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Biostimulating cover crops

Biostimulants

Could including a biostimulant seed treatment when sowing cover crops be the key to better establishment and increased soil health gains? *CPM* accesses the latest trial results to find out more.

By *Janine Adamson and Rob Jones*

Biostimulants and cover crops – the benefits of the two in isolation are widely publicised and as a result, their use is now commonplace across many UK farms. But what happens when they’re combined together? Furthermore, could this approach help growers in the North to improve cover crop establishment?

Pondering this concept led to ProCam running an experiment at its trial site at Stockbridge Technology Centre at Cawood in North Yorkshire, working with a seed treatment biostimulant from Unium Bioscience.

However, an initial hurdle had to be overcome – understanding how to apply a biostimulant to the cover crop seed in the first place. “We’ve traditionally worked with liquid-based seed treatment biostimulants which although very positive, do have some logistical limitations,” says Unium’s Andrew Cromie.

“They’re mostly designed to go through

conventional seed treatment systems such as those which dress cereal seed. But some crops such as maize arrive pre-bagged, or in the case of grass, treated seed can clump which is problematic later on,” he explains.

Taking inspiration from the USA and its use of graphite, Unium realised there was greater potential to use the technology for UK-based applications.

Dry lubricant

“In the USA, they often use graphite as a dry lubricant within precision systems but we wanted to know if it could be used as a new means of integrating a biostimulant in a seed treatment formulation instead,” adds Andrew.

Similar to rubbings from pencil lead, graphite is a charged fine powder which forms a slick, film-like coating to seed which enhances flow without clumping. Having undertaken a series of viability trials, Unium has identified a suitable formulation in the guise of Elios-GT.

According to Andrew, the product is a metabolite-graphite complex which as per most biostimulant seed treatments, maximises seed germination, establishment and seedling vigour. What makes Elios-GT different is due to the graphite component, it can be used across a wide range of crops including cereals, maize, pulses, oilseed rape, cover crops and vegetables.

In terms of application to the seed, it’s been coined a ‘salt and shake’ method – a sachet of Elios-GT is added to a bag of seed and shaken. This, plus the vibration from a drill when sowing, allows the graphite to create the even coverage required.

It was this innovation which caught the attention of the ProCam trials team, coupled with a desire to mitigate the challenges associated with establishing

cover crops, which have become increasingly popular since the launch of the Sustainable Farming Incentive (SFI).

Trials manager, Becky Tunnicliffe, devised a protocol to gain a deeper understanding of Elios-GT’s performance and its potential. “This involved three different cover crop mixes which are designed to meet the NUM3 (legume fallow) SFI action, sown at two drilling dates (19 April and 7 May), with and without Elios-GT. A second aspect of the trial explored different establishment cultivation methods.

“From experience, we know that early planting of a cover crop can be less favourable in terms of establishment, but if successful, can provide more time for the plants to flower and is therefore more likely to meet the aims of SFI actions. By using a biostimulant, we hope we can



According to Andrew Cromie, graphite is often used in the USA as a dry lubricant within precision systems but Unium realised its wider potential.



Using Elios-GT to accelerate cover crop establishment can equate to gaining up to a fortnight on drilling date, says ProCam's Becky Tunnicliffe.



In the trial there was a measurable difference in the April-drilled Elios-GT-treated plots (shown right) from cotyledon stage through until stem extension.

overcome this challenge and improve biomass and ground cover," she says.

With this year's unfavourable spring conditions, Becky points out that 19 April was the earliest possible opportunity to drill the plots and where possible, planting would have taken place earlier. Equally, with cold, wet weather continuing throughout spring, the 7 May plots were only sown once soils were warm and moist, however struggled to flower until much later than anticipated.

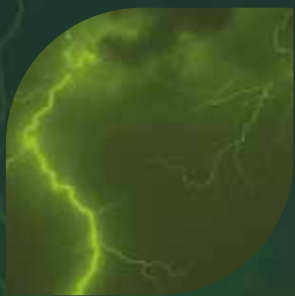
Despite these challenges, the cover crops treated with Elios-GT showed a marked difference, even to the naked eye, she reveals.

"You could particularly see an improvement in the early vigour and ground cover of the buckwheat. As for sowing date, there was a measurable difference in the April-drilled Elios-GT-treated plots from cotyledon stage right

through until stem extension, from a biomass perspective (see tables).

"Anecdotally speaking, there also appeared to be more flowers which means the plots could offer more to pollinators," adds Becky.

As for cultivation method, the trial suggests this depends on what's being planted. "When the cover crop was drilled, a greater breadth of species established



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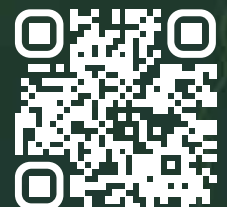
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Early emergence is a critical stage for weed suppression and if this isn't managed correctly, it can be difficult for a cover crop to overcome the subsequent competition, says ProCam's Josh Baker.

