



“ The leaf cuticle is the most challenging barrier for the penetration of pesticides. ”

# Control the uncontrollable

## Technical Pushing performance

A lot of thought and attention goes into picking the best fungicide products and rates to do the job, yet efficacy is highly dependent on good delivery to the target. CPM discovers how an adjuvant can help achieve this.

By Lucy de la Pasture

**“When you master the things under your control, the uncontrollable eventually becomes irrelevant.” Those may be the words of an American motivational speaker, but they also ring very true when it comes to considering disease control.**

Many factors that can influence fungicide efficacy are relatively uncontrollable — the weather, the mutations that evolve during the season, the fungicide chemistry available and breakdowns in varietal disease resistance to name a few.

At a time when the sensitivity of septoria pathogens to the two main fungicide groups continues to shift, getting the best performance out of products has never been more important and is largely under grower and advisor control, says Agrii regional technical advisor and Cambridgeshire grower David Felce.

Agrii have a well-established programme for testing adjuvants to sift out the wheat from the chaff and Kantor has proven to be one of these, he says. “We look at the technical story behind adjuvants and put them through their paces to better understand their properties and, most importantly, find out where is the right place to use them.”

### Doing many things

The list of Kantor’s attributes means it’s not an adjuvant that can be easily pigeon-holed — it appears to be capable of doing many things. Stuart Sutherland, technical manager at Interagro, explains that this makes Kantor different to all other adjuvant products.

“Kantor helps the active ingredient on its way from the sprayer tank to its target. Crop protection product efficacy is often under pressure from tank to tissue — from factors such as high pH water, compatibility problems, spray drift, poor spreading and penetration of the leaf and low levels of spray retention on leaf tissues. Kantor is the only adjuvant to offer corrective action at every step in this delivery process,” he says.

The journey starts with the spray water that delivers the chemistry to its target and it’s a factor that can influence the effectiveness of plant protection products and compatibility in the tank. One important influence on the efficacy of some chemistry is the pH of the water.

“The more alkaline the water, the more

rapidly the pesticide breaks down (alkaline hydrolysis) and this will reduce overall efficacy,” explains Stuart.

“Alkaline hydrolysis can be very fast when the pH of the water is greater than 8 or 9. Some pesticides begin to break down as soon as they are combined with alkaline water in the tank and as a result, the active ingredients start to change before the pesticide even leaves the spray tank. For other actives this only becomes an issue if the spray is left in the tank for a period before spraying.

“Reduced product performance may not be obvious. In some cases, the influence of water on the pesticide



SDHIs and azoles have acropetal movement, so will only move from where they land on the leaf towards the leaf tip, explains David Felce.

reduces its effectiveness only slightly, yet enough that tolerant or tough-to-control weeds, insects and diseases aren't well controlled."

David adds that while Kantor isn't a water conditioner as such, it definitely helps with tank-mix compatibility because of its slight buffering effect (to pH6). "We've found that adding Kantor to the tank results in better compatibility, especially in early season when the spray water tends to be cold and when tank-mixes can be quite hefty."

One of the most important ways Kantor influences spray delivery is the effect it has on droplet size and this is something David has looked at closely in Agrii trials. "Typically a flat fan nozzle will produce a range of droplet sizes, with a Number Median Diameter (NMD) to Volume Median Diameter (VMD) ratio of approx. 5:1.

"The addition of Kantor results in a narrower range of droplet sizes, with fewer very fine or coarse quality drops, reducing the NMD:VDM. As a result, the spray is more controllable so there is a reduction in drift and improved spray deposition on the target leaf tissues."

David stresses the importance of spray coverage, especially when it comes to fungicide applications. "Multisites act as a protectant but don't move on the leaf — this means they can only protect the parts of the leaf that the spray covers.

## Acropetal movement

"Azoles and SDHIs have acropetal movement, so will move from where they land towards the end of the leaf. So if the base of the leaf doesn't receive adequate coverage the fungicide will not move in a downwards direction and that part of the leaf will either be completely unprotected or have received a sub-lethal dose of active ingredient."

