

Providing a natural boost?

Biostimulants

Growing pressure to farm more sustainably and in-line with the environment has meant the buzz around biostimulants has only got louder. *CPM* takes a look at what some of these claim to do to enhance plant health and crop yields.

By Rob Jones
and Melanie Jenkins

An ever-increasing breadth of data is showing that applying supplementary silicon to field crops can boost a plant's natural defence mechanisms. This can increase resilience to pests and disease, as well as improve nutrient use and yield quality, according to James Kennedy of Orion Future Technologies.

It's a bold claim but one that's underlined by data, explains James. "Research has shown that elevating silicon levels in a crop helps to strengthen the plant's natural defences. Split field data has shown the benefit of applying plant available silicon to a wheat crop in Kent. Following four applications of a silicon biostimulant — Sirius — the treated wheat crop accumulated over 500mg/kg more silicon than the untreated crop, which increased the wheat's health and resilience.

"The outcome at harvest was a consistently high yield which saw the treated sample weigh 0.3t/ha more than

the untreated," he says.

Although some silicon is available in the soil, this varies with soil types and overall soil health. Orion has developed a way to apply it as a foliar spray or seed treatment, which offers growers the opportunity to boost a crop's silicon uptake. "Results across a variety of crops have demonstrated that applying silicon biostimulants is reducing losses and increasing yield," adds James.

Improved plant defences

Silicon accumulation improves the physical strength and resilience of plants against attack by pests and diseases, he explains. "By improving the plant's defence response, higher silicon levels can also help to reduce damage from aphids and fungi. And the biochemical effect of higher levels of silicon in the plant reduces the feeding appeal for predating pests like aphids. In addition, silicon increases the leaf cuticle thickness, enhancing the plant's physical barrier to reduce the threat of fungal hyphae penetration or cabbage stem flea beetle."

While the accumulation of silicon in the plant has shown yield benefits, trials have demonstrated this is due to a combination of silicon and other nutrients.

"In an accumulation study with KWS, we were able to establish that applying Sirius to different varieties of wheat (KWS Palladium, KWS Ultimatum, KWS Dawsum, KWS Zyatt and KWS Extase) helped increase the uptake of silicon. However, this also helped boost the uptake of nutrients such as calcium, copper, iron, magnesium, manganese, zinc, and nitrogen."

The Sirius treated crop contained more than double the levels of calcium, magnesium, and manganese compared

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with the untreated. It also saw an increase in copper of more than 50%, he adds.

"Increasing the availability of nutrients to a crop will improve plant health and strength, but also add biomass which will carry through to harvest. Using a biostimulant doesn't have a negative effect on the soil — a healthier crop that's less dependent on inputs will also leave healthier soil for the next rotation."

In a similar trial carried out in Brazil, silicon was applied to a wheat crop to improve resistance to bird cherry oat aphid (*Rhopalosiphum padi*). Silicon accumulated by the crop helped to create a barrier to aphids by triggering the jasmonic acid-dependent defence of the plant.

Because silicon only becomes available to plants in its monosilicic form, Orion has ▶



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Last month Defra clarified its position about the implementation of the rules for ammonia mitigation with urea fertilisers, which means that as originally planned, farmers must use inhibitors (or other permitted forms of mitigation) after April 1st 2024. It's crucial farmers across the UK adhere to self-regulation and deliver the required reductions in emissions, alternatively Defra will revert to formalised regulation.



Scott Baker,
National Agronomy Manager

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Increasing the availability of nutrients to a crop should help improve plant health and strength, but also add biomass which will carry through to harvest.

► developed 'iNHIB Technology' that makes silicon available to the crops in this way to help mitigate plant stress, adds James.

"This formulation technology also allows products to be easily tank-mixed with plant protection products with no compatibility or efficacy issues. This makes their inclusion very convenient to growers wanting to apply silicon without making additional spray applications."

With an ever-increasing

Switching on yield potential

With many growers venturing back to oilseed rape after a challenging few years, achieving a good yield at harvest is essential for minimising the on-going risks associated with growing the crop.

Although the market for biostimulants is quite crowded, YieldOn from Valagro claims to work differently to the rest and effectively allows growers to 'switch on' yield potential, says Mike Garner of Valagro UK.

