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MAGAZINE

SPRAYING SUPPLEMENT

ADJUVANT TECHNOLOGY



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MINIMISES PRESSURE. MAXIMISES PERFORMANCE.

ACROSS THE ENTIRE SPRAYING OPERATION



“Flexibility is key when it comes to crop protection, and that’s what Kantor[®] gives us – extra flexibility when conditions challenge the performance of our programme.”

Luke Medd, Partner,
N Medd and Son, County Durham

UNIQUELY VERSATILE, ONLY KANTOR[®] GIVES YOU THE FLEXIBILITY FOR SUCCESS

The go-to-adjuvant for tank-mix recovery and complex tank-mixing in a single pass, Kantor[®] improves the efficiency and effectiveness of all products in your tank.

Improved rainfastness and valuable drift reduction extends the spray window for chemical application, keeping you spraying in challenging weather conditions.

Enhanced coverage across plants leads to more effective and targeted control, whilst unique penetrative power helps active ingredients get to work faster, increasing the efficacy of your spray mix.



Sarah Ferrie,
Marketing Manager,
Interagro

A WORD FROM THE EDITOR

It’s no secret that agriculture finds itself in both an exciting and challenging era.

For several years now, getting more from less has been the theme – whether that be land, capital or crop production and protection products – challenging many to think creatively about how they approach operations and decision-making.

When it comes to chemistry, this has pushed partner products like adjuvants into the spotlight – which have long been aids to growers to help optimise efficiency in the spray tank.

When used correctly, adjuvants have the potential to perform a variety of valuable functions – as highlighted in the farmer stories and research trials in the pages that follow.

Not only do these functions – such as enhancing spray coverage and balancing complex tank-mixes – make sense for the bottom line but also form an integral part of the strategy as many farmers seek to move towards a more sustainable way of farming. So much so that work has shown that partnering crop protection sprays with the right adjuvant can add as much as 40% efficacy and over 1t/ha yield in a challenging situation.

This notion of getting more from less is only likely to continue, meaning it’s more important than ever to make use of all the tools in the toolbox – with adjuvants being among those which have the potential to make a huge difference.

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ISSUES AT SPRAYING

Factors that could be reducing your crop protection efficacy through the season

Spraying delays / spray drift

Timely on-target application is crucial for crop protection efficacy, but spray drift is a risk to every application. It can stop you spraying all together, may damage off-targets and risks some spray targets being under-dosed and others over-dosed. Applications most susceptible to drift include:

Pre-emergence herbicides

Can be high risk due to bare soils that release stored heat causing air/spray to rise, and there being no crop to intercept the spray.

Post-emergence herbicides

Most herbicides are applied as a fine-medium quality. The smaller droplets provide better coverage, which is important when the target surface is small, but fine droplets are prone to drift.

Increased forward speed

Can impact boom height and stability. Spray drift doubles when the spray boom is raised from 40cm to 70cm, and again from 70cm to 80cm.

Poor coverage and retention in the soil

For residual herbicides, the target is the soil and making sure it is in position to be taken up by weeds that germinate in that critical top 5cm can be a challenge.

Rain after application

With heavy rainfall after application, a high percentage of residual herbicides can move out of the weed zone. Chemical leaching is particularly problematic with the stacking of residual herbicides late in the autumn, when soils become saturated with prolonged spells of heavy rain.

Lack of moisture after application

At the other end of the spectrum, a lack of moisture and dry conditions can also cause residual herbicides to fail as moisture plays a crucial role in herbicide activation and uptake.

Poor coverage and retention on the plant

Good coverage of plant surfaces is crucial for protectant fungicides and contact herbicides to work effectively. While coarse spray droplets can cause droplet bounce, high surface tension prevents the spreading of droplets on plant surfaces, limiting both coverage and effectiveness.

This is exacerbated when:

- target plants are very waxy e.g. oilseed rape, Fat-Hen.
- target plants have tricky surfaces eg. wheat ears, awns.
- plants have hairy/prickly surfaces e.g. bromes, nettles.
- low water volume spraying.

Alkaline hydrolysis (pesticide breakdown)

The conditions in which you mix your crop protection chemicals can affect their lifespan and absorption into plants. Water may be an essential carrier for your pesticide application, but it can also destroy the active ingredients in your crop protection if its pH is too high. Many products undergo a chemical reaction known as alkaline hydrolysis in water. The more alkaline the water, the faster the breakdown, reducing absorption into plants.

Effect of pH on rate of active ingredient breakdown

Pesticide active ingredients	Optimum pH	pH 8-9	pH 6-8	pH 4-6
Azoxystrobin (f)	6			
Beta-cyfluthrin (i)	7			
Clethodim (h)	6			
Cypermethrin (i)	4			
Dicamba (h)	5.5			
Dimethomorph (f)	6			
Ethephon (pgr)	5			
Fenoxaprop (h)	7			
Gibberelic acid (pgr)	6			
Glyphosate (h)	5			
Indoxacarb (i)	7			
Mancozeb (f)	7			
Metsulfuron-methyl (h)	7			
Spinosad (i)	7			
Thifensulfuron-methyl (h)	7			
Tribenuron-methyl (h)	7			
Trinexapac-ethyl (pgr)	7			

(f) = fungicides
(i) = insecticide
(g) = herbicide
(pgr) = plant growth regulator

Slow breakdown
Moderate breakdown
Rapid breakdown

Incompatible tank-mixes

Short spray windows and heavy workloads often lead to big, complex tank-mixes. While tank-mixing can improve efficiency of spray programmes, an incompatible mix can cause antagonism and actually reduce efficacy in the field. Water is not a great carrier for agricultural chemicals. As a charged polar molecule, variability in water temperature and quality can affect how well products dissolve into it.

Common causes of incompatibility:

- Large number of products added to the tank – more than three increases the risk.
- Product formulation – some formulations do not mix well e.g. wettable powders, emulsifiable concentrates, and salt formulations.
- Mixing conditions including low water volumes, high pH, hardness, and low water temperature.

Insufficient uptake into plants

Effective uptake and distribution within plants is crucial for the efficacy of curative fungicides, contact herbicides and plant growth regulators. The waxy cuticle on the upper and lower surfaces of plants is the biggest barrier the active ingredients in crop protection have to work against. As plants grow, it becomes thicker and tougher to penetrate, which can be disastrous if you're facing spraying delays. Uptake also slows in cold conditions. Active ingredients with high water solubility struggle to penetrate plant cuticles - some typical examples shown in the table (right).