Once the spray has been delivered to its target, Kantor's other properties help get the active ingredient to where it needs to be. It achieves this by retaining the active ingredient on the leaf, spreading the spray droplets and helping the active penetrate the waxy cuticle of the leaf. Stuart explains how Kantor achieves these many functions.

"The surface characteristics of the leaf influence both the retention and spreading



Stuart Sutherland explains that by paying attention to the water that delivers the active ingredient, product performance can be optimised.

of the spray solution on the leaf surface. When a spray droplet lands on a leaf it may be retained or bounce/run off. Aqueous fungicides have droplets with a high dynamic surface tension which will frequently bounce off, leaving the leaf or ear with poor coverage.

"Kantor reduces the dynamic surface

## View from the field

Agrii agronomist Greg Taylor looks after crops in the North Buckinghamshire, Northamptonshire, Oxfordshire and Hertfordshire areas. In his view there are three key timings that suit Kantor — with certain herbicides, with fungicides in cereals and oilseed rape and with PGRs.

"We've seen in Agrii trials that there's a yield benefit from adding Kantor to fungicide applications. Making products work better is what adjuvants do, the question is why?"



Matt Clark is using Kantor with early yellow rust treatments to help get fungicide to the base of the canopy.

What I believe is that the properties of Kantor that alter the droplet spectrum and better reach the lower parts of the canopy don't make fungicide products better, it enables them to do their job more effectively," he says.

One of the problems Greg identifies is caused by the structure of crop plants and this makes it very challenging to get a fungicide to the basal region of leaves and down into the canopy. "Brown rust can bubble away low down in the crop canopy, particularly at the junction where the leaf sheaf joins the stem. Products like Kantor can help get the most out of the fungicide programmes we're using by getting the fungicide to where it's needed."

Greg sees Kantor as a very versatile adjuvant but favours adding it to the tank at the later T2 and T3 timings in cereals and with sclerotinia sprays in OSR because of its ability to help get fungicide into all the nooks and crannies.

"At this stage the crop canopy is massive in OSR and you need to achieve good fungicide coverage.

Another useful attribute of Kantor is that it also helps improve rainfastness," he adds.

Earlier in the season Greg also believes Kantor is justified when conditions are cool. Often this coincides with PGR applications, when the adjuvant can also aid compatibility and help to safen the multiple tank-mixes that may go on.

Further east, Agrii agronomist Matt Clark is seeing a lot of early yellow rust in varieties across the board, in spite of the cold spell in Feb. Where that would have been surprising a few years ago because cold weather would have subdued infections more, he points out that the new strains of yellow rust affect varieties differently than expected and are much harder to control.

"We've now lost morpholine chemistry, which would have been the go-to for a quick knockdown, and we'd have added a triazole for a more persistent effect. With a smaller range of chemistry now available, we have to be careful how we use it," he says.

That means getting the most out



Greg Taylor favours adding Kantor to the tank at the later T2 and T3 timings in cereals and with sclerotinia sprays in OSR.

of the azoles that remain when it comes to controlling yellow rust and this is where Matt sees Kantor as playing a key role.

"Kantor helps get the spray across the whole of the leaf surface and down to the base of the canopy, which is where the fungicide is needed to knock out yellow rust infection. It's an additional cost that we don't really want but sometimes it's needed."



# Pushing performance



*Kantor reduces the dynamic surface tension of the spray droplets, allowing them to spread out on impact.*

► tension of the spray droplets, allowing them to spread out on impact and this increases the area that the active ingredient is in contact with on the plant's surface. This also reduces the propensity for spray droplets to bounce or run off," he explains.

One of the most effective ways to improve efficacy is by increasing the penetration of the active ingredient into target leaves.

