



techtalk

Getting the best from autumn weed control

The responsible use of herbicides required to control yield and quality robbing weeds is a key component to maintaining the gross margin potential of cereal crops. DuPont plays a pivotal role in helping growers reach that potential and so is keen to support the most recent Tech Talk.



Broader approach to weed control

Some broadleaf weeds are even more competitive than grassweeds. *CPM* finds out how both types can be controlled using the herbicide stack.

By Lucy de la Pasture

When it comes to blackgrass control most growers set out with a clear strategy in mind, using both cultural and chemical controls. Every little addition to overall control helps in reaching the ultimate goal of 97%, which is needed to manage seed return.

With eyes firmly fixed on grassweed control, it's easy to forget that some broadleaf weeds are ranked in the same category as blackgrass when it comes to their

ability to be competitive with the crop. Black bindweed, charlock, common poppy, creeping thistle and scentless mayweed all fall into the same competitive category as blackgrass. While it's a numbers game where the relative importance of weeds is concerned, broadleaf weed control remains an important part of an overall herbicide strategy.

ADAS weed scientist Dr Sarah Cook and DuPont's Alister

McRobbie give some essential advice on weed control strategies.

Why apply an autumn residual herbicide?

Broadleaf and grassweed control go hand-in-hand, with many of the herbicides commonly used as part of the residual herbicide stack for blackgrass control also having some effect on broadleaf weeds.

Weeds emerge at different times and the interaction between weed and crop growth is important, most problems occur when weeds and crops emerge at the same time.

A pre-emergence or early post-emergence autumn herbicide can help get the crop off to a good start by removing potentially competitive weed species while they are still small. Any susceptible weeds that aren't killed outright will be sensitised to subsequent post-emergence herbicide applications.

Many broadleaf weeds are also very susceptible to competition, especially at the early growth stages, and a strongly competitive crop will assist other control measures and may negate the need for a follow-up application in the spring.

Resistance to the pre-emergence herbicides used for grassweed control tends to be only partial and builds up relatively slowly, so they appear to be a lower resistance risk than most post-emergence options.

Which are the target weeds?

Many broadleaf weed species emerge at specific periods of the year. Some tend to be autumn germinators, for example cleavers,



Alister McRobbie says flupyr-sulfuron gives useful control of the increasingly troublesome weeds, wild carrot and bur chervil.

volunteer oilseed rape, cranesbill, parsley piert, poppy, scentless mayweed, ivy-leaved speedwell and charlock, while others emerge in the spring; black bindweed, black nightshade, fat-hen, fools parsley, hemp-nettle, knotgrass, redshank and scarlet pimpernel.

Other weed species germinate in both autumn and spring, including common species such as chickweed, common field-speedwell, field pansy, fumitory, groundsel and shepherd's purse.

Some broadleaf weeds are becoming increasingly problematic on farm, with the umbelliferous weeds, bur chervil (hedge parsley) and wild carrot, increasing and being typically reported not only on sandy soils but also on some heavier soil types. They're a problem because very few control options are available and they're very competitive weeds.

“ Broadleaf and grassweed control go hand-in-hand. ”

What about grassweeds?

Grassweeds are bound to take precedence on most farms, but control strategy should complement broadleaf weed control. The principles are the same, early removal of competition while weeds are small, so consider broadleaf weeds even when the primary target is blackgrass.

Pre-emergence residual herbicides are the most valuable component of a chemical blackgrass control strategy, providing moderate to high levels of efficacy, even against target site (ALS and ACCase) resistant blackgrass.

Resistance to residual herbicides tends to develop slowly relative to



Wild carrot is a competitive weed that's difficult to control.

that for post-emergence herbicides, so even when some enhanced metabolism resistance (EMR) is present, they can still provide useful control.

So while a pre-emergence flufenacet is the keystone to herbicide programmes, adding herbicides with different modes of action to the 'stack' adds a few more percentage points of control.

How do you reduce the weed seed burden?

The foundation of all good weed control is managing the seed-bank. The prevention of seed return is particularly important as most broadleaf weeds produce seeds that are much more persistent than grassweed seeds.

For many broadleaf weed species, there's virtually no opportunity for depleting the seedbank prior to drilling a crop in early or late autumn (see table on p20). These weeds emerge over longer periods, sometimes in autumn but also in spring. Even if good control is achieved, the seeds are persistent and can emerge in future years.