Source: Pesticide Properties Database, University of Hertfordshire.
* Interpretation: <50 = Low; 50-500 = Moderate; >500 = High

Active ingredients	Solubility in water at 20°C (mg/l ¹)	*Interpretation
Aminopyralid	2,480	High
Bentazone	7,112	High
Bromoxynil	38,000	High
Clethodim	5,450	High
Clopyralid	7,850	High
Halauxifen-methyl	1,830	High
Imazamox	625,000	High
Iodosulfuron-methyl-sodium	25,000	High
Mecoprop-P	250,000	High
Mesotrione	1,500	High
Metamitron	1,770	High
Metoachlor	530	High
Nicosulfuron	7,500	High
Rimsulfuron	7,300	High
Prosulfuron	4,000	High
Pyroxulam	3,200	High
Metsulfuron-methyl	2,790	High
Tribenuron-methyl	2,483	High

ADJUVANT SOLUTIONS

The right tank-mix adjuvant can help maximise success



Vital components or expensive extras? The use of adjuvants dates back to the 70s. But despite their long heritage, adjuvants are sometimes dismissed as “muck and magic” – regardless of the fact that the right adjuvant when used correctly, can be an incredibly beneficial partner in the crop protection programme.

Tank-mix versus built-in adjuvants

As many crop protection products contain some degree of adjuvant system built-in to their formulation, you may be questioning why you should even consider adding a tank-mix adjuvant to your applications. Why would you need more?

Built-in adjuvancy will no doubt help improve the coverage of your spray mix across target plants, but only tank-mix adjuvants can reduce surface water tension on the leaf sufficiently for optimal spreading – because their application rate is based on water volume, whereas pesticides are applied rate/ha.

What's more, tank-mix adjuvants can offer way more than just improved coverage. They can provide a wide variety of benefits from stabilising and mixing your pesticides in the spray tank, to improving the targeting of your spray application and helping it to reach its intended target.

No one adjuvant can perform all the functions to the degree you might need it in every crop, but effective adjuvant components are often combined at different strengths and available in pre-packaged products for specific crop uses. The trick is to select the right adjuvant for the right situation.

Selecting the right adjuvant and getting the best results comes down to a sound understanding of how adjuvants work and what challenges specific types of products can address.

As such, spray adjuvants can largely be divided into two categories – activator adjuvants and special purpose adjuvants – each with different purposes.

Activator adjuvants

Consist of surfactants and oils. Also known as “surface acting agents,” surfactants physically change the properties of the spray solution. They can help a pesticide's ability to emulsify in the tank, and spread and stick on the target. Oils help increase penetration through leaf cuticles and improve spreading across the leaf.

Special Purpose Adjuvants

Buffering agents, compatibility agents and anti-drift agents. Buffering agents are used to lower pH. Compatibility agents are used to help pesticide products and other components in the tank, mix thoroughly together and remain in homogenous solution. Some adjuvants may have a built-in anti-drift aid.

So how can these adjuvant functions help?

Buffering pH stabilises products in the tank

You might not realise it, but many of the crop protection products you will be applying to your fields are susceptible to alkaline hydrolysis – breakdown in high pH water. You could lose up to 50% of your pesticide's efficacy.

Adjuvants that contain a buffering agent lower the pH of the water, preventing alkaline hydrolysis. As most spray water in England is typically alkaline, using an adjuvant that lowers pH to a pre-determined level is a good

idea. This way you can create the pH that is most stable for your spray mixture so it remains stable and active in the spray tank, and can perform to its maximum potential in the field.

As a general rule of thumb, because you will likely be adding numerous products to the spray tank, it is worth keeping spray water around pH6-7 to create the most stable environment for your mixture. This can be achieved using an adjuvant such as Kantor.

Glyphosate however, is most stable at pH5 and therefore will require a specific glyphosate water conditioner such as Volta-Ego that can make the water more acidic.

Emulsifying the mix improves tank-mix compatibility

Adjuvants such as Kantor that contain a compatibility agent, aid emulsification (the mixing of two or more products that are normally immiscible) to help reduce/eliminate physical incompatibility. They help multiple products of a tank-mix to thoroughly mix together and remain thermodynamically stable in the spray tank. With more of your pesticide active ingredients and nutrition in solution, more of it will be absorbed by your target plants in the field, instead of sat in the bottom of your spray tank/blocking nozzles.

Manipulating droplet size optimises coverage

Some adjuvants contain anti-drift agents that help reduce spray drift and keep your spray mix on target. They do this by changing the viscosity of the liquid, which manipulates droplet size. Ultimately, they bind the ultra-small droplets together, reducing the number of fine spray droplets smaller than 100 microns susceptible to drift, and reduce the number of very coarse droplets which are prone to bounce. The result is a droplet with a more uniform spray angle at the nozzle that can hit the target better.

Reducing surface tension increases coverage and retention

Adjuvants which contain surfactants or oils reduce surface tension between the spray liquid and the plant surface, so your spray solution can spread out properly. As explained earlier, this is crucial for coverage and retention to be maximised, on which contact herbicides and protectant fungicides depend. In fact, improving coverage and retention are key requirements for most sprays you will apply if you want better weed and disease control.

Increasing penetration through leaf cuticles improves uptake

As the leaf cuticle is the biggest barrier to crop protection sprays, adjuvants that can improve penetration into the leaf, have a lot to offer.

In fact, many post-emergence herbicides need an adjuvant for optimal uptake – active ingredients with high water solubility struggle to penetrate (waxy) leaf cuticles because oil and water do not mix. Active ingredients with low water solubility – most fungicides – can permeate plant cuticles relatively easily in good conditions, but you can increase entry speed with the right adjuvant.

Increasing herbicide retention in the top 5cm increases residual activity

Residual herbicides typically have a limited lifespan in the soil, and their effectiveness can diminish over time due to factors like degradation or movement. Some adjuvants like Backrow Max can help extend the residual activity of herbicides by reducing their breakdown or enhancing their binding [to soil particles. This prolongs the weed control period, reducing the need for frequent herbicide applications.

How to select the right tank-mix adjuvant

1

Always read the pesticide label. Advice may be given that must be followed on what type of adjuvant to use/avoid.

2

Always buy reputable products produced by a trusted manufacturer. Whilst adjuvant manufacturers may offer many of the same functions, product quality and adjuvant technology varies dramatically. Check there is data and evidence to back up any claims.

3

Using an adjuvant is not always necessary. Think about your target, the pesticides you are applying and what they need to do and weaknesses they have. In good conditions, you may not need an adjuvant and you might therefore not see a benefit. On the other hand, there may be weaknesses in your spray preparation, application and delivery that can be improved.

4

Although different adjuvants can perform a variety of different functions and significantly improve pesticide performance, no one adjuvant can perform every function for every situation. Make sure you have a good knowledge of the adjuvant you are using and it's the right one for the job.

5

Finally, do a small test on your farm. You won't know unless you take the leap to find out.



TOOLS FOR SUSTAINABILITY



In a quest to achieve long-term sustainability, deploying a range of techniques – from precision farming to using adjuvants – is proving to be key for one Lincolnshire grower.

Over the past 13 years, Peter Cartwright has taken the arable enterprise at the Revesby Estate in Lincolnshire from a heavily tilled operation to one that is now almost exclusively based on direct drilling – as well as dramatically changing the rotation, with the aim of improving the overall sustainability of the business.

