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Technical Grassweed control

Though a number of crop protection products have come and gone from the market over the past 60 years, Avadex has remained a constant feature. *CPM* takes a look at the lifetime of the product and the ever-changing weed picture.

By Charlotte Cunningham.

1961 — the year that saw the demise of the farthing as legal tender, Yuri Gagarin became the first man in space, and also the launch of the residual herbicide, Avadex.

Launched first as a diallate, followed soon after as its triallate formulation it's become known for, Avadex has arguably been a staple product in the crop protection armoury for many years, and its performance — to date — hasn't faltered, says Barrie Hunt, UK and Ireland technical manager at Gowan. "There can't be many examples of a herbicide which has stayed approved for 60 years."

Looking back on its history, 1954 marked the discovery of the herbicidal properties of the '-allate' thiocarbamate chemical family, which soon expanded to include diallate and triallate, explains Barrie. "In 1960, the first Avadex UK trials were carried out by Boots on behalf of Monsanto. A year later in 1961, Avadex launched in the UK as a new wild

Time after time

oat herbicide for cereals and sugar beet. It was a brand-new herbicide launched as a liquid formulation, applied pre-emergence of crop and weeds. If there was a downside, it was that it required incorporating immediately after application."

This challenge was addressed and Avadex BW 10G (10% triallate) — a microgranule formula — was introduced to the market. "This marked a major breakthrough as it solved the challenge of having to incorporate the product," explains Barrie.

Research and development

The research and development of the product continued through the 1970s and 1980s, and in 1994 Avadex Excel 15G (15% triallate) was launched. "This was a more concentrated, precision formulation which reduced handling and logistic issues seen in the previous versions, he adds. "In fact, we saw the application rate go down from 22.5kg/ha with 10G down to 15kg/ha with the new 15G — which made a huge difference to both farmers and distributors. Even today, this remains our key product, applied through specialist applicators."

Ten years later, Gowan purchased Avadex from Monsanto. "At the time, Gowan's focus was really on the opportunity presented by blackgrass but also the rise of integrated weed management — and the potential for Avadex in that slot," adds Barrie.

Gowan continued the development of the product and were finally able to crack those initial Avadex challenges — launching Avadex Factor in 2016, a liquid formulation which didn't need incorporating. "It wasn't just a case of putting a new product out to

market, the launch of Avadex Factor marked an end to a major formulation challenge, whereby growers could apply a liquid which didn't require any additional input," he notes. "It required the use of novel technology to create a specialist encapsulated formulation so that the capsules released the product into the soil to mimic the behaviour of the granule formula.

"This allowed for a wider adoption of Avadex, specifically by users who didn't have access to their own microgranule applicator or a contractor who had one."

Not only has the product itself evolved over that time, but so has the usage, continues Barrie. "In the 1960s, we saw Avadex taking off — which was really the era of widescale herbicide adoption across the board.

"But around the late 1970s, this dipped



The launch of Avadex BW 10G was a major breakthrough as it solved the challenge of having to incorporate the product, explains Barrie Hunt.

back slightly following the introduction of post-emergence wild oat herbicides. Understandably, at the time the reality was why would growers fuff about trying to incorporate a product when a simpler option was available.”

However, the rise of wild oat resistance and the spread of blackgrass meant the popularity of post-emerges were short-lived, with many growers reverting back to Avadex once again, explains Barrie.

Avadex usage faced challenge in the early 2000s, following the launch of flufenacet and Atlantis (mesosulfuron+ iodosulfuron). “This suddenly put control back in the hands of growers, giving them the ability to control blackgrass post-em, but also gave growers a different method of application — which didn’t require a microgranule applicator, or incorporation.”

What happened next needs no real explanation, leaving products like Avadex the last



In 1961 Avadex launched in the UK as a new wild oat herbicide for cereals and sugar beet.

effective man standing — coinciding with a rise in blackgrass resistance and a greater focus on integrated weed management, an area where the product slotted in perfectly, adds Barrie.

Fast forward to today, and against all odds, Avadex is still providing effective activity against wild oats in particular — with just two cases of resistance logged across the products’ entire lifespan. “This is despite resistance noted in other modes of actions and products. Namely this includes ACCase-inhibitors (A/1), ALS-inhibitors (B/2) and antimicrotubule mitotic disrupters — across both winter wild oats (*Avena sterilis* ssp. *ludoviciana*) and spring or common wild oats (*Avena fatua*).

“One of the reasons triallate is relatively low risk is because it’s a multi-site or multi-enzyme herbicide active against a range of very long chain fatty acid ▶



Gowan purchased Avadex from Monsanto in 2004, with the aim of using the product as part of an integrated weed management strategy.

Avadex – how it works

Avadex’s mode of action is inhibiting the synthesis of very long chain fatty acids, e.g. fats and waxes.

Specifically, triallate is believed to interfere with the activity of a range of lipid elongation enzymes. Because triallate acts against a range of these enzymes, it’s considered to be a multi-site herbicide.