There's a moderate chance in

depleting scentless mayweed, chickweed, Ivy leaf and field speedwells, and field pansy seeds from the seedbank. All have peaks of emergence in the spring and autumn and cultivations help to deplete weed seeds by between 41-62% annually.

A fallow year offers a limited opportunity to deplete the weed seed-bank of many species. Of the broadleaf weeds, this approach gives a moderate chance of reducing cleaver seeds as they have a shorter persistence than other weeds (2-3 years) and a peak germination period in Oct and Nov.

Two species of broadleaf weeds, poppy and fat hen, are difficult to deplete, even after a full year of fallow. These species have a very high level of seed production and a long persistency, poppy seed surviving for 50 years or longer in the soil.

Cultivations can stimulate emergence and delaying drilling will give time for control of germinated weeds. Repeated cultivations have only been shown to deplete poppy and fat hen populations by 31-32% annually.



Sarah Cook points out that cultivations can be useful to deplete cleaver populations as the seed isn't as long-lived as many broadleaf weeds.

What works best for the pre-em herbicide?

Delayed drilling is a useful tactic for both broadleaf weeds and grassweeds as the number of weeds emerging becomes less as autumn drilling becomes later. The cooler conditions and improved soil moisture that occur later in the autumn period means that residual herbicides also work better.

Firm, moist and clod-free seedbeds are essential to get the best performance from pre-emergence herbicides, where good soil coverage is all important. For many pre-emergence herbicides, cereal seeds need to be covered by ►

FPU critical part of winter barley stack

Growing winter barley is no longer an option for many arable farmers where significant blackgrass populations are encountered, despite the crop's ability to compete, according to Glos-based independent AICC agronomist Jonathan Olver.

"Our winter barley acreage has declined significantly and been replaced by spring barley," he says.

"Where we can delay drilling in a wheat crop to good advantage in Oct, agronomically winter barley is far better drilled in late Sept. If aggressive and high populations of blackgrass exist, then it's a far harder job to achieve even adequate control with the limited post-emergence options."

Where Jonathan's clients are still able to grow winter barley without the threat of blackgrass dramatically reducing yield to unsustainable levels, the whole herbicide programme relies on getting maximum efficacy from a stack of actives applied pre-emergence.

"If we've made the decision to grow winter barley then the herbicide strategy has to be incredibly robust and able to deliver at least 95% control. If that's not the case, then spring barley is the only option under those circumstances," he says.

An application of Avadex (triallate) granules followed by either Crystal (flufenacet+ pendimethalin) or Liberator (flufenacet+ DFF), plus Defy (proflumicarb) or Lexus SX (flupyrsulfuron) is essential in order to control blackgrass at a sustainable level that winter barley can happily compete with.

"In those situations where there might only be a slight problem with blackgrass, then this 'belt and braces' approach works very well. For modest levels, then including FPU in the mix can boost control significantly.

"Phytotoxicity can be a real issue with winter barley and that's why the focus is primarily on a pre-emergence

treatment. FPU, of course, must be applied pre-emergence to barley anyway, but if conditions are right, then in combination with flufenacet and DFF the results can be very encouraging."

Jonathan insists on Avadex paving the way for the subsequent pre-emergence herbicide. FPU then complements the mix, being kinder to the crop overall than perhaps other herbicides that can be used in the same application slot.

Coupled with the blackgrass control FPU offers, he also highlights the benefits of dealing with populations of broadleaf weeds, such as volunteer OSR and cranesbill, and the way FPU complements the spectrum offered by DFF and PDM.

"Effective control early on in the crop's life is key to achieving target yield," he adds. "Post-emergence control is unfortunately no longer a viable option and if we can suppress the emerging weeds successfully, both



Jonathan Olver is employing a robust approach to weed control to keep winter barley a viable option where blackgrass is a problem.

blackgrass and broadleaf weeds, then we have a chance of success.

"FPU is integral to that success and in winter barley, it's a far easier decision to make than in the wheat crop. You could say it's a 'no brainer'. Having said that, I rigorously monitor crops for signs of an increase in the blackgrass population and if the criteria are met, then I advise growers still wanting to grow barley to switch to spring drilling."