And he's not stopping there. Having already cut insecticides from the wheat and bean crops, Peter is working with his long-standing agronomist, Richard Butler of Agrii, to seek further efficiencies.

Starting with the rotation, knowing milling specification is difficult to achieve without high quantities of nitrogen, wheat is now grown mostly for feed. "Nitrogen is the biggest carbon input on the farm, so I'm keen to reduce it," says Peter. "Yields are heading towards 10t/ha with our feed wheat – so we're producing a good 'barn-filler' without the need for much nitrogen."

He adds that they have also put N-sensors in the ground to better understand what nitrogen is available and therefore help them to make better decisions about applications.

The rest of the rotation, which spans across 1,200ha, comprises spring barley, oilseed rape, winter and spring beans, spring oats, sugar beet and cover crops.

"Beans are grown for seed and the oats for milling," explains Peter. "We also do a bit of malting barley after late-lifted sugar beet."

"Beet is a useful break crop for us, and it's only grown on land that suits it. It also yields well – we achieved 74 t/ha in 2023."

In terms of establishment, 95% of crops are established via direct drilling, having transitioned away from a traditional plough-based system. As well as the cost and

carbon-saving benefits this has brought, Peter says it's also advantageous for the soils, creating a more resilient structure which improves crop production.

The change in establishment techniques has proved beneficial in reducing the black-grass problem on farm too. "Being flat land, below sea level, we've been heavily burdened by black-grass," explains Peter. "However, by employing cultural controls and optimising the performance of chemistry, the once hay-like fields have been brought back to manageable levels."

Keen to achieve the highest level of control



possible, the Revesby Estate is the host farm for Agrii's mid-Lincolnshire Technology Centre – a decision driven by Peter's keen interest in trials and desire to understand what's working and delivering value and what isn't.

Working with Richard, Peter has based his approach around five key steps. "No disturbance direct drilling has been the first step, followed by trials with varieties rated for their black-grass control, to help select the most vigorous options," he explains.

"We then looked at seed rates and found 450 seeds/sqm to be optimal. We did try as high as 750 seeds in spring wheat and while, yes it outcompeted the black-grass, the cost of the seed was too high."

At the other end of the spectrum, Peter says that at 250 seeds/sqm the black-grass was "horrendous".

The fourth step of the plan involved altering drilling date. "We opted to delay the drilling of winter crops until mid-October. Now, we let the flush of black-grass come through and then spray it all off to keep weed levels to a minimum."

The final part of the approach is herbicide choice, which includes optimising performance with an adjuvant, to help Peter achieve near to 100% control.

"As a base, we apply Liberator (flufenacet + diflufenican) and Bandur (aclonifen) at pre-emergence and top up the flufenacet peri-emergence," explains Peter. "The next step up is to use Luxinum Plus (cinmethylin) and Pontos (flufenacet + picolinafen), but with everything we include Backrow Max in the mix to optimise the application itself and the performance of the application."

"It also gives valuable drift reduction which extends the spray window, particularly during catchy weather. Holding the herbicide longer in the weed germination zone is also a key driver for using Backrow Max, and combined, this all helps us deliver on those crucial percentage gains."

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Backrow Max is a specialist residual herbicide adjuvant that can be applied with pre- and peri-emergence tank mixes to maximise performance in all weather conditions. It does this by optimising herbicide droplet size and binding to clay particles in the soil, meaning that both coverage and longevity is maximised.

The drift-reducing benefits delivered by Backrow Max came into their own this autumn with Storm Babet, notes Peter. "It was a season of relentless rain and catchy weather, making it more important than ever to keep on top of the black-grass and ensure herbicides kept working in the weed zone for as long as possible."

Looking to the future, nothing is set in stone and Peter says he isn't one to make sudden changes. "Everything is about trialling, measuring, refining and even going back to the drawing board if needed."

One thing he is planning to do next year, however, is to use Rhiza to help look at the long-term plan to reduce inputs – mainly nutrition and crop protection. "I really want to tear up the rule book on T1 and T2 and I'm going to use Rhiza to help plan treatments based on when disease is likely to come in," says Peter. "The hope is that we may be able to treat once and then top up the potency with an adjuvant like Kantor, for example."

"I also want to investigate the trace element side of things with adjuvants and see if they can help optimise adhesion and uptake. At the moment, we apply magnesium and manganese every time we go through the crop in season as have low magnesium soils, so I'm keen to see what else we can do."

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Peter Cartwright, Farm Manager, Revesby Estate, Boston



BACK UP WITH BACKROW MAX®



Stuart Sutherland,
Technical Manager,
Interagro



With residual herbicide performance at risk from unpredictable weather and challenging application conditions, incorporating an adjuvant into the mix can be a valuable tool within the IPM strategy to help optimise pre-emergence performance and minimise resistance.

Keeping weeds like black-grass at bay can feel like a never-ending battle, and with herbicide efficacy having declined over recent years, many growers have turned to cultural control options like delayed drilling, as well as alternative options like adjuvants to get the most from what chemistry they do have access to.

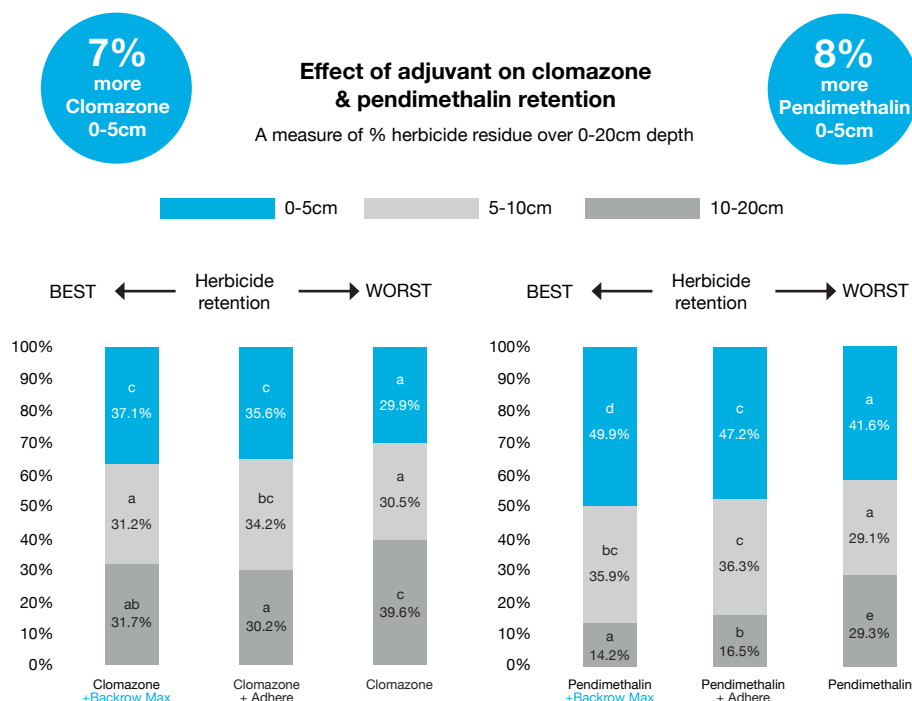
Among the adjuvant offerings is Interagro's Backrow Max – a specialist residual herbicide adjuvant that can be incorporated into the pre- and peri-emergence tank-mix to maximise performance – in all conditions.