"The leaf cuticle is the most challenging barrier for the

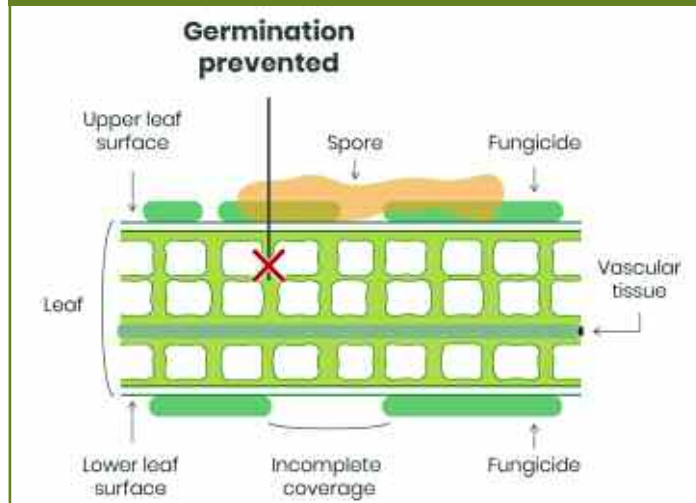
penetration of pesticides, particularly at low temperatures. Kantor, due to its extremely small molecular size (three times smaller than most adjuvants) is able to 'concentrate' the number of molecules on the leaf surface," explains Stuart.

"The entry into the leaf is determined by a diffusion co-efficient, where the higher the concentration the higher the entry. Kantor increases the lateral diffusion of the active across the cell membrane into the leaf by increasing both its contact with the leaf and by increasing the number of entry points it has into the leaf.

So what does this mean in practice? David explains that these are properties that are particularly useful with some fungicides.

"Kantor acts as a good penetrant and this is beneficial because we apply fungicides to the outside of a waxy leaf and the disease is growing inside

## Why coverage matters



*Good spray coverage is important for protectant activity from fungicides.*

*Source: Interagro, 2021*

the leaf, so azoles and SDHIs need to get through the cuticle of the leaf to reach their target site in the fungus.

Some chemistry may benefit from a bit of extra help to get into the leaf and being a large molecule, prothioconazole is one of these. "The faster

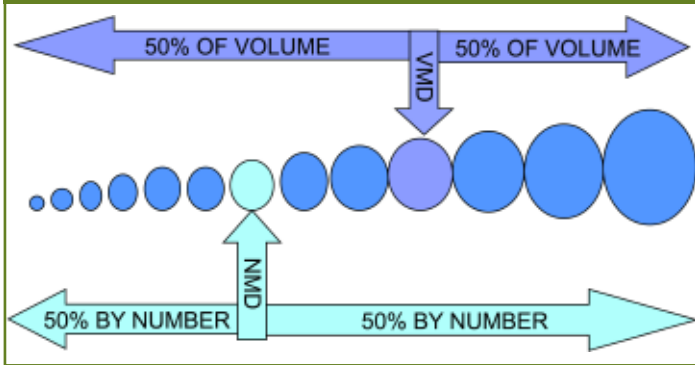
prothioconazole penetrates the leaf, the better because it needs to be metabolically activated to form desthioconazole within the leaf."

Prothioconazole will be forming the backbone of many fungicide programmes this season, with the loss of





## The droplet spectrum



Kantor changes the ratio of NMD to VMD.

Source: Agrii, 2021

epoxiconazole meaning it is likely to be the most widely used azole at the T1 and T2 timings. The improvements in delivery of the active ingredient to the target site offered by Kantor may well also prove useful for early yellow rust control which can linger at the base of the canopy, believes Stuart.

In Agrii trials, one of the fungicides that benefits the most from the addition of

Kantor is Boogie XPro (bixafen+ prothioconazole+ spiromoxamine), with an average yield response of 0.5t/ha which is worth £61.60, adds David.

Folpet has also been shown to benefit from the inclusion of Kantor in the tank in trials, with significant improvements seen in yields even where the levels of disease control showed very little difference between treatments.

## 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.

Kantor is a unique activator adjuvant that helps to optimise the performance of plant protection products at every stage of the spray delivery process, resulting in improved efficacy and crop safety. Visit [www.interagro.co.uk/kantor](http://www.interagro.co.uk/kantor) for more information.



Another situation where Kantor's properties can prove invaluable is with early season PGRs, says Stuart. He describes chlormequat as very basic chemistry that normally benefits from the addition of a wetter.

David agrees and believes Kantor can help ameliorate some of the negative effects early growth regulation can have on crops, particularly when conditions are cool and there's a large diurnal range in temperature. ■

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