

Hold on a bit longer

“The greatest slowdown in the movement of both clomazone and pendimethalin was observed when applied with Backrow.”

Technical Pushing performance

Keeping herbicides where they need to be is crucial for weed control, crop safety and for minimising potential losses to the environment. CPM digs into new research which shows not all adjuvants have the same effects on herbicide movement in the soil.

By Lucy de la Pasture

Unpredictable weather patterns have made herbicide applications more like Russian roulette over the past two autumns. For those drilling later to combat blackgrass the game has become even more deadly, with the odds stacking up in the weather's favour as herbicide spraying opportunities diminish.

Even if the game of chance has been survived and the pre-emergence is on and ready to do its job by sensitising or taking out weeds as they attempt to push through the herbicide layer, the weather can still upset the applecart.

Keeping residual herbicides in the top 5cm of the soil is more than just nice to have, it's a must for safe and effective weed control at the pre- and peri-em spray timings, says Stuart Sutherland, technical manager at Interagro.

“The surface layer of the soil (0-5cm) is particularly important as it's the germination zone for many weeds and it's also where the

young crop roots scavenge for nutrients during the early growth stages.

“For weed control success, the herbicide must also be located in the top 5cm and be retained in this later so that there's still a lethal dose present to prevent subsequent flushes of weeds that may germinate over time. A longer presence of the herbicide in this soil layer contributes to better uptake of the active substance by germinating weeds, which ultimately increases the effectiveness of the herbicide,” he says.

Reliability and safety

Herbicides vary in their physical properties, which means some are more prone to leaching down the soil profile than others. Stuart believes many pre-em herbicides often require additional support to keep them in the weed germination zone, particularly during heavy rainfall events and in light soils.

“Adding an effective adjuvant partner to the mix could offer the reliability and safety required and this has been confirmed in trials where it's been reported that some adjuvants could help retain an active substance in the top 5cm for longer, compared with when the herbicide is applied alone.”

Research conducted in the Netherlands during 2017 has already shown Backrow's ability to retain both herbicide and moisture in the surface layers of the soil, says Stuart. Earlier this year, new research was commissioned by Agrii and carried out by the Institute of Soil Science and Plant Cultivation in Poland. The aim was to evaluate the effects of different adjuvants, which included Backrow and two competitor products, on the movement of two main

pre-em herbicide active substances — clomazone and pendimethalin.

The two herbicides were chosen for their different properties. Clomazone represents herbicides with high mobility and medium adsorption onto soil particles, so its retention in the top 5cm is most affected by rainfall and wet soils. At the opposite end of the spectrum is pendimethalin, which has low mobility and very high adsorption onto soil particles, hence its efficacy is most affected by dry soils.

Soil cores (30cm deep, 6.7cm diameter) were taken from an arable field in Wroclaw in Poland using a Van der Horst core sampler. The cores were analysed and the soil texture was found to be 73% sand, 21% silt and 6% clay, with a pH of 6.8 and maximum water-holding capacity of 67.8%.

The soil cores were treated with the herbicide plus adjuvant mix in a stationary



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Soil cores were taken to a depth of 30cm from a sandy soil in Poland using a Van der Horst sampler.

spraying chamber in a water volume of 200 l/ha using a TeeJet XR 11003-VS nozzle. After 20 hours, irrigation was applied at 20 l/m² over a one-hour period to simulate heavy rain. The soil cores were then extracted the next day and cut into samples to represent soil layers of 0-5cm, 5-10cm and 10-20cm.

The core samples were initially frozen, then thawed prior to analysis and the core sections mixed, with three replicates taken to give statistically significant results. The residue analysis was performed according to the procedures developed at the Institute, which consisted of three basic steps — extraction of the herbicide active from the sample matrix; purification of the extract; and lastly analysis using gas chromatography for the pendimethalin core samples and liquid chromatography for the clomazone treatments.

So what did the results show? The adjuvants varied greatly in their influence on the retention of both herbicides, with Backrow standing out as the

top performer, says Stuart.

“The addition of Backrow significantly increased retention of clomazone and pendimethalin in the top 5cm of the soil. The level of clomazone retained by Backrow in the top 5cm had the knock-on effect of reducing the amount of active substance found at 5-10cm and at 10-20cm — more of the clomazone was held higher up in the soil core profile,” he says.

“With pendimethalin, the percentage of active measured at 5-10cm was also increased significantly by the addition of Backrow, thereby also significantly reducing the amount of Pendimethalin lost lower down at 10-20cm.”

So what’s the significance of these findings? Stuart says the research draws out the differences between the two herbicides on this soil type.

“Pendimethalin is characterised by its lower mobility into the soil under the influence of rainfall compared with clomazone. This was borne out in the results which showed approximately 10% more pendimethalin remained in the surface layer of the soil, which is a direct consequence of its chemical properties.”