“It not only enhances herbicide coverage across the soil, it also works to consistently maintain a ‘lethal dose’ of active herbicide in the weed germination zone, more effectively than any other residual herbicide adjuvant tested in the market, maximising crop safety and efficacy in adversely wet conditions,” explains Stuart Sutherland, technical manager at Interagro.

Top-performing retention in wet conditions

Research conducted by the Institute of Soil Science and Plant Cultivation in Poland in 2021 and 2022 showed that adjuvants vary greatly in their influence on herbicide retention, with Backrow Max securing the greatest retention in the top 5cm of the soil compared with three competitor adjuvants at their recommended rates, including one of the newer adjuvants, Adhere.

“The research was interesting because it confirms observations in the field, that even active ingredients like pendimethalin can move following heavy rainfall after application. Inclusion of Backrow Max slowed movement significantly,” explains Stuart, with an additional 8% retained in the top 5cm of the soil.



Institute of Soil Science and Plant Cultivation National Research Institute in Wroclaw. Prepared by Prof. Mariusz Kucharski. 2022. Different letters signify statistically significant difference between treatments. All treatments applied at their recommended rates.

Benefits latest chemistry

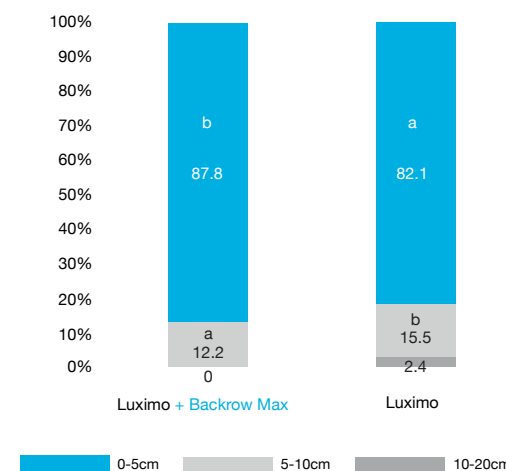
The Institute conducted further studies in 2023, this time with new herbicide active cinmethylin, continues Stuart, and found similar benefits, with Backrow Max retaining significantly more of the herbicide in the upper soil profile.

“The point being, that all residual herbicides have the potential to move – adding the right adjuvant can add valuable efficacy benefits.”

Stronger retention with Luximo

6% more Luximo 0-5cm

A measure of % Luximo residue over 0-20cm depth



Institute of Soil Science and Plant Cultivation National Research Institute in Wroclaw. Prepared by the Prof. Mariusz Kucharski. 2023. Different letters signify statistically significant difference between treatments. All treatments applied at their recommended rates.

Improved crop safety

As well as better weed control, keeping herbicides in place is also beneficial from a crop and water safety perspective, adds Stuart. “Leaching research conducted in The Netherlands has previously shown that Backrow can reduce chemical leaching by >60%. Given Backrow Max offers even stronger retention in wet soils, it’s the perfect safety net for growers.”

Field trials have also demonstrated benefits in the form of reduced phytotoxicity when Backrow Max is added to the tank, both with Luximo and with Avadex Factor in trials carried out at Stow Longa looking specifically at the crop safety benefits. “Herbicides with high mobility and low adsorption to soil particles pose the biggest threat to crops and groundwater, particularly in lighter soils,” explains Stuart. “But with heavy rainfall, all herbicides have the potential to move down to the crop seed, risking plant health and establishment.”

In the Avadex Factor trial, researchers compared cultivated and non-cultivated wheat plots, with the crop purposely shallow drilled to increase the likelihood of crop damage from the active. In the non-cultivated, direct drilled trial there was 10% crop damage in the form of chlorosis where Avadex Factor was used alone. When the Backrow Max was included there was zero crop damage and an additional 29 wheat plants/sqm.

In the cultivated trial, the Avadex Factor alone was found to cause 20% damage to the crop but with the Backrow Max, this was avoided – and once again showed no evidence of chlorosis. As a result, there were an additional 11 wheat plants/ sqm.

Winning the weed war

The benefit of all of this is the valuable added efficacy to herbicide activity, meaning growers are able to improve both weed control and reduce seed return. For example, “Trials have shown 12% higher black-grass control with Octavian Met (diflufenican + flufenacet + metribuzin) plus Pontos (flufenacet + picolinafen) in winter wheat, and 4% higher with Luximo,” explains Stuart.

Some of the best results have been seen when applied with Liberator plus Proclus (aclonifen). In this trial, the Backrow Max improved black-grass control by an impressive 22%. It has also been proven to enhance control of ryegrass and brome in winter wheat as well as annual meadow grass in spring barley and broad-leaved weeds in multiple crops.

“We’ve actually found that in dry conditions – which prohibit the movement of residual herbicides into the weed zone – Backrow Max can be as effective as an inch of rain when it comes to improving pre-em performance.” With lots of growers reporting late weed flushes and higher pressures than usual this year, Stuart concludes that any tools which can be used to help keep burdens at bay are a “no brainer”.

“The efficacy and options when it comes to herbicides are ever declining and it is vital to protect what we do have available. Adjuvants play a key role in this and have the potential to make a real difference when it comes to getting the most out of chemistry.”

TAKES WEED CONTROL TO THE MAX COME RAIN OR SHINE



ONLY BACKROW MAX® PUSHES PRE-EM PERFORMANCE TO THE LIMIT

- ✓ Top-performing herbicide retention & therefore residual activity
- ✓ Only adjuvant shown to improve herbicide effectiveness in dry conditions
- ✓ Significantly reduces nitrogen leaching
- ✓ Increases retention of subsequent chemical applications
- ✓ Clean label, better for environment



SCAN ME

Scan the QR code to find out more.

KEEP GOING WITH KANTOR®



Stuart Sutherland,
Technical Manager,
Interagro



Challenging weather, suboptimal spraying conditions and tank-mix incompatibility can all put added pressure on spraying workload, reducing its efficacy over time. Though these stress factors are often out of the hands of growers, incorporating an adjuvant can help reduce the impact.

Getting high performance from crop protection sprays is vital in keeping yield-robbing weeds and diseases at bay. However, there are numerous factors that can threaten this, says Stuart Sutherland, technical manager at Interagro. “The past few years have seen sprayer operators dealt a tough hand, with catchy weather windows and heavy workloads often leading to suboptimal conditions for spraying and efficacy.

“In practice, this might mean big, complex mixes in the spray tank or mixing products in cold water, which can make the operation tricky. With products often added via the induction hopper, the issue is that you may not even know there is a mixing problem until you get blocked nozzles.”