"YieldOn is a combination of three natural plant extracts, including seaweed, with the addition of manganese, zinc and molybdenum," explains Mike. "It's been developed using cutting-edge genomic technology and works by stimulating cell number and size in the developing grains, as well as enhancing the movement of sugars and nutrients into the grain sites."

Trial work commissioned by Valagro in 2019, highlighted statistically significant yield responses in OSR from a single application during flowering. These were carried out by independent contractor Cropsure at two different sites and involved comparing two single applications, made at different timings during the flowering period, with untreated crops.

Applied at a rate of 2 l/ha, YieldOn provided a yield benefit when applied at early and mid-flowering, explains Mike. However, the application at mid-flowering had the edge over



Trials highlighted a statistically significant yield responses in OSR from a single application of YieldOn during flowering.

the earlier timing.

When applied at early flowering, the product was responsible for a 0.44t/ha yield uplift in the first year of the trials, and 0.12t/ha in the second season. At mid-flowering, the treatment recorded a yield response of 0.49t/ha and 0.17t/ha respectively over the two years. Oil content also improved at early flowering compared with the control crop.

Delving into the economics, Mike says these responses can stack up well financially. "Based on a standard OSR price of £350/t, plus 1.5% of contract price for every 1% over 40% oil content, the two-year averages of these results show growers could receive an additional £12.56/ha in oil bonuses when using YieldOn during early flowering, compared with untreated OSR.

"In terms of yield, the mid-flowering timing gave the best returns over the two years, and this additional yield is estimated to provide an increased crop value of £124.00/ha, over untreated crops."

number of crop protection products being withdrawn or failing to gain registration in the UK, and pressures to reduce chemical usage, it's clear that the development of biostimulant solutions can help to reduce the reliance on traditional chemistry, he believes.

However, silicon biostimulants don't seek to claim crop protection status and aren't

an alternative to pesticides, emphasises James. "Silicon biostimulants should be used as part of a sustainable pest and disease management strategy. Integrated pest management shows us that it's necessary to consider as wide a range of solutions as possible to develop ways to control threats to our food chain and productivity," he concludes. ■

New tools in the toolbox

The early days of January this year saw the UK launch of a new face in the biostimulants market, with the French company Ga^aago debuting at LAMMA. The firm brings a series of pre- and probiotics to the table, offering enhanced soil and crop quality, but how are these different to what's already on offer?

The foundation of the firm's range is Nutrigeo, a soil prebiotic, explains Mark Shaw of Ga^aago. The product, which contains no living elements, consists of polysaccharides, various organic acids and complex trace elements and acts a stimulus for other living elements of the soil, such as fungi, so that these create a better mycelium structure. "This helps to restructure the soil, improving overall soil health and nutrient availability," he says.

"A knock-on effect is the creation of stable organic matter which results in greater carbon storage in the soil of 3t/ha per year from an annual application of Nutrigeo," explains Mark. "Whether it's issues like compaction or waterlogging that farmers are trying to alleviate, growers should notice a visible difference in their soils within the first six months from application."

For those looking to optimise their fertiliser applications, Ga^aago's Free N100 biologically fixes nitrogen from the air. This root probiotic is based on Azotobacter chroococcum, a naturally occurring bacteria found in soils across northern Europe, explains Mark. "This works in the rhizosphere, so is independent of the climate and



Ga^aago claims its Nutrigeo product can improve mycelium structures in the soil.

works in a symbiotic relationship with plant roots. The bacteria fixes atmospheric N and, when plants require this, they feed the bacteria with root exudates and in return the bacteria feeds the plant N.

"This means that plants get N when and as they require it," he adds. "This can be helpful to fill any gaps where there hasn't been an opportunity to apply fertilisers and will fix approximately 30-35kgN/ha over the life of the plant in an available form."

Working in a similar way, Free PK uses bacteria – *Bacillus mucilaginosus* — to free up nutrients already available in the soil, says Mark. "Quite often there are nutrients in the soil, but they just aren't available to the plant."

The bacteria release organic acids around minerals resulting in the solubilisation of nutrients that can then be taken up by plants.

"At a time where farmers are constantly getting tools removed from their toolboxes because of regulation we're trying to bring some new ones back in to allow for a more holistic approach," adds Mark.



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