“This multi-site activity is in contrast to the majority of herbicide groups which target a single

enzyme,” explains Barrie. “Like fungicide chemistry, this is valuable in resistance management.”

In terms of its site of action, triallate only enters the grassweed through the coleoptile where it inhibits seedling development. “It usually kills the germinating seedling so that it never emergences through the soil,” he adds. “The important thing to remember is that once the leaf is up and out, it’s too late for triallate.”



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Grassweed control



Avadex is still providing effective activity against wild oats – with just two cases of resistance logged across the products entire lifespan.

► elongation enzymes. Target-site resistance is highly unlikely as so many elongation enzyme mutations would need to occur in the target weeds to stop the product working. However, like many pre-emergence herbicides, the threat of enhanced metabolism resistance is always a concern.”

For wild oat control Avadex continues to prove its power. “Across 47 trials, Avadex 15G has given a mean wild oat control of 92.7% across both spring and winter cereals,” explains Barrie. “Meanwhile, Avadex Factor across 11 trials delivered average control of 84.5%.”

Bringing focus to today's challenges, Avadex remains an incredibly useful tool for

controlling wild oats and managing blackgrass — as well as other bromes and ryegrasses.

Common wild oats themselves have been around for almost as long as agriculture, however, the nature of the weed has evolved over that time, explains NIAB's John Cussans. “Winter wild oats are much more of a recent problem. The first UK reports of species was in 1910.”

Fast forward to today and the UK has just come out of a really terrible year for wild oats, he adds. “Primarily what seems to be happening in the field is that the *A. fatua* type — those really late emerging spring oats — are resurgent, along with difficult conditions which make control a challenge.

“When it's cold and dry and you don't have active growth from the weed, you're in this situation. You've got an application window on the basis of the weed size you want to hit — but you don't have weed growth. So we've had an awful lot of control failure — not because of resistance but due to poor conditions and late germination.”

But winter wild oats are becoming an increasing issue too. “In a 2019 survey, 30% of all wild oat populations were found to contain the ludo type,” explains John. “In the central band across England, it was in well over 50% of the samples.

“Where it occurs, the winter wild oat is reported to be more of a growing problem than spring wild oats. It seems that winter wild oats are associated with winter cereals, but the common/spring wild oat is seen



In a 2019 survey, 30% of all wild oat populations were found to contain the 'ludo' type, explains John Cussans.

more within diverse rotations with spring cropping.

“That said, it's an association and not a requirement and as such, the ‘winter’ and ‘spring’ common names need to be treated with caution. Spring wild oats can occur and thrive in winter cropping, and winter wild oats can equally be found in spring crops.”

So the challenge is clear, but alongside the use of something like Avadex — what else can growers do to manage the growing weed burden?

“The key things here are no-till, fallow and non-cropped periods,” explains John. “Then there's biosecurity to consider — particularly around the spread of the winter type. Crop competition also has a roll to play. These factors together form that essential integrated weed management approach.”

John explains that wild oats are one of the few weed seeds that are actively predated by granivores, and data has shown that due to seed predation, germination and fungal attack, huge reductions in viable seeds can result from leaving wild oat seeds on the soil surface. “Conversely, cultivation soon after harvest will increase wild oats in following crops.

“As well as this, wild oat seeds can emerge from much deeper than other weeds — such as blackgrass — so effective cultivations to bury seeds need to be deep and ideally use inversion.”

In terms of biosecurity, although the majority of wild oat seed is shed pre-harvest, combining is a major cause of seed movement — both within fields and potentially in field, he adds. “Studies have shown a greater than 142m spread of wild oat seeds by a combine.

“What's more, any farm-saved seed also needs to be free from wild oat seeds to prevent this spread further.” ■

Getting the most from Avadex.

To maximise control with Avadex Excel 15G, there are a few important practical measures to consider, says Barrie.

“Firstly, we always promote Avadex as part of an integrated weed control programme,” he notes. “From a practical point of view, it's essential to consolidate loose puffy seedbeds before drilling and to make sure drilling depth is correct. Remember, for wheat this should be 4cm.”

It's also vital to apply within 48hrs of drilling, he adds. “With regards to the applicator, be sure to check the ‘pipe work’, deflector plates and calibration regularly.

“Specifically, keep the deflector plates clean and at the right angle. As a side note, Avadex Excel 15G can be applied during the frost, light snow or rain provided the deflector/spreader plates can be cleaned.”

When it comes to what not to do, applying pre-em to very cloddy seedbeds is top of the list, adds Barrie. “We also advise not applying



to soils with more than 10% organic matter or consolidating after application if seed depth is likely to be affected.

“Remember to also consider the weather — if it's too windy to spray, it's too windy to apply granules.”

From a rotational point of view, it sounds obvious, but Barrie stresses the importance of not undersowing grass species — or sowing oats/grass — within one year of applying Avadex Excel 15G. “Remember, some cover crops include oats.”