While this can be a big problem, Stuart says there is a simple solution – adding Kantor to the tank. It’s unique adjuvant properties deliver a plethora of benefits, unrivalled by any other adjuvant on the market.

A plethora of benefits

Kantor is an innovative activator and special purpose adjuvant in one, which can buffer spray water to pH 6-7, improve tank-mix compatibility, reduce spray drift, and enhance product effectiveness by increasing coverage, adhesion and penetration across plant surfaces. “In fact, it’s the only one-can adjuvant solution on the market that alleviates risk across the entire spraying operation – from tank-mixing, through to spraying and even down to action on target plants,” notes Stuart. “It’s an extremely versatile product. Kantor gives growers the flexibility for complex tank-mixing in a single pass without the risk of crop damage, can keep you spraying, and improves the efficiency and effectiveness of all products in the tank-mix, including herbicides, fungicides, insecticides, PGRs, and nutrition.

So how is this possible? Looking at its tank-mix compatibility benefits, Stuart explains that Kantor enables this through an emulsification agent in the formulation that helps vital components in the tank to mix together properly, even in cold water.

Where water for spraying has high pH, there are more than three products in the spray mixture – ie multiple active ingredients – or growers are using low water volumes, product mixing becomes even more problematic.

But, adding Kantor to the spray tank before chemistry conditions the water by lowering pH and creates more optimum conditions for the tank-mix.”

Aside from improving stability and compatibility in the spray tank, the improved rainfastness and drift reduction properties of Kantor can help both extend spray windows and keep crop protection where it needs to be for longer. “Kantor enables more precise and targeted applications by significantly reducing the number of <100 micron fine spray droplets which are most susceptible to drift,” explains Stuart. “Crucially, this reduces the risk of off-target damage and environmental contamination, while also providing flexibility in scheduling crop protection applications.”

Kantor also reduces the number of coarse droplets, creating a more optimal droplet size to improve deposition and adhesion to plant surfaces, he adds. “What’s more, Kantor’s ability to reduce surface tension and promote spreading results in better coverage of target plants and leaf layers, leading to more effective treatment overall.”

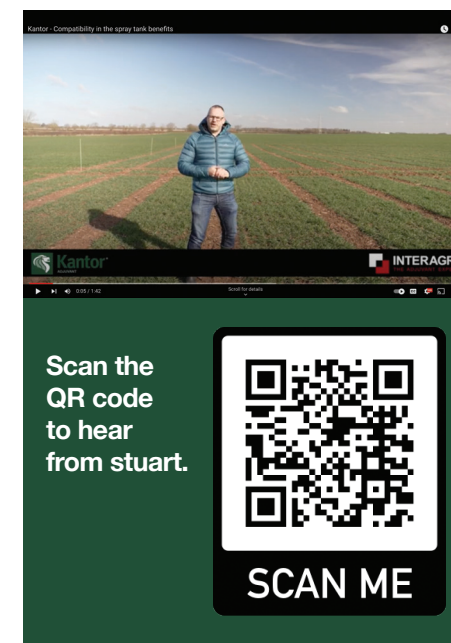
But it’s Kantor’s small molecular size compared to most adjuvants that provide unique penetrating power helping active ingredients get to work faster and help make it so versatile, says Stuart.

Tried, tested, trusted

Easy mixing, improved active ingredient stability

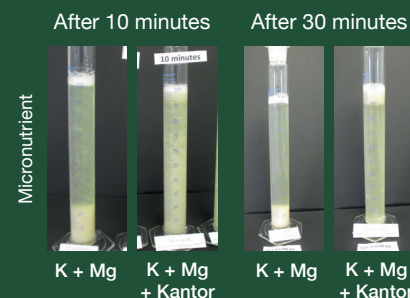
Extensive testing over the years shows adding Kantor to the spray tank before adding chemicals, speeds up the mixing process and helps traditionally incompatible mixtures to blend together.

This is perfectly demonstrated by Stuart in the video, below – scan the QR code.



Trials at Eurofins in 2022 proved Kantor’s ability to aid complex micronutrient mixtures to dissolve and remain in solution – with less flocculation and sedimentation – compared with when the mix was used alone. “This meant that plants were more likely to fully absorb the products,” says Stuart.

Kantor® improved micronutrient mixing



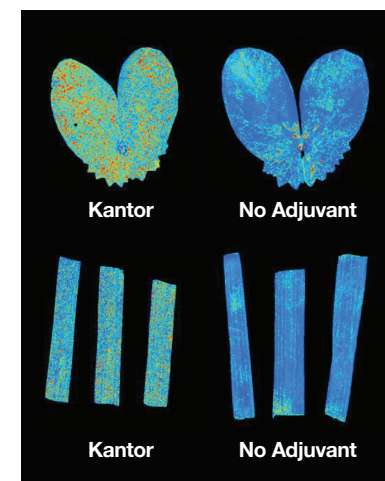
Keeps you spraying

Work at Silsoe Spray Applications Unit has shown Kantor reduces the number of drift droplets, which we hear frequently from growers, is a really noticeable benefit.

Enhanced coverage benefits re-enforced at Rothamsted

The research conducted by CHAP and Rothamsted in 2023 used brilliant blue dye and videometer lab imaging to visualise the impact of Kantor on spray retention and distribution on pea and wheat leaves. The images show Kantor having the greatest positive impact on spray deposition, compared to the tracer and water control treatment.

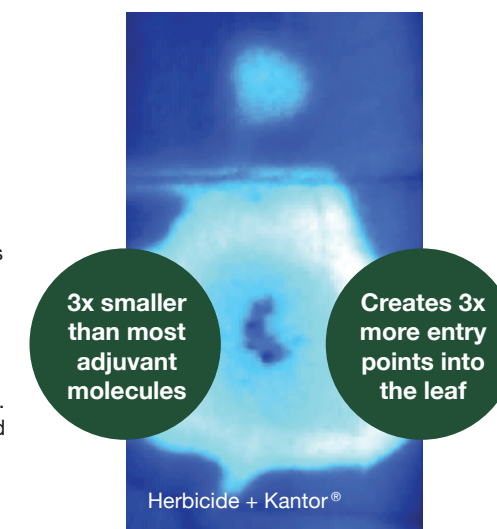
For protectant fungicides, this brings crucial disease benefits, which we are seeing more and more of in trials as varieties break down.



Higher uptake into plants

Kantor’s ability to aid the penetration of active ingredients into plants has too been examined in various studies, including at Wageningen University where researchers used UV tracer dye to look at penetration. They found that Kantor delivered higher concentrations of crop protection to the leaf cuticle – compared with when these products were used alone – resulting in significantly higher uptake into plants.

Adjuvant benefits can sometimes be difficult to see in trials, as products are often applied in optimal conditions with knapsack sprayers. But in this Birds Eye pea trial below, the weed control benefits from adding Kantor to Basagran were clearly obvious.



