The making of maize

> *“Keeping crops free from early weed competition is crucial to protect yield in the first month or so after emergence.”*

Pushing performance

There’s little doubt an effective herbicide programme can be the making of a maize crop. *CPM* gains an insight into how an adjuvant can spice up the mix to help get on top of weed challenges.

By Lucy de la Pasture

For a crop that can grow like the speed of light when the days begin to warm, in its early stages maize plants often look pale and wan, growing slowly and without the poke to battle weeds for those vital elements — sunshine, water and nutrients. At this time, herbicide performance can literally make or break the crop.

Back in the day, pre-emergence residual herbicides, such as atrazine and simazine, formed the foundation to maize programmes, staying active in the soil for very long periods and often taking care of many weeds for the duration of the crop. In modern times herbicide options are very different and now it’s post-emergence herbicides that are the go-to for many growers, explains Stuart Sutherland, Interagro’s technical manager.

Although taking out early competition to the crop is the main aim of herbicide programmes, it’s not the whole story. It’s often said one year’s seeding makes seven year’s weeding and possible seed return, especially where grassweeds are problematic, is another aspect to bear in mind when looking at weed control in maize, he believes.

“Herbicides can also reduce the weed burden in the next crop, so it’s important to ensure applications are as effective as possible. But even with the best product choices, weather, herbicide resistant weeds, herbicide chemical properties and suboptimal conditions can all contribute to poor weed control.”

So how can growers stack the odds to help circumvent these potential problems? By helping herbicides do their job better, believes Stuart.

Significant benefits

About to enter its third season on farm, Interagro’s adjuvant Sorrento has been adding significant benefits to weed control programmes in cereal and maize crops, he says, particularly against some tough to control grasses and for broadleaf herbicides applied in suboptimal conditions.

“Keeping crops free from early weed competition is crucial to protect yield in the first month or so after emergence, particularly in sensitive crops such as maize.”

Applying post-em herbicides can pose a particular challenge when it comes to delivering the herbicide to its target, he highlights. “Weeds can be tricky to hit within the crop. As maize plants increase in size, it becomes more difficult to hit weeds because they become shaded. Some of the herbicide is intercepted by the crop, leading to poor coverage and a reduction in overall control.”

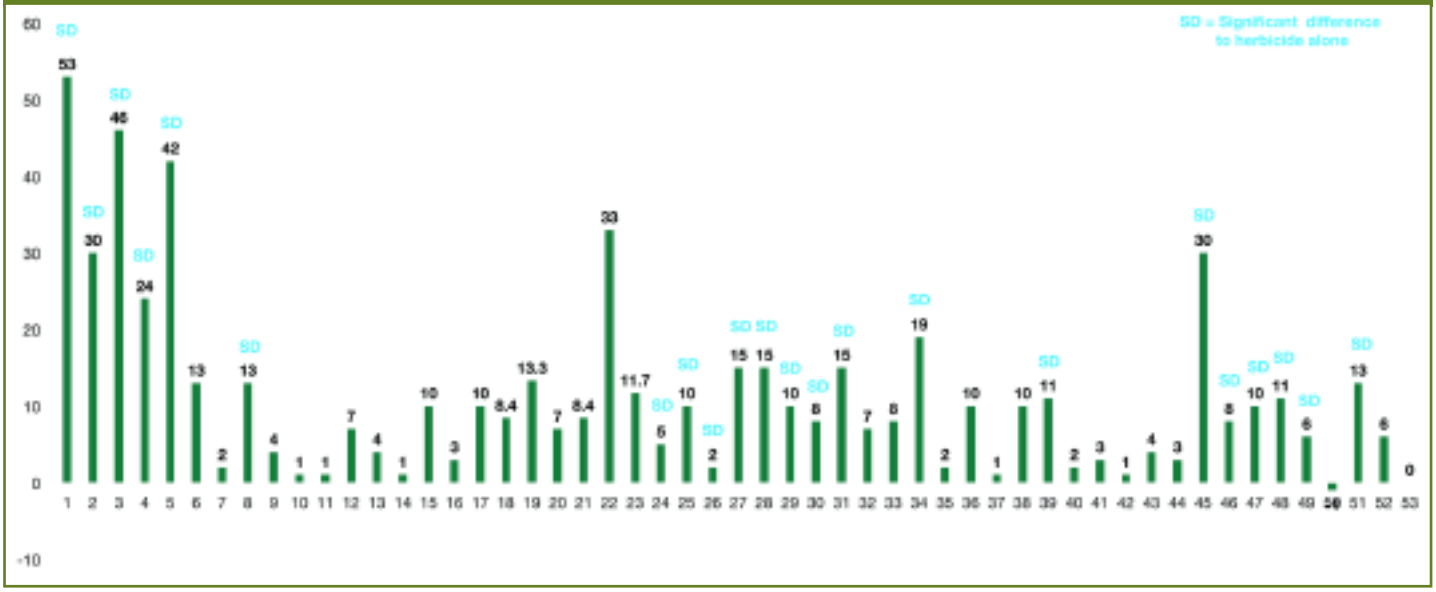
By their very nature, contact post-em herbicides must be distributed onto the leaves of the weeds they’re being applied to control, says Stuart. “As weeds get larger, the surface area of the weed also becomes greater and coverage across the whole weed becomes vital to prevent re-growth.