Perhaps of most interest was the difference between the adjuvants in terms of their effect on the migration of both herbicides through the core profiles.

“The greatest (statistically significant) slowdown in the movement of both clomazone and pendimethalin was observed ▶

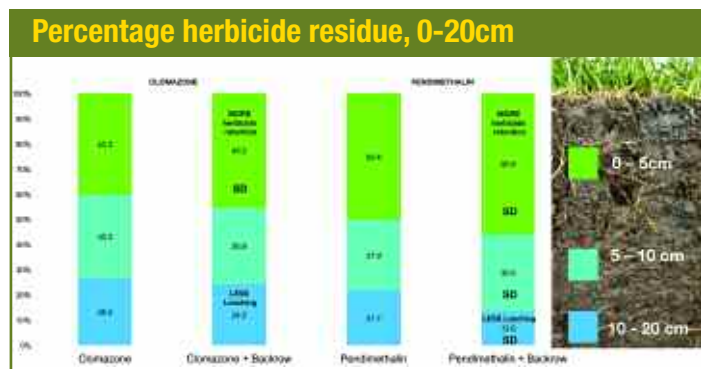
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Source: Prof Mariusz Kucharski, Institute of Soil Science and Plant Cultivation National Research Institute, Wroclaw, 2021.

Pushing performance



David Felce says that even though Backrow has performed consistently well in over a decade of field trials, understanding why is also important.

► when applied with Backrow. Only the Backrow maximised retention of both herbicides in the top layer and minimised the amount that moved into the bottom layer.

“Where the herbicides were applied with the other adjuvants tested, herbicide losses were significantly increased lower down the core profiles,” he comments.

Agrii regional technical advisor David Felce says the research is part of its ongoing efforts to rationalise why some products, such as Backrow, are performing

consistently well in trials.

“We have a big data set for Backrow having now completed eleven seasons of trials work which demonstrate an average 9% uplift in weed control where it’s used with residual herbicides. But even though the data is strong, and Backrow has been well-proven, it’s still important we find out more about why.”

Agrii use Backrow as a datum point to assess other adjuvants but have yet to find anything better, says David. The work to date has helped the company

justify Backrow’s selection as the best available adjuvant to use with residual herbicides.

“We’ve found Backrow works in a number of ways to increase the efficacy of residual herbicides. It helps optimise droplet uniformity, which avoids drift but also ensure good coverage on the soil surface,” he explains.

European studies

“The study in Poland looked at the transference of two herbicides within the soil profile. If there’s better retention in the top layers, then there’s less active present further down the profile.

“This latest piece of work shows that Backrow does retain herbicides near the soil surface and is better than other adjuvants at achieving this. Retention in the surface layers has a twofold effect. One of these is to improve the efficacy of the herbicide in the germination/rooting zone of weeds. The second is to avoid washdown through the profile, which aids crop safety and mitigates potential losses to water.”

David highlights that empirical data, such as gathered in the Poland study, can go ‘out of the window’ when in a field situation. The sandy, light soil used draws out the differences in the movement of the herbicides without other soil properties coming into play but is relevant to all soil types. Data such as this is important to understand the ‘nuts and bolts’ of products so that they can be used to their best advantage, he says.

“Crop safety is always a priority in lighter soil types where herbicide can more readily be washed into the germination zone, causing crop damage. But it’s not a problem confined to light soils — later drilled crops in all soil types have effectively lost a month of potential growing time, so any knock will affect vigour and the crop doesn’t have time to recover as conditions get cooler and growth slows down.

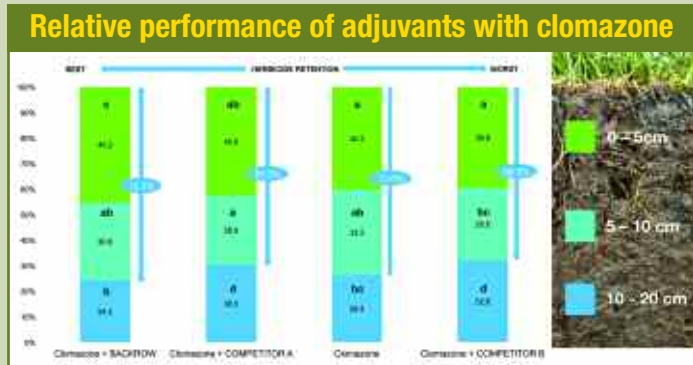
Summary of results

Clomazone

0-5cm – only Backrow significantly increased clomazone retention in the top 5cm. Competitor product A also increased retention of the active, but this increase wasn’t statistically significant. Competitor product B actually decreased it, but again this difference was not significantly different to the clomazone alone.

5-10cm – Backrow retained the highest levels of clomazone compared with the other adjuvants, however statistically there were no differences between the treatments.