Herbicide only



Herbicide + Kantor®

Improved herbicide uptake and weed control in peas

Flexibility for success

Looking at how the combined benefits affect the overall plant health picture, trials and farmer feedback show Kantor adds valuable efficacy, benefiting weed, disease and lodging control in a wide range of crops, notes Stuart. "We invest heavily in trials every year – you can download our new Kantor booklet by scanning the QR code below to see some of the latest results."

"In trials looking at septoria infection in winter wheat, Kantor has significantly reduced infection levels, compared to when fungicides were used alone. Looking at how this stacks up financially, we're seeing upwards of an additional £21.50/ha margin over input cost."

"A similar effect was seen in oilseed rape trials, where adding Kantor was found to reduce light leaf spot infection levels, resulting in an additional £134/ha margin over input cost."

Positive results have also been seen in reducing ramularia infection in barley and fusarium infections in winter wheat, making it a truly versatile product, says Stuart. "With challenging seasons becoming the 'norm', aids like adjuvants are going to be vital for getting the most from crop protection and Kantor is the only adjuvant that helps you mitigate the risks across the entire spraying operation, giving the flexibility for success."

THE DOES- EVERYTHING ADJUVANT THAT GIVES YOU THE FLEXIBILITY FOR SUCCESS

- ✓ Enables complex tank-mixing in a single pass
- ✓ Creates optimal conditions for spray mix stability
- ✓ Keeps you spraying in challenging weather conditions
- ✓ More effective protection against invading pests, weeds, diseases, and lodging
- ✓ Improves the efficiency and effectiveness of all products in your tank including herbicides, fungicides, insecticides, PGRs, and nutrition



MINIMISES PRESSURE. MAXIMISES PERFORMANCE.

ACROSS THE ENTIRE SPRAYING OPERATION

"We apply all fungicide with Kantor® as the drift reduction and rainfastness it provides buys us so much time. The improved coverage also helps protect our crops for longer and for complicated tank-mixes it pays to use Kantor®."

Will Parrott, Operations Manager,
Evesham Vale Growers

Scan the QR code
for information.

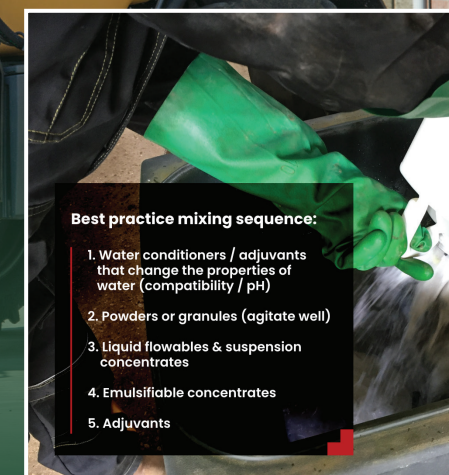


SCAN ME

Kantor® is a registered trademark of Interagro (UK) Ltd

HOW TO AVOID A TANK-MIXING DISASTER

With catchy weather windows often forcing growers to put bigger, more complex mixes in the tank, careful preparation is key to avoid a disaster.



Best practice mixing sequence:

1. Water conditioners / adjuvants that change the properties of water (compatibility / pH)
2. Powders or granules (agitate well)
3. Liquid flowables & suspension concentrates
4. Emulsifiable concentrates
5. Adjuvants

"If we look at weather we've seen this last year alone, it has been incredibly inclement and often left spray operators with just a day or two to get a lot done," says Stuart Sutherland, technical manager at Interagro. "With such tight windows comes 'larger-than-ideal' mixes – which heightens the risk of a problem. Mixing in cold water, at high pH and with hard water makes mixing troublesome."

As well as ensuring products are compatible and best practice is followed, Stuart says a compatibility adjuvant can help overcome some of the challenges.

"If we take Kantor for example it contains a self-emulsifying agent that makes agricultural chemicals more compatible with each other, preventing undesirable interactions and ensuring that multiple products can be used effectively in a single application."

"Adding micronutrients into the mix can be particularly tricky, but compatibility testing has shown Kantor helps them to dissolve, alleviating flocculation and sedimentation so they can be absorbed fully by target plants."

Stuart's top tips for avoiding a disaster in the tank-mix:

- 1 Periodically inspect agitation system for wear and tear and ensure any worn parts are replaced
- 2 Ensure the sprayer is scrupulously clean before starting
- 3 Half fill the spray tank with water before adding any products
- 4 Maintain good agitation throughout the filling process
- 5 Always mix products in the correct order – ensure product labels are referred to and always follow guidance. Carry out a jar test if you're unsure of compatibility
- 6 Add compatibility adjuvant Kantor (at rate of 0.15% v/v) if water is cold and/or adding more than three products into the tank, to help products dissolve. Kantor will buffer to optimal pH
- 7 Add more water as products are added
- 8 Make sure concentrates do not come in to contact with each other in the induction bowl and allow one product to completely clear the induction bowl before adding the next one
- 9 Check slow to dissolve formulations like wettable powders and water dispersible granules are in solution before adding more
- 10 Only mix up what you need – never leave a mixed solution in the spray tank overnight
- 11 Clean the sprayer thoroughly between jobs

interagro.co.uk

BUYING TIME WITH ADJUVANTS

Will Parrott, Operations Manager,
Evesham Vale Growers

With high value, comes high risk, something Will Parrott knows all too well.

Will is operations manager at Springhill Farm – part of Evesham Vale Growers – in Worcestershire. The farm is home to a crop fed anaerobic digester and is the UK's third largest grower of salad onions with a total area of production stretching upwards of 1,600ha (4,000 acres) annually. In addition, as a group, they supply almost a fifth of the total UK market for tomatoes, 52 weeks of the year – supplying both supermarkets and wholesale customers.

Cereal crops grown include maize, wheat and triticale, grown for grain and wholecrop as well as grass. "All of these crops provide feed for our own AD plants," explains Will.

"Our teams manage the entire growing process from seed, drilling, agrochemical and digestate applications, as well as harvesting, and packing for all of the spring and salad onion varieties we sell." "We harvest every product by hand, and we then process the onions in our purpose-built packhouse at Springhill Farm. All salad and vegetable growing is carried out within a 20-mile radius of our packhouse, helping us provide the freshest produce possible."

With such a high demand and value for the crop, careful management is required

at all stages of the growth cycle to ensure maximum yield and quality crops.

Dealing with disease

Disease is a huge threat to vegetable crops, and so Will works closely with his consultant Dominic Swainson, senior agronomist at Agrii. "Downy mildew is the biggest problem and sometimes means we can be spraying weekly for it," explains Dominic.

In terms of the programme, mancozeb and metalaxl-p in the form of Fubol Gold, is key for protection he adds, together with Amistar (azoxystrobin) and Orondis Plus (oxathiapiprolin). There are also early applications of Signum (boscalid + pyraclostrobin) employed to help with white rot, a soil borne disease of alliums.