“Once herbicide droplets land on the leaf, spreading and retention becomes critical. Effective distribution across the leaf’s surface is necessary because contact herbicides don’t move within plants.”

Leaves are designed to protect the plant from water loss and damage by having a waxy cuticle — with variations in waxiness between different weed species. Some spring germinating weeds are notoriously waxy and problematic to control, such as fat-hen or orache, as are perennial weeds like thistles. ▸

Sorrento has been adding significant benefits to weed control programmes, particularly against grassweeds and for broadleaf herbicides applied in suboptimal conditions, says Stuart Sutherland.

% Weed control benefit from addition of Sorrento to a range of herbicides



Summary of 53 trials where Sorrento was used with different herbicides. N=53 comparisons

Source: Independent trials, 2016-2021.

▸ This natural leaf protection poses a bit of a problem when a droplet of spray solution lands on a leaf, he adds. "Approximately 95% of the spray solution is water and this beads on waxy surfaces and is prevented from spreading out due to the high surface tension between water droplets and the waxy surface.

"Poor coverage is even more problematic on hairy leaves, which can suspend spray droplets above the leaf surface, preventing contact. This is why the labels of contact herbicides invariably recommend the addition of a suitable tank-mix adjuvant to help reduce this surface tension and therefore increase the spreading required for effective coverage."

Stuart believes that the extra spreading ability brought by the addition of an adjuvant to the sprayer tank can't be matched by the 'in-can' adjuvants used in herbicide formulations. "For formulated products, the spreading ability is fixed by the pesticides recommended rate per hectare. But for tank-mixed adjuvants the use rates are based on water volume, and this ensures spreading and coverage can be optimised."

Waxiness of the cuticle also varies under different conditions of growth, with cold and dry periods increasing leaf wax and warm or windy periods de-waxing leaves. And thick, waxy cuticles are troublesome because they slow down herbicide uptake by weeds, he adds.

"Post-em herbicides have to penetrate the leaf cuticle and reach the living tissue to be able to exert their effect," he says.

That too poses a problem to contact herbicides as the cuticle is present on the upper and lower surfaces of the leaf and it forms the biggest barrier to herbicide active ingredients.

"As weeds increase in growth stage, their cuticles become thicker. This makes them tougher to penetrate, particularly in dry conditions. Weeds which are particularly waxy, such as brassicas and fat-hen, can be very challenging to control."

The properties of the active ingredients themselves also influence uptake by weeds, adds Stuart. "The ability of an active

When the weeds get tough…

In the Vale of Belvoir, nestled between the borders of Leicestershire, Lincolnshire and Nottinghamshire, Agrii agronomist Martin Frost is right in the arable heartlands. Maize comes and goes in many rotations, so he's been putting Sorrento through its paces in winter wheat.

"Last season I had some big grassweeds in dry growing conditions. The weeds were toughened and starting to grow away so it wasn't ideal for herbicide efficacy," he says.

Martin looked to Sorrento and tank-mixed it with Axial Pro (pinoxaden), where wild oats were the target, and with Avocet (pyroxsulam) in situations where brome species were problematic.

"Sorrento is one of the adjuvants recommended for use with Avocet and we find it has the edge where conditions are unfavourable. In these situations where I don't expect to get full control it becomes the adjuvant of choice."

Last year was Martin's first experience with Sorrento and it's encouraged him to utilise its properties in other ways.

"I have a few fields with wild oats and brome so I'm looking at using Sorrento early when conditions are unfavourable ie cool, dry and growth is slow, or later in the season when grass weeds are larger — which makes them much harder to kill.

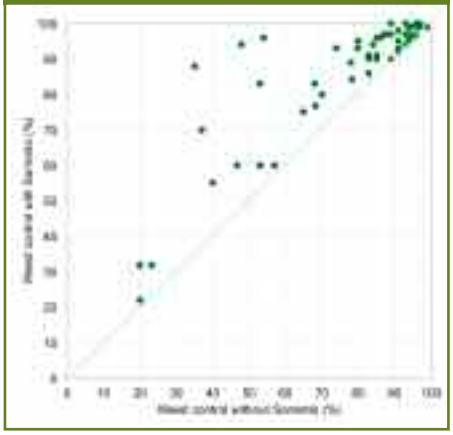
"The idea is to target the grassweeds early, while they're smaller, and to use Sorrento to try and get the actives into the weeds a bit quicker under cooler conditions — though I'll be avoiding any frosts," he adds.