Strategies to deplete the broadleaf weed seed-bank

Strategy	<i>Tripleurospermum inodorum</i>	<i>Stellaria media</i>	<i>Veronica hederifolia</i>	<i>Veronica persica</i>	<i>Viola arvensis</i>	<i>Galium aparine</i>	<i>Chenopodium album</i>	<i>Papaver rhoeas</i>
	Scentsless Mayweed	Chickweed	Ivy-leaved speedwell	Field speedwell	Field pansy	Cleavers	Fat hen	Poppy
Covercrop fallow year	Mod	Mod	Mod	Mod	Mod	Mod	Low	Low
Cultivated fallow year	Mod	Mod	Mod	Mod	Mod	Mod	Low	Low
Spring sown after cover crop	Mod	Mod	Mod	Mod	Mod	Low	Low	Low
Spring sown after fallow	Mod	Mod	Mod	Mod	Mod	Low	Low	Low
Late-sown autumn crop	Low	Low	Low	Low	Low	Low	Low	V. Low
Autumn sown crop	Low	Low	Low	Low	Low	V. Low	Low	V. Low
Rate of annual decline (%)	43	48	62	51	41	75	32	31
Periodicity of emergence	All	All	AUT + spr	All	SPR + AUT	spr + AUT	SPR + aut	spr + AUT
Factor promoting germination	light	Light (dark)	unaffected	unaffected	Light?	unaffected	(light)	light
Primary dormancy	none	a little	yes	unknown	yes	some	variable	yes
Secondary dormancy	transient	some	yes	unknown	unknown	yes	variable	yes
Seed persistence (yrs)	>5	>5	>5	>5	>5	2-3	2-4	>5
Seeds/plant	10000-200000	2500	50-10000	40-100	2500	350	3000-20000	20000
<i>Source: ADAS</i>								

► 32mm of settled soil.

Application is advisable as soon as possible after drilling for best efficacy, avoiding spraying when soil conditions are very dry.

What should you add to the stack?

With its efficacy being little affected by resistance, flufenacet is the cornerstone of the herbicide stack, typically giving up to 80% control of blackgrass pre-emergence.

Other residual active ingredients added to the stack, such as flupyrsulfuron (FPU) diflufenican (DFF), flurtamone, pendimethalin, prosulfocarb and tri-allate provide additional levels of control to the flufenacet base. FPU consistently adds 15-20% control to a

flufenacet base in blackgrass programmes, according to results from 78 trials over five years.

FPU also has the advantage of a broad spectrum of activity against broadleaf weeds, including difficult to control species such as wild carrot and bur chervil (see table below) at 20g/ha and when weeds are small. For wild carrot control, FPU plus DFF is more effective than FPU used alone.

DuPont trials have shown that when Avadex and FPU are used pre-emergence of the blackgrass, FPU dramatically reduces the variability of control which is seen with Avadex when used alone. The use of several herbicides with different modes of action is useful

for resistance management, as well as improving the spectrum of weed control.

What about spring weed control and sequencing SU's?

Follow-up spring weed control may be necessary where autumn-treated weeds haven't been fully controlled or new weeds have emerged. The herbicide selected will be dependent on the species of weeds present in the spring, but is often based around a sulfonylurea (SU) urea herbicide.

Generally, only two applications of SU herbicides are allowed and sequencing restrictions are dependent on individual product

labels and tank-mixes. For the most up-to-date information check the DuPont ALS-sequence app for legality before applying. ■

Getting the best from autumn weed control: top tips

- **Apply pre-emergence** – FPU can add 15-20% to flufenacet for blackgrass control.
- **Use different modes of action** – to reduce selection pressure for resistance to herbicides.
- **Consider broadleaf weeds** – FPU offers a broad spectrum of weed control, including difficult to control weeds.

Sponsor message

The challenge in keeping on top of blackgrass plus troublesome autumn broadleaf weeds is to make best use of the tools available in your chemical armoury. Drawing on most recent research and practical field experience, the inclusion of FPU in an autumn programme serves as a cost-effective boost to blackgrass control pre-emergence, and removes the majority of broadleaf weeds including cranesbill, mayweed, volunteer oilseed rape, charlock, bur chervil, groundsel and chickweed.