The main risk timings are April-May and also August-September because this is when moisture and dew points on the leaf are at their highest. "Shorter days means longer time for the dew to be sat on the leaf," says Dominic. "Irrigation in hot dry weather also runs the risk of raising humidity levels and conditions conducive for downy mildew. Many of the fields suitable for onion growing are on lighter soils close to the rivers which also adds to the humidity. Some of our summer production is moved up to the Cotswolds to spread growing period and risk, but they also run the risk of staying damp longer in cool conditions."

The location also impacts fungicide application, forcing Will and his team to frequently spray in less-than-ideal conditions, meaning he often needs to incorporate an adjuvant into the mix. We apply all fungicides with the adjuvant Kantor as the drift reduction and rainfastness it provides are critical to us.

"We never have time to spray in a timely fashion, spray days seem to be getting less and less as the years go by. We end up against it most of the time and Kantor buys us more time."

Kantor, from Interagro, is a highly versatile activator adjuvant which contains a compatibility agent – a self-emulsifying agent which helps products mix thoroughly together, even in cold water, and remain in solution without phase separation. "Kantor also works as an anti-drift aid and benefits coverage and retention, helping keep chemicals where they need to be," explains Interagro's Stuart Sutherland.

Agrii agronomist Kathryn Styan, who also works alongside Will and Dominic, adds that as well as the rainfastness benefits on the farm, Kantor helps fungicide retention on salad onions in particular. "Onions grow very upright, and the leaves are very waxy so it can be hard to get the fungicide to stick on. But effective coverage is absolutely crucial to keep the downy mildew out, so the other major reason we use the Kantor is to help maximise coverage and adhesion to the crop."



Battling weeds

Keeping the salad onion crop weed-free is also essential as onions are not very competitive and this is worsened by a groundsel endemic at the farm, notes Dominic. "With this in mind, we mostly use repetitive low doses of residuals with the addition of Backrow Max to protect the crop."

Designed to enhance residual herbicide performance in challenging conditions, Backrow Max is another specialist activator adjuvant from Interagro which has been proven to reduce drift and enhance retention in the soil.



Delving further into the programme, pre- and peri-emergence applications of Wing-P (dimethenamid-P + pendimethalin), Stomp Aqua (pendimethalin) and Backrow Max. This is followed by repeat low doses of Wing-P and Emerger (aclonifen) all within three weeks of each other.

As well as optimising the efficacy of the herbicides, Backrow Max brings valuable crop safety because it retains the residual herbicides in the weed germination zone – the top 5cm of the soil, explains Dominic. "Consistency of emergence is crucial so we cannot afford to knock the crop with herbicide damage, particularly if we're irrigating in the drier conditions to aid emergence."

Being a minor crop reliant on EAMUs, weed control is also equally challenging in the British Vale of Evesham Asparagus crop – the only asparagus of its type that can be grown in Evesham, says Will.

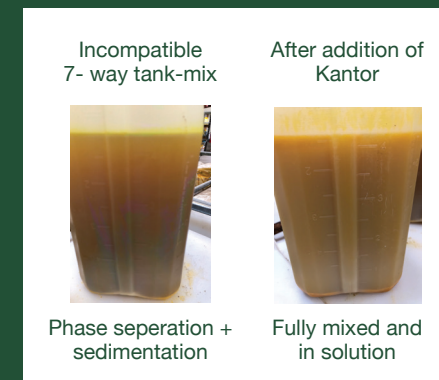
"We try to use a number of different residual herbicide active ingredients with different modes of action to get season long control, as there is only one shot – pre-emergence – before the asparagus spears come up. It's a perennial crop, in the ground for up to 10 years, so crop safety is important too."

Looking at the programme, Will says they rely on a combination of clomazone, pendimethalin, metribuzin and mesotrione, as well as Roundup Biactive (glyphosate) pre- and post-harvest. "It's a complicated mix, being applied in the spring when the spraying water is cold, so mixing can be difficult with settling out."

Saving solutions

The complexities and the associated challenges with this mix came to a head in spring this year. "We went to spray the field on 21 March, and nothing came out the nozzles – it was totally blocked up and we had to spend half a day cleaning out the sprayer and unblocking it, having pumped the contents into an IBC."

Will says that they looked into the spray tank and could see that the mix had settled out, so Dominic suggested trying adding Kantor to see if it could "rescue" the chemistry. "We decided to test it by taking a couple of cans out and added approximately 200ml in to one of the containers."



"We shook it all up and Kantor totally brought the whole mix back into a homogenous solution. We left it overnight and it was still in suspension the next morning."

"So we pumped the contents of the IBC back into the spray tank with Kantor and were able to apply to the fields with no issues to the crop. The lesson learnt was for complicated tank-mixes, always add Kantor. It saves so much time."

Extensive testing over the years has shown that adding Kantor to the spray tank before filling speeds up the mixing process and helps difficult mixes homogenise in the tank and stay in solution, explains Stuart.

"Tank-mixing pesticides offers flexibility, saves time and may increase effectiveness, but it can be problematic. Adding any more than three products to the tank increases the risk of a mixing issue."

Of course, thorough mixing is crucial for pesticide effectiveness, he adds. "Only active ingredients fully dissolved in water can be absorbed by plants. But mixing can be slow and tricky in cold water and some formulations can be hard to mix together, particularly at high pH and with hard water. You could be losing efficacy without even realising it."

Therefore, adding Kantor to the tank before filling is a good insurance to avoid a mixing problem and achieve dependable crop protection performance, says Stuart.

What's more, although growers should take every precaution to avoid a tank-mixing issue, with time and effort it may be possible to recover a problematic tank-mix using Kantor, as Will proved this spring. "Once the products have been successfully re-suspended, apply with constant agitation to avoid any further issues," advises Stuart.

With catchy weather patterns, challenging spraying conditions and crop protection weaknesses all putting pressure on the spring workload, Will says that if you can take the stress out of the operation, save yourself time and make the products mix together properly and perform as they need to then it's a no-brainer.

"Optimising the delivery of your crop protection products to where they are needed is crucial to get the most out of them," he concludes.

FLEXIBILITY CULTIVATES SUCCESS

In an industry where change is the only constant and resilience in the face of adversity is becoming more and more crucial to long-term sustainability, one inspiring young farmer in Darlington has found flexibility is the key to managing risk and maximising success – with adjuvants playing a pivotal role in the strategy.

Farming 240ha in Winston, Darlington quiet days are few and far between for Luke Medd. Luke farms in partnership with his father, Alan and grandfather, Brian, operating a mixed farming system consisting of arable, grassland, beef, and sheep enterprises alongside a mid-tier countryside stewardship scheme, as well as land dedicated to research and development with various field-scale trials. “It’s a proper mixed farm, where the arable, beef and sheep enterprises need to work together, and as such the cropping is extremely diverse,” says Luke.

Diverse cropping

On the arable side of things, West Whorley Hill Farm boasts a 15-crop diverse rotation including wheat, barley, rye, oilseed rape and triticale, with herbal leys, forage and silage crops also grown to support the 400 strong Wagyu beef herd and 400 head of sheep.