"It can go very dry at about the time you need to apply post-em herbicides in maize and it's very easy to lose weed control," he says.

Martin Frost has had success controlling big wild oats and bromes in cereals by adding Sorrento to the tank.

He also may draw on Sorrento to accompany any sulfonylureas in the spring "if conditions go against you".

Benefit from addition of Sorrento



All trials 2016-2021 in cereals and maize. Range of herbicides and rates compared against a variety of weeds. N=53 comparisons.

Source: Independent trials.

ingredient to penetrate the leaf cuticle and plant tissue inside is determined by its intrinsic chemical properties. Active ingredients with low water solubility have a natural advantage. They're able to penetrate leaf cuticles by simple diffusion through the waxy components, which make up the most part of the cuticle, although this can be slowed in cold/dry conditions.

"In contrast, for active ingredients with moderate to high water solubility the mobility through the cuticle is much less, resulting in less active being absorbed. And this is where many herbicides sit in terms of their solubility," he says.

Stuart suggests that it's these actives, the group with moderate to high water solubility, which benefit most from the addition of a suitable adjuvant as this will help them penetrate the waxy cuticle and increase the flow of active ingredient into the leaf.

"This is highly relevant for the control of difficult weeds and in suboptimal conditions," he adds.

And this is where Sorrento appears to tick all the boxes, overcoming the host of potential obstacles to herbicide performance.

Interagro's claims for Sorrento are backed up by comprehensive replicated trials data, with significant benefits shown for herbicides with higher water solubility in 2021. These include Avocet (pyroxsulam), Samson Extra (nicosulfuron), Callisto (mesotrione) and Ally Max (metsulfuron-methyl+ tribenuron-methyl). The moderately water-soluble Axial Pro (pinoxaden) has also shown benefits from the addition of Sorrento.

Replicated field trials have shown that Sorrento can add significant weed control benefits against hard to control weeds, even in ideal application conditions. In dry conditions, the benefits to overall weed control will be even more beneficial, says Stuart.

Uplift in control

Significant differences in control of fat-hen, poppy and redshank were seen in maize, with better control of blackgrass observed when Sorrento was used with Diniro (prosulfuron+ dicamba+ nicosulfuron). A similar uplift in Italian ryegrass control was observed when Sorrento was used with Axial Pro in winter wheat, though neither of the results on grassweeds were statistically significant by the final assessment. The speed of kill, however, was significantly faster, he notes.

When faced with a young maize crop being smothered by fumitory last spring, William Pitts, agronomist at NB Pitts, decided to give Sorrento a try.

"The crop hadn't had a pre-em in half of the field and here the fumitory was about 100mm across in size."

Common fumitory is a prostrate and scrambling weed which can soon out-compete uncompetitive crops such as maize. William looks after a lot of mixed farms in his Devon region, so grassweeds can be a problem — as was also the case in this field — requiring Samson Extra.

With neither of the post-em herbicides options, Callisto and Samson Extra, offering good control of fumitory, William potentially had a problem on his hands.

"Sorrento was new to me last year but having had good results with other products in Interagro's range, I thought this would be the perfect opportunity to see what Sorrento could add."

William held his growers back from planting maize last spring due to the unseasonably late frosts and cool days at the time when the crop would normally have been going in the ground. When the post-em herbicide was applied on 3 June, the fumitory-troubled crop was at the 2-3 leaf stage and a tank-mix of Callisto and Samson Extra was applied over the whole field with Sorrento.

William Pitts added Sorrento to help post-em herbicides control large fumitory in maize.

"I noticed the weeds showed symptoms earlier and the fumitory was completely knocked out by 16 June. The crop had moved on to nine leaves and was motoring once the weed competition had been removed."

William intends to have a closer look at Sorrento this spring. He won't be adding it to the tank for no good reason but says it could be useful for improving herbicide activity on difficult weeds or even help reduce herbicide application rates in some situations. ■

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.

Sorrento reliability, it's a sure hit

Sorrento is a unique, low dose activator adjuvant that helps overcome herbicide performance barriers, leading to more reliable and effective weed control, by optimising contact and penetration into weeds. Sorrento is approved for use in a wide range of crops and is available to purchase through Agrii.

INTERAGRO
THE ADJUVANT EXPERTS