% Ground cover by date						
Drilled 19 April	30 April	13 May	17 May	20 May	28 May	05 June
Mix 1	0.5	10	30	30	60	80
Mix 1 + Elios GT	0.5	15	25	30	60	80
Mix 2	2	20	50	60	75	85
Mix 2 + Elios GT	3	25	60	60	75	85
Mix 3	0	3	7	10	15	20
Mix 3 + Elios GT	0	7	20	25	40	50



Anecdotally speaking, with Elios-GT (shown right) there appeared to be more flowers which would offer more to pollinators.

► successfully compared with when the seed was broadcast due to improved seed-to-soil contact. In fact, the buckwheat pretty much failed in this instance.

"We've also seen variation in the success rates of the different mixes as a whole – mixtures with more species diversity have established better, achieving good levels of biomass by June. Whereas a less diverse mix with a high proportion of buckwheat and vetch, haven't done so well," she says.

So what does Becky believe this means? "Using Elios-GT to accelerate establishment can equate to gaining up to a fortnight on drilling date, which is particularly helpful in the North where soils take longer to warm up. This year at Stockbridge was the perfect demonstration of that – really tough conditions and cold, wet soils – so Elios-GT impressed even more.

"With longer in the ground, the cover crops then have a greater chance of delivering the environmental gains and meeting the aims of the appropriate SFI action. With these NUM3 mixes this meant the provision of food for pollinators, improving soil health and suppressing grassweeds," she suggests.

"Beyond that, the trial indicates the importance of treating a cover crop with the same attention to detail as a conventional

break crop, not cutting corners with establishment method, and using other tools to ensure good survival and rapid growth when conditions are sub-optimal."

North Yorkshire agronomist Josh Baker believes as well as meeting SFI criteria, biostimulating cover crops has the potential to deliver much more. "With improved biomass comes better soil cover which means less erosion and increased organic matter – just some of the original aims behind using cover crops in the first place.

"There's also the concept of weed suppression – part of the guidance for several SFI actions including NUM3 legume fallow and AHL1 pollen and nectar mix, is that herbicides can't be used once the cover crop is established meaning a full canopy is the only way to manage the weed seed-bank," he points out.

Although recent positive news has reinstated the rotational aspect of NUM3, the crop is expected to be in the ground long enough to meet the aims of the action. With that in mind, considering weed

burden and the risk associated with poor suppression is critical. Reducing cover crop seed rates or opting for more cost-effective mix options might reduce initial seed costs, but could incur greater spend with herbicides later in the rotation."

Furthermore, he says early emergence is a critical stage for weed suppression and if this isn't managed correctly, it can be difficult for a cover crop to overcome the subsequent competition. "Therefore it's encouraging to see how Elios-GT boosts emergence, particularly in the challenging conditions we experience in the North," adds Josh.

"Having now seen the trials, it's definitely something I'm keen to try in the field. Regardless of the type of cover crop, establishment is key, there's not much point doing it if it doesn't achieve its purpose or true potential."

A final benefit Josh highlights is the fact Elios-GT is a separate seed treatment which the grower can apply themselves, without a tie to specific mixes. "Equally, undertaking a separate pass through a cover crop, such as to apply a liquid biostimulant or fertiliser, is both dependent on field conditions as well as weighing up the associated machinery costs.

"Being the graphite formulation makes for a convenient and appealing delivery mechanism," he concludes. ■

Cover crop mixture	Species (>5%)
Mix 1	Balansa clover, berseem clover, crimson clover, common vetch, linseed, buckwheat, phacelia
Mix 2	Berseem clover, crimson clover, lupin, linseed, buckwheat, phacelia
Mix 3	Common vetch, linseed, buckwheat

Benefits from an integrated approach

An ongoing multi-site trial programme is producing a roadmap for how biosolutions can be used to deliver the most effective results. The work, conducted by Agrii, suggests integrating biosolutions into conventional agronomy programmes can boost both disease control and crop margins, with timings and product combinations having a major effect on their performance.

While in some cases, when used alone, biosolutions can offer a similar control to moderate fungicide approaches, integrating within reduced programmes can produce the same results as full strength conventional treatments, suggests Agrii's Jodie Littleford.

"It's time to take biosolutions seriously; there are fewer new active ingredients coming to the market and all are facing tougher regulatory hurdles," she says. "Then, there's the fact that across the food supply chain, pressure is growing for greater sustainability and lower carbon footprints of production, with reductions in synthetic inputs seen as a key contributor.

"But we know biological solutions don't perform in the same way as traditional

chemistry, so it's critical we understand how to best target their use."

Not all biosolutions are created equal, she says, and it's wrong to group them together as universally effective and beneficial. "Equally misleading is perceiving them as direct replacements for conventional chemistry, product for product, with the most powerful gains observed when both are able to complement each other and create synergy.