“Stubble turnips are grown as an overwinter cover to feed the sheep and forage crops are ensiled to fatten cattle over the winter months,” he explains. “We’re growing forage rye for the first time this year. It’s in the ground now and we’ll take it off in the spring ahead of the maize and other forage crops.”

The rye will be followed by forage maize in the spring and taken off in October, before winter wheat is sown. “As well as the feed value, the rye provides cover over the winter – I hate bare ground and I’m not keen on overwinter stubbles. Therefore, the forage rye is a great way to help improve soil structure and allows three crops in one field in one year.”

Prioritising soil health

The combination of diverse cropping and the livestock enterprises has huge soil health benefits and is an approach that Luke believes is fundamental for the sustainability of his business. “Fifty years ago it was



commonplace for sheep to be considered highly useful on arable farms. They support the rotation, help keep weeds and cereal pests at bay, and perhaps most importantly, the manure releases essential plant nutrients into the soil for the following crops.”

Over the winter months, Luke grazes the sheep on wheat and triticale – putting them on in mid-January and taking them off in March before the first fertiliser application is made. “Grazing the crop also forces additional rooting and tillering,” he adds.

Establishment trials

Soil health is also being prioritised through the approach to crop establishment with Luke part-way through a long-term trial to transition from a conventional plough-based system towards the end goal which is direct drilling of most crops. “This is crucial for the long-term sustainability of the farm – we’re demanding a lot from the soil, so I feel it’s important to repair it.”

Now into year three, one of the main focuses of the trial is to develop a greater understanding of what the soils are currently capable of and what can be done to further enhance the soils properties, explains Luke. “Organic matter levels are already very high and given the time it takes to build organic matter, its paramount that soil analysis is undertaken to allow these levels to be maintained.” To enable this analysis, Luke is working alongside his agronomist Robert Bowes and deploying Agrii’s Soil Resilience Strategy. “The electrical conductivity scanning with Rhiza has enabled the trial to be set up in the field where there is no soil variation at all, so the only difference in the field is the cultivation type,” notes Rob.

And so far, so good, says Luke. “In the first year of trials, there was little difference in winter wheat and spring barley yields when the two establishment techniques were



compared. In year two, the direct drilled winter barley and winter wheat actually outyielded the conventionally sown.”

With the year three winter oilseed rape and winter rye trial now drilled, while it’s too early to make conclusions on yield, Luke has noticed huge differences in ground conditions between the two plots. “We got hit pretty hard with Storm Babet in the autumn. There’s no way we would have been able to travel on the conventional fields, but could have on the direct-drilled plots, so as well as the potential yield benefits, direct drilling is already demonstrating greater ground resilience too.”

Crop protection strategy

Getting the establishment right is just one part of the resilience puzzle and Luke says having a carefully formulated chemistry programme which balances crop protection with strategic usage is key. Both Luke and Rob keep a careful eye on disease and base fungicide applications on the circumstances in front of them, rather than sticking to the same prescribed programme every year. And to get the best out of inputs, Luke says including an adjuvant in with the tank-mix has proven to be a beneficial addition.

“Flexibility is key when it comes to crop protection, and that’s what Kantor gives us – extra flexibility when conditions challenge the performance of our programme.”

Kantor is a multi-functional activator adjuvant from Interagro, designed to enhance compatibility in tank-mixes, control drift and improve both chemical coverage and penetration. It’s claimed to be the only plant protection tank-mix adjuvant with a built-in micro-emulsifying compatibility aid to ensure stability in the tank and enhances the performance of all products in the tank.

“We don’t use it everywhere, but it reduces the risk of products not working, and given the costs of inputs, it makes sense to get the most out of them,” explains Luke.



Rob has been a big advocate for the use of the adjuvant. “On farm every operation is different – different sprayers, different products, different climatic conditions. Regarding the crop protection programme, you can be as technical as you want with the best products in the tank, but if the application isn’t right, it doesn’t matter what’s in there – you’re not going to get the right result. Including adjuvant Kantor is all about mitigating the risks from external factors.”

Adding flexibility

The spring of 2023 was an example of where both disease and spray applications were tricky, adds Luke. “Conditions pointed to a high pressure septoria season, and we were conscious of varietal weaknesses in some of our varieties.

“T0 – comprising Sakura (tebuconazole, + bromuconazole), with magnesium and early season PGR – was applied on 3 April to take care of high yellow rust pressure, but come T1, the septoria pressure was high and ideally, I should have sprayed around 25 April. However, the weather didn’t come right and proved to be a huge challenge – delaying T1 by almost three weeks, meaning it didn’t go on until mid-May.

“In the end, T1 turned out to be a big mix of active ingredients and included Boogie Xpro (bixafen + prothioconazole + spiroxamine), Phoenix (folpet), magnesium and trace elements, and Adjust (CCC). As it was such a small application window, we decided to add Kantor to the tank to ensure everything would mix, work properly, and keep product on the plant by reducing drift.

“Not only does the Kantor influence the fungicides, but it also optimises the availability and uptake of the PGR and nutrition in the mix. Even though it wasn’t windy when we did get on, the leaves were so wet. Therefore, having Kantor in there just gave us a bit of peace of mind in terms of coverage and adhesion.”

Penetrant properties

The coverage and penetrant properties of Kantor also come into their own during autumn phoma fungicide sprays and sclerotinia flowering sprays. “Oilseed rape has such a waxy leaf, which can make penetration of protection products a challenge,” explains Rob. “With phoma control it’s crucial to maximise coverage – and therefore protection – across the leaf. But autumn is a difficult timing to get optimal fungicide coverage on the leaf as it’s often wet and already waxy. This is where we’ve found Kantor to be particularly useful as it reduces surface water tension on the leaf so the fungicide coverage and protection can be maximised.”

Turning focus to spring applications and while the team usually opt for a two-spray sclerotinia programme, the weather in 2023 was “way too risky” to assume that was feasible so timed one spray with Kantor in the mix to increase the efficiency and efficacy of the application on 13 May at mid-flowering, adds Rob. “As a result, we saw no sclerotinia.” Testament to their success, Luke was the proud winner of the NFU’s 2023 Durham Districts Crop Competition Cereal Class – Oilseed Rape.

Luke concludes that as weather patterns seen in 2023 become more the ‘norm’, using partner products like adjuvants are going to be vital. “Weather windows are tight, and that’s likely to continue so it’s crucial to reduce the risk of products not working as well as we need them to. We’re such a mixed, diverse farm that sometimes some jobs get neglected, so we need to increase product efficiency and effectiveness as there’s often such a small window for applications.

“We find ourselves constantly on the backfoot if we don’t get on at the right time, so we end up having to pile products into the tank which is not where anyone wants to be. Using an adjuvant just buys us a bit of flexibility and insurance to help keep us on the right track for success.”

Luke Medd, Partner,
N Medd and Son, County Durham

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