10-20cm – the least clomazone was detected in the sample with the Backrow because more of it was retained higher up in the soil profile. Both of the other adjuvants retained



Source: Prof Mariusz Kucharski, Institute of Soil Science and Plant Cultivation National Research Institute, Wroclaw, 2021.

a significantly higher proportion of clomazone at 10-20cm than the untreated and Backrow.

Summary – in terms of the top 10cm, only Backrow retained a higher proportion of clomazone than

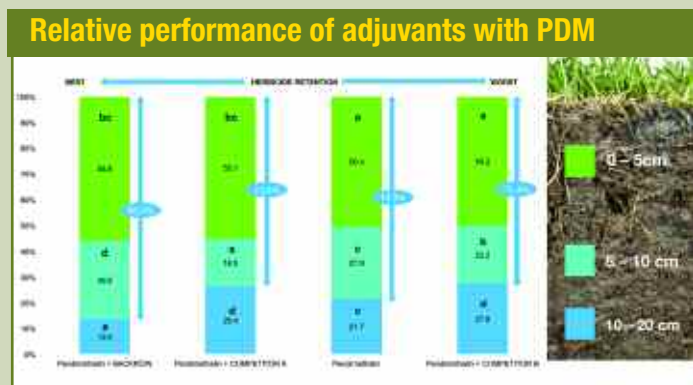
the untreated. A significantly higher proportion of the active had leached through the core profile and was lost down to 10-20cm where the other two adjuvants were used.

Pendimethalin

0-5cm – Backrow, followed by competitor product A, resulted in the highest levels of pendimethalin retention in the top 5cm, both of which were significantly higher than straight pendimethalin and where competitor product C was used.

5-10cm – Backrow helped retain significantly more pendimethalin, whereas both the other adjuvants tested lost significantly more compared with where straight pendimethalin was applied.

10-20cm – with Backrow, there was significantly less pendimethalin detected in this layer, as most of it was retained higher up in the soil profile. With the other two adjuvants,



Source: Prof Mariusz Kucharski, Institute of Soil Science and Plant Cultivation National Research Institute, Wroclaw, 2021.

a greater proportion was held in this layer that at 5-10cm.

Summary – Backrow gave the highest levels of pendimethalin retention of all the adjuvants tested,

at both the top 5cm and 5-10cm soil depths, which was statistically significant over the untreated and competitor product C.

“On heavier soils, sustained rainfall will also cause herbicide movement through the profile, so Backrow also has a role to play here. The seedbed also plays a part in heavier soils as herbicide movement often occurs where seedbeds are poorer and there’s less seed to soil contact, allowing transference through another route.”

Agri trials have time and time again demonstrated that successful grassweed control isn’t just about using an adjuvant like Backrow, he stresses. “It’s about getting everything right — seedbed, nozzle-type and application. If you use the best adjuvant but the boom height is wrong, then you won’t get the best results. You have to do it all.”

Stuart also puts the results into context, explaining that some moisture and herbicide movement is a good thing. “Only in the presence of moisture can herbicides be absorbed into the roots of germinating weeds.

Typically some rain will be required to move the herbicide from the soil surface where it was applied through the soil profile and the amount required will vary for every herbicide active ingredient according to its adsorption and water solubility properties.

Herbicide movement

“However, the latest research has shown that with excessive rain, even herbicides with low mobility, such as pendimethalin, can be lost beneath the weed germination zone — particularly in light soils. It seems as though soil type and/or rainfall are the determining factors rather than a herbicides mobility/adsorption.”

He believes farmers may not be aware of the sensitivity of herbicide actives to movement in their soils and the benefits of adding an effective herbicide adjuvant, such as Backrow.

“It’s not just important for weed control, it can be extremely valuable for crop and

groundwater safety too, particularly when stacking residuals or using herbicides. Any herbicide damage to the crop will not only impact

establishment, it will also reduce the crop’s competitiveness against germinating weeds that will be fighting for light, space and nutrients in the soil.” ■

Pushing performance

At the heart of good crop production lies careful use of chemistry to protect the plant and maintain performance, right through the season. But optimising the efficacy of plant protection products can be challenging, while increasingly restrictive regulations limit just how far you can go.

This series of articles explores the science behind the use of adjuvant and biostimulant tools to help power both chemistry and crop performance, as well as increase understanding of why they’re needed and what they do. We’re setting out to empower growers and drive crops to reach their full potential.

CPM would like to thank Interagro for kindly sponsoring this

article, and for providing privileged access to staff and material used to help put the article together.

Backrow is a vital performance adjuvant for pre- and pre-emergence residual herbicides to work at their best. Backrow powers residual herbicides in suboptimal soil and application conditions by reducing drift and by optimising moisture and herbicide retention in the top 5cm of the soil. The resulting improvements in herbicide coverage, uptake and safety are crucial benefits to help ensure your herbicide programme is both reliable and safe for a weed-free start.



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