"Furthermore, we have clear evidence that using biosolutions early in the programme, before disease takes hold, is where they're most effective," she continues.

Future promise

"Weather conditions during the past two seasons have highlighted just how difficult future disease control might be, but this also provides insight into the promise biosolutions hold. With changing climatic conditions, there's an even greater desire to focus on crop resilience and stress mitigation," says Jodie.

No two seasons are the same and there's no such thing as a 'normal' season anymore, she ▶



Where biosolutions are used early and before disease levels escalate there's a sustained reduction in septoria levels through the season, even compared with full four-spray fungicide programmes, suggests Agrii's Jodie Littleford.

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Benefits from an integrated approach continued

► adds. “We’ve had two years characterised by high levels of disease pressure at the beginning of the season, for example. While last year stalled later on, this year disease levels have progressed right the way through.”

For this season, many experienced a wet period during autumn planting which has meant a wide array of drilling windows with sub-optimal establishment in both early and later drilled crops, she explains.

“The spring continued with wet weather driving septoria levels in crops and again there were few windows for early applications resulting in a curative situation. Wet, mild conditions have been maintained meaning a sustained high disease pressure year and even without gaps in programmes, normal level fungicide programmes have struggled.

“In fact, it’s been a perfect introductory year for two new active ingredients – Iblon (isoflucypram) and Adepidyn (pydiflumetofen) – offering potentially better disease control levels.”

Equally, maintenance of green leaf area has been even more critical in contributing to yield generation, so its likely returns from crop protection spend this year are going to be significant, suggests Jodie.

As a result, some approaches have stood out from others. “Products related to building crop resilience, like elicitors which boost a plant’s hyper sensitive response, have shown particularly positive results, especially used alongside the right supportive elements.

“Generally, these products work best when they’re applied ahead of disease, similar to a flu vaccine. We’re essentially giving the plant everything it requires to better prepare and initiate an immune response for when the pathogen does eventually arrive,” she explains.

“Effectiveness largely depends on when disease starts cycling in the crop, but this isn’t necessarily a new concept if we consider current practices around protective applications of fungicides.”

Agrii has also seen encouraging trends from the use of amino acids. “These building blocks are utilised across a number of biochemical functions including protein synthesis, stress reduction and modulating stomatal opening. Biostimulation of these processes can enhance growth, nutrient cycling, help crops combat disease and improve productivity,” she adds.

Growth promoting compounds such as PGA (pyroglutamic acid) and phosphite have also impressed. “These enhance nutrient utilisation and efficiency, which improves rooting as well as upregulating photosynthesis



Integrating biosolutions within reduced fungicide programmes can produce the same results as full strength conventional treatments, suggests the trial. Left: Agrii standard 4-spray fungicide programme. Right: Agrii bio approach T0 and T1 followed by Agrii standard fungicides at T2 and T3.

which in turn provides the plant with more energy and resources to thrive,” says Jodie.

Trial protocol

With all of this in mind, to date, the Agrii programme trials have adopted three levels of application – a full biological approach, a 50% reduction in synthetic inputs, and then a fully integrated approach supported with a robust fungicide programme.

According to Jodie, these have been tested alongside more traditional approaches using different levels of fungicide input, with a range of encouraging responses.

“Where we use biosolutions earlier in the programme and before disease levels escalate we see a sustained reduction in septoria levels right through the season, even compared with full four-spray fungicide programmes.

“Where this pattern starts to break down is when septoria levels have already started to build in the early stages of the spring so the effects of the biosolutions on crop resilience are potentially limited.

“In terms of yield and margin, all three approaches have generally been equivalent, if not better, than our standard fungicide programmes which indicates how much biosolutions can contribute to crop performance success.”

In trials this current season, similar trends have emerged, even under the heightened and sustained disease pressure of the 2024 season, highlights Jodie.

“Early septoria scores in one trial found much lower levels when using elicitors versus standard chemistry. Other trials visited in July 2024 in South Wales, where septoria pressure has been extreme, showed plots treated with a standard fungicide programme with virtually no green leaf area remaining.

“But plots in the same trial with a fully biological approach at T0 and T1 had significantly more green leaf area remaining on the flag leaf. So even in a year such as this, biosolutions are stacking up against traditional chemistry when used in the right way within a programmed approach,” she says.

So far, all trials have been field-based, but new developments at Agrii’s Throws Farm in Essex will allow mode of action and integration of biosolutions to be looked at in much more detail. The construction of a large environment-controlled glasshouse will facilitate the removal of external ‘noise’ such as weather, variable growing conditions and pests, from future trials.

According to Jodie, this means focusing specifically on what the biosolutions actually provide while improving the management of aspects such as spray timings and crop nutrition.

“That should provide a more accurate picture of what the biosolutions are contributing and what the best combinations with other crop inputs are. All told, our objective is to cut through the claims and instead hone-in on what the real grower benefits are and how these can be replicated on farm,” she concludes.