeing so much resistance with ryegrass and blackgrass to other modes of actions that it's increasing the reliance on glyphosate.

"We don't want this to increase further as it could endanger the availability of the chemistry in future. If you do see glyphosate failure developing into a pattern, and obvious patches of glyphosate survivors it's important to speak to your agronomist and/or the ADAS weeds team as soon as possible."

Glyphosate application trials treatments

Product	Dose l/ha	Nozzle	Characteristic	Water Volume l/ha	Speed km/h	Pressure Bar	Nozzle Height cm
Untreated							
Roundup	TBC	Fan Jet 110-025	Standard	100	10	2.2	50
Roundup	TBC	Guardian Air 025	-75% Drift	100	10	2.2	50
Roundup	TBC	Lechler ID3 025	-90% Drift	100	10	2.2	50
Roundup	TBC	Hypro 3D 025	-50% Drift Angled	100	10	2.2	50
Roundup	TBC	Fan Jet 110-025	Standard	100	10	2.2	100
Roundup	TBC	Guardian Air 025	-75% Drift	100	10	2.2	100
Roundup	TBC	Lechler ID3 025	-90% Drift	100	10	2.2	100
Roundup	TBC	Hypro 3D 05	-50% Drift Angled	100	10	2.2	100

Source: *Tom Robinson, Roundup Application Trial 2022. Green = recommended nozzle/treatments.*

With resistance to glyphosate now noted in other parts of the world, it's vital growers maintain good stewardship of the herbicide to keep it in programmes.

guidelines which growers should reference for advice when it comes to minimising the risk of glyphosate resistance."

Thinking about performance this spring, Roger says a combination of factors led to poor levels of control. "From what we've seen, a lot of this came down to dose rates and timings," he explains. "We did have some situations where farmers had been written a recommendation in January but didn't apply it until April – so there's a message there to revisit recommendations where appropriate and change dose rates accordingly.

With unavoidable delays to applications last spring, many plants were also in stem extension phase of growth which is notorious for variable performance. It's not recommended to apply glyphosate when plants are at this stage as efficacy will be compromised.

Anaerobic conditions

"A lot of fields were very wet and saturated and roots were sat in anaerobic conditions for quite some time. So when glyphosate was applied plants were stressed, not always actively growing and mobilising glyphosate into the roots. Where this didn't happen, control was poor and regrowth in the base of the plant occurred."

Thinking more broadly, careful planning of the whole cropping system is also important in glyphosate stewardship, he adds. "Ask yourself, do you have diversity in there? This includes autumn and spring crops, monocots, dicots – essentially opportunities to give you other ways to control weeds than glyphosate.

"Also managing that overall weed burden in the field is crucial. Knowing what you're dealing with on a field-by-field basis is optimum. For example, fields carrying a high weed burden are at higher risk of resistant individuals appearing.

"Cultivations can help manage weeds away from chemistry too. For some, the plough is a dirty word but in a year like the one we find ourselves in currently, judicious use could be beneficial from a weed management perspective."

For those operating a more regenerative or reduced tillage system – and therefore limited with what they can do cultivation wise to control weeds – there are still alternative approaches other than over relying on glyphosate; something which Essex farmer David Lord advocates.

Farming 600ha on the coast, David says he deploys a typically no-till strategy. "That said, we will do some remedial if we get a particularly wet year and have had a really poorly established cover crop, for example.

"In terms of glyphosate usage, I think direct drilling gets a bad reputation. However, we've found the key to avoiding multiple applications is to ensure there's a lot of diversity in the system."

For David, this diversity includes winter and spring cropping, using spring oats, canary seed and Wildfarmed spring wheat. "We don't do second wheats or have oilseed rape anymore. We're probably about 50/50 on our winter to spring cropping ratio now, just to de-risk the system where we can as blackgrass has typically been our biggest issue. Now, grassweeds aren't generally a concern."

As a result, he only uses a maximum of two applications of glyphosate – one to kill cover crops ahead of drilling and then potentially another at or after drilling, depending on the season. "We don't tend to see repeated applications on bare ground, which is where I see the main risk as being. Good glyphosate stewardship is all about attention to detail and looking at the system as a whole, which is very possible to achieve." ■