Full broadleaf weed spectrum for FPU

Broadleaf weed	Susceptibility	Broadleaf weed	Susceptibility
Black bindweed	MS to 6TL	Mayweeds	S to 6TL
Charlock	S to 6TL	Nippewort	MS to 6TL
Common chickweed	S to 2TL/MS to 6TL	Pale persicaria	MS to 6TL
Mouse-eared chickweed	S to 6TL	Parsley piert	MS to 6TL
Cranesbill	S to 6TL	Poppy	MS to 6TL
Dead nettle, red	S Pre-em	Redshank	MS to 6TL
Dead nettle, henbit	MS to 6TL	Runch	MS to 6TL
Docks	MS seedling	Shepherd's needle	MS to 6TL
Fat hen	S to 6TL	Shepherd's purse	S to 6TL
Field pennycress	S to 6TL	Small nettle	MS to 6TL
Fools parsley	MS to 6TL	Sow thistle	Aerial growth to 6TL
Forget me not	S to 6TL	Venus looking glass	S to 6TL
Groundsel	S to 6TL	Vol sugar beet	MS to 6TL
Hemp nettle	MS to 6TL	Vol OSR	S to 6TL
Knotgrass	MS to 6TL	Wild carrot	MS to 6TL

Weeds in red are also controlled pre-emergence

Source: DuPont

Spray application technique can have a dramatic effect on the performance of residual grassweed herbicides

Pre-emergence and post-emergence residuals play a vital role on many farms. They can take the pressure off contact graminicides, which are often struggling to cope with rising resistance.

With bills approaching £100/ha on some farms for residual herbicides alone, growers need to maximise the best possible performance from their chemistry. Coverage is vital to get the best performance from residual herbicides.

To achieve this, we need to combine higher water volumes and lots of droplets and this can be difficult to achieve together. In order to achieve higher water volumes, traditionally we would switch to a nozzle with a larger orifice which would increase water volume, but also increase droplet size.

There are 64 times as many droplets using a fine spray with a droplet diameter of 100 microns than a coarse one with diameters of 400 microns for the same volume of water. For best performance it is vital to retain a smaller droplet size as

well as higher water volume for optimal coverage. There are several ways to achieve both of these simultaneously.

Slowing down forward speed is a simple way to increase water volumes and maintain a smaller droplet size. Whilst this may not be a popular move, it is something that should be considered for difficult grassweed fields.

Using twin lines with the front line angled 30 degrees forward and the back line straight down has been a successful way of achieving best coverage in Agrovista's application development work in the past. This allows higher water volumes without having to increase droplet size and brings in lateral movement to spray droplets, significantly improving coverage.

A twin cap on each turret can replicate twin line performance for sprayers without twin line capability. As with the twin line set-up, the front nozzle should be angled 30 degrees forward and the back nozzle angled straight down.

The best results for a number of seasons have been with flat fan nozzles angled forwards and down using either twin lines or twin caps. Using blue 03 nozzles at 3 bar angled forward 30 degrees and straight down in the same turret allows double the water volume whilst maintaining and not compromising spray quality. At 9.6kph that would deliver 300litres per hectare (150 forward & 150 down), and this has consistently produced optimum results.

The following photos show the difference between the best and worst performances from the same product, applied to the same field on the same day using traditional farm equipment, boom heights and forward speeds:

Where 300 l/ha is impractical, the same configuration at 14.4kph forward speed would deliver approx. 200 l/ha (100 forward & 100 straight down). Whilst this performance is not as good as the higher water volume, it has consistently been the next best and significantly better than air inclusion nozzles.

To complement smaller spray droplets, the closer the nozzle is to the target (while still achieving the correct spray pattern) the better the performance is going to be.

Most spray booms are being carried too high, compromising efficacy and leading to excessive drift. The ideal is to reduce your boom height to around 50cm above the target.

Whilst air inclusion nozzles are very popular and can potentially bring in extra spray days, the performance has been consistently poorer than flat fans. Like with flat fans however, the performance of air inclusion nozzles can be improved significantly by using application aids such as Remix.

Trooper 2 l/ha + Herold 0.3 l/ha applied on same day to same field



Twin cap delivering 300 l/ha total



Air Inclusion nozzle 